

Restoring Meanders to Straightened Rivers

1.7 Reconnecting remnant meanders

RIVER LITTLE OUSE

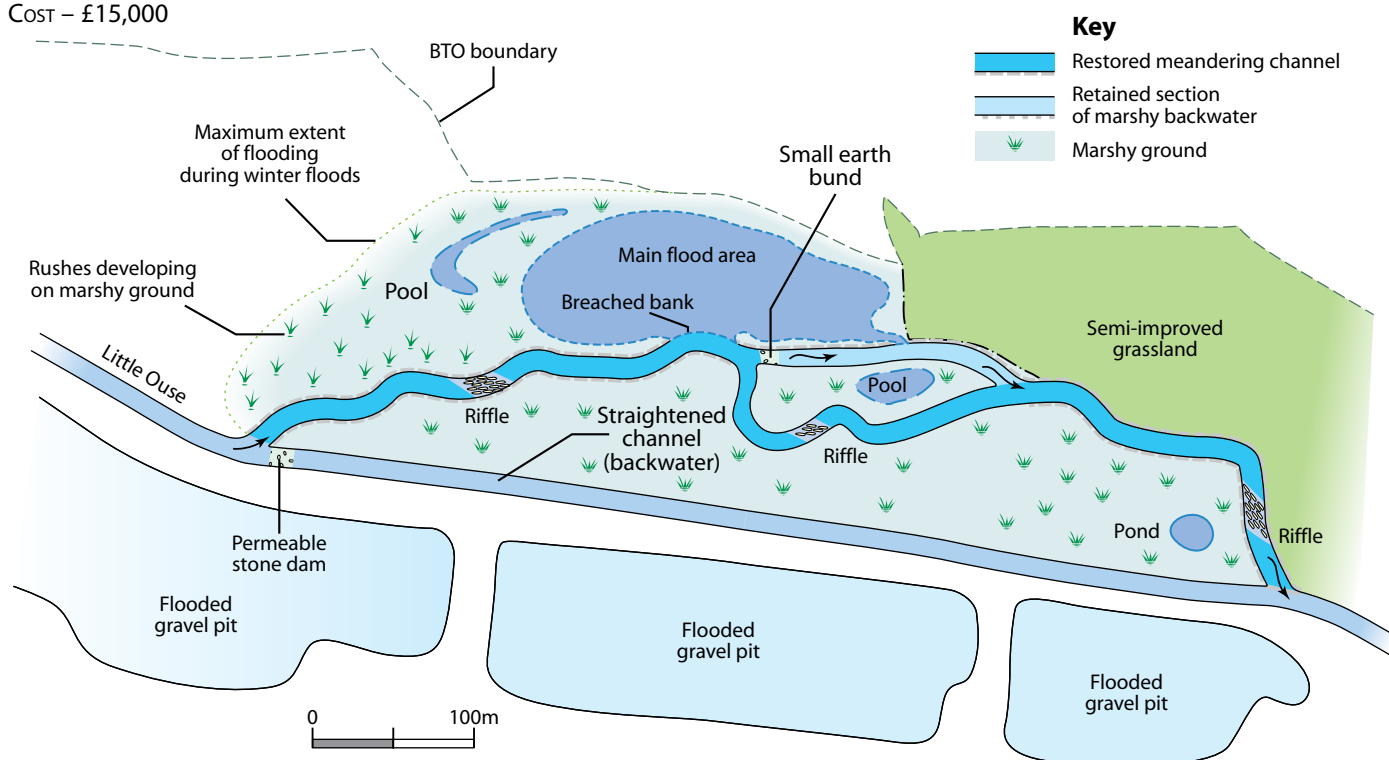
LOCATION - THETFORD, NORFOLK TL870812

DATE OF CONSTRUCTION - 1994

LENGTH - 900m

COST - £15,000

Figure 1.7.1
PLAN OF MEANDERS



Description

The Little Ouse is a low gradient river draining an area of mixed land use (forestry, dry grassland and arable). Sand and gravel extraction has taken place as part of a 30 year programme within the valley. This had led to 900m of the river being bypassed by a new canalised channel.



Canalised course of the Little Ouse

In 1991, the site and adjacent land was purchased by the British Trust for Ornithology (BTO) to create a wetland bird reserve. BTO approached the Environment Agency to assist with restoring flows to the meandering course. The grassland on either side of the old course was beginning to dry out due to the lower water levels within the new channel, and resultant lack of connectivity between river and floodplain.

The new canalised course was straight, trapezoidal, circa 6m wide and 1-2m deep, with 3m dry, steep banks dominated by tall ruderals and grass. In-stream habitat was poor, macrophytes were confined mainly to the shallow margins, and the substrate was dominated by sand with some silt and gravel.

The old meandering channel remained as a damp depression, merely infilled at each end during the excavation of the new cut. By restoring flows to the old channel 900m of diverse river habitat incorporating deep pools, runs and riffles would be regained, in contrast to the uniform, slack and deep water of the canalised section. Additionally, the landowner was keen to see the land adjacent to the meanders flood, restoring the lost hydrological connection between river and floodplain.

Restoring Meanders to Straightened Rivers

1



Looking downstream along the old meanders

The marshy habitat that the isolated meanders provided would be lost through reconnection, so it was decided to retain and bypass a short 120m section of the old course. This would provide a refuge for plants and animals and a source for colonisation of the proposed wetland reserve.

Design

Assessment and design of the restoration scheme was kept simple and carried out 'by eye', since the old channel was still intact as a reedy, damp depression meandering through the valley bottom.

The old course was reopened by excavating the 'plug' material from the upstream and downstream ends of the meanders. Some tree work and minor regrading was carried out along the remaining length of the original course where necessary. The very small amount of spoil was spread within the immediate reach of the excavator. The restored Little Ouse now has an average channel depth and width of 1m and 8m, respectively.

Using a 50 foot (15m) reach dragline, a boulder and stone structure was placed into the river at the upstream end of the canalised reach (permeable stone dam on Figure 1.7.1), to raise the river level by 0.6m. This would ensure that approximately 90% of flow would be routed through the re-opened course.



The structure, 6m wide by 10m long by 2m high, was constructed using 1.5m by 1m prefabricated concrete blocks below a 0.75m depth of boulder sized limestone, surfaced with 0.25m of cobble sized limestone. The 'weir' was designed to be permeable to provide a sweetening flow to the canalised channel. Flows, where levels exceed the 2m crest, will overtop and discharge through the retained canalised 'flood relief' backwater channel.

In the middle of the meandering reach a marshy backwater section was isolated with a bund and a sluice at the upstream end to protect the habitat from high velocity flood flows.



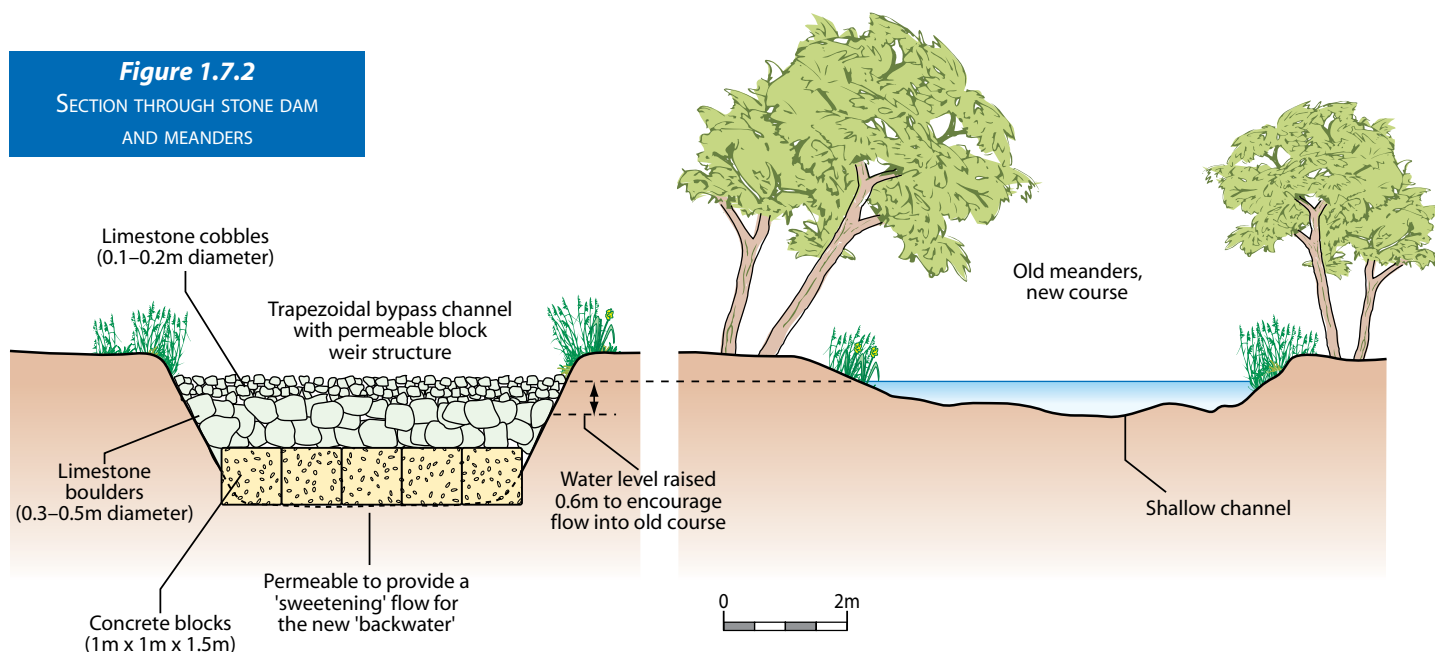
Sluice, bund and upstream flooding area

The meanders needed to be 'unplugged' at both ends

Restoring Meanders to Straightened Rivers

Figure 1.7.2

SECTION THROUGH STONE DAM
AND MEANDERS



Subsequent performance 1994 – 2001

Surveys show that the meandering channel is sustaining a diverse aquatic invertebrate community, with stonefly (*Plecoptera spp.*), mayfly (*Ephemeroptera spp.*) and snail (*Gastropoda spp.*) species which are not present in the canalised section. Fish species such as chub (*Squalius cephalus*) and dace (*Leuciscus leuciscus*), also not found in the straight section, are using the reconnected reach as spawning and nursery habitat.

The re-establishment of marshland plants on this site has taken longer than originally anticipated. This may be due to a combination of factors, including an inadequate seed-bank, build-up of silt deposits, and prolonged inundation. However, wildfowl and waders have not been slow to use the greater areas of shallow standing water, including nesting pairs of lapwing (*Vanellus vanellus*).

After reconnection
to the river



Restoring Meanders to Straightened Rivers

1



The restored Little Ouse

Sections of fencing have been erected along the meanders to restrict grazing and poaching by cattle, and to allow marginal plant establishment.

Original Information Providers:
Geraldine Daly
Chris Gregory

Some scour around the weir was discovered, due to overtopping in high flows. The length of the dam and a section immediately upstream has since been revetted to minimise further scour.



Flooding along meanders – Spring 1999



Restoring Meanders to Straightened Rivers

1.7 River Little Ouse 2013 Update



© BTO

Main breach along the meanders – 2002



© BTO

Same bank reinforced using blue clay – October 2003



© BTO

Breach of the reinforced clay bank – March 2004

River Little Ouse	Low energy, gravel
WFD Mitigation measure	
Waterbody ID	GB105033043090
Designation	None
Project specific monitoring	Vegetation, Birds, Water level

High river levels resulted in scour of the more vulnerable sections of meanders causing breaches in the banks. These were repaired using clay in 2002, but subsequently failed and further breaches occurred. These were exacerbated by a fallen willow (*Salix spp.*) branch that deflected the flow.

In the context of this project, the original design was aimed at encouraging seasonal inundation on the floodplain to create suitable nesting habitats for waders such as lapwing, as well as providing winter wildfowl refuge. These unpredicted breaches have, instead, resulted in permanently ponded areas.

The increased regularity with which the floodplain is inundated, combined with the topographic variability of the floodplain, means that lower areas now remain permanently wet. At this site this is not acceptable. In other locations however, this could be deemed as providing additional habitats on the floodplain whilst working with natural river and hydrological processes. In addition the project has had positive benefits for the river. In flood flows fine silt is deposited on the floodplain resulting in a clean gravel bed.

Clay bunds and the subsequent implementation of staked-in pre-planted matting and pallets installed to prevent erosion of these highly vulnerable banks have not been successful. In the case of the latter measure, it is possible that cattle poaching exacerbated the destruction of the matting and pallets.

Monitoring of the vegetation has indicated that the banks greater than 0.35m in height have become well vegetated, indicating greater potential stability where overtopping is less frequent (i.e. time between floodplain flood events is designed to allow vegetation to establish). As a result a decision has been made to raise banks slightly from the original design. This is to ensure future over-topping only occurs when banks are stable and not vulnerable to erosion during the flood season. Young willow shrubs will be used to build up the banks to create 'living revetments'. Work will commence in September 2013 at an approximate cost of £6,000.

Restoring Meanders to Straightened Rivers

1



Initial vegetation growth
on pre-seeded coir matting
– December 2005

© BTO



Erosion of the coir matting
– April 2008

© BTO

This project demonstrates the need to understand the specific characteristics and vulnerability of your site. Whilst lowering a bank to create a breach for floodplain reconnection is a positive idea, getting the height correct to enable vegetation to establish and create some stability between overtopping events is critical. In addition it has highlighted that monitoring the site can allow you to adaptively manage and enable you to resolve any initial issues.

Contact

Chris Gregory, British Trust for Ornithology
chris.gregory@bto.org, 01842 750050

