4

Revetting and Supporting River Banks

4.8 Bank protection using root wads

RIVER DULAIS

LOCATION – RHOSMAEN, LLANDEILO, CARMARTHENSHIRE SN645243

DATE OF CONSTRUCTION – MARCH 2004

LENGTH – 80m

COST – £18,000

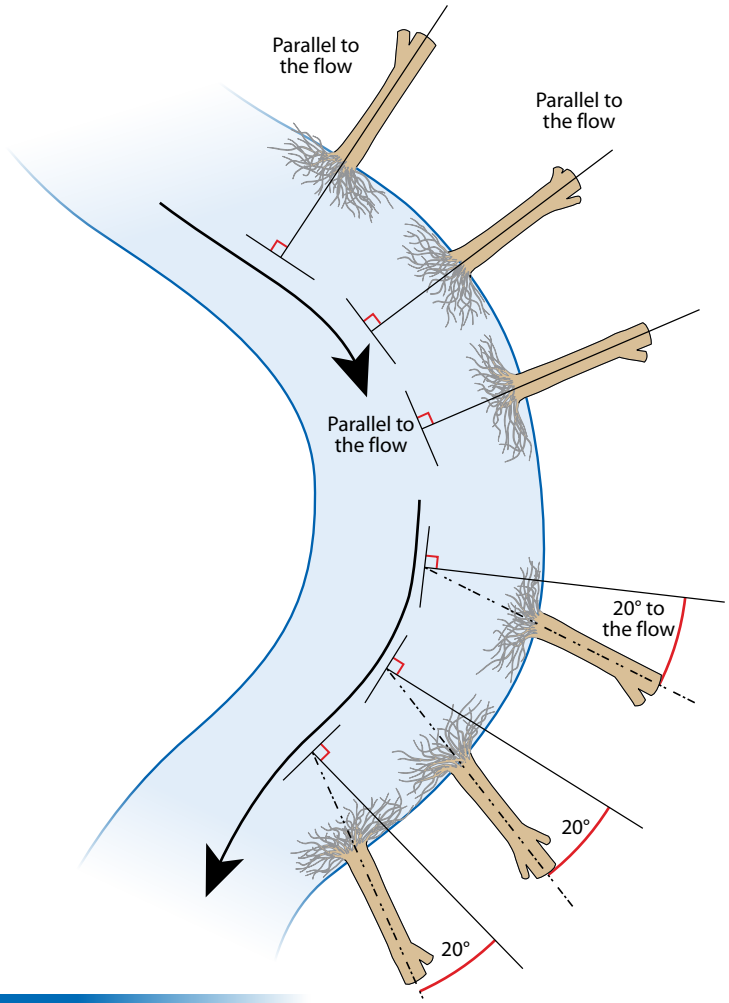
River Dulais	High energy, gravel
WFD Mitigation measure	**Click Here** to view details
Waterbody ID	GB110060036250
Designation	SAC, SSSI
Project specific monitoring	Fish

Description

The River Dulais (Afon Dulais) is a tributary of the River Towy, and is an important spawning habitat for migratory fish. The river had a history of instability and planform adjustment, with a channel cross section up to fifty per cent wider at this location than upstream reaches. Unrestricted grazing, by sheep and cattle, had resulted in a loss of bankside vegetation. This had reduced cover for fish and increased erosion, causing bank and bed instability. Coarse gravels were covered with a layer of fine silt deposits. For a period of three years the Environment Agency Wales (now Natural Resources Wales) worked with local landowners to fence off 4.9 km of the River Dulais to combat erosion. However, some sections were in need of more extensive bank protection in order to prevent further bank failure and allow vegetation to recover naturally.

This technique was designed to stabilise a highly mobile reach on the River Dulais using root wad revetment. It intended to demonstrate that soft engineering methods can be used as an alternative to blockstone, whilst also restoring physical habitat to degraded channels and maintaining geomorphological processes.

Figure 4.8.1
PLAN SHOWING POSITION OF ROOT WADS



© Salix

Growth of root wads along bank two years after installation. Brushwood protection can just be seen between root wad growth – 2006

Revetting and Supporting River Banks

4

Design

1

© Salix Trench excavated in bank – 2004

2

© Salix Excavator moving root wad into position– 2004

3

© Salix Installing root wad in bank– 2004

Forty root wads were installed over eighty metres of bank, with two to three metres of trunk left attached to the root wad. Crack willow (*Salix fragilis*), grey willow (*Salix cinerea*) and white willow (*Salix alba*) with an average trunk diameter of between 0.3m and 0.6m were used. Live willow was chosen as each tree should root and shoot to quickly bind the surrounding bank. All trees were sourced from within the Dulais catchment and two adjacent river valleys.

In some areas additional brushwood protection was needed in between the root wads. Careful thought was given to creating a smooth profile along the bank to reduce the risk of erosion. The riverbank above each root wad was protected by erosion control matting.

1 Where banks were more than 0.5 metres high they were re-graded to a more stable profile

Once root wad centres were identified a trench was dug into the bank, with attention given to the interception angle of the root wad and the flow, as well as the position of the root plate in relation to the bed

2 Each root wad was installed to face upstream at a 10 to 20 degree angle to the flow

Installation took place from upstream to downstream so that the angle of each root wad can be "eyed in" after judging the best fit with the upstream root wad

Backfill of each root wad should be well compacted over the anchor trench

Buoyancy and drag equations are available to calculate the appropriate embedding depth

As a simple guide each trunk was embedded 3 to 4 times the diameter of the root wad

Average trunk diameter was 0.3m to 0.6m

Spacing of root wads set to 3–4 times the diameter of the rootplate

3 With no published guidance, expert opinion was used to finalise spacing based on visual impact of flows

Each root wad needed to pick up the flow and direct it to the next root wad, avoiding other areas of the bank or bed

Figure 4.8.2
PLANFORM SHOWING INSTALLATION METHOD FOR ROOT WADS

4 Revetting and Supporting River Banks

© Salix

Rootwads immediately after installation looking downstream – March 2004

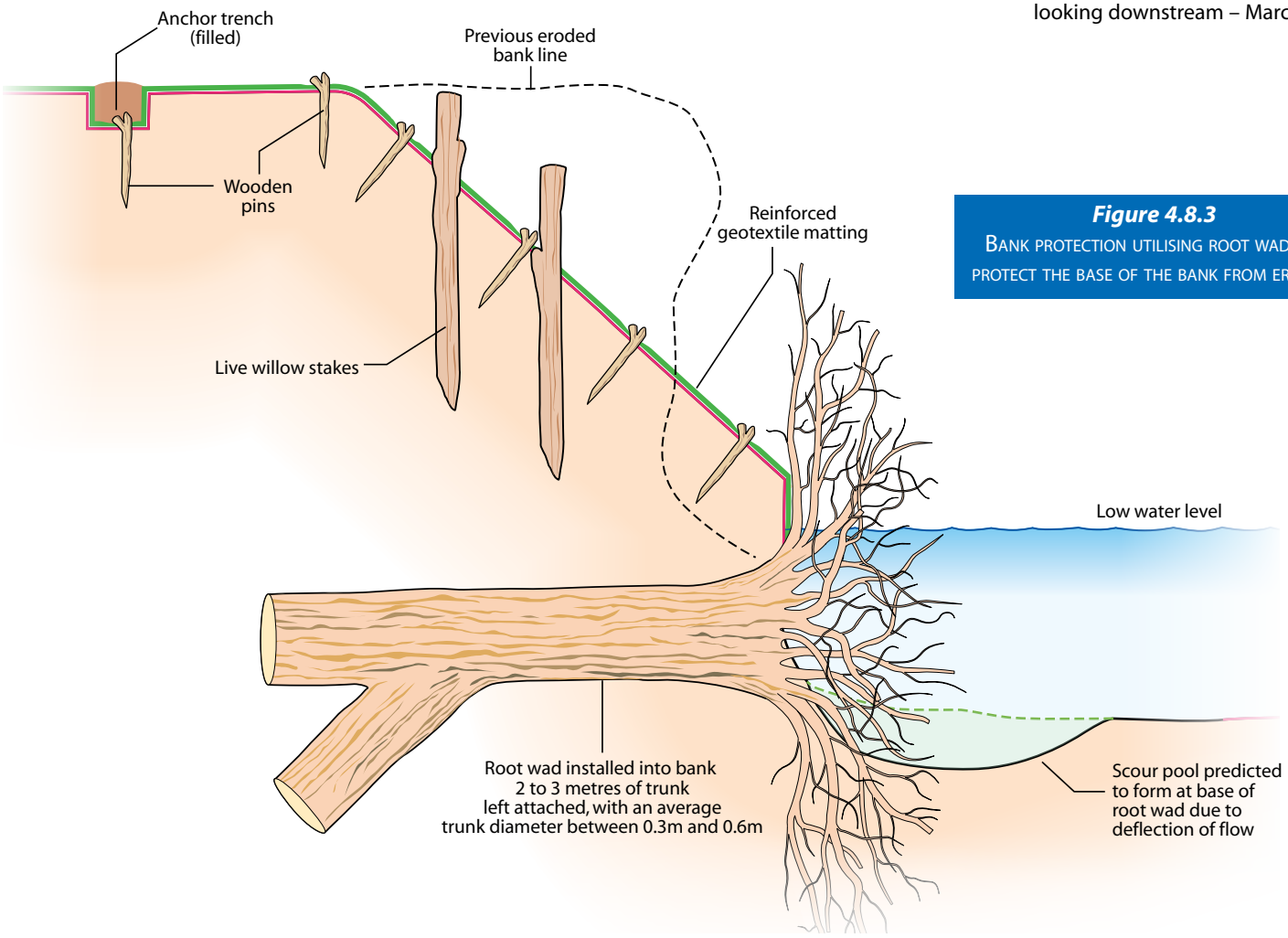


Figure 4.8.3
BANK PROTECTION UTILISING ROOT WADS TO PROTECT THE BASE OF THE BANK FROM EROSION

Revetting and Supporting River Banks

4

Subsequent performance

Stabilisation of a complex outer meander bend has been achieved and each of the root wads installed has grown well.

Monitoring encompassed HABSCORE and electro-fishing surveys, which were undertaken by the Environment Agency Wales just after construction in 2004 and again in 2006. Three sites were surveyed within the project reach, and a further three upstream to act as controls. At each site two semi-quantitative and one quantitative electro fishing surveys were carried out to determine population estimates for Atlantic salmon (*Salmo salar*) and brown trout (*Salmo trutta*) fry and parr.

No marked differences were observed in fish densities between the two survey occasions, with some sites showing a reduction in fish numbers. However, it should be noted that the post-scheme surveys were undertaken just one year after the works and the full benefits are not likely to be realised until several years after implementation.

Where flow is focussed directly at the root wads, an area of localised scour has formed under the base of the exposed root ball. This provides an overhanging vegetated bank, which is a valuable new habitat feature.

Diverse bankside cover has established and cleaner gravels are present, with visibly less fine sediment. Overall the channel geometry is now similar to more well vegetated reaches of the river.

Due to its rural and over-wide location, maintenance of flow conveyance was not deemed to be an issue. Even with the very fast growth rate of willow no post-project maintenance (coppicing) was required.

Over-wide eroding channel before restoration – 2003

Root wads have become established, stabilising the bank and reducing erosion – August 2013

Contacts

David Holland, Salix River & Wetland Services Ltd
david@salixrw.com, 0870 3501851