



River Otter, Deer Park Hotel, Honiton, Devon



An Advisory Visit by the Wild Trout Trust June 2016

Contents

Introduction	3
Catchment and Fishery Overview	4
Habitat Assessment	5
Conclusions	26
Recommendations	29
Making it happen	34

Introduction

This report is the output of a visit undertaken by Mike Blackmore of the Wild Trout Trust, on approximately 3.4km of the River Otter near Honiton, Devon. A walk-over of the site was requested by Mr. Oliver Foster, Estate Manager at Deer Park Country House Hotel. The visit was primarily focussed on assessing habitat for wild trout (*Salmo trutta*) and biodiversity in general and also identifying opportunities for improving the management of the fishery.

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. Sections of the river are identified by the colloquial names provided by the fishery.

	Deer Park Country Hotel waters
River	River Otter
Waterbody Name	Lower River Otter
Waterbody ID	GB108045009170
Management Catchment	East Devon
River Basin District	Sid and Otter
Current Ecological Quality	Overall status of Moderate ecological status (2015 assessment cycle) upgraded from Poor status (2009 cycle).
U/S Grid Ref inspected	SY 13634 99826
D/S Grid Ref inspected	SY 11236 98421
Length of river inspected	~3.4km in total

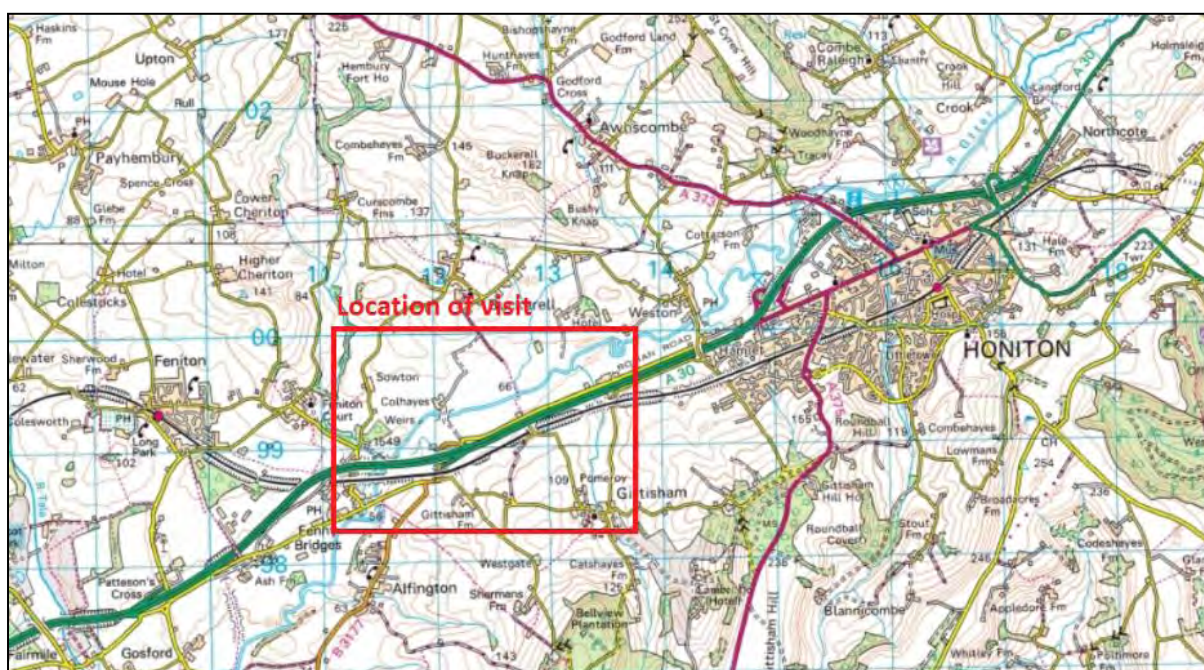


Figure 1: Map showing the locations of the water visited

Catchment and Fishery Overview

The River Otter rises in the Blackdown Hills, north of Otterford, where a stream feeds the Otterhead Lakes. From here the river flows south / south west through Upottery and Monkton, then roughly parallel to the A30 trunk road skirting around the northern limits of Honiton and flowing under the road near Alfington before turning south and flowing through Alfington, Ottery St Mary, Tipton St John, Newton Poppleford and Otterton. The Otter enters the English Channel at Budleigh Salterton where the tidal mudflats and salt marshes of the Otter Estuary Nature Reserve are designated as a Site of Special Scientific Interest (SSSI).

The geology of the catchment is primarily an undifferentiated mix of sandstone, siltstone and mudstones with some greensand in the headwaters. The river drops approximately 200m over its 32km length, 150m of which occurs before the river reaches Ottery St Mary. The steep gradient of the upper catchment makes the river prone to powerful spate flows during periods of prolonged rainfall.

The Otter flows through a predominantly rural area, with the main land uses being intensive arable agriculture and sheep and dairy farming.

As with most rivers in Devon and Cornwall, the fish communities of the Otter are predominantly resident brown trout and seasonal runs of sea trout and Atlantic salmon (*Salmo salar*). Historically, salmon and sea trout have struggled to migrate upstream of Tipton St John but the recent replacement of a poorly functioning 'pool and traverse' fish pass with a 'Lariniere' technical fish pass has significantly improved fish passage. Other significant obstacles to migration still remain which limit the numbers of salmon and trout reaching the upper Otter, but overall fish populations are improving. Other fish recorded in the Otter include bullhead (*Cottus gobio*), gudgeon (*Gobio gobio*), and European eel (*Anguilla anguilla*).

Under the European Water Framework Directive (WFD), the river has previously been failing its targets for fish. However, the most recent cycle of survey data (2014) shows that fish populations are now classified as 'Good'. Any classification below 'Good' is considered a failure under WFD and, unfortunately, the phytobenthos community (microscopic plants/algae that live attached to riverbed substrates) in the river is still not as healthy or diverse as it could be. For this reason, the Otter's biological quality is classified as 'Moderate' but with a target of achieving 'Good' in the next cycle of testing. The pollutants driving this failure are most-likely phosphate and / or fine sediment and are probably linked to agricultural run-off and treated sewage effluent within the catchment. Phosphate is the only physico-chemical quality element of the Otter that is also classified as Moderate; levels of other specific pollutants, such as heavy metals and pesticides are low enough to be classed as 'Good'.

<http://environment.data.gov.uk/catchment-planning/WaterBody/GB108045009170>

Habitat Assessment

For the purposes of this report, the river will be assessed from the upstream to the downstream extent of the reach visited.

Beat 1

At the upstream extent of the visit, the river forms a deep pool on a tight hairpin meander **known as 'Boulder Pool'**. The remains of a rip-rap (boulder) revetment was observed on the LB (Figure 2), presumably giving the pool its name. Hard-engineered revetments may protect the bank behind them short-term, but at the expense of the bank at the edges of the revetment, or sometimes a section of bank downstream.

At the interface between the hard surface of the rip rap and the soft, friable bank, erosive forces are concentrated, often increasing the rate of erosion around the back of the revetment. Rip-rap bank revetments are remarkably common on the River Otter. In many places the technique has completely denuded the river of marginal habitat and tree cover, creating a general lack of overhead cover and shade. Rip-rap revetments are often installed in an attempt to protect eroding banks. However, in many cases, the increased rate of erosion is a direct result of intensive grazing right up to the top of the bank and the absence of an un-grazed fenced buffer. Riverbanks afforded wide fenced-off livestock exclusion are naturally resistant to erosion as a deep, dense and complex root structure is allowed to establish within the upper bank. Tree saplings are also more readily established in fenced buffers where they are protected from browsing livestock. As well as providing valuable habitat, an established and diverse marginal plant community, complimented by occasional bankside trees such as willows (*Salix* spp.) is, therefore, much more resistant to erosion than banks protected with hard-engineered structures.

Mid-way through the meander, an enormous volume of river gravels has been deposited during a recent spate event, covering the RB (Figure 3) and forming a gravel bar in the channel (Figure 4). Alongside the bar a mature willow has toppled over and a deep run has been scoured below the exposed root ball. A short distance downstream, a riffle has developed as material scoured out from under the toppled tree has been redeposited.



Figure 2: The remnants of a rip-rap revetment on the RB (right of image)



Figure 3: Several tonnes of gravel have been deposited over the inside of the meander during a spate event



Figure 4: A gravel bar has formed and a mature willow has toppled over

This section of river has recently undergone some substantial geomorphological changes in response to the sudden influx of gravel. The natural processes of erosion and deposition, in conjunction with the naturally fallen tree, have greatly enhanced habitat quality. The increased diversity of flow patterns and depth and width, alongside the physical cover created by the fallen tree, provide an abundance of habitat for trout and other fish and invertebrate species.

Unfortunately, the alien invasive plant species, Himalayan balsam (*Impatiens glandulifera*) is dominating the reach, reducing overall biodiversity. HB grows prolifically in late spring/summer, out-competing native species and creating a monoculture, yet dies back completely in the winter, leaving banks bare and vulnerable to excessive rates of erosion.

Evidence of a recent algal bloom was also observed (Figure 5), this is a response to excess nutrient input (or nutrient-laden sediment), probably originating from intensive agriculture within the catchment. Algal blooms are often a response to increased levels of phosphates and sometimes nitrates (or both). They are often short-lived, resulting in an abundance of dead organic matter which decays and is broken down by bacterial action. However, the decay process utilises a proportion of the available dissolved oxygen, limiting the abundance of oxygen-sensitive invertebrate species and in extreme cases, suffocating fish.



Figure 5: Dead algae from a recent bloom

Moving downstream, a natural pool-glide-riffle sequence has established, doubtlessly maintained by an ample supply of gravel being transported by spate flows but also by the meandering river planform which varies the flow speeds, resulting in a range of different erosional and depositional features. A good abundance of natural fallen woody features helps to further diversify flow patterns and provides cover for all life-stages of trout.

At SY 13511 99909 (Long Reach Pool), a large sallow (round-leaved willow, either goat willow *Salix caprea* or grey willow *Salix cinerea*) has fallen across the river (Figure 6). Sallows are particularly valuable trees for fisheries. They are generally slow-growing and bushy, providing good cover yet requiring minimal maintenance. They also flower early in the year, supporting a range of invertebrates which often become prey for trout.

Too often, fallen trees are removed by fishery managers in order to facilitate **casting or access or simply in an attempt to keep the fishery 'tidy'**, at the expense of valuable habitat. In this case, the feature is providing excellent cover and during spate conditions will force flows down underneath it, scouring out a deep pool, sorting the gravel and diversifying habitat downstream as scoured-out sediment is redeposited. This feature should be retained if at all possible.



Figure 6: A fallen willow provides excellent cover habitat

Beat 2

Downstream of the fallen willow the river straightens out for approximately 250 metres through a reach known as 'Lazy Run'. Throughout the Lazy Run beat a high diversity of habitat features is present despite the relative straightness of the channel. This is largely owing to the abundance of mobile gravel but also to a number of small trees (mostly willow) growing from the very toe of the bank and deflecting flow (Figure 7). These trees also provide a wealth of low cover habitat in the form of trailing roots and branches.



Figure 7: Small trees growing from the toe of the bank provide some flow deflection and cover

Some long, laminar glides (sections of laminar flow) were observed in the Lazy Run beat (Figure 8). Straight sections of river are often prone to an over-abundance of glide habitat as the uniform nature of the channel evens out flow patterns. However, the glides in the upstream section of the beat are broken up by occasional riffles and natural woody habitat features help maintain a relatively good balance of different habitats. Toward the downstream end of Lazy Run, the river would benefit from some additional woody features to maintain flow deflection and diversify conditions. Simply hinging (cutting partially through and laying downstream) some small bankside trees or large limbs into the river would create conditions similar to those present in the upper section of the beat.



Figure 8: A long glide is broken up by occasional riffles and woody habitat features

The downstream section of Lazy Run also illustrates the point made earlier with regards to bank erosion. A section of the LB is much less intensively grazed and although bank erosion is occurring, deep root structure is helping to hold the upper bank together (Figure 9). The sandy soil of the Otter Valley is particularly friable, resulting in a naturally incised channel and banks that are prone to cliffing (presenting an almost vertical cliff-like face) on the outside of bends. In general, this is part of the natural character of the river and helps facilitate a naturally active geomorphology that results in a meandering and diverse habitat. The bank erosion also exposes the gravel seam of the floodplain and introduces new gravel into the system. As a spate river with a particularly abundant supply of mobile gravel, flowing through a valley with particularly friable soils, the Otter is prone to abrupt changes in rates of bank erosion. However, the straightening (and therefore shortening), of the river will have increased the energy of flows as the gradient of the river is also increased. The straightening reduces the river's ability to retain substrate, causing bed incision and potentially accelerating the rate of erosion.

In many cases, erosion is not a problem and results in a more diverse habitat. However, where erosion is deemed to be a problem, there are a number of techniques available to protect vulnerable banks that are cheaper, more cost effective and more ecologically sensitive than rip-rap revetments. This can range **from simple tree planting to the creation of 'soft-engineered' revetments**. Examples of such techniques are outlined in the *Recommendations* section of this report.



Figure 9: The naturally friable soils make banks prone to 'cliffing'. However, a deep root structure helps to control the rate of erosion

Beats 3 and 4

At SY 13202 99769, a boulder weir (High Bank Weir) impounds flow and interrupts natural gravel transport (Figure 10). The structure is not a barrier to fish migration but nonetheless has a detrimental effect on habitat quality and diversity. Weirs such as this have often been **installed as 'summer weirs' in the belief that a depth** of water needs to be held up to mitigate for lower flows in the summer months. However, holding up water causes flows upstream to be slowed, resulting in sediment (along with associated excess nutrients) dropping out of suspension and depositing uniformly across the bed. Weirs also trap sediment, causing the bed to rise and, over time, fill in the pools they were installed to create. The combined action of these two processes results in a uniform and static habitat upstream which is suited to only a limited number of species. Wild trout, being naturally territorial, often defend a small territory from competitors within their line of sight. A wide, uniform deep glide habitat, such as that found above a weir, may sometimes hold bigger fish (able to defend the open territory), but will almost always hold fewer fish than a naturally diverse section of river. The best practice for mitigating against low flows is to work with natural processes and ensure that

there is sufficient structure in the channel to scour the bed and allow a network of naturally maintained pools to develop.

A study of maps dating back to 1887 (old-maps.co.uk) show the river significantly straightened. It is possible that weirs at this location were originally installed to deliberately impede sediment transport and maintain the straightness of the channel by suppressing the natural geomorphology.



Figure 10: High Bank Weir is constructed from boulders. The structure creates a uniform habitat upstream and impedes natural sediment transport (and therefore the natural processes that diversify habitat) downstream.

Two more weirs are present a short distance downstream (Mayfly Weir and Ginnors Weir). Ginnors Weir is more substantial and may pose a significant barrier to fish passage under certain flow conditions. Part of the weir has been constructed (or repaired) using gabion baskets. Situated adjacent to a parking area, this is one of the most accessible sections of the fishery. However, bed material trapped between the weirs has caused the bed to rise and become uniformly shallow with the only substantial holding habitat being the weir pools created by the action of turbulence immediately below the weirs.

Downstream of the three weirs is a large pool. This has developed as the rate at which gravel is transported away from the section immediately below the weirs is greater than the rate at which it is replaced, essentially resulting in a net loss of gravel from the reach. This has caused the channel to deepen and may be destabilising the banks downstream, causing an increased rate of erosion (Figures 11 and 12).

Removing the weirs will allow natural processes to resume and restore habitat diversity. This would also provide a greater number of lies for trout and more opportunity for anglers. Methods for removing these features are explored in the *Recommendations* section of this report.



Figure 11: The RB downstream of the weir (looking upstream)



Figure 12: The LB downstream of the weir (looking upstream)

Below the weir pool is a wide riffle and ford. Further evidence of algal blooms, indicating elevated nutrient concentrations were observed (Figure 13). Below the ford the river returns to a more natural condition (Figure 14). From here the river flows through a more densely-wooded section with an abundance of natural woody **features**. The aptly named **'Hanging Bush Pool'** (Figure 15) provides some excellent marginal refuge habitat. Partially submerged live wood is an excellent habitat for juvenile trout. Not only does the tangled assemblage of branches and roots provide good protection from predators such as piscivorous birds, but also enables a large number of juvenile trout to occupy a section of the river margin

without being in direct line of sight from one another. Trout fry are territorial from the moment they emerge from the gravel. Complex submerged cover allows them to occupy small micro-habitats without feeling threatened by neighbouring fish. This means that a greater number are able to take shelter and fewer fish are displaced into the open water where they would be at a greater risk of predation.



Figure 13: Further evidence of excess nutrient in the form of algae smothering a riffle



Figure 14: The river resumes a more natural character with a rich diversity of habitat



Figure 15: Dense marginal refuge habitat at Hanging Bush Pool

Within the wooded reach, several examples of the river responding to woody habitat features were observed. The abundant supply of gravel causes bars to form in the lee of almost any structure that deflects flow. Simultaneously, deep 'runs' have developed that provide excellent feeding opportunities for fish (Figure 16). Holding up in pockets of slack water next to runs of faster-flow, fish are able to conserve energy and wait for prey to drift past. At the end of one such run a tree has fallen into the river as its roots became undercut (Figure 17). This will probably lead to new habitat features developing downstream and the tree should be left *in situ*. Near here **some evidence of the River Otter's** Eurasian beaver (*Castor fiber*) population was found (Figures 18 and 19).

There is, to date, very little known about the potential interactions between beavers and fisheries in the UK. The interaction is likely to be complex and site-specific and there are a myriad of factors, potentially both positive and negative. Trials similar to that being undertaken on the River Otter may have limited scope for extrapolation to other rivers and the interactions may not be fully realised for several decades. Cataloguing sightings and any other interactions with the river habitat may however be useful in establishing practical policies for the future.

More information on the potential interactions between beaver and trout populations are outlined on the Wild Trout Trust website - www.wildtrout.org/content/beaver-trout-interactions.



Figure 16: A gravel bar (foreground left) has formed in conjunction with a fast-flowing 'run' (background right)



Figure 17: A naturally fallen tree provides some excellent cover and will develop further morphological diversity



Figure 18: A gnawed willow branch. Possibly signs of the River Otter's beavers?



Figure 19: Another piece of willow, this time stripped of its bark

Beat 5

At the downstream extent of the wooded reach, the character of the river changes significantly. The river is significantly straightened and is extremely uniform in width and depth. Some good low cover habitat is present on both banks but tree cover is sparse and the channel is lacking in flow deflection and submerged structure for approximately 300m (Figure 20).



Figure 20: A long straightened section with laminar flow presents a poor quality habitat for wild trout populations

The long uniform reach ends at a riffle at SY 12446 99348 (Figure 21). A sequence of glides and riffles introduce some variation in depth but the reach remains lacking in flow deflection and deep pool habitat.



Figure 21: A riffle introduces some diversity into the straightened section

At SY 12148 99292, gravel has been pulled from the channel and piled against the LB (Figure 22). The bank did not appear to be undergoing an accelerated rate of erosion so it was not entirely clear what the motivation for this action was. It is possible that as a bend at the end of a long straightened section, this is the first opportunity for gravel supplied from upstream to settle. It may be that the person

who undertook this action did so out of concern over a gravel bar forming in the channel. However, widening the channel here will almost certainly increase the rate of deposition. This is a potentially very damaging undertaking and is unlikely to have been done with the consent of the Environment Agency (EA). Engaging with the land owner responsible and ascertaining the reason for undertaking such an activity is recommended. Following on from this discussion, it is likely that the Wild Trout Trust or EA will be able to advise on a more ecologically appropriate alternative to whatever it is the person responsible is trying to achieve.



Figure 22: Gravel piled along the LB has been pulled from the river with heavy machinery.

Beats 6 and 7

A short distance downstream, the river is impounded by a weir under a bridge (Figure 23). Below the weir is a brick apron which would have been installed to prevent the bed from cutting under the structure. The shallow and fast flows over the apron and the head drop over the weir make it a barrier to fish migration in all but the highest flow conditions. Ideally, this structure should be removed but the presence of the bridge and apron could make this difficult and potentially a major capital project. Engaging with the land owner and EA and exploring options to remove this structure in the medium–long term is recommended. Exploring options to improve fish passage over the structure in the short-medium term may **help to safeguard and enhance the fishery’s wild trout population.**

From the bridge downstream, the river flows in a straightened course past a farm yard. On the only bend in the river, a revetment of concrete slabs and iron bars has been installed (Figure 24). Again this is neither the most effective or economical means of protecting banks and the land owner/farmer may benefit from being informed of better practices that will protect the bank whilst also providing the best possible ecological outcomes.



Figure 23: The brick-built weir and apron under the bridge are a barrier to fish passage



Figure 24: A concrete and steel bank revetment is neither cost-effective nor particularly effective. Soft engineering alternatives are available

A short distance downstream, another brick-built weir impounds flow and presents a significant obstacle to fish passage (Figure 25). Boulders in the channel near the RB, possibly originating from the adjacent rip-rap revetment, may be helping to ease fish passage by baffling flow and creating conditions similar to those that are often found in natural cascades that trout are well-adapted to overcome.



Figure 25: Another brick-built weir is an obstacle to fish passage, suppresses geomorphology and causes uniform flows

This structure may be relatively easy to remove but because of its unusual construction, further investigation may be required. Below the brick weir, a series of smaller boulder weirs are present (Figures 26 and 27). These are relatively passable but it is worth noting that even structures deemed to be 90% passable can have a significant cumulative effect on the number of trout successfully migrating upstream to spawn (Figure 28).

Much of river through this reach is channelised between hard-engineered blockwork banks (Figure 29). This prevents the natural processes that would otherwise diversify habitat from occurring. There is also a paucity of tree cover, resulting in a lack of shade and cover habitat. Planting some occasional trees on both banks throughout Beats 5 – 7 would provide much-needed cover and would also eventually provide woody material that could be used for further habitat enhancement. Ideally, the revetment restraining the river would be removed so that a more natural plan form could develop. However, this would be an expensive operation and would require the full support of the land owner and other stakeholders.



Figure 26: Another boulder weir



Figure 27: And another

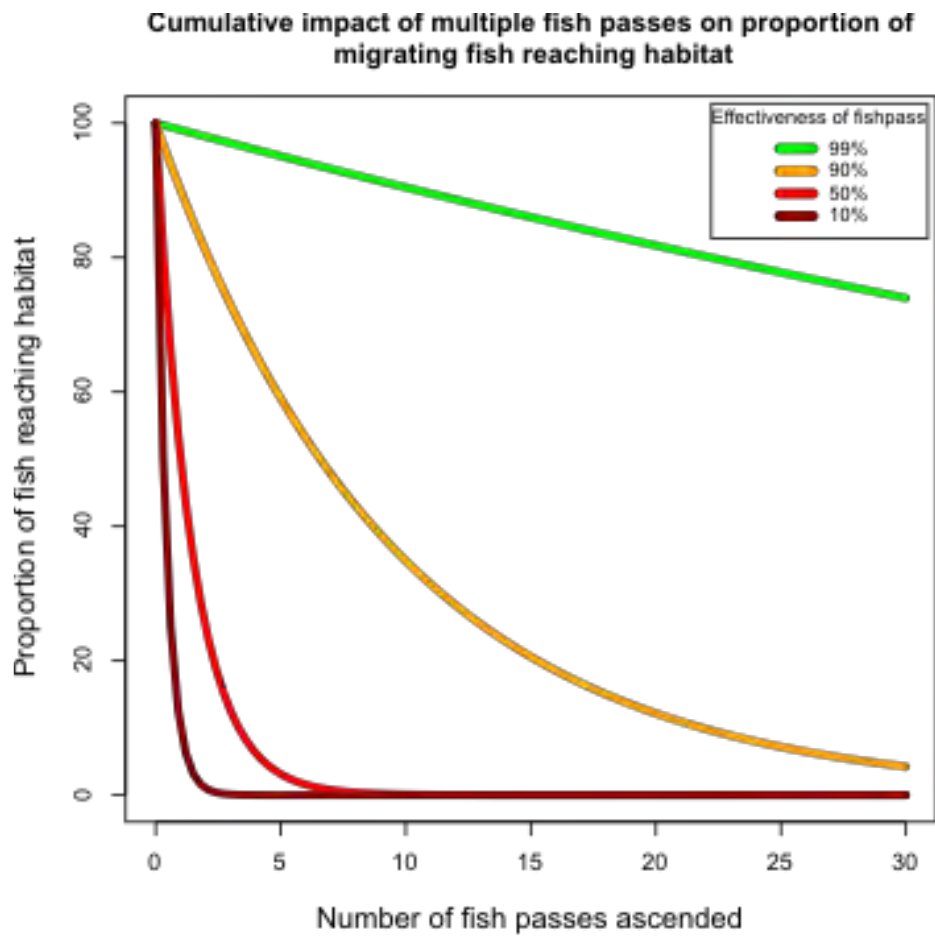


Figure 28: Graph showing the cumulative effect of multiple obstacles to fish passage on upstream migration (courtesy of Dr E Shaw, Catchment Science Centre, University of Sheffield).



Figure 29: A brick/blockwork wall forms the LB, inhibiting natural geomorphology

At SY 11549 98849, the river flows under the A30 and the West of England Main [railway] Line through private land. Viewing the river upstream from the B3177 at Fenny Bridges (Figure 30), an island was observed. An examination of satellite imagery (Google Earth) shows the river flowing mostly around the right hand side of the island. However, on the day of the visit, the majority of flow was to the left of the island. This change highlights how active the morphology of the river can be when not constrained by weirs and bank revetments. Immediately downstream of the weir is an EA flow gauging station. Flow past the gauging station is **controlled by a large 'flat V' style weir** under the road bridge. This type of weir is basically a downstream facing wedge which a shallow V-shaped cross section that creates uniform, predictable flows, aiding in accurate calculation of river discharge. They are also notoriously problematic for fish passage as the long face of the structure requires a prolonged burst of exertion from fish attempting to overcome it. It is unlikely that the weir will be removed in the short-medium term but there are a number of low-cost options available to ease fish passage over them. Engaging with the EA and exploring low-cost easement options is recommended.



Figure 30: A view upstream from the B3177 road bridge. EA gauging station (foreground) and the island (background).



Figure 31: A flat V weir creates uniform, predictable flows. Good for gauging, bad for fish passage.

Downstream of the bridge, some good examples of natural woody habitat features were observed deflecting flow and helping create a range of different flow speeds, channel depths and widths. Cover was relatively abundant and there were a number of good feeding lies for trout. At SY 11475 98375 is a tight right hand meander. The acute angle of the meander has caused a large point bar to be deposited on the LB (Figure 32). On the day of the visit it was clear that gravel was being removed from the river at this location on a large scale (Figure 33). The purpose of this operation was not clear and it may be worthwhile enquiring why so much material was being removed and where it was/is going.



Figure 32: A large gravel point bar has accumulated on the inside of the sharp bend

Removing gravel from a river at any location can be detrimental to habitat. A reduced gravel supply is likely to impact on the quality or availability of spawning habitat downstream. It is possible that this activity is not being undertaken legally.



Figure 33: Gravel is being removed and taken away for unknown reasons

Conclusions

Beats 1 and 2 have some excellent wild trout habitat and should make for an exciting and challenging wild trout angling experience. This is also true of the wooded section of Beat 4. This is largely due to the fact that the upper part of the fishery has not been significantly straightened and so the natural sinuosity of the river promotes a high level of morphological diversity. The abundance of naturally fallen woody features in these beats further adds to their dynamic nature as well as providing excellent habitat features in their own right. These sections serve as a good example of the potential of the River Otter and a contrast to some of the more heavily modified sections of the river.

The straightened sections of the fishery, particularly where bankside tree cover is sparse, present as uniform habitat with a paucity of cover features (e.g. Beats 5 and 7). These sections would benefit from an increased abundance of submerged woody features; a major step towards improving habitat will be to increase the abundance of tree cover on both banks.

A number of weirs on the fishery limit both habitat diversity and fish passage. It is a commonly held misconception that only anadromous (sea-running) fish migrate. In reality there is no such thing as a non-migratory fish and all species

need to move up and downstream, sometimes over great distances, to find different habitat for certain stages of their life cycles. Adult brown trout for example, will migrate both up and downstream in search of suitable spawning habitat, while juvenile trout may disperse in either direction throughout their development as their habitat requirements change.

Barriers (or significant obstacles) to fish passage can fragment fish populations, making them more vulnerable to predators, pollution or other fish kill events. Weirs also have a significant impact on natural geomorphology, suppressing natural processes and reducing habitat diversity. The interruption of natural sediment transport can lead to habitat uniformity upstream as well as increased rates of erosion downstream. A video prepared by the Wild Trout Trust making use of the Severn Rivers Trust's EmRiver geomodel; a scale model used by scientists and researchers to demonstrate river processes, illustrates these points. www.youtube.com/watch?v=ILofBcLiDts

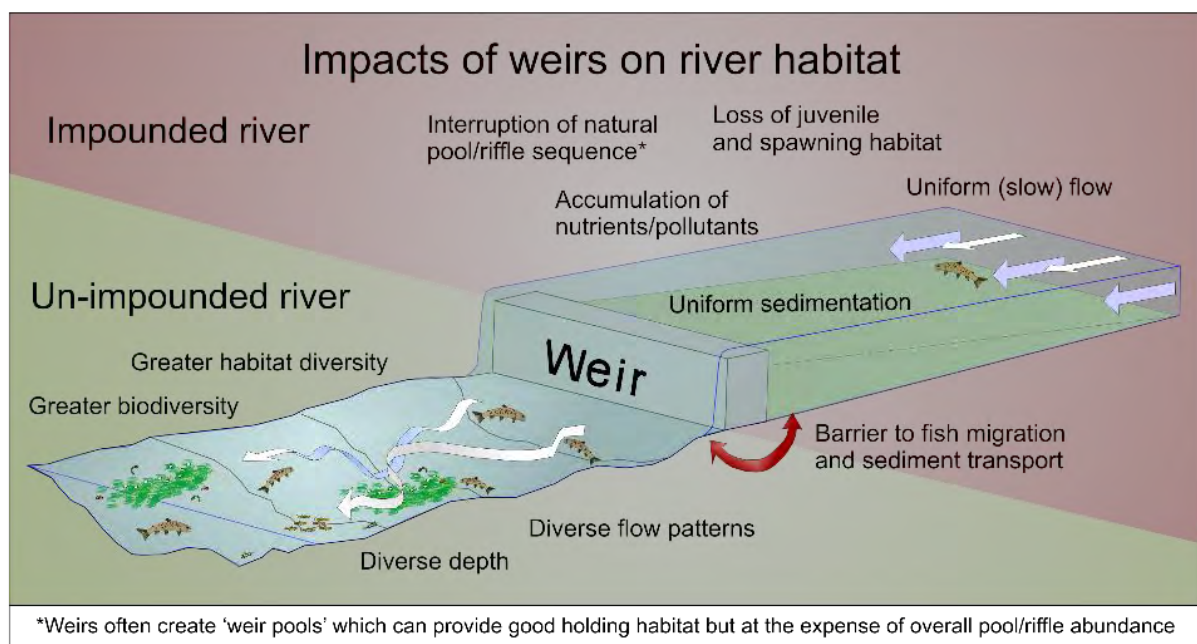


Figure 34: An illustration showing the impact of weirs on river habitat

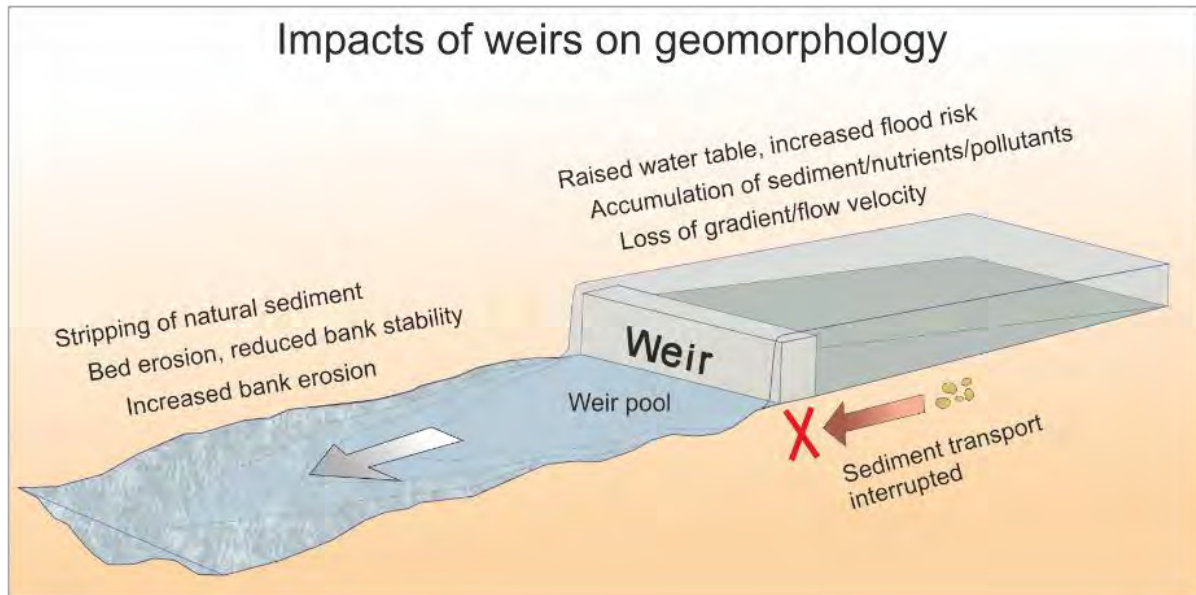


Figure 35: An illustration showing the impact of weirs on river morphology

Obstacles to fish passage combined with sections of river lacking in submerged and overhead cover could lead to a **'population bottleneck'** at the spawning and/or juvenile trout life stages (Figure 36). Fish unable to reach good quality spawning/nursery habitat will have a substantially reduced chance of successfully spawning or of their offspring surviving. The end result is that the fishery is unlikely to be supporting as many fish as it otherwise could.

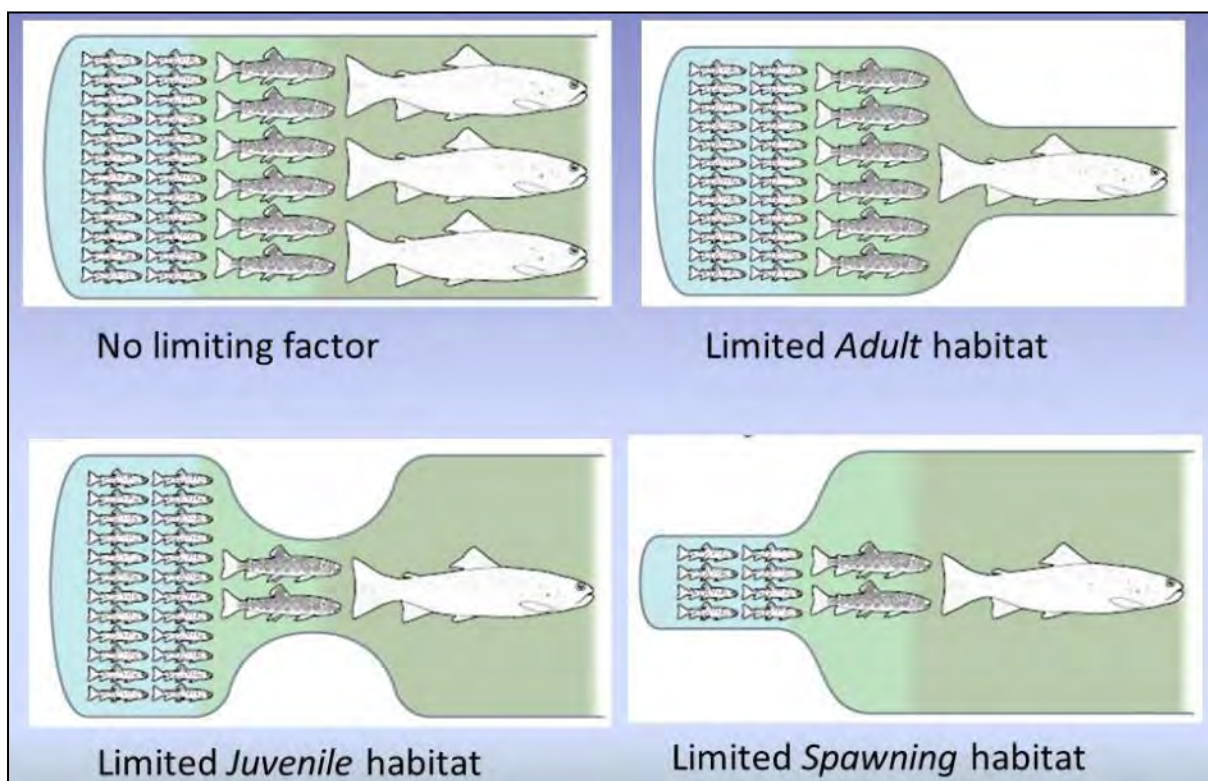


Figure 36: An illustration showing how 'bottlenecks' at a particular life-stage can impact on fish populations

Riparian land management is also a key factor affecting habitat quality within the River Otter catchment. Un-restricted grazing of river banks increases the rate of erosion and compacts soil, decreasing the permeability of the land and increasing the rate of surface water run-off. Along with other point-sources such as household septic tanks and plumbing misconnections, diffuse run-off from agricultural land contributes significantly to the phosphate levels in UK rivers.

A lack of bankside trees, as a direct result of bankside grazing, further reduces bank stability, contributing to fine sediment inputs as banks experience block failure and collapse. It also creates a paucity of shade, low cover habitat and in-channel structure.

The widespread, inappropriate and often ineffective use of rip-rap and other hard-engineered bank revetments reduce the abundance and diversity of marginal habitat, with knock-on effects for plants, invertebrates, and ultimately fish, mammals and birds.

Throughout the waters visited, several infestations of Himalayan balsam were observed. This alien invasive species can quickly out-compete other bankside plants during summer months, dying back in the winter to expose bare soil banks that are vulnerable to erosion. Balsam is prolific and its elimination requires catchment-scale co-ordination and a source-to-sea approach. However, infestations can be controlled at a reach scale and tackling the problem early will reduce the rate at which it spreads.

Recommendations:

In order for the River Otter at Deer Park Country House Hotel to achieve its full potential for biodiversity and good quality habitat, capable of supporting healthy, self-sustaining populations of wild brown trout, the following actions are recommended:

1. The boulder weirs at Beat 3 and the lower part of Beat 7 should be removed. This should be a relatively easy undertaking provided a suitable size of excavator is used. Engage with the Environment Agency and explore options for weir removal and what is required to obtain the relevant permissions. Depending on available resources, it may be cost-effective to initially remove only half of each weir, alternating the side to be removed on each weir so that a meandering deep trench **or 'thalweg'** is scoured through the bed between them as the river adapts to the new flow regime. This might also maintain some shallow gravelly habitat in the margins, making for easy angler access.

The brick-built weirs should also be addressed. The brick weir at the farmyard (Figure 25) could be removed with an excavator but the weir by

the bridge (Figure 23) may be more challenging. As a stopgap to removing the weir and apron, notched timber baulks could be affixed to the structure to raise water level over the apron and reduce the head loss over the weir. In all cases, the ownership of the weirs will have to be established and owner permission, as well as formal consent from the EA will need to be sought. Engage with the EA **and explore the likelihood of a 'low-cost easement' being installed on the gauging station weir at Fenny Bridges.** This is a tried and tested technique used by the Agency in several locations across the country and usually involves affixing baffles to the sloping face of the weir in an offset pattern to provide a path of slowed and raised water for fish to follow over the feature.

2. Engage with land owners/tenant farmers and discuss the benefits of installing stock-exclusion fencing at least 3-5 metres back from the top of the bank where required.

Where only cattle are present, two strand barbed wire fencing should be sufficient to exclude them from the river bank. This is a cheap, quick and easy method to exclude cattle from a river bank and, owing to its minimal structure, has a relatively low risk of wash-out through flooding.

If large scale fencing is deemed unfeasible in the short term, it may be worth considering fencing off blocks of riverbank and undertaking tree planting within the fenced blocks. Alternating blocks from bank to bank downstream will help to develop a good balance of light to dappled shade (a roughly 50:50 ratio). More information on the benefits of fencing riverbanks can be found by following these links to videos on the Wild Trout Trust website: www.wildtrout.org/content/land-use-impacts-rivers
www.wildtrout.org/content/case-study-videos#wufbuffer

Areas inside fence lines do require management through controlled livestock grazing and/or mechanical cutting, especially to avoid infestation by invasive, non-native plant species such as Himalayan balsam and Japanese Knotweed, both sadly present in the Otter catchment; see 3 below.

The Woodland Trust are able to provide trees free of charge for planting along riverbanks. Contact Hamish Thomson (SW Woodland Creation Advisor) hamishthomson@woodlandtrust.org.uk to discuss this option.

3. Take steps to control infestation of Himalayan balsam at the earliest possibility. Some angling clubs organise balsam pulling days, sometimes followed by a barbecue or other social activity in late spring/early summer to try and tackle infestations before the plants go to seed. It would be worthwhile contacting Devon Wildlife Trust and enquiring what balsam

eradication programmes they may have already running and how the club could work within such a programme.

4. Encourage the use of soft-engineered techniques such as live willow revetments to protect excessively eroding banks. On sharp bends these structures should be installed to form as smooth a curve as possible so as to limit the occurrences of eddying flows and uneven friction. Live willow brushwood should be aligned in the same direction, ideally with the branched ends pointing downstream to reduce the risk of trapping debris that could pull the structure apart. Finally, the willow should be firmly secured and the upper bank fenced to protect new growth from browsing livestock.

The upstream and downstream ends of the revetment should be keyed into the bank beyond the start and finish of the bend if possible. This will help ensure that the river cannot erode behind the revetment.

Once the structure is established, it will require annual maintenance (trimming) in order to ensure that it remains relatively even and does not encroach into the channel.

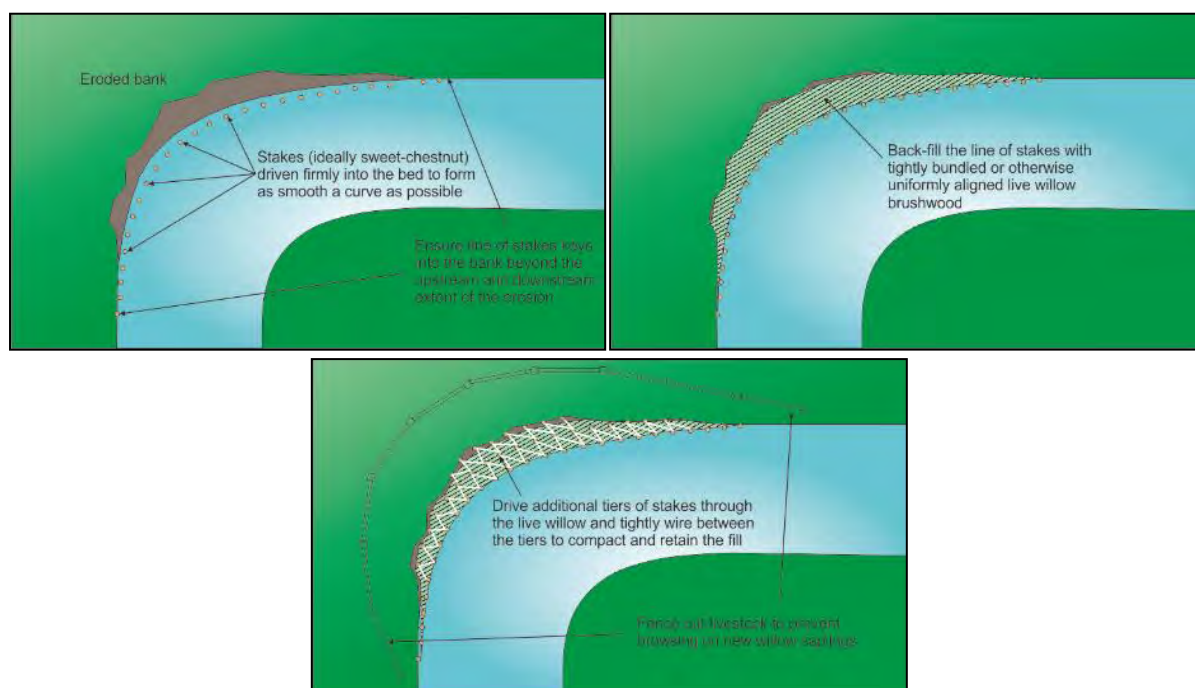


Figure 37: A step by step plan view illustration of how to best create a live willow revetment on a sharp outside bend

Good land and river management practices are prescribed in the Wild Trout Trust Upland Rivers Habitat Manual.

www.wildtrout.org/sites/default/files/library/uplands_section4.pdf

Another WTT video illustrates the difference between hard and soft bank revetments and the way they interact with river processes.

www.wildtrout.org/blog/bank-erosion-matter-balance

5. Retain natural woody features wherever possible and introduce further woody habitat enhancements through the more uniform reaches, sourced from existing trees within the floodplain. Look for opportunities to either hinge and secure medium-sized trees (Figure 38) or create cabled kickers to deflect flow (Figures 39 and 40).



Figure 38: An example of a hinged willow being secured into the River Blackwater, Berkshire

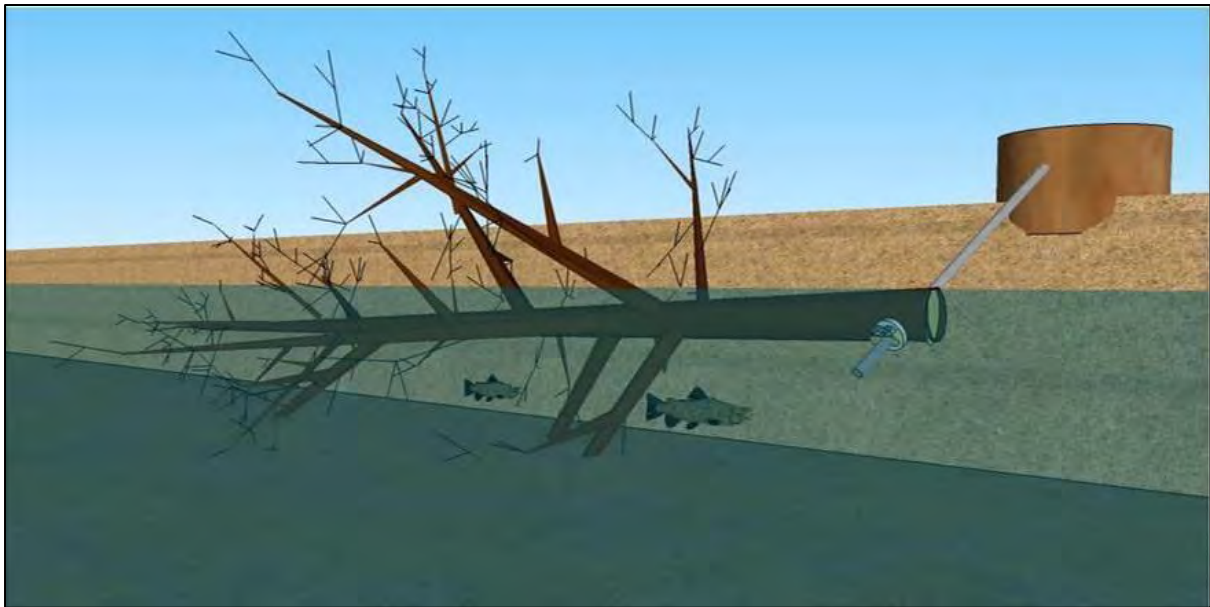


Figure 39: An illustration of a felled tree limb secured to its stump as a 'kicker' to provide woody cover habitat



Figure 40: A close up of a cabled kicker in high flows. The cable allows the limb to move out of the main flow and provide refuge habitat during spate conditions

Tree kicker Methodology:

- A qualified chainsaw operative should trim fallen woody debris or cut limbs ready for cabling
- Use a petrol wood auger or chainsaw to bore a hole through the limb
- Thread 10mm braided steel cable through the hole on the limb and secured with a stainless steel washer and cable crimp.

- Loop the bankside end of the cable around a suitable anchor point (such as the original bankside tree or stump) and secure with a cable crimp. Alternatively, secure by threading the bankside end through another hole bored through the anchor point and secured by the same method as the limb.
- The length of cable must be set so that flow will naturally push the limb out of the main current during spate conditions but not so long that the limb can be lifted out of the channel during high flows.

The following 'how to' video provides instruction on best practice for installing tree kickers: <http://vimeo.com/72720550>

6. Consider monitoring water quality by conducting regular invertebrate monitoring via the Riverfly Partnership.
www.riverflies.org/get-involved
7. Consider marketing the different parts of the fishery to cater for different anglers. Anglers not used to wild trout fishing may not understand the value of good quality habitat or the potential enjoyment a wild and challenging river fishing experience can provide. The straightened sections of the river may not provide good quality habitat for trout but may be more easily accessed by less experienced or less able-bodied anglers. Signing and marketing the different beats to highlight the different types of fishing experiences available, may help to protect the good quality habitat sections as well as ensuring that anglers enjoy a rewarding fishing experience.

Making It Happen

The creation of any structures within most 'Main 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. Lower flood risk watercourses are **designated as 'Ordinary Watercourses', in which case** the body responsible for issuing consent will be the Local Authority. Contacting the EA early and informally discussing any proposed works is recommended as a means of identifying the relevant authority and 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:

www.wildtrout.org/content/index

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 more specific Project Proposal (PP). This service is designed to help land owners, fishing clubs and community groups put together the necessary plans and documentation to obtain the relevant permissions to undertake a project.

The WTT could also help with 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 high demand for advice and 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.

Acknowledgement

The WTT would like to thank the Environment Agency for supporting the advisory and practical visit programme in England, through a partnership funded using rod licence income.

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.