River Hipper: Project Proposals

Wild Trout Trust

15/08/2016

	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 previous Advisory Visit report (17/05/2016) assessed habitat between upstream and downstream limits of National Grid References SK 35514 70173 and SK 36054 70328 respectively. Conditions and opportunities for improvements were identified within that report. Based on those findings, a series of interventions are proposed here to protect and improve prospects for trout and other river corridor flora and fauna.

Throughout this document, 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 Proposed Project Elements

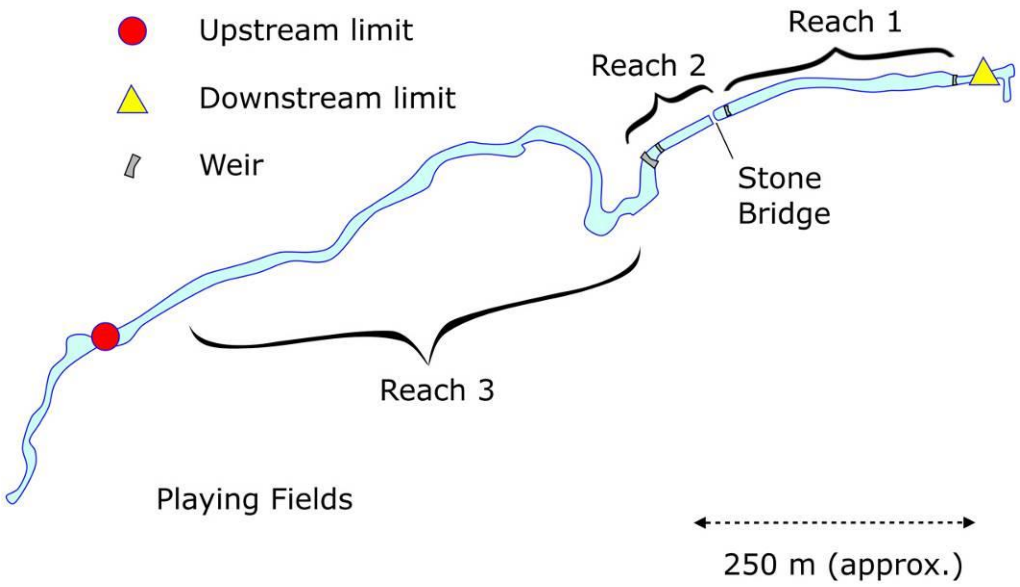

Figure 1: Map of proposed interventions.

The map above (Fig. 1) shows the divisions between 3 distinct reaches – numbered sequentially from downstream to upstream. The appropriate interventions on each reach differ in cost and difficulty. As a result, a phased approach that allows tractable goals to be set and achieved is appropriate. The chronological sequence of tackling each phase will not match the downstream to upstream sequence of numbered reaches.

For the purposes of this report, it makes most sense to lay out the proposed phases in an "order to be tackled" (rather than spatial) sequence. First of all, Reach 3 (Fig. 1) will benefit from supported, volunteer-centred activities (with the addition of some tree work carried out by an appropriately-qualified and insured chainsaw operative) that can occur in parallel with all other works. A more involved set of actions are proposed for Reach 1 (Fig. 1) that combine weir modification with habitat works. Suitable contractors will be required for weir modification/removal work, whereas the supporting habitat works can be delivered in partnership with local volunteers. Finally, the proposed modifications

to weirs in Reach 2 are likely to require specialist geomorphological assessment to gauge and mitigate potential impacts on the stone bridge directly upstream of the weir at SK 35919 70335. Reach-specific proposals are as follows:

2.1 Reach 3

Figure 2 represents typical channel conditions under normal flows. The channel would benefit from stable introductions of woody material. This could be in the form of hinged saplings (e.g. Fig. 3) to provide coarse/brashy refuge habitat for juvenile fish, cold-water specialist invertebrates (benefiting from the cooling effect) and all detritivores (benefiting from the retention of coarse particulate organic matter).

Figure 2: Typical channel characteristics in Reach 3. Both sinuosity and scour-pool habitat creation would be enhanced by large woody material introduction.

Figure 3: Hinged saplings, in this case hazel, laid into the margins of a stream to provide valuable shade, shelter and a food resource for detritivores. The technique is essentially the same as that used in hedge-laying and can be carried out using hand-tools.

The lack of scour-pool habitat could be addressed by introducing and stabilising some larger woody material. Ideally, timber that rests on the bank-top at its root-end would be angled down into the water and lodged at the toe of the opposite bank (e.g. Fig. 4). Secure anchoring would be achieved by cabling the thick end of the trunk (braided steel cable and cable crimps) to a secure anchor point – ideally either its cut stump and root-mass or another tree. The far end could be pinned to the riverbed or opposite bank using either steel rebar pins or wooden stakes as appropriate.

The cabled attachment has the advantage of acting as a fail-safe should the staked end ever break free. This would then be anchored in the same manner as a standard "tree kicker" (Fig. 5).

Figure 4: Illustration of how the angle of an individual log (here the picture includes two logs) from high on the bank provides clearance between the underside of the timber and the riverbed during spate flows. The length of timber on the bank can be much shorter (e.g. flush with the anchor tree). NB this is not an illustration of anchoring methods or proposed lengths of timber.

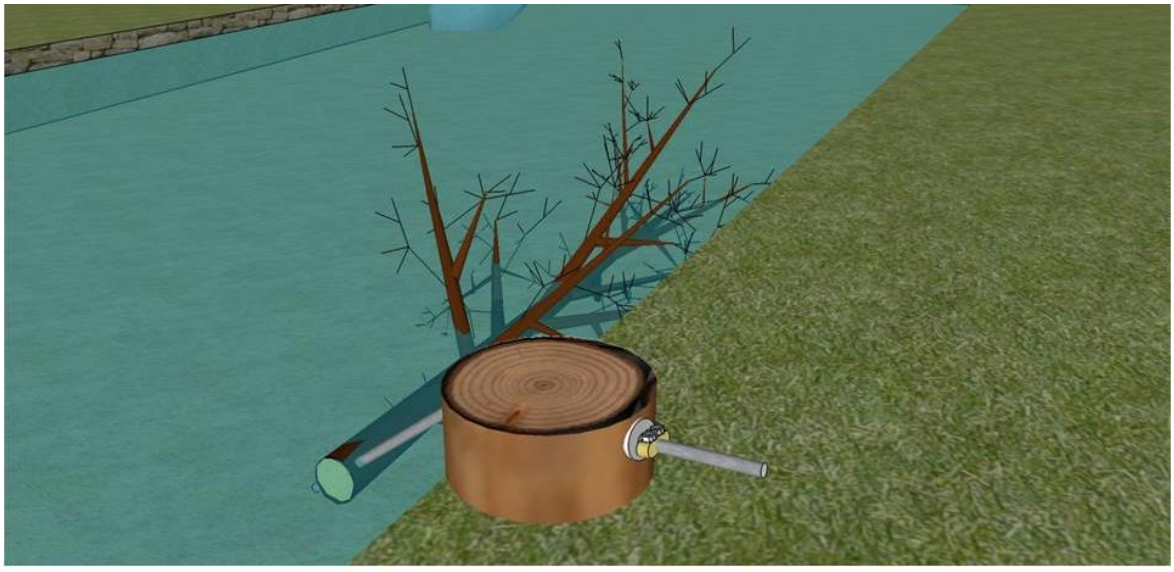

Figure 5: A typical "tree kicker" placement - where the trunk lies parallel to the bank. This would be the failsafe condition in the event that the in-stream end of the timber was dislodged.

An example of one opportunity to apply this technique on Reach 3 is given below (Fig. 6).

Figure 6: Secure timber example - note how the clearance beneath the trunk prevents blockage of watercourse.

A maximum of 8 such stable timber introductions and a maximum of 10 areas (max 5m x 2m) of hinging are proposed for Reach 3. In the event that satisfactory effects are achieved with fewer structures, then the remaining "quota" of structures would not be completed.

2.2 Reach 1

The removal (preferably complete – but taking out the central third down to the downstream riverbed level as a minimum) of the weir at SK 36054 70328 will produce dramatic improvements in the upstream habitat. It will also significantly

Figure 7: Low concrete weir at SK 36054 70328.

increase the amount of connected river-channel habitat and improve opportunities for gene-flow between members of a larger pool of breeding individuals (creating more opportunities for locally-adaptive traits in offspring produced from that larger breeding population). The current uniformity of the flow and channel habitat within the impounded reach is shown in Fig.8. Weir removal will need to be carried out using contracted, certificated and insured operators of appropriate plant/hydraulic breaker equipment.

Figure 8: Impoundment resulting from weir in Fig. 7. The upstream limit of the impounded reach is at SK 35974 70335.

The second phase of works will maximise the benefits of the weir removal and can be carried out as partnership work between the Wild Trout Trust and local volunteers. It will be necessary to wait for the natural width/wetted perimeter under normal flow conditions to be established following the removal of the weir (ideally allowing at least one high flow event). After that time, the natural re-shaping of the channel can be reassessed and, if necessary, augmented using techniques such as planting of tree cuttings/whips (best carried out between December and mid-March). This will help to provide variety in the resistance to erosion of the new, narrower, bank-line. In subsequent years, a portion of the sapling growth can be hinged into the water to provide excellent marginal cover habitat. Allowing a spate event to pass down the river will give very good guidance on appropriate dimensions of the upstream "post-weir-removal" channel.

In addition, secure placements of timber (as shown in Figs. 4 – 6) would also provide valuable habitat by contributing to the riverbed structural formation processes. For this reach – a maximum of 3 timber introductions would be proposed. Planting of tree cuttings (with, for example, goat willow) would be beneficial if carried out in blocks of around 8m – 10m upstream to downstream extent and a maximum width of around 3m. Such blocks (maximum of 6) should be staggered on alternating banks so as to introduce a degree of meandering flow. Some management of the existing tree canopy may be necessary in order to promote successful establishment of planted tree cuttings. Targeted felling of large, veteran trees (coppiced and allowed to re-grow) would generate beneficial

variety in the existing canopy/shade structure, and the felled component could be used for the stable timber introductions.

2.3 Reach 2

Of the three reaches, this section would require the most detailed consideration ahead of any works taking place. The removal of weirs at SK 35919 70335 and SK 35866 70287 (Figs. 9 and 10) would first require the quantification of the likely impacts on channel stability – and the stability of the stone bridge crossing the river just upstream of the weir at SK 35919 70335. This assessment could potentially be contributed by Chesterfield Borough Council as part of a partnership project.

Figure 9: Weir at SK 35919 70335.

Figure 10: Low weir at SK 35866 70287. Sited on bedrock – so there is more limited potential for structural issues arising from removal at this point.

The nature and extent of any structural revetments would need to be determined by an appropriate engineering expert. Of course, subsequent to weir removal and any associated structural reinforcement, the river channel and bank-side woodland vegetation would benefit from similar partnership works to those detailed for Reach 1.

The size, location and continuing function (to supply Walton Dam with water) of the large weir at SK 35861 70273 is likely to make removal a difficult prospect. However, this option should still be thoroughly investigated – as it is the only one that provides benefits to the upstream (and downstream) habitat as well as restoring connectivity 100% (and equally for all species). Are there alternative ways to provide the water to Walton Dam that do not require that weir? Can suitably-designed channel interventions produce a stable channel that does not compromise surrounding infrastructure?

If there are one or more insurmountable barriers to that course of action – the less-effective, but "least-worst" alternatives to restore a degree of connectivity for migrating fish should be determined. The ability to construct a semi-natural bypass channel would be the preferred option if possible – even if the challenge of the considerable vertical head-loss from the crest of the weir to the downstream channel bed is daunting at first sight.

The final, substantially-imperfect (but better than "no action") option would be to fit an engineered fish pass or fish-passage-easement structure to the weir itself. These are very often extremely expensive – especially (surprisingly) compared to the normal costs of weir removal.

For all options relating to this large barrier – appropriate specialists in those specific, relevant disciplines would need to provide designs and deliver the interventions. There is likely to be considerable expense associated with any and all worthwhile interventions that would improve ecological functions that are currently degraded by the presence of the weir.

3 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.

4 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.