



WILD TROUT TRUST

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Advisory Visit
River Derwent
Darley Dale FFC, Derbyshire



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River	Derwent
Waterbody Name	Derwent from Wye to Amber
Waterbody ID	GB104028052390
Management Catchment	Derbyshire Derwent
River Basin District	Humber
Current Ecological Status	Moderate
U/S Grid Ref inspected	SK2603264076 (53.173162, -1.612008)
D/S Grid Ref inspected	SK2627062757 (53.161352, -1.608835)
Length of river inspected	1.42 km



1 Summary

- *Historic channel modifications (straightening and locking the course of the river in place, plus multiple weirs in the wider catchment; reducing physical diversity and connectivity in the habitat).*
- *An associated disconnection of river from its floodplain (limiting the capacity to retain varied sizes of substrate plus reducing the redistribution of nutrient-enriched sediment from the riverbed onto surrounding land)*
- *Surrounding land-use that limits the presence of riparian woodland and diverse understory species (which increases surface runoff/nutrient enrichment while reducing cover against predation and spate flows as well as reducing reciprocal subsidies between aquatic and terrestrial foodwebs)*
- *A relative lack of large woody material in the channel (limiting the structural diversity as well as constraining the potential for well-sorted spawning gravel beds)*

Those impacts have the potential to be tackled at different scales - with widely differing cost implications. At a basic level:

- *Creation of an effective grazing exclusion would aid the redevelopment of a well vegetated riparian buffer strip.*
- *Over time this may also increase the supply of large woody material.*
- *For best effect, grazing exclusion would also come with annual control of invasive plant species - especially Himalayan balsam.*
- *Drinking water provision for livestock/horses is also necessary*

To achieve much more significant improvements would be a large undertaking, requiring significant buy-in from landowners and substantial funding. This could include measures such as:

- *Removal of bank reinforcements and large-scale earthworks to re-establish lateral connectivity of the river channel with its floodplain (in other words, lowering of the surrounding land over multiple channel-widths on both sides of the river) and/or raising the bed of the river*
- *Associated facilitation of a more meandering planform channel*
- *Establishment of extensive, species-rich riparian woodland*
- *A likelihood of pairing work within the visited reach to a wider programme of weir bypassing/removal to re-instate more dynamic geomorphological processes as well as enhancing immigration/emigration of mobile species.*

2 Introduction

The Wild Trout Trust (WTT) was invited to assess habitat quality on a length of the River Derwent in Derbyshire by Darley Dale Fly Fishing Club. Throughout the report, banks are designated as right (RB) and left (LB) while facing downstream. The summary table at the start of this report contains both Decimal Degrees and National Grid Reference formats for mapping locations to enable cross-referencing between reporting systems. Decimal Degrees are cited in the main body text for ease of use with online mapping.

3 Habitat Assessment

The surveyed reach was walked in a downstream direction. Observations were recorded and are reported following that same downstream, sequential progression. At the upstream limit, two of the main characteristics of the investigated reach were evident. Firstly, the **extensive grazing access down to the water's edge (Fig.1) is a feature throughout** much of the reach. Secondly, the degree to which the river is incised below the level of the surrounding floodplain (Fig.2).



Figure 1: Grazing access **down to the water's edge** reduces the resistance of banks to erosion and also leads to a loss of ground-cover vegetation and tree regeneration.



Figure 2: Unrestricted grazing, single line of veteran trees and channel incision.

The net result is a lack of robust, vegetated buffer zones between agricultural land and the river. Aside from a single line of veteran trees, there is a low structural diversity in the riparian (riverside) vegetation, and with the current grazing regime, they too will be lost, ultimately. The lack of ground cover and susceptibility to trampling by livestock footfall tends to elevate runoff of fine sand and silt particles into the river. Similarly, the access and egress points for livestock using the river create runoff pathways. The feedback loop between soil erosion occurring during surface water runoff events and ongoing trampling created by livestock consolidate sediment runoff pathways (e.g. Fig.3).

Elevated levels of sand and silt supplied to the channel from surface water runoff do not tend to be accompanied by inputs of cobble and gravel substrate. In other words, surface water runoff increases fine sediment supply but does not increase inputs of coarse sediment such as gravel, cobbles and boulders. Typically, input of coarse sediment tends to arise more extensively in headwater areas and via channel meandering across the floodplain. As with many rain-fed rivers, the Derbyshire Derwent has its headwaters impounded behind a network of drinking water reservoirs. Consequently, a significant component of coarse sediment supply is interrupted before it reaches the river valleys below reservoir dams. Furthermore, historic modifications to the Derwent within the visited reach appear to include straightening and locking the channel in place using stone

revetments to the bank-toe. Across the wider Derwent catchment there are multiple significant weirs which also interrupt downstream transport of sediment.



Figure 3: Fine sediment runoff pathway exacerbated by grazing, livestock access and rainfall events.

While the main River Derwent contains gravel and fish successfully spawn on that substrate, these dynamics highlight the high value of any available spawning beds. Along with a somewhat restricted supply of gravel, there is a risk of redds (salmonid fish "nests" for fertilized eggs) becoming choked with fine sediment. The eggs rely on a continuous flow of oxygenated water between the gravel grains and excess fine sediment can block the percolation of water and suffocate them. The Derbyshire Derwent supports good wild trout and grayling populations. However, in other main river reaches across the UK, more plentiful supplies of silt-free gravel often occur. In those rivers there will be a greater resilience of wild populations to occasional shocks and stresses.

Channel incision prevents naturally frequent overflows of the river onto the surrounding floodplain. Floodwaters are, consequently, artificially constrained within the river channel and off the fields during a higher proportion of significant rainfall events. One consequence of this is reduced opportunity for the river to deposit fine silt on the surrounding land. Therefore, in addition to an increased supply of fine silt, the incised channel

also cuts off a major mechanism by which silt would otherwise be exported from the river.

Surrounding land use is also contributing to elevated fine sediment runoff. Earth compaction by livestock and lack of diverse root structure associated with grazing prevents surface water from soaking into the ground. This effect **isn't easy to visualise without a physical demonstration**. The following short video helps to place the scale of the effect into context:



https://youtu.be/00tcTY_UEk4?si=VmcS9LcYIXqmfoEM

Throughout the visited reach, relatively few high-quality spawning opportunities were noted. With that said, there were certainly areas where it is reasonable to expect trout to attempt to breed. It would be beneficial for club members to walk the reach regularly during November and December to monitor breeding efforts. As a visual aid to what to look for, freshly dug redds consist of an approximately tear-drop shaped bright patch of gravel. The hen fish first cuts a depression into which the eggs are laid and fertilised. This leaves a tailing of clean gravel behind the hole. She then moves upstream of that first depression and cuts a second hollow in order to cover the eggs with a further tailing of gravel (e.g. Fig. 4).



Figure 4: Trout redd (circled) with the upstream hollow located in the centre of the frame, towards the log while the mound of gravel tailings are towards the lower left corner of the frame. Gravel particle diameters tend to be in the 10-50mm range.

Further information on redd identification can be found on the WTT website (https://www.wildtrout.org/assets/files/about_trout/Trout-redds.pdf).

Trout will often dig several “test” pits prior to committing to a full breeding attempt and these will be much smaller. Similarly, if the hen fish is very small then both the diameter of gravel particles and overall size of the redd will be smaller. An example of this would be in a population of slow-growing fish in acidic moorland stream settings.

For spawning gravels to be optimally utilised, there needs to be nearby cover available for fish to use between active breeding attempts. In fact, cover from predation is essential for adult and juvenile fish alike, particularly as they emerge from the gravel. A good example of valuable cover on the opposite bank (RB) was noted from the LB at 53.171004, -1.612618 (Fig.5).



Figure 5: Valuable cover habitat on the opposite bank (RB) incorporating both low, overhanging limbs and submerged crown and trunk from deadfall. Note the higher quality riparian habitat within the buffer strip there.

When cover is associated with water at least 30cm deep, this tends to make very good adult trout habitat. Similar opportunities to shelter from both predation and spate flows are also important in shallower areas that suit juvenile fish. For healthy wild trout populations there needs to be free access to spawning, nursery/juvenile and adult habitat so that full lifecycles can be completed. That habitat complex could exist within a single reach

controlled by the angling club or, equally, may rely on good connections over a wider catchment scale. In fact, connectivity is essential as a source of resilience to any river reach. The ability of fish to emigrate and immigrate in response to pollution or environmental impacts is just as important as accessing habitat that supports normal lifecycle completion. When combined with the importance of rivers being able to convey riverbed material throughout the system, this highlights the importance of supporting weir removal initiatives across the catchment.

Wherever unrestricted grazing access was available to the riverbank, the combined effects of shallow roots and poaching by livestock footfall were evident (e.g. Figs. 6-8).



Figure 6: Steep, collapsed banking associated with trampling and the loss of deeper root structure created by over-grazing. Grazing intensity that is perfectly suitable for a farmers field is not suitable for a riverbank.

As well as the inhibition of deeper root structure, over-grazing also prevents the successional growth of young trees. This is leading to only a single line of veteran trees remaining along much of the visited reach. That single line is highly susceptible to being breached and creating further fine sediment input pathways. As well as reducing sediment input, having a wider woodland buffer strip would provide increased resistance to erosion of the banks. Getting the balance of such resistance is vital. The river should still be able to make gradual structural alterations over time within a woodland

buffer strip. The aim is not to lock the channel completely in place (as would be the case with a concrete or stone-lined channel). Instead, promoting just enough bank resistance that is necessary to create deeper scour pool habitat. Where banks are fragile, the river will spread laterally and create uniformly-wide, shallow habitat. Conversely, focussed bed-scour helps to create variations in depth and current speed associated with healthy rivers.



Figure 7: Single line of trees with livestock poaching.



Figure 8: Single line of trees with habitual walking and river channel access routes visible.

What appears to be an old pumping station and two associated pipe outfalls or intakes were noted at 53.170978, -1.612481 (Fig.9). Finding out if these assets are still live and pose any pollution threat is recommended.



Figure 9: Dual pipes with their open ends facing downstream apparently associated with an old pumping station or other asset building at 53.170978, -1.612481.

Similarly, it is recommended to investigate what could be a combined sewer overflow in the steep banking adjacent to the location shown in Fig.9 (Fig.10).



Figure 10: Outfall that is apparently in use. At the time of visit this was not showing gross signs of pollution.

Further downstream of the outfall, the confluence with Hill Carr Sough was visible on the RB (photographed from 53.170062, -1.612190; Fig.11).



Figure 11: Hill Carr Sough confluence with the Derwent visible on the far bank (RB).

Sampling and identification of basic riverfly invertebrate groups around this confluence may help to characterise the water chemistry derived from Hill Carr Sough. In order to achieve useful insights, this would need to be compared to a wider sampling distribution **over the club's reach of** the main River Derwent. Sampling locations upstream and downstream of any noted outfall sites, sediment runoff points or other features of interest would maximise the benefits of invertebrate monitoring.

Directly downstream of the point from which Fig. 11 was photographed, an area of scattered stonework appears to have arisen due to collapse of the stone revetment lining the LB. As a minimum, stone has been taken from a nearby structure and positioned in an improvised fashion to limit bank erosion. The resultant flat area has a well-consolidated, firm base and seems to have been adopted as a drinking area by stock. This type of access to the river tends to introduce pollution in the form of nutrient enrichment derived from livestock urine and faeces, along with soil runoff pathways previously highlighted. Consequently, a more river-friendly option would be to create an offline stock watering area by excluding livestock from the channel and providing either pasture pump or mains-water-fed trough drinking facilities well away from the river. Mains-fed troughs have an

advantage over river-water in the form of reduced rates of waterborne disease infection rates. It may be possible, for instance, to recover the costs of mains supply in the form of reduced veterinary treatment charges.



Figure 12: Collapsed (or deliberately positioned) stonework that appears to be used by stock as a watering point.

Creation of a more abundantly-vegetated riparian buffer zone (as previously recommended) would require grazing exclusion from the riverbanks. Alternative stock watering arrangements need to be provided as part of this strategy. Mains-fed troughs appeared (from a distance) to already be present in fields adjacent to the river, raising the possibility that pasture pumps may not be required. Confirming the presence and suitable capacity of mains watering points for desired stock levels with the landowner is certainly advisable. Any strategy for excluding livestock from the river would be a positive development for water quality as well as in-river habitat. For the full benefit to be realised, involving parties responsible for land management on the opposite bank (RB) would be needed. Collaborating to ensure ongoing double-bank exclusion of stock, while allowing angler access, throughout the Darley Dale FFC reach is a great opportunity. Ultimately, the beneficial presence of large woody material in the channel will rely on there being a ready supply of trees within the immediate surroundings. The only reliable way to ensure such a supply over

time is by the creation of diverse riparian vegetation that allows successional growth of trees along with a wide range of understory species.



Figure 13: A modestly-sized fallen tree whose crown is providing highly valuable cover against predation and refuge during spate flows. Grazing prevents successional regeneration that would replace such fallen mature trees via sapling growth. It also limits the growth of understory species that would, otherwise, reduce losses of topsoil, silt and sand from the surrounding land into the river, leaving the existing trees at greater susceptibility to washout.

Although scattered (and ecologically valuable) examples of large woody material were noted in the river (e.g. Fig. 13), a more plentiful supply with a greater long-term assurance would be preferable. Restricting the bankside vegetation to a thin covering of grazing-resistant species tends to expose topsoil. Bare soil is highly susceptible to being washed into the river during rainstorms. This is another reason that having very narrow or only a single row of veteran trees provides only limited ecological benefits to the river. The bank reinforcement by the roots of a single line of mature trees tends to enforce a linear path for the channel. Conversely, a wider woody buffer strip with a much more scattered distribution of trees allows for more lateral migration of the channel while still maintaining the course of the river within manageable boundaries. When single lines of mature trees and lack of sapling growth are maintained by grazing, it is inevitable that grazing also excludes the lush understory growth necessary to protect topsoil from being washed away. Clear examples of these dual impacts

were noted throughout reaches of the Derwent accessed by grazing livestock (e.g. Fig. 14).



Figure 14: Single line of mature trees, lack of understory growth and accompanying bare earth and banking collapse.

Straightening a watercourse can lead to the channel following along contour lines for greater distances than would otherwise be the case. This reduces the gradient of the channel compared to watercourses that cross contour lines. Conversely, removing meanders often creates a steeper reach which would exacerbate channel incision. In short, channel realignments have the potential to create both increases and decreases in longitudinal gradient. As well as fundamental structural variety lost when meandering channels are straightened, the artificial creation of low gradient reaches particularly limits the potential for erosion and deposition to recreate complex habitat. These canal-like glides tend to have a reduced variation in substrate sizes and cross-sectional profile (Fig.15).

Where variable bank resistance allows more freedom of movement outside prescribed limits of channel width and direction, greater structural diversity may arise. Particularly when regular pools are interspersed with areas of naturally-steep gradient (i.e. riffles), the channel shows much greater structural diversity and habitat quality (e.g. Fig. 16).

Throughout the visited reach there are consistent patterns of positive features that are tempered by negative impacts. The most widespread of these positive patterns is the welcome tolerance for naturally-arising large woody material in the channel. Conversely, consistently negative impacts are the maintenance of a relatively straight, incised channel via historical revetment and ongoing grazing practices (Figs. 17-20).



Figure 15: Flat glides are more common when channels are artificially straightened. A common method used by the Victorians was to line banks with rubble and then plant trees (usually alders or sycamore) into that matrix. This is very effective at locking a river channel in place.



Figure 16: The far greater diversity in current pace, depth and direction affords a much wider range of opportunities for fish and invertebrates. In the absence of weirs and the replacement of stone-revetment/single tree-lined banks with diverse, low-lying vegetated riparian flood plain, the frequency of such complex features would significantly increase.



Figure 17: Large tree crown providing cover and valuable structural diversity in an otherwise uniform section.



Figure 18: Low, overhanging and submerged cover in shallower water that is likely to boost juvenile salmonid fish survival rates and benefit a range of important invertebrate species.



Figure 19: The slightly "messier" brush on the far bank at the downstream limit of the Darley Dale FFC fishing at 53.161352, -1.608835 also provides great cover from predation.



Figure 20: Channel incision, single line of trees, grazing to the water's edge, livestock poaching of banks and obvious sediment runoff pathways. Most of the typical impacts noted throughout the reach are captured here in one image.

It's important to note that whatever trees are present are still valuable. In other words, removal of the remaining single-line of trees is not advised. Instead, it should be viewed as those trees hanging on to provide some benefits, having escaped grazing early in their lifespan. Rather than attempting to tinker with rotational coppicing of such a sparse row of trees, a more valuable intervention would be to extend the width of a diverse, vegetated riparian buffer strip and to incorporate a more scattered distribution of trees within that strip.

Trees should occur at varying distances from the water's edge, not simply follow the line of the wetted margin. In addition, the development of understory vegetation at a range of heights and densities beneath the high tree canopy would provide many benefits to the river corridor wildlife as a whole. It may seem counterintuitive, but increasing riparian plant diversity is likely to provide far more opportunities for the riverfly species anglers rely on for dry fly sport. Most aquatic flies need bankside vegetation to complete their lifecycles and a huge number of winged terrestrial insects crash-land on the water from riverside foliage. Furthermore, rain-fed rivers such as the Derwent particularly rely on deciduous leaf-litter as a major source of food for large components of their aquatic foodweb.

A more specific, individual potential impact was noted at 53.165256, -1.611404 (Fig.21). This was an ochreous discharge presumed to derive from groundwater associated with underlying coal measures.



Figure 21: Emerging at the piled stones in the background, an orange coloured discharge trickles towards the river.

The orange ochre is iron III oxide (essentially rust) and is commonly associated with minewater. When deep underground in anoxic conditions it will be green Iron II oxide which is highly toxic. However, upon contact with atmospheric oxygen, the Iron III oxide becomes much more inert. When discharged in sufficiently high volumes, even the inert and relatively non-toxic substance can create a marked smothering effect on the streambed. There may also be other metallic contaminants within minewater. As such, it would be worth visually monitoring the site for signs of obvious toxicity or significant increases in discharge volume and smothering impacts. However, in comparison to the landscape-scale impacts noted throughout this report, the limited individual discharge shown in Fig. 21 is likely to be having relatively minor or undetectable effects on the ecology of the river, particularly considering the significant dilution factor from the Derwent. Nevertheless, exercising due diligence and making enquiries as to the source of this discharge and any other known characteristics would be worthwhile. If a watching brief on the extent of the discharge and any associated impacts give cause for concern, it may be possible to create a reedbed settling and biotreatment feature as mitigation.

Overall, when assessing in-river habitat structure and diversity, there appeared to be good opportunities for both adult and juvenile salmonid fish. However, at least within the visited sections of river, trout spawning habitat opportunities were relatively limited. The most suitable example noted was just above the downstream limit at the tail end of a glide, as it reached the head of a riffle (Fig. 22).



Figure 22: Although often referred to as "riffle-spawning" species, trout tend to prefer less turbulent flows in which to lay their eggs. The upward ramp of gravel just upstream (i.e. to the right) of the head of this riffle represents potentially suitable spawning habitat.

The ramp of gravel and cobbles just upstream of the broken water of the riffle itself is likely to have water forced between the grains of substrate. That through-flow of water is important to continually replenish oxygen-rich water within those gravel deposits. Without that ongoing irrigation of oxygenated water, eggs laid in such gravel deposits will suffocate before they can hatch. Since the walked route alongside the visited reach resulted in some sections being bypassed, it is recommended that any habitat features similar to those shown in Fig. 22 are identified by club members. If possible those features should be observed each winter between around November to late January to check for signs of trout spawning activity. Patches of brighter gravel that have been turned over and formed into shallow mounds are indicative of spawning activity. Sometimes these may be small test-pits dug prior to genuine spawning. Often, there will be more substantial areas of gravel turned over at the most suitable sites at a later date. An example of what to look for when spotting redds is shown in Fig 4.

Finally, a very clear example of the effects of grazing exclusion is available adjacent to the angling access path that serves the downstream limit area of the beat. Here, a combination of fenced grazing exclusion and periodic mowing of a ride to allow angler access on foot indicates the potential for vegetated buffer strip development (Figs. 24 and 25). Within the grazing exclusion zone a far more diverse and lush understory vegetation has developed. As well as potential for more scattered tree distribution, the protection against sediment runoff and potential for greater invertebrate diversity are significant benefits of this practice.



Figure 23: Grazing excluded to the right of frame, a mown access ride in the centre and much wider unmown buffer strip to the left. Note the incredible species diversity when compared to the adjacent fields and unfenced bank sections. The ride could be reduced to half its width to create a wider buffer strip and increase terrestrial insect inputs.



Figure 24: Greater diversity and coverage of understory species beneath the tree canopy is very obvious when compared to images such as Figs. 6, 12 and 20 as examples.

4 Recommendations

There are a range of options that would help to protect and improve habitat within the river corridor that have been considered during this Advisory Visit. Options will span a range of difficulty and estimated cost to implement. In particular, to meaningfully tackle the problems of channel incision and disconnection from the surrounding floodplain would require significant commitments of effort and funding.

The following summary of recommended actions should help to create a prioritised list of future actions for the River Derwent:

- Achieving the largest ecological and wild fishery gains would entail changes to the surrounding landscape at a massive scale and require extensive expert geomorphological assessment, advice and formal design work.
- Probably the most significant impacts are associated with channel straightening, incision and interruption of coarse sediment supply. The ultimate goals of significantly addressing those impacts would be to re-establish connectivity between the river and a surrounding floodplain and to enable ongoing sediment supply throughout the catchment along with the capacity for the channel to naturally evolve a meandering path over time. However, prescribing the

steps needed to achieve those outcomes is exceptionally complex. For instance, it would be necessary to assign the relative importance, feasibility and sustainability of interventions that could include (but not be limited to) options such as:

- Decide whether to undertake significant excavation and earth removal/redistribution to create a lower-lying floodplain around the river or to tackle the incision by means of bed-raising via substrate supply (or a combination of both)
- Choose between allowing the river to naturally re-meander within the floodplain (relying on riparian woodland to control that process) versus a kickstarting that process via a more formally designed and constructed channel
- Reach expert consensus on how to accurately characterise the relative weight of different impacts; such as upstream substrate supply disruption (e.g. due to reservoir construction), meander removal/channel diversion that may variously have reduced or increased channel gradient within specific sections of the river, changes to flow regime imposed by reservoir operation, presence/removal of constructed barriers, changes to (and requirements of) land-use and many more considerations
- To carry out such a project would require interventions and buy-in from stakeholders at unprecedented scales in the UK
- However, to avoid outlining those challenges would be to ignore the most significant impacts currently affecting the Derwent

Whether or not floodplain reconnection and significant re-meandering were undertaken, there is great value to establishing more species-rich and structurally-diverse riparian vegetation. Similarly, gains to habitat complexity, geomorphological and ecological processes supported by increased inputs of large woody material into the channel are worth pursuing. The following recommendations are made with this in mind:

- Creation of an effective riparian buffer strip of ungrazed, woodland vegetation via
 - Exploration of options with relevant landowner(s) to set back fence-lines to a functional distance from the bank top (recommended 10-12m)
 - Work with landowners in seeking funding designed to support riparian buffer strip/riparian woodland creation via potential routes such as
 - CSHT; <https://www.gov.uk/find-funding-for-land-or-farms/csw25-manage-riparian-and-water-edge-habitats> (12-m buffer strip minimum)
 - WCPG; <https://www.gov.uk/government/publications/woodland-grants-and-incentives-overview-table/woodland-grants-and-incentives-overview-table> (10-m buffer strip minimum)

- Using fencing grant funding to create grazing exclusions a minimum of 5m (ideally 8m or more) from the bank top; <https://www.gov.uk/countryside-stewardship-grants/fencing-fg1>
- Sourcing subsidised tree planting via <https://www.woodlandtrust.org.uk/plant-trees/trees-for-landowners-and-farmers/morewoods/> in support of river woodland creation; <https://www.woodlandtrust.org.uk/plant-trees/river-woodland/>
- Break up and redistribute stone revetments so as to allow some additional, natural meandering to take place
- Continue to allow natural deadfall of trees into the river channel
- Liaise with landowners/tenants in order to ensure adequate livestock watering provisions are available as part of any fencing projects
- Liaise and collaborate with interests on the RB in order to match interventions as far as possible on both banks

Riparian buffer strip creation and providing space for the river to adjust its course over time, are likely to be valuable interventions for this section of the River Derwent. Securing sufficient space and funding for this can often be challenging. In addition to installation of fencing and any supportive planting, there is likely to be a challenge in ongoing control of invasive, non-native plant species which tend to colonise grazing exclusions from upstream sources. Consequently, there is likely to be a need to monitor for and control Himalayan balsam, Japanese knotweed, giant hogweed etc. and allow native vegetation to re-establish.

- Control Himalayan balsam and maintain at low densities
 - Hand pulling of balsam can be effective using volunteer parties (potentially drawing on local wildlife groups and wider volunteering networks)
 - Strimming balsam below the first node while plants are in flower can also work well
- Eradicate known stands of Japanese knotweed while still relatively small
 - Stem injection of knotweed stands and/or giant hogweed plants by appropriately certified personnel as necessary
- Establish regular Riverfly monitoring at points upstream and downstream of areas of concern (e.g. noted pipe outfalls, ochre-rich outfall point and existing stock drinking areas) to gain an understanding of baseline invertebrate populations and any point-source impacts
- Within existing (and any created) riparian woodland sections, monitor for and retain any large dead-fall trees so as to promote localised bed scour and improve spawning gravel conditions as well as diversifying channel morphology
- Seek to understand connectivity to the wider catchment and support efforts to achieve weir removals.

- Removing or bypassing weirs (rather than fish pass installation) benefits morphology and downstream substrate transport processes which are just as important as fish migration opportunities.
- Fish pass installation may not sufficiently improve downstream migration opportunities or reduce predation impacts within impounded reaches – though they are sometimes the least-worst option in the absence of better solutions.

5 Acknowledgements

Wild Trout Trust would like to thank the Environment Agency for supporting the work in this report. The advice and recommendations in this report are **based solely on the expert and impartial view of WTT's conservation team.**

6 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.

Legal permissions must be sought before commencing work on site. These are not limited to landowner permissions but will also involve regulatory authorities such as the local council as well as relevant departments within the Environment Agency – and any other relevant bodies or stakeholders. Alongside permissions, risk assessment and adhering to health and safety legislation and guidance is also an essential component of any interventions or activities in and around rivers.