River Douglas II

Advisory Visit

	River Douglas
River	Douglas
Waterbody Name	Douglas - Mid
Waterbody ID	GB112070064780
Management Catchment	Douglas
River Basin District	North West
Current Ecological Quality	Moderate
U/S Grid Ref inspected	SD 58137 08960
D/S Grid Ref inspected	SD 58782 07113
Length of river inspected	2km

Wild Trout Trust Report – Following a Site Visit on 19/08/2019

1. Introduction

A site visit and habitat appraisal of the River Douglas was made at the request of local landowners who also sit on the Douglas Catchment Partnership steering group. Previous Advisory (08/12/2010) and Practical (March 2013) Visit inputs created improved habitat in the reach bracketed by the sections visited for this report.

Catchment partnership Electric fishing survey work completed by Mike Forty of Ribble Rivers Trust − as well as Environment Agency (EA) monitoring − indicate that these sections of the Douglas suffer severely impacted fish populations. The purpose of this visit was to explore potential means to reverse those impacts.

To define the general process by which Wild Trout Trust (WTT) advice is derived, it is useful to understand that there are three key lifecycle stages of wild trout (spawning, juvenile and adult). By examining sections of watercourse, it is possible to identify if there are either absences − or a lack of access to − habitat that supports each key lifecycle stage.

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 above (Fig. 1). Those varied requirements (Figs. 2-4) create a demand for varied habitat, which is (in turn) vital for supporting a wide variety of species.

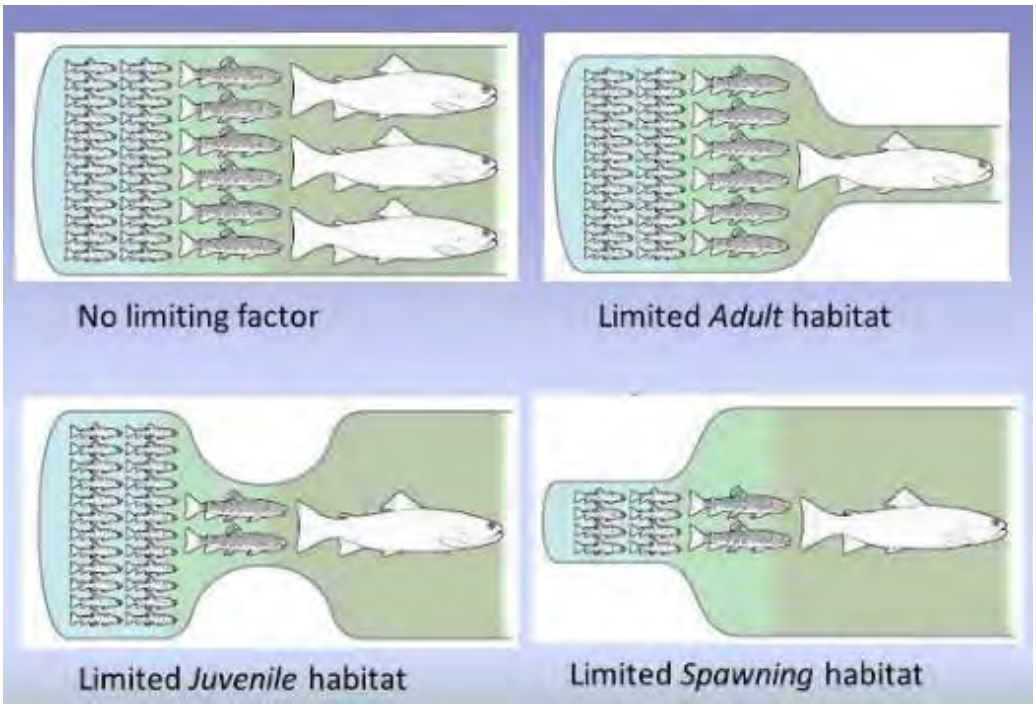

Figure 1: The impacts on trout populations lacking adequate habitat for key lifecycle stages. Spawning trout require loose mounds of gravel with a good flow of oxygenated water between gravel grains. Juvenile trout need shallow water with plenty of dense submerged/tangled structure for protection against 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.

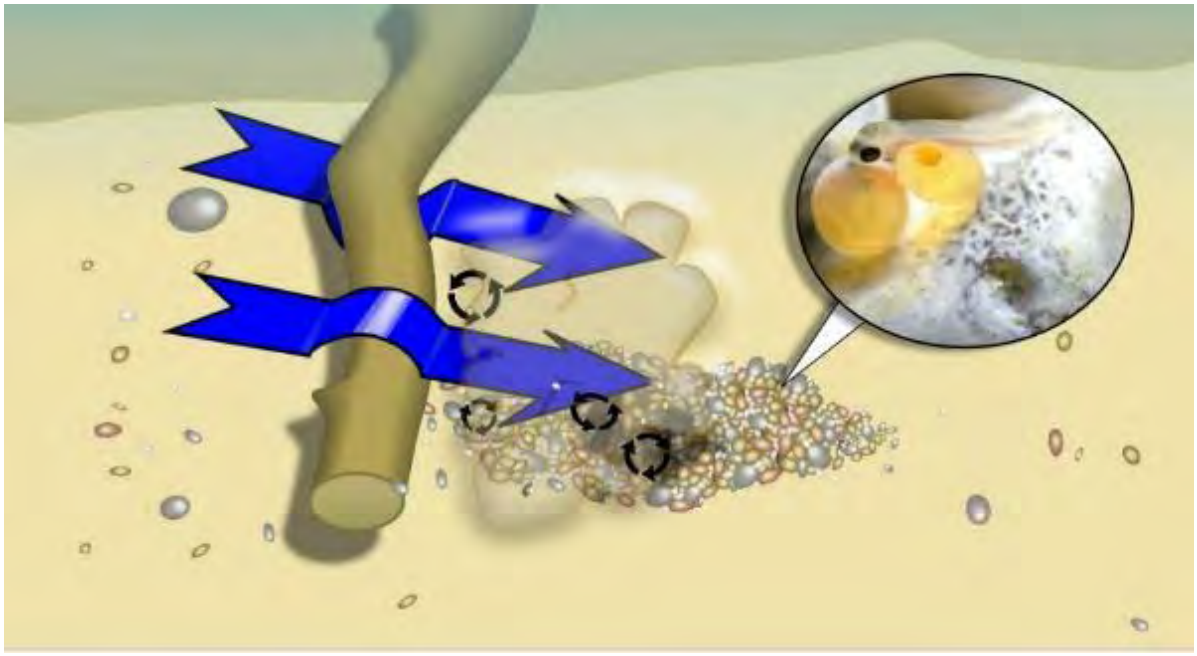

Figure 2: Features associated with successful trout spawning habitat include the presence of silt-free gravels. Here the action of fallen tree limb is focusing the flows (both under and over the limb as indicated by the blue arrows) on a small area of river-bed that results in silt being mobilised from 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 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 diverse bank-side vegetation 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 and with prey likely to fall from overhanging tree canopy in this case) are all strong components of adult trout habitat requirements.

With these broad descriptions of the elements of spawning, juvenile (nursery) and adult trout habitat in mind, both habitat bottlenecks and examples of good habitat are easier to highlight and define. 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 downstream limit of this visit was the bridge leading down from the gated entry to the plantation at SD 58782 07113 (Fig. 5). This is a wet woodland area with excellent potential to support diverse flora and fauna. Unfortunately, it is dominated by an extensive infestation of the invasive non-native Himalayan balsam.

Infestations by this plant are associated with significant reductions in invertebrate biodiversity – i.e. between 58% and 75% reduction in species number depending on the taxonomic group as noted in the following infographic: https://himalayanbalsamdotcabidotorg1.files.wordpress.com/2013/06/himalayan-balsam-infographic.pdf

The benefits of Himalayan Balsam control to wildlife are evident both above and below ground with reference to the more detailed work sitting behind that visual summary:
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0067271

Figure 5: Looking downstream from the bridge at the downstream limit of the visit

Although subject to apparent intermittent mine-water upwelling, a tributary stream (the Yellow Brook) joins the main River Douglas at SD58759 07073. Unusually in a post-industrial setting, there is apparently good migratory connectivity between the main river and this side-stream (Fig. 6).

Figure 6: Confluence of Yellow Brook & River Douglas. The tributary benefits from an absence of the usual culverting/discharge over a weir into the main river! Himalayan balsam is, however, abundant.

At the time of the visit, recent rainfall had generated natural, localised bed-scour and "sorting" of substrate particles around naturally occurring woody-material in the manner illustrated previously (Fig. 2).

As a result, valuable potential spawning habitat has been created – and shows the potential for the Yellow Brook as a spawning and nursery-habitat resource (Figs. 7 - 9). A more usual silt and sand-dominated characteristic displayed by the Yellow

Brook also highlights an important phenomenon: the existence of high-quality habitat patches is dynamic, varying in time as well as spatially.

In other words, good quality spawning gravels may not appear or exist at these locations in all years. However, given the right conditions leading up to spawning time, a vital resource will be available in certain years. Similarly, there may be a gap of several spawning seasons before the right conditions occur at the right time of year.

Figure 7: Stable woody material and recent high flows have created a good quality spawning opportunity at SD58902 07065

Figure 8: Spawning habitat 20 metres upstream of example shown in Fig.7

Figure 9: Spawning habitat within 20 metres of the examples shown in Figs. 7 and 8.

This demonstrates the importance of stable woody material in the channel, especially that woody material which, with sufficient rainfall, will create localised scouring action and heap the gravel into loose (silt-free) mounds.

Preserving connectivity with the main river, allowing the continued existence of stable woody material within the Yellow Brook and also protecting the water quality from excessive mine-water (or other polluting) inputs are priorities for this side stream.

Accounts of previous poor water quality would be worth examining with the current risks of pollution assessed and − where possible − mitigated.

As with the Yellow Brook, on the main River Douglas at SD 58769 03310 the reach is dominated by a sandy riverbed − with some gravels also present (Fig. 10). From the previous Advisory Visit (2010), inputs of soils from heavily-grazed banks were contributing substantially to this high loading of sand and silt. The dominance of Himalayan balsam throughout the upstream catchment also tends to elevate inputs of fine sediment.

Excessive levels of fine sediment have a negative effect upon the spawning success of trout. Efforts to identify and reduce sources of excessive inputs of fine particles will benefit conditions in large sections of the River Douglas.

The presence of marginal, partially-submerged woody material and cross-sectional variation in flow depth and velocity create good conditions for adult and juvenile trout − along with a many other species of aquatic flora and fauna.

Figure 10: A substantial proportion of the bed-load at this point is made up of sand. The pores between gravel particles here are blocked with sand. This results in very poor egg-survival for any gravel-spawning fish species, especially trout.

Just upstream of the reach pictured in Fig. 10, a cobble and gravel riffle – combined with partially-submerged and overhanging marginal branches represents high quality habitat for a range of species (including salmonid fish; Figs. 11 and 12).

Figure 11: Cobble riffle (visible right of frame) gives way to a drop-off into deeper water with a high degree of cross-sectional variation in flow and depth. High quality habitat for a range of aquatic species.

Figure 12: Substantial, dense and complex marginal cover created by stable woody / brashy material. Vital for good overwinter survival of juvenile and adult trout (according to water-depth - with larger fish favouring deeper water)

Some of the best possible adult trout habitat features were observed at SD 5873107427 (Fig. 13). The lateral and longitudinal variation in depth and velocity here arises from the cobble and gravel point-bar, meandering character and accumulated coarse and large woody material.

Figure 13: Examples of extensive structural diversity, dappled light / shade, ready supply of digestible leaf-litter, connectivity to the floodplain, localised scour, accumulation of coarse woody material, scour and cover generated by fallen (stable) large woody material. Extremely high quality habitat for trout and a wide range of aquatic fauna. N.B. Water-colour associated with recent rainfall.

Moving upstream, the woodland gives way to a more open, previously grazed surrounding landscape. The channel here has a more uniform cross-sectional profile – consistent with a widening over time due to low resistance of banks to

erosion. The sandy soil is very soft and, with riparian vegetation consisting of shallow-rooted plants rather than trees, highly susceptible to erosion. The increased cross-sectional area (caused by the widened channel) has a more uniformly slow flow across the full width of the channel. Accordingly, fine sediment has a greater tendency to settle on the riverbed and smother gravel beds deposited in the reach (Fig. 14)

Figure 14: Wider, slower and more uniform with fragile banks - probably a legacy of previous grazing regimes.

With the apparent cessation of the bank-top grazing previously identified as a source of fine sediment inputs (2010 Advisory Visit), vegetation is beginning to recolonise the banks at SD 58121 08463 (Fig. 15)

Figure 15: The bankside vegetation that is returning following grazing cessation includes native species – but is dominated by the invasive, non-native Himalayan balsam.

However, the rapid domination of Himalayan balsam means that winter storms will still generate significant inputs of fine sediment – due to the annual die-back and shallow-root systems. The return (and expansion) of sapling-growth to the bank-side is a valuable factor – and will create additional cover habitat and leaf-litter input over time. Similarly, existing trailing branches (e.g. Fig. 16) continue to provide cover habitat and patches of shade.

Figure 16: Overhanging, mature tree limbs on the LB (right of frame) at SD 58141 08562.

Further upstream at SD 58137 08960 (to the limit of the reach visited for this report) the tree cover increases once again. The potential to create valuable structure from tree root-plates exposed during the natural cycle of tree-growth, senescence and deadfall is clearly visible here (Fig. 17).

Figure 17: Beginnings of new meandering flow in this back-eddy created by an exposed root-plate. The size and shape of these structures creates a tendency to lodge in highly stable orientations. The associated localised scour creates valuable habitat features and cover.

Taking these observations as a whole, it is important to recognise that the current habitat status should be supporting a significant population of wild brown trout and a wide diversity of aquatic fauna. All of the features indicated in Figs. 2-4 as essential for trout − along with the capacity to move between them − are present.

While there are undoubted negative influences of Himalayan balsam infestations (and potential for fine sediment to reduce egg-survival), the trout that are found upstream of this location are conspicuous by their absence in the surveyed reach.

A solitary (large) adult trout specimen was captured in 2011. Similarly, only a single juvenile trout was captured (with zero adult trout observed) during the extensive electric fishing survey work completed by Mike Forty in 2019.

Consequently, the remaining reason that this high-quality habitat does not support a thriving and diverse wild-fish population must be attributed to intermittent pollution events. A number of significant pollution events and fish-kills have been recorded in the past (including events formally classified by local Environment Agency Officers). The ongoing absence of fish strongly suggests that pollution events continue to occur with sufficient frequency (at least annually) to prevent the re-colonisation of fish.

3. Recommendations

Here are some recommended actions based on the findings of this report. Prior to listing those recommendations, please pay attention to the important information relating to permissions:

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

- Continue with (and extend if possible) the current manual control of Himalayan balsam
- Explore opportunities to be included in the programme of releases of the rust fungus biological control agent of Himalayan balsam (particularly in the area around the downstream limit of the reach visited for this report). An initial starting point would be to monitor news items from the CABI website following their journal paper on the proposed modified variety of the fungal agent: https://www.cabi.org/isc/abstract/20153061506
- Don't change the current practices that allow overhanging vegetation to develop and persist! (including the selective pollarding practices noted during the visit)
- Undertake some whip planting of locally-appropriate tree species within the previously-grazed reaches (along with Himalayan balsam control to enable establishment and growth of planted trees)
- Undertake training in invertebrate identification for a larger group of volunteers that allows water quality to be assessed - so that problems can be identified and improvements or declines can be monitored without undue burden falling on a small number of individuals

    - For the River Douglas, the standard Riverfly Partnership monitoring protocols would be highly appropriate (http://www.riverflies.org/rp-riverfly-monitoring-initiative)
    - Comparisons of results above and below suspected problem spots will be particularly valuable
- Extend and intensify a campaign to highlight and bring to account entities responsible for polluting inputs into the River Douglas
- Explore opportunities with the Douglas Catchment Partnership for increasing public engagement with the river and utilise collaboration with groups carrying out similar activities via the Trout in the Town Facebook group (https://www.facebook.com/groups/wildtrouttrusttroutinthetown/), as well as the examples in the Sheaf and Porter Rivers Trust Facebook Page: https://www.facebook.com/SheafAndPorterRiversTrust/

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

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 habitat improvement measures that we recommend in our AVs. A significant component of PVs is the training we provide that allows you and your partners to deliver similar works under your own steam.

Demand for PVs is high and are subject to the availability of our Conservation Officers (and our ability to identify supportive 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