Upper Dearne Woodlands – Upper Cumberworth

An advisory visit carried out by the Wild Trout Trust – March 9th 2015

1. Introduction

This report is the output of a Wild Trout Trust Advisory Visit (AV) undertaken along ***approximately 1.2 km of the River Dearne in the Upper Cumberworth and Denby Dale area between an upstream limit at National Grid Reference SE 20242 08008 and a downstream limit at SE21355 08249.***

The visit was carried out by Dr. Paul Gaskell and hosted by Phil Slater and Roy Senior of the Upper Dearne Woodlands Group.

Throughout the report, normal convention is followed with respect to bank identification i.e. banks are designated **Left Hand Bank** (**LHB**) or **Right Hand Bank** (**RHB**) whilst looking downstream.

Figure 1: Map of visited reach including upstream (red dot) and downstream (yellow triangle) limits of inspected reaches

2. Catchment overview

The Upper Dearne is captured as a single waterbody (reference number: **GB104027063220**) under the Water Framework Directive (WFD) river basin management plans. This waterbody is described as "River Dearne from source to Bentley Brook". However, the specific arm of the River Dearne (as labelled on Ordnance Survey mapping) that was visited for the purposes of this report is to the north of the "source" identified within the Environment Agency maps of WFD waterbodies. Consequently, the visited reaches contribute to and influence the mapped waterbody, but also lie outside the formally-labelled reaches (Fig. 2). It is classified as a heavily modified waterbody and is currently assessed as having "moderate" ecological potential. Notable categories responsible for this designation are fish survey scores (moderate) as well as quality and dynamics of flow that do not support "good" status.

Due to the difference in location between visited reaches and WFD records, some specific conditions within the visited reach may differ from the characteristics identified in the current assessment of Ecological Potential. For instance, the WFD classification lists the waterbody typology as low, small, calcareous – compared to British Geological Survey data that identifies underlying geology as sandstones (including Pennine lower coal measures sandstone formation, Penistone Flags, Grenoside sandstone, Greenmoor rock and other related sandstones).

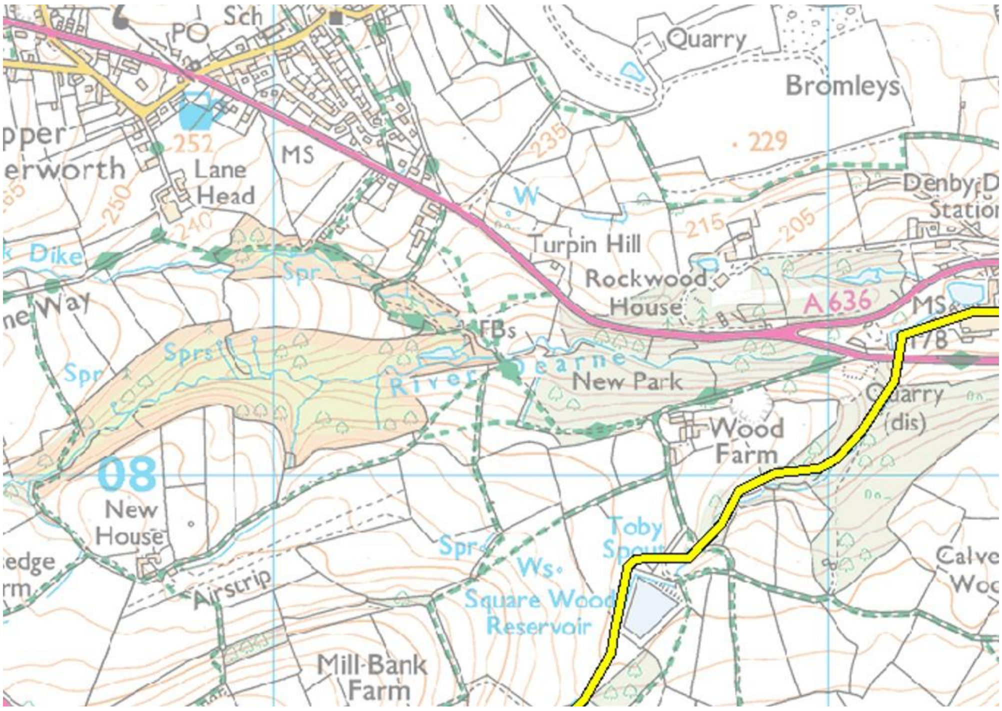

Figure 2: Visited reach (labelled "River Dearne" in woodland, centre of frame) versus WFD waterbody (highlighted as yellow line) listed as "River Dearne from source to Bentley Brook"

The remainder of this report concentrates on conditions observed within the visited reaches during the site assessment.

3. Habitat assessment

Initial motivations for the visit were reported to include the potential for an isolated population of wild brown trout in these headwater reaches (above the influence of any historic stocking activities in the River Dearne downstream). In addition, advice was sought on changes in watercourse characteristics and the construction of weirs for the purpose of creating deeper pools. With these themes in mind, the watercourse was examined for its general characteristics and broad ecological issues.

Observations made during the visit sought to identify whether there were obvious shortages of (or lack of access to) habitat features that would support the full lifecycle of wild trout (*Salmo trutta*) breeding populations. The sensitivity of trout to low oxygen levels and requirement for physical diversity in riparian and aquatic habitat and associated flora and fauna make it a good species to use as a yardstick of river quality. Figure 3 illustrates the effect that a lack of specific habitat features can have on the structure of trout populations.

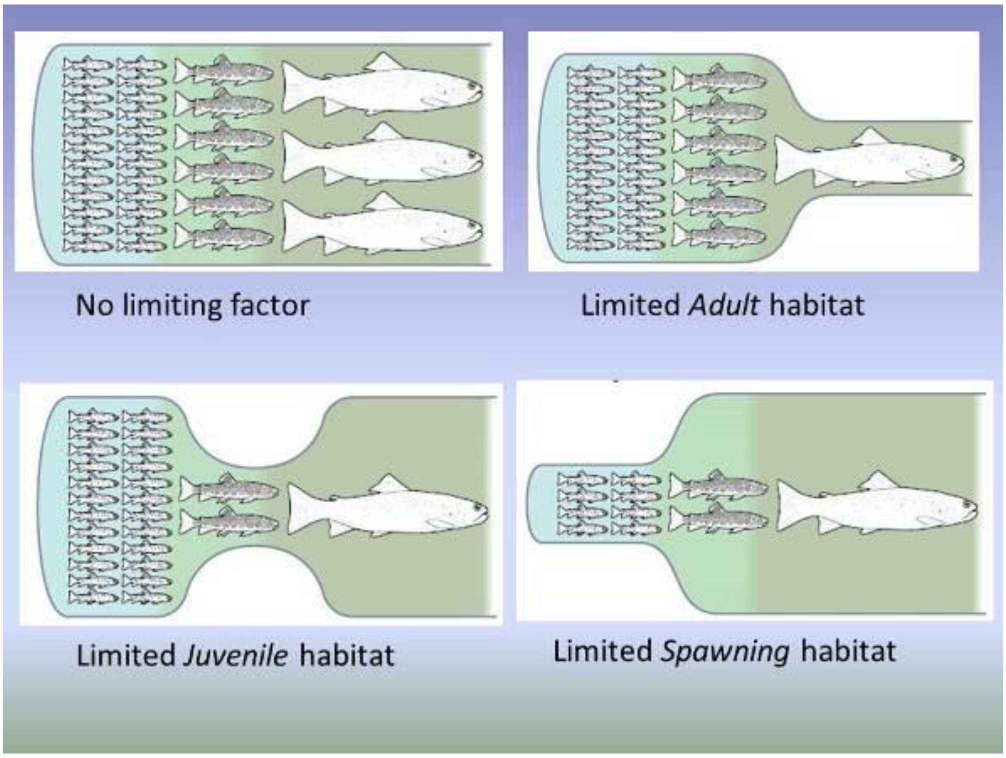

Figure 3: The knock-on impacts to fish populations caused by a lack (or degradation) of specific types of habitat at three crucial lifecycle stages; spawning, juvenile/nursery and adult. Spawning trout require loose gravel deposits with a good flow of oxygenated water between gravel grains. Juvenile trout require shallow water (quite variable around an average of 20 cm) with plenty of dense submerged/tangled structure for protection against predators and wash-out during spates. Adult trout require deeper pool habitat (generally > 30cm depth) with nearby robust structural cover such as undercut boulders, sunken trees/tree limbs and/or low overhanging cover (ideally within 30cm of the water's surface).

Pausing initially at SE21355 08249 enabled observations to be made just above the confluence of Park Dyke and the Upper Dearne (Fig. 4). Here the degree of incision of Park Dyke is reported to be greatly increased compared to historic conditions.

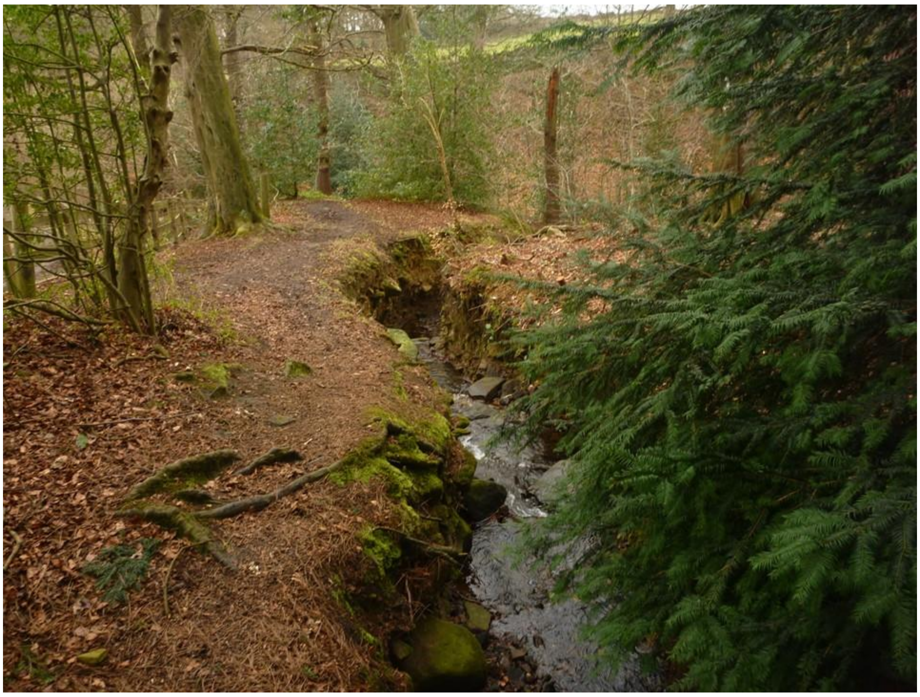

Figure 4: Incised channel on Park Dyke just above confluence with the Dearne

It is possible that here, as with other similar cases close-by, the alteration of flows through the construction of ornamental dams may be intercepting riverbed material. As a consequence, net erosion downstream of such structures will tend to increase. Such effects will also act in combination with changes in rainfall patterns and any shifts in forestry management (which may, in turn, include alterations to tree canopy cover and species composition and drainage regimes).

The most prominent example of sediment interception is, of course, the on-stream lake (Fig. 5) produced by damming of Park Dyke at the lake outlets to both Park Dyke and the River Dearne.

Figure 5: Ornamental lake created predominantly by damming the Park Dyke

The impact of sediment interception upstream of ornamental weirs is illustrated in Figures 6 and 7.

Figure 6: Retention of sediment upstream of weir. The initial increase in water depth has been lost due to the infilling of retained bed material at SE21267 08201

Figure 7: Potential increase in erosion/channel incision downstream of the weir pictured in Fig. 6. This would result from the retention of riverbed material above the weir. Retained material would, otherwise, replace and offset eroded material in the downstream channel – reducing the rate at which the stream cuts through the streambed.

The same process illustrated in Figs. 6 and 7 will occur at any of the weirs built within the stream (e.g. Fig. 8). Such weirs will also reduce the ability of any fish to emigrate from and immigrate to particular habitat patches in response to changing needs throughout their lifecycles.

Figure 8: Weir constructed to hold up water depth at SE 21234 08201 - clearly showing the shallow depth of water both upstream and downstream of the barrier - but with a large impassable "step" between the two riverbed levels. Ecologically this is a poor outcome for the river as a result of this intervention.

Rhododendron clearances undertaken in this region of the woodland are an excellent (and labourious!) undertaking with benefits not only to understory species – but also to mature trees. The clearance will greatly reduce the available host area for *Phytophthera* spp. fungal spores that can cause devastating disease in native tree species.

Away from the influence of artificial impounding structures (weirs), some nice stream features were noted. These included free-flowing sections with a good variation in cross-sectional depth (Fig.9) as well as examples of vital inputs of large woody debris (LWD; Figs. 10 and 11).

Figure 9: Channel with more natural dimensions and cross-sectional depth variation

The input and retention (i.e. lack of removal as part of stream management practices) of LWD are absolutely vital factors in the generation of healthy streams. As well as the increased cover from predation that such debris produces, there are a host of physical processes that LWD drives in streams:

- Generation of localised bed scour (pool habitat)
- Promotion of meandering channel form (increased habitat variety and buffering of both low and high extreme flows)
- Sorting (grading) of bed substrate in patches (provides deposits of similar particle sizes suitable to particular ecological needs – such as spawning gravels or localised silt accumulation)
- Retention of fallen leaf litter (vital to supporting food webs in upland streams reliant upon nutrients generated by photosynthesis in surrounding tree canopy)
- Provision of specific substrate/food sources associated with rotting wood

Many streams suffer either from the loss of patches of riparian woodland (supply) or the active management practices of removal (retention) of LWD and are ecologically impoverished as a result. Recruitment of salmonid fish is just one of many ecological processes that depends strongly on supply and retention of such debris.

Figure 10: Part of a natural LWD input at SE 21098 08177. Under high flows this may provide some substrate-sorting via undershot scour. However, more benefits will be realised as the trunk degrades and sags into the stream directly.

Figure 11: The leaf litter retention and increased structural benefits of partially-submerged LWD are readily evident in this photo at SE21051 08184

The natural plunge-pool sequences that form in some sections of the river could provide habitat for larger juvenile fish as well as the occasional deposit of potential spawning substrate (Fig. 12).

Figure 12: Part of a plunge pool sequence in which many pools had a small gravel deposit at their outflowing ends

Due to the shallow nature of the stream (and generally dark/solar-absorbant riverbed), in the absence of trees it would be extremely vulnerable to high summer temperatures. The presence of one or two short sections of near complete shade are, consequently, a good thing from this perspective (e.g. Fig. 13).

Figure 13: Short section of dense shade at SE 20787 08141 providing a refuge for cold water specialist species during hot weather

A barrier to migration was noted at the footbridge crossing at SE 20607 08024 (Fig. 14) in the form of a low, stepped weir upstream of the bridge footings.

Figure 14: Although (individually) relatively small in height - each of these vertical steps is separated by extremely shallow water on the horizontal surfaces. This provides no opportunity for fish to progress up this obstacle

From the lower limit visited up to SE 20483 07997, the stream benefits from the varied riparian woodland that is cared for by the Upper Dearne Woodlands Group. However, at SE20483 07997, there is grazing access right down to the stream and this has a noticeable impact on the watercourse (Fig. 15).

Figure 15: Grazing access causing accelerated bank erosion.

The compaction of the ground and lack of penetrating, deep root systems that result from grazing result in increased over-land flood water (and potential pollutant) inputs. Long sections of riparian grazing prevents deep root systems from developing and binding the bank together. This tends to make the river uniformly wide and shallow – constraining the diversity of flora and fauna that can live in those conditions. The combination of increased surface-water runoff (https://youtu.be/00tcTY_UEk4), "poaching" of banks by livestock footfall combined with siting of access tracks (Fig. 16) and the associated sediment input pathways all have negative impacts on the stream.

Figure 16: Grazing combined with the breakdown of the bank (poaching) by livestock in combination with the hard surface of the access track making a runoff pathway into the river causes water quality issues to this section of the Upper Dearne at SE 20335 07978.

Those negative effects on water quality (via sediment and nutrient runoff in surface water) are apparently acting on the whole reach all the way to the upstream limit of this visit at SE 20242 08008 (Figs. 17 and 18).

Figure 17: Photograph facing upstream on RHB from the same point that the photograph in Fig. 16 was taken

Figure 18: Steep, grazed slopes with little to intercept overland runoff of water, nutrients and sediment into the stream at the bottom of the valley

4. Recommendations

4.1 Overall findings and broad recommendations

Completing our site survey highlighted a number of key findings. First of all, allowing for summer low-flow levels, there is very little opportunity for adult trout to mature and grow within the surveyed sections. Water of at least 30cm depth (a broad minimum requirement for adult trout) under most flow conditions was in short supply.

Previous efforts to increase water depth by damming the stream have not been able to provide an increase in deeper pool habitat. Raising the height of the water-surface was cancelled out by build-up of riverbed material. There was a relative abundance of juvenile trout habitat and also some potential for trout spawning.

Taking these findings together and in consideration of the principles outlined in Fig. 3, priority should be given to the following aims:

- Investigating, improving and maintaining connectivity (i.e. access for fish) to downstream reaches that are capable of supporting mature trout (presence of cover and pool habitat of at least 30cm depth).
- Improving connectivity/accessibility of the surveyed sections – with particular focus on removing ornamental dams and also tackling the stepped weir pictured in Fig. 14 (see section 4.2 for additional guidance)
- Encouraging the input and stabilisation of LWD within the stream to retain leaf litter and sort/retain spawning substrates (simple advice is available in our habitat management sheets available here: http://www.wildtrout.org/product/habitat-management-sheets)

Additionally, to mitigate the water quality and flash-flood impacts of grazing/pasture compaction, it is recommended that a grazing exclusion buffer strip is established on both banks of the river upstream of the woodland section (pending appropriate approval from relevant land owners and regulatory authorities). If possible, this riparian buffer zone would be at least 5-m wide on both sides of the stream (top-hung "water gates", Figs. 19 and 20, can be used to maintain a crossing point as necessary to preserve access). Buffer strips of less than 5m could still provide some worthwhile benefits, as long as the fence was set back sufficiently to avoid damage/loss during spate flows.

Figure 19: Cattle drink and crossing point using traditional fencing panels

Figure 20: Top-hung gate using heavy rubber curtain material as an adaptation to local conditions, available materials and local livestock requirements

4.2 Tackling barriers

The damming of a river would ordinarily be subject to obtaining an impoundment licence (see section titled "Impoundment" here: https://www.gov.uk/water-management-abstract-or-impound-water) and potentially several other permissions depending on the site and its ownership.

Given the exemption to works carried out without licences prior to 2006 this means that there should not be a problem with allowing the volunteer-constructed weirs to degrade naturally. Notching these structures and performing maintenance under the aim of clearing blockages would also aid this process. Additional legal advice may be useful in order to explore more pro-active removal of these impounding structures.

For the step weir just above the footbridge at SE 20607 08024, there will certainly be additional considerations for relevant permissions to place suitable notches (Fig. 21) and construct simple "pre-barrage" structures (Fig. 22) to ease fish passage over this barrier. Some introductory guidance on seeking permissions (also relevant to buffer strip fencing) is given in the following short video:
http://www.wildtrout.org/content/how-videos#Permissions

Figure 21: Notching a low concrete weir step

Figure 22: Simple pre-barrage (shown dry) that holds enough water back to produce resting pools and breaks down a barrier into several smaller jumps

As an interim or possible alternative (and very simple) measure – wooden boards could be attached to the downstream faces of each step in the weir (Fig. 23). Leaving gaps as shown in the diagram will create a stepped series of pools with reasonable access for fish into each. Simply drilling into the face of each step and inserting appropriate gauge rawl plugs would allow each board to be fixed in place.

Figure 23: Schematic with red lines indicating positions of wooden boards that could be used to raise the level of water between each step. This may also need to be augmented by an increased water level beneath the bridge (perhaps via bolding sleepers to the stream bed just downstream of the bridge)

The Wild Trout Trust is on hand to provide additional guidance in seeking the appropriate permissions. Additionally, depending on availability of staff and funding, we may be able to carry out examples of proposed habitat works by way of a "Practical Visit" training event. Please be aware that demand for Practical Visits is very high.

Acknowledgement

The WTT would like to thank the Environment Agency for supporting the advisory and practical visit programme in England, through a partnership funded using rod licence income.

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