Advisory Visit for the North Yorkshire Moors National Park and Glaisdale Angling Club

River Esk, North Yorkshire

13th June 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 Esk, on 13th June 2013. Comments in this report are based on observations on the day of the visit and discussions with Simon Hirst (North Yorkshire Moors National Park - River Esk Project Officer), Andrew Delaney (Environment Agency Fisheries Officer), and Gareth Jones, Ian Whisker and Mike Greening of Glaisedale Angling Club.

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 River Esk rises on the North Yorkshire Moors, flowing in an easterly direction, to discharge into the North Sea at Whitby. Although once resembling open woodland/heathland, the deforestation by Neolithic man cleared large areas of the catchment. This clearance started degeneration of the thin soils, which became depleted of nutrients and prone to erosion once the woodland cover was removed, leading to a collapse of upland farming. Now some woodlands do exist, but most are associated with the river valley, and in many cases, only form a narrow band along the riparian corridor.

The upper reaches of the river, including many of the upper tributaries, now originate in relatively open moorland, with little vegetation, other than heather, gorse and grass. As such, the predominant land use in the upper areas is grouse moor, transitioning to unimproved sheep grazing, then improved grazing for sheep and cattle further down the catchment as the altitude lowers and land productivity increases.

The geology of the catchment is dominated by sandstones, siltstones and mudstones of various periods, with some influence of limestone in discrete areas. This combination makes for sandy in-cohesive soils, which have a strong influence on the form and function of the river (http://www.naturalareas.naturalengland.org.uk/Science/natural/NA_search.asp).

Much of the catchment lies within Natural England's (NE) Higher Level Stewardship Target Area. This means that there may be the possibility of agreements between NE and landowners/tenants to adopt more environmentally sympathetic land management practices, and to compensate them for putting land into less intensive farming and create buffer strips along watercourses (http://www.magic.gov.uk/website/magic/).

Under the Water Framework Directive, this waterbody, the 'River Esk from Sledale Beck to Ruswarp' (GB104027068150), is considered to be heavily modified (it has been significantly altered by human modification), and while assessed as 'high' for invertebrates (the expected species are present in the numbers expected), the section is classed as only 'moderate' for fish (lower than expected numbers of fish were present). The other parameters are all assessed as being 'high' (http://maps.environment-agency.gov.uk).

Glaisdale Angling Club members fish primarily for migratory salmonids and although resident trout are present, most of the actively-fishing members are believed to wait for conditions that suit salmon and sea trout. It is thought that resident trout stocks started to decline approximately 8 years ago, possibly in conjunction with large-scale tree removal along one of the banks.

The club controls a range of double and single bank fishing over approximately 3.2Km of river, of which approximately half was assessed, between the stepping stones near Rake Farm (NZ 77993 06571) and the wood at the downstream limit of the fishery (NZ 77854 05959). The club consists of 25 members of which only one third were considered to be regularly using the fishery. No stocking has been undertaken on the fishery for approximately 5 years, following the conclusion that most of the fish stocked were lost downstream with very little contribution to catches. Some stocking is thought to be undertaken by clubs upstream.

3.0 Habitat Assessment

Owing to the upland nature of the catchment, minimal tree cover in the upper moorland areas, and relatively steep gradient, the River Esk conforms to the profile of a spate river. Assessment of the channel features confirmed this, with the coarse cobble and boulder substrate present in many of the higher gradient riffle areas, and large depositional features around bends

and in-channel structures, indicative of a “spatey”, high-energy river system (Figure 1).

The river is also capable of moving large trees that become dislodged from the bank, depositing them as large woody debris (LWD) in other areas of the channel to provide valuable habitat for a range of species. The storage of sediments along the channel margins such debris provides helps reduce the volumes that are transported downstream and deposited within other areas of the channel. This can reduce the potential detrimental impacts upon other habitats, whilst creating depositional features that provide habitat for many invertebrate species and lamprey. The flow diversity and scouring that LWD creates in other areas of the channel can also provide habitat for fish and invertebrates (Figure 2), and the associated cleaning and sorting of gravels improves the quality of salmonid spawning habitat.

Figure 1. Highly-beneficial large woody debris that has been washed out of the bank and become lodged towards the tail of a pool. Note the significant accumulation of bed material upstream, providing valuable storage, and the area of protection from higher flows provided downstream.

Figure 2. Another excellent example of Large Woody Debris (LWD) that is providing great cover for trout and down-scouring of the bed that will help create and maintain deeper areas with clean substrate.

For most of the reach inspected the river bed lies well below the bank top, within an incised channel. As there are no obvious signs of dredging, it is likely that this is a product of the light sandy soils and relatively high-energy river system causing erosion and incision. Correspondingly, there was a significant over supply of sediment within the reach, and into the reach from upstream that is likely to be significantly compromising spawning habitat for smaller salmonids such as resident trout. It is possible, however, that the higher flows over the larger gravels and cobbles on which migratory salmonids spawn are more capable of transporting the sandy sediments that appear to be compromising the trout-sized spawning gravels. These conditions favouring larger fish may be contributing to the suspected reduction in resident trout populations. Figure 3 demonstrates the issue quite clearly, with significant fine sediment deposits in the far (RB) margin, and cleaner, darker substrate in the deeper, higher energy flows.

Figure 3. Obvious signs of over supply of fine sediment in any areas of slower flow.

The poor cohesion of the sandy soil makes the banks of the Esk particularly susceptible to scouring and wash-out. This can create significant issues when combined with sheep and cattle grazing that remove the protection that would ordinarily be provided by diverse vegetation structure. Grazing also greatly reduces root structure within the soil, as the majority of plant growth is concentrated above the surface to replace what is grazed. The subsequent lack of growth put into root structure can lead to significant issues with bank erosion without the beneficial binding they provide.

Compare the difference in cover and root structure between the ungrazed, diversely-vegetated section of more stable bank (Figure 4), and that of the heavily grazed bank downstream, where serious erosion issues are occurring (Figure 5). Some erosion is occurring in the first example (Figure 3), but at a much slower more natural rate, and it is much more likely to become consolidated over time than the second example (Figure 4), where the next large flood is likely to wash out large volumes of the unprotected earth.

Bank erosion is a natural process, and part of a healthy river system so should not be stopped completely; however, better bank management can significantly slow the process to natural levels and reduce the potential negative impacts on habitat, and loss of land.

Figure 4. Ungrazed-bank where some erosion is occurring, but at a relatively slow, natural rate, due to the positive effect of vegetation.

Figure 5. Bank erosion, significantly exacerbated by livestock access to the river bank.

(Appendix A shows a similar scenario on the River Eden in Cumbria, before and after fencing; and how the simple action of stock exclusion is sometimes all that is required. The section of river bank was heavily grazed and lacking in protection, but is now well vegetated and very stable).

In addition to the general erosion issues, and the major erosion at the downstream end of the section inspected (Figure 5), there was also another significant area of erosion where springs within the bank, possibly exacerbated by field drains, are saturating the high bank, leading to mass failure. Over time this has also led to the loss of many of the bankside trees that would ordinarily protect the bank toe (Figure 6: NZ 78073 06314). Stock poaching and grazing are further exacerbating the issue.

Figure 6. The toe of mass failing section of bank where several trees have been lost previously. Coppicing the tree in the background (red arrow) should promote more low level cover through re-growth and reduce the leverage that will, at present, ultimately pull the tree over.

Despite the ubiquitous problems with sediment input, areas of reasonable quality habitat were observed for most salmonid life stages. Shallow riffles with good flow diversity and marginal structure provide quality habitat for juvenile trout and salmon (Figure 7). The section depicted in Figure 7 was apparently heavily cleared on the RB, with many of the trees and low branches cut back. This type of action seriously denudes vital aerial and trailing cover along the river bank that is vital fish holding habitat. It was not surprising, therefore, to hear that anglers observed a decline in trout catches in this section subsequently. Now the cover has regenerated, the habitat is much more capable of holding fish, increasing the potential carrying capacity of the river. This serves as a warning that tree management should only be undertaken very sparingly to avoid negative consequences.

Figure 7. Good juvenile salmonid habitat, with reasonable aerial cover and some potential for spawning, although the substrate is somewhat compromised for smaller species by excessive sedimentation.

In some areas self-set willows also provide good trailing and aerial cover, and undoubtedly increase the number of fish that the river can hold, while also stabilising the toe of the banks (Figure 8). A further benefit of these natural, "hydrologically-rough" structures along the river banks is that rather than deflecting flows, as hard structures like rock armouring or groynes would, they actually slow and diffuse the flows, dissipating the energy along the river bank, causing sediment deposition where it is beneficial and encouraging formation of more river bank. They still, however, provide channel narrowing, increasing local flow velocities and diversity within the channel that is highly beneficial for rheophilic species such as salmonids.

Figure 8. Bank side willow along the waterline that will increase beneficial deposition and consolidate the bank toe, while providing valuable cover and shade for adult fish, and protection from flows and predation for juveniles.

The remains of several small rock weirs, groynes and hard bank protection were also observed throughout the section inspected. For the most part these are in a poor state of repair and relatively innocuous. However, some of the groynes and solid structures are making the banks susceptible to erosion by diverting higher flows into the bank (Figures 9 & 10). One of the weirs is also a potential issue, being fully intact and impounding flows upstream. This is exacerbating issues with sedimentation of the pool upstream and also increasing the depth over what would otherwise probably form a spawning riffle (Figure 11: NZ 77809 06205).

Figure 9. One of the old groynes that could lead to increased bank erosion.

Figure 10. Scouring and exacerbated erosion up and downstream of previous attempts at hard bank protection.

Figure 11. Stone weir which is causing impoundment of flows upstream, increasing sedimentation and degrading the lift at the tail of the pool that would otherwise provide spawning habitat.

4.0 Recommendations

4.1 Sedimentation

The erosion and sedimentation issues that are occurring on the river must be addressed before significant improvements can be made to wild salmonid stocks. Several tens of kilometres of riverside fencing have already been undertaken within the catchment (S. Hirst, pers. comm., 13th June 2013), which should start to reduce sediment inputs, but stock exclusion along all areas that are not currently fenced should be an important aspiration.

Natural England's (NE) Higher Level Stewardship (HLS) advisors may be able to organise payments for farmers placing land into buffer strips, for creation/enhancement of woodlands, and for more sympathetic land management practices, if the land can be entered into Higher Level

Stewardship schemes. If NE cannot help, the Forestry Commission may be able to assist with funding for woodland creation or enhancement schemes.

The area of mass failing bank shown in Figure 6 is a prime location for fencing, as stock exclusion should promote regeneration of the understory within the wood, and help consolidate the land. It may also be worth considering brash type soft revetment around the toe of the bank, either by anchoring tree tops on the bank, to trail into the river, or by wiring brash along the river margin and lower bank to baffle flows (as demonstrated in Appendix B). The requirement for this can be reassessed in the autumn.

The area shown in Figures 5 & 10 would benefit greatly from stock exclusion, well back from the bank top, to allow more diverse vegetation structure to develop and natural bank consolidation to occur. While this may not be the entire solution, it would be an ideal, low-cost, first step to promoting consolidation of the bank, which has already re-graded to a more stable angle. It is worth raking the bare earth and planting it with a natural local seed mix to kick-start the vegetation. The issue can then be assessed later in the year, and soft bank revetments undertaken with willow, if required.

5.0 Tree Management

5.1 Planting

With stock excluded from the river banks, planting additional trees within the buffer strips will be particularly beneficial (Figures 5 & 10). Planting willow from whips and saplings of local provenance, particularly smaller shrub species (*Salix pentandra*, *S. phylicifolia*, *S. cinerea & S. caprea*), will increase bank stability and provide good cover. The smaller shrub species are best for this as they require less maintenance and provide good dense cover at a low level.

Another highly effective and beneficial method is to secure small bundles of live willow (c.5-10 pieces) to the toe of the river bank slightly below the water line. These will begin to root into the water like cuttings, hopefully accumulating sediment around them, quickly becoming small bushes.

Either of the methods described would be beneficial in areas where groynes are already present in the river margins (as Figure 9). As the willow grows, it will consolidate the deposited material around the groynes, with the

diffuse structure of the shrubs slowing the detrimental erosive flows around the groynes - while still providing beneficial channel narrowing.

Planting other species of local provenance such as alder *Alnus glutinosa*, hawthorn *Crataegus monogyna*, elm *Ulmus minor* and hazel *Corylus avellana* would also be beneficial to increase species diversity. All of these species will also coppice well for future maintenance and are suitable for laying into the channel, particularly if done as saplings/small shrubs (Appendix C).

5.2 Coppicing

Coppicing is great way of increasing low-level re-growth where tree canopy has lifted. This treatment was not considered necessary in most areas, but coppicing of the tree highlighted in Figure 6 could reduce the leverage acting against its roots and prolong its time *in situ*. A demonstration of coppicing can be seen in Appendix D, where a whole run of trees have been coppiced; however, better results can be achieved by only coppicing selected trees, to prevent short term loss of habitat diversity.

In general, planting and tree work should be undertaken at low flows during the dormant season, as it will yield a much greater success rate and reduce the risk of killing trees; however, willow work, particularly if planted below the water line, has a good chance of becoming established at most times of the year. Removing most of the side leaves/buds can also increase success.

6.0 Weir removal

It is strongly recommended that the central section (ideally 1/3 of the total width) of the weir downstream of the railway bridge (Figure 11) is removed. This will restore beneficial flow to the pool upstream, allow formation of a spawning area at the tail of the pool upstream and restore some degree of bed-load-transport through the section.

Before any work is undertaken to a watercourse, or within 8 metres (or 5 under certain byelaws), 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 manage the potential flood risk and biodiversity implications of any work.

Making it Happen

Outline of the steps necessary to put the recommendations into action. Further WTT assistance:

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 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 club members to demonstrate the habitat enhancement methods described above. The recipient 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.

7.0 Acknowledgement

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

8.0 Disclaimer

This report is produced for guidance and not for specific advice; 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 guidance made in this report**.** 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.

Appendix A

The River Eden Nr. Crackenthorpe before fencing, subject to significant erosion issues due to a lack of vegetational cover and root structure.

The exact same section of the River Eden as shown above following buffer fencing to remove livestock from the river banks.

Appendix B

Hawthorn/tree top type bank protection (Courtesy of Wye and Usk Foundation).

Wired brash type bank revetment.

Appendix C

Willow after laying.

Hazel after laying into the channel margin.

Appendix D

Alder shortly after coppicing

Alder 5 years after coppicing (Fort better effect, coppicing would ideally be undertaken to the occasional, or alternate tree, rather than a continuous row).