WILD TROUT TRUST

River Lathkill

(Waltonians Update)

19/10/2020

River	Lathkill
Waterbody Name	Lathkill (Source to Bradford)
Waterbody ID	**GB104028058450**
Management Catchment	Derwent Derbyshire
River Basin District	Humber
Current Ecological Quality	Moderate
U/S Grid Ref inspected	SK1809065711
D/S Grid Ref inspected	SK2106465888
Length of river inspected	3.25 km

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1. Introduction

The Wild Trout Trust were invited to return to the River Lathkill and offer specific advice on locations covered in an initial Advisory Visit (AV) from July 2018. This report will detail the findings of the visit with specific respect to queries raised.

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 to identify specific locations.

2. Background

The River Lathkill above Conksbury bridge and throughout Lathkill Dale has a special significance in historic and ecological terms – as well as in the eyes of fly fishers. This report also references the existing background information given in the 2018 AV report.

The visit hosts have concerns over the loss of spawning habitat at specific locations in the dale (a feature that is already in short supply). The legacy of channel modifications impacts in-channel habitat quality as well as longitudinal connectivity.

3. Habitat Assessment

Introduced woody material has created some variation in bed-scour and roughness at several locations in the Lathkill. However, the surface geology, water chemistry, hydrology and history of channel modification create a complex situation. Only a thin "skin" of gravel tends to lie over soft sand/silt. A lot of that gravel-sized substrate can be quite light and less dense than typical pebbles due to it being formed from "oncoids" of tufa precipitate. These oncoids arise when dissolved salts within the water precipitate out of solution and adhere to the outside of a small piece of debris. Successive layers of that precipitated mineral "skin" build up to form broadly egg-shaped chunks of substrate.

The lower density of that substrate makes it a little easier for bed-scouring currents to mobilise. Consequently, when scour is focussed by fallen wood it can easily dig below the gravel into soft sand and silt. While variation in depth is undoubtedly created, the ordinary pattern of substrate sorting and deposition into good quality spawning beds may not materialise.

In a specific case at SK19421 65899, a bank of gravel previously spanned most of the cross-section of the channel – and would be covered in trout redds at breeding time. With the introduction of large woody material at this specific spot, silt accumulation in the lee of that structure has been increased. As well as burying gravels and becoming colonised by emergent vegetation, the resultant "pinching" of the flow has blown out most of the gravels from the remaining open water – to create a deeper, sandy pot-

hole. While the deeper pool habitat and increased cover is likely to provide habitat for adult trout, it appears to come at the expense of an important breeding resource (Figs. 1 - 3).

Figure 1: Installed Woody Debris – associated with good cover habitat for adult and juvenile fish. Interventions such as this are common (and often valuable) recommendations found in Wild Trout Trust advice. The context, however, is always critically important.

Figure 2: Previous gravel layer scoured away leaving soft sand with scattered larger cobbles. Again, in different contexts, this might be the main/only limiting factor. However, in this scenario, spawning habitat is an extremely scarce resource. Therefore, relative amounts of different habitat types are best considered together to judge best compromises and trade-offs.

Figure 3: Fine, nutrient-rich sediment has been deposited over gravels under the influence of installed woody material. The resulting colonisation by emergent, aquatic vegetation has narrowed and deepened the channel (facilitated by the thin layer of gravel over soft sand). Approximately two thirds of the cross-sectional width is now vegetated – with previous spawning beds locked up beneath the consolidated silt and root systems.

It is difficult to balance the needs of each lifecycle stage of wild trout populations in managed environments. This is particularly true in watercourses impacted by significant historical modification – whose effects are still harming habitat. Lathkill Dale is a prime example – where channel straightening and "perching" above the true valley bottom (along with stone bank revetment and multiple weirs) has significantly degraded natural geomorphological processes. This is further complicated by artificial abstractions of headwater flows (coupled with artificial and natural losses to underground sough-systems).

The ability of a stream to create diverse habitat depends on some variation in the course of the river over time. This process is vital to supply and redistribute different substrate particle-sizes (from silts through to cobbles and boulders – and everything in between). The ever-shifting formation of depositional and erosive features in the habitat **over time** is essential for maintaining maximum biodiversity. It is not sufficient to have only a degree of *structural diversity which is invariant through the passage of time*. Temporal variation helps to re-set and re-balance competitive interactions between the greatest range of species; limiting the potential for monopolisation by a smaller sub-set of species.

Straightened channels with reinforced banks lock the channel in place over time. This cuts off the natural supply of gravels that would, ordinarily, arrive via erosion and shifting of the banks. That effect is compounded by the presence of weirs which intercept downstream transport of gravels (for instance). The impoundment of water above weirs also promotes

smothering of substrate with fine particulate material – resulting in a homogenous layer of silt covering the majority of the channel. Silt (and low dissolved oxygen) tolerating species will thrive within that substrate – at the expense of flow-loving species with a higher requirement for dissolved oxygen. Conversely, uniform, cobbled riffle habitat with little cross-sectional variation in current-speed, depth and substrate particle-size may dominate (e.g. Fig. 4). In that case, flow-loving species would be over-represented at the expense of, for instance, collector/gatherer species of invertebrate.

Engineered modifications to streams tend to create artificial dominance of a smaller (and simpler) set of conditions over much larger areas than are optimal for biodiversity. Releasing some of those artificial constraints and re-starting more natural processes underpin the most valuable strategies for protecting and improving biodiversity.

Figure 4: Heavily modified section at SK19329 65805. The straightened course is locked in place using stone banks. The (possibly artificial) bed is comprised of a very uniform size-range of interlocking cobbles. As well as low variation in flow depth and velocity over the cross-section, there is little to no potential for temporal changes in structure (an observation corroborated by the thick bryophyte carpet on stones).

Re-establishing the potential for bank-erosion (i.e. by removal/redistribution of stone bank revetments) and localised bed-scour (i.e. by woody material introductions) would be highly beneficial to reaches such as the example in Fig. 4. At the other end of the current-speed scale, a different kind of uniformity is created by water impoundment and sediment deposition by the weir at SK18519 65796 (Fig. 5). The hosts were concerned, following consultation with Natural England, the body responsible for Lathkilldale National Nature Reserve, to understand the potential impacts on water vole habitat of bypassing this structure. As well as the benefits of reintroducing more geomorphological and ecological

process back into the channel, it seems important to assess species-specific effects in the context of the assessed reach.

Figure 5: Impoundment above weir creating uniformly silty conditions and limiting structural and biological diversity

In non-impounded sections below the weir in question, there appears to be plentiful appropriate habitat resources for water vole (e.g Fig. 6). Creating more of this habitat - while also re-establishing the capacity of the channel to recreate structural diversity – would seem to be a double win.

Figure 6: An absence of artificial impoundment does not seem to lead to impoverished water vole habitat.

In fact, the beneficial (habitat-diversifying) effect of weir-notching is available to observe in action in Lathkill Dale. For instance, albeit suffering from camera-shake, the diversification of erosion and deposition in the riverbed is clearly visible in response to a previous weir-notching operation (Fig. 7). This area was previously much more comparable to the situation shown in Fig. 5. The clear impact from even one weir is cause for concern.

Figure 7: Blurred, but still illustrative, photograph at SK18159 65723 showing effects of weir notching. Note the variety in flow velocity and depth over the cross section (including paler scoured gravel/cobble substrate and darker/silty depositional areas).

Another quite unusual impact of past engineering of the channel – and associated banks/footpath creation – was noted at SK18289 65754 (Fig. 8).

Figure 8: Scree slope separated from river by footpath and bank.

This section of river is, generally, constrained by a lack of gravel inputs from bank erosion – yet the scree slope shown in Fig. 8 is effectively cut off from the river. A potential solution to limited spawning habitat would be to explore how this source of gravel might re-seed river geomorphological processes. It may be possible to instigate stochastic/seasonal inputs by reconnecting the slope to the river. Alternatively, a more formally-managed process of gravel redistribution may be appropriate.

4. Recommendations

Here are some recommended actions based on the findings of this report. Prior to listing those recommendations, be aware that appropriate permissions should be obtained before carrying out any interventions. The following short illustrations (Figs. 21 – 24) indicate how diversifying habitat structure helps to avoid bottlenecks for wild fish populations. There are three main types of habitat that trout require in order to complete their lifecycles (spawning, nursery/juvenile and adult). By providing for these key lifecycle stages through wide structural diversity in habitat, a wide range of flora and fauna is also catered for. Ideally, by ensuring that there are no barriers between the various habitats utilised throughout a complete lifecycle, access for the widest diversity of fauna is also ensured. There is no biological separation between the aquatic and terrestrial components of the river corridor so it is also critically important to maintain maximum structural and biological diversity in the surrounding terrestrial habitat. This is one useful benefit to wider river corridor biodiversity associated with addressing habitat bottlenecks for trout.

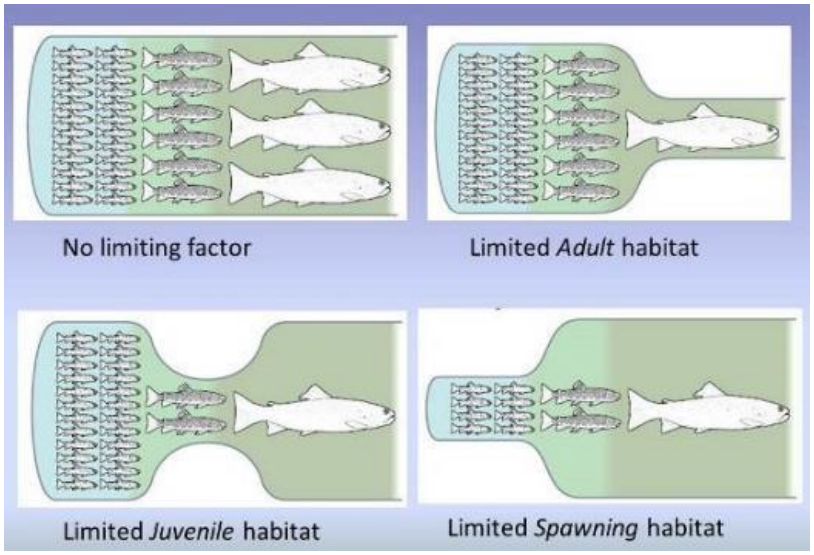

Figure 9: The impacts on trout populations lacking adequate habitat for key lifecycle stages. Spawning trout need to create loose mounds of gravel that maintain a good flow of oxygenated water between gravel grains. Juvenile trout need shallow water with plenty of dense submerged/tangled structure for 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 cannot make up for a "weak link" in the remaining critical habitat.

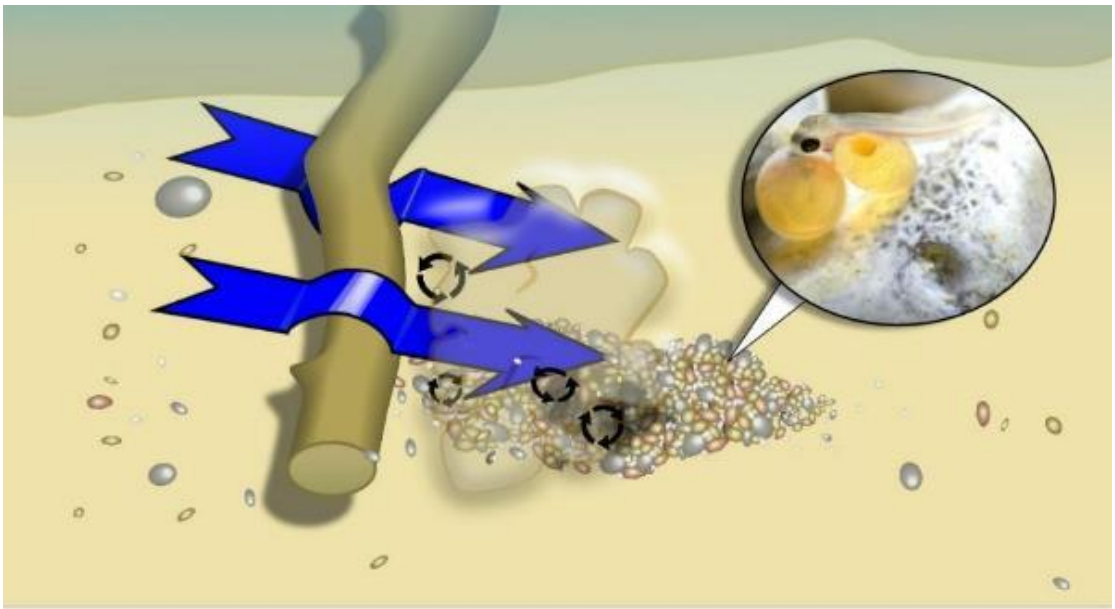

Figure 10: Features associated with successful trout spawning habitat include the presence of silt-free gravels. Here the action of fallen tree limb is focusing the flows (both under and over the limb as indicated by the blue arrows) on a small area of river-bed that results in silt being mobilised from between gravel grains. A small mound of gravel is deposited just downstream of 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 within the gravel mound (inset) until emerging in spring.

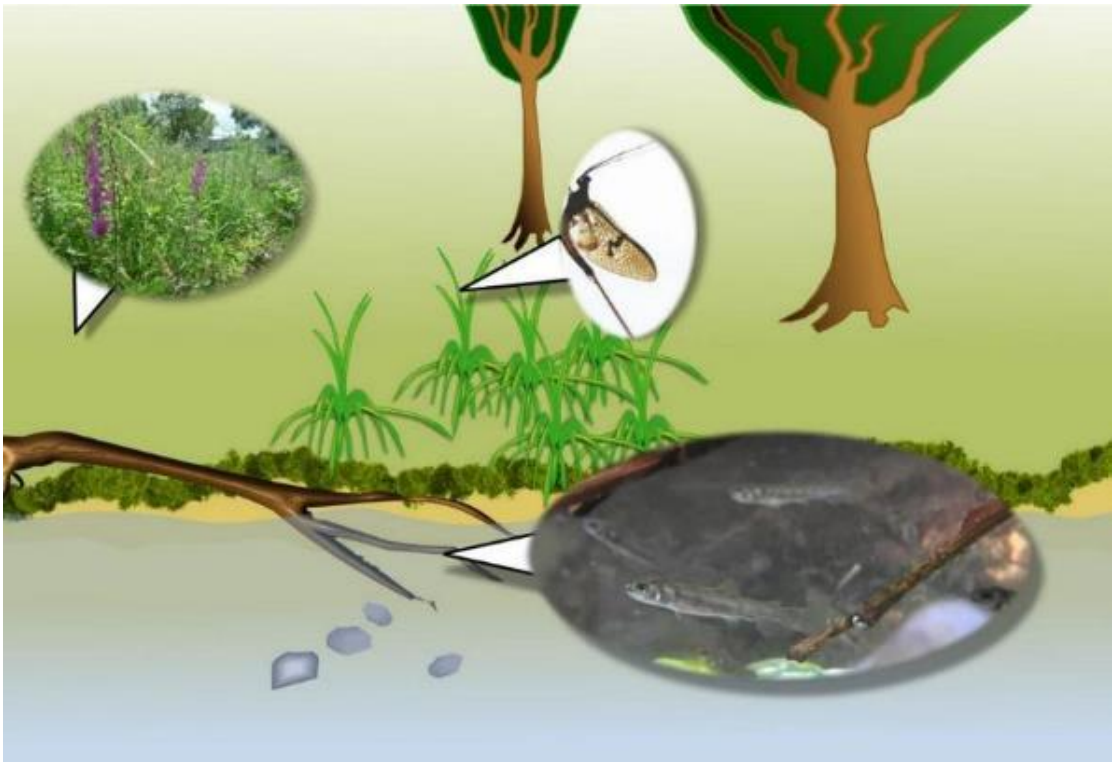

Figure 11: Larger cobbles and submerged "brashy" cover and/or exposed fronds of tree roots provide vital cover from predation and spate flows to the tiny juvenile fish in shallower water (<30cm deep) after they emerge. Trailing, overhanging vegetation also provides a similar function and diverse bank-side vegetation has many benefits for invertebrate populations (some of which will provide a ready food supply for the juvenile fish).

Figure 12: 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 and with prey likely to fall from overhanging tree canopy in this case) are all strong components of adult trout habitat requirements.

With these core habitat features in mind – a summary of recommended actions are as follows:

- Arranging events and opportunities for stakeholders - including the public/friends-of community group(s), Natural England, the Sheffield Waltonians angling club and other appropriate groups/individuals - to discuss the ecological value and management of Lathkill Dale (with two Advisory Visit Reports to help guide/focus issues around river corridor ecological health)
- Explore (with Wild Trout Trust involvement) aspirations for ecological processes that can be re-established in Lathkill Dale (with the river as an important focus)
- Try to reach collaborative decisions in partnership with regulatory organisation personnel (i.e. Natural England for matters within the reserve) on appropriate actions
- Pro-actively identify Win:Win scenarios wherever possible (e.g. water vole and weir bypass/notching)
- Identify specific locations/opportunities where favourable gravel-spawning bed habitat could be encouraged to form
- Assess remaining artificial impoundments for their potential to enable re-establishment of more active channel geomorphology
- Explore creative options for Water Vole predator (namely mink) control/management

5. Further information

The WTT may be able to offer further assistance such as:

- WTT Practical Visit
  - Where recipients require assistance to carry out the improvements highlighted in an advisory report, there is the possibility of WTT staff conducting a practical visit. This would consist of 1-3 days' work, with a WTT Conservation Officer(s) teaming up with interested parties to demonstrate habitat enhancement methods (e.g. tree kickers and willow laying etc.).
- WTT presentation/Q&A session
  - Where recipients are unsure about the issues raised in the AV report, it is possible that your local conservation officer may be able to attend a meeting to explain the concepts in more detail.

In these examples, the recipient would be asked to contribute to the reasonable travel and subsistence costs of the WTT Officer.

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.

Acknowledgements

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