Halse Water, Norton Fitzwarren, Somerset

An Advisory Visit by the Wild Trout Trust November 2014

Contents

Introduction

This report is the output of a Wild Trout Trust visit undertaken on the Halse Water at Norton Fitzwarren, Somerset (national grid reference (NGR) ST 18505 26586 to ST 19114 25898). A walk-over of the site was requested by Janet Gobey, who is the clerk of Norton Fitzwarren Parish Council. The visit was primarily focussed on identifying cost-effective and environmentally friendly solutions to an erosion problem and assessing habitat for wild trout (*Salmo trutta*).

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.

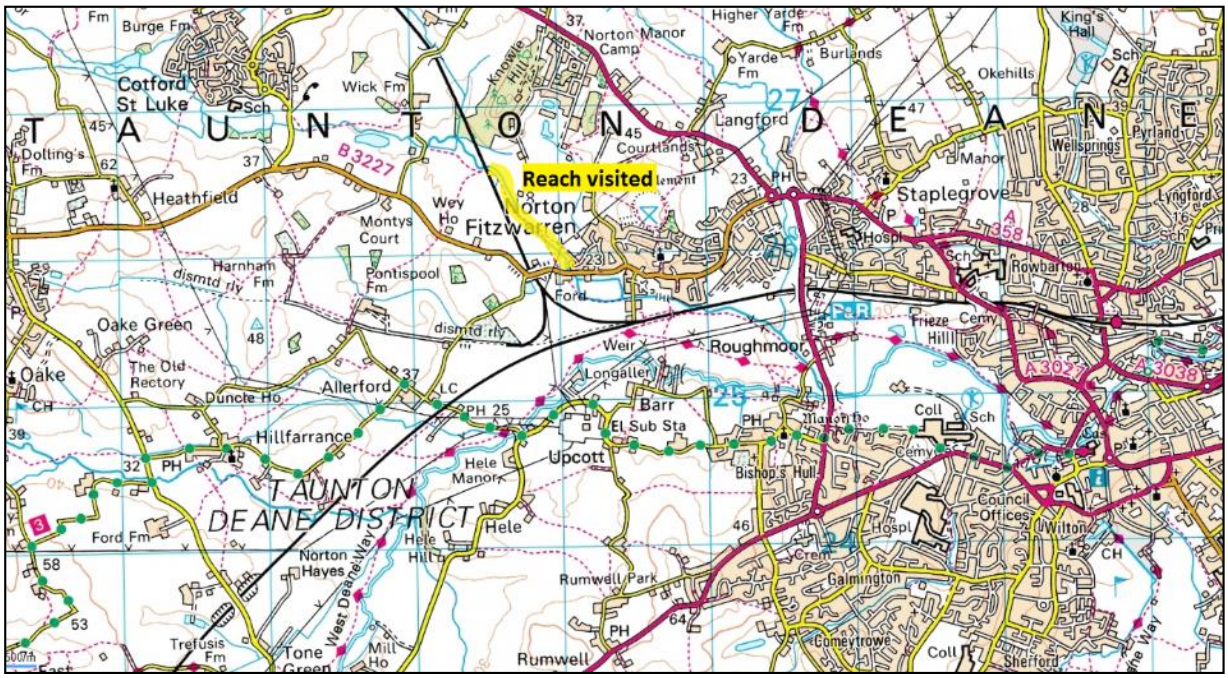

Figure 1: Map showing the location of the water visited

Catchment and Fishery Overview

The Halse Water is a tributary of the River Tone that rises from silicate-rich slate formations to the northwest of Norton Fitzwarren and drains a mixed geology catchment of mudstones, sandstones and alluvial pebble beds. This results in a sand and gravel riverbed flowing between incised clay banks. The clay banks naturally colour the river during high flows but the predominantly agricultural catchment is likely to result in a high volume of diffuse fine sediment which contributes significantly to water turbidity and bed sedimentation.

The Halse Water is a small but biologically diverse river supporting a range of fish species including bullhead (*Cottus* gobio), minnow *(Phoxinus phoxinus)*, stone loach (*Barbatula barbatula*), rudd (*Scardinius erythropthalmus*), chub (*Leuciscus cephalus*), dace (*Leuciscus leuciscus*), European eel (*Anguilla anguilla*), grayling (*Thymallus thymallus*), brown trout (*Salmo trutta*) and even Atlantic salmon (*Salmo salar*).

Despite the relatively good abundance and diversity of fish species recorded during Environment Agency surveys, the river is designated as failing its ideal targets for fish under the European Water Framework Directive. This designation is a reflection on the abundance of fish recorded compared against an ideal model scenario. As with many UK rivers, the Halse Water has undergone a number of historical modifications, such as straightening and the installation of weirs, for milling and land drainage purposes. These modifications will have affected the natural morphology of the river, reducing physical diversity and consequent range and abundance of aquatic habitat. In addition to historical modifications, the Halse Water is impacted by numerous common habitat and water quality issues associated with rural land management including diffuse inputs of fine sediment and excess nutrients.

The 'Moderate' (as opposed to 'Good') designation for fish is therefore not surprising, but does highlight the potential of the stream to be improved as a healthy and biologically diverse habitat.

Table 1: Water Framework Directive information (from Environment Agency website)

Site details	
Waterbody Name	HALSE WTR
Waterbody ID	GB108052021380
Management Catchment	South and West Somerset
River Basin District	South West
Current Ecological Quality	Moderate Status
Biological Quality:	
A characteristic or property of a biological element that is specifically listed in Annex V of the Water Framework Directive for the definition of the ecological status of a water body (for example composition of invertebrates; abundance of angiosperms; age structure of fish).	
OVERALL BIOLOGICAL QUALITY	Moderate
Fish	Moderate
General Physico Chemical Quality:	
OVERALL PHYSICO CHEMICAL QUALITY	Good
Ammonia	High
Dissolved Oxygen	High
pH	High
Phosphate	Good
Hydro Morphological Quality:	
OVERALL HYDRO MORPHOLOGICAL QUALITY	Not High
Hydrology	High
Morphology	Good
Specific Pollutants Quality:	
OVERALL SPECIFIC POLLUTANTS QUALITY	High
Ammonia	High
Copper	High
Zinc	High

Note: Anything classified as less than 'good' is failing quality targets

Habitat Assessment

For the purposes of this report the water visited will be described from the upstream to the downstream extent visited.

The Halse Water flows under the West Somerset Railway Line via a clear-span bridge (Figure 2) at the top of the reach inspected. Bridges are usually more favourable to river habitat than culverts as they allow for a greater free movement of river sediment (stone, gravel and fine sand and silt) as well as posing no physical or behavioural barriers to fish and other river wildlife.

Figure 2: The Halse Water flows under the West Somerset Railway line

From the bridge the stream flows in a south-easterly direction towards Norton Fitzwarren. The river was clear-flowing on the day of the visit and a relatively clean gravel bed was visible. The stream is slightly incised (cut down into a steep-sided channel) which is sometimes an indication of previous dredging works. However, areas with an underlying alluvial geology can have relatively mobile soils, suggesting that the river may naturally form such a channel. The steep and relatively friable banks are susceptible to erosion which, depending on circumstances, can have both positive and negative impacts on river ecology. Bank erosion is a natural component of river morphology, helping to maintain habitat diversity and introducing new gravel into the system. As a river slowly meanders across the floodplain, bank erosion exposes the gravel seam deposited hundreds or even thousands of years ago, often by the same river (Figure 3).

Figure 3: Natural bank erosion exposes the floodplain's gravel seam (centre of image). This introduces fresh gravel into the river system

Alongside the river, at the rear of the footpath on the right-hand bank (RB) is a pond surrounded by unmanaged and over-grown willows (*Salix* spp.) (Figure 4). The pond was difficult to access and it was not clear how (or indeed *if*) the pond was connected to the stream.

With some maintenance work, this pond could become a valuable local amenity that could help to connect the wider Norton Fitzwarren community with local wildlife.

At NGR ST 18707 26254, the river flows under a small footbridge and bends sharply to the left. Flow is pinched as it passes through the narrow footings of the bridge (Figure 5) which causes the flow to be accelerated towards the opposite bank (Figure 6). The faster flow combined with the back-eddy effect that occurs when a river channel becomes abruptly wider after a pinch-point (Figure 7) has contributed to bank erosion.

The narrow aperture of the bridge footings, which may have once been part of a sluice structure, was blocked by a loose piece of woody debris on the day of the visit (Figure 8).

Figure 4: The pond is overgrown and covered with duckweed (*Lemna* sp.) which could cause anoxic conditions. With some maintenance could be a valuable wildlife and community amenity

Figure 5: At ST 18707 26254 the Halse Water is pinched between the narrow footings of a footbridge

Figure 6: Flow is accelerated towards the opposite bank, exacerbating erosion.

Figure 7: Back eddies form as the channel abruptly widens after a narrow 'pinch point'

Figure 8: A small log was trapped against the bridge footings, slightly impounding the river upstream

From the footbridge the stream flows through an artificially straightened channel towards the village. Flow is sluggish and as a result fine sediment has dropped out of suspension and smothered the bed in places. Occasional patches of clean gravel were observed suggesting that a quantity of settled fine sediment may be periodically scoured away and flushed downstream during spate flows.

Straightened, dredged or otherwise 'channelised' rivers are often very poor freshwater habitats. The uniform depth and width results in an environment with a limited range of distinct habitat niches. The biodiversity of a stream is proportional to physical diversity of bed topography, channel widths, flow speed and direction and submerged habitat features such as woody debris (Figure 9).

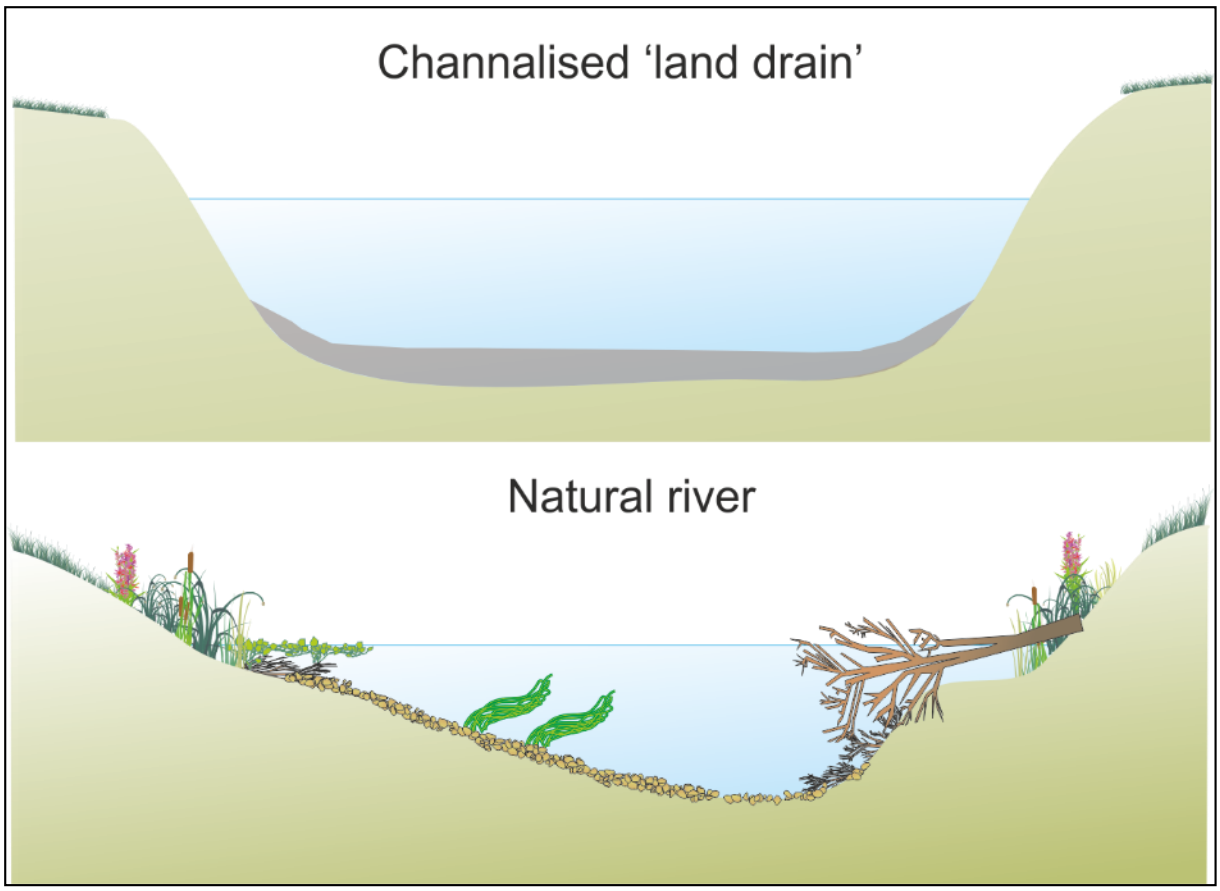

Figure 9: A healthy and biodiverse river contains a broad range of different physical conditions and features. Conversely, channelised rivers provide a much more uniform habitat, unable to support a broad range of plant and animal species.

The uniformity of the channel is slightly mitigated by occasional roots and trailing branches which provide some good cover habitat. Occasional woody habitat features consisting of fallen branches and small logs also help to introduce some valuable habitat and help to diversify flow.

For millions of years, trees and tree limbs have fallen into rivers, forcing flow to scour around them and re-shape the channel. The generation of such structural variety is the basis of an associated biological diversity. Many river species have evolved to utilise these features, either as a food source (i.e. directly by invertebrates with shredding mouthparts, or by indirectly by invertebrates that graze on algae growing on the wood), or as a refuge or ambush habitat. Emergent woody material can also be an important interface between the aquatic and terrestrial habitats for fly life with life-stages in both.

However, if fallen debris constricts flow more severely than the narrowest point of conveyance downstream, flood risk can become increased upstream of that debris. In the past this has often led to the perception that woody material should be removed as a matter of course and in many cases all but the smallest pieces

of woody debris have been indiscriminately removed, regardless of the risk posed. That policy also precludes any potential *reduction* of overall flood risk across the catchment that can result from fallen debris.

Over the past few decades, the role of woody debris in river ecology and morphology have become better understood and it is now widely accepted that woody debris is a vital component of the river ecosystem. On a catchment scale, in-stream woody material can also actually help to reduce flooding in lower reaches by slowing the rate at which water drains down through the river catchment.

On the day of the visit, a large tree had fallen across the stream (Figure 10). This was collecting leaf litter and other debris. In this particular incidence the tree poses an increased flood risk and should be removed.

Figure 10: A fallen tree has significantly blocked the channel

Whilst the channelised stream limits habitat diversity, the steep banks provide an abundance of burrowing habitat for water voles *(Arvicola amphibius)* (Figure 11). Water voles are a protected species and Britain's fastest declining wild mammal. Water voles, like many river species, need an abundance of marginal vegetation for food and cover. The wide buffer strip between the stream and the ploughed field on the RB will help with the abundance of cover but the uniform canopy height

and density of the alders *(Alnus glutinosa)* along the LB casts uniform shade over both banks, possibly limiting marginal plant diversity (Figure 12).

Figure 11: Burrows in the bank appear to be those of the Water vole

Figure 12: A view (facing upstream) of the wide buffer strip and uniform tree cover over the straightened reach

At ST 18846 26126, the river is impounded by a weir which forms the footings of a small footbridge (Figure 13). The original purpose of the weir is unclear but a study of maps from 1887 (old-maps.co.uk) show that sluices were once positioned

in several locations along this part of the Halse Water and the block-stone revetments either side of the weir hint at an industrial past.

Figure 13: A weir now forms the footings of a footbridge but probably had a more industrial purpose originally

The wide crest of the weir (Figure 14) makes it a complete barrier to fish passage under most flow conditions. However, the weir may be passable to large adult trout under spate conditions when the head loss (the difference between the water level above and below the weir) is reduced.

Figure 14: The wide crest makes the weir a complete barrier for most fish species

Impounding structures such as weirs not only pose a barrier to fish passage and fragment river habitats into smaller, more vulnerable ecosystems; they also interrupt natural bed load transport and slow flows upstream, resulting in sedimentation and reduced habitat diversity (Figure 15).

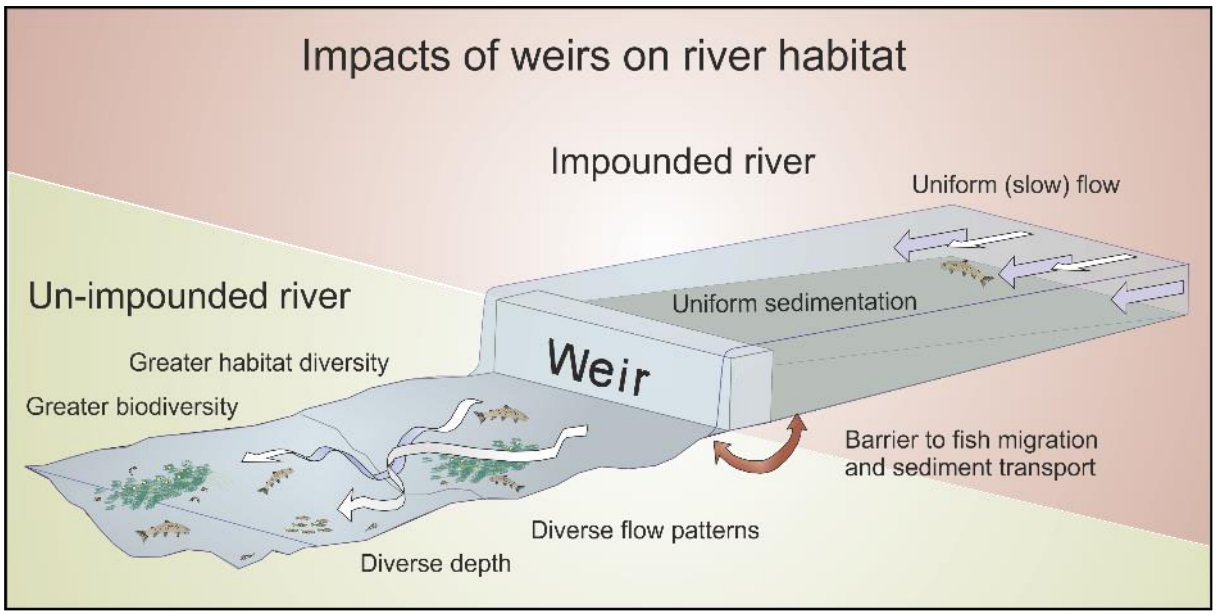

Figure 15: An illustration showing the various impacts of weirs on river habitat

Below the weir the channel abruptly widens out in a similar scenario to the footbridge upstream (see Figure 6). The eddying flows during spate conditions have led to bank erosion on the left bank (Figures 16) which appears to have been exacerbated by dense shade inhibiting vegetation growth and by dogs scrambling up and down the bank.

Fortunately, the bankside trees that are presently casting shade over the banks also give rise to a cost-effective solution to repair the erosion. Coppicing the surrounding hazel *(Corylus avellana)* will allow direct sunlight onto the banks and will also give rise to coarse woody material which can be used to create a brushwood 'marginal mattress' to patch up the erosion and provide a growth medium for marginal plants (Figure 17).

Densely packed brushwood structures quickly accumulate fine sediment and with sufficient sunlight should eventually become colonised by emergent river plants. The roots of these plants will replace the brushwood as it decays over time, locking in accumulated sediment and forming a natural lower bank.

Figure 16: An eroded bay on the left-hand bank on the weir pool

Figure 17: Eroded bays patched up on Wellow Brook at Midsomer Norton, Somerset. Brushwood from felled trees is packed behind a row of sweet-chestnut stakes securely driven into the bed (image taken immediately following installation)

The process of colonisation can be accelerated by introducing marginal turfs translocated from the riverbank nearby or by planting with native marginal plants purchased from specialist suppliers.

Downstream of the weir the river is free-flowing, allowing natural morphological processes to take place. As a result the channel becomes more sinuous and forms a natural sequence of pools and riffles (Figures 18 & 19).

Figure 18: The river downstream of the weir has a greater diversity of depth, width and flow conditions.

Figure 19: A natural pool and riffle sequence is important for providing habitat for different fish species and life stages

Flow diversity is important for a healthy river ecosystem, as the greater the range of flow patterns, the more diverse the scouring effect of the flow will be. This results in a greater diversity of physical habitat niches and enhanced opportunities for a variety of aquatic life to flourish. For wild trout, a diverse river will provide better habitat and refuge for the various trout life-stages, and a higher chance of fish surviving to breed. In addition, being relatively territorial, trout can more densely populate a section of river where the topography of the bed and the range

of submerged features such as large woody debris (LWD) create a mosaic of different micro-territories. Trout are also apex predators, relying on the whole ecosystem to provide a complex diet. These complex habitat requirements are why wild trout are such a good indicator species for the overall health of a river.

The full extent of the river visited was accessible via a footpath along the bank and parts of the river towards Stembridge Way are especially attractive (Figure 20). This could provide an opportunity to undertake a community-driven project that would improve the river for wildlife and also as a public amenity to be enjoyed by the local community.

Figure 20: The Halse Water near Stembridge Way is an attractive landscape feature which should be enjoyed by local people

Recommendations:

In order for the section of Halse Water visited to achieve its full potential as a good quality and biodiverse habitat, capable of supporting healthy, self-sustaining populations of wild brown trout, the following actions are recommended:

1. The hazel and small trees around the eroded bay should be coppiced to allow more sunlight onto the banks. Arising brushwood should be retained and used to repair the erosion.

2. Repair the eroded bay by installing a brushwood marginal mattress via the following methodology:
    - Drive wooden (ideally sweet chestnut) stakes securely into the bed at approximately 800mm centres to form the outer edge of the mattress.
    - Densely back-fill behind the stakes with the coppiced brushwood to approximately average summer water level.
    - Drive a second row of stakes through the brushwood and into the bed to form an upper terrace at the rear of the structure
    - Back-fill the upper terrace with coppiced brushwood.
    - Lay straight rods of hazel across the structure and secure to the stakes with galvanised fencing wire and staples.
    - Drive the stakes further into the bed to compact and secure the brushwood (Figure 21).

This solution should require no more than one or two days work, should cost no more than £500 - £1000 and will be significantly more sensitive to the river ecosystem than a hard-engineered solution This type of solution is also likely to be more successful as the brash absorbs and slows flow against the banks, rather than deflecting erosive forces dowsntream.

Figure 21: An illustration of how a brushwood mattress repair of the eroded bay would look (pre-vegetation).

3. The weir at ST 18846 26126 (Figure 13) is a major limiting factor affecting the quality of the river habitat. The original purpose of the weir is unclear and it is likely that the weir presently provides no useful function. Ideally it should be removed or a significant portion of it should be lowered to bed level.

   Whilst this option will provide the best outcomes for the river as a habitat and for biodiversity in general, the removal of a weir on an artificially straightened channel is not necessarily a straight forward undertaking.

   A sudden drop in bed and water level can potentially lead to head-cut erosion (erosion of the bed) or reduced bank stability. Whilst these risks are relatively low on such a small weir, advice should be sought from the area Environment Agency geomorphologist, John Philips (john.phillips@environment-agency.gov.uk)

   If the removal or lowering of the weir proves unfeasible in the short term, other options to improve fish passage and habitat connectivity should be explored. For example, a stepped, retained riffle could be installed to replace the weir whilst retaining the water level upstream. This technique has been successfully used on other rivers to improve fish passage by spreading out the head loss of an impoundment (Figures 22 and 23).

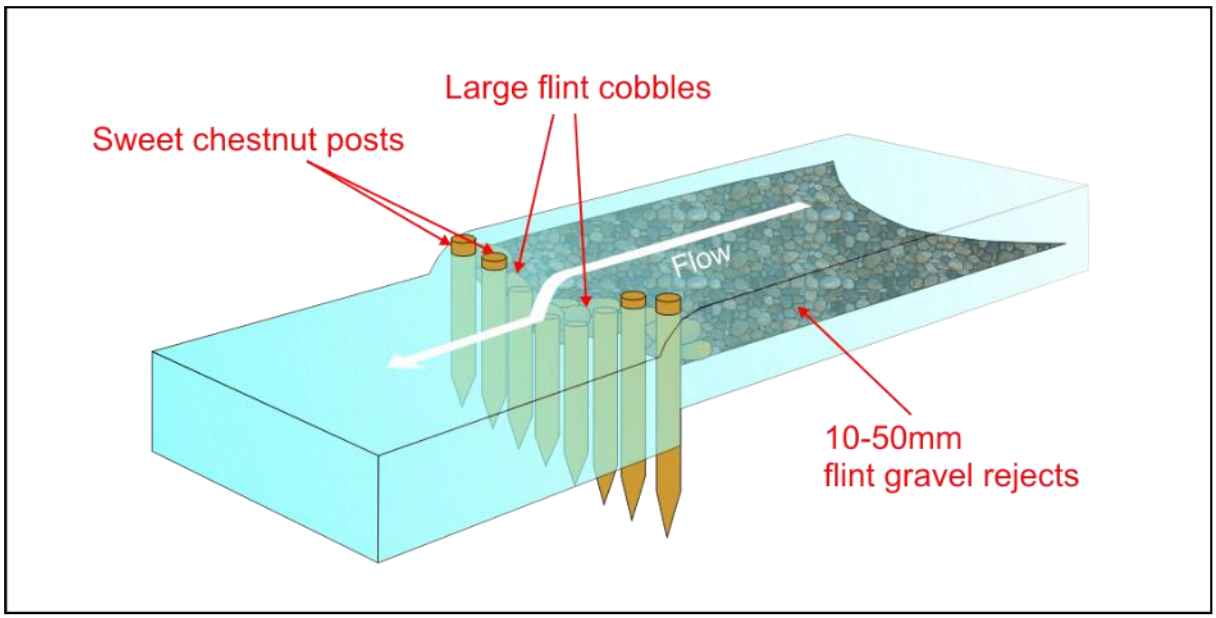

Figure 22: An illustration showing a basic design of a retained riffle fish pass

Figure 23: A long gravel riffle passage easement installed to replace a weir in Ravensbury Park on the River Wandle. (Image courtesy of Cain Bio-Engineering Ltd).

Another option could be to install a technical fish pass on the weir. A number of engineering firms specialise in bespoke and pre-fabricated fish and eel passes that can be attached to existing structures. As a minimum, fish passage over the weir should be eased by installing timber baulk pre-barrages to create a 'pool and traverse' passage easement (Figure 24).

Figure 24: An example of a timber pre-barrage installed to ease fish passage by raising water level immediately below a weir

4. Engage with the local community and gauge what interest there might be in a WTT River Habitat Workshop as a means of galvanising interest in the river and its wildlife. A small team of regular volunteers to undertake simple litter picks and perhaps even conduct monthly invertebrate samples will benefit the river and will also reduce the time between potential blockages, such as the log at the upper footbridge (Figure 8) and the large fallen tree (Figure 10), occurring and being reported and dealt with. A WTT Habitat Workshop will also provide an opportunity to educate local people about the difference between beneficial 'woody habitat' features and scenarios where woody material could potentially raise the risk of flooding. Details of the Anglers Riverfly Monitoring Initiative, a method for assessing water quality through the invertebrate fauna, can be found at the Riverfly Parnership website www.**riverflies**.org/.

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 formal Flood Defence Consent (FDC) from the Environment Agency. This enables the EA to assess possible flood risk, and also any possible ecological impacts. The headwaters of many rivers 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/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 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.