Holly Wood Local Nature Reserve Brook

Advisory Visit

River	Brook in Holly Wood
Waterbody Name(s)	Trib. of "conf. Two arms River Rea"
Waterbody ID(s)	**GB104028046842**
Management Catchment	Tame Anker and Mease
River Basin District	Humber
Current Ecological Quality	Moderate
U/S Grid Ref inspected	SP05155 94521
D/S Grid Ref inspected	SP0549294454
Length of river inspected	0.4 km

Wild Trout Trust Report – Following a Site Visit on 28/11/2017

1. Introduction

A site visit and habitat appraisal of the small brook within Holly Wood, Great Barr nr. West Bromwich was carried out on behalf of Friends of Holly Wood Local Nature Reserve, Waterside Care and the Environment Agency.

The brook within the visited section of Holly Wood is a small tributary of the upper arms of the River Rea. Under the Water Framework Directive (the scheme currently used to assess Ecological Status and Ecological Potential of our surface waterbodies in Britain) the Confluence of the two arms of River Rea is identified as waterbody GB104028046842.

For waterbodies classified as "heavily modified", such as this, the classification of Ecological Potential (rather than Ecological Status) is applied. The Environment Agency (EA) data held for this waterbody indicates that it has an Ecological Potential of 'Moderate' according to the most recent assessment in 2016 – despite ratings of 'Bad' for fish, 'Poor' for phosphate and failing for Chemicals on the Priority Substances "Nickel and its compounds".

Further details of this downstream waterbody can be found on this link:

http://environment.data.gov.uk/catchment-planning/WaterBody/GB104028046842

However, it is important to appreciate that the chemical and biological measurements taken in the downstream waterbody are not possible to directly transfer to an upstream tributary – such as the brook in Holly Wood. While there may be some impacts that are common to both, the lack of direct measurement means that it cannot be assumed automatically. For this reason, site-specific walk-over surveys (such as the ones reported here) can help to identify clear impacts and opportunities for improvement. The use of indicator species can be a practical method for performing these types of assessment.

Due to the requirement for clean, well-oxygenated water, structurally-varied habitat and free movement between different habitat types; the UK's native wild brown trout makes an ideal indicator species for healthy rivers. These characteristics mean that a simple and effective assessment for river health can be based around the lifecycle requirements of brown trout.

The factors required for robust populations of wild trout map very well onto the more general requirements for healthy, diverse communities of flora and fauna in river corridors. In fact, the quality and diversity of riverbank, overall structural variety and associated fauna is of vital importance to the prospects of aquatic species (including trout).

Identifying and noting the presence or absence of habitat features that allow trout to complete their full lifecycle is a very practical way to assess habitat quality (Fig.1). By identifying the gaps (i.e. where crucial habitat is lacking; Figs. 2-4), it is often possible to design actions to solve those habitat bottlenecks.

Where there is little, or no chance of wild trout colonising a stream (as in this case), those requirements for structurally varied habitat, diverse vegetation and clean water are all good yardsticks for the generalised health of a stream.

Consequently, it is broadly useful to examine streams for the bottlenecks that would prevent self-sustaining trout populations from existing.

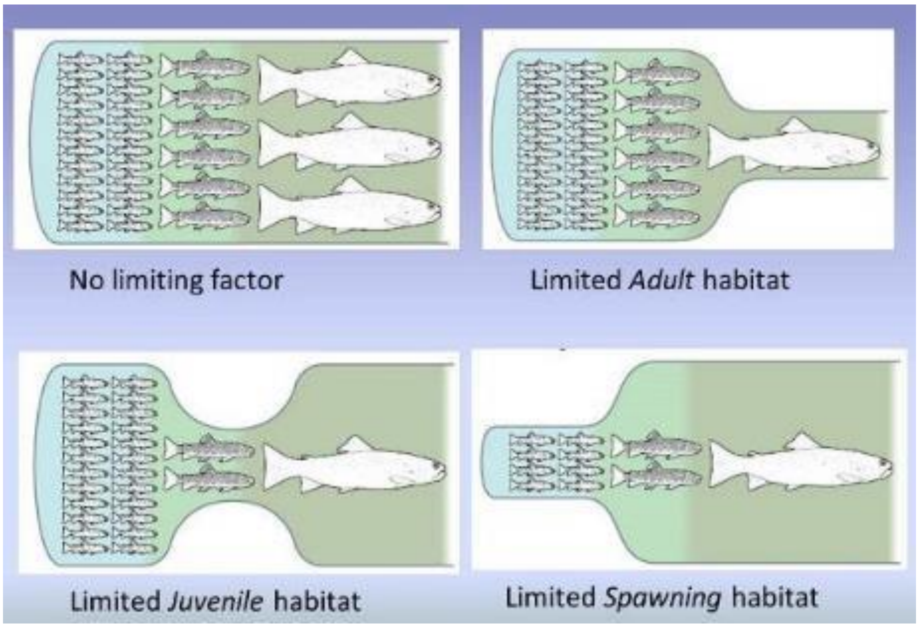

Figure 1: The impacts on trout populations lacking adequate habitat for key lifecycle stages. Spawning trout require loose gravel with a good flow-through of oxygenated water. Juvenile trout need shallow water with plenty of diverse structure for protection against predators and wash-out during spates. Adult trout need deeper pools (usually > 30cm depth) with nearby structural cover such as undercut boulders, sunken trees/tree limbs and/or low overhanging cover (ideally trailing on, or at least within 30cm of, the water's surface). Excellent quality in one or two out of the three crucial habitats may still not be able to make up for a "weak link" in the remaining critical habitat.

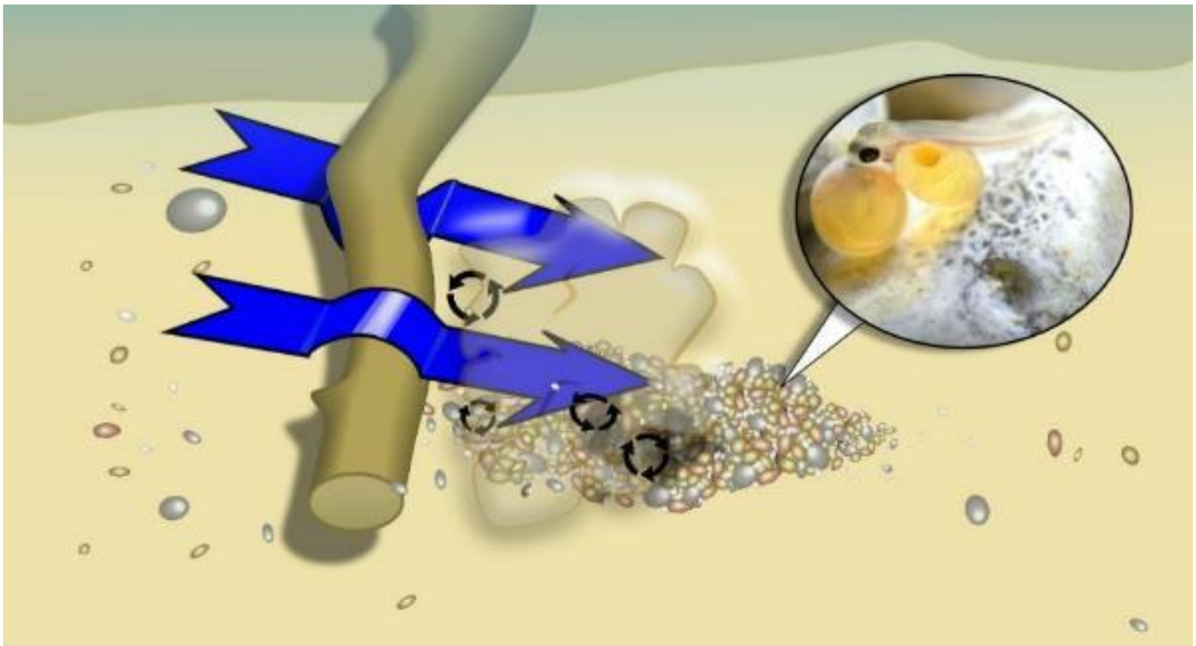

Figure 2: Features associated with successful trout spawning habitat include the presence of relatively silt-free gravels. Here, the action of fallen tree limb is focusing the flows (both under and over the limb as indicated by the blue arrows) on a small area of river-bed that results in silt being washed out from between gravel grains. A small mound of gravel is deposited just below the hollow dug by focused flows. In these silt-free gaps between the grains of gravel it is possible for sufficient oxygen-rich water to flow over the developing eggs and newly-hatched "alevins" to keep them alive as they hide within the gravel mound (inset) until emerging in spring.

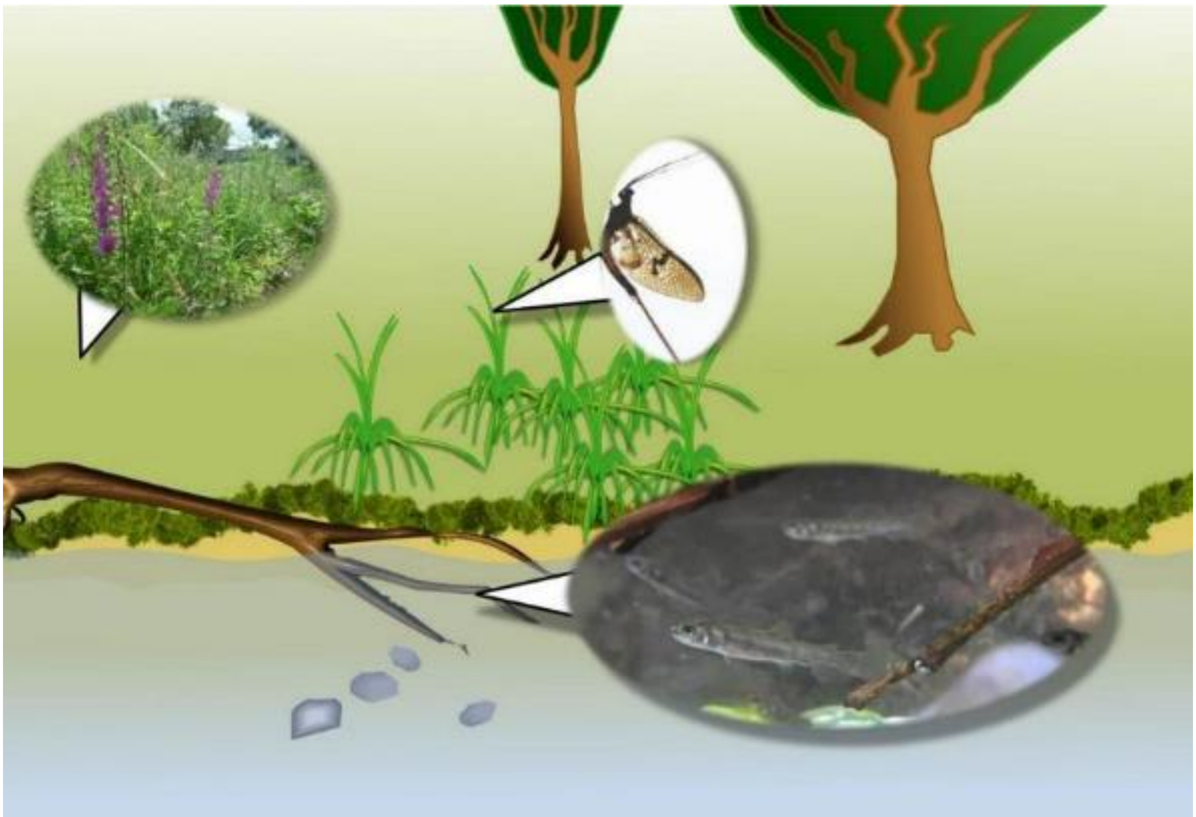

Figure 3: Larger cobbles and submerged "brashy" cover and/or exposed fronds of tree roots provide vital cover from predation and spate flows to tiny juvenile fish in shallower water (<30cm deep). Trailing, overhanging vegetation also provides a similar function and has many benefits for invertebrate populations (some of which will provide a ready food supply for the juvenile fish).

Figure 4: The availability of deeper water bolt holes (>30cm to several metres), low overhanging cover and/or larger submerged structures such as boulders, fallen trees, large root-wads etc. close to a good food supply (e.g. below a riffle in this case) are all strong components of adult trout habitat requirements.

To put this into context, *there are three types of habitat* that are needed in order for wild trout to complete each one of the *three key lifecycle stages* identified previously (Fig. 1). Those requirements (Figs. 2-4) create a demand for varied habitat, which is (in turn) vital for supporting a wide variety of species.

With these broad descriptions of the elements of spawning, juvenile (nursery) and adult trout habitat in mind, measures to address the issues identified during the survey can more easily be described.

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

The upstream and downstream limits of the brook that were visited within the Local Nature Reserve at Holly Wood were at National Grid References SP05115 94521 and SP0549294454 respectively. These limits are noted on Figure 5 as well as the context of the surrounding transport network infrastructure.

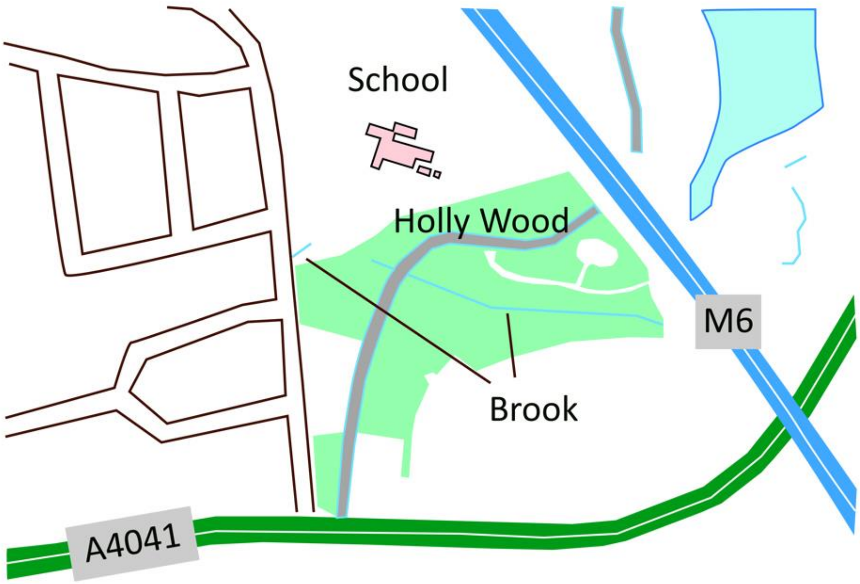

Figure 5: Upstream (far left of marked "Brook") and downstream (far right of marked "Brook") limits of the inspected reach. The watercourse is a very small, straight woodland stream with a relatively steep longitudinal gradient.

At the upstream limit of the visit, there appeared to be a problem caused either by misconnection or perhaps a blockage of the Combined Sewer system. Grey water was entering the brook under low-flow conditions via an outfall at SP05115 94521 (Fig. 6).

Figure 6: Grey water in the Brook directly below an outfall pipe at the upstream limit of the visit at SP05115 94521

Since the outfall from which the grey water is issuing is readily identifiable, continuing to report this issue (as is already being done) and potentially bringing the issue to the attention of local councillors may speed the response to this issue. A few metres downstream of this discharge the brook runs into an on-line pond at SP05243 94504 (Fig. 7).

Figure 7: Photograph of on-stream pond from close to the outflowing point (outside of frame), looking back up towards the inflow of the brook (upper left of frame).

The pond and its associated vegetation may be acting to mitigate some of the poor water quality arising from the grey-water discharges of the outfall. However, to continue to allow that greywater discharge to occur without remedial action to the combined sewer itself is not acceptable.

The brook continues downstream after the outflowing discharge from the pond into a steep gradient as it passes below the main footpath (pictured in Fig. 5) and flows down a steep, narrow valley. The brook is piped through a small plastic culvert, embedded into the footpath that forms a bridge over the brook (Figs. 8 and 9).

This, along with the on-line pond (and especially culverted brook at the upstream and downstream visit limits) is one of multiple examples of the habitat being split into inaccessible fragments for many aquatic species. As well as the existence of the specific habitat types outlined in Figs. 2-4, the ability for species to move between each type of habitat throughout their lifecycle is also vital.

To significantly improve the freedom of movement (or "connectivity") would require a significant investment – particularly given that the downstream culvert is buried within the embankment carrying the M6 motorway. Therefore a judgement must be made as to whether tackling the barrier posed by the footbridge culvert would be cost-effective within the 400-m reach within the boundaries of Holly Wood. With that said, the culvert could be replaced by a clear-span bridge at relatively little cost.

Figure 8: Upstream/inlet of the plastic-pipe culvert that carries the brook beneath the footpath at SP05375 94463

Figure 9: Looking downstream from the bridge and culvert through the footpath

The steep gradient and presence of natural, fallen woody material within the channel creates valuable variation in the structure of the habitat. As well as creating different depths and flows over the cross-section of the channel, the process of "sorting" or "grading" substrate is very valuable (e.g. Fig. 10).

Figure 10: Substrate material of different particle-size "fractions" is separated out into discrete patches by the scouring and deposition processes promoted by the presence of fallen woody material. Notice how the finer material has been deposited around this tree limb, while the coarse cobbles are exposed by faster flows being focused towards the lower edge of the frame.

The creation of those distinct patches of substrate size, depth and flow velocity is critical to maintaining high biodiversity. Each combination of physical conditions supports a characteristic, associated flora and fauna.

There may be some opportunities to create additional variation in some reaches of the brook (e.g. Fig. 11).

Figure 11: Relatively uniform cross-sectional depth, flow and substrate. The steep gradient would readily promote extra structural diversity following the introduction of stable, large woody material.

Introduction and secure anchoring of woody material within the channel could focus spate flows to create localised scour and deposition. In turn, this would result in a greater range of physical conditions that could make a broader range of habitat niche conditions available for colonisation.

Although no Himalayan balsam or Japanese knotweed plants (typical non-native, invasive plant species associated with watercourses) were encountered during the visit, Rhododendron growth was extensive. As well as creating dense, uniform shade (e.g. Figs. 12 and 13) which limits the diversity of understory species; Rhododendron is also a host to fungal pathogens that can adversely affect native woodland tree species in the UK.

Figure 12: Dense Rhododendron overgrowth competing with holly to produce a uniformly-shaded watercourse at SP05436 94456

Figure 13: Photograph from the same location as Fig. 12, facing downstream

For these reasons, a programme of Rhododendron control (a notoriously physically difficult task) would be valuable to introduce and maintain. Just as physical variety stemming from the redistribution of riverbed material creates a wider range of opportunities for increasing species diversity, so too does reducing the dominance of competitively-dominant Rhododendron bushes. Their removal also greatly reduces the reservoir of fungal spores that can cause serious diseases of our native woodland trees. A significant proportion of the ground cover within the whole of the Holly Wood Local Nature Reserve woodland was noted to be Rhododendron.

Figure 14: Further examples of extensive Rhododendron overshading of the channel just above the downstream visit-limit

At the same time, this is not an argument to create entirely open canopy throughout the whole visited reach. Again the guiding principle should be variety. A broad rule of thumb for canopy management (as well as promoting a diverse range of herbaceous and woody species) is to aim for an approximate mix of 60% dappled shade to 40% light.

While not an absolutely rigid formula – it gives a useful starting point. To this end, light, rotational coppicing of the mature trees can greatly enhance woodland biodiversity – and the biodiversity of their associated streams. Creating a staggered range of canopy heights - rather than a flat single-height – allows a more diverse understory to develop.

In turn this supports a wider range of associated species. The presence of some dense shade is, still vital for small streams. During hot weather and low flows, spots of dense shade provide cool-water refuge areas.

Finally, the small culvert that carries the brook beneath the M6 was located at SP0549294454 (Fig. 15). This is another significant barrier to migration that, together with the upstream-limit culvert and on-stream pond, effectively isolates the reach within the Holly Wood Local Nature Reserve.

Figure 15: Tiny culvert that carries the brook underneath the M6.

3. Recommendations

N.B. *Any and all works will be subject to a variety of legal permissions that include, but are not limited to, landowners, regulatory authorities for the watercourse (which could be local council, Environment Agency etc.) and other stakeholders such as local volunteer groups or even bodies responsible for underground services that might have the potential to be affected by works.*

Given the polluted water entering the top of the watercourse within the nature reserve, citizen science monitoring of the presence and effects of those chemical inputs could be a practical way to increase the pressure to tackle that pollution. Along with the other highlighted issues, a good starting point for positive action could be:

Basic Tier works to include:

- Undertake training in invertebrate identification that allows water quality to be assessed so that problems can be identified and improvements or declines can be monitored
    - The Brook within Holly Wood appears to be a suitable watercourse in which to apply the Riverfly Partnership monitoring approach (www.riverflies.org/rp-riverfly-monitoring-initiative)
- Using the Waterside Care chemical testing kits to monitor phosphate levels (in particular) and other nutrient enrichment
- Continue to report any and all pollution events on 0800 807060
- Particular emphasis should be placed on pollution events occurring at times of low/no rainfall when the receiving watercourse(s) are under low-flow conditions

- Use materials arising from any routine tree-management activities within the park to securely fix limbs, stems and branches from trees to encourage localised bed and (where safe to do so) bank scour (e.g. Fig. 17).
- Explore the potential to control/remove dominant stands of Rhododendron growth
- Planting areas that have been cleared of Rhododendron bushes with "plug" plants of appropriate native understory species may be beneficial (e.g. Fig. 18). There appears to be little supporting evidence for the theory that Rhododendrons "poison the soil" for other plants – rather than simply dominating the space and the nutrients as well as producing poor leaf litter

Figure 16: Securely pinned/staked woody material producing localised bed scour during higher flows. Using this technique with material arising from tree management – or even repositioning existing in-channel material - would create better habitat.

Figure 17: Plug plants ready to be planted to augment the in-channel features on the near bank and opposite bank created using brash (also pictured here) within an urban park on the Lyme Brook in Staffordshire.

The constraints imposed by the degree of surrounding infrastructure (particularly with respect to culverted sections of the watercourse in the surrounding housing developments) would make a more extensive restoration effort extremely expensive.

While such projects are not without precedent (e.g. Figure 29 above which is a stream that was previously buried below ground in a town centre brick culvert), they require significant financial investment which is likely to be beyond the scope of current stakeholder aspirations.

The WTT is willing to provide support (within its capacity) to meet our recommendations. We'll also work to provide assistance in establishing contact with appropriate partners where further support is required.

We are often able to provide demonstration and training in delivering the basic recommendations made in our Advisory Visit (AV) reports (like this one). This commonly takes the form of a "Practical Visit" (PV) where one or more of our Conservation Officers help you to carry out the habitat improvement measures recommend in our AVs. A significant component of PVs is the training we provide that allows recipients to deliver similar work in future.

Demand for PVs is high and subject to the availability of our Conservation Officers, funding for staff time, mileage and materials.

For any clarifications on the observations and recommendations given in this report (or any other related questions/comments) please feel free to contact me on pgaskell@wildtrout.org.

4. Acknowledgement

The WTT thanks the Environment Agency for supporting the advisory and practical visit programmes (through which a proportion of this work has been funded) in part through rod-licence funding.

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.