Advisory Visit

Ryedale Anglers' Club

River Rye (North Yorkshire)

20/10/2017

Undertaken by Gareth Pedley

Key findings

- The River Rye already supports healthy wild trout populations but specific areas of the Ryedale Anglers' Club waters could be improved to increase the number and size range of fish that they hold.
- Straightening and past channel maintenance has left sections of the river channel straight and uniform and failing to fulfil their fish-holding potential.
- The employment of simple woody material techniques to increase flow diversity within the channel and kick-start more natural geomorphological processes would be greatly beneficial.

1.0 Introduction

This report is the output of a site visit to the Ryedale Angler's (RAC) section of the River Rye in North Yorkshire at the request of John Aston (RAC board member); also present on the visit were Nigel Walters (RAC board member), Jim Gurling (RAC riverkeeper) and John Shannon (East Yorkshire Rivers Trust). The purpose of the visit was to provide a general habitat assessment and offer recommendations of how the habitat in two particularly uniform sections of the river could be improved for the general ecology of the river to benefit the angling prospects.

Normal convention is applied throughout this report with respect to bank identification, i.e. the banks are designated left bank (LB) or right bank (RB) whilst looking downstream. The Ordnance Survey National Grid Reference system is used for identifying specific locations and references to upstream and downstream are often abbreviated to u/s and d/s, respectively, for convenience.

2.0 Catchment and fishery overview

Table 1. Overview of the waterbody details for the section of River Rye visited

	Waterbody details
River	Rye
Waterbody Name	Rye from River Seph to Holbeck
Waterbody ID	GB104027068200
River Basin District	Humber
Current Ecological Quality 2015	**Moderate** (potential) – driven by 'moderate' classification for 'supporting elements (surface water)'
U/S Grid Ref of reach inspected	SE 61859 83145
D/S Grid Ref of reach inspected	SE 63183 81999
Length of river inspected (km)	1

Water body classification

Select year: 2009 Cycle 1 ▼ Select year: 2016 Cycle 2 ▼

	2009 Cycle 1	2016 Cycle 2	Objectives
Overall Water Body	Moderate	Moderate	Good by 2027
Ecological	Moderate	Moderate	Good by 2027
Biological quality elements	Poor	Good	Good by 2015
Fish	Poor	Good	Good by 2015
Invertebrates	High	High	Good by 2015
Macrophytes	High	-	-
Macrophytes and Phytobenthos Combined	-	Good	Good by 2015
Phytobenthos	Moderate	-	-
Hydromorphological Supporting Elements	Supports Good	Supports Good	Supports Good by 2015
Physico-chemical quality elements	High	High	Good by 2015
Specific pollutants	High	-	Not assessed
Supporting elements (Surface Water)	Moderate	Moderate	Good by 2027
Mitigation Measures Assessment	Moderate or less	Moderate or less	Good by 2027
Chemical	Does not require assessment	Good	Good by 2015

(**http://environment.data.gov.uk/catchment-planning/WaterBody/GB104027068200**)

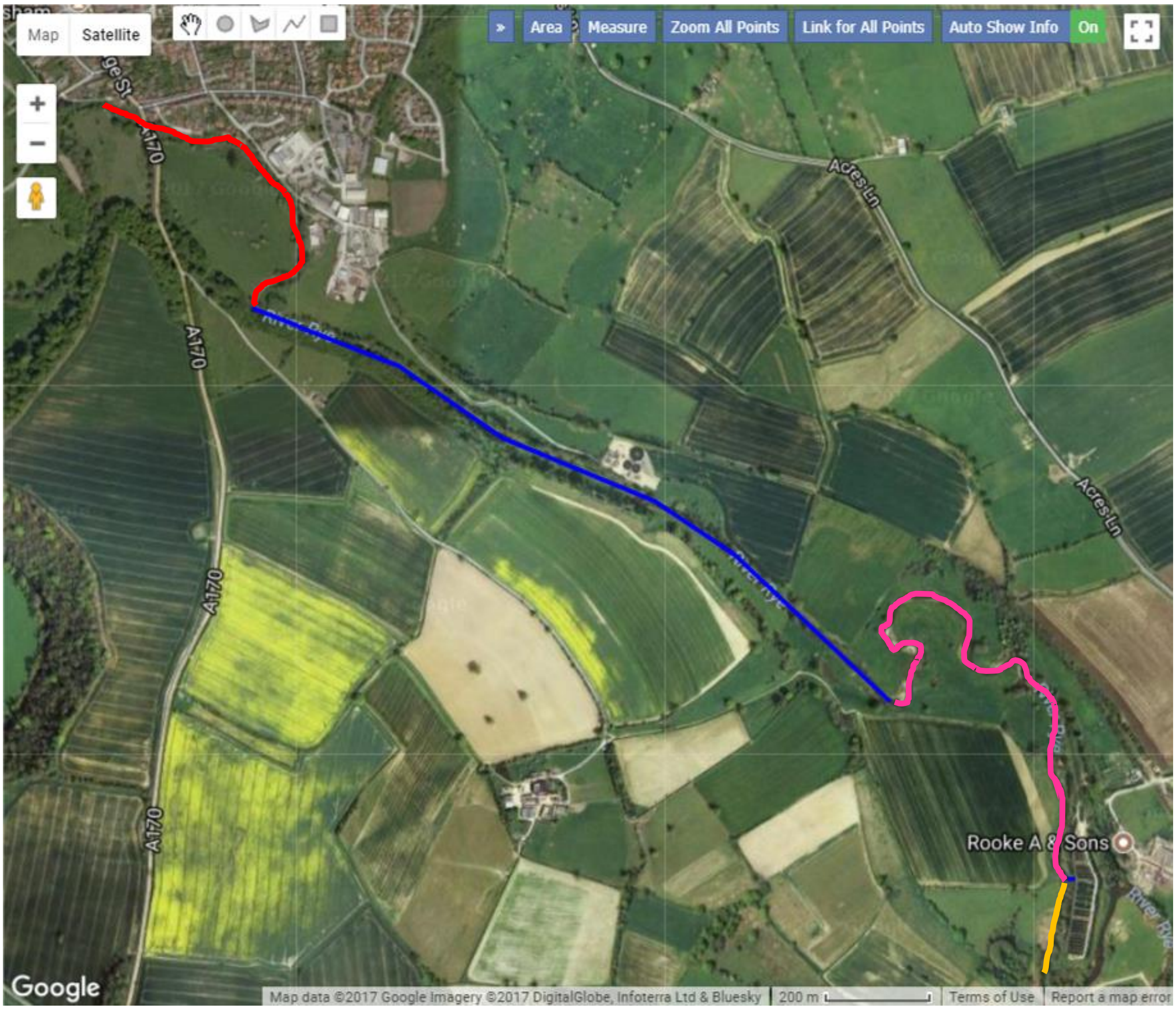
The upper tributaries of the River Rye originate in on the southwestern edge of the North York Moors. The upper catchment geology comprises predominantly limestone, gritstone, sandstone, siltstone and mudstones; clay also becomes a major component (both bedrock and superficial) downstream of Helmsley. Although some of the upper tributaries are steep and run off moorland, the influence of the permeable substrata and reduction in gradient in the middle and lower reaches creates a more sedate river from around Helmsley. The significant influence of calcareous sand, grits and clays also buffer the more acidic moorland of the upper tributaries and the river's productivity is higher than many of the more northerly moors rivers, creating ideal conditions for diverse invertebrate and fish populations.

The permeability of the underlying geology does create challenges for the aquatic flora and fauna of the river. In dry years, some sections of the river become significantly depleted, with a large proportion of flow becoming subterranean; in drought years, the surface channel can even dry out completely. Fortunately, those areas are relatively short and populations of fish and invertebrates are maintained year round in most of the river. The impact of the depleted river sections is also mitigated by recolonisation of the aquatic fauna from adjacent populations as the aquifer and river becomes recharged. Rapid recolonisation will be assisted by the habitat quality and healthy natural structure (plenty of juveniles) and fitness/local adaptation of the wild fish populations within those adjacent sections - and the good habitat connectivity through most river sections (few weirs or barriers).

“The Ryedale Anglers' Club was founded in 1846 by a small group of friends to fish for trout on the River Rye. Since its foundation the Club has remained entirely based on the Rye's resident stock of wild brown trout, which makes it a rarity amongst its peers. Today the Club's has 65 members who enjoy fishing one of the most beautiful trout rivers in England.” (www.ryedaleanglers.org.uk/)

3.0 Habitat Assessment

Two sections of the river were visited on the day (Map 1). The first, alongside Harome Trout Farm and the second, upstream of Helmsley sewage treatment works (STW). Both of these sections of channel are straight; the section upstream of the STW particularly so, with clear evidence that it has been straightened artificially in the past. The conditions on the day of the visit were dry; however, the river flow was elevated and carrying colour (fine sediment).



Map 1. The straightened section u/s and d/s of the STW (blue line) and adjacent, more naturally sinuous sections around Helmsley (red line) and upstream of the Harome trout farm (pink line). Also marked is the uniform section alongside the trout farm (orange line), which may also have been straightened and / or dredged in the past, although less clear evidence of alteration was observed.

3.1 Alongside the trout farm

Towards the upstream end of the trout farm, a slight bend in an otherwise relatively straight channel creates some flow diversity, with greater volume passing along the LB side and providing increased depth through natural bed scour along that bank side. This flow diversity is greatly beneficial from a geomorphological and, consequently, ecological perspective but does create additional considerations in the site management as the adjacent trout farm is close by (<10m away).

The bank has clearly been reinforced with block stone revetment in an attempt to protect it but is lacking in trees which would provide more effective, natural protection (Fig. 1). Unlike block stone which simply deflects flows and exacerbates erosion elsewhere, trees and vegetation create roughness, slowing flow velocities along a bank and dissipating the energy and erosive force. Their roots penetrate into the bank, providing structure/reinforcement and consolidating the soil. The floodbank along the LB also exacerbates issues, preventing high flows from spilling out onto the floodplain which would ordinarily allow the flow energy to dissipate. Clearly in this situation, however, the banks are required to prevent the trout farm from becoming inundated by high flows.

Rather than block stone, the susceptible area of bank would be far better protected by re-planting a mix of native, deciduous trees which would also improve the habitat quality (shade, food, shelter etc). Those trees may require some light maintenance over time, but this would be far cheaper and much easier than maintaining block stone revetment which will become out-flanked and / or undermined. The remains of a mature tree root-ball (Fig. 1 - blue circle) was observed adjacent to the block stone and it is very likely that tree was undermined as a result of scour deflected by the stone revetment. The deflection which occurs leaves the banks at either end of stone revetment at greatly increased risk of erosion.

The long section of straight, uniform channel d/s of the bend (possibly dredged in the past) imparts little flow diversity and, outside of the influence of the bend, lacks discrete features (Fig. 2). With uniform flow and width, bed scour at high flows and sediment deposition at lower flows will be relatively uniform across the full with of the bed, leading to a lack of discrete bed features. It should also be considered that in low summer flows or drought conditions, the flow diversity will decrease further, leaving water that is poorly suited to flow loving species like trout, and many invertebrates. This limits the number and size range those species that the section can support. Such areas are also less productive for anglers, with fish moving long distances if they are disturbed (spooking the rest of the pool in the process) rather than simply tucking into a nearby bolt-hole.

Figure 1. Looking u/s, the bend alongside Harome trout farm provides some flow diversity, creating deeper areas on the outside, along the LB. Block stone (red circle) along the bank is likely to exacerbate erosion in the long term. The remains of the fallen tree's rootball can also be seen (blue circle).

The tree-lined banks do provide beneficial features and the section is certainly capable of holding some fish, just far less than it would with a greater range of depths and structure within the channel. A greater availability of trailing branches and lodged woody material would improve the flow and width variability of the channel and create a far greater occurrence of fish-holding features and refuges.

It should be noted that sheep grazing and trampling along the RB is also preventing the development of herbaceous vegetation and natural tree regeneration, threatening the stability of the bank (Fig. 3). Most of the trees are now large/mature but there are no smaller saplings being allowed to develop and replace those lost through disease, old age or erosion. Without stock exclusion, the reduction of vegetation and bank cover between the trees and around their roots and increased bank erosion places the trees at even higher risk of being washed out or toppling into the channel. If this is allowed to occur the stability the trees currently provide in locking the whole bank line together will be lost and much more extensive erosion is likely to occur. However, simply excluding livestock from the riverbank could greatly reduce the chances of such issues from occurring.

Figure 2. The straight, uniform section alongside the trout farm. The lack of flow diversity leads to more uniform scour and erosion and a relatively bland, uniform river bed.

Figure 3. The lack of vegetation between and around the base of the bankside trees leaves those sections of bank at greatly increased risk of erosion (as can be seen by the erosion bays developing between them). Losing these trees would result in a loss of habitat and further bank destabilisation. Contrary to common belief, sheep grazing can be equally, if not more, detrimental than cattle in destabilising banks as they more often graze and trample a bank bare.

3.2 Upstream of the sewage treatment works

The section walked u/s of the STW suffers a similar basic issue to that alongside the trout farm, being overly straight, with uniform width and flow, and generally lacking discrete in-channel features (Fig. 4).

Figure 4. A typical example of the channel u/s of the STW, being straight with uniform width and flow.

The channel has clearly been artificially straightened, evident by the increased gradient, paleo-channels (the old river course) within the adjacent fields and the unnaturally long (~1.5km) section with little more than a slight bend (Map 1) - comparison with the relatively sinuous nature of other adjacent areas of the river alone would provide a strong indication of artificial straightening. While higher gradient and narrower valleys can lead to the natural development of straighter channels, the length of straight channel and extreme straightness preclude it from having occurred naturally.

The steepness of channel and uniformity of flow have led to the persistence of a uniform capacity, shallow-water channel which provides some potential spawning and juvenile (fry and parr) salmonid habitat, but lacks slower, deeper areas conducive to the retention of larger adult trout and grayling. The banks in this area are adequately tree-lined and relatively stable, with woodland on the RB and a basic buffer fence along the left to exclude livestock.

Past attempts have been made to create deeper-water areas with the use of stone weirs and deflectors. While weirs do create depth initially, they also effectively create a gravel trap, preventing the transmission of substrate past the raised structure and dissipating flow energy in the impounded reach upstream which increases sediment deposition there. This means that in the long term, the channel upstream becomes shallower and the initial depth benefit is lost; however, the negative impact of the impoundment in reducing bed scour and increasing fine sediment deposition u/s remains.

Flow deflectors (partial channel width) can produce beneficial effects within unnaturally straight or uniform channels, increasing flow diversity and encouraging discrete areas of scour and deposition. However, it is important that they are only partial channel-width structures, to prevent impoundment of the flow and to maintain sediment transport through the reach. A stone deflector in this reach (Fig. 5) and dilapidated weir (with adequate gaps – not full width) do provide some beneficial bed scour adjacent to and d/s of those structures, with the resulting depth being naturally maintained by the flows received, but they are quite artificial and similar benefits can be attained more naturally.

Figure 5. Again, note the uniform channel where some localised flow diversity gained through the stone flow deflector against the far bank (red circle).

While flow deflectors are a perfectly justifiable technique to employ within artificially impacted channels, other more natural solutions can deliver even greater improvements. In locations where natural material has become lodged within the channel, the benefit of reinstating the flow diversity can be seen as clearly identifiable fish-holding features (Fig. 6). There, as with the bank protection they provide, the structure and increased roughness slow the flow in the immediate area, with the benefit of increasing the flow rates in the rest of the channel. That flow diversity then ultimately creates and naturally maintains beneficial features within the channel, like deeper adult fish holding areas and depositional areas that help to further diversify flows (Fig. 7). By introducing more structures like this into a straightened channel, ideally alternating bank sides, flow diversity can be greatly increased.

The additional benefit of intricate woody material within the channel is that it also provides fish refuge areas from high flows and, in particular, predators, which are far less able to pass within the structure, allowing fish to put a greater distance between them and their pursuers. While these structures may create some small obstruction to anglers, the greater number of fish they can support within a reach and the additional angling opportunity they provide far outweigh any inconvenience.

Figure 6. Natural woody material in the LB margin. Note how the flow deflection and dissipation creates a much slacker area along the bankside and focusses flow into the centre of the channel, ultimately kicking more flow over towards the other bank.

Figure 7. A natural depositional feature comprising fine sediment that has accumulated d/s of woody material (red ellipse). The localised natural narrowing of the flow here is a result of the river starting to develop more sinuous flow pathways (even within the banks of the straightened channel). This will ultimately help to diversify the river bed and create a greater variability of water depth.

The straightening, and hence shortening, of this section and resulting increased channel gradient may even be contributing to the periodic low flows/drying up of the river in the area as the transit of water through that section will be accelerated, potentially lowering the water table locally and possibly even draining the aquifer. This is something that could possibly be addressed by a river restoration scheme to reinstate a more natural channel and slow the river flows; however, the permeable limestone, sandstone and gritstone geology of the area is likely to be the predominant cause of the issue, as is experienced on many other limestone rivers, like the Bradford and Lathkill (Derbyshire) and Manifold (Staffordshire), to name but a few. River restoration would certainly improve the habitat quality of the river channel but would be a large-scale project, requiring landowner buy-in and significant funding, and making it unlikely to happen in the short-term.

4.0 Recommendations

Although impacted by channel alterations, the sections of the Ryedale Anglers Club waters inspected still provide areas of good quality habitat for salmonids. It must be remembered that the areas inspected were preselected as poorer quality and adjacent sections provide naturally high quality habitat which supports thriving wild trout and grayling populations. Those sections provide an excellent source from which fish can be recruited into any areas where habitat can be improved.

4.1 Increasing in-channel structure

The addition of simple, nature-like in-channel structures could help to kick-start geomorphological processes and further improve habitat in both reaches. These techniques could increase the numbers and size range of fish than can be held within those areas. In order of preference, the three most applicable techniques that could be employed to provide the lacking structure are tree laying, lodged flow deflectors or tree kickers. The three techniques will be detailed below.

4.1.1 Tree Laying

Where trees of a suitable species are already established along the banks, in-channel structure can be quickly and easily increased by laying the trunks (or selected branches) down into or over the watercourse. This is the preferred technique as the manipulated tree or shrub remains intact, with all limbs maintained in a living state.

Laying is usually limited to pliable species, predominantly willow (*Salix* spp.), hazel (*Corylus avellana*), elm (*Ulmus minor*) and small alders (*Alnus glutinosa*), but some others can be laid carefully when they are small. Willows are the best species to lay into the water as they will thrive in the wet conditions and the may even take root amongst any sediment they accumulate. Other species are usually better laid along the bank - water interface or into shallower areas, so a good portion of the canopy is not submerged and can continue to grow.

The laying method involves cutting part way through the stem/trunk from the upstream side, until it falls or can be forced over in a downstream direction (Fig. 8). The cut should be made quickly to halfway through the trunk (to reduce the potential of the split running up the trunk), then as little extra as is required to bend the limb over, as this will maintain maximum size and strength of the hinge and the health of the tree/shrub. Fast growing tree species (willow, hazel etc) can even be strategically planted in anticipation of employing this technique once they become established.

Figure 8. Willow hinged into the river margin to provide cover and structure and increase flow diversity.

4.1.2 Lodged flow deflectors

Lodged flow deflectors are an alternative, relatively new technique in the toolbox of habitat improvement but are very quick to install, secure and effective. The added bonus of this technique is that the structure is completely secured without the requirement for unnatural, manmade fixings like cable.

The process involves selecting a tree or branch (ideally from a species that coppices well, so as not to kill the stump) and cutting off the desired length (dependent upon channel size and desired impact). The branch or trunk is then naturally secured to one or more intact living trees. This can be by pulling or winching the deflector between two or more closely adjacent trees and allowing the deflector to swing round to lie at a d/s angle. Figure 9 depicts the technique where the deflector has been winched (a good, secure, tight fit) between two branches and the leverage of the flow alone completely secures the deflector in place (where multiple stem trees are present additional points of contact can be made). This technique simply mimics the very natural and regular occurrence of a tree or limb falling between standing stems/trunks.

Figure 9. A lodged flow deflector – the technique can be used with a single pole (primarily to increase scour) or a branched limb (to create greater flow dissipation). The elevated butt end (bank end) reduces the potential detrimental bank scour usually associated with d/s deflectors as a through-flow is maintained along the bank.

The alternative lodged flow deflector method is equally simple but relies upon a deflector with multiple branches (Fig. 10) and simply involves hooking one of the branches around an upright tree. The example uses a medium sized branch but any size of branch or tree that can be moved can be employed, providing the anchor tree is of sufficient size and is stable. A winch can even be used to manoeuvre larger deflectors.

Figure 10. A medium sized deflector which is securely anchored in place against an upright tree.

4.1.3 Tree Kickers

Woody material can also be secured into the channel in the form of a tree kicker (Fig. 11). The technique involves selecting and cutting down an appropriately sized tree/shrub (as for a lodged deflector) and then cabling it to its own or an adjacent stump, to hold it in place (Fig. 12).

It should be noted that retaining natural woody material, low branches, stumps etc. within the channel is greatly preferable to having to reinstate it at a later date. For this reason, pruning, tidying, or any other works potentially impacting upon in-channel habitat should only be undertaken as a last resort, after professional advice, to ensure that the work is actually beneficial and not further impacting upon habitat quality.

In many cases, where more diffuse structures are employed to increase deposition, the deposition in and around the limbs will further secure the structure in place as the lower parts become buried (as is occurring in Fig. 12). In addition, the orientation of the structure with its streamlined shape (tree butt u/s) also means that once it is partially submerged and high flows are passing over it, the structure will be forced in a d/s direction, but also downward towards the bed, further securing it in place.

Figure 11. A basic tree kicker cable setup using 4000 kg breaking strain cable and two sets of cable clamps. The webbing strap in the background is used to pull the kicker close to the stump for fastening but is removed once the cable is fully fixed in place.

Figure 12. A perfect example of how a tree kicker can be employed to diversify flow and increase deposition in the river margin that will focus flows down the far side of the channel.

4.2 Buffer fencing

Along the RB, opposite the trout farm, clear impact from the livestock access was evident. It would be well worth installing buffer fencing here, and any other areas where livestock has access to prevent further bank instability and allow natural regeneration of vegetation, shrubs and trees that will improve habitat and bank stability.

Himalayan balsam was noted during the visit and it is recommended that this invasive, non-native species is tackled to prevent it from becoming established within any buffered fencing or elsewhere. Balsam can be easily pulled up and composted (must occur before they seed to be effective) or regularly strimmed to prevent the seed pods from developing. Herbicides can also be used but a licence is required to use them by a watercourse and so should only be applied by a trained professional.

4.3 Planting

In areas lacking in tree cover and, importantly, where livestock is excluded, planting with some locally native, deciduous tree species can be undertaken. A prime location would be the area of open bank alongside the trout farm, to help consolidate and protect the bank. Saplings could be purchased or possibly obtained from the Woodland Trust, Trust for Conservation Volunteers, or possibly through NYMNP, to provide a natural variety of species.

However, the quickest and easiest way of establishing trees is by pushing short sections of freshly cut willow into areas of wet ground, ideally close to the waterline. This can be undertaken at any time of the year, but will have the greatest success during the dormant season, shortly before spring growth begins (ideally late Jan-March). Whips should be planted into the ground so that there is a greater length (at least $^2/_3$) within the ground, to minimise the distance that water has to be transported up the stem. The whips should also, ideally, be planted at an angle (not vertically) with the tip end pointing d/s, to ease water transport within the stem of the developing shrub and reduce the potential for it catching debris and being ripped out. Leaving 300-400mm of whip protruding from the ground is sufficient (providing this protrudes past the surrounding vegetation, to allow access to light). Whips of 5mm-50mm diameter tend to take best, but even large branches or stakes can be used. Care should be taken not to leave excessive amounts of foliage on the whips if they are planted during the growing season as these greatly increase the rate of transpiration and can lead to dehydration of the shrub.

The species of willow whip used will depend upon the required result. Small shrub willow / sallow species, particularly grey willow and goat willow (*Salix cinerea and S. caprea*) tend to be best for creating low, dense fish holding cover, with larger individual trees eventually growing out into the channel which can also be ideal for laying into the river margin. The larger tree species like crack willow (*Salix fragilis*) tend to grow fast and eventually collapse under their own weight, so creating a great method of naturally introducing woody material and structure into a channel. They can require maintenance in areas with flood risk but in low risk areas can be simply planted al allowed to develop a diverse range of habitats naturally. The desired outcome and array of species naturally present should dictate those that are used. Sourcing the cuttings locally should help ensure their suitability to the area and reduce the chances of bringing in disease of non-native species.

4.4 Fish population management

As Ryedale Anglers' Club is already operating as a successful wild trout fishery, little advice is required on fish population management, except to keep up the good work and maintain the highest possible rates of catch and release. Catch and release will ensure that plenty of fish are present in the river to be caught and reproduce, while also allowing older, larger specimen fish to grow on (all of which will benefit the angling experience on the river).

5.0 Making it Happen

WTT may be able to offer further assistance such as:

- WTT Project Proposal
    - WTT can devise a more detailed project proposal (PP) report. This would usually detail the next steps to take in initiating improvements, highlighting specific areas for work, what exactly is required and how it can be undertaken. The PP report could then form part of any required consent applications.
- WTT Practical Visit
    - Where recipients are in need of assistance to carry out the improvements highlighted in an advisory visit report, there is the possibility of WTT staff conducting a practical visit. This would consist of 1-3 days' work, with a WTT Conservation Officer(s) teaming up with interested parties to demonstrate habitat enhancement methods (e.g. tree kickers and willow

laying etc.). The recipient would be asked to contribute to the reasonable travel and subsistence costs of the WTT Officer.

In addition, the WTT website library has a wide range of free materials in video and PDF format on habitat management and improvement:

www.wildtrout.org/content/wtt-publications

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 populations and managing invasive species.

The DVD is available to buy for £10.00 from our website shop 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 with funding from rod licence sales.

7.0 Disclaimer

This report is produced for guidance; 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.