Advisory Visit

River Wear

Witton-le-Wear Flyfishers

31/01/2019

Undertaken by Gareth Pedley (WTT)

Key findings

- The habitat quality of the newly acquired water is already good owing to an extended period of minimal intervention and natural channel adjustment. A key aspect of future management will be maintaining the high-quality habitat already present.
- Weirs between the original Witton-le-Wear Flyfishers' water and the new section still create a major impact upon the function of the river channel and the habitat it provides. Their removal represents the single greatest potential improvement that could be initiated in the area. The naturalisation and improvement of in-channel habitat would quickly offset any perceived detriment. The added benefits of improving fish passage and habitat utilisation throughout the reach, for all fish species and sizes should also be considered.
- It may be worth liaising with the Durham Wildlife Trust with regard to the Low Barns Nature Reserve and how management of the site could be undertaken to limit fine sediment input to the River Wear.

1.0 Introduction

This report is the output of a visit to Witton-le-Wear Flyfishers' water on the River Wear, undertaken in the 31st January 2019. The purpose of this visit was to inspect a newly acquired section of river that adjoins their downstream limit. A previous visit to Witton-le-Wear Flyfishers' waters was undertaken in 2014 and an advisory report detailing the findings and including more detailed background information can be found on the Wild Trout Trust website:

www.wildtrout.org/assets/reports/River%20Wear%20-%20Witton%20Le%20Wear.pdf

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.

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

	Waterbody details
Waterbody ID	GB103024077462
River	Wear
Waterbody Name(s)	Wear from Houselop Beck to Beechburn Beck
River Basin District	Northumbria
Current Ecological Quality (2016)	**Moderate**: being moderate for 'Macrophytes and Phytobenthos' which counts as a failure under the Water Framework Directive (WFD). The beck is not classified as a 'Heavily Modified Waterbody (HMWB)' and being a main river, is not surveyed/assessed for juvenile salmonids.
Grid Ref	NZ 15919 31054
Length of river inspected (km)	1.5

(https://environment.data.gov.uk/catchment-planning/WaterBody/GB103024077462

2.0 Habitat Assessment

The river was inspected from weirs at the downstream end of the existing Witton-le-Wear Flyfishers' water (Figs 1 & 2: NZ 15917 31051 and NZ 15956 31000, respectively), progressing downstream to the viaduct (NZ 16975 30838). As highlighted in the previous report, these weirs create a major negative impact. Consequently, the adjacent habitat is poorer with fewer individual territories for flow-loving fish and invertebrates. The uniform (similar velocity across the channel), low energy flow upstream of the weirs is unable to effectively transport bed material which is deposited relatively uniformly across the bed, creating progressively shallow, wide and poor-quality pool habitat over time (as the pools fill with bed material).

Numerous fish passage studies have improved our understanding of the issues posed by weirs, with clear short-term and subtle longer term impacts undoubtedly reducing the success of fish populations locally, and catchment wide. However, it is still common to hear claims that structures are passable, simply because fish are observed to pass at certain times. All this proves is those fish can pass the structure at that point in time - and with the specific conditions of that day. It certainly does not prove that fish can pass the obstruction when they need to. There may be many more fish that have already failed or do not attempt to pass. Similarly, there is a widely held misconception that fish will only move at certain flows. This is a flawed rationale if their movement is being prevented by barriers.

Changing flows/water heights can make any obstacle become a physical barrier (e.g. because there is insufficient or too much water to pass) or a behavioural barrier (e.g. fish avoid a structure – perhaps because it is exposed or enclosed, and/or predators congregate there), but there are a wide range of factors affecting the passability of a structure from day to day. Temperature has significant implications, with normally passable structures becoming impassable due to low temperatures (when fish become lethargic and unable to move quickly enough to ascend an obstacle) or high temperatures (when there is insufficient oxygen in the water to support strenuous activity like jumping or burst swimming).

While waiting for conditions that make a weir passable, fish are potentially subject to increased predation, physical damage (if attempting to pass), disease, poaching, and general delays in reaching their destination by the required time. The increased stress and potential for disease transfer when fish are at high densities around barriers, and the exertion required to ascend an obstacle (and subsequent exhaustion), also places fish at further risk of mortality (particularly from predation). Conversely, in the absence of barriers, fish can move continually as they chose to, often even on relatively small flow increases, leading to healthier fish being dispersed through the available habitat, increased predator avoidance better fishing.

Figure 1. Stepped concrete weir. The obstacle created will vary depending upon flow, water temperature, direction of fish movement (upstream or downstream), and the size and species of fish, but it clearly unnecessarily restricts fish movement in a range of conditions. The impact of habitat degradation upstream and interruption of bed material transport through the reach in also considerable.

Figure 2. The furthest downstream of the two weirs. This was presumably installed to assist passage over the weir upstream but much of the pool it once created has now filled with bed material. If the concrete weir upstream was removed, this weir could also be removed to reinstate far better habitat quality and connectivity through the reach.

The timing of upstream adult migration is incredibly important in ensuring fish locate ideal spawning sites and deposit their eggs in time to ensure optimal survival of their offspring. Significant delays to migration and late spawning reduces egg fertility and shortens the vital first growing season of the resulting fry. However, it is not only the adult fish that require unrestricted passage. Overcrowding and increased competition between juvenile salmonids has major negative impact upon their survival. Rapid growth rates and continually changing habitat requirements to meet the physical and dietary needs at different life stages also makes the ability to disperse into different areas vital. Improving the quality of available habitat, and access to under-utilised habitat, around a catchment is therefore an easy way to increase juvenile production.

The timing and ease of smolt emigration is also critical. Downstream migrating parr/smolts are often delayed at weirs (particularly in low flow) where they can be subject to massively increased predation. Recent studies have highlighted up to over 80% mortality of smolts at a single weir. Even aside from the predation issues, the period in which smolts reach the sea can be critical, with delays potentially preventing a successful transition from freshwater to the sea and compromising their subsequent migration.

While there is a misconception that delaying adult fish around obstructions is a benefit to anglers, the complex range of issues weirs create for fish populations and the reduction in angling potential of other river sections mean the negative impacts far outweigh any perceived benefit. With our native fish populations suffering an increasing range of threats, it is important to remove avoidable impacts like weirs, wherever possible.

Downstream of the weirs, substantial bank revetment is evident and while this is not ideal, the river's general morphology does improve, exhibiting a more natural pool and riffle sequence (Figs 3 & 4). As the pools are created by scour at high flows, depth is naturally maintained the same way and they do not fill with bed material like impounded river sections. This is an important consideration as the River Wear is a high energy system with the potential to supply large volumes of material from upstream. In the absence of weirs, this material is naturally transported down the river, being temporarily deposited as bars which create riffles downstream of pools (Fig. 5). Riffles help retain pool depth, but without the fish passage or sediment transport issues of weirs, because the material is free to move and adjust as flows dictate. They also improve flow diversity and bed structure, providing vital spawning and juvenile habitat, with the naturally accelerated flows oxygenating the water and improving the angling interest of a reach. While the dimensions of natural pools and riffles alter over time, overall habitat quality and availability remains similar throughout a reach, providing that natural geomorphological processes are not inhibited.

Figure 3. Downstream of the weirs, the depth maintained in natural pools provides excellent habitat for a range of fish sizes/species. Revetment on the RB restricts natural geomorphological processes somewhat and limits the growth of bankside vegetation, but water depth is naturally maintained within the un-impounded channel.

Figure 4. The tail of a riffle (right of shot) that naturally provides vital habitat for juvenile fish and invertebrates, flowing into an area of deeper, adult fish holding water. The trailing willow shrubs on the far, RH bank, further enhance the fish-holding potential of the area.

Figure 6. A natural gravel/cobble bar between pools that crates a riffle, providing flow diversity and oxygenation with high-quality juvenile salmonid and invertebrate habitat. The feature also enhances adult fish holding areas upstream and downstream, along with improving the interest of the area for angling interest - all without the significant barrier to fish movement or sediment transport created by weirs.

In the lower half of the section, habitat diversity increases further and although bank areas of revetment remain, a recent acceptance of natural processes and channel adjustment has facilitated an array of high-quality habitat. Trees provide beneficial shade and trailing cover whilst protecting the banks with their roots. Their branches also help dissipate the energy of spate flows. Where adjustment has destabilised the bank and trees have fallen in, they now provide valuable structure, deflecting flow and further sculpting a high-quality channel. Diverse structure increases the number of fish territories available and therefore the number of fish that the river can produce. The movement of large gravel bars is creating some bank instability, and many of the pools are likely to adjust over time, but the resulting habitat will remain high quality. Correspondingly, increased in-channel structure shifts the advantage away from predators like cormorant and goosander, which can decimate fish numbers in open pools and around obstructions (like weirs) where it is easy to corral fish.

Ice on the water surface during the visit demonstrates the flow enhancement that structure within the channel creates (Fig. 7). Even the small area of bank retained by a willow stump is enough to deflect the predominant flow of the river from the LB across to the RB. Unfortunately, the tree was cut off and the protection to fish and the bank is now diminished, but some benefits remain until the stump completely rots away.

Figure 7. The remains of a willow stump deflects the flow from the LB to the RB, as evident by the frozen, slower flowing areas contrasting with the higher velocity, central channel that is maintained ice-free (red arrow). Unfortunately the tree was cut off, so the other benefits of fish-holding cover and protection are lost. Even the current habitat benefit and bank protection will be lost when the stump rots away. It would have been far better to retain the tree in place (alive) and accepted trickier casting to higher numbers of fish.

On the LB downstream of the Low Barns Nature Reserve, a series of newly created side-channels have yet to stabilise and further adjustment should be expected (especially with the destabilising effect of Himalayan balsam). It is unclear whether these channels were created entirely by natural erosion or partly through human intervention, but they are already beginning to retain valuable areas of coarse substrate and will ultimately provide good invertebrate and salmonid habitat. However, one channel appears to be supplying a high volume of fine sediment (Fig. 8). Further inspection revealed it to be the outflow of the nature reserve lake which appears to have been partially drained down (Fig. 9).

The draining down of any artificially elevated lake has the potential to liberate large volumes of fine sediment that have accumulated over the years. It is possible that the new channels within the wood downstream of the lake have allowed an increased outflow which may have contributed to the impact, but the presence of a sluice on the outflow means that the impact should be manageable. The timing and undertaking of any lake drain down should be planned and, if necessary, prevented during sensitive periods to avoid unnecessary issues and pollution. The input of fine sediment to a salmonid river in the winter can be particularly damaging and greatly reduces the survival of eggs that are incubating within the river bed.

Figure 8. The particularly silty channel emanating from the Low Barns Nature Reserve. This picture clearly shows finer depositional material smothering the bed. Many of the developing channels within the wood currently have an earth bed, although coarse gravel and cobble is becoming established in many areas which will greatly enhance their ecological potential.

Figure 9. Low Barns Nature Reserve Lake appears to have been partially drained down. This is almost certainly the cause of the increased fine sediment loading observed in the outflow channel/connected side-channels.

3.0 Recommendations

It is tempting to try and improve the habitat of newly acquired water but it is not always necessary to do so. The fact that the majority of this river section has been left relatively untouched in recent years is facilitating the development of a more naturally diverse channel. Significant additional habitat work therefore runs the potential risk of degrading what is already there. Laying the occasional tree or limb into the river could create some localised improvements, but simply allowing the habitat to continue to develop naturally would be sufficient.

Rather than degrading the existing high-quality habitat by maintenance work to improve casting access within the channel, it would be far more productive to simply maintain limited tracks alongside the river. This would allow better access and greater utilisation of the water while maintaining the in-channel habitat quality, fish holding-potential and angling opportunities provided.

Removing the weirs between the two Litton-le-Wear Flyfishers' beats remains the greatest potential improvement that could be made, to restore habitat quality and access for fish and alleviate a predation hot-spot. There are concerns that removal would degrade the existing fishing prospects around the weirs. This is understandable; however, the natural processes required to re-establish self-maintaining pool and riffle features will begin within the first few high-flow events post removal. Should the channel adjustment take longer than anticipated, a range of enhancement techniques can be employed to accelerate/mitigate the transition. These would involve focussing flows to encourage discrete areas of bed scour and deposition that would naturally maintain depth variability, but they may not be necessary. Simple monitoring and further assessment of the reach (as required) will easily identify whether additional habitat work is needed.

As highlighted in the previous advisory report, a general prescription of retaining low-lying/trailing vegetation and increasing its occurrence wherever lacking remains. Further advice and assistance with tree management and installation of in-channel structure throughout Witton-le-Wear Flyfishers' water may be possible if required.

Himalayan balsam and Japanese knotweed were observed throughout the reach inspected and these invasive, non-native species should be addressed to prevent further dominance over native species and subsequent problems with bank erosion. Wear Rivers Trust (WRT) are currently looking to coordinate the control of non-native species across the catchment and it is strongly recommended that Witton-le-Wear Flyfishers support the initiative. WRT will be able to provide further advice and information regarding their plans and possibly even assistance and/or training.

4.0 Further information

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.

5.0 Acknowledgement

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6.0 Disclaimer

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