Advisory Visit for Andrew Bywater

River Eden - Skygarth Farm

24/09/2013

1.0 Introduction

This report is the output of a site visit undertaken by Gareth Pedley of the Wild Trout Trust to the River Eden on Tuesday 24th September 2013. The visit was undertaken at the Request of Andrew Bywater, whose observations appeared to indicate a reduction in the number of larger fish, particularly in the 0.45-1kg (c.1-2.2lb) size. There was also a feeling that the river depth in many areas has decreased over the years. Comments in this report are based on observations on the day of the site visit and discussions with Chris Bywater and Andrew Bywater.

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

The Eden Valley is distinctive for its gently sloping, or rolling, topography. This is in contrast to the steep, 'harder' ground of the Pennine escarpment, the limestone country of the Orton & Asby Fells and the eastern flanks of the Lake District. This topography is largely a consequence of the extensive blanket of drift deposits (deposits which result from natural erosion and deposition during the Quaternary period, originally derived from solid rocks) overlying the solid geology of the valley, and the manner in which the streams and rivers have cut through deposits to the bedrock. In a few places there are drift-free hills of bedrock, mainly comprising Penrith Sandstones (http://www.naturalareas.naturalengland.org.uk/Science/natural/NA_search.asp). Areas of limestone bedrock in the upper catchment, and upper and middle sections of many of the Eden's tributaries also provide a beneficial increase in the river's pH and greatly improve the river's productivity.

Current land use along this section of the River Eden is predominantly sheep grazing, with some cattle and areas of woodland and riverside buffer strips. According to the Government's Magic.org website, the area lies within one of Natural England's Higher Level Stewardship (HLS) target areas. While the current round of HLS invitations have been completed, there is likely to be potential for gaining subsidy payments on land placed into buffer strips

along the river banks, to exclude livestock, when the next round of the scheme or its successor come into place (http://www.magic.gov.uk/MagicMap.aspx).

The fishing at Skygarth is owned by the Bywater family, who control approximately 1.2km of predominantly double bank fishing on the River Eden, from NY 606 262 - NY 612 254 on the RB, and NY 608 260 - NY 617 250 on the LB. There is also an additional c.1.4km section of fishing on the River Lyvennet, on the RB, from the confluence with the Eden upstream. The family fish the river themselves, but also let out accommodation and fishing approximately six times per year, which creates an additional twelve weeks fishing.

The river is currently stocked with 100 x c.25cm triploid brown trout *Salmo trutta* which are introduced in two locations. This action has been undertaken annually since 1993, when a large-scale fish-kill occurred on the river. Angling pressure is considered to be relatively low, and exploitation to be around 10%, with approximately 90% of fish being retuned.

The waterbody in which this section of river lies 'River Eden from Kirkby Stephen to the Eamont' (Waterbody ID - GB102076070880) is a particularly large waterbody, and is classed as heavily modified under the Water Framework Directive. This means that although it only achieves a 'moderate' status for fish (poorer than would be expected), this fact does not degrade the overall classification from 'good', as other aspects assessed are as good as would be expected.

However, regardless of the general WFD status, this part of the river is a European Special Area of Conservation, so is a Natura Protected Area under WFD, The SAC stretches of river, including this stretch, are required to meet favourable condition as defined by the SAC conservation objectives. The designation includes the river type and salmon so under WFD the stretch must meet more stringent targets including a near natural riparian zone, near natural 'morphology' and meeting the Conservation Limit for salmon for 4 years out of 5.

3.0 Habitat Assessment

Upon reaching the river, a stark contrast between the habitat quality of the right and left river banks was apparent. The RB borders mature deciduous woodland, with a good diversity of trees and diverse marginal vegetation. Low level and trailing branches, along with large woody debris (LWD) provide excellent shade and cover along the margins and an abundance of fish holding features (Figure 1).

Habitat along the LB, however, was of much poorer quality. A history of grazing has left the bank lacking in trees or herbaceous vegetation and highly susceptible to erosion. For this reason, it was not surprising to see that the channel had become over-wide for normal river flows, leading to increased deposition of bed material, shallowing of the river and a reduction in habitat quality of the section.

Past attempts have been made to narrow the channel with the use of a downstream facing groyne. While at low flows, the groyne provides some of the desired effect by narrowing the channel (by both the structure, and the deposition it facilitates), and increasing flow velocities and scour within the channel, once the groyne is overtopped it directs additional flow into the already susceptible grazed LB, which has increased the rate of erosion.

Figure 1. Excellent habitat along the right bank, provided by low branches and woody debris. The rock groyne is exacerbating erosion on the already susceptible, grazed left bank (red arrow).

In areas where livestock are excluded from the river bank, a significant increase in the quality and diversity of bankside vegetation can be observed (Figure 2). This not only provides valuable shade and cover habitat for fish and invertebrates, but also increases the integrity and stability of the river bank, greatly reducing the rate of erosion. As a consequence, areas of channel where livestock are excluded from the bank are narrower, due to reduced rates of erosion and natural narrowing through marginal encroachment. This is because, over time, depositional features within the margins of over-wide river sections can become vegetated in the absence of grazing pressure; these features then become consolidated to form the new bank line (see examples in recommendation section). As the extent of this narrowing is governed by the natural erosive forces of the river, it will subsequently maintain an optimal width.

Figure 2. Improved river bank vegetation resulting from livestock exclusion. The quality of vegetation is still less than optimal on the near bank, due to sheep getting through the poorly maintained fence; however, a naturally diverse vegetation structure can be observed on the far bank where stock are completely excluded.

The issues with grazing and channel over-widening continue upstream, where livestock have access to the river bank. In this section the LB is fenced and supports healthy tree and herbaceous vegetation, but the unprotected RB has been heavily grazed, again leading to bank erosion, loss of trees, a significant increase in channel width and loss of channel depth (Figure 3). The wider, shallower channel sections created do provide some habitat for juvenile trout and salmon (*Salmo salar*), but the lack of deeper water significantly reduces the habitat quality for adult fish, and therefore potentially impacts upon angling and the carrying capacity of the reach.

In addition, the reduction in flow velocities and beneficial bed scouring in over-wide reaches inhibits the natural cleaning and sorting processes that ordinarily maintain the quality of the river bed. This also often has a negative impact upon salmonid spawning, as the gravels become infiltrated with finer sediments, making them less desirable for fish to spawn on. The

increased deposition of fine materials on top of the gravels also mean that any eggs that are laid within the gravel are likely to become smothered, reducing the throughput of water and amount of oxygen that they receive, greatly reducing the egg survival. Compacted, silty gravels also reduce habitat diversity for invertebrates, reducing species diversity and the availability of food for trout.

Figure 3. Good tree cover on the far left (LB), with significant erosion issues resulting from stock grazing on the near bank. As with sections downstream, the grazing pressure has accelerated rates of erosion, resulting in channel widening and a reduction in water depth, degrading habitat suitability for larger trout.

Further upstream, towards Ousenstand Bridge, the channel remains wide, but becomes deeper; however, it is suspected that this is the result of historic channel maintenance and dredging in relation to the bridge, as the channel morphology does not appear natural. The channel is deeper, straighter and wider than river flows would ordinarily maintain, leaving an over capacity channel with little flow diversity. It is, in fact, likely that over time this channel will be capturing and storing a large proportion of bed

material that is supplied from upstream and will be progressively shallowing over time.

The deeper water does provide some of the pool habitat currently lacking in other areas, and there is good tree cover along the LB. As such, the area is likely to hold some larger adult trout. However, due to the poor flow diversity, the quality and variety of habitats is greatly reduced in comparison to a natural channel, and the size range and number of fish that it can support is lower.

Figure 4. Over deep and wide section downstream of Ousenstand Bridge, suspected to be the result of past maintenance and dredging. Good cover along the LB and the availability of deeper water does provide some habitat for larger fish, as does the willow shrub on the RB.

Upstream of Ousenstand Bridge, stock exclusion continues on the LB, and although not alder lined, as downstream, the bankside habitat is of a high quality. A good diversity of herbaceous vegetation lines the bank, providing bank protection and cover, with occasional willow trees and shrubs further increasing cover and providing some increased flow diversity (Figure 5).

Habitat along the RB is of much lower quality, however, primarily due to livestock grazing, even though it is at a lower intensity than downstream. Although the lighter grazing has facilitated some increase in species diversity and reduced the rates of bank erosion, there is still a general lack of herbaceous vegetation and tree regeneration. Consequently, in one section, on the outside of a bend (RB), erosion has become an issue, where formal rock armouring of the bank has failed. Once the armouring failed, likely due to cattle poaching and grazing around the armouring, high river flows appear to have scoured around the rocks, creating the effect of a weir and eroding a large scallop out of the bank. It is probable that this erosion issue would not have occurred if livestock had been excluded from the bank and a more diversely vegetated bank were present, as is the case on the LB.

Figure 5. Wide section of river upstream of Ousenstand Bridge, with a well vegetated far bank (LB), and correspondingly, no erosion issues. Trailing willow branches provide excellent adult trout cover and greatly enhance the habitat.

In addition to the main River Eden, a short section of the River Lyvennet was also walked, from the confluence, upstream, for one field length. This

section of river has been significantly altered in the past, as evident by the uniform, straight channel (Figure 6), but also from the historic course that is still present within the adjacent field. The constrained nature of the channel is also likely to lead to further incision of the river into its bed, as being constrained by the unnaturally high banks, the energy of flood flows are no longer able to dissipate across the flood plain, causing increased bed scouring.

Although compromised by the past channel maintenance, habitat within the lower Lyvennet has begun to recover through natural events and is starting to improve. Willow trees along the banks are creating increased flow diversity and facilitating beneficial scour and erosion (natural formation of scoured pools and deposited gravels, as opposed to accelerated bank erosion) while also providing valuable cover and fish holding habitat. Fencing to exclude stock in this section has facilitated good growth of bankside vegetation and greatly reduced the potential for erosion, to the extent that the only area where erosion is an issue is where stock are regularly gaining access through the fence.

Figure 6. The lower River Lyvennet, at its confluence with the Eden. The channel is heavily influenced by dredging and straightening, but is starting to recover some natural features, with willows providing valuable habitat.

4.0 Recommendations

4.1 Stock management

The River Eden is a large and diverse catchment, with a good range of habitats that are capable of providing natural trout production in most areas, even though some of them are sub-optimal at present. With this in mind, it is highly recommended that stocking of the Skygarth beat with farmed fish is stopped in favour promoting natural, wild fish production. Skygarth is now the only beat on the River Eden catchment that still does stock (Appleby Angling Association have now also stopped) and it would be great to be able to boast that the Eden is one of the first major river catchments in England to completely cease stocking and fully embrace wild fishery management.

This would mean that funds historically spent on stocking can be directed towards optimising habitats for the production of wild fish, free from the impacts of stocked fish. More importantly, by doing this, the potential for competition between stocked and wild fish can be removed, and any risk of wild fish being displaced by stocked fish, only for the stocked fish to vacate the area subsequently, would also be removed.

Natural river habitats have a much greater capacity for healthy wild fish populations than stocked fish populations. This is because, from emerging, wild fish naturally distribute themselves throughout a river, dispersing to find territories appropriate to their individual size and dominance, thereby achieving optimal utilisation of the available habitat. This also means that the overall population density and abundance of fish is dependant upon the quality and availability of the habitats.

Having established territories, there is also a much greater chance that wild fish will remain within those areas, only moving to another area if they are displaced by another fish, or as their requirements change, at which point the habitat can be taken up by a subordinate individual, again, ensuring optimal habitat utilisation.

In contrast, stocked fish with no affinity to a reach and little suitability to the habitat are likely to emigrate to other areas soon after stocking, but not necessarily before negatively impacting upon the distribution and abundance of native fish. So, although initially a counterintuitive concept, stocking actually has the potential to reduce the numbers of fish within a reach, even if infertile fish are used; whereas, wild fisheries have the potential to support much greater overall fish populations (more information can be found on this subject at http://www.wildtrout.org/content/trout-stocking)

It is also strongly recommended that catch and release is actively promoted on the Skygarth waters, as on any fishery where wild trout stocks and angling are to be optimised. Although exploitation of fish stocks is often considered to be low, with only a few fish taken, if those fish are the older, larger fish, or from an age/size group of limited abundance within the population, the impact can still be significant. For example, the larger trophy fish (>0.5kg) are unlikely to account for 10% of the total fish caught, but 100% of those fish may be taken. So angler exploitation of that portion of the population could be particularly high. This is just an example, so the

scenario is not limited to the larger fish and the issue could occur on any size range of fish that are exploited.

As such, it is much safer to return fish and preserve the standing stock of a reach to optimise future angling potential. In this way, a far greater number of anglers can enjoy the river, and a greater number of quality days fishing can be provided.

4.2 Fencing

As described in the habitat assessment, fencing livestock away from the river would provide many significant improvements to both the river function and its habitat quality, and is likely to be one of the single biggest improvements that could be made here.

Recent informal discussions with Natural England (NE) have already identified the potential for a Conservation Enhancement Scheme (CES) on the Skygarth land that could provide funding assistance towards fencing livestock away from the river. In addition, the land placed into the buffer strip will also likely to be eligible for an annual payment of up to £7.5k/ha for five years, for removing the land from agricultural production. Payments are also available for assistance with the management of contractors and delivery of the CES project, to reduce the burden upon the tenant or landowner.

The other alternative may be to encourage the tenant to enter the farm into the next round of Stewardship type scheme (successor to HLS) with Natural England, to generate subsidy payments for reducing the intensity of farming on land entered to it, with increased payments for features such as riverside buffer fencing. However, the new schemes will not be brought in until 2016 and details of options are not yet available, so a CES scheme is probability the better option from both the financial benefit it provides and the timescales involved. Please contact gareth@edenrt.org (07500870583) for more information on progressing a scheme, and to be put in contact with NE.

If livestock can be excluded from the river, the banks within the fenced area would become more densely vegetated, with a greater diversity of species, creating greater protection of the bank, both above and below the ground, improving habitat and reducing bank erosion. Over time the banks can then naturally start to encroach into the channel (or can be assisted with planting

and in-channel structures), causing a natural narrowing effect, until the river returns to a sustainable, self-maintaining width. Once the beneficial species have become well established and started to create the benefits mentioned, it may then be worth allowing some closely controlled grazing within the fencing to maintain species diversity and reduce the potential for non-native species taking over.

Figures 7 and 8, and 9 and 10 show two sections of river bank, before, and after fencing work to exclude livestock from the river – the results are pretty dramatic and a direct comparison can be drawn between those locations and the likely improvements that could be realised in the land shown in figures 1 & 3, if livestock are excluded from the river banks.

Figure 11 shows a great example of the extensive (40-60cm), diverse root mass that exists underneath an un-grazed turf. If this is compared to the before fencing shots of grazed banks where the root depth is around 5-10cm (Figures 7 and 9), it is easy to see why the more diverse vegetation structure of an un-grazed bank offers far greater protection at the surface and consolidation of the ground.

Figure 7. River Eden at Crackenthorpe before riverside buffer fencing to exclude livestock.

Figure 8. River Eden at Crackenthorpe after riverside buffer fencing to exclude livestock.

Figure 9. River Eden at Barrowmoor before riverside buffer fencing to exclude livestock.

Figure 10. River Eden at Barrowmoor after riverside buffer fencing to exclude livestock.

Figure 7. 40-60cm deep root matrix provided by a diverse un-grazed river margin which is significantly reducing the rate of bank erosion compared to heavily grazed bank.

4.3 Increasing the number of trees

Inside buffer fencing, self-set trees and shrubs can also start to establish and it becomes viable to plant additional trees and shrubs, without the risk of browsing by livestock. Once established the trees will bind the banks together further and greatly increase their stability while providing beneficial habitat features and material to use for future enhancements, such as laying, coppicing and pollarding.

Tree planting can be used to provide important cover around the riffles and pools that already exist, but also, planting discrete clusters along the straight sections can be beneficial in redirecting uniform flows as roots and branches encroach into the channel. Appropriate trees to plant would include most native deciduous species, but hawthorn *Crataegus monogyna*, willows *Salix* spp. (Particularly goat willow *Salix Caprea*, as it is small and bushy)

and alder *Alnus glutinosa* are good fast growing species that provide good bank protection and are well suited to wet areas and bank lines.

The quickest and easiest way to plant willow is by pushing short sections of willow whip into the ground around the water line (where it will get plenty of water). This can be undertaken at any time of the year, but will usually have the greatest success if undertaken within the dormant season, shortly before spring growth begins (ideally late Jan-early March). Whips should be planted into soft, wet earth/sediment so that the majority of the whip is within the ground than out of it, to minimise the distance that water has to be transported up the stem; 300-400mm of whip protruding from the ground is sufficient.

Willow can also be established as living willow bundles, which consist of a several willow branches tied together into a faggot. These can then be staked along the waterline, ideally with the majority of the bundle submerged in most flows. When they take, this method can rapidly increase the availability of low, dense canopy over the water, rapidly creating fish holding lies.

Planting of willow whips, and/or bundles is recommended along any open or featureless sections of river bank in which livestock are excluded. The benefits of planting in unfenced sections are likely to be very limited as livestock tend to home in on the lush fresh willow growth as a preference, particularly in heavily grazed areas.

It is preferable to source willow locally, ideally from adjacent areas of the bank. This ensures that it is suited to the conditions and helps to avoid potential issues with transportation of non-native species. There are numerous willow species found on river banks, even locally, but the smaller shrub types are particularly good for creating dense, low cover, as they remain small. However, on over-wide sections, crack willow *Salix fragilis* may be preferable, as its natural propensity to grow quickly and collapse into the river under its own weight would, over time, naturally increase the marginal structure and facilitate beneficial sediment depositions to increase channel narrowing.

If the CES scheme mentioned previously were initiated with Natural England a subsidy towards tree planting can be also be included.

4.4 In-channel structures

To reduce erosive flows against the LB, it is recommended that the rock groyne located downstream of the footbridge (Figure 1) is removed. While the narrowing effect it creates does provide beneficial reduction in channel width at low flows, it is also working as a downstream flow deflector and turning higher flows which over-top into the LB and increasing erosion.

In place of the groyne softer techniques involving large woody debris and brash could be employed to give similar benefits by increasing deposition along the left bank that could then become vegetated (assuming stock exclusion). This would facilitate a more sustainable, natural channel narrowing, without the risk to the river bank that the groyne poses. Figure 12 shows how 'tree kickers' (trees that have been cut down and tethered into the river margins to provide deflection of flows) can be used to encourage additional deposition along bank.

However, if livestock are excluded from the LB bank and brash/living willow protection installed alongside and downstream of the groyne, the erosion may be controllable.

Tree kickers and LWD could be used in any other over-wide sections of the river (ideally following stock exclusion from the river banks) to narrow the channel, increase flow diversity and deposition, and provide cover, particularly in the deep, apparently dredged section below Ousenstand Bridge. In this section, kickers on the LB are likely to provide valuable cover and flow diversity, while structure installed on the RB is likely to encourage gravel and sediment deposition. Again, excluding stock from the riverbanks will maximise the benefits that can be gained from these techniques, as it will allow consolidation of any exposed depositional features and natural narrowing.

Figure 12. Tree kicker (tethered just out of shot to the left) creating beneficial deposition in its lee and creating a channel narrowing effect, with a significantly lower risk to bank erosion than a groyne. Over time the deposited material is likely to become vegetated and create a new bank line.

Before any work is undertaken to a watercourse, or within 8 metres (5 in some areas), 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.

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

5.0 Making it Happen

WTT may be able to offer further assistance such as:

- WTT Project Proposal
  - Further to this report, WTT can devise a more detailed project proposal report. This can be used for the detailed project proposals for a Natural England CES application if desired. This would usually detail the next steps to take and highlighting specific areas for work, with the report forming part of a land drainage consent application.
- WTT Practical Visit
  - Where clubs are in need of assistance to carry out the kind of improvements highlighted in an advisory visit report, there is the possibility of WTT staff conducting a practical day for a club. This would consist of 1-3 days work with a WTT Conservation Officer teaming up with interested parties to demonstrate the habitat enhancement methods described above. You would be asked to contribute only to reasonable travel and subsistence costs of the WTT Officer.
- 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

In addition, 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 the Environment Agency for their continued support of the advisory visit service.

7.0 Disclaimer

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