River Hipper: Advisory Visit

Paul Gaskell Wild Trout Trust 17/05/2016

	Chesterfield Borough Council: Hipper
River	River Hipper
Waterbody Name	Hipper – Source to River Rother
Waterbody ID	GB104027057660
Management Catchment	Don and Rother
River Basin District	Humber
Current Ecological Quality	Moderate
U/S Grid Ref inspected	SK3605470328
D/S Grid Ref inspected	SK3551470173
Length of river inspected	~750m in total

1 Introduction

A site visit and habitat appraisal was carried out by Paul Gaskell at the request of Jerome Masters (EA) and William Thornhill (Chesterfield Borough Council) to explore the potential for habitat improvement on the River Hipper – a tributary of the River Rother. The Water Framework Directive (WFD) captures the Hipper as a single waterbody from its source to the River Rother under the Waterbody ID code GB104027057660.

Although the classification for the full waterbody cites "good" status for fish and "high" status for invertebrates, the published classification data show that the overall Ecological potential is "moderate". That classification stems from the "moderate" rating appended to surface water supporting elements. As a result, further investigation into the specific mechanism by which that supporting element is causing a "moderate" rather than "good" rating is warranted.

The Hipper is a typical, small, rain-fed Derbyshire stream whose source is located on Beeley Moor – a wetland area that forms part of the Chatsworth Estate. The section that was appraised for this report flows through Somersall Park in Chesterfield; which has an active "Friends Of" group as well as obvious general public amenity value.

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

2 Habitat Assessment notes

The upstream and downstream limits of the inspected section were at National Grid References SK 35514 70173 and SK 36054 70328 respectively. The main focus for potential habitat improvements on this visit concentrated on the reaches between the downstream limit and the footbridge at SK 35679 70253.

Upon walking the reach, there are two main impacts that are immediately apparent. Firstly, the historic realignment of the channel (Fig. 1) has produced a series of long, artificially-straight sections (punctuated by one substantial bend that has formed on the downstream side of a very large weir).

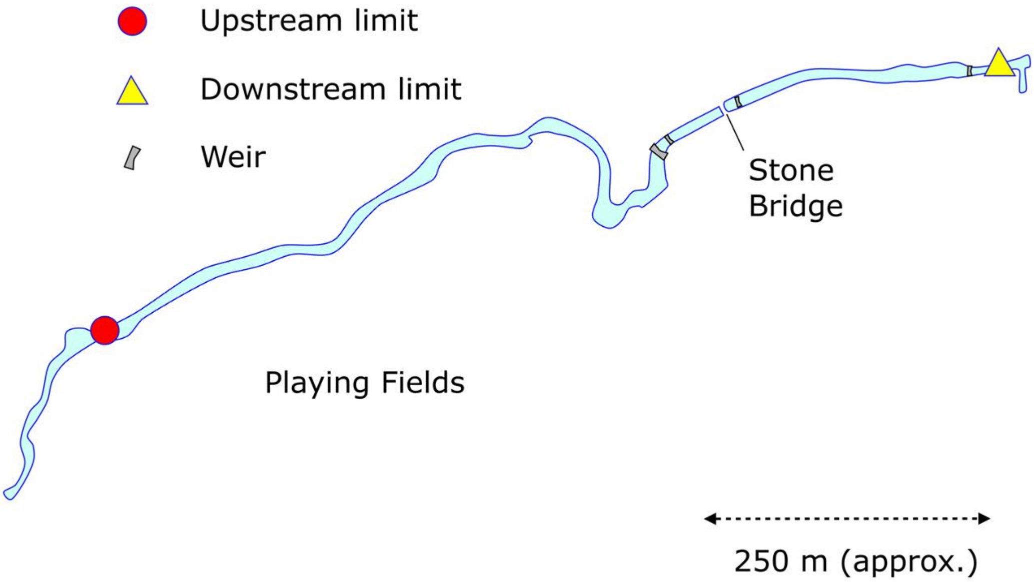

Figure 1: Planform of the visited channel reach.

Secondly, there are numerous weirs (both small and much larger) that impound the flow and also act as barriers to migrating fish. The close proximity of these barriers to each other will inhibit gene-flow between individuals that would, otherwise, likely belong to the same (resident) breeding populations. In combination, the impoundments and disruption of breeding-population structure reduce habitat quality and also constrain the resilience and adaptability of resident fish populations (including trout). These barriers are detailed in Figs. 2-7 as follows:

Figure 2: Low concrete weir at SK 36054 70328.

Figure 3: Impoundment resulting from weir in Fig. 2. (photographed from crest of the weir facing upstream). The upstream limit of the impounded reach was found to be at SK 35974 70335.

Figure 4: Weir at SK 35919 70335 – functionally redundant in terms of diversion of water.

Figure 5: Low weir at SK 35866 70287. It is noted that between this weir and the one pictured in Fig. 4 that there is a stone bridge (Fig. 6). It would be necessary to consider potential effects of alterations to either/both weirs on the condition of the bridge.

Figure 6: Bridge between the weirs pictured in Figs. 4 & 5 (note crest of Fig. 4 weir in lower right of frame).

Figure 7: Huge weir relative to channel size at SK 35861 70273. This is less than ~20m upstream from the weir pictured in Fig. 5. It is located just downstream of the pronounced bend and wide pool in the middle of Fig. 1 and feeds a reservoir via a (partially-culverted) leat. As well as its ongoing function of feeding the reservoir, the removal of this structure is complicated by the likelihood of significant changes to the path of the upstream and downstream channels.

The reduced structural variety associated with both channel straightening and impoundments may limit the overall species richness of the visited reaches. Large impoundments produce commensurately large areas of siltation and the associated anaerobic microbial respiration significantly increases methane production. Methane has a far greater impact on climate change than CO_2 (methane will trap 72x more heat during a 20-year period than CO_2).

In addition, weirs have a less visible impact on the future prospects of existing trout populations. The reduction in the size of the pool of individuals who can breed with each other is associated with an increased risk of genetic changes due simply to chance events (genetic drift). Such genetic changes are not driven by adaptation and, consequently, put populations at greater risk of extinction. On an even simpler level, the ability for individuals to recolonise following a pollution incident or unusually heavy predation is substantially constrained by the artificial barriers. Of course, they also preclude access to potential breeding habitat for large, main-river-dwelling trout and the recovering Atlantic salmon populations of the Don catchment.

The historic realignment of the channel to conform to the surrounding land-use (in addition to diversion of flow via weirs and leats) has been achieved and maintained by a clever form of bioengineering. In addition to any use of stonework to delimit channel width and path, a line of trees has also been used to consolidate the LB and RB. This is an extremely stable condition – and is further exacerbated by the normal practice of removing fallen timber from channels in public parks. When combined with the serial impoundments along this reach, these effects substantially limit the ability of the channel to form structurally-variable habitats.

This is especially notable with respect to the natural range of cross-sectional profiles that would otherwise be expected throughout a reach of this length. The formation of deeper scour pools on the outside of bends – with shelving "point-bars" of gravel and cobble on the inside of bends is an essential process for providing a diverse range of habitats for micro and macro flora and fauna. Fallen timber promotes this process – as well as the dynamic retention (i.e. a patchy slowing of rate of loss/turnover) of leaf-litter; an essential resource for aquatic foodwebs. Because of the artificially-designated channel width, there is a tendency for over-wide and uniformly shallow reaches to form (Fig. 8). Although this shallow, cobbled habitat is a vital component of a healthy river – where it is over-represented at the expense of other types of habitat it can constrain biodiversity. Additionally, its potential value as a nursery habitat for juvenile fish will be compromised when there is inadequate submerged cover from predation. This latter effect is another by-product of removing natural inputs of (stable) large and coarse woody material.

There would be ecological value in the secure installation of woody material to mimic the natural processes that are lost through the removal of natural inputs. Some examples of beneficial effects include:

- Provision of cover from predation
- More variable channel structure/cross sectional profiles
- Localised increases in retention time of leaf litter (and associated components of the aquatic food-web)

Ensuring the stability of such introduced material would avoid increasing flood risk due to timber being washed downstream during spate conditions.

Figure 8: A typical straight and overwide/uniformly-shallow reach produced by the single line of trees on both LB and RB as part of historic channel modification/realignment.

3 Summary of Recommendations

A separate, more detailed, project proposal document will be produced to accompany this Advisory Visit report. However, there are some useful general principles that will be applied in order to generate that proposal.

- A phased approach is likely to be the most practical way to secure funding and deliver benefits to the habitat
- In reaches that are not impounded, the WTT can work with local volunteers to deliver simple improvements to habitat structure, variety and available cover
- As part of that work, funding should be sought for interpretive signage to support the public understanding of – and engagement with – those benefits to nature
- The smaller, redundant weirs can be removed with relative ease and lower investment (verification of the impacts on the bridge would be required for the structures pictured in Figs. 4 & 5).
- The large weir (Fig. 7) would require a detailed consideration of potential options – with the strong adherence to the guiding principle that the very best solution should be creatively-sought. The cost of any intervention on that weir will be considerable – so it needs to deliver the maximum ecological benefit alongside optimally accounting for the amenities associated with the structure.
- The first phase of work to address impoundments should, therefore, concentrate on the removal of the weir at SK 36054 70328 (Fig. 2)
- Assessments of the potential impacts arising from removing the weirs at SK 35919 70335 and SK 35866 70287 should be explored in parallel with that phase of work
- Subsequent habitat management and improvement in the previously-impounded reaches can be delivered in partnership by the local volunteers (supported, where necessary, by WTT)

4 Acknowledgement

The WTT would like to thank the Environment Agency for supporting the advisory and project proposal work associated with this project – including a portion of funds arising from rod licence sales.

5 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.