WILD TROUT TRUST

Oxfolds Beck

23/11/2020

River	Oxfolds Beck
Waterbody Name	Costa Beck (Source to Pickering Beck)
Waterbody ID	**GB104027068480**
Management Catchment	Derwent Humber
River Basin District	Humber
Current Ecological Quality	Moderate
U/S Grid Ref inspected	SE7802583855
D/S Grid Ref inspected	SE7704582767
Length of river inspected	1.8 km

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1. Introduction

The Wild Trout Trust were invited to return to the Oxfolds and Costa Becks to offer specific advice on locations covered in an initial Advisory Visit (AV) from June 2010. This report will detail findings of the return visit with specific responses to queries and issues raised.

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 to identify specific locations.

2. Background

The Costa Beck splits into two arms (and is also connected to a complex network of man-made channels) to the west of Pickering. The northern arm retains the label of Costa Beck, while the southern arm becomes known as the Oxfolds Beck.

Three of the main reasons behind the artificial channel network include accommodating sewage treatment works effluent, land drainage and fish farming facilities. Tim Jacklin's 2010 AV report cites invertebrate monitoring data indicating negative impacts due to organic (carbon-rich) pollution entering the watercourse. Typical effects of such organic enrichment include a deficit in dissolved oxygen concentrations as well as direct toxicity associated with nitrogenous compounds. Other common consequences often include excess algae and weed growth and a shift in macrophyte species composition as well as a loss of diversity in aquatic fauna.

A history of channel modification and organic enrichment from water treatment, land-use and aquaculture is also associated with a steep decline in fish populations. In the 20th century, the Oxfolds and Costa Beck fishery was highly renowned for the quality of its trout fishing.

Successfully supporting ecological recovery on the Oxfolds and Costa Beck will require action in at least three areas: Water Quality, Habitat Structure and Habitat Connectivity. A problem in any of these (individual) three areas can derail recovery. Unfortunately, only fixing problems in one or two of the three key areas is highly unlikely to deliver the desired result.

3. Habitat Assessment

Previous attempts to introduce structural variation to channel habitat have been restricted to relatively small-scale actions (e.g. small flow deflecting structures; Fig. 1). Beneficial effects of such structures are also likely to be hampered by larger catchment-scale processes creating excess fine sediment supply, modifications that locally reduce longitudinal bed-slope and channel sinuosity (and therefore flow diversity) and increases to channel cross-sectional area. The combined effect of these processes is to promote extensive accumulation of fine, nutrient-rich, sediment. As well as smothering a more varied range of riverbed particles, accumulated sediment can act as a chronic source of nutrient enrichment and/or other pollutants.

Figure 1: Small woody structures can provide some extra structural diversity. The small scale of this particular intervention is not sufficient to overcome the scale of ecological degradation currently impacting the Oxfolds and Costa Becks

The fencing, although creating a relatively narrow buffer strip, has had significantly more impact on structural diversity. To this end, the repair of some crushed sections of fencing (e.g. Fig. 2) should be prioritised.

Figure 2: Allowing uncontrolled access for grazing animals to the buffer strip risks undoing positive impacts of a more structurally-diverse riparian zone and ultimately leading to bank destabilisation and accelerated erosion

It appears that livestock use this area for drinking – so the repair of fencing should be combined with an alternative provision of water. Although mains water troughs can offset installation and running costs by reducing waterborne disease rates, other options also exist. These include pasture pumps, small ram pumps or even drinking troughs supplied by solar-powered pumps.

For further improvements to structural diversity – and the creation of a far more resilient and biodiverse river corridor – it would be beneficial to set the fence-line back further from the river. Investigating available incentive schemes and determining landowner priorities may create opportunities to extend the riparian buffer zone; there are encouraging moves among policy makers at a national level that might encourage such extension, even before the introduction of the Environmental Land Management Scheme in 2024.

A low impoundment at SE 77898 83822 (Fig. 3) is reducing the potential for the river to redistribute bed material and create greater structural diversity.

Figure 3: Log sitting on what appears to be a low, artificial impoundment structure. It would create ecological benefits to remove the impoundment at this location. Note how the structure also splits the flow down either bank side. It is generally far more beneficial to maximise the sinuosity of flow (from one bank to the other) and capitalise upon the depth-maintaining scour that produces

As is often the case with heavily modified channels, the situation is not simple. Not far downstream from the impoundment featured in Fig. 3, there is a particularly prominent example of extensive soft silt deposition (Fig. 4). Whether this is as a result of historic excavation of “sediment trap” basins in the riverbed, the diversion of the watercourse parallel to (rather than across) slope contour lines or another impact is unclear at first sight.

However, the presence of deep, fine silt from bank to bank (and to a considerable depth) has created particularly uniform habitat that will suit only a limited subset of aquatic species.

As highlighted previously, compounds that have an affinity for sediment will also persist for long periods of time within such deposits. Depending on their propensity to be released from sediment particles (one aspect of what is known as "bioavailability"), such chemicals can represent a chronic pollution source. That long-term presence can complicate recovery processes – since it may persist even after the original source of pollution has been removed.

Figure 4: Extensive, deep, soft silt deposition - only a short distance *downstream* of the low impoundment pictured in Fig. 3

The creation of conditions that favour the dispersal and redistribution of such sediments may carry a perceived risk of causing further pollution downstream. While that is a valid concern, it is also fair to say that dispersal and "dilution" or "capping" with cleaner, coarser sediment transported during spate events from upstream tends to reduce the risk of negative chemical impacts. This is particularly pertinent when considered that the material will only be mobilised in large volumes at higher flows.

Additionally, the further down a river system that substrate travels, the higher the natural levels of organic enrichment. This means lower river and estuarine species are naturally adapted to those conditions. Similarly, with reduced bed-slope, lower reaches of rivers are areas where fine sediment naturally accumulates; it is typical of that habitat. Often it is deemed too expensive to mechanically remove highly nutrient-enriched sediments for disposal, and the process can lead to other issues like over-dredging. However, even in those cases, there are a multitude of ecological benefits to introducing structure and creating flow diversity that will naturally redistribute the fine sediment over time. As such, intercepting or removing excessive, anthropogenic inputs of fine sediment (before they reach the river) invariably provides the greatest ecological benefit. That is especially true where such sediments are also vectors for high nutrient enrichment or other pollutants.

Another, slightly unusual, potential source of fish toxicity could be the "saponin" content of horse chestnut fruits and twigs. Native Americans traditionally used crushed bark or fruits containing this substance to poison fish and collect them. Although more often associated with crushed fallen horse chestnut fruits on roads (and rainfall washing this into streams), those kinds of inputs have been observed to cause fish kills over 1km reaches of stream (Andy Thomas, Pers. Comm.). There is the relatively famous case in Kolding, East Jutland where unexplained periodic fish kills each autumn were eventually tracked down to an avenue of Horse Chestnut trees along the watercourse. The buffer strip (e.g. Figs. 5-7 inclusive) contains a quite unusually high proportion of horse chestnut trees. There is a case, therefore, for removing most/all of these and replacing with specimens of a locally-appropriate species.

Figure 5: Riparian strip containing young horse chestnut trees (1 of 3 examples)

Figure 6: Riparian strip containing young horse chestnut trees (2 of 3 examples)

Figure 7: Riparian strip containing young horse chestnut trees (3 of 3 examples); part of the fish-farming facility is also visible in the background

Silt deposits and a corresponding increase of starwort (*Callitriche* sp.) – plus extensive realignment of the channel - continue to dominate the section of river adjacent to the fish farming ponds (Fig. 8).

Figure 8: Silt and starwort predominate in the artificial, uniform channel. The riverbed in the upper reaches visited during this assessment are dominated by this characteristic set of conditions – which are consistent with over-dredging and resultant bed-lowering

It is possible that, previously, a capping layer of gravel lay on top of soft silt and sand deposits – before channel realignment and dredging removed that protective layer. The lower resistance to erosion of fine sediment (and/or continued dredging) would lead to the channel becoming increasingly “incised” below the level of the floodplain. In the absence of extensive gravel and cobble inputs from upstream, and the restoration of more natural flow characteristics, that new (incised) equilibrium condition is hard to reverse. Relying on simple, visual observation, it is difficult to categorically state the causes for the current silt-dominated conditions in the upper reaches. On balance, it is likely to be a combination of:

1. *Historic dredging and realignment removing capping/armouring layers of gravel and cobbles (likely predominant factor)*
2. *Areas with artificially-created conditions favouring deposition of fine sediment (exacerbating the problem in some locations)*

During the visit, the first gravel deposit was noted around SE 77736 83819 (in the channel adjacent to historic cress beds; Fig. 9).

Figure 9: Gravel deposits and *Ranunculus* sp. as well as fine silt/sand, emergent and marginal vegetation; a little more in-channel habitat diversity via more natural capacity

Figure 10: Sandy deposits (lower right of frame) indicate water flowing from the cress beds into the Oxfolds Beck channel

The evidence of water returning to the Beck channel from the site of old cress beds (Fig. 10) may indicate an opportunity to incorporate wetland treatment of fish farm effluent (if not already doing so). Utilising the cress beds in this way could significantly reduce any inputs of organic and nitrogenous compounds – even when current consent levels are being met.

As is visible in Figs. 10 and 11, there appears to be evidence of herbicide treatment of riparian vegetation. Avoiding overspray onto the watercourse would be essentially impossible in this situation – so it is important to understand if this is what is happening, whether this activity is properly consented and certificated, and what is the actual purpose.

Figure 11: Apparent spray-treatment of riparian vegetation right down to the waterside

The two branches of channel join at the downstream limit of the cress beds - though the watercourse continues to be called Oxfolds Beck apparently as far as the gauging weir shown subsequently in Fig.16. After combining into a single channel, the historic realignment (downstream of this point) has created much longer reaches of completely straight channel. The channel running past the mill cottage is a prime example of this (Fig. 12).

Figure 12: Straightened channel by mill cottage

Although some scattered tree growth and the presence of a wider range of substrate particle-sizes has created slightly more diverse habitat in some areas (e.g. Fig. 13), extensive straightening is still constraining biological diversity.

Figure 13: The more diverse light/shade regime created by riparian trees has created some structural diversity by producing a patchwork of aquatic weed and bare substrate. However, the severe straightening of the channel means that there is little potential for cross-sectional variation in water depth and flow velocity

Just downstream from Fig. 13, there is an outflow at SE 77449 83659 that is cited to be “final effluent” from the sewage treatment works but which was not flowing at the time of the visit. Additionally, the colour and appearance of the sediment below this outfall looks to be of poorer quality than would be expected from final effluent (Fig. 14).

Figure 14: Outfall cited as "final effluent" at SE 77449 83659

Silk weed (filamentous algae, indicative of nutrient enrichment and increased Biochemical Oxygen Demand) was prolific below this outfall (Fig. 15) – while all but absent in the upstream reach.

Figure 15: Silk weed (filamentous algae thriving in elevated nutrient levels) visible as all the dark green growth on the riverbed below the outfall. Note that this growth spreads across the full channel width, indicating that the nutrient enrichment appears to be cross-sectionally well-mixed at this point – and of (chronically) sufficiently high volumes to maintain "bank-to-bank" silk weed growth throughout the channel.

The full, longitudinal, extent of this likely "chemical barrier" to species with a high dissolved oxygen content requirement (including, but not limited to trout) would require more detailed benthic flora and fauna analysis. However, even from casual observation from the bank-top, a significant impact is evident.

While this visit was conducted during November, the biological impacts during mid-summer with raised temperatures, lower river flows and longer daylight hours are likely to be significantly more severe. The temporal as well as spatial dimension to these impacts are always significant when considering full-lifecycle requirements. In other words, it wouldn't matter if conditions and water quality were acceptable for 364 days of the year – the one day that the water column becomes toxic may be sufficient to remove a susceptible organism from that reach.

In conjunction with the "chemical barrier" effect, the ease and speed of recovery via recolonisation will be hampered by the physical barrier of the gauging weir at SE 77413 83628 (Fig. 16). As with all physical impoundments, the impact of this weir is not restricted to the impedance or prevention of upstream/downstream migration of pelagic species. Of equal or greater significance is the interruption of geomorphological processes of riverbed material transport. The "step" created in the riverbed harms habitat diversity upstream and intercepts bed material that would otherwise form habitat downstream of the barrier.

Figure 16: Weir and associated monitoring instrumentation at SE 77413 83628

Downstream of the weir, examples of more structurally-diverse habitat were found (e.g. Fig. 17).

Figure 17: Biologically valuable habitat created by in-channel woody material. Note, however, the relative lack of gravel compared to upstream of the weir pictured in Fig. 16

There are also examples of wider (vegetated) riparian buffer strips downstream of the gauging weir (e.g. Fig. 18). These are especially important given that many aquatic invertebrates complete their lifecycle in terrestrial vegetation. Similarly, many “subsidies” to the diets of aquatic predators arrive from riparian/overhanging vegetation.

Figure 18: Although a mown "ride" is maintained along this section of river, there is a wider unmanaged strip of riparian vegetation compared to other reaches. Many additional ecological benefits are accrued in the river channel from this slightly wider and structurally-varied buffer strip

Some localised bed-scour and a degree of meandering course result from larger bankside tree-roots and trunks (e.g. Fig. 19).

Figure 19: A large bankside willow has created some much-needed lateral redistribution of bed material in this historically-straightened channel

However, there is also evidence of the removal of low-level overhanging cover that is essential for balancing predator/prey interactions (particularly in simplified habitat). Figure 20 shows limbs cut off a bankside tree – reducing the value of this as a potential lie for fish.

Figure 20: For aquatic fauna, the most valuable overhanging limbs are those which trail in the water - and/or hang within about 12"/30cm of the normal water-level

As well as retaining the tree growing within the channel (Fig. 21; resulting in dense submerged cover – essential for overwinter survival of fish), the effect of trailing branches on riverbed substrate “sorting” is also evident (Fig. 22).

Figure 21: A dense matrix of submerged branches not only protects against predation but also creates a haven of low flow velocities during spates

Figure 22: Separation (i.e. sorting) of gravel particles (lower edge of frame) from fine sand/silt particles is created by the effect of localised scour resulting from deflection around submerged and trailing branches in higher flows

The vital importance of the cover was highlighted by a flock of cormorants estimated to contain over 40 birds taking flight at the start of the visit. Their number may well be boosted by the existence of the fish farming facilities (and any nearby stocking activities that may take place). This means that, during colder weather when stillwater hunting grounds freeze over, predation pressure will be transferred to ice-free flowing water habitats.

The ability to artificially maintain such high densities of predators adjacent to severely simplified (and hence more easily over-exploited) river habitat is a significant threat to wild fish populations. The addition of hatchery trout (with their lesser ability to utilise habitat and avoid predation) to the Oxfold and Costa Beck system would encourage and support further bird predation (likely retaining more birds in the area) – resulting in greater predation pressure on any wild fish present in the Becks.

Throughout the lower reaches of the PFA waters – and notably-associated with overhanging/submerged woody cover – over a dozen large, wild trout were spotted (e.g. Fig.23).

Figure 23: Large trout among the branches - estimated to be between 2lb and 3lb in weight depending on condition/depth of body

This, again, emphasises the extreme importance of allowing such cover to develop and persist within the channel. Retaining such cover is not at odds with angling. Of the 12 to 14 adult trout spotted during the visit, all were holding in positions that were possible for an angler to cast to. However, *in the absence of directly-adjacent "bolt holes" those fish would not be able to feed in those locations*. The bolt holes are for hiding in – and the adjacent feeding lanes are to be ventured out into when prey is available. Take away the bolt hole – and the feeding lane is no longer a viable option.

There was also evidence of in-channel breeding attempts at the time of the visit (e.g. Fig. 24):

Figure 24: Freshly turned-over gravels. In this location this probably results from multiple breeding attempts. Previous redds can be over-cut by subsequent mating pairs (blurring the boundaries of each individual redd-site)

Other individual redd sites were also observed but proved difficult to photograph during the visit. The key observation here is that there are trout present in the stream undergoing their own breeding cycles. Offspring produced from those in-stream breeding attempts will undergo natural selection (as did their parents) according to conditions within their natal stream. Over generations, this acts to create a high degree of local adaptation. Even wild fish from other areas (though especially hatchery-bred fish) lack this degree of specialised, local adaptation.

Adding stock fish to waters that are supporting these stream-bred populations represents yet another pressure on the wild population of an already heavily impacted watercourse. Based on the available habitat and food supply, a watercourse will have a particular "carrying capacity" for trout.

Any additional trout biomass added to that system over and above the carrying capacity means that a proportion of trout must die or be lost via downstream displacement. This is usually most of the stocked fish, hence their poor survival, but will also include vital wild fish. As mentioned already, there will be a further complicating factor through the "training" of fish-eating birds to forage on the Becks. By rewarding birds that forage on the Becks with an artificially-elevated abundance of naïve/non-locally-adapted trout, you are likely to create overspill predation pressure on wild fish.

This problem is exacerbated by forcing the native fish into competitive interactions with stocked fish – sometimes resulting in temporary displacement of native fish. When that displacement coincides with a foraging visit from fish-eating birds, it increases the likelihood of native fish being killed.

In other words, if you are trying to "hide" wild fish from the attentions of mobile predators, it does not make sense to "bait" the area with naïve stock fish.

Because trout are territorial, adding stock fish to a section of river will force the existing resident fish into a higher number of battles for ecological "real estate". The stock fish may, ultimately, not survive the rigours of the following winter (which resident fish have proven themselves to be capable of).

However, the energy that they force resident fish to expend in defending their territories may also drag a proportion of wild fish down with them. At the same time, any prey that stocked trout eat while they occupy the stream will, of course, be unavailable to wild fish. More detail on this is available in the paper: "*Foraging behaviour of freeranging wild and hatchery brown trout in a stream*", Bachman, R. A. 1984.Transactions of the American Fisheries Society 113:1-32".

Although previously carried out by some keepers, the (now illegal) practice of "winter feeding" of rivers would not solve this issue. Instead it creates yet another nutrient-enrichment pollution problem – and has the same effects as any other form of "eutrophication". In other words, the reduction of dissolved oxygen and elevation of nitrogenous compounds that stimulate excess weed growth and can be especially toxic to trout – **particularly in limestone and chalk streams**.

Alkaline conditions favour the existence of the much more toxic ammonia (NH_3) over the ionised and less toxic ammonium (NH_4). The simple presence of an excess of stock fish excreting their metabolic waste into the water will elevate the concentrations of nitrogenous waste.

This is in a system where effluent from water treatment works and fish farming facilities are already likely to raise concentrations of nitrogenous waste. Consequently, even small miscalculations relating to the supply of fish to the Becks so as to avoid exceeding their carrying capacity, are adding an unnecessary burden to wild fish populations.

To summarise the pressures that stock fish exert on the (observed) resident fish populations:

- Competition for space and food (calorific deficits for wild fish) – this could directly increase wild fish mortality, but even if not, it will certainly result in more wild fish vacating the area
- Elevated "overspill" predation risk
- Additional water quality stresses (on top of existing eutrophication)

In the reaches immediately adjoining the downstream limit of the angling club water there was evidence of recent extensive habitat destruction via dredging and riparian vegetation removal (e.g. Figs.25 – 28 inclusive).

Figure 25: Riparian structure removed and channel dredged

Figure 26: Cross-sectional variation removed via dredging – leaving only sand/silt. Note also the loss of vital bankside tree cover

Figure 27: Spoil dredged from river applied to bank tops

Figure 28: Discarded woody material on opposite bank to cut tree limbs

Downstream of these recent works, it seems that there has been a longer-term/ongoing programme of dredging and vegetation removal. This has left long reaches of sterile, trapezoidal channel devoid of its original rich ecological habitats (Fig. 29).

The extent of this degradation is particularly tragic in the context of the records of the historic condition of the wild brown trout fishery.

Figure 29: The sterile, dredged drain of what was previously the Costa Beck

Assuming this condition continues throughout the visible landscape in Figure 29, then this massively degraded habitat also represents another barrier to recolonisation. Straying into this long, uniform, clear-water reach without cover carries an extremely high risk of predation for fish. Consequently, the proportion of fish willing to continue exploring upstream for the distance required to reach the next available refuge will be extremely small. The combinations of chemical, degraded habitat and artificial impoundment barriers mean that any recovery from pollution incidents is most likely to rely on immigration from upstream. By reducing the opportunities for re-colonisation, the duration of impacts resulting from poor water quality incidents may be significantly extended.

4. Recommendations

Here are some recommended actions based on the findings of this report. Prior to listing those recommendations, be aware that appropriate permissions should be obtained before carrying out any interventions. The following short illustrations (Figs. 30 – 33) indicate how diversifying habitat structure helps to avoid bottlenecks for wild fish populations. There are three main types of habitat that trout require in order to complete their lifecycles (spawning, nursery/juvenile and adult). By providing for these key lifecycle stages through wide structural diversity in habitat, a wide range of flora and fauna is also catered for. Ideally, by ensuring that there are no barriers between the various habitats utilised throughout a complete lifecycle, access for the widest diversity of fauna is also ensured. There is no biological separation between the aquatic and terrestrial components of the river corridor so it is also critically important to *maintain maximum structural and biological diversity in the surrounding terrestrial habitat*. This is one useful benefit to wider river corridor biodiversity associated with addressing habitat bottlenecks for trout.

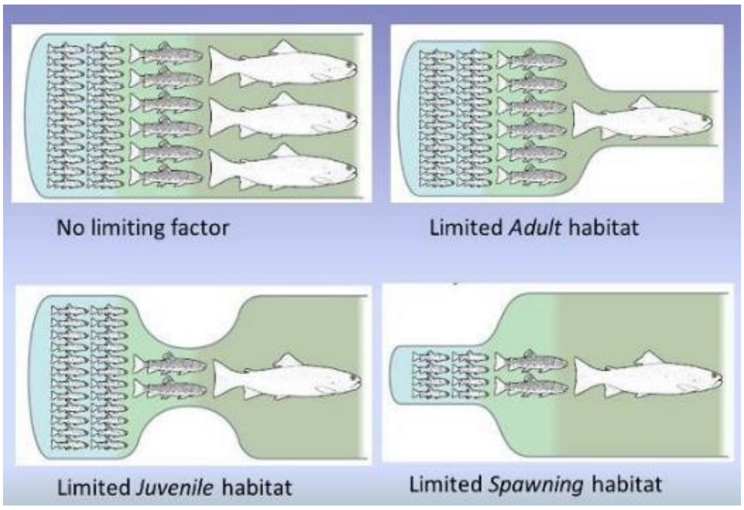

Figure 30: The impacts on trout populations lacking adequate habitat for key lifecycle stages. Spawning trout need to create loose mounds of gravel that maintain a good flow of oxygenated water between gravel grains. Juvenile trout need shallow water with plenty of dense submerged/tangled structure for protection against predators and wash-out during spates. Adult trout need deeper pools (usually > 30cm depth) with nearby structural cover such as undercut boulders, sunken trees/tree limbs and/or low overhanging cover (ideally trailing on, or at least within 30cm of, the water's surface). Excellent quality in one or two out of the three crucial habitats cannot make up for a "weak link" in the remaining critical habitat

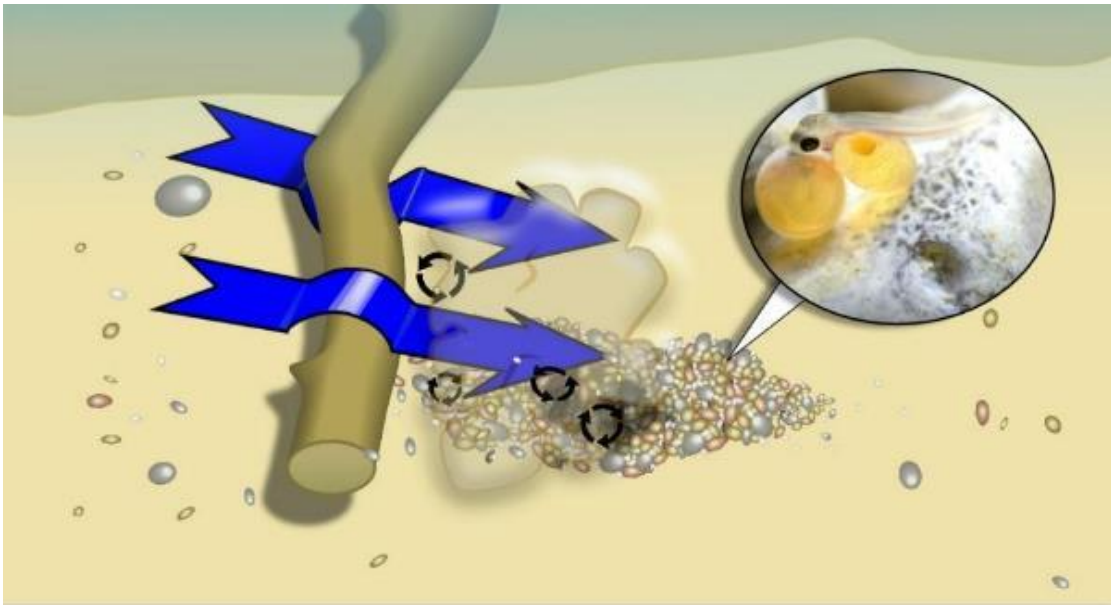

Figure 31: Features associated with successful trout spawning habitat include the presence of silt-free gravels. Here the action of fallen tree limb is focusing the flows (both under and over the limb as indicated by the blue arrows) on a small area of river-bed that results in silt being mobilised from between gravel grains. A small mound of gravel is deposited just downstream of the hollow dug by focused flows. In these silt-free gaps between the grains of gravel it is possible for sufficient oxygen-rich water to flow over the developing eggs and newly-hatched "alevins" to keep them alive within the gravel mound (inset) until emerging in spring

Figure 32: Larger cobbles and submerged “brashy” cover and/or exposed fronds of tree roots provide vital cover from predation and spate flows to the tiny juvenile fish in shallower water (<30cm deep) after they emerge. Trailing, overhanging vegetation also provides a similar function and diverse bank-side vegetation has many benefits for invertebrate populations (some of which will provide a ready food supply for the juvenile fish)

Figure 33: The availability of deeper water bolt holes (>30cm to several metres), low overhanging cover and/or larger submerged structures such as boulders, fallen trees, large root-wads etc. close to a good food supply (e.g. below a riffle and with prey likely to fall from overhanging tree canopy in this case) are all strong components of adult trout habitat requirements

In combination with proper structural diversity in habitats, there must be accompanying adequate water quality/quantity and sufficient access/connectivity between key habitat elements (Fig. 34). A lack of any of these elements prevents self-sustaining populations of trout and other ecologically-important species.

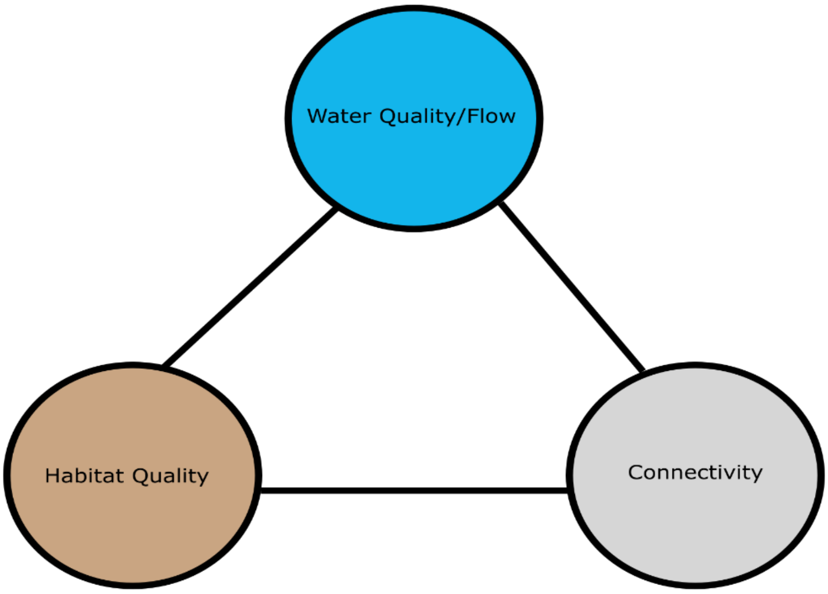

Figure 34: Triad of essential elements for a healthy river

While Figs. 31-33 indicate what is necessary to meet habitat requirements, clearly the need to remove or mitigate the chemical, habitat and physical barriers to migration also exists. Similarly, within the fishing club waters, maintaining "non-toxic" water 365 days a year allows species to actually utilise the available habitat.

With these core concepts in mind – a summary of recommended actions are as follows:

- Continue to look for ways to eliminate polluting conditions arising from water treatment facilities and activities
- Explore whether old cress bed infrastructure could be used to create wetland water treatment for fish farm effluent
- If the club has any aspirations towards being a wild trout fishery, avoid stocking trout at this stage – even as an initial temporary measure. Stocking would set back the Becks even further from their current degraded status on several fronts including:
    - Increased predation risk
    - Displacement/calorific deficits for resident, locally adapted fish (i.e. exactly the fish with the best chance of thriving in your waters)
    - *Delays to, and weakening of, the imperatives for improvements to water quality and recolonisation/connectivity*
- In collaboration with club membership and committee - establish what a successful Club Water and Associated membership looks like

e.g. does the club aspire to adopting catch and release angling for wild, self-sustaining populations of wild trout – and are its members happy with that vision?

- Seek to pursue the straightest path to achieving that successful vision – and in the case of running a wild fishery - beware creating a more ecologically-degraded and unsustainable set of conditions
- **Extensively hinge and secure a scattered selection of existing bank-side trees to create similar conditions to Fig. 22) throughout all "simplified" (i.e. historically over-dredged and straightened) sections**
- Allow significant patches of in-channel and (low) overhanging tree growth (e.g. Fig.21) to continue to exist – and extend this throughout the club's reaches
- Undertake targeted removal of horse chestnut trees from riparian buffer strips (and replace with locally-appropriate native trees)
- Explore opportunities to extend the width of the buffer strip where possible
- **Explore opportunities with landowners to increase the degree of meandering within a widened buffer strip/river corridor by either**
    - Creating controlled, localised erosion through targeted felling and securing of riparian trees
    - Undertaking a more ambitious creation of a nature-like channel according to a formal, geomorphological, design process
- Undertake gravel and cobble reintroductions to offset losses to dredging, channel realignment, sedimentation and impoundment/interception
- Remove the low impoundment at SE 77898 83822 (shown in Fig. 3)
- Pursue either formal fish pass or at least fish passage easement at the gauging weir (with appropriate recalibration of monitoring; as per other comparable projects undertaken elsewhere in England)
- Undertake redd counts during winter to estimate the range and frequency of breeding efforts. This will be important to carry through into "post works" and "post episodic pollution" situations.

Due to the specific, existing suite of impacts that the Oxfolds and Costa Becks currently suffer (and the presence of resident, locally-adapted trout), the recommendation to avoid any trout stocking is paramount. The Wild Trout Trust often works with clubs who are currently stocking to help them to move to wild fishing/catch and release fisheries. In the current case, there has not been a stocking regime for many years. We contend that starting stocking would be an unjustifiable negative impact (on top of existing degradations) on the fish already reproducing in-stream. As well as potentially masking intermittent problems that have been impacting wild populations (and risk letting polluters off the hook), the act of stocking will impose a significant set-back to recovery of wild stocks by adding yet another burden to an already challenged river, including increased predation pressure from piscivorous birds. It also jeopardises the future aspirations of running a wild fishery if the membership needs to be temporarily “kick-started” with stocking that may actively damage wild fish recovery.

5. Further information

WTT may be there in future to support PFA’s recovery of the wild trout fishery with assistance such as:

- WTT Practical Visit
    - Where recipients require assistance to carry out the improvements highlighted in an advisory 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.).
- WTT presentation/Q&A session
    - Where recipients are unsure about the issues raised in the AV report, it is possible that your local conservation officer may be able to attend a meeting to explain the concepts in more detail.

In these examples, the recipient would be asked to contribute to any reasonable travel and subsistence costs of the WTT Officer.

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/shop/products/rivers-working-for-wild-trout-dvd or by calling the WTT office on 02392 570985.

Acknowledgements

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