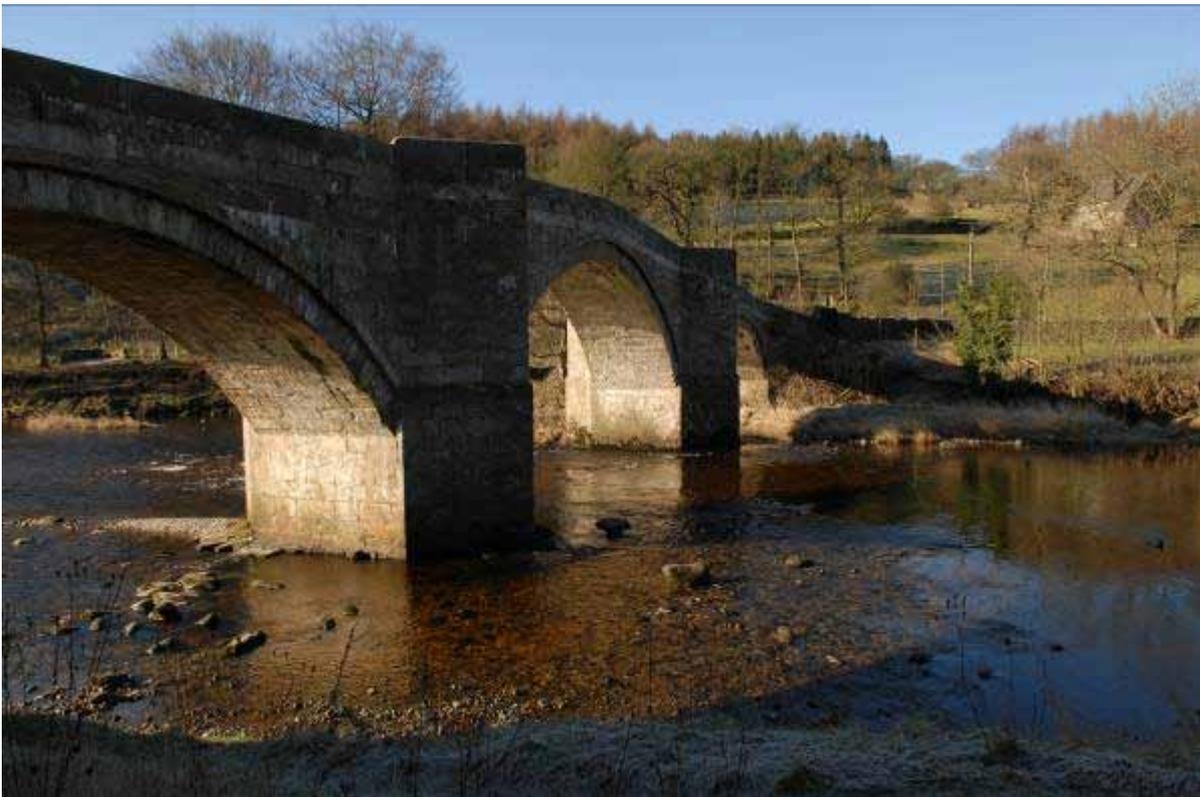


**Wild Trout Trust
Advisory Visit Report**

**River Wharfe – Bolton Abbey Estate,
(Barden Bridge) North Yorkshire**



1.0 Introduction

This report is the output of two site visits undertaken by the Wild Trout Trust on the River Wharfe, Bolton Abbey on 22nd January and 6th February 2007.

Comments in this report are based on observations on the day of the site visit and discussions with Mr David Wilby and Mark Whitehead of the Bolton Abbey Estate and Mr Alistair Maltby and John Shilcock of the Association of Rivers Trusts (ART).

Normal convention is applied throughout the report with respect to bank identification, i.e., the banks are designated left hand bank (LHB) or right hand bank (RHB) whilst looking downstream.

WTT is intending to hold an open day in May 2007 in partnership with the Estate, The Farming and Wildlife Advisory Group, Yorkshire Dales Rivers Trust, ART and others.

The working title of the event is 'Managing large spate rivers for wild trout and biodiversity'. The Wild Trout Trust intends to launch its Practical Visit Programme at the event. Practical Visits, or PV's as they are known are 3-4 day funded visits whereby a team of 'wetwork' experts will work alongside fishing clubs and or riparian owners to demonstrate streamside conservation techniques. A PV is intended to 'kick-start' projects by facilitating practical information exchange to allow project groups to undertake physical works such as spilling, coppicing and the introduction of large woody debris.

An initial river walk in December highlighted some serious bankside erosion issues, both on the main river and the Hambleton Beck, which is thought to be an important spawning tributary.

1.0 The Issues

2.1 River Wharfe

The section of the river downstream of Barden Bridge to the Aqueduct is suffering from extensive erosion problems on the LHB. River banks are constantly on the move, it is a natural part of the river processes of erosion and deposition. In places the banks of the River Wharfe are composed of soft sands and gravels, a highly erodable material.

The roots of bank vegetation bind the soil together, making it more resistant to the powerful erosion forces of the river. Livestock overgrazing and pressure from high visitor numbers can result in a loss of river bank vegetation which accelerates river bank erosion. This is a "double whammy" for not only is valuable land lost, but the water can also become choked with sediment, which has a devastating effect on the biodiversity of the river and the ability of trout to spawn.

There is an almost complete absence of Large Woody Debris (LWD), e.g. fallen trees and branches in the channel. The presence of LWD has been shown to be extremely important in several respects.

- An increase in mean flow depths and velocities.
- Development of high in-channel physical habitat diversity
- LWD can have significant benefits to the control of run-off at the catchment scale. Woody Debris helps regulate the energy of running water by decreasing the velocity. Thus the 'travel time' of water across the catchment is increased.

Removal of LWD reduces the quality and availability of habitat for juvenile and adult brown trout. LWD is extremely important habitat for native crayfish.

Woody debris in rivers can provide habitat for a variety of animals. Brown trout numbers increase significantly with the presence of woody debris along the banks and in the river as they provide refuge and cover. They may offer lies for otters or perches for kingfishers. Woody debris in the river may also create pools and riffles in sections of the river that would otherwise have a dearth of aquatic habitats. LWD provides a range of surfaces including splits and hollows in which algae, microbes and invertebrates can colonise. These tiny organisms are crucial as they make up the base of the aquatic food chain and provide food – directly and indirectly – for all creatures associated with the watercourse including mayflies, stoneflies, caddis, crayfish, trout, dippers and otters.



Erosion on River Wharfe looking u/s to Barden Bridge

2.2 The Hambleton Beck

The beck enters the main river downstream of the A59 Skipton Bypass. The instream habitat (gravels) appear to be suitable for successful spawning, however grazing pressure has led to a dearth of fringing vegetation and tree growth. Bankside vegetation is important for a variety of reasons:

1. Erosion protection- the roots of shrubs and trees strengthen banks and allow natural rates of erosion to take place.
2. Cover – marginal vegetation provides cover for swim-up fry and trout parr. It also provides extremely important habitat for a variety of invertebrates, birds and mammals.

In the last few weeks there appears to have been a 'one-off' flooding event which has caused the river to cut-off a meander loop. The large boulders present on the banks indicate that the flooding event was very high in energy. Although this is probably a rare event it would be worth assessing and changes within the catchment that may have triggered this event, such as changes in land-use.



The 'new' channel and meander loop in the background on the RHB

2.0 The Solutions

It is a legal requirement that all the works to the river and beck require written Environment Agency consent prior to undertaking any works, either in-channel or within 8 metres of the bank.

Local EA Fisheries and Development Control staff should be contacted at the earliest opportunity to discuss any recommendations arising from this report that the estate may wish to pursue.

The issues facing both the River Wharfe and Hambleton Beck are considerable. The spate characteristics of both rivers necessitate that any potential techniques to restore habitat have to be carefully evaluated. That said, there is also considerable scope to take a more 'innovative' approach to trial techniques being currently developed in North America. By taking this approach it is hoped to add to the river restoration knowledge base and assist in developing best practice for other river managers.

The scope of WTT's involvement will be concentrated on the outputs of the PV. It is proposed to undertake the PV before, during and after the Open Day. WTT and our advisers will work in partnership with estate staff to demonstrate techniques required to allow the continuation of works after the PV has finished. Considerable 'buy-in' will be required from the estate in terms of provision labour, materials and machinery to keep project capital costs down to a minimum.

3.1 – River Wharfe

Immediately downstream of Barden Bridge it is recommended that a new fence line be installed to create a buffer zone / conservation area down to the Aqueduct. The popular recreational usage of this site is potentially speeding-up rates of erosion due to compaction of soil and vegetation loss. Creation of a buffer strip of at least 10m will allow development of a vegetated 'conservation area'. Consideration should be given to planting with a wild flower conservation mix and willow / alder whips to facilitate greater bank protection. In areas where grazing occurs fences should be repaired and installed.

It is recommended that all fields running adjacent to the river have buffer strips (5-9m) created to reduce the risk of fine sediment run-off from arable fields.

Buffer strips adjacent to a watercourse can be treated as non-rotational set aside. The same rules apply as strips adjacent to hedges and woodland edges, further information can be obtained from: -

www.defra.gov.uk/farm/capreform/pubs/pdf/Setaside2006.pdf

Grass buffer strips can be included as part of an Entry Level Scheme in the Defra environmental stewardship package.

Rules and points for grass margins are detailed in the ELS handbook -

www.defra.gov.uk/erdp/pdfs/es/els-handbook.pdf

For capital works such as fencing, this would have to be part of a higher level scheme in environmental stewardship or, if there is already a Countryside Stewardship Scheme or an Environmentally Sensitive Area agreement in place this may be able to be added to any

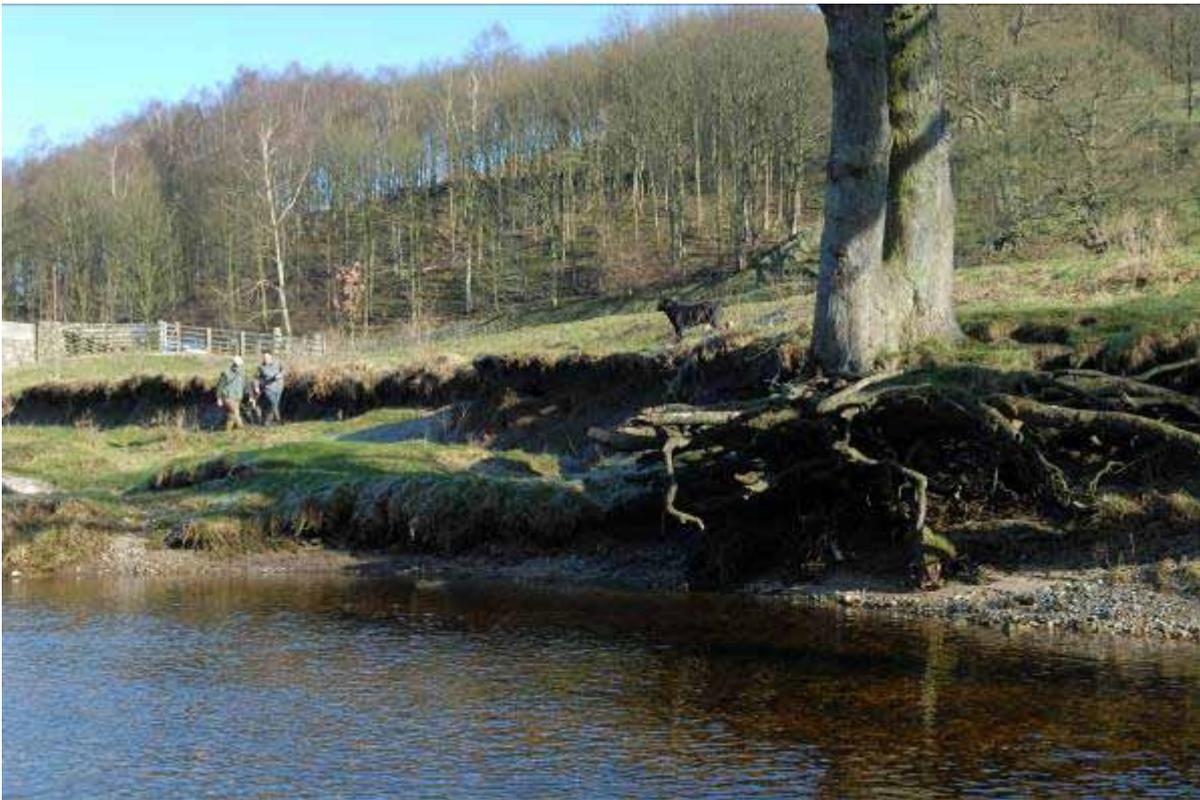
existing agreement. Entry to HLS is only available once an ELS scheme has been agreed. Further info on HLS can be found at www.defra.gov.uk/erdp/pdfs/es/hls-handbook.pdf

The 'conservation area' will have the added benefit of reducing disturbance to both day ticket and syndicate fishermen. The permissive path should be relocated behind the conservation area and in places 'stabilised access points' could be created to provide viewing points. It is recommended that interpretation boards also be installed explaining the reasons for the 'conservation area' perhaps with before and after photographs.



Start of the proposed 'Conservation Area' – fence line and planting should be placed 5-10m from terrace edge (dogs)

There are some mature sycamores on the LHB that are having the banks eroded under their root balls. These trees could be pushed over into the river, with their roots balls still attached to the bank to install much needed woody debris. The trees should be placed facing upstream to deflect flow away from the LHB. The rootballs should be enough to secure each tree to the bank, however consideration should be given to pinning them to the riverbed and to establishing erosion protection behind the exposed root ball. Larger boughs from the trimming of the trees (prior to placement) could be placed and pinned into the bank where various erosion 'nick-points' are starting to form. It may also be prudent to leave larger boughs in-tact to act as stabilisers and prevent trunk rolling in the flow.



Erosion under the Sycamore root ball.

The main area of erosion occurs 100m downstream of Barden Bridge on the LHB. This area requires considerable intervention to address the problems caused by accelerated erosion.

The toe of the bank and the bank itself all require protection. It is suggested that 'tree-kickers' are deployed in this section.

Tree "kickers" are hardwood logs which are used to deflect stream flow away from an unstable bank area. One or more logs are anchored to the streambank and placed at an angle to "kick" stream flow away from the bank and towards the middle of the stream. Brush is tied between the log and the bank to prevent scour erosion. Tree kickers are most often used to correct bank undercutting especially where the crest of the cut is 1.5m or more above normal water levels. A kicker deflects the concentration of stream energy away from the bank. In addition, kickers help to re-build the bank by providing an area for sediments to deposit and provide underwater structure for fish and aquatic insects.

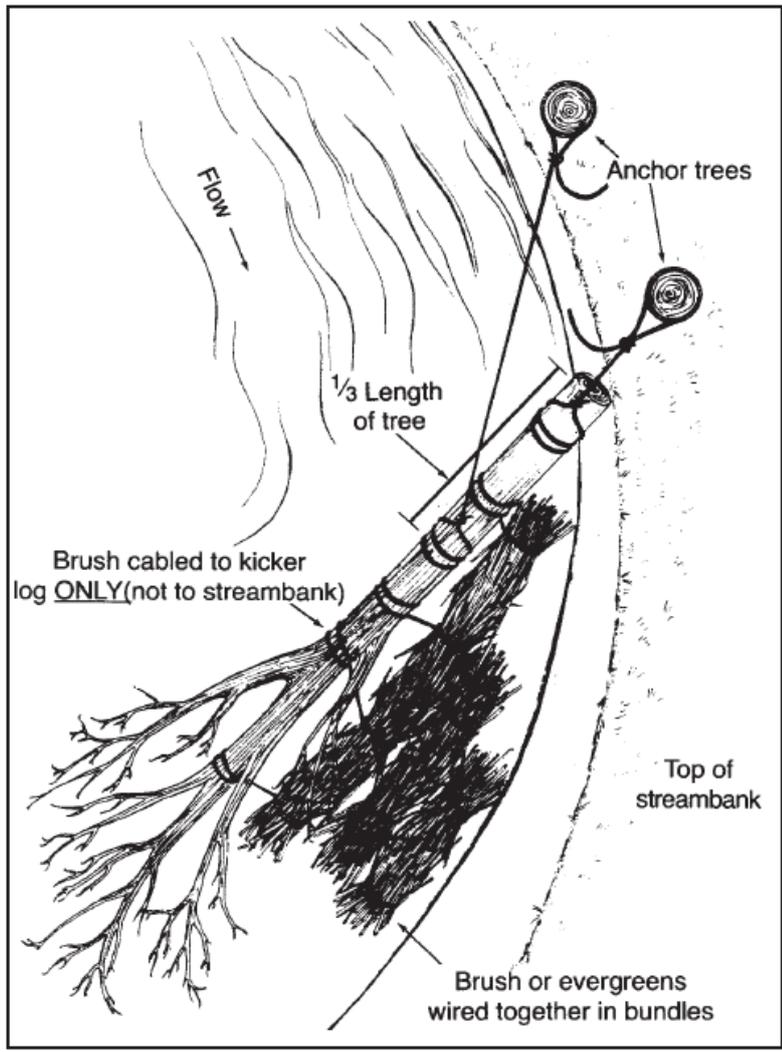


Figure 1. Tree Kicker Construction

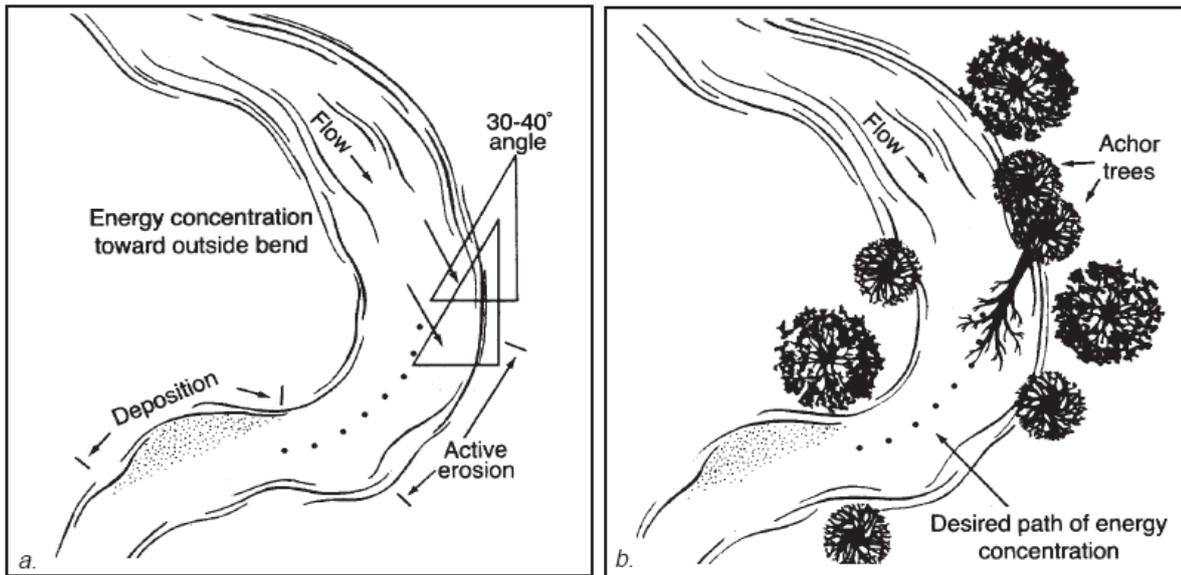


Figure 2. Placement of Kickers

Kickers need to be securely anchored to the streambank. Anchoring it to two live anchor-trees on the bank is best. If no anchor trees are available consideration should be given to installing a deadman anchor. The same angle is used for placing the kicker log. A T-shaped trench will need to be excavated and the kicker will need to be cabled to a large telephone pole or log placed in the crossbar of the 'T'

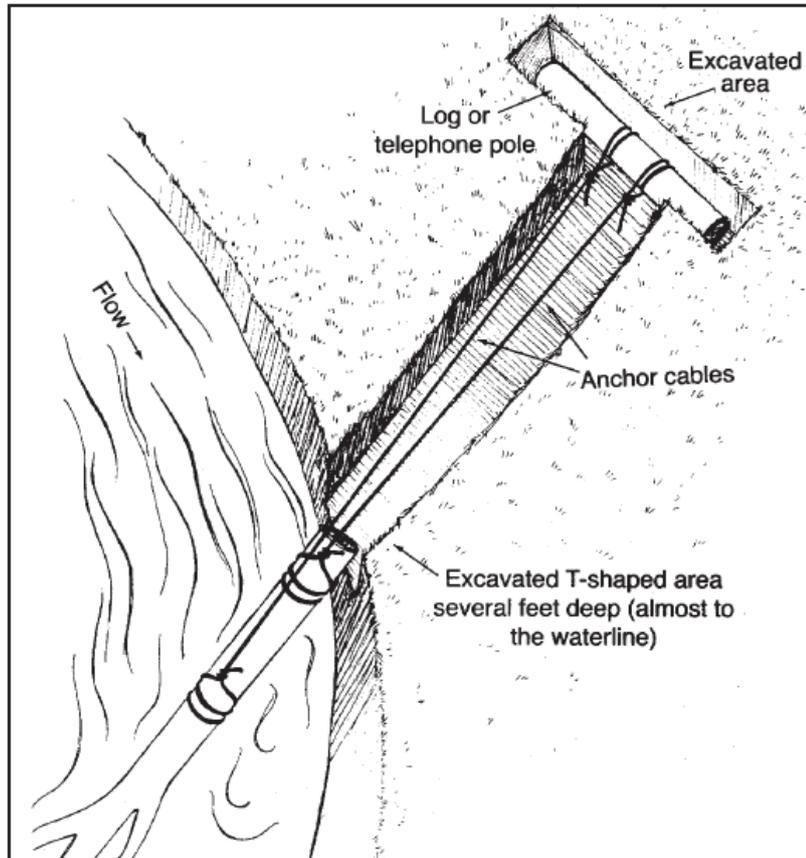


Figure 4. Dead Man Anchor

In conjunction with kickers the problems of slope stability need also to be addressed. This can be undertaken by re-profiling the sheer cliff faces back to a slope of around 30° . Coupled with this it is strongly recommended that the re-profiled slope be stabilised with the sowing of grass seed 'conservation mix' and/or planting of whips (alder / willow). The bank work should be undertaken as early as possible to allow roots to establish and stabilise banks before the winter spate season. An alternative and potentially less expensive approach (machinery / spoil disposal) to re-profiling may be the stabilisation of the banks using an evergreen revetment such as pines, firs or recycled Christmas trees. The more limbs and fine branches a tree has the more it will continue to slow the streams current after the needles are gone, allowing sediments to accumulate within the anchored trees. Anchoring trees to the streambank in a manner that will resist the force of the water is imperative. In order to protect the area of active erosion an evergreen revetment needs to extend beyond the area of exposed soils on the riverbank. The trees need to be fixed to log revetment which has been pinned at the toe of the bank. Logs need to be 3m by 0.25 – 0.3 m diameter secured with two pins (2 m of iron rod, 2 cm diam); each tree nailed to log in at least two places

Start downstream of the exposed soil anchoring each tree in place with the butt end of the trunk pointing upstream. Work upstream laying each tree so that it overlaps the previously laid tree by 50% until the revetment extends beyond the exposed soils. The first row of trees needs to be placed so that tree crown (the widest part of the tree) rests on the toe of the bank slope.

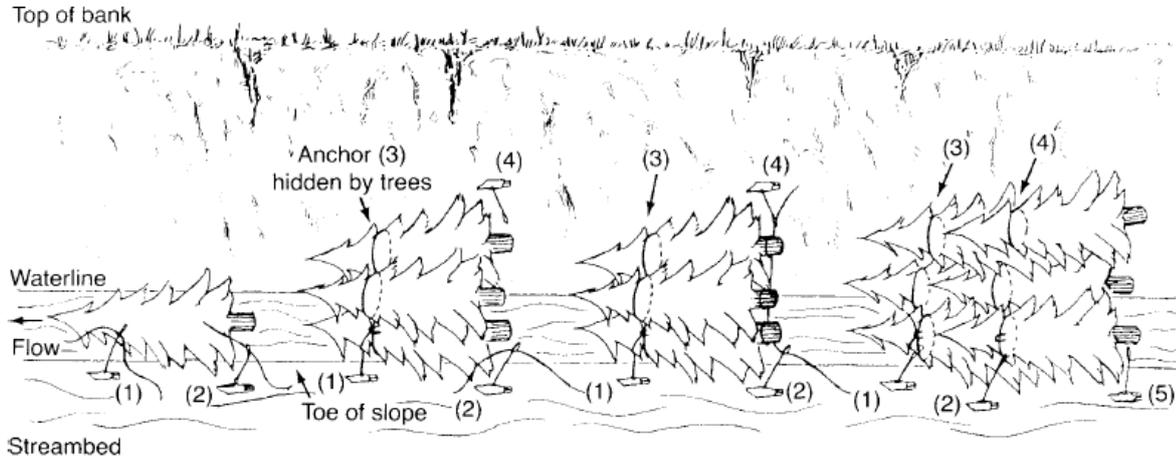


Figure 6. Constructing a Multiple-Row Revetment - Figure shows the general placement of cable. Cable should be wrapped around trunks only and not the outside branches. Compress the trees, pull the cable together as tight as possible and clamp tightly.



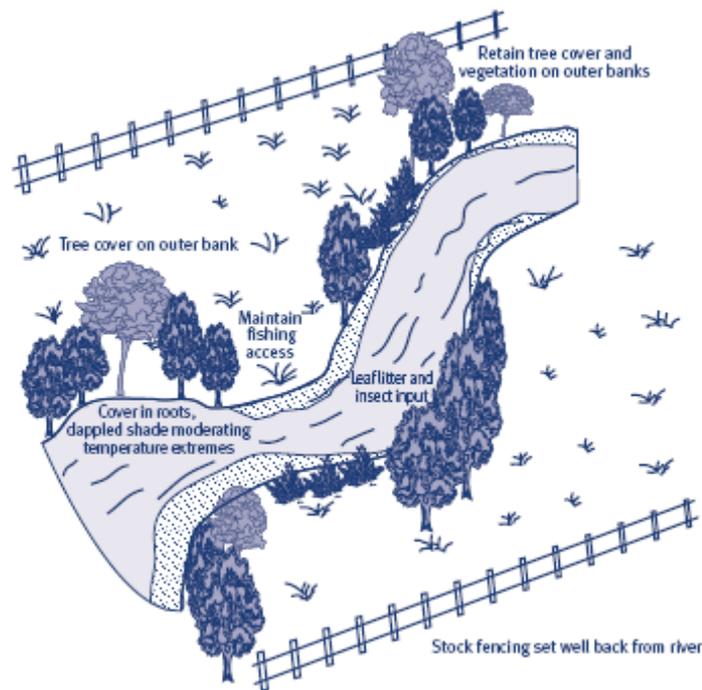
Proposed start (Island) of revetment works

3.2 Hambleton Beck

It would appear that the beck has recently experienced a high energy flooding event which has caused some significant changes to the long profile of the channel. To what extent this event was a natural phenomenon is open to debate, but the heavily grazed banks and absence of riparian trees and shrubs must be a contributing factor to what appears to be accelerated erosion. It is strongly recommended that the estate do an assessment within the Hambleton catchment to look for any gross changes in land use, etc which may have contributed to such a high energy flooding event.

The most practical and cost effective solution would be to completely fence of the river and create a vegetated buffer strip of at least 9m in width. (see above – Wharfe)

The fence line should be placed well back from the bank in a straight line to avoid trash getting caught on wires (causing 'blow-out') during peak flows.



There is a tight S-bend at the bottom of the reach upstream of the health club. It is recommended to undertake some planting of willows on the banks as a priority to reduce the speed of the erosion at this point. The outside of the bend could also be spilled using willow withies.



The 'S' Bend

3.3 – The Wild Fishery

The Estate currently stock with around 1000 'takeable' domesticated brown trout per annum. There are considerable opportunities to consider reverting to a wild fishery reliant purely on natural production. However before a bold decision of this nature can be considered it is vital the wild trout population of the Wharfe is surveyed. A comprehensive survey of spawning burns should be undertaken to assess numbers of fry, and parr in the system. To this end WTT has offered partnership funding to Yorkshire Dales Rivers Trust to allow them to undertake a catchment-wide monitoring programme to assess trout and grayling populations. If populations are lower than predicted 'limiting factor analysis' will be undertaken looking a key physical and chemical factors that affect trout, such as water quality, quantity and the availability and quantity of habitat.

3.0 Making it all Happen

It is strongly recommended that the Estate make contact with the Fisheries, Conservation and Development Control functions of the local Environment Agency, The National Park and Natural England to arrange a 'pre-application meeting'. Pre-application meetings are extremely useful to help scope out design work and to take into consideration any issues that could affect proposed works. The worked-up proposal should allow the Estate to complete a land drainage application. The WTT is happy to assist with the preparation of the application. This legal consent from the Environment Agency must be obtained in writing before works can commence. Consents can take up to two months to process.

The physical works can be 'kick-started' by a WTT Practical Visit and indeed this is to be the centre-stage of the planned Open Day in May. Each year WTT funds several PV's which include the cost of labour (two /three man team for three days) and materials (£1500 max). Recipients will be expected to cover travel and accommodation expenses of the contractor. The use of specialist plant will be by separate negotiation. Added to this the Estate has donated two lots for the WTT Ebay auction of promises, the proceeds of which will be ring-fenced for this project. This will undoubtedly leave a shortfall in funding which could potentially be sourced from the Environment Agency, Yorkshire Dales National Park, Defra / Natural England (agri-environment schemes) and the Estate. Considerable savings on capital costs will be achieved if the Estate is able to provide labour, materials and machinery. The aim of the visit is to demonstrate the techniques required for the Estate to complete the biotechnical revetments outlined in this report.

5.0 Disclaimer

This report is produced for guidance only and should not be used as a substitute for full professional advice. Accordingly, no liability or responsibility for any loss or damage can be accepted by the Wild Trout Trust as a result of any other person, company or organisation acting, or refraining from acting, upon comments made in this report.