Advisory Visit

Endon Brook, Staffordshire

January 2012

1.0 Introduction

This report is the output of a site visit undertaken by Tim Jacklin of the Wild Trout Trust to the Endon Brook, near Cheddleton, Staffordshire on 17th January, 2012. Comments in this report are based on observations on the day of the site visit and discussions with Mick Buxton (Fisheries Technical Officer), Carl Lea (Environment Officer) and Dan Griffiths (WFD Officer) of the Environment Agency.

Normal convention is applied throughout the report with respect to bank identification, i.e. the banks are designated left hand bank (LHB) or right hand bank (RHB) whilst looking downstream.

2.0 Catchment / Fishery Overview

The Endon Brook is a tributary of the River Churnet. The section of brook subject to this advisory visit is from the confluence of the Horton Brook (National Grid Reference SJ93580539) downstream to the confluence with the River Churnet (SJ96550535). Water Framework Directive (WFD) details regarding the waterbody and its status are shown in the table below.

Waterbody ID	GB104028052710
Waterbody Name	Endon Brook from Horton Brook to R Churnet
Management Catchment	Dove
River Basin District	Humber
Typology Description	Mid, Small, Siliceous
Hydromorphological Status	Heavily Modified
Current Ecological Quality	Moderate Potential
Current Chemical Quality	Does Not Require Assessment

2015 Predicted Ecological Quality	Moderate Potential
2015 Predicted Chemical Quality	Does Not Require Assessment
Overall Risk	At Risk
Protected Area	Yes

The elements contributing to the overall moderate status are fish (moderate status – quite certain) and phosphate (moderate – very certain). The upstream waterbodies (Endon Brook – source to Horton Brook GB104028052660; Horton Brook – source to Endon Brook GB104028052780) are also failing (moderate) for phosphate, but the latter is good status for fish (not listed for former).

The brook falls within the Potteries and Churnet Valley Natural Area. The geology of the Churnet valley is generally Carboniferous Permo-Triassic sandstones overlain in the main with brown earths and podzols, with gritsone outcrops in higher areas (www.naturalareas.naturalengland.org.uk/Science/natural/NA_search.asp). The sediments resulting from erosion of this geology tend to have a high proportion of sand, which has an influence on the composition of the river bed and hence in-stream habitat.

There are no designated conservation sites along the watercourse, and very little land is under any form of environmental stewardship scheme (approximately 100 m of brook borders a field in Entry Level Stewardship). Water quality impacts are reported to be limited to the occasional report of a wrong connection in the village of Endon, and the consented discharge from Endon sewage treatment works (STW) although a serious fish kill caused by a farm slurry spillage occurred on the Horton Brook tributary about a year ago. The whole brook catchment is within a Nitrate Vulnerable Zone.

3.0 Habitat Assessment

Churnet confluence – Sutherland Road / Park Lane bridge

Immediately upstream of the Churnet confluence up to the disused railway bridge, the brook is in a straightened, incised channel with a trapezoidal cross-section; the flow pattern is a smooth glide with a fine sandy bed substrate. Channel dimensions are approximately 5 metres wet width and 10 metres bank-full width. The channel is open (few trees) with an unmanaged right bank and improved grazing on the left bank (Photo 1). Upstream of the railway bridge the channel is more shaded by willow and sallow trees (Photo 2); there is some evidence of a stone toe to the banks and the channel remains artificially straight (probably moved when the railway was built). There are two bed checks (possibly old weirs?) which create a localised riffle effect, but otherwise the flow pattern is smooth glide with a fine bed substrate, apart from a few cobbles (originating from eroded artificial stone toe).

A flow gauging weir is present (SJ965535) with an approximate 0.8m head difference at the time of the visit (Photo 3). The fast flowing, steep face of the weir presents a moderate barrier to fish passage (probably impassable by smaller trout, most coarse fish and small species). There is a notch in the centre of the weir, currently blocked off at the upstream end. The impounding effect of the weir creates a slow glide upstream, becoming wide and shallow with progress upstream. The banks here are scrub / woodland up to the road culvert (Photo 4).

In-stream habitat on this section is generally poor, because of historic channel modification (straightening) and impoundment by the gauging weir. The brook lacks a pool-riffle structure, being largely slow, uniform, shallow glide habitat with bed substrate dominated by sand and silt.

Photo 1

Photo 2

Photo 3

Photo 4

Sutherland Rd Bridge – Denford

The culvert under the road does not present a barrier to fish movement and neither does the rough block-stone weir just upstream (Photo 5). The brook runs alongside a large pond on the left bank, much of which has been recently dredged; the spoil from this has been spread over the field between the pond and brook, with some pushed down the banks of the brook.

The brook has a meandering plan form throughout this section although the channel remains incised reflecting past bed lowering. There is some good tree cover on the downstream reach (below the railway bridge SJ959535) and reasonable in-stream fish habitat (Photo 6). Above the railway bridge the trees become fewer with progress up towards Denford where the channel is open alongside improved pasture. The flow pattern continues to be a smooth glide throughout, but with more pace than the downstream section. A small tributary from Deep Hayes Park joins on the right bank.

Marginal and in-stream emergent vegetation was evident between the railway bridge and Denford, but it has been recently dredged out of the downstream section (Photos 7, 8).

Overall the in-stream habitat in this section was poor, with a lack of natural features, an incised, trapezoidal cross-section channel and uniform glide flow pattern and fine bed substrate. The riparian zone was poor, being mainly grazed right up to the fall of bank, apart from one field upstream of the Deep Hayes tributary (right bank) with scrubby vegetation.

Photo 5 Rough blockstone weir just upstream of Sutherland Road

Photo 6 Pond on left bank (right of picture)

Photo 7 Just upstream of Deep Hayes tributary; emergent vegetation had recently been dredged from this section

Photo 8 Further upstream towards Denford; emergent vegetation is intact and providing some flow variation, although riparian habitat is poor

Denford – Horton Brook confluence

The section of brook from upstream of Denford to the footbridge at SJ943540 was not inspected, but a view from the valley side upstream of this point indicated that habitat was similar to that described below. The brook was walked from the A53 road bridge over the Horton Brook, down past the Endon-Horton Brook confluence to beyond the sewage works discharge.

In-stream habitat was very poor throughout this section (Photo 9). The brook flows through a broad, flat valley bottom and has been the subject of a land drainage scheme (Endon Brook Improvement Scheme 1985). This has resulted in a deeply incised (3m below field level in some areas), very steep-sided, narrow channel completely disconnected from the floodplain. The flow pattern is a uniform, shallow glide with fine, sandy bed substrate. The channel is open, with no trees, and the banks are grazed by livestock to fall of bank.

There is the occasional low block-stone weir, plus remnants of a stone toe to the bank in some areas, presumably installed when the land drainage scheme was carried out (Photos 10, 13). Just below a farm bridge near the sewage works, there is a section of faster flow and a gravel substrate (Photo 11), and immediately downstream a lateral scour pool and downstream riffle are starting to develop; these are however exceptional features in an otherwise barren channel for fish habitat.

At the confluence of the Endon and Horton Brooks (Photo 12), it is evident that most flow originates from the latter. About 100m upstream from the confluence, on the Endon Brook, is a block stone cascade, presumably installed during the 1985 scheme. At the A53 crossing of the Horton Brook there is a potential barrier to upstream fish movement (see next section).

Photo 9 Typically poor in-stream habitat of this section

Photo 10 Low weir just upstream of farm bridge

Photo 11 Steeper, faster flowing section with a gravel bed

Photo 12 Confluence of Endon (left of picture) and Horton Brook

Photo 13 Fine bed material, plus blockstone bank toe reinforcement.

Horton Brook

Although outside the waterbody under scrutiny, a couple of areas were inspected on the Horton Brook. At the A53 road bridge close to the Endon Brook confluence, the culvert presented a barrier to fish migration, having a step at both ends of the culvert bed under the road. In-stream habitat is very poor downstream of this point to the Endon confluence, for the same reasons as the above section (Photos 14-16).

A short section at SJ938556 was inspected (Photos 17 – 19). Here the Horton Brook has reasonably good in-stream habitat, with a fenced 5-m ungrazed riparian zone which includes alder and willow trees. No past land drainage works are evident and there is a pool-riffle structure. The bed substrate still contains a high proportion of sand, and although coarser sediments are apparent, no suitable spawning gravel was observed. The road bridge culvert and a farm bridge (pipe culvert) just downstream are not ideal in terms of fish passage, but do not present major barriers.

At SJ936576 near Boot Hall road bridge (Photos 20, 21). There is better bed substrate here comprising sizes suitable for trout spawning. In-stream habitat is good, but there are some land use issues; there is no buffer zone between the brook and fields, one of which had recently been ploughed and re-seeded. Excessive bank erosion was evident alongside this field.

Photo 14 Horton Brook just upstream of Endon Brook confluence

Photo 15 A53 road culvert (Horton Brook), view upstream under bridge.

Photo 16 A53 road culvert (Horton Brook), view from downstream.

Photo 17 Horton Brook (near SJ938556). Good in-stream and riparian habitat.

Photo 18 Road bridge (Horton Brook, near SJ938556).

Photo 19 Farm vehicle crossing and potential fish migration barrier, just downstream of Photo 18.

Photo 20 SJ936576 near Boot Hall road bridge – land use impacting riparian habitat on the left bank.

Photo 21 SJ936576 near Boot Hall road bridge – better trout spawning substrate

4.0 Conclusions and Recommendations

The reason this waterbody is failing to reach good potential for fish is because of poor in-stream habitat resulting from extensive channel engineering works (reportedly in 1985) and subsequent maintenance. The re-grading and realignment of the river has disrupted the natural morphology of the channel, leading to an absence of habitat features necessary to support healthy fish populations.

To improve the status of this waterbody for fish, the in-stream habitat needs to be improved. To do this sustainably, the physical processes controlling channel shape and dimensions need to be considered in detail (via a geomorphological survey) and restoration design options considered. Options may be constrained by the availability of space, finance and the need to retain specific river functions (e.g. land drainage, flood alleviation) (Hey, 2000).

The ideal restoration scenario is one with none of the above constraints, resulting in restoration of the original river morphology (or a naturalised channel appropriate for current climate and catchment conditions) and reconnection to the floodplain. Realistically there will be constraints (in this case likely to be retaining a land drainage function) meaning the options are likely to be:

- Creating a new, lower level floodplain and a meandering channel at the existing bed level within this. The width of the lowered floodplain depends on required flood capacity, but should extend beyond the belt width of the new meandering channel as a minimum.
- Use of structures (deflectors, riffles, vanes, woody debris) introduced to the existing channel to create localised scour and hence variation in depth and substrate composition.

The cost of the former option is likely to be the order of magnitude of hundreds of thousands of pounds, compared with tens of thousands for the latter, depending upon the length of river restored. Options for funding such works include Environment Agency internal funding (WFD budgets), the Catchment Restoration Fund (open to NGOs for applications) and working with partners such as Trent Rivers Trust and Staffordshire Wildlife Trust. There may be scope for partnership with the Churnet Valley Living

Landscape Partnership (CVLLP, www.churnet-valley.org.uk), particularly under Programme A (headwaters section); it is recommended that this report is discussed with CVLLP representatives.

Improvement of fish passage at structures including the gauging weir (Photo 3) and A53 culvert (Photos 15, 16) are recommended, to improve connectivity with better habitats upstream (Horton Brook) and downstream (River Churnet). However, this work is a lower priority than tackling the in-stream habitat deficiencies and will not address the waterbody failure if carried out in isolation.

5.0 Making it Happen

The following steps should be undertaken in order to progress a restoration project:

- Undertake a geomorphological survey of the reach and appraisal of options for restoration, including indicative costs.
- Undertake a consultation with local interested parties, including landowners and the wider community, to explain the goals and objectives and to identify constraints.
- Identify the preferred option, obtain landowner agreements, draw up detailed design, obtain necessary consents and funding and carry out works.

6.0 Acknowledgement

The Wild Trout Trust would like to thank the Environment Agency for the support which made this visit possible.

7.0 Disclaimer

This report is produced for guidance only and should not be used as a substitute for full professional advice. Accordingly, 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 comments made in this report.

References

Hey, R.D. (2000) *River habitat restoration in canalised watercourses: possibilities and constraints*. Paper presented at CONNECT Workshop, 6-8 November, Lillehammer, Norway.