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Modifying River Bed Levels, Water Levels and Flows

5.7 Felling trees into a channel to create flow diversity

RIVER BURE

LOCATION - BLICKLING ESTATE, NORFOLK. TG161301

DATE OF CONSTRUCTION - PHASE 1 - Nov. 2008
- PHASE 2 - Nov. 2010

LENGTH - 300m

COST - APPROX. £5,000 (INCLUDING STAFF WAGES, CHAINSAW FUEL AND VOLUNTEER EXPENSES)

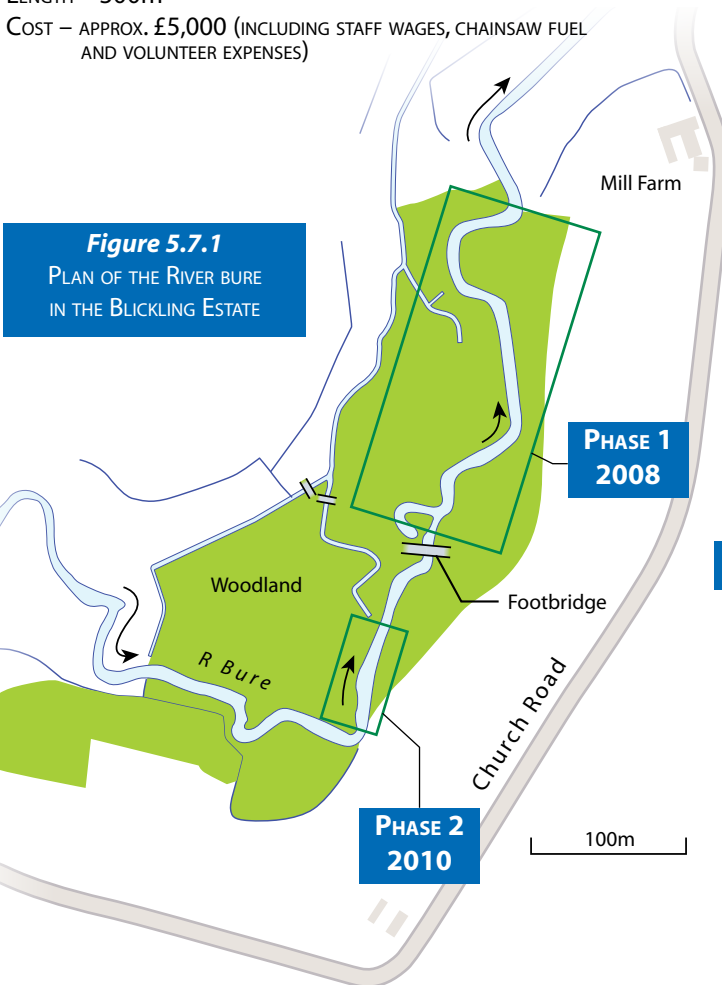


Figure 5.7.1
PLAN OF THE RIVER BURE
IN THE BLICKLING ESTATE

River Bure	Low energy, gravel
WFD Mitigation measure	
Waterbody ID	GB108049007170
Designation	SAC, SPA, SSSI
Project specific monitoring	Fish, macroinvertebrates, plants, sediment transport and distribution, flow velocity, substrate characteristics,

Woody material (entire trees) was felled into the channel in as natural a form as possible to increase flow variability. It was envisaged that the trees would either create scour or trap mobilised silt and sediment. Marginal deposition would eventually vegetate and stabilise creating a faster flowing, narrower channel with clean gravel substrate.

Design

There was no formal desk-based design process for this technique beyond the broader planning of the improvement of the river reach. Rather, an intuitive approach was used in the field, as near as possible forming natural features with natural materials.

Flow diversity was achieved by felling whole trees in to the river channel and leaving them in situ as much as possible. Generally the selected trees were those which were leaning over the water already which were likely to eventually fall into the river. An application for Flood Defence Consent was submitted to the Environment Agency detailing this approach. The proposed works were accepted as in this particular location it was determined that there was no increase in flood risk to adjacent properties.

As a channel had to be kept open, some repositioning was made with the use of a small hand winch. Often a second felled tree pinned down one already lying in the water, so it was not always necessary to stake the trees to keep them in place. It was necessary to stake some of the trees. 1.5m peeled and pointed stakes were used to wedge the butt end of the felled trees until the tree became waterlogged. It was envisaged that a certain amount of movement of trees would occur in flood events.

The site was intended to remain dynamic adjusting to natural processes. The remaining riparian tree cover will continue to contribute fresh woody material. Due to the relatively low cost, materials used and support of the landowner it would be fairly simple to move the trees if problems arose, so there was scope to be bold with the works.

Description

The aim of the project was to re-establish the natural river processes interrupted by past management and to provide morphological, hydrological and habitat diversity. The project was completed in two phases. The project was low cost, used on-site materials and had minimal impact on the riparian zone.

The River Bure at Blickling National Trust Estate had been historically altered for milling and, more recently, meanders were cut off at the end of the 19th century. The local channel gradient is moderate (between 1 in 300 and 1 in 800) and the river has a gravel bed with a significant overlying silt layer in an over-widened channel. The river is flashy, prone to high flows during and after heavy rain especially in the winter. The riparian and adjacent land is well wooded, with alder and willow carr and remnants of ancient woodland.

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1 Select trees which are already leaning over the water and are likely to eventually fall in the river.



2 Fell them so that they remain attached to the stump (often referred to as 'laying' or 'hinging') or so that part of the trunk stays on the bank. Allow branches to penetrate the river bed to increase the stability of the tree and to prevent the tree from rolling or being mobilised by the flow.



3 Modify the position if necessary to maintain an open channel if the felled tree blocks the flow. If absolutely necessary, prevent movement with a 1.5m stake.

Once the wood is waterlogged it will become less prone to movement at low to medium flow events. However, significant flood events may still cause major re-working and movement. Similar schemes elsewhere have used tethering to prevent downstream movement of placed woody material.



4 Fell more than one tree on top of each other to provide a greater mass to the structure and give a dense web of branches.

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Subsequent performance

Up to 2013 the technique has had no negative outcomes and no adaptive management has been necessary. There is a possibility that some of the material may move so the site is visited by the National Trust countryside staff a few times a year, especially after high flows, to see if there are any issues. So far no significant movement has occurred, despite significant flooding which occurred in March 2013.

There is scouring of fine sediment and exposure of gravel in areas where the structures have concentrated flow. The movement of sediment and the colonisation by marginal plant species around the wood structures can be seen. These observations appear to support effective narrowing of the over-widened channel and an increase in physical habitat complexity.

This technique has caused a local change in attitude to in-channel woody material in that requests from the fishing club to remove trees that have fallen in to the river have all but ceased. Instead the request is to modify their position so as not to block the river. This also has a benefit through reduced management costs from not having to use large machinery to lift or winch trees out of the river.

Pre-works monitoring was only undertaken for the second phase (2010) and consisted of flow velocity, substrate characteristics, fine sediment distribution, bed topography and aquatic plants. An upstream wood-free section has also been similarly monitored. Repeat surveys have been undertaken in 2010, 2011 and 2013. Results will be published at a later date as part of a PhD thesis. The project team has committed to continuing the survey work to enable critical evaluation of the works.



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Before – Over widened silt laden channel



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After – With narrowed channel and vegetated berms where silt has built up downstream of the felled trees – 2012

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Reference material – Click [here](#)