**Advisory Visit to Torver Beck – River Crake Catchment**

**South Cumbria**

**February 2014**

## 1.0 Introduction

This report is the output of a site visit undertaken by Gareth Pedley of the Wild Trout Trust to Torver Beck on the 20th February, 2014. Comments in this report are based on observations on the day of the visit and discussions with Jen Aldous and Pete Evoy of South Cumbria Rivers Trust (SCRT).

Normal convention is applied throughout the report with respect to bank identification, i.e. the banks are designated left hand bank (LB) or right hand bank (RB) whilst looking downstream. Location coordinates are given using the Ordnance Survey National Grid Reference system.

## 2.0 Catchment / Fishery Overview

Torver Beck is a major tributary of Coniston Water, which drains into the River Crake, a tributary of the River Leven that enters the sea via the Kent Channel. The Beck originates in the South Lakes Low Fells Area, to the north of Torver Village, towards the southern end of the Lake District National Park.

Land use within the upper catchment is primarily extensive sheep grazing, which intensifies progressively moving downstream towards Coniston Water as the land becomes lower gradient, lower altitude and more productive. Riparian land visited during the walkover is currently covered by one of three environmental schemes: Environmentally Sensitive Area agreements, Entry Level Stewardship or Entry Level plus Higher Level Stewardship. This means that the land has already been targeted by Natural England as being sensitive and requiring additional protection from farm subsidy payments to encourage sympathetic land management. (http://www.magic.gov.uk/MagicMap.aspx)

Under the Environment Agency's Water Framework Directive assessment, the Beck scores 'good' or 'high' for all aspects other than fish. This would suggest that all of the chemical parameters and biological indicators are as good as would be expected, except for the fish populations which bring the ecological status of the waterbody down to 'moderate' (see summary table below: Figure 1).

| Torver Beck | |
|---|---|
| **Waterbody ID** | GB112073071200 |
| **Waterbody Name** | Torver Beck |
| **Management Catchment** | Kent or Leven |
| **River Basin District** | North West |
| **Typology Description** | Mid, Small, Siliceous |
| **Hydromorphological Status** | Not Designated A/HMWB |
| **Current Ecological Quality** | Moderate Status |
| **Current Chemical Quality** | Does Not Require Assessment |
| **2015 Predicted Ecological Quality** | Moderate Status |
| **2015 Predicted Chemical Quality** | Does Not Require Assessment |
| **Overall Risk** | Probably At Risk |
| **Protected Area** | Yes |

**Figure 1. Water Framework Directive summary sheet for the waterbody.**

The length of beck inspected lies directly downstream of Torver village and was inspected from the A5048 road bridge (NGR: SD 28529 94073) to the large waterfall downstream (NGR: SD 28585 93249), a distance of c. 850m.

## 3.0 Habitat Assessment

Torver Beck has been the subject of significant realignment and historic channel modification, which has left an unnaturally straight channel throughout much of the length inspected. In addition, the Beck is now incised within its banks, likely due to the amount of material removed when the channel was excavated, and exacerbated by the increased scour within an overly steep, confined channel. This is an issue throughout, but particularly notable in the section immediately downstream of the A5084 road bridge, where the channel is uniform and significantly narrower than would naturally occur for the size of the beck. As a result, the beck cannot escape the confines of the banks and dissipate its energy at medium and high flows. This creates excessive bed scouring, with little subsequent opportunity for substrate deposition, leading to loss of bed material from the reach and undercutting of the banks and riparian trees (Figure 2).

The narrow confined nature of the channel significantly modifies habitat, greatly accelerating flow velocities and creating an unnaturally high energy environment. Substrate is maintained clean and well sorted, but is in many areas of a higher than natural size for this order of beck. As a consequence, habitat is generally better suited to salmon than trout; however, diadromous fish access is restricted to the beck by the waterfall at the downstream end. The lack of slower deeper areas means that habitat for larger, resident adult trout is limited. In wider areas, where flow energy is dissipated, some good quality trout spawning substrate is present (Figure 3).

In addition to morphological issues through channel modification, grazing of the banks, often right up to the water's edge, has inhibited development of a herbaceous river margin, leaving only close-cropped grass with little root structure to stabilise the bank. This is easily eroded in high flows. The lack of shallow, gradual margins or trailing marginal vegetation fringe also means that there is limited refuge for fry, meaning that there are significant habitat deficiencies for both extremes of the trout lifecycle. Tributaries confluencing within the reach may provide some additional juvenile habitat; however, a cursory inspection suggests that grazing and channel modification are likely to remain an issue.

**Figure 2. Overly narrow and straight channel for the size of beck where flows are uniform and high velocity, leading to increased scouring and erosion, especially where banks are heavily grazed.**

**Figure 3. Suitable sized gravel for trout spawning.**

In many areas, erosion has resulted in bank being lost, generally where there is no tree-lining to provide bank stabilisation, or in-between trees where the absence of marginal vegetation has left the bank susceptible (Figures 4 & 5). This is something that needs to be controlled to manage the land loss currently being experienced; however, it is important to preserve areas of wider channel, as they provide valuable energy dissipation that will reduce erosive river forces acting upon the banks (locally and downstream) and provide vital refuge habitat for fish. This should not simply be seen as unnecessary erosion and land loss in every instance, but instead, as the beck attempting to reinstate a more natural channel width.

It is also important to ensure that erosion does not continue to a point where the beck becomes overly-wide, which can be an equally significant issue for its function. This is the case where an area of large woody debris (LWD) has led to erosion where grazing has left the bank susceptible (Figure 6) and some management of the material is now required.

It is the interaction between channel shape (as modified to be straight, steep, incised and high-energy) and bank stability (high stability with trees - low stability without trees) that influences erosion and land loss. A more natural plan-form and gradient with lower banks that are of a lower gradient would be more stable and less susceptible "blowing out", even if trees fall into the channel.

**Figure 4. Straight, high-energy section where a lack of tree and vegetation cover allows bank erosion.**

**Figure 5. Erosion around bankside Alder Trees. While this represents a loss of land, the wider channel allows some flow dissipation so is beneficial in reducing river energy and providing habitat.**

**Figure 6. Area that would benefit from a central channel being cleared to reduce pressure currently acting upon a susceptible grazed bank. On a well-buffered, vegetated bank, this issue is unlikely to have occurred.**

A consequence of the bank erosion that has to be managed carefully is the potential for tree loss along the bank-line. Loss of trees in most instances will have a negative impact upon bank stability and lead to a loss of valuable habitat. Fencing livestock well back from the river bank helps to mitigate this by allowing a natural herbaceous margin to develop that will provide bank protection above and below the ground, and complement the root structure already present from the trees. Failure to exclude livestock from the bank will create a high probability of tree loss as the earth around the tree is eroded. This issue is occurring at several points along the reach which are at different stages. The issue begins with erosion around the back of the tree (Figures 7 & 8), with the erosion eventually cutting right behind the tree and the tree ending up within the new width channel (Figures 9 & 10). Ultimately, this process is likely to lead to loss of the tree, if left unchecked. Sheep can thus lead to the loss of mature trees!

**Figures 7 & 8. The first stages of erosion behind a tree.**

**Figures 9 & 10. Erosion that left unmanaged will likely lead to loss of trees.**

There are obviously signs of historic tree management along the beck (laying and coppicing), and the confined nature of the current channel in many areas is a product of the tree lining (Figure 11). As with most tree maintenance, the job is an ongoing one and in many areas along the channel previously managed trees are now at a stage where they are somewhat over-shading the channel and banks. This is inhibiting the growth of both aquatic and bankside vegetation.

**Figre 11. Obvious signs of historic coppicing and laying bankside trees, which are now in need of maintenance.**

Two potential issues were noted on tributary crossings points where benefits can potentially be realised for both the function of the watercourse and for the land management. There appears to be a capacity issue with a culvert that crosses a tributary on the LB (NGR: SD 28574 93733: Figure 12). There, high flows appear to be backing up and spilling over the bunded banks, with water then becoming trapped behind the bunds (Figure 13). The other issue is one of stock fording a tributary, where poaching of the banks is leading to sediment being liberated to the watercourse (Figure 14).

**Figure 12. Under capacity culvert that would be better replaced with a much larger capacity, partially sunken pipe or culvert that would facilitate retention of a natural bed.**

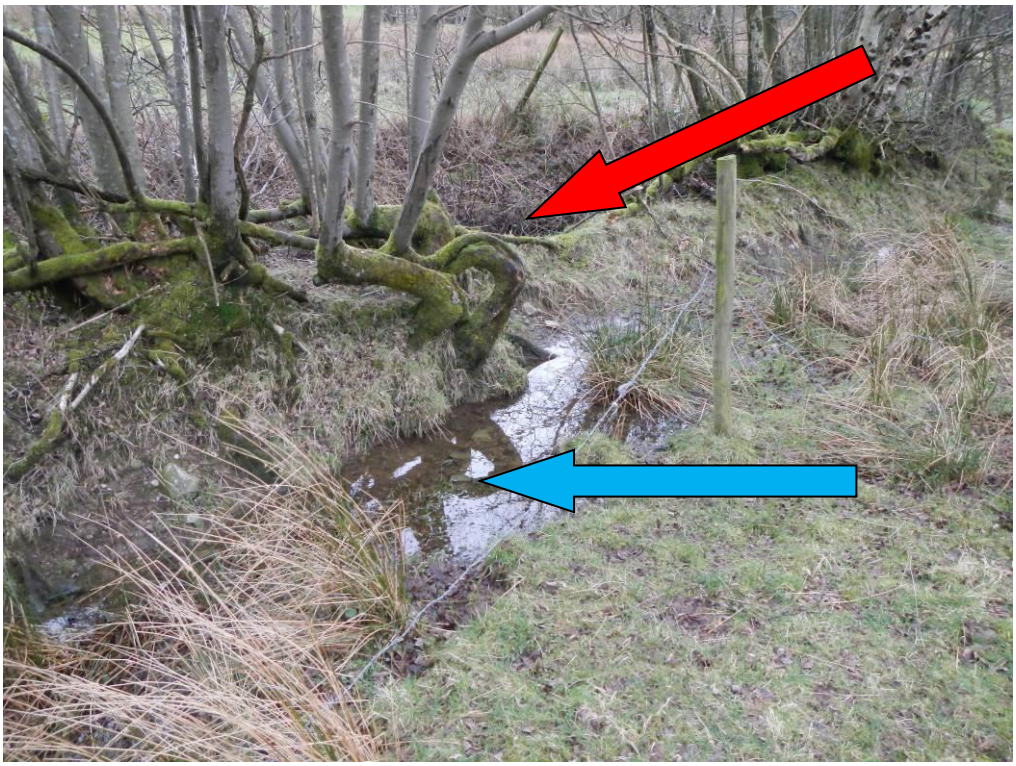

**Figure 13. Watercourse in the background (blue arrow), water trapped behind the bund unable to get back to the watercourse following high water centre of shot (red arrow).**

**Figure 14. Issue of stock poaching at a crossing point that is leading to sedimentation of the watercourse.**

# 4.0 Recommendations

## 4.1 Long-term

The ultimate solution to the channel morphology, function and habitat issues is to create a more sinuous plan-form to the beck, creating natural channel dimensions suited to the flows it receives. Ideally, this should be achieved through reinstating the original course of the beck; however, this is likely to be a long-term goal, owing to the considerable cost, planning and negotiation that would be required. There is scope for this to be achieved, if agreement could be made, as demonstrated by obvious signs of the paleo-channel within the adjacent land (Figures 15). This is something that is particularly evident within the wood at the downstream section of the reach (Figure 16). Funding for this work may be difficult to obtain, as the land is not within a SSSI, so outside the scope of the River Restoration Strategy.

**Figure 15. Low-lying wet areas along the paleo-channel, where the beck would have originally flowed.**

**Figure 16. Obvious signs of the paleo-channel within the wood at the downstream end of the reach.**

## 4.2 Short-term

There are, however, a suite of improvements and management practices that can be employed along the watercourse to greatly improve habitat and river function to benefit both the land users and wildlife.

### 4.2.1 Fencing

In line with the report previously produced by Jen Aldous, it is recommended that a generous buffer strip is created along all watercourses, wherever possible, to allow development of a herbaceous marginal zone that will protect the bank and enhance habitats. A figure of 2m back from the bank top was discussed on site and it is recommended that this is ensured as a minimum. Any additional distance that can be agreed, especially on the outside of bends and eroding sections will increase efficacy of the strip.

### 4.2.2 Tree Maintenance

The almost continuous tree line in places along the bank would greatly benefit from rotational coppicing, as would several other areas, where every third or fourth tree should be coppiced to allow light penetration to the river bank and bed. This will ensure beneficial balance of light and shade along the watercourse and promote growth of both aquatic and marginal vegetation. Coppicing would be particularly beneficial on trees that are subject to large areas of erosion behind or at either side of them, to reduce the leverage currently acting against the root-ball and allow the bank time to stabilise through the beneficial effects of the buffer strip (e.g. Figures 9 & 10 and any similarly susceptible exposed trees). In such examples it would also be beneficial to install wired brash around the base of the tree to encourage sediment deposition, or to fix brash bundles around the tree base to trap sediment and provide a medium for vegetation to colonise.

Hinging some of the tree material into the channel would also be beneficial in creating cover and refuge habitat, and diffusion flow. The ideal species for this are willow and hazel as they are supple, but thin willow and ash can be treated in this way, if done very carefully. Tethering LWD in to increase structure within the channel (Figures 17 and 18) would also help.

**Figure 17. Hinged willow.**

**Figure 18. Hinged Hazel.**

Maintenance of the trees along the tributaries was also discussed and it is recommended that coppicing and pollarding along those watercourses could be undertaken, but is not vital. The cover that they provide does create good habitat for birds. That said, the long section of willow along the main LB tributary will be a very useful source of living willow material to be utilised within the bank protection works and to provide whips for quick and easy planting. Short sections of willow whip (c.45-60) can simply be pushed/driven into the ground so that about 2/3 of their total length is buried. This will be particularly beneficial along the toe of the bank line in wet areas where erosion is an issue.

### 4.2.3 Bank Protection

Some of the bank erosion being experienced will ultimately be beneficial, through the increased channel width it is creating; however, in general erosion is something that should be managed. Installation of the buffer strips to exclude livestock from the watercourse will address the issue in some cases (Figure 20), but in others the use of overlapping brash revetment or installation of brash bundles will assist in management of the issue.

The overlapping brash technique is demonstrated on a larger scale with a mixture of willow and other species in Figure 17. This method diffuses flows along the bank, increasing deposition in areas that were subject to excess erosion. The benefit of using living willow being that, if at least some of the branch is in contact with the water and bank, it should start to root. This technique would be particularly beneficial in areas such as that depicted in Figure 4, and along the erosion in Figure 6 where clearance of the central channel would also be beneficial to relieve pressure from the bank.

In a similar way, brash bundles/wired brash (ideally live willow) can be installed in a line along the base of the river bank to create a toe (Figure 20). This method works by creating a stable base to the bank that can colonise with vegetation and will catch any material that slumps from the bank above. The benefit of using live willow for this being that if it is in contact with the water the branches are likely to take root and grow, rapidly providing bushes along the bank that will stabilise it and create high quality habitat.

**Figure 19. Mixed brash bank revetment (mainly hawthorn and willow).**

**Figure 20. A perfect example of an area where erosion is likely to stop as soon as the vegetation grows up within the buffer strip.**

**Figure 21. Wired willow brash installed by Yorkshire Dales Rivers Trust resulting from the advice of a previous WTT advisory visit.**

**Figure 22. Living willow bundle toe being installed during a previous WTT workshop.**

There are also, however, notable areas where it will be essential not to fill in the erosion bites in the bank. In instances such as those depicted in Figures 5, 20 and 23, retention of the slack, back-water habitat that is so scarce along the waterbody will be vital in maintaining habitat diversity. Here, coppicing the trees should reduce flow deflection into the bank short-term until the buffer strip vegetates. The choice of which areas to leave will have to be made through careful inspection of each individual location to ascertain where the trees are well enough anchored to survive simply through the protection provided as the well-vegetated buffer strip develops.

**Figure 23. Not every area of eroded bank should be filled with brash, so that the valuable and scarce adult trout holding water can be retained.**

**NB.** Any coppiced trees, willow planting and willow bundles must be protected with fencing as any fresh regrowth is likely to be targeted by livestock. Browsing/grazing of this growth is likely to lead to death of the trees.

### 4.2.4 LB Tributary

If the custodian/s of the land on the LB tributary with the undersized culvert has the appropriate machinery, it may be possible that they can install a larger capacity pipe/culvert at the crossing point, if it were supplied by the SCRT. The stipulation need only be that the pipe is a minimum of 1m dia.(an increase from the current pipe), and that is it is sunken into the bed of the tributary by about 1/3 of its total capacity.

### 4.2.5 Poaching on RB tributary

On the main RB tributary the issue with poaching at the fording point (Figure 14) could be rectified by buffer fencing; however, if this is not possible, installation of a clear span bridge to cross the watercourse may be a solution. This will incur additional cost, but the high banks, relatively equal height banks in several locations could easily facilitate such a bridge. Either option is likely to require some kind of additional water source for livestock.

Before any work is undertaken to a 'Main River', or within 8 metres, it is important to first contact your local Environment Agency. The EA will be able to inform you whether there is a legal requirement for Flood Defence Consent, and supply you with any necessary forms, which they or the WTT will be able to assist you in completing.

Similarly, the local County Council should be contacted prior to any work within an 'Ordinary Watercourse'. They will then inform you whether consent is required.

The Flood Defence Consent process allows the competent authority to assess and manage the potential flood risk and biodiversity implications of any work.

## 5.0 Making it Happen

In conjunction with this report, the Wild Trout Trust can provide practical assistance in initiating some of the recommendations made, providing a workshop to demonstrate some of the tree management and bank protection techniques. The aim of this guidance should be for participants to develop a better understanding of the skills and techniques so that the work can be replicated in other areas and similar improvements can be made to other areas.

WTT may also be able to offer further assistance such as:

**WTT Fundraising advice**

- Help and advice on how to raise funds for habitat improvement work can be found on the WTT website - http://www.wildtrout.org/content/project-funding

The WTT officer responsible for fundraising advice is Denise Ashton: dashton@wildtrout.org

**Instructional material**

- The WTT website library has a wide range of free materials in video and PDF format on habitat management and improvement:

http://www.wildtrout.org/content/index

- We have also produced a 70 minute DVD called 'Rivers: Working for Wild Trout' which graphically illustrates the challenges of managing river habitat for wild trout, with examples of good and poor habitat and practical demonstrations of habitat improvement. Additional sections of film cover key topics in greater depth, such as woody debris, enhancing fish stocks and managing invasive species.

The DVD is available to buy for £10.00 from our website shop http://www.wildtrout.org/product/rivers-working-wild-trout-dvd-0 or by calling the WTT office on 02392 570985.

## 6.0 Acknowledgement

The Wild Trout Trust would like to thank the Environment Agency for their continued support of the advisory visit service.

## 7.0 Disclaimer

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