Advisory Visit

River Kent – Levens Hall

10/04/2017

Undertaken by Gareth Pedley

Key findings

- Low and trailing cover was generality lacking along the river and is likely to be a major factor impacting upon the fish populations at this location. The scarcity of sub-surface structure limits the availability of habitat, meaning that the river cannot hold or produce as many fish as it would do with a full range of micro-habitats/niches.
- A lack of refuge structure also leaves the fish that are present more susceptible to predation, particularly from fish-eating birds like goosanders and cormorants. The fish basically have few areas in which they can evade those predators.
- Simple techniques could be employed to increase the availability of structure and cover in the short-term (selective coppicing, tree/branch laying) and longer term (retaining any woody material that falls into the channel and planting trees to grow out over and into the channel). These actions would improve the resilience of fish stocks to predation and increase the numbers of fish that can be held and produced within the reach.

1.0 Introduction

This report is the output of a site visit to the River Kent at Levens Hall, south Cumbria. The visit was undertaken for Richard Bagot (Estate owner), to assess riverine habitats and offer recommendations that will help develop and improve the wild trout fishery. Also present on the day of the visit was Jayne Wilkinson (South Cumbria Rivers Trust).

Normal convention is applied throughout this report with respect to bank identification, i.e. the banks are designated left bank (LB) or right bank (RB) whilst looking downstream. The Ordnance Survey National Grid Reference system is used for identifying specific locations and references to upstream and downstream are often abbreviated to u/s and d/s, respectively, for convenience.

2.0 Catchment and fishery overview

"The River Kent and its tributaries support nationally important populations of whiteclawed crayfish *Austropotamobius pallipes*. One of the headwaters also supports one of the largest populations of fresh water pearl mussel *Margaritifera margaritifera* in England.

The River Kent's main tributaries have their catchments in the south eastern Lake District fells. On the higher ground these drain from rocks of Ordovician and Silurian age. Natural mineral enrichment provides the calcium necessary for growth of crayfish. Downstream from Kendal, the main channel of the Kent flows through a series of limestone defiles and gorges. This stretch is influenced by calcium-rich limestone springs.

White-clawed crayfish are found throughout the river system, from the headwaters of the Rivers Kent, Gowan, Mint and Sprint downstream to the lower reaches of the main Kent channel near Sedgwick. The Kent is the only major river system in England where populations of white-clawed crayfish can still be found throughout the catchment, wherever there are suitable habitats. Within the Kent catchment, crayfish are found in the lower reaches near sea level up to at least 250m above sea level in the headwaters of the Rivers Kent and Mint. Dubbs Beck, the headwater of the River Gowan, also has populations in two small reservoirs.

The Kent system presents a variety of habitats for crayfish. This includes extensive areas with a loosely structured but stable stream bed of cobbles and stones. Crayfish are also found in the more unstable, turbulent reaches of the upper Kent and Sprint wherever there are small areas of cobbles and stones at the edge of channels. In the lower reaches, and particularly

through Kendal, there are extensive beds of water crowfoot *Ranunculus* spp. and alternate-flowered water-milfoil *Myriophyllum alterniflorum* providing a further habitat and food source for crayfish. In the headwaters of the River Gowan, populations are found in streams less than a metre wide with only a few centimetres depth of water. This contrasts with the lower stretches of the main Kent channel where crayfish are found in much deeper water amongst boulders and shattered bedrock.

The main channel of the River Kent has extensive reaches with undisturbed riparian habitats of woodland and tall riparian vegetation. Much of the river system is lined with tall, marginal vegetation of reed canary-grass *Phalaris arundinacea*, hemlock water dropwort *Oenanthe crocata* and associated tall herbs and grasses. The submerged roots of these plants, and the diversity of habitats created by the riparian vegetation, provide excellent refuges for crayfish." (www.sssi.naturalengland.org.uk/citation/citation_photo/1003424.pdf)

The river also supports populations of both Atlantic salmon (*Salmo salar*) and resident and sea run brown trout (*Salmo trutta*). Although receiving only a brief mention in the citation for the Kent SAC, they are also Biodiversity Action Plan (BAP) priority species in their own right, are pivotal to the lifecycle of the river's pearl mussel populations and, therefore, should receive equal standards of protection and promotion.

Table 1. Overview of the waterbody details for the section of River Kent visited

	Waterbody details
River	Kent
Waterbody Name	Kent – conf Sprint to tidal
Waterbody ID	GB112073071460
River Basin District	North West
Current Ecological Quality 2015	Good (all aspects assessed as High or Good – fish not assessed)
U/S Grid Ref of reach inspected	SD 50646 86277
D/S Grid Ref of reach inspected	SD 49237 85192
Length of river inspected (km)	2.2

(http://environment.data.gov.uk/catchment-planning/WaterBody/GB112073071460)

3.0 Habitat Assessment

The river was walked in an u/s direction, from the Hall to the u/s extent of the deer park. This report will discuss the observations of the visit working chronologically u/s.

The first pool viewed is relatively wide and open, with a rough buffer strip along the LB, adjacent to a lightly grazed livestock field. The breast-wire buffer fence excludes cattle but any sheep within the field have access to the LB. Sheep access is usually of detriment to the beneficial river bank vegetation and limits tree regeneration. However, here, it appears that the extent of sheep grazing is limited. As a result, a visible improvement in the habitat quality is still achieved within the buffer (Fig. 1). Fencing to completely exclude sheep from this area would further improve the quality of that habitat but would require a fence that would be more susceptible to fold damage, and could allow a proliferation of Himalayan balsam that would then require control. Marginal habitat along the LB is limited owing to the natural morphology of the pool (e.g. relatively shallow water gravel bed) but provides some refuge for fry. This habitat could be enhanced by laying the bankside willow into the river margin to provide additional cover and shelter.

The far bank provides a greater extent of cover through increased flow and water depth, and the presence of bankside trees; this is the area around which most of the anglable fish are likely to hold. However, the quality of habitat along the RB is greatly limited by past tree maintenance work to improve angling access (primarily removal of any low/trailing branches). This kind of work is often undertaken with the best intentions but greatly reduces the availability of in-channel structure that is required for fish-holding habitat and as refuge from high flows and predators (Fig. 1). The reduction in habitat availability and quality actually reduces the number of fish the pool can hold.

To greatly improve the quality of that habitat, bankside trees should be allowed to develop naturally and overhang, and ideally trail into the watercourse. To rapidly reinstate some of the lost cover and greatly improve the habitat and fish-holding potential of the pool, the previously pruned willow tree (suspected to be crack willow *Salix fragilis*) on the far bank could be laid into the river margin (see Recommendations).

Slightly further u/s in the pool, similar pruning work on the bankside sycamore trees (*Acer pseudoplatanus*) has also denuded them of low and trailing branches (Fig. 2). Coppicing of one or two of these trees would encourage low level regrowth and help reinstate some of the lost habitat.

Figure 1. Note the general lack of low and trailing cover resulting from past tree pruning/maintenance (blue ellipse). Some of the now lacking cover could be quickly and easily reinstated by laying the willow tree (red ellipse) down into the water along the river margin.

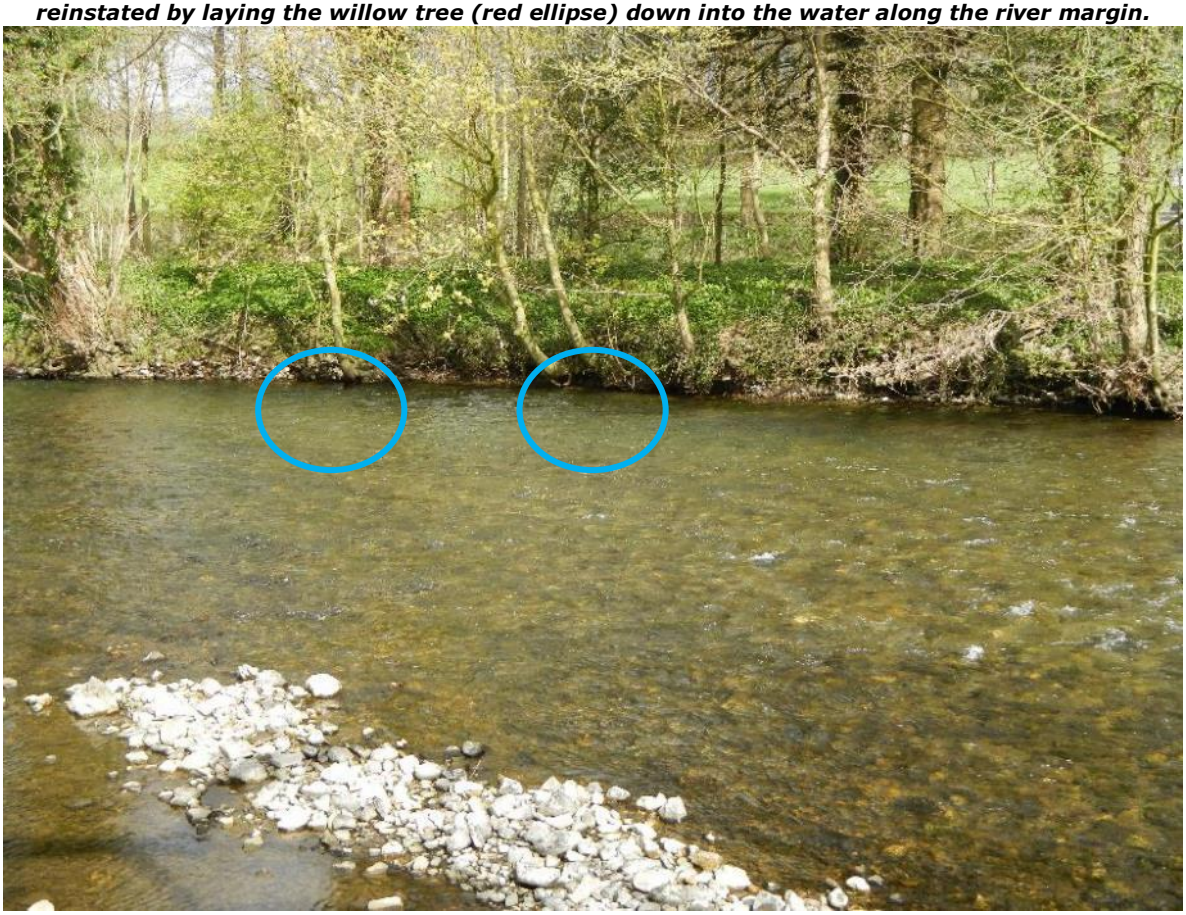

Figure 2. Raised canopy through past pruning work (some will also be lost through high flows/natural breakage, so it is important to preserve/promote this habitat wherever possible). Coppicing one or two of the trees, low to the water (blue circles), would help reinstate the lacking cover.

Land use and the habitat available changes dramatically u/s of the A6 road bridge, where the land is managed as deer park. It is understood that sheep were also grazed there until recent years and the impacts may still be evident in a general lack of natural tree regeneration (small shrubs) and herbaceous bankside vegetation (Fig. 3). The availability of bankside vegetation may now naturally increase over upcoming years, depending upon the grazing/browsing intensity by the Norwegian black fallow deer (*Dama dama*). Planting with native deciduous saplings and willow (*Salix* spp.) whips in order that they can be encouraged to grow over the river would be beneficial, providing that they are not simply browsed off by the deer. If allowed to establish, they would then greatly enhance the habitat back towards a more natural state, with increased shade and structure.

The river is naturally active geomorphologically and provides a beneficial supply of coarse sediment through the reach, to the benefit of both invertebrate, and salmonid spawning and juvenile habitat (Fig. 3). Although resident trout often seek spawning sites on smaller tributaries, some main stem spawning is likely to be undertaken, with salmon and sea trout almost certainly utilising the main channel. Increasing cover and structure within the river margins is a sure-fire way to improve juvenile habitat and the survival rates of fry and parr within the main river. Increasing the prevalence of bankside trees and vegetation (and their root matrices within the bank) will also help to stabilise the river bank material and therefore reduce the potential for over-widening of the channel and allow narrowing of the channel in areas over-widened through previous bank erosion.

Where established trees are present along the banks they provide valuable shade and cover that it is vital to preserve, avoiding any temptation to trim or prune their branches (Figs 4 & 5). Anglers often feel that they are being restricted from accessing the best lies by overhanging trees, but there is absolutely no point in removing the vital habitat that is accommodating the fish in the first place. Even if fish within a location are not accessible all of the time, they will move to feed in different locations, at which point when they will become available to anglers.

The alternative: removing the habitat that holds fish is likely to result in the fish vacating those areas and the river section holding less fish. Owing to the height of the trees above the water (often influenced by limestone bedrock towards the base of the bank/cliffs – Fig. 5) it is important to allow them to grow out over the channel and trail down into it. Consider that, although some fish may be inaccessible at times, they will all be contributing to the population of a wild fishery, being long-term residents of an area and part of the spawning population. Until the carrying capacity of the river in its near-pristine state is reached (unlikely with today's anthropogenic impacts upon habitat), the more fish present within the river, the more that can be produced and the greater the size of populations that are achievable.

Figure 3. A general lack of bankside trees for shade and in-channel structure. Note the un-vegetated gravel bar signifying an active transport of coarse sediment through the system.

Figure 4. Where bankside trees are present on the outside of bends they greatly enhance the fish-holding potential of those areas. Any trailing branches that meet the water enhance it further, as will any other woody material that can be retained within the channel.

Figure 5. In areas, the rocky nature of the lower bank limits the availability of low tree cover, it is therefore important to allow branches to grow out and over the channel.

A weir, towards the upper end of the reach, creates an unnecessary impediment to sediment transport and potential behavioural barrier to fish movement (Fig. 6). The impact upon sediment transport (effectively working like a gravel trap) means that much of the water depth the weir once created u/s is now lost. At high flows, more of the river's bed material will also be forced out of channel and across the field (as can be seen), rather than continuing along the main channel. The flow deflection effect around the hard stone structure is also clearly increasing bank erosion.

Although most fish could easily ascend or descend the weir relatively easily, in low flows, they are likely to be at least partially obstructed / delayed by it. This will cause increased numbers of fish to congregate in the area, allowing predators greater feeding opportunities and increasing their impact upon the fish population. The solid structure within the channel also provides a barrier against which fish can be corralled against by predators, making it easier for them to fish the area, again, increasing their impact.

In contrast, large diffuse structures within the channel like trees and logs actually favour the fish (prey species), which can more easily manoeuvre through the structure than predators (particularly fish-eating birds) allowing them to evade capture and further protecting wild fish populations. Installation of additional diffuse in-channel structure and retention of natural structure is therefore a vital part of protecting wild fish populations.

Figure 6. An unnecessary impediment to sediment transport and fish movement that is also likely to increase the impact of bird predation upon the fish. Note the increased bank erosion around the hard stone structure.

4.0 Recommendations

After inspection of the Levens Hall reach of the River Kent, the following simple actions are recommended to improve habitat quality and promote the wild fish populations of the reach:

4.1 Tree Laying

Where trees of a suitable species are already established along the banks (like the willow identified in Fig. 1), habitat improvements can be quickly and easily achieved by laying the trunks, or branches down into the watercourse. Laying is usually limited to pliable species, predominantly willow (*Salix* spp.), hazel (*Corylus avellana*), elm (*Ulmus minor*) and small alders (*Alnus glutinosa*), but some others can be laid carefully when they are small.

The method involves cutting part way through the stem/trunk, a little at a time (ideally while it is under light tension), until it can be forced over into the river (Figs 7 & 8). The depth of the cut should be limited to only that which is required to bend the limb over, as this will maintain maximum strength in the hinge and the health of the tree/shrub. Fast growing trees like willow can even be strategically planted in anticipation of employing this technique once they become established.

Figure 7. Willow hinged into the river margin to increase cover and structure.

Figure 8. Hinged hazel.

4.2 Installation of woody material

Dead woody material can also be introduced to the channel to provide significant habitat enhancements and increase the level of protection from predators (particularly piscivorous birds). The technique involves cutting a tree/shrub and then cabling it to its own or an adjacent stump, to keep it in place (Figs 9 – 13).

Figure 9. Felling the tree.

Figure 10. The tree is down and just needs slewing round into the river margin. It could be left for the river to do this do this during the next high water event, providing the tree is well cabled to its stump before it is left.

Figure 11. A basic tree kicker setup using 4000 kg breaking strain cable and two pairs of cable clamps on either end. The webbing strap in the background is used to pull the kicker close to the stump for fastening but is removed once the cable is fully fixed in place.

Figure 12. Tree kicker cabled and slewed round to lie along the bank. In this instance a bore cut has been made into the trunk, through which the cable is passed.

Figure 13. The finished job – a tree kicker employed to provide cover within the river margin and focus flows down the far side of the channel. When installed on the shallower inside of a bend (depositional areas), this method can be employed to increase sediment deposition. When installed within the main flow, the technique can be employed to increase in-channel cover and fish-holding structure.

4.3 Coppicing

Particularly where there is a predominance of one age class of tree and/or the canopy is of a uniform height, low coppicing can be a great way to increase habitat diversity by rejuvenating low-level regrowth. This technique would be ideal for the trees highlighted d/s of the A6 road bridge (Fig. 2). This technique should always be undertaken sparingly, only on the occasional tree, to ensure that one type of habitat is not gained at the expense of another. The resulting material can then, potentially, be employed as tree kickers.

Coppicing should be undertaken during the dormant season as this is when the process will create the lowest impact upon the tree and it will have the greatest chance of survival. When used properly, this technique causes minimal impact on a tree's long-term viability and can actually reinvigorate the tree (like pruning a rose). Coppicing can therefore often extend the life of a tree, particularly if the work reduces weight out of the tree's crown and allows it to remain in place longer.

4.4 Planting

It is recommended that judicious planting with locally native, deciduous tree species is undertaken wherever cover is lacking. Saplings can be purchased, or possibly otherwise obtained from the Woodland Trust, to provide a natural variety of species but the quickest and easiest way of establishing trees is by pushing short sections of fresh willow whip into areas of wet

ground, ideally close to the waterline. This can be undertaken at any time of the year, but will have the greatest success during the dormant season, shortly before spring growth begins (ideally late Jan-March). Whips should be planted ground so that there is a greater length within the ground than out of it, to minimise the distance that water has to be transported up the stem; 30-40cm of whip protruding from the ground is sufficient (providing this protrudes past the surrounding vegetation to allow access to light). Whips of 5mm-25mm diameter tend to take best, but even large branches can be used. Care should be taken not to leave excessive amounts of foliage on the whips as these greatly increase the surface area of the plant and can lead to their dehydration.

The species of willow whip that should be used will depend upon the required result. Small shrub willow species, particularly grey willow and goat willow (*Salix cinerea and S. caprea*) tend to be best for creating low, dense fish holding cover with larger individual trees eventually growing out into the channel. Larger specimens can also be ideal for laying into the channel. Large crack willows tend to grow fast and collapse under their own weight, so creating a great method of naturally introducing woody material and structure into a channel.

4.5 Weir structure removal

Removal of the weir towards the u/s end of the fishery (Fig. 6) would be beneficial to reinstate substrate transport and reduce the potential for increased bird predation. This would also reinstate more natural sediment transport through the section. The redistribution of sediment (bed material of all sizes) is central to the creation of varied habitat features that trout and invertebrates need to complete their full lifecycles.

5.0 Making it Happen

WTT may be able to offer further assistance such as:

- WTT talk
    - Further to this report, it may be possible for a WTT conservation officer to attend an AGM or evening meeting to discuss the topics covered in this report. Many of the concepts, particularly around the installation of woody material, can seem daunting to anglers at first and discussion around the subject can help to address any concerns.
- WTT Project Proposal

- WTT can devise a more detailed project proposal (PP) report. This would usually detail the next steps to take in initiating improvements, highlighting specific areas for work and how it can be undertaken. The PP report could then form part of any required consent applications.

- WTT Practical Visit
  - Where recipients are in need of assistance to carry out the improvements highlighted in an advisory visit report, there is the possibility of WTT staff conducting a practical visit. This would consist of 1-3 days' work, with a WTT Conservation Officer(s) teaming up with interested parties to demonstrate habitat enhancement methods (e.g. tree kickers and willow laying etc.). The recipient would be asked to contribute to the reasonable travel and subsistence costs of the WTT Officer.

In addition, 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

We have 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.

6.0 Acknowledgement

The Wild Trout Trust would like to thank the Environment Agency for their continued support of the advisory visit service with funding from rod licence sales.

7.0 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.