River Barle, Dulverton, Somerset

An Advisory Visit by the Wild Trout Trust August 2016

Contents

Key Findings

- The main route for fish passage on the River Barle is the main stem of the river via the rock ramp fish pass on Dulverton Weir. As fish passage into and through the mill leat is poor, maintaining the main route is vital to the health and viability of the river's fish populations

- Considering the number of landowners involved and the age and heritage value of the leat and mills, rectifying fish passage through the entire leat is likely to be a significant challenge that may not provide ecological benefits proportional to the cost.

- There is ample scope to improve habitat quality within the leat from a biodiversity perspective as well as for fish that may drop into the upper (passable) section of the leat.

- Dulverton Weir is a significant impoundment that impacts on habitat quality.

- It is understood that the age of the weir (~700 years) and its role in the history of Dulverton make it extremely valuable in terms of the local heritage.

- The existing nature-like fish pass on Dulverton Weir appeared to be very passable.

- Fish passage should be a key factor in any designs to restore Dulverton Weir. The Environment Agency Fish Passage Panel may have to formally approve any modifications to the existing weir and fish pass.

Introduction

	Dulverton Leat
River	River Barle
Waterbody Name	Lower Barle
Waterbody ID	GB108045015100
Management Catchment	Exe Main
River Basin District	South West
Current Ecological Quality	Good
U/S Grid Ref inspected	SS 91403 28383
D/S Grid Ref inspected	SS 91245 27734
Length of river inspected	~700m

This report is the output of a visit undertaken by Mike Blackmore of the Wild Trout Trust on approximately 700m of the an old mill leat connected to the River Barle at Dulverton, Somerset (national grid reference (NGR) SS 91403 28383 to SS 91245 27734). A walk-over of the site was requested by Mr Philip Hull of Dulverton Weir and Leat Conservation Trust (DWLCT) and was accompanied by Mr Peter Romain of DWLCT. The visit was primarily focussed on assessing fish passage and habitat for wild trout (*Salmo trutta*) and for biodiversity in general.

Comments in this report are based on observations on the day of the site visit. 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.

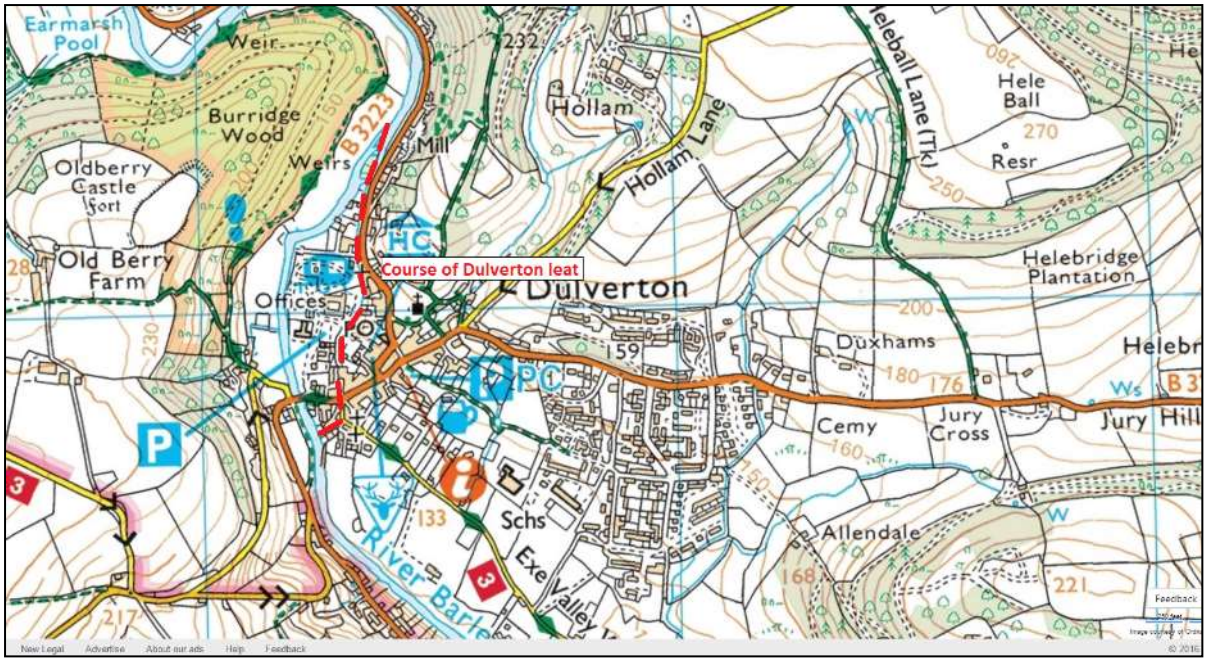

Figure 1: Map showing the course of Dulverton Leat

Catchment and Fishery Overview

The River Barle rises at approximately 450m above sea level on the north-west plateau of Exmoor (The Chains). Exmoor is sparsely wooded with steep-sided, V-shaped valleys. Surface water run-off is rapidly transported downstream resulting in flashy spate flows to the rivers that rise there. The Barle was dammed at the source by Industrialist John Knight to create a reservoir now known as Pinkery Pond in the 1800s. From here the river flows south and then east to Simonsbath and Withypool collecting additional flow from the Bale Water, White Water, Sherdon Water and Pennycombe Water tributaries. From Withypool the Barle flows roughly south-east to Dulverton and is joined by the West Water, Little River and Dane's Brook along the way. The Barle joins the River Exe downstream of Dulverton near Exebridge.

The geology of the catchment consists predominantly of slate formations in the headwaters and sandstone in the lower catchment, overlain by superficial alluvial deposits within the river valley. The sandstone acts as a minor aquifer and supplies a steady base flow to the river (supplemented by additional flow running off from Exmoor). The slate geology accounts for the river carrying a bedload of smooth, rounded gravel that is particularly mobile and readily transported great distances in high flows.

The Barle is predominantly a trout and grayling (*Thymallus thymallus*) river but also has runs of salmon (*Salmo salar*).

History/heritage considerations

Dulverton weir is a medieval weir believed to have been constructed in the 11th or 12th century. The 'Urban Watermill System' including the leat and milling operations that it powered can be traced back to the 1300s. The town of Dulverton, was built around the industry powered by the weir and leat, and the structures are understandably of substantial heritage value to the local community.

The best outcome for the long-term health and stability of the river and ecosystem is to fully remove weirs and any other man-made impoundments that suppress natural channel morphology and/or inhibit habitat connectivity. Of course, given sufficient time, Dulverton Weir will naturally be broken apart by the spate flows of the River Barle. In many cases, ancient weirs have been allowed to collapse over time as the potential benefits to ecology and river morphology usually outweigh the financial cost of a major repair project or ongoing maintenance. However, the heritage value of the weir at Dulverton, as well, as the leat which it feeds, make it an exceptional case. The fact that a charity (DWLCT) was founded and continues to raise significant funds for the restoration of the weir and leat are testament to their importance to the local community as well as to historians across the country and even internationally.

For this reason, the options of removing the weir or significantly or partially lowering it (as would be explored for most weirs in relation to fisheries and wildlife conservation) are not addressed in this report. The report instead focusses on the current ecological condition of the mill leat and offers practical advice with regards to its future management as well as the major ecological issues such as fish passage, which should be carefully considered when planningrestoration of the weir.

Habitat Assessment

For the purposes of this report and highlighting barriers to fish passage, the water visited will be described from the downstream to the upstream extent visited.

At SS 91245 27734 Dulverton leat discharges back into the main Barle via a small culvert. (Figures 2 and 3).

Figure 2: The outfall of the mill leat (circled in red) where it discharges back into the main Barle

Figure 3: The culvert discharges over a shallow concrete apron

The culvert is relatively narrow and discharges over a concrete apron to prevent the bed from undercutting the hard-engineered bank revetment. Due to the

narrow diameter of the culvert, the flow speed through it is accelerated. Under the flow conditions observed on the day of the visit, the culvert represents a complete barrier to fish passage. Even a strong-swimming adult salmonid would be extremely unlikely to successfully leap into the culvert and maintain a sufficient burst of exertion to then traverse it. When water level in the main Barle is higher, it may be that the culvert is more accessible, however, under such circumstances, it is almost certain that the volume of water discharging through the culvert will also be higher, potentially negating any easing of fish passage.

Even if fish are able to traverse the culvert, they are immediately met with another obstacle to overcome, at the remnants of the lowest mill on the leat (now Dulverton Laundry, Figure 4).

To successfully continue upstream, any fish that make it through the culvert will have to pass over the weir and through or around the trash screen affixed on its crest. As with the culvert itself, the weir may be more passable under higher flow conditions when the head drop (the difference in water level above the weir compared to below it) is reduced.

Figure 4: The entrance to the culvert (red arrow) is below an old mill weir

The river upstream is impounded (held up and ponded) by the weir and the bed has reportedly risen over the past few decades (Pers. Comm. Peter Romain). A sluice gate (closed) controls flow through a secondary culvert (dry) that was presumably part of the operation of the mill. The closed sluice and dry culvert are probably what has caused the bed to rise at this location as sediment carried through the mill has steadily dropped out of suspension in the slow, impounded flow above the weir. The interruption of sediment transport caused by impounding structures such as weirs causes fine sediment to drop out of suspension and smother the bed. The result is a uniform, flat and silty riverbed with a significantly

reduced habitat diversity and quality. As in all environments, biodiversity in rivers is directly linked to physical diversity. In short, the greater the diversity of different habitat niches, the greater the potential diversity of organisms filling them.

Figure 5: The riverbed above the weir has risen as sediment has accumulated. When the mill was in operation the sluice pictured would have regularly diverted flow through a secondary culvert and flushed the channel

A short distance upstream the river flows under Bridge Street. In an effort to raise the profile of the mill leat with the local community and tourists, DWLCT was displaying a piece of kinetic sculpture artwork in the channel (Figure 6). The sculpture, consisting of a functional water wheel which as it turns drives a mechanical flower to slowly open and close, depicts both the industrial and natural heritage of the leat channel. It was encouraging to see that although the mill leat was originally created for purely industrial purposes, the DWLCT recognises the fact that it is nonetheless a living ecosystem and a habitat for wildlife. Reconciling these two potentially disparate components of the leat will be a complex and difficult, though ultimately rewarding challenge.

Figure 6: A temporary kinetic sculpture installation portrays both the industrial and natural hertiage of the leat

The next mill is just a few metres upstream (Town Mills). Here the leat flows directly under the old mill building. As with the mill downstream, flow above Town Mills was originally split into two channels and controlled by a sluice. This was common practice with many water mills, granting millers the ability control the rate of flow through the mill works. The sluice is now derelict and the majority (but not all) of the flow is carried under the old mill. The culvert under the mill is broad with a natural bed (which is generally good news for fish passage). However, the weir immediately above the culvert is a major barrier to fish passage (Figure 7).

Figure 7: The weir immediately upstream of Town Mills

The fact that the weir is so close to the mill building and culvert also means that it would be extremely difficult to improve fish passage at this location. The weir could be notched to create a low area to ease fish passage but this would require an assessment by a structural engineer to ensure that doing so would not compromise the mill building. Easing fish passage through the other culvert would also be a very difficult undertaking. This culvert has a steep gradient and curves sharply, making working in such a confined space (an already risky option), almost impossible. Other common options, such as de-culverting (excavating), are also unlikely to be feasible at such a historic, and almost certainly listed location.

The bed of the leat above this structure has built up to the height of the weir crest and is shallow and fast-flowing despite the impoundment. Between the Dulverton Heritage Centre and Dulverton Police Station, a section of channel exhibits some good morphological and ecological diversity (Figure 8). If fish were able to travel up past the two mills downstream, they would find a section of flowing river habitat with a clean gravel bed and relatively abundant (if not necessarily particularly diverse) marginal vegetation. No further major barriers to fish passage were observed during the visit except for a small 'stoplog' board placed in the river next to a property on Lady Street (Figure 9). This is probably a temporary feature but should nonetheless be removed to provide as long a stretch of unbroken connected and unimpounded habitat as possible within the leat.

Figure 8: Some good natural features observed between the Heritage Centre and Police Station

Figure 9: A small stoplog in the river should be removed

The reach flowing along the back of the properties on Lady Street down to the Heritage Centre is followed by a public footpath on the RB. In places the stream margins have been colonised by ferns, true wetland species, or otherwise planted with garden cultivars (Figure 10). This affords some good marginal cover habitat that is beneficial to fish and other aquatic/amphibious fauna.

Figure 10: Marginal plants, even if not necessarily true marginal wetland species, provide good cover habitat

However, for most of this reach the RB consists of vertical timber shuttering (Figure 11) which denudes the stream of marginal habitat and significantly limits biodiversity. Occasionally, a clump of vegetation has established in front of the

shuttering, which helps to soften the hard edge and provide some degree of marginal cover but the reach could be significantly improved by replacing the shuttering with a softer medium in which a greater diversity of marginal plant species could establish and thrive.

Figure 11: Wooden shuttering inhibits marginal habitat

The LB throughout this reach consists mainly of a tall, vertical stone revetment at the rear of the Lady Street properties (Figure 12).

Figure 12: The tall wall on the LB colonised by a few ferns but otherwise providing very little habitat

Beyond the footpath on the RB is a dense row of trees and hedge. Some selective tree works to reduce selected crowns and introduce more light into the channel would increase productivity. Maintaining a mosaic of direct sunlight and dappled shade will be essential in promoting biodiversity. This publically accessible reach is perhaps the most important section of the leat both in terms of potential habitat quality and for public engagement and enjoyment. It is also a section of the leat that could be enhanced relatively cost effectively. Any brushwood (branches etc.) arising from crown reduction, hedge laying or other tree works aimed at improving light conditions, could be used to replace the shuttering with a narrow but sinuous 'marginal shelf' . The brushwood would itself form a valuable refuge habitat for fish and invertebrates and, perhaps more importantly, will also collect fine sediment and provide habitat for marginal plants to colonise. This is just one option that could be employed along the footpath and other options are explored in the *Recommendations* section of this report.

Upstream of the reach with the footpath, the leat flows alongside Northmoor Road. Both banks of the leat are hard-engineered vertical revetments offering very little refuge habitat. Some low cover habitat is provided by small trees, shrubs and ferns that overhang the river from the RB (Figure 13).

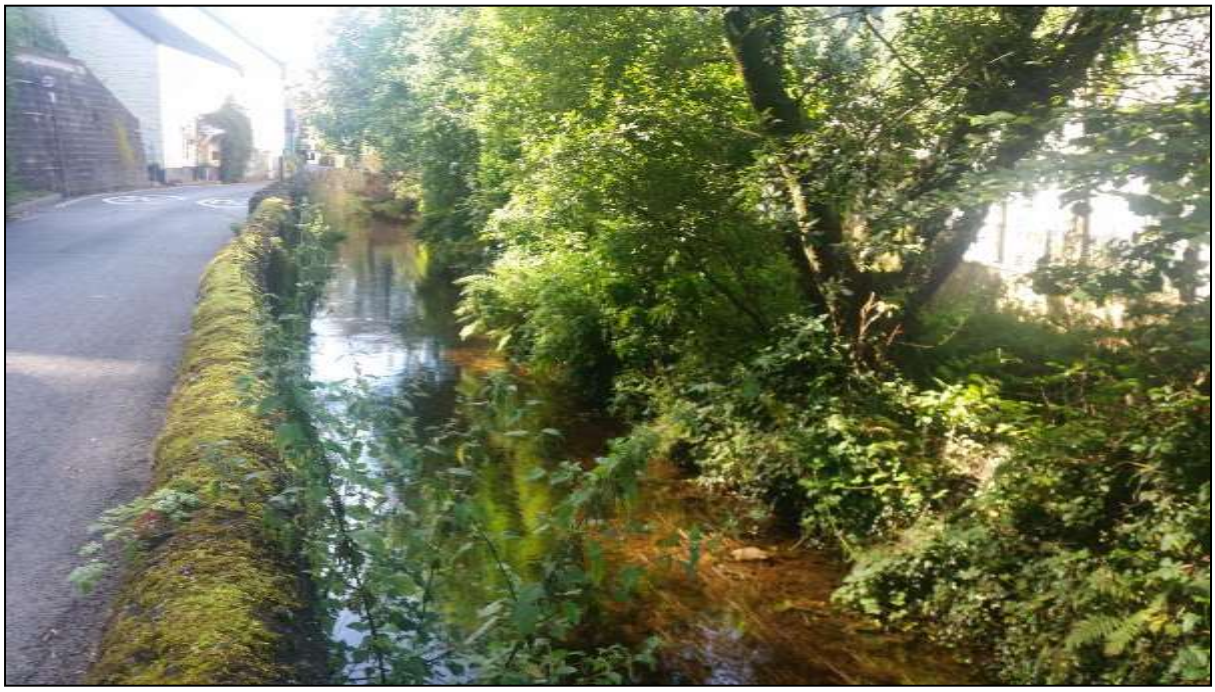

Figure 13: Low overhanging vegetation provides cover and softens the hard-engineered channel

The leat appears to have a more-or-less natural bed but is cobbled in places. It is also possible that it is hard-engineered below some of the natural substrate. The riverbed that is present is compacted and 'armoured' (i.e. consists of a coarse surface layer of large stones over finer material, Figure 14). This occurs as smaller gravel grains are transported away, leaving larger material behind.

Figure 14: The riverbed is cobbled or otherwise armoured in many places.

This armoured and compacted bed is unsuitable spawning habitat for gravel spawning fish like trout, grayling and salmon. Even if fish were able to cut a redd (nest) in the hard bed, the eggs they deposited would almost certainly become smothered in fine sediment and suffocate. The lack of space between the gravels/cobbles, owing to inundation with finer material, also greatly degrades it as invertebrate habitat.

An absence of finer gravels in the leat here is in a large part due to the lack of in-channel structure. The straight and smooth hard banks provide very little friction and no opportunities for finer gravel to deposit. The installation of a few, small flow deflecting features could allow a more diverse bed profile to develop over time and perhaps lead to some viable spawning habitat developing. The Barle carries a substantial loading of gravel during spate flows and providing even some very minor opportunities for deposition could yield valuable habitat improvements.

At the head of the leat is a relatively modern undershot sluice (Figure 15). This structure controls what proportion of the available flow is diverted through the leat and what proportion of flow instead flows over the weir. Undershot sluice gates (where water flows beneath the sluice) are better for habitat both in terms of connectivity and quality than overshot sluices (where water flows over the sluice). Fish, invertebrates and other aquatic wildlife can easily pass through the sluice except under very high (and therefore fast) flow conditions. The sluice also allows for relatively natural sediment transport.

Figure 15: An view from upstream of the undershot sluices

Dulverton Weir itself is an enormous structure approximately 120m in length that spans the river diagonally (Figure 16). The structure has undergone temporary repairs after breaching in the high flows and flooding of winter 2012/13.

The structure can be described in 4 distinct sections:

At the RB end of the weir is a 16m long boulder ramp that serves as a 'rock ramp' type fish easement (Figure 16). This type of easement mimics the structural variety of natural rocky 'rapid' features usually found in high energy rivers. These features are relatively passable to fish as the roughness and randomised arrangement of boulders baffle flows and provide an abundance of small 'pockets' where fish can rest. The complexity, diversity and roughness of such features can ease passage for a broad range of fish species including eels. Rock ramp fish easements can reduce problems with attraction flow that hinders the performance of some technical passes but they are often less passable by adult fish at lower flows.

The middle-right 22m section of the weir consists of a modern block stone repair undertaken in 1993 and 2000 (Figure 17). This section is not passable for fish under normal flow conditions but is probably passable to strong-swimming fish under high flow conditions.

The middle-left 27 metres of the weir consist of the surviving ancient structure constructed from wooden stakes and large, rounded stones (Figure 18). The upper part of the ancient weir is protected by a row of gabions.

The weir then continues a further 48m in the form of a stone revetment along the left-hand side of an island. This island is densely wooded (Figure 19) and is bisected by a small channel which is dry under normal summer flows (Figure 20).

The island is undoubtedly a small wildlife haven and should be managed as such. The alien invasive species Himalayan balsam (*Impatiens glandulifera*) is present on the island. Himalayan balsam (HB for short) is prolific both in its rate of growth and its reproduction. It can rapidly out-compete native wetland species and disperse seeds by means of exploding seed pods. Not only can HB fire seeds over 7m in any direction, these seeds also float, making them particularly invasive within river corridors. HB is particularly shallow rooted and dies back during the winter leaving riverbanks exposed and vulnerable to erosion. Annual eradication efforts should be included in the ongoing management of the island.

Adjacent to the sluices is a further 7m wide section of stone weir (Figure 21) that carries flow along the back of the island to re-join the main Barle.

Figure 16: The nature-like fish pass on Dulverton Weir.

Figure 17: The blockstone (middle) section of the weir

Figure 18: The oldest part of the weir constructed from wooden stakes and hand-placed stones.

Figure 19: The heavily wooded island

Figure 20: A hidden channel in the middle of the island (note Himalayan balsam on the left).

Figure 21: The 7m section of weir next to the sluice diverts excess flow around the island

The low overhanging branches of the trees on the island provide excellent cover for wild trout and the highest abundance of fish was observed within the leat feeder channel (upstream of the sluices). The number and size of fish observed became much smaller with distance down the leat channel. This suggests that although some fish do drop down into the leat from upstream, the barriers to fish passage downstream prevent fish from entering the leat from the Barle downstream. It also suggests that fish that do drop down into the upper part of the leat are returning back upstream into the main river. There is often a tendency to 'think upstream' in regards to salmonid migration. However, both adult and juvenile fish also need to move downstream to fulfil the different requirements of their lifecycyles. For this reason it would be a worthwhile endeavour to improve conditions within the leat so that fish that do drop into it have access to appropriate habitat.

The weir itself causes a significant impounding effect on flow upstream for some distance and also interrupts natural sediment transport. This has increased habitat uniformity upstream (suppressing biodiversity) and the interruption of sediment supply to downstream reaches maybe affecting bank stability downstream (Figures 22 and 23). Impounded reaches also create easy hunting grounds for predators (particularly piscivorous birds) which can have significant impact upon the mortality of downstream migrating juvenile fish. Fish trapped below weirs are also more susceptible to stress and damage (as they attempt to ascend a weir) and are easy targets for predators.

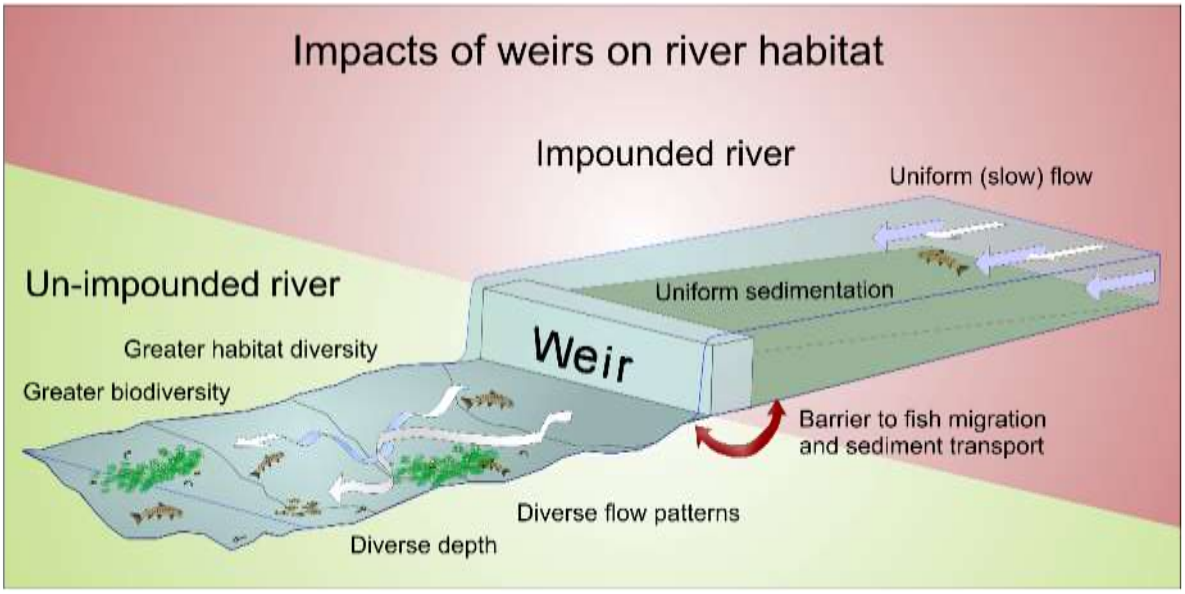

Figure 22: An illustration showing the impacts of weirs on habitat

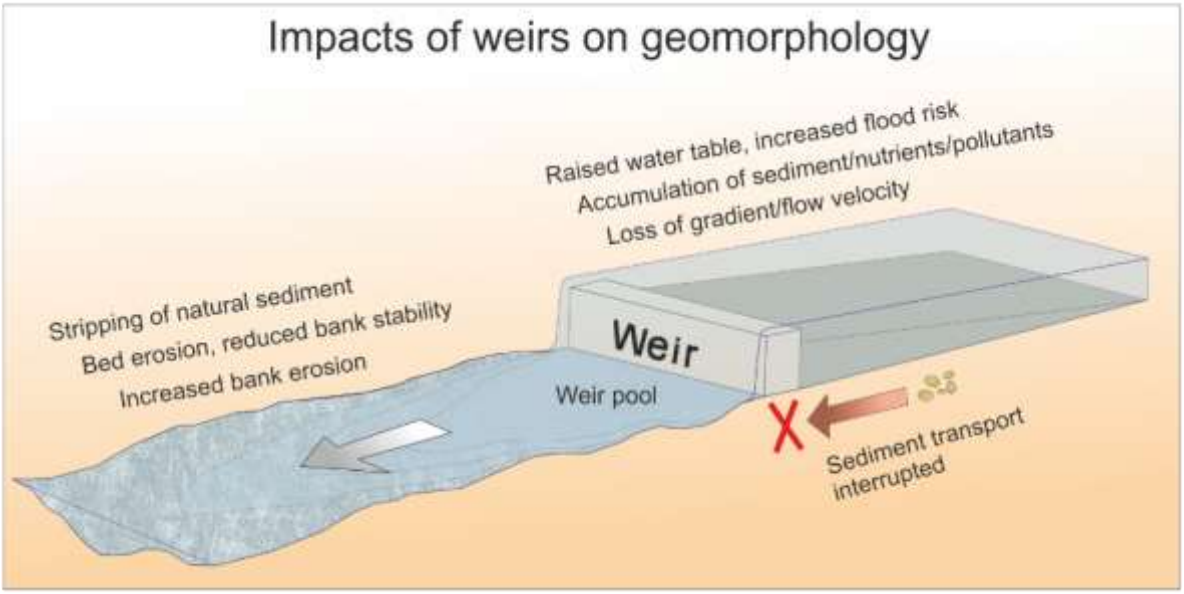

Figure 23: An illustration showing the impacts of weirs on geomorphology

Conclusions

The numerous weirs situated along the leat itself, associated with the various mills that once operated through the town, are barriers to fish passage and fragment the leat into a series of poorly-connected, degraded habitats. Some of the weirs could perhaps be considered just 'challenging obstacles', rather than complete barriers, but even if all of the weirs were technically passable for fish, the cumulative effect of each weir would make the leat impassable for most fish under almost all flow conditions.

Improving fish passage within the leat is challenging and could potentially be a relatively major engineering project. Such a project may require the alteration of

features that are probably perceived as having a high heritage value within the local community. However, options such as cutting notches into impassable weirs should be explored fully. Whilst improving fish passage in the leat is not an impossible task, the potential cost compared to the ecological benefit may make it unfeasible in the short term. As such, it seems the leat is unlikely to achieve its full potential as a biodiverse habitat capable of supporting a thriving fish population.

However, whilst some habitat issues (such as habitat connectivity) are unlikely to be easily resolved in the leat, there is still ample scope for habitat improvement. It is likely that fish will occasionally drop down into the leat from upstream and a project to make life more comfortable for those that do would benefit the channel from both an ecological and aesthetical perspective. Such a project would simultaneously improve habitat for freshwater and terrestrial invertebrates, birdlife and mammals (such as otters). A good mix of native, colourful, nectar-rich, flowering marginal plants would be good for biodiversity and also greatly enhance the aesthetics of the leat, especially through the more publicly accessible sections. It should also be noted that the goals of the DWLCT need not be confined to the weir and leat and that improving habitat within the main Barle through Dulverton alongside the leat would be a rewarding endeavour.

Dulverton weir is a major impoundment and obstacle to fish passage. From a purely habitat perspective the river function and habitat quality would be greatly improved if the weir were simply allowed to collapse. However, the heritage value of the 700 year old structure is significant and the desire to preserve the feature and the watermill landscape that developed around it is understandable. The existing fish pass is provides an example of a crude multi-species easement and any future modifications to the weir should incorporate either the existing pass (ideally with improvements) or reconstruct one to similar specifications. DWLCT should resist any temptations to rebuild the weir in its entirety and replace the boulder pass with a heavily-engineered and 'neater-looking' technical pass.

Recommendations:

In order for the Dulverton Leat to achieve its best potential for biodiversity and provide good quality habitat, capable of supporting fish that drop into it, the following actions are recommended:

1. Replace the toe board shuttering along the public footpath between Lady Street and the Heritage Centre with a soft-engineered and diverse margin of true marginal wetland plant species. There are a number of techniques that could be employed to achieve this and a number of specialist soft-engineering/river restoration companies that can supply and install such features. Perhaps the most cost-effective option is to make use of locally-won brushwood arising from 'skylighting' tree works to create a narrow brushwood shelf (Figure 24 and as described on page 13). These features act as silt traps, slowing flow through them and encouraging fine sediment to drop out of suspension. Given sufficient time and afforded sufficient sunlight, the silt-laden brushwood will

become colonised with marginal plant species. However, considering that the seed bank within the sediment is quite likely to contain Himalayan balsam, it may be prudent to plant up the structures with desirable plant species. These can either be translocated from riverbanks nearby or purchased from reputable suppliers.

Figure 24: A marginal brushwood shelf immediately after installation (left) and after one year (right)

Other options include the use of pre-planted coir (coconut fibre) logs. These provide an almost instant riverbank and can be prepared with a wide range of plant species to suit the requirements of any specific site (e.g. colourful, flowering native plants to improve aesthetics as well as biodiversity). Coir logs are biodegradable and work best when positioned in depositional areas with plenty of direct sunlight. This is because the plants must develop sufficient root mass to keep them established in place once the coir has rotted away.

A third option which might be useful where the bed of the leat is cobbled or is otherwise too hard to penetrate

2. Consider installing a number of low-level, log flow deflectors in some of the more uniform reaches of the leat to help diversify flow conditions and locally mobilise gravel. This will provide a greater abundance and diversity of habitat for fish as well as help create patches of cleaned gravel where fine silt has been scoured away.

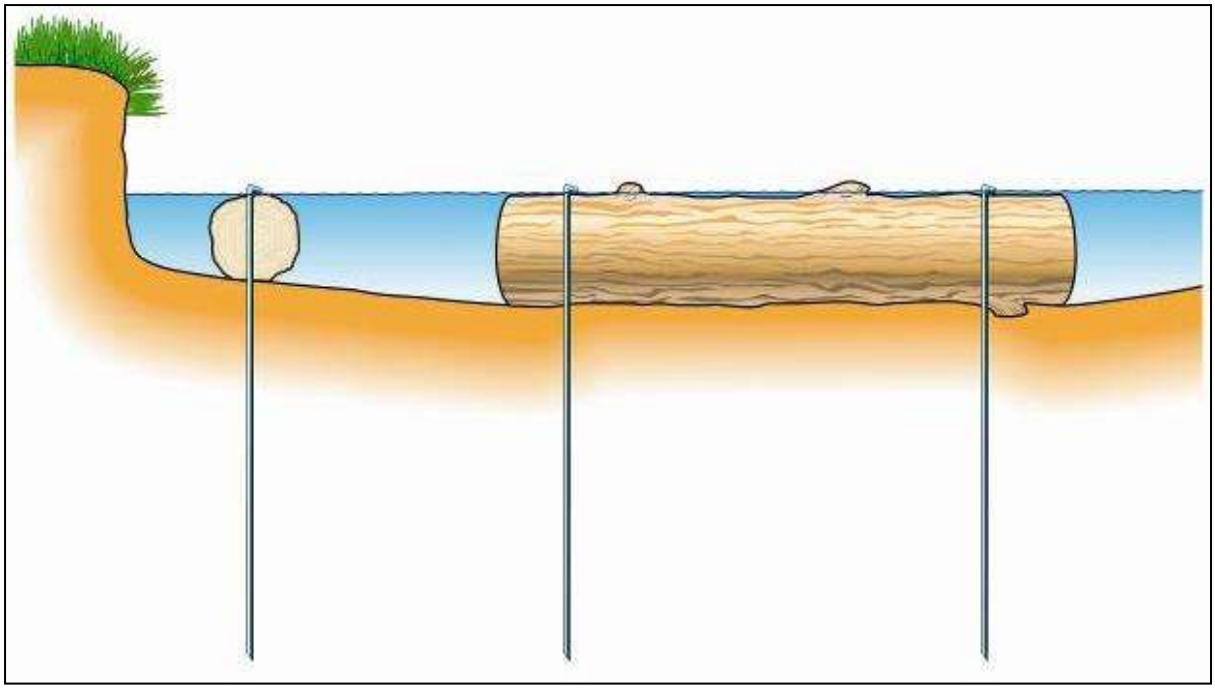

Figure 25: An illustration showing logs 'pinned' to the bed with reinforcing bar (rebar) driven through drilled holes

3. Where the bed of the leat is cobbled, armoured or otherwise too hard to penetrate with stakes or rebar, consider improving marginal habitat by introducing stone berms back-filled with gravel and soil. This technique has proved successful elsewhere in the county (Figure 26). Depending on the flow speeds and shear forces experienced in the leat during spate conditions, it may be prudent to fix every third or fourth stone to the bed by drilling into the stone, chemi-fixing a short section of threaded bar into the hole and then drilling another hole in the bed and placing the bar into it. This technique has been used in a concrete channel on a spate-prone section of the River Meon in Hampshire.

Figure 26: Planted stone berms in a hard-engineered channel in Midsomer Norton, Somerset

4. In some of the wider and straighter sections of the leat, consider creating some small brushwood berms to introduce some sinuosity and provide additional refuge habitat for fish and invertebrates as well as substrate for marginal plants.

Figure 27: Small brushwood berms introduce flow diversity into a small stream

5. The existing nature-like fish pass on Dulverton Weir eases passage for a range of species and sizes of fish. This structure should be retained and enhanced if possible. If the restoration of the weir requires a new fish pass to be created, a number of key factors need to be considered

- Under the Salmon and Freshwater Fisheries Act: in waters frequented by salmon or migratory trout, if a weir is destroyed or taken down by more than half its width or alterations increase its obstruction to fish passage, a fish pass and approval of that pass by the Environment Agency (EA) is likely to be required (See SAFFA 1975 – Chapter 51, Part 2, section 9).

- Species: Any new fish pass would have to facilitate large migratory salmonids but should also be passable to as many species as possible, including eels (*Anguilla anguilla*). The requirements of each species will differ slightly. Not all species can achieve as strong or prolonged a 'burst speed' to overcome river obstacles as large salmonids (salmon/sea trout).

- Attraction: A well designed fish pass should be positioned in an area in which fish are naturally drawn. On diagonal weirs (like Dulverton) this is likely to be the upstream end (RB, in this case) but can also be influenced by other areas where a high volume of water flows over the weir as the natural behaviour of fish attempting to pass over/through an obstacle is to follow the strongest flow (where they would naturally be more likely to find a way through). Many fish passes fail to perform well because fish cannot easily find the entrance and instead exhaust themselves attempting to jump over an impassable part of the weir.

- Flow: The way that water flows over the weir and through a fish pass is likely to change under different flow conditions. A good fish pass should perform well at low flows (when weirs are more difficult to pass) and at high flows (when migratory salmonids often move). Ensuring that high flows are sufficiently baffled and that sufficient flow is provided during low flow is a difficult balance to achieve. A good fish pass should be effective under all flow conditions both in terms of flow speeds and attraction, with effective passes often allowing fish to ascent in low-medium flows, rather than having to wait for high flows.

- Maintenance: A fish pass that is only effective when kept clear of debris, but then is difficult to keep clear during high flows (i.e. for health and safety reasons), is unlikely to perform well throughout the year. Nature-like passes and rock ramp passes tend to perform the best in this matter whilst technical passes and 'pool and traverse' (fish ladder) passes often get blocked with debris.

- Downstream passage: It is important to consider not only upstream passage but downstream passage for juvenile fish

(particularly smolts) and kelts (spent fish). However, this is complicated by usually requiring passage at the downstream end of a diagonal weir (the end where fish are naturally corralled). More information can be found in the EA Fish Pass Manual: https://ifm.org.uk/wp-content/uploads/2016/01/Fish-Pass-Manual.-minimum-size.pdf

6. Try to maintain the island on the weir as a wildlife refuge and resist the temptation to 'garden' it too heavily. Reducing disturbance will make the island more attractive to birds and mammals such as otters (*Lutra lutra*), particularly as there is a hidden channel through the island's centre (see Figure 20).

   However, Himalayan balsam will need to be managed. This is best done with volunteer work parties hand-pulling the plants in late spring before the seed pods develop. A secondary pull later in the summer, to eradicate any later sprouting plants may also be beneficial. The nature of HB is such that only a concerted joined-up source-to-sea effort will effectively eradicate the species from a river. However, blitzing it annually at a local level will minimise its impact and safeguard biodiversity (e.g. http://www.sciencecodex.com/global_plant_diversity_hinges_on_local_battles_against_invasive_species-105553).

7. Via project partners, engage with Dulverton Angling Association as a local group with an interest in the ecology of the R. Barle. DAA has undertaken a number of river habitat improvement projects along the Exe, Barle and Haddeo and may be able to offer advice and assistance with river habitat issues such as invasive species. DAA will also be key stakeholders with regards to fish passage over Dulverton Weir.

Making It Happen

The creation of any structures within most rivers or within 8m of the channel boundary (which may be the top of the flood-plain in some cases) normally require a formal permit from the Environment Agency. This enables the EA to assess possible flood risk, and also any possible ecological impacts. The headwaters of many rivers, as well as some smaller carriers and leats, are not designated as 'Main River', in which case the body responsible for issuing consent will be the Local Authority. In any case, contacting the EA early and informally discussing any proposed works is recommended as a means of efficiently processing an application.

The WTT website library has a wide range of free materials in video and PDF format on habitat management and improvement:

http://www.wildtrout.org/content/library

The Wild Trout Trust has 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 stocks and managing invasive species.

The DVD is available to buy for £10.00 from our website shop http://www.wildtrout.org/product/rivers-working-wild-trout-dvd-0 or by calling the WTT office on 02392 570985.

There is also the possibility that the WTT could help via a Practical Visit (PV). PV's typically comprise a 1-3 day visit where WTT Conservation Officers will complete a demonstration plot on the site to be restored.

This enables recipients to obtain on the ground training regarding the appropriate use of conservation techniques and materials, including Health & Safety, equipment and requirements. This will then give projects the strongest possible start leading to successful completion of aims and objectives.

Recipients will be expected to cover travel and accommodation (if required) expenses of the WTT attendees.

There is currently a big demand for practical assistance and the WTT has to prioritise exactly where it can deploy its limited resources. The Trust is always available to provide free advice and help to organisations and landowners through guidance and linking them up with others that have had experience in improving river habitat.

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.