Advisory Visit

West Beck (Driffield Beck)

River Hull Catchment

East Yorkshire

15/08/2016

Key findings

- The channel of the West Beck in this area is notably altered through past land drainage work but does show signs of natural recovery.

- Major, rapid improvements could be initiated with 'dig and dump' type channel improvements.

- Simple habitat improvement works to increase in-channel structure would significantly improve the channel morphology and ecological value of the reach.

- Although impacted, the habitat already provided on the Beck is capable of producing and supporting wild salmonid populations. The proposed improvements would further improve wild recruitment and the Beck's fish holding capacity.

- Stocking is suspected to be an impact upon the wild fish populations and likely to be unnecessary.

1.0 Introduction

This report is the output of a site visit to a section of Driffield Beck locally known as West Beck, which is a major tributary of the River Hull. The visit was undertaken for West Beck Preservation Society (WBPS) at the request of the Society's Chairman, Mr Paddy Hall, to assess riverine habitats and offer recommendations that will help develop and improve the fishery. Also present on the day of the visit were John Trail (Yorkshire Wildlife Trust – riparian owners of the downstream section), Alan Mullinger (East Yorkshire Rivers Trust) and David Southall (Society member).

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 upstream and downstream references are often abbreviated to u/s and d/s, respectively, for convenience.

2.0 Catchment and fishery overview

"The headwaters of the River Hull are nationally important as the most northerly chalk stream system in Britain. Also of interest within the site are areas of riverside grassland, woodland and fen; remnants of habitats formerly more widespread but now limited in distribution due to agricultural and urban development.

The upper tributaries of the River Hull originate on the edge of the chalk Wolds and enter an alluvial flood plain with drift deposits of boulder clay and occasional pockets of sand and gravel within a few miles of their source. This surface geology influences the character of the river with gravel, sand and silt sediments deposited on the riverbed in varying proportions. This variation in the riverbed sediments is reflected in the species composition of the aquatic vegetation which is abundant throughout the headwaters during the summer.

Driffield Trout Stream and the upper section of West Beck, the fastest flowing streams in this catchment, are shallow and dominated by stream water-crowfoot *Ranunculus penicillatus var calcareous*." (www.sssi.naturalengland.org.uk/citation/citation_photo/1003424.pdf)

The river holds populations of brown trout (*Salmo trutta*), grayling (*Thymallus thymallus*), chub (*Squalus cephalus*), brook lamprey (*Lampetra planeri),* European eel (*Anguilla anguilla*), minnow (*Phoxinus phoxinus*) and barbel (*Barbus barbus*) but surprisingly, none of which are cited in the River Hull and Tributaries Site of Special Scientific Interest (SSSI) designation for the river.

Until around nine years ago, WBPS stocked with large rainbow trout (*Oncorhynchus mykiss*) and brown trout. Stocking currently comprises around 450 large 28-36cm (11 – 14”) brown trout per annum, split between three introductions, with 100 additional yearlings introduced for the last three years. In 2013 & 2014 some fingerlings were stocked into one of the feeder streams but not last year due to high water. Around two years ago, the Environment Agency (EA) also introduced about 3000 grayling fry, and a further 2000 were stocked this year; these fish were stocked between the WBPS water and the two adjacent fisheries u/s. Three years ago, 300 barbel and 200 dace were also stocked d/s of the weir. Fish stocking information was kindly supplied by the Society’s secretary Mike Wright. Previous EA electrofishing surveys have identified three year classes of trout (M Wright 2016, pers. comm., 07 September).

WBPS has 30 members who lease and manage approximately 2.5 km of fishing d/s of Wansford Bridge, the majority of which is double bank. The upper portion of the fishery is owned privately, with the lower section and adjacent features owned by Yorkshire Wildlife Trust.

The River Hull and Tributaries SSSI is currently in ‘unfavourable recovering’ condition and both Water Framework Directive (WFD) waterbodies in which WBPS waters lie are classified as being ‘moderate’ potential. The ‘moderate’ classification for the West Beck Upper waterbody is driven by classifications of ‘moderate’ for both ‘fish’ and ‘surface water’, while the West Beck lower to River Hull waterbody (in which the very downstream end of the fishery lies) achieves ‘good’ status for fish but is again downgraded by a ‘moderate’ classification for ‘surface water’. Both are Heavily Modified Waterbodies and therefore assessed against Ecological Potential rather than Ecological Status.

3.0 Habitat Assessment

West Beck is already considered to be of high conservation importance, as evidenced by the River Hull headwaters as a SSSI designation. However, the habitat observed during the visit is far from natural and has long been subjected to alteration (dredging, re-sectioning and realignment and tree/vegetation clearance), with some of those impacts still imposed on the river periodically today.

Historically, the channel has been maintained to a relatively uniform width and has clearly been dredged to a greater depth in many areas than would naturally occur (Fig. 1). Channel clearance, removal of fallen trees etc. further reduces natural in-channel structure and all of these actions simplify flows and inhibit the development of discrete erosional and depositional features that would otherwise diversify channel structure. The lack of gradient and flow energy in the Beck means that dramatic changes (additions of woody material etc.) are likely to be required in many places to bring about significant improvements to its channel structure.

All of the above mean that the habitat provided remains poorer quality than can be achieved and there is great scope for improvement of both the physical structure of the river and its habitat quality. In turn, this would vastly improve the wild fish stocks and potential of the fishery.

Figure 1. Typical channel section of the West Beck: uniform width and excess depth for an extended distance. These areas will hold some trout but do not exhibit the natural channel structure or habitat diversity to fulfil the Beck's significant potential.

Areas do retain, or have recovered, some semblance of natural morphological features, particularly around bends where the scouring energy of higher velocity flow on the outside of the bend maintains greater depth (Fig. 2). Transitional areas between bends are subject to less scouring and may temporarily retain some of the scoured material, forming gravel bars. As can be seen in Figure 2, the extent of these features remains significantly limited, due to the past channel modifications and current channel conditions, but are just visible through on-site inspection. This was the general situation throughout the reach.

It should be noted that a degree of continual d/s sediment transport is natural and beneficial and that it is the overall abundance of discrete features and range of habitats provided that will increase the fish carrying capacity.

In many sections, over-growth of aquatic vegetation was also noted, with a tendency for the channel to become weed-choked. This is likely in part due to the channel modification and lack of discrete (and scouring) flows but also due to excessive light penetration to the bed. Correspondingly, many of the areas of excessive weed growth were associated with a lack of tree shading from the south, south east and south westerly directions.

Figure 2. Relatively uniform channel that does show some signs of natural features. The deeper areas (blue ellipses) represent pools, associated with the bends, where greater depth will be naturally maintained, with the slightly shallower area between (red ellipse) being the beginning of (or remains of) a gravel bar. Note the open southern bank (left of shot) and therefore minimal channel shading.

An overriding issue is the fact that the Beck has long been managed for land drainage, hence the dredging and flood banks (Fig. 3); aspects that prevent the natural inundation of the floodplain that should occur. Preventing flows from spilling out onto the floodplain also increases the energy within the channel which then potentially maintains areas of the channel over-capacity for normal flows.

Increasing in-channel structure would introduce greater flow diversity and provide beneficial areas of more discrete bed scouring in periods of high flow but also create lower flow areas where greater substrate retention can occur. Where riffle formation is required (e.g. d/s of scour points/narrower areas and where gradient and flow velocity allow) it would even be beneficial to widen the channel slightly, to assist gravel retention; however, this would be a major a step in general chalkstream management. The exact requirements for this action would differ for each individual location. It may even be beneficial to initiate a larger 'dig and dump' type restoration project (see recommendations) throughout the fishery to reinstate a more natural channel and bed morphology.

Widespread vegetation clearance along the floodbank (being undertaken during the site visit) poses another impact upon habitat quality. It is understood that this is a change to the historic site management, with a far greater amount of vegetation removed now that the Internal Drainage Board (IDB) has taken over the task from the EA. This denuding of bankside vegetation not only degrades habitat for stages of aquatic and terrestrial invertebrate lifecycles but also for a vast array of other wildlife that utilise the river corridor. It may simply be that this extensive mowing was undertaken as an initial inspection by the new custodians but agreement should be sought to greatly reduce/cease the mowing of anything but an access path in the future.

Mowing of the banks is also undertaken by WBPS and although generally minimal (to create a path), the proximity of the mowing to the bank top (e.g. leaving only emergent vegetation) in most places lowers the value of the marginal fringe. Bringing the mowing line even c.500mm further back from the river would allow a greater diversity of terrestrial and aquatic (rather than predominantly emergent) species to establish, thereby improving the biodiversity of the area and reduce the potential for anglers to spook fish while using the path.

The abundance of stocked fish observed during the visit also poses another potential impact upon wild fish populations (Fig. 4), particularly where they congregate in the larger pools. These fish were obviously stocked, owing to the condition of their fins (many deformities), poor scale adhesion and general behaviour.

Stocked fish present an additional burden upon resources within the river, taking up habitat and food that would otherwise support wild fish, yet most will not persist within the fishery long-term and none will contribute to recruitment. Their size gives them ascendancy over many of the wild fish so they have the potential to be a significant impact, out-competing and displacing the wild fish but never contributing as beneficially as healthy wild stocks could (more detail in the recommendations section).

Figure 3. Excessive mowing of the flood bank leaving a lack of habitat for wildlife and a lack of cover for anglers. Reducing this to a thin path, set further back from the Beck would benefit a host of wildlife, and the anglers.

Figure 4. A snap-shot of the numbers of stocked fish than were present in some pools. Even more stocked fish were actually present than are visible in the shot. Stocked fish are likely to congregate in pool areas where their impact upon wild fish stocks (including trout and grayling) will be amplified.

Towards the tail of the large pool full of stocked fish, a hint of the natural gravel lift that would be expected at the tail of a pool was observed. These areas provide vital potential spawning habitat with better-sorted gravel being deposited d/s of the pool from which it would originally be scoured. However, consider the high density of large stocked fish that inhabit the area and the potential predation upon and competition with emerging fry.

Figure 5. The gravel lifts at the tail of pools (blue ellipse) are important spawning areas but, correspondingly, are usually located near areas of high of stocked fish density.

In some areas, existing deeper areas and depressions within the bed create valuable habitat but also an opportunity for improvement, particularly where bankside willows provide a source of material. Figure 6 highlights an area where willow trees on the far (LB) could be laid into the channel, keeping the tree alive but creating a sizeable structure within the channel that will facilitate more scour and develop additional pool habitat. The scouring created should also help sort the substrate to provide a valuable gravel lift and potential spawning habitat on the d/s side. This method can also be used to create new areas of scouring and maintain deeper pool habitat where such features are not already present. Such features also provide the main natural refuge for fish from predators.

Livestock access is not a major issue on this section of beck but where they do have access, even at low density, the impact is obvious with areas of poaching in the river margins (Fig. 7) and reduced species abundance and richness on the banks (Fig. 8).

Figure 6. An existing depression in the bed that can be enhanced and maintained by laying willow into the channel adjacent to or slightly u/s of the feature to focus flows and provide additional cover.

Figure 7. Bank poaching and reduced vegetation where cattle have access to the bank.

Figure 8. An obvious difference between the grazed bank (foreground) and un-grazed bank (background), also note the reduced emergent vegetation in the foreground.

In several sections along the Beck, particularly toward the d/s end, where willow has been allowed to grow out into the channel, the benefits are obvious. Pinching of the channel and the associated focussing of higher flows has created depth and additional gravel lifts in the bed (Fig. 9) with gravels ranging in size at different sites (Fig. 10). This diversity creates potential habitat for a wide range of invertebrate species as well as spawning habitat for both trout and grayling. The water depth and trailing structure within the channel also provides some of the best, natural refuge for fish from predators.

The remains of an old fish farm weir towards the d/s end of the fishery poses an unwanted obstruction within the channel that, unlike natural tree and woody material structure, provides little or no benefit. The multiple vertical stanchions accumulate material, causing a blockage, but with the fixed cross-section formed by the weir base, create little beneficial bed scouring so are just a potential obstruction and flow impoundment. Ideally this structure should be removed (Fig. 11).

Figure 9. A trailing willow encroaching into the channel provides a beneficial pinch point that has scoured depth, created a gravel lift d/s and also provides vital shelter for fish from high flows and predators.

Figure 10. An area of deeper habitat in the background where flows have been forced under the willow branches (blue circle) surrounded by a raised area of lightly sorted fine gravels that provide valuable diversity in the substrate composition and bed morphology.

Figure 11. The remains of the old fish farm inlet weir serves no beneficial purpose but does negatively impact upon the Beck.

The very bottom section of the fishery, d/s of the old weir, exhibits a much greater impact from dredging, possibly associated with the defunct fish farm. As a result, the channel has clearly been excessively over-capacity in the past but has started to narrow with emergent vegetation encroaching from both banks. The extensive growth of emergent plants makes it difficult to access the river and the over-capacity channel leaves a general lack of flow diversity and habitat features.

Overhanging/trailing willows on the LB do provide some cover and, correspondingly, appeared to be a hotspot for fish-holding. Planting additional willows in this section, on alternate banks, would increase the availability of high quality fish-holding lies while also helping to deflect and focus flows and encourage more discrete bed scour and deposition. There may, of course, be a subsequent need for management of any trees that are planted. Further benefits here would also be achieved by removing the weir, which would reinstate a more natural transport of sediment through the section. It should be remembered, however, that the morphological recovery of the Beck will be a long-term process.

Figure 12. The previously excessively over-dredged section d/s of the weir. Note the large stands of emergent vegetation and general lack of flow diversity. Willow cover on the LB significantly improves habitat quality in the area.

4.0 Recommendations

4.1 Channel restoration

The channel of West Beck is heavily modified but despite the uniformity of its bed in many places the planform remains relatively natural and sinuous. Owing to the extent of previous dredging, it would be beneficial to re-introduce washed gravels to the channel to replace the significant volumes removed. However, unlike many dredged watercourses where the natural substrate has been completely removed, West Beck still retains a gravel bed (albeit at a lower than natural level), meaning that the actual features should be maintained once more natural geomorphological processes are reinstated.

A rapid method to create a more natural, varied bed morphology would be to lightly re-sculpt areas with an excavator, often known as 'dig and dump' and would complement any gravel re-introduction. Areas of uniform bed could be easily manipulated to develop deeper areas on the outside of bends, using the material to create point bars on the insides and form gravel bar/riffle areas between the pools, possibly including slight channel widening to maintain channel capacity and retain gravel around the riffles (Fig. 13). Chalkstreams, being relatively low–energy, generally exhibit a less distinct pool and riffle sequence than higher energy systems but the Beck should certainly display a greater variation in bed topography than it currently does. For the same reasons, the Beck is unlikely to have the flow energy to rapidly recover from past dredging work, so intervention would be beneficial. Such work would require detailed discussion with the IDB.

The technique is relatively simple, requiring only a long-reach excavator and operator (c. £600/day + c.£1000 mobilisation to and from site), and someone to direct the works (c.£300/day), with the enhancement of multiple features possible within a day. Additional washed gravel can usually be purchased for around £40/tonne.

While such a project may not seem financially viable to the WBPS, it is the sort of work that the EA and Natural England have already funded and supported on many sites around the country to improve the poor performance in WFD and SSSI classification; WTT has been involved with several such projects. It could well be possible to work up a river restoration project for the WBPS section of the West Beck if the support was there for it and such a project would not only improve the fishing but could also enhance/restore the Wildlife Trust's asset.

Consent would be required for the work as it would be a relatively invasive process but, if funding could be obtained, this could be an ideal way to drive major, rapid improvements in habitat quality.

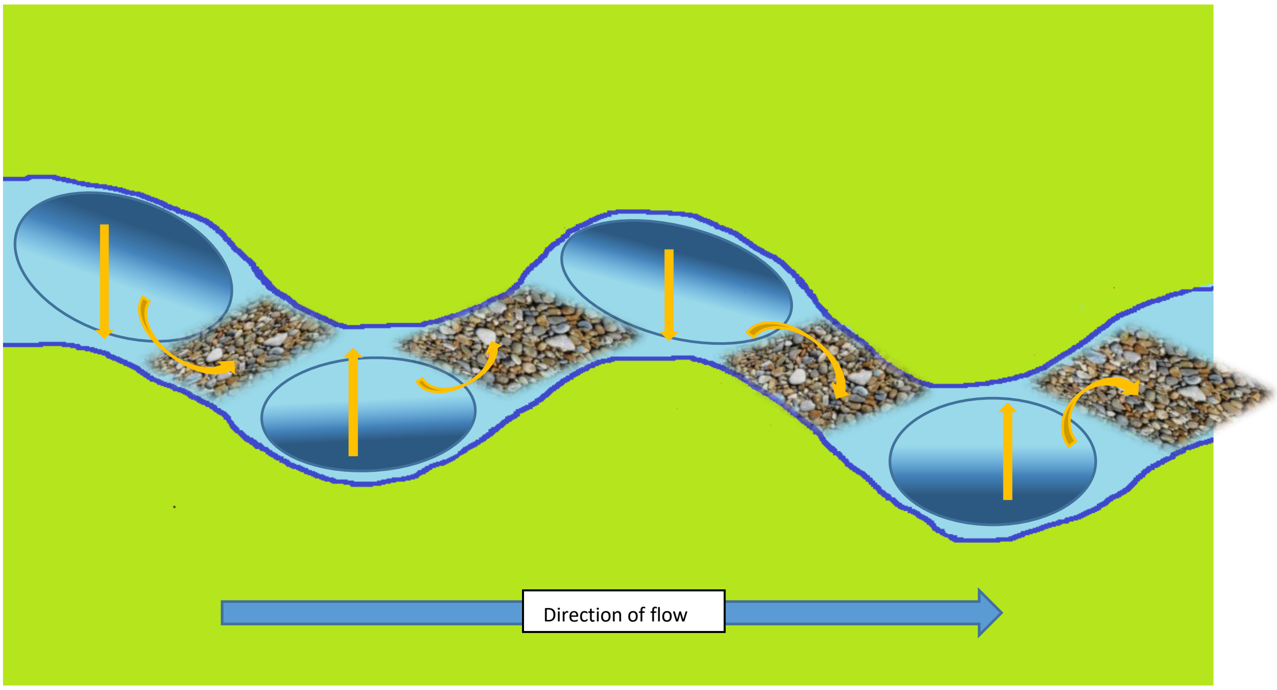

Figure 13. A simplified diagram of how bed material relocated from the outside of bends to create pools (blue ellipses), supplemented with brought-in gravel, can be employed to reinstate a more natural bed topography and provide shallower gravel riffles and spawning areas.

4.1.1 In-channel structure

4.1.1.1 Tree Laying and woody material

Where existing trees are already established along the banks, habitat improvements can also be quickly and easily achieved by laying the trunks, or branches down into the watercourse; replicating the overhanging, trailing willows already present. This technique also works with natural river processes by increasing in-channel structure to focus flows and drive bed scour to create depth and well-sorted gravel lifts (as seen naturally occurring in Figs 9 & 10). On straight, uniform sections, the exact placement is not critical but where existing features are present it is important to employ the techniques in appropriate areas so as not to inhibit natural processes. Often, allowing the channel space to adjust between installed structures is key to their success.

Laying is usually limited to pliable species like willow, elm, hazel, hawthorn and small alder, but some others can be laid carefully. The method used to lay a tree or branch is simple: it involves cutting part way through the stem/trunk, a little at a time (ideally while it is under light tension), until it can be forced over into the river (Figs 14 & 15). The depth of the cut should be limited to only that which is required to bend the limb over, as this will maintain maximum strength in the hinge and the health of the tree/shrub. On smaller shrubs, simply cutting the stem/trunk at a very shallow angle and then putting an axe blade into the cut and hitting it with a hammer can also help the laying while retaining a good strong hinge.

This is also a great method to rapidly increase low cover but as with any interventions should be employed sparingly so as not to detract from other valuable habitats. The method is best employed specifically where low or trailing cover is lacking or alterations to the bed morphology are sought. Fast growing trees like willow can even be strategically planted in anticipation of employing this technique once they become established.


Figure 14. Hinged willow.


Figure 15. Hinged hazel.

Dead woody material can also be introduced to the channel to provide significant habitat enhancements, particularly within a heavily impacted channel sections and where willow trees are absent. The technique involves cutting a tree/shrub and then cabling it to its own or an adjacent stump, to keep it in place (Fig. 16). Where a largely diffuse structure is installed, the slowing effect around the structure encourages deposition and focuses flows into the rest of the channel, providing natural channel narrowing (Fig. 17). See in Fig. 17 how the kicker has caused sediment to be accumulated at the d/s side, focussing flows along the far bank of the previously over-wide channel. Where a more solid structure is used, the focussing of flows that occurs around the structure drives bed scour and provides depth while also providing valuable sorting of the substrate (Fig. 18).

Owing to the stable flows of a chalkstream, it is likely that each structure, dead or living willow, would have to be relatively extensive (as shown in Fig. 18 and 9, respectively) to really pinch the flow and create bed scour. While such features create inaccessible areas of channel, the numerous additional fish lies created more than make up for any inconvenience.

The type of structure created and location in which it is installed can influence the outcome. Using either type of structure on the outside of a bend is likely to create more bed scour, whereas, diffuse structures are particularly good at encouraging deposition on the inside of a bend.

Figure 16. 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 17. A perfect example of how a tree kicker can be employed to create deposition in the river margin that will focus flows down the far side of the channel.

Figure 18. Scoured depth that will be maintained by the river flow (blue ellipse), with well-sorted gravel lifts (red ellipses) created as the scoured material is deposited d/s.

It should be noted that, where available, laid willows are likely to provide a quicker, easier and more natural result with a similar benefit created. The main difference being that laid willows remain alive and, in some cases, dead wood within the channel may be beneficial as a specific habitat type and for its lack of maintenance need.

4.2 Planting

It is recommended that judicious planting with locally native, deciduous tree species is undertaken wherever cover and/or shade is lacking. This would also be an excellent method of naturally controlling weed growth in the Beck, if trees are planted along the south, south east or south westerly banks (as appropriate) to cast maximum shade over strategic areas of the channel. If undertaken effectively, this action could reduce the requirement for weed cutting. Discussing this plan with the IDB would be beneficial to ensure that they are happy with such action and don't remove any of the trees.

It may also be beneficial to plant trees along sections of eroding bank, ideally, along the waterline as well as the bank top to increase bank stability. This would create low-level cover and flow dissipation in addition to consolidation of the bank. However, bank erosion was not considered to be a major issue on the Beck, ecologically, and some degree of erosion is beneficial, being a natural aspect of riverine processes.

The quickest and easiest way of establishing trees is with willow, by pushing short sections of fresh willow whip into the ground. 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 soft, wet ground so that there is a greater length within the ground than out of it, to minimise the distance that water has to be transported up the stem; 30-40cm of whip protruding from the ground is sufficient (providing this protrudes past the surrounding vegetation to allow access to light). Whips of 5mm-25mm diameter tend to take best, but even large branches can be used. Care should be taken not to leave excessive amounts of foliage on the whips as these greatly increase the surface area of the plant and can lead to their dehydration.

Small bundles (faggots) of freshly cut willow can also be employed to rapidly increase marginal cover. If they are staked into sections of river bank along the waterline they have a good chance of rooting and becoming valuable, dense cover. The structure they provide is also likely to retain sediment which will become consolidated over time.

The species used will depend upon the required result. Small shrub willow 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. Larger specimens can also be ideal for laying into the channel. Large crack willows tend to grow fast and collapse under their own weight, so creating a great method of naturally introducing woody material and structure into a channel, but for obvious reasons they can require more maintenance. However, allowing a greater extent of fallen branches, dead and live tree material to become established within the channel, throughout the WBPS water, will be key to improving habitat and maximising the angling prospects.

4.3 Coppicing

Particularly where there is a predominance of one age class of tree and/or the canopy is of a uniform height, low coppicing can be a great way to increase habitat diversity by rejuvenating low-level regrowth but, correspondingly, can increase the need for future maintenance. This technique should always be undertaken sparingly, only on the occasional tree, to ensure that one type of habitat is not gained at the expense of another. The resulting material can then, potentially, be employed as tree kickers.

Coppicing should be undertaken during the dormant season as this is when the process will create the lowest impact upon the tree and it will have the greatest chance of survival. When used properly, this technique causes minimal stress to the tree or impact on its long-term viability. Coppicing can often extend the life of a tree, particularly if the work reduces weight out of the tree's crown and allows it to remain in place longer.

4.4 Weir structure removal

Removal of the weir towards the d/s end of the fishery (Fig. 11 - TA 06480 54597) would be a beneficial action reinstating substrate passage d/s and alleviating the obstruction to debris passing down the channel. However, this is not a high priority action owing to the likely costs involved. It is a shame that removal clauses were not written in to the consents for such structures as too many are left as impacts upon watercourses, long after their intended use ceases.

4.5 Vegetation management

4.5.1 Mowing

It is recommended that discussion is entered into with the IDB to negotiate a reduction in the extent of mowing that they undertake. Ideally, to leave the banks un-mown. Mowing of a small access path along the river need not be a major impact upon the riparian ecology but setting the path a little further back from the water's edge (a further c. 500mm) would allow a much healthier diversity of bankside species to establish, benefiting a range of wildlife, including important invertebrate species.

4.5.2 Livestock access

It is understood that Yorkshire Wildlife Trust (the owners of the grazed field) are monitoring the impact of the livestock grazing and it is to be hoped that if the current level of impact upon the river bank does not decrease, they will install some kind of buffer fence. Being only low-density grazing by small cattle, an exclusion fence need only consist of one, possibly 2, strand post and wire, which would be very cheap, quick and easy to install.

4.6 Fish stock management

There is certainly potential for improving salmonid spawning habitat (trout and grayling) on the Beck, though it is already producing wild fish, as evident by individuals observed below stocking size. Ingress of juveniles from other areas will also occur, providing that there is habitat available for them and predation is not excessive.

In deciding how to optimise future management, WBPS might consider the need for continuing to stock and whether the Beck could actually be better off without stocking. West Beck meets the basic trout and grayling habitat requirements and certainly has the potential to produce and support wild fish stocks - even quite impacted channels can produce viable wild fish populations but with habitat improvements, those populations can thrive. Although stocking has long been seen as the obvious option, the numerous wild fisheries around the UK, and the rest of the world, demonstrate a far better option that will cost less and can produce a greater abundance of fish.

It should be remembered that the native, wild trout populations are amazingly resilient and able to adapt to a wide range of habitats and environmental conditions. This enabled them to thrive in our rivers since the last ice age (without human interference) and they should continue to do so if we can limit our impact upon them. However, in the latter part of this period (last 150-200 years), human impact upon wild fish populations has increased exponentially, with major issues arising from pollution, the land management (e.g. significant intensification of agriculture) and channel modification (e.g. dredging to increase flood conveyance, and denuding vital habitat to reduce perceived flood risk or to ease angler access to rivers). To compound the habitat-related issues, direct interference with wild fish populations also increased, with large numbers of ill-suited hatchery fish introduced to rivers.

Stocked fish (both diploid and triploid), are affected by domestication and unnatural selection, even within one generation in the hatchery (<u>so this also includes fish from wild brood-stock schemes</u>), greatly reducing their survival rate within a wild river environment.

Artificially pairing two fish (even wild caught fish) completely bypasses the natural mate selection process where vital chemical and visual stimuli ensure mate compatibility and maximise offspring fitness – unlike artificially paired, farmed fish. Furthermore, growing and surviving within an unnatural captive environment (concrete raceway, earth pond or tank), farmed fish are poorly adapted for the very different conditions they experience when released to a natural river, also making them an easy food source for predators. Adaptation to a farm environment is cumulative, with the wild traits (genetic diversity and behaviours) and survival rates decreasing with each generation in captivity.

Stocking produces a *'catch 22'* situation: if stocked fish don't survive long enough to reproduce in the wild, or are infertile (triploids), they are just an additional impact upon the ecosystem (the river has limited food and space); if they do survive long enough to breed, their offspring have much poorer survival than the offspring of two wild fish. Stocked fish do, however, temporarily take up space and resource within a river. It should also be considered that by removing wild brood-stock from a river you are also removing the contribution they would have made to the population if left in the river to breed naturally.

So, what is the other option?

Well-managed, natural rivers (without impact of stocking) have a far greater capacity to produce and support healthy fish populations, at all life stages. Following emergence from the gravel, wild trout disperse throughout the available habitat to find territories appropriate to their size and dominance. They constantly compete, creating a "pecking order", which ensures the dominant fish control the best lies, where drifting food is the easiest to intercept for the least energy expenditure. They will remain there (often for years in the case of a large, dominant fish) until they challenge for a new territory, are displaced by a more dominant individual or they die.

The salmonid life strategy is to over-produce offspring that are then subject to density dependant mortality, so the greater the habitat variation and availability (cover, in-channel structure and flow diversity), the greater the number of trout that will survive each year. Increasing the occurrence of those features (low, trailing branches) will therefore increase the total number of fish that a river can hold and also mitigate aquatic and avian predation.

This process ensures that the available habitat is always fully utilised and a river holds the optimal number of fish, being naturally repopulated with each year's wild fish production, from fry upwards. This is something that is impossible to achieve through artificial stocking or alongside stocking, because as soon as you stock fish of any size you disrupt the process.

Also, consider that, wild fish are constantly defending their adopted territory and will strive to stay within their native river reach. In contrast, stocked fish have little affinity for the reach into which they are stocked and are poorly suited to it. A large proportion of stocked fish therefore lose condition and leave the stocking location or die within a short time of being stocked, particularly if high river flows are experienced. Consider where the thousands of previously stocked fish are at the beginning of each season and why there is that need to restock (in contrast to wild fisheries where some of the best fishing is actually early season). Before stocked fish vacate an area, however, they cause increased competition and potentially displace the valuable wild fish, particularly smaller individuals, thereby fundamentally disrupting the natural balance and leading to less fish within a river section.

For example, the habitat required for five 0.5kg stocked fish may have originally supported many more (20+) wild fish, in a range of sizes from parr upwards. If those wild fish are displaced (fish that would naturally stay within that reach), there will be less fish to grow on and naturally maintain the population each year.

Although counterintuitive, for all of the above reasons, stocking often leads to <u>less</u> fish within a river, suppressing the wild population and creating a requirement to re-stock year-on-year. In contrast, wild fisheries have the potential to support much greater overall fish populations with only sympathetic habitat management required, thereby also saving money. Many angling clubs actually report increased catches after ceasing stocking as demonstrated by the ever-increasing number of case studies that on the WTT website link - www.wildtrout.org/content/trout-stocking. Anecdotal evidence from several fisheries (including the River Ribble) suggest that grayling stocks also proliferate once stocking ceases, likely linked to a reduction in competition and predation.

An excellent video produced by Wild Fish Conservancy North West documents how the state of Montana in North America investigated the subject of stocking and concluded cease stocking completely. This too resulted in greatly increased fish numbers within the rivers – www.youtube.com/watch?v=U_rjouN65-Q&app=desktop

To further safeguard natural fish populations, increasing the rate of catch and release fishing is advisable. This need not be mandatory but will greatly assist in preserving the valuable wild spawning stock that support a healthy fish population.

Any large wild fish caught clearly possess the characteristics necessary to survive well within a river and if these fish are returned, they have a good chance of attaining even larger size and further enhancing angling opportunities. On fisheries where a very high percentage or complete catch and release is practiced the results are often staggering, with fish produced way in excess of the sizes expected. However, this cannot be achieved if the fish are killed before they have had time to attain their potential. Even reasonably light exploitation can limit the upper size that resident trout achieve; conversely, on fisheries where near or complete catch and release is now practiced, good numbers of fish attain trophy sizes (2 kg / 4lb+).

Considering the above factors, and wild fish already being present (as observed during the visit), along with the potential of habitat to produce and support those fish, it is recommended that West Beck be developed into a wild trout fishery. Money currently spent on stocking could be beneficially redirected towards habitat improvements that will further increase the wild fish populations.

Completely stopping stocking would be the best result for the wild trout population and produce the best results. Some clubs choose to reduce the stocking over a few of seasons but remember that each over-sized stock fish is one (or more-likely several) less wild fish the river can support. It should be recognised that wild fish do take time to grow on, so a period of adjustment could be expected after stopping stocking, but many clubs observe a proliferation of smaller fish right from the first season, with larger fish naturally growing on each year.

5.0 Making it Happen

WTT may be able to offer further assistance such as:

- WTT talk
    - Further to this report, it may be possible for a WTT conservation officer to attend an AGM or evening meeting to discuss the topics covered in this report. Many of the concepts, particularly around fish stocking, can seem quite alien at first but are supported by a wealth of experience and scientific literature. A question and answer session can help to address any concerns around development of the wild fish population.
- 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 and how it can be undertaken. The PP report could then form part of any required consent applications.
- 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 visit. This would consist of 1-3 days' work, with a WTT Conservation Officer(s) teaming up with interested parties to demonstrate the habitat enhancement methods described above (e.g. tree kickers and willow laying etc.). The recipient would be asked to contribute to the time, and reasonable travel and subsistence costs of the WTT Officer. This service is in high demand and so may not always be possible.

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/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 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.