



Woody debris in rivers (England and Wales) – supplementary case studies

Quick guide 139_13

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This document is for staff in Asset Performance,¹ Partnerships and Strategic Overview,² NEAS, ncpms and Fisheries and Biodiversity (F&B) who undertake or regulate work near rivers.



Document
details

Case study 1. Arborfield Weir (River Loddon) – retaining an existing tree to restore floodplain connectivity



Related
documents

Background

In 2011 a bypass channel was constructed to enable fish passage and to help achieve WFD objectives. A live willow crossed the route of the new bypass channel, rather than removing this tree it was retained as a feature.

Benefits

The willow has helped restore river-floodplain connectivity creating upstream flood storage. It has also created physical diversity within the channel providing habitat for invertebrates, fish and plants.



Feedback



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Source: Dominic Martyn, Environment Agency

¹ In Wales Asset Performance teams are called Asset Systems Management and Operations Delivery.

² In Wales Partnership and Strategic Overview teams are called Development and Flood Risk.

Case study 2. Hawley Meadows (River Blackwater) – introducing woody debris to create new habitat for fish

Background

In 2008 one live willow and one poplar were felled into the river and staked into place across the channel. At about the same time two willows fell into the river and were left in place and monitored. This was part of planned mitigation for removal of woody debris in high flood risk sites nearby. In 2010 the naturally fallen trees were removed from the river, although the deliberately felled trees remained in place. Once the impact of removing the two natural falls had been monitored, we mimicked one of the fallen trees and installed smaller scale woody debris to see if the fish population would respond. It did, and fish density rose significantly. This indicates that the size and structure of woody debris is important in controlling density, biomass and composition of fish in rivers.

Benefits

The fish population surveys show the dramatic effect that the woody debris has had. From 2007 to 2008 the total biomass of fish caught more than doubled, with the number of Roach in particular increasing. However, in 2010, after the removal of some of the woody debris, the fish biomass fell sharply to a little more than it's 2007 level.



Source: Dominic Martyn, Environment Agency

Case study 3. Shepherd Meadows (River Backwater) – retaining an existing tree to create new habitat

Background

A small oak tree has recently fallen into the River Blackwater towards the south of Shepherd Meadows. Because of the position and size of the tree it doesn't present any flood risk, it was therefore retained to improve the river for wildlife.

Monitoring

The tree is inspected 6 monthly to ensure that it is stable and to monitor the development of the river channel. Litter is removed from around the tree annually.



Source: Sue Dent, Blackwater Valley Countryside Partnership; and Dominic Martyn, Environment Agency

Case study 4. Woodsford Channel (River Frome) – range of woody debris structures to improve flow and bed profile diversity

Background

In 2009, a 1.5km reach of the River Frome SSSI was rehabilitated as part of the River Frome Rehabilitation Plan. This historically dredged channel had bed and bank reprofiling carried out to introduce flow and habitat diversity. Woody debris was installed along the reach using a range of different techniques including buried limbs, tree hinging and tree kickers

Benefits

The trees have helped narrow the channel at key points on the reach. The woody debris creates a variety flow patterns and helps to vary bed profiles.

Deep pools are created below the woody debris structure and often sands or gravels are distributed downstream. Faster velocities will be created at the structure's edge keeping spawning gravels clear of silts. A range of habitats are created supporting a wider variety of plants, fish and invertebrates.



Buried limbs (third) in banks



Tree hinging (live limbs)



Small Tree Kicker (attached to existing tree)



Large Tree Kicker

Source: Alasdair Maxwell, Environment Agency

Case study 5. Moreton Channel (River Frome) – tree hinging to provide marginal refuge for fish fry

Background

In 2010, a 0.5km reach of the River Frome SSSI was rehabilitated as part of the River Frome Rehabilitation Plan. Woody debris was installed along the reach to provide improved marginal habitat using the tree hinging technique.

Benefits

The hinged trees have helped create a marginal zone in the channel where they were installed. They have created refuge areas for fish fry and help trap sediment. Each structure creates a variety of flow patterns, faster velocities help keep spawning gravels clear of silts. A range of habitats are created supporting a wider variety of plant, fish and invertebrate species.



Tree hinged and buried in bank to create back water for fish



Source: Alasdair Maxwell, Environment Agency

Case study 6. Amesbury (River Avon) – tree limbs creating silt traps, loose berms and marginal refuges for fish fry

Background

In 2011, a reach of the River Avon SSSI / SAC at Amesbury (downstream of Ham Hatches) was rehabilitated in partnership with Salisbury and District Angling Club (SADAC) as part of the River Avon Restoration Project. Woody debris was installed along the reach to provide improved marginal habitat. These structures were created using felling and pinning (chestnut stakes and wire) the limbs to the bed and bank.

Benefits

The staked limbs have helped form a marginal zone in the channel where they were installed, creating refuge areas for fish fry and helping trap sediment. Faster velocities on the outer edge of the structure keeps spawning gravels clear of silts. A range of habitats are created supporting a wider variety of plant, fish and invertebrate species.



Source: Alasdair Maxwell, Environment Agency

Case study 7. Langford Lakes (River Avon) – tree limbs creating marginal habitat flow variety and refuge for fish fry

Background

In 2009, a reach of the River Avon SSSI / SAC at Langford Lakes was rehabilitated as part of the River Avon Restoration Project. Woody debris was installed along the reach to provide improved marginal habitat. These structures were all created using felled and pinned trees that are pinned to the bed and bank.

Benefits

The staked limbs and / or trees have helped create a marginal zone in the channel where they were installed. They have created refuge areas for fish fry and help trap sediment. Faster velocities on the outer edge of the structure helps keep spawning gravels clear of silts. A range of habitats are created supporting a wider variety of plant, fish and invertebrate species.



Source: Alasdair Maxwell, Environment Agency

Case study 8. Kennet below Newbury (River Kennet) – enhancement of a SSSI

Background

The River Kennet SSSI is designated for its chalk river features. It is also a high priority water body under the WFD. This project looked to achieve favourable condition on a SSSI and Good Ecological Status from a WFD perspective.

The works were carried out on two separate reaches: 1) Hambridge Lane to Bulls lock and 2) Doghead Stakes to Chamberhouse farm.

Both reaches lack in-stream cover, flow diversity and backwater features. This means there are no refuges for fish during high flows, and a lack of spawning habitat for some species. Historically fallen trees and woody debris have been removed for land drainage and flood risk purposes leading to a loss of physical habitat.

Benefits

The project installed over 20 pieces of woody debris over a 2km stretch of the SSSI. The aim was to create in-stream habitat and improve flow diversity to help increase fish populations. In addition to woody debris, three back waters were excavated to provide refuges for fish during high flows and habitat for juvenile fish.

Each piece of woody debris (trees cut on site): was firmly secured to the bank and bed; did not extend more than 50% of the way across the channel; were cut and placed so as not to create a high level blockage; and were designed to be submerged during high flows.

The impacts of these works on flood risk were assessed and it was established that they would not increase the risk of flooding.



Excavated back water



Source: Paul St Pierre, Environment Agency

Case study 9. East of Basingstoke (River Loddon) – introducing woody debris to create new habitat

Background

We improved the River Loddon, to the East of Basingstoke, through the installation of woody debris in a section of channel which was previously over-shaded and over-wide.

This project was undertaken through a collaborative project with Hampshire and Isle of Wight Wildlife Trust. The project also involved removal of two weirs and cost £10,000 in total.

Benefits

Woody debris will improve the channel's resilience to lower flows in future and remediate for previous works for flood risk management, i.e. dredging.





Photo of contractors installing woody debris



Woody debris in place

Source: Joanne Harkness, Environment Agency

Further reading

Gurnell A and Petts G. Eds. (1995) River Channel Change: the role of large woody debris by Macdonald A. and Keller E.A. John Wiley & Sons Ltd ISBN. 0-471-95727-5