WILD TROUT TRUST

Bentley Brook (aka Bradbourne Brook)

(River Dove Catchment)

Derbyshire

February 2024

Author: Tim Jacklin (tjacklin@wildtrout.org tel. 07876 525457)

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1. Introduction

The Wild Trout Trust (WTT) was approached for advice by Leek & District Fly Fishing Association (LADFFA, www.ladffa.com) on an approximately 1.6-km section of the Bentley Brook near Tissington, Derbyshire. The visit was undertaken on the 26th February, 2024. A number of previous habitat improvement works have been carried out here under WTT advice and supervision as detailed below.

Specific locations are identified using decimal latitude and longitude (e.g. **53.065770 , -1.7035809**), which can be pasted straight into Google Maps to identify locations. Figure references within the text of the report are hyperlinked (green font), so holding Ctrl and left-clicking on them will move to that point within the document.

2. Background

The Bentley (or Bradbourne) Brook is a tributary of the River Dove, with the confluence near Ashbourne, Derbyshire. It runs off limestone geology in the White Peak area of the Peak District National Park and supports a good wild trout and grayling fishery. The section of brook fished by LADFFA extends from around the ford near Tissington for approximately a mile downstream.

Table 1 summarises the ecological assessment by the Environment Agency under the Water Framework Directive for the Bentley Brook waterbody, with an overall *Poor* ecological status. The Reasons for Not Achieving Good status (RNAGs) include diffuse agricultural pollution and point source sewage discharges (elevating phosphates and impacting plants and algae). It should be noted that the sewage impacts refers to Ashbourne sewage treatment works which discharges 6km+ downstream, but diffuse agricultural pollution is evident on this reach.

River	Bentley Brook
Waterbody Name	Bentley Brook Catchment (trib of Dove)
Waterbody ID	GB104028052750
Current Ecological Quality	Overall **Poor** Ecological Status (Assessment cycle 3, 2022)*
U/S limit inspected	53.066963 , -1.7021245 (SK 20057 52233)
D/S limit inspected	53.055354 , -1.7077122 (SK 19688 50940)
Distance inspected (KM)	1.6km

*Table 1 Waterbody details from https://environment.data.gov.uk/catchment-planning/WaterBody/GB104028052750. *The monitoring sites used to classify this*

waterbody are downstream of the reach inspected during this visit, the nearest being Mapleton Bridge near Ashbourne (53.019106 , -1.7446769).

Another RNAG affecting the watercourse are barriers affecting fish movement, some of which have been addressed since this 2022 assessment (see below).

Previous improvement works carried out on the LADFFA sections include:

- Pre 2011 – installation of log flow deflectors and brushwood mattresses on the downstream section (between the sluices).
- 2015 – removal of impoundment caused by collapsed packhorse bridge (53.057791 , -1.7072609); removal and notching of low weirs; introduction of woody material at various locations (as noted in habitat assessment below).
- 2023 – notching of large weir/sluice at downstream end of the fishery; fencing out livestock on RB between the sluices.

Non-native signal crayfish are present in the fishery; these were until recently thought to be restricted to the lower reaches of Bentley Brook by weirs/barriers to movement, but were discovered on the LADFFA section in 2016 having spread upstream despite the presence of weirs. Evidence of water voles was found on the LADFFA section in 2015 and mink rafts were observed during this visit.

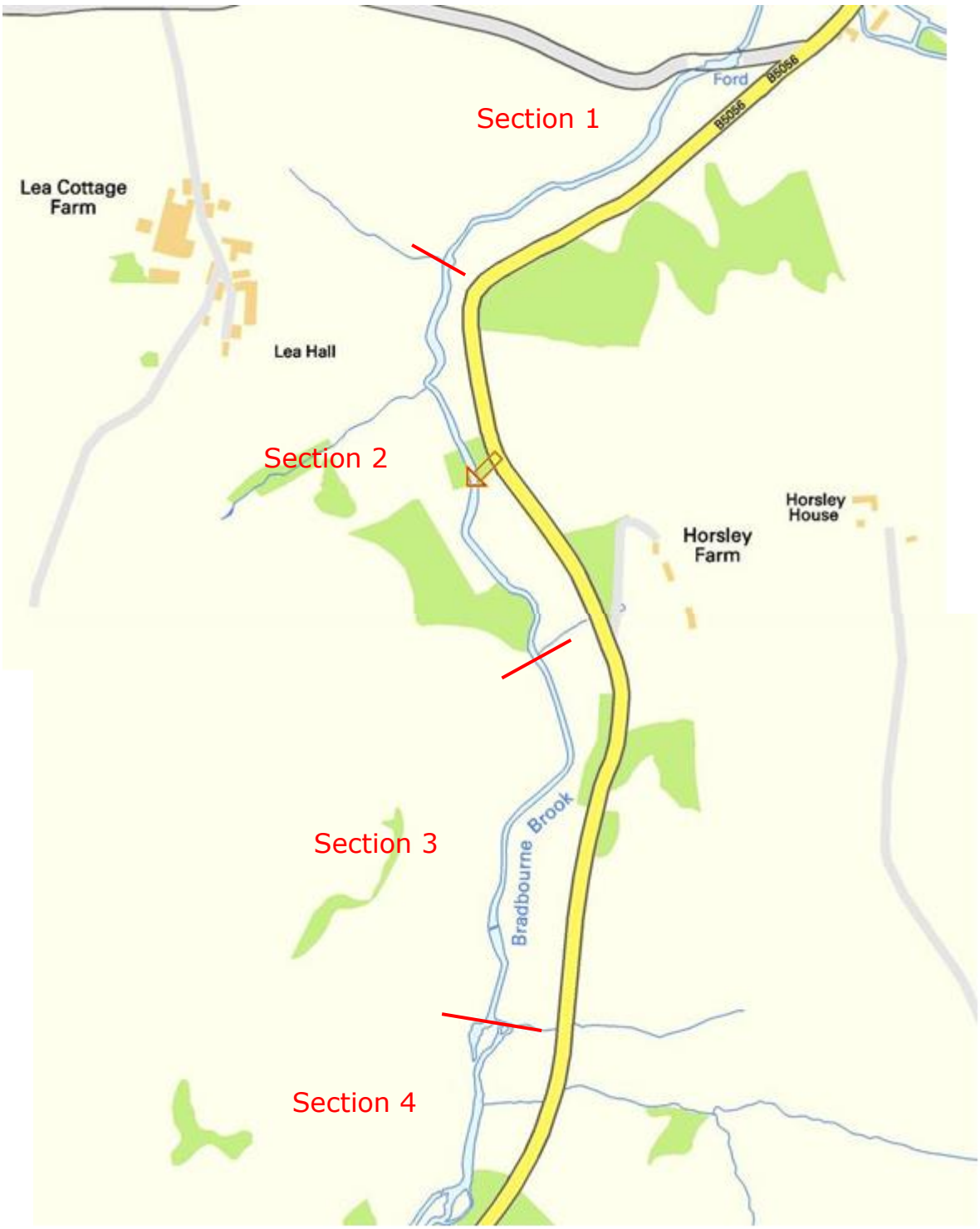


Figure 1 LADFFA waters on the Bentley Brook, split into sections referred to in the text.

3. Habitat Assessment

The reach is described in a downstream direction from the upstream limit.

3.1. Section 1 Upstream Limit to RB Field Boundary above Lea Hall (53.064184 , -1.7078483)

The upstream limit of LADFFA water is at the confluence of the Havenhill Brook and Bletch Brook. On the day of the visit, the former was running clear whereas the latter was carrying some turbidity, potentially indicating the source of some of the diffuse agricultural pollution noted in section 2.

Between the upstream limit and the ford, vegetation cover is relatively sparse. The banks are grazed (more so on the RB) restricting vegetation to short grass and a handful of trees and bushes and their submerged root balls; no tree succession is occurring (Figure 2). A lack of low/submerged cover limits available habitat for trout and restricts their numbers.

Figure 2 Limited cover, few trees and no tree succession due to grazing.

Improving riparian cover here would rely on excluding livestock from the river bank. The left bank (Figure 3) appears to be protected from grazing to some degree by the drystone wall, although an absence of self-seeded trees suggests some browsing is preventing trees establishing. It may be possible here to plant some willow whips and/or peg some live willow bundles into the river margins to improve cover. Checking each end of the wall and making sure the river bank is inaccessible to livestock is also recommended, e.g. with a post-and-rail barrier (easily repaired after floods).

Figure 3 Absence of shade or cover.

Downstream of the ford are a series of low, concrete weirs (Figure 4, Figure 5 and Figure 6). These have been outflanked by bank erosion to varying degrees and LADFFA and WTT have previously attempted to manually notch / partially remove the structures (with limited success due to the very resistant concrete). Recommendations for each structure are noted below.

Figure 4 First weir downstream of the ford. Continue to enlarge and deepen the notch close to the true RB (left of shot).

Figure 5 Second weir downstream of the ford. Notch the weir at its lowest point (arrow)

Figure 6 Third weir downstream of the ford. No action required.

Mature alder trees are present along this section and their submerged root balls provide some cover, but grazing is limiting bankside vegetation to a short grass sward and preventing tree succession, with direct negative consequences for riparian habitat. Towards the field boundary at the downstream end of this section, livestock poaching of the ground around a small RB tributary and gateway is contributing to soil erosion and fine sediment inputs to the brook; the latter restricts fish spawning success by clogging gravels and degrades invertebrate habitat. Reducing livestock levels and/or riparian fencing is required to improve this situation.

Figure 7 Grazing pressure leading to impoverished riparian vegetation, lack of fish cover, reduced bank stability and accelerated erosion.

Figure 8 Livestock poaching around a wet flush contributing to fine sediment pollution.

Figure 9 Livestock poaching around a gateway contributing to fine sediment pollution.

3.2. Section 2 Field Boundary above Lea Hall (53.064184 , -1.7078483) to Horsley Farm (53.060335 , -1.7065796)

There is a distinct contrast in land use between the LB and RB immediately downstream of the field boundary. The LB is woodland with mature trees providing shade, cover and bank stability. In contrast, the RB is heavily grazed and poached by livestock; reducing livestock levels and/or riparian fencing is required to improve this situation. In addition, ducks are reared here for shooting, exacerbating the overgrazing, bare banks and nutrient input to the watercourse. This has been an ongoing issue for many years which has not been satisfactorily addressed despite liaison by LADFFA with their landlord, the shooting tenant and Environment Agency.

Figure 10 Contrast between wooded RB and overgrazed, eroding LB.

Figure 11 Duck-rearing pen draining directly to the watercourse. Clearly this is an inappropriate location; duck rearing ponds should be offline and well away from watercourses.

Further downstream, the valley side on the RB becomes steeper which naturally limits livestock access close to the river, leading to an

improvement in riparian habitat quality. A fallen willow from the LB creates a good in-stream feature which should be retained.

Figure 12 Retain the fallen willow.

Livestock and grazing impacts are evident again on both banks at the shallow riffle, which appears to be a drinking/crossing point for livestock (Figure 13). A block of woodland on the RB is set back around 10m from the watercourse; it would be beneficial if this were extended to the edge of the river.

Figure 13 Riffle which forms a livestock drinking/crossing point.

Towards the downstream end of this section is an area where habitat improvement work was carried out previously by WTT in 2015. Figure 14 - Figure 16 show the changes in this area and give an indication of the lifespan of this type of habitat improvement in the Bentley Brook. The coppice re-growth on the RB should be hinged into the brook margins here to create some dense cover; this will improve survival rates of juvenile trout.

Figure 14 Nov 2014 pre-works.

Figure 15 Jan 2016 post-works (completed March 2015). Large trunk winched into the channel and willow & alder trees hinged over to form dense marginal cover.

Figure 16 Feb 2024 Large trunk has rotted/washed out and marginal cover lost. Re-growth of previously coppiced trees gives scope for further hinging to restore marginal cover.

At the downstream end of this section (53.060335 , -1.7065796), LB in particular lacks marginal cover (Figure 17), despite the land use/grazing there being less intensive (a mix of tussocky grass and willow scrub). Previous attempts here (2015) at establishing marginal cover by installing willow bundles have failed, with just the chestnut posts remaining; evidently the scouring force of high flows is too great for this technique here. An alternative would be to try pinning some larger living willow boughs and stakes into the bank face and on top of the bank. There is plenty of material available nearby and it is a quick and easy technique; grazing pressure may be light enough to allow willow to establish, which could then be manipulated to improve marginal cover in the future.

Figure 17 Area where previous willow bundles have failed. Pinning some larger pieces of living willow should be tried here (see recommendations).

3.3. Section 3 Horsley Farm (53.060335 , -1.7065796) to Sluice (53.056848 , -1.7069907)

At the upstream end of this section, low cover is similarly lacking and could be improved by hinging and pinning suitable willow boughs along the margins of the brook (Figure 18). The fallen willow (Figure 19) is a long-standing feature (over 15 years) which provides multiple habitat benefits and demonstrates how natural structures can remain stable and provide habitat benefits for many years, compared to the limitations of artificial structures (particularly those created manually). Needless to say, these natural features should be valued and retained.

Figure 18 Hinging willow boughs and pinning them to the banks would improve low cover here.

Figure 19 A fallen (but still living) willow creates a fantastic and long-standing habitat feature. It provides excellent refuge habitat for fish allowing them to escape predators such as fish-eating birds and otters. It also scours the riverbed, throwing up well-sorted gravel downstream. The combination of clean gravel and adjacent refuge makes this an ideal (and known) spawning area for trout.

With progress downstream, the brook channel becomes more incised with high, steep banks, greater grazing pressure and very limited amounts of cover. Previous attempts at introducing habitat structures here in the form of brushwood bundles and log flow deflectors have failed and washed out due to the high flow energy.

The large willow on the RB (Figure 20) is providing some limited cover with trailing branches. It was discussed whether this should be cut back for angling access, but given the dearth of cover along this section (and hence plentiful access elsewhere), it is recommended this is left unaltered, If allowed to grow unhindered, this tree may form a valuable habitat feature in future like the one in Figure 19.

Closer to the footbridge there are several bushy willow trees (sallows) which would lend themselves to hinging into the margins of the brook and provide a source of material for use elsewhere (Figure 21).

Figure 20 Open area that would benefit from fence repair and some willow whip planting.

Figure 21 Sallows (background) alongside the brook that could be hinged to improve marginal cover and used sparingly as a source of willow whip material.

The sluice at the downstream end of this section and bypass channel which connects at high water (Figure 22 and Figure 23) has previously been assessed in detail by WTT for fish passage. The conclusion was the bypass channel has too steep a gradient to be cost-effectively adapted for fish passage, whereas the sluice is passable under low-medium flow conditions as long as it is kept clear of debris.

Figure 22 Side channel around the sluice which runs at higher flows.

Figure 23 Dilapidated sluice – this is not a barrier to fish passage as long as it is not blocked.

3.4. Section 4 Sluice (53.056848 , -1.7069907) to downstream boundary (53.055354 , -1.70771220

Downstream of the sluice the river channel is very wide with large amounts of deposited fine sediment. This area had been a long-standing problem with livestock access to the river causing poaching of the banks, mobilising fine sediment and preventing the sediment bars from colonising with vegetation (Figure 24). In 2023 the RB of the river was fenced off and alternative livestock watering provided (mains-supplied trough) under a WTT project funded by Environment Agency and a FiPL grant (Farming in Protected Landscapes)(Figure 25). To ensure the benefits continue, it is important LADFFA ensure it remains stockproof.

Figure 24 Area downstream of the sluice in 2014 showing typical livestock damage.

Figure 25 Same area as above, now fenced off from livestock.

At the downstream boundary, the weir and sluice was modified in summer 2023 in a WTT project to improve fish passage funded by the Environment Agency. A large notch was made in the weir wall, diverting low flows through the notch rather than the sluice and chute on the right hand side of the weirpool (Figure 26 and Figure 27).

Since the notch was created, one of the wettest winters on record has provided ample high flow events which have transported trapped sediments from above the weir, an effect which was anticipated. To some extent this process has been limited by the rock cascade which has been exposed (Figure 28), but this needs to be assessed at lower flows before any decision is taken on whether to modify it. Previously installed habitat improvements have benefited from the rejuvenated flows and LADFFA members report an improved depth profile, far less silty substrate (which formerly dominated here) and some good catches (Figure 29). This will have also greatly improved habitat for many flow-loving invertebrates whose hatches benefit anglers.

Figure 26 Notched weir (downstream view). Note freshly deposited coarse sediment on mid-channel bar.

Figure 27 Weir prior to notching (in 2016) during high flow conditions. During low flows, water would pass only through the far sluice at high velocity (preventing fish passage).

Figure 28 The lowered water levels above the weir have exposed a rough stone cascade, which is acting as a bed level check, slowing the re-grading of the river bed. At this stage (<1 year since weir notching), it is recommended this is not altered and an assessment of bed levels, fish passage and sediment transport is carried out at lower water levels. The structure appears passable to trout at current water levels.

Figure 29 Further upstream from the notched weir, the re-energised flows have allowed previously installed habitat improvements (log deflector, marginal woody cover) to function better. A large amount of accumulated fine sediment has been scoured from this section, increasing depth variability.

4. Recommendations

See appendices for details of techniques.

Observation	**Figure**	**Location**	**Recommendation**
Discoloured water in Bletch Brook	n/a	53.064184 , -1.7078483	Investigate further upstream to see if there is an obvious source.
Lack of cover	Figure 2	53.066482 , -1.7030284	Make drystone wall stockproof; establish trees through willow whip planting.
Concrete weirs	Figure 4, Figure 5.	53.065227 , -1.7046230 to 53.064363 , -1.7072301	Enlarge / create notches (Appendix 4).
Overgrazing, livestock poaching	Figure 7, Figure 8, Figure 9	53.064111 , -1.7081313	Lower livestock densities, riparian fencing.
Overgrazing, duck rearing	Figure 10, Figure 11	53.063381 , -1.7082594	Lower livestock densities, riparian fencing, relocation of duck rearing away from the watercourse.
Fallen willow	Figure 12	53.062659 , -1.7077920	Retain fallen tree.
Overgrazing, livestock	Figure 13	53.061708 , -1.7075345	Lower livestock densities, riparian fencing, extend

poaching			woodland block to edge of watercourse.
Previous habitat works (fallen black poplar)	Figure 16	53.061028 , -1.7071643	Hinge coppice re-growth into brook margins.
Lack of cover	Figure 17	53.060335 , -1.7065796	Pinned willow boughs and stakes / whip planting (Appendix 3).
Lack of cover	Figure 18	53.059906 , -1.7062256	Willow hinging and pinning; willow stake planting.
Fallen willow / accumulation of woody material	Figure 19	53.059629 , -1.7060217	Do nothing – retain valuable habitat feature.
Large crack willow	Figure 20	53.058878 , -1.7067298	Do nothing – retain as possible future large woody material. Repair fencing.
Sallow willows near footbridge	Figure 21	53.058252 , -1.7070517	Hinge over into margins to provide low cover. Sparingly harvest material away from river for use in other locations.
Sluice	Figure 23	53.056940 , -1.7069981	Keep sluice free of debris to aid fish passage.

Downstream of sluice (newly fenced section)	Figure 25	53.055318 , -1.7078456	Ensure fence remains stockproof.
Notched weir	Figure 26	53.055673 , -1.7077839	Assess extent of bed regrading and scope for further habitat improvement works at low water.

5. Further assistance

The WTT may be able to offer further assistance such as:

- WTT Practical Visit
    - Where recipients require assistance to carry out the improvements highlighted in an advisory report, there may be 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. pinned woody material, willow planting, willow laying, etc.). Please contact your local WTT Conservation Officer for further information.

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

https://www.wildtrout.org/content/wtt-publications

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 populations and managing invasive species.

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

6. Acknowledgements

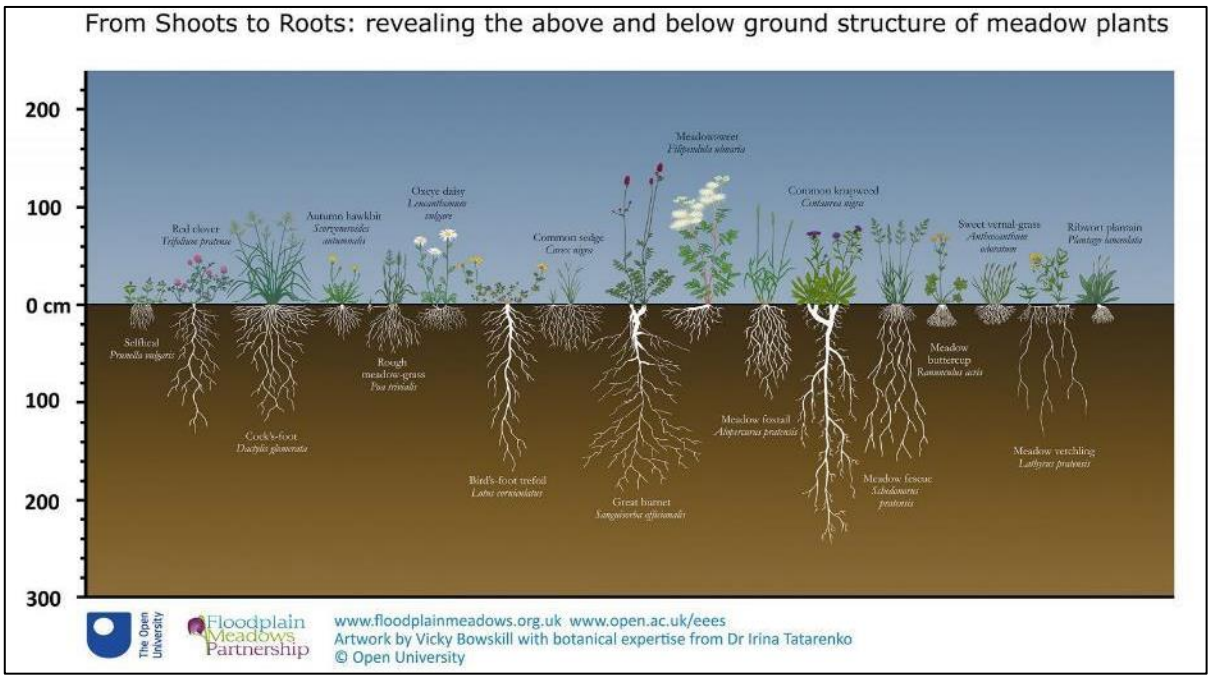
The Wild Trout Trust would like to thank the Environment Agency for their continued support of the advisory visit service, in part funded through monies from rod licence sales. The advice and recommendations in this report are based solely on the expert and impartial view of WTT's conservation team.

7. Disclaimer

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

Appendix 1 - Riparian Grazing

For a riverbank to be naturally stable, it generally requires diverse vegetation - the deeper rooted the better. The vegetation visible above ground is generally reflective of the root structures below, so the more abundant and diverse the vegetation, the greater the variety and extent of roots they support.



www.floodplainmeadows.org.ukabout-meadowswildlifeshoots-roots

Grazing has a similar impact to mowing: the reason a garden lawn remains largely grass is that they are one of the few groups of plants that can withstand regular cropping. Just as grazing (and mowing) limit the extent and variety of foliage above ground, the associated loss of species also reduces root matrices within the ground. The plants also expend more energy on foliage regrowth, rather than root systems, to the point they may even slough some of their roots if they become heavily grazed. All of which can leave riverbanks poorly consolidated and susceptible to erosion. For this reason, the most stable and biodiverse banks are generally ones where livestock have been excluded.

Beyond the loss of bankside vegetation diversity, one of the other clear symptoms of long-term grazing, particularly with sheep, is the loss of willow. Being one of the most palatable tree species, willow is selectively browsed by sheep. This can often even happen at grazing levels that are sufficiently light they don't destabilise a bank, but the initial signs of their impact is still there.

As grazing intensity increases, regeneration of other tree species is lost, often leaving only single lines of mature trees along a watercourse, with no smaller sapling regeneration to replace losses through old age or erosion – the latter often completely outflanking trees in a heavily grazed scenario. In the most extreme cases, trees are lost completely from the watercourse.

When grazing is by cattle, the negative impact upon foliage and root structure is generally less marked, as the grass is not so tightly cropped as by sheep, but they create greater physical damage to a bank, which can be significant, particularly so if they are grazed at high densities and/or alongside sheep.

Livestock farming is an important aspect of the UK rural economy, supporting vital food production, and there are simple ways of protecting riparian habitat from its influence. With the most environmentally sensitive of farming regimes, it may be possible to reduce stock density and duration to facilitate improvement to riparian habitat. However, often the simplest and most effective way to protect watercourses is with a fence and buffer strip that will allow a healthy riparian zone to develop – sometimes assisted by reseeding or planting. The benefits of protecting trees and facilitating regeneration not only extend to the natural ecology of an area, but can also deliver benefits to the farming community too, as shown in the Pont Bren Project (and many others), where improvements to agricultural production, habitat quality and flood risk have been delivered through trees and shelter belts.

Appendix 2 - Tree Hinging Introduction

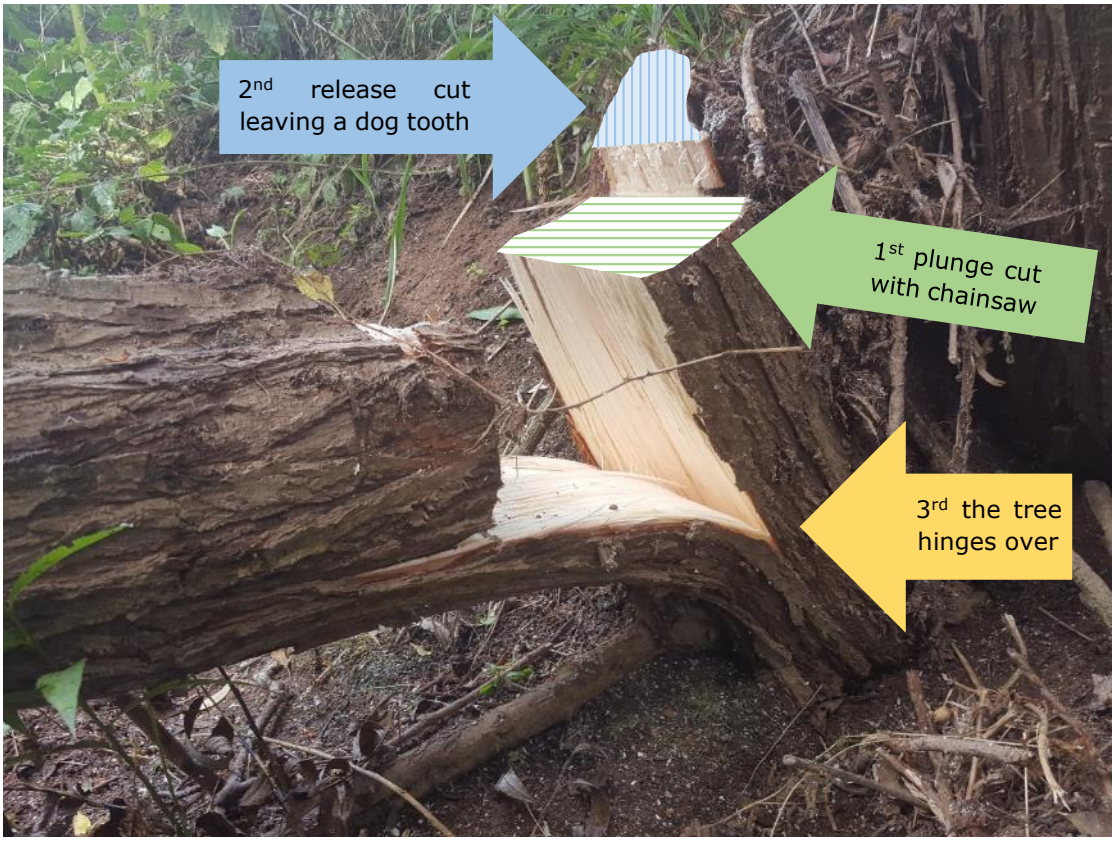
Hinging (also called laying, folding or pleaching) trees into a watercourse is an excellent way of adding flow diversity and roughness to a channel. Hinging replicates the natural process of trees falling into the channel, with the added benefit that the hinged section of tree should continue to grow, developing even more habitat complexity over time.

Willows are the best type of trees for hinging directly into the channel and can still thrive with up to 50% of their canopy submerged. Many other species also hinge well but should be laid into shallower areas or along the river margin, to ensure that the majority of their canopy remains in the dry.

Small, pliable species like, willow, hazel, elm, hawthorn and even alder (with a bit of practice) can easily be hinged, using hand tools such as pruning or bow saws. Trunks or limbs up to 100 – 150mm diameter can be cut by hand, in a process much like hedge laying. The more brittle species such as sycamore, ash or elder should generally be avoided as they tend to break off rather than bend.

In its simplest form, hinging involves a single quick cut through the first two-thirds of the trunk/branch, then continuing to cut a little at a time until the trunk/branch collapses down over the river or along the bank (depending upon species). The cut should be made from the exact opposite side of the tree to the desired felling direction. This is similar to conventional tree felling, however the face cut should be omitted. As a result the retained material forms the necessary hinge.

Advanced Hinging



A more advanced technique for suitably-qualified chainsaw operators to use on large or leaning trees, utilises a plunge or bore cut. This defines the extent of the hinge first, while retaining holding wood at the back side of the tree. The final fell can then be achieved by extending the plunge cut out to the back side of the tree, or with a dog tooth cut, from the back (as above). This method provides more control over the extent of the hinge, and can be safer with large or leaning trees.

When hinging larger or leaning trees, please also take the following into account:

- This is specialist work and should only be undertaken by trained, experienced personnel and proper assessment of the risks
- Large crack willows can hinge well, but may be susceptible to cracking or "barber-chairing" (collapsing and folding back on itself)
- Alders tend not to produce a strong hinge, so may not be appropriate in high energy or high flood risk areas. They can also crack suddenly, especially if badly affected by *Phytophthora* disease. However, smaller trunks can be laid effectively with practice and in appropriate places
- Poplars can be tricky too: the bark tends to crumple and ruck up (reducing their survival rate), and should only be used if nothing else is available
- Ash and sycamore are very brittle, and tend to lay very poorly as a result
- In cold weather, trees can react particularly explosively to being cut – failing more suddenly, and splitting further and in a less controlled way.

Appendix 3 - Pinned Woody Material

This technique can be utilised where in-channel cover is lacking but there are no bankside trees to act as an anchor point. Instead, the material is securely held in place with stakes, sometimes wired over the top for extra security depending upon the energy of the river. Posts are driven into the bed and/or bank to secure the wood, with the butt end u/s, replicating how the woody material would usually come to rest naturally.

Use of this technique is usually more suitable for lowland rivers or lower energy areas, like sheltered inside bends, where it can be incredibly effective at driving bed scour or increasing sediment deposition to reshape a uniform channel, depending upon how exactly it is used.

This is generally a deadwood technique, with the material not usually expected to grow, it is more to kickstart river processes. However, depending upon the channel conditions, a living structure can be created by using a live willow limb or trunk. Similarly, where live willow is used for the posts, they will usually form a new tree that can be used for future habitat enhancement, often by simply hinging it down into the channel.

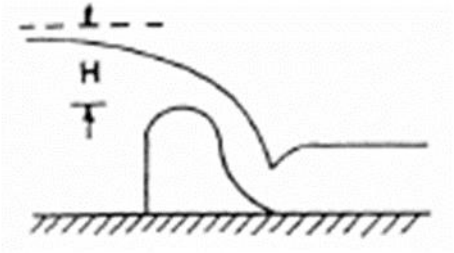
Above, live willow posts used to secure a branch into a recently restored channel to assist the retention of coarse sediment during high flows. The following picture shows a piece of live willow pinned into the channel with live willow stakes, providing much-needed cover and refuge for fish.

Appendix 4 Weir Notching

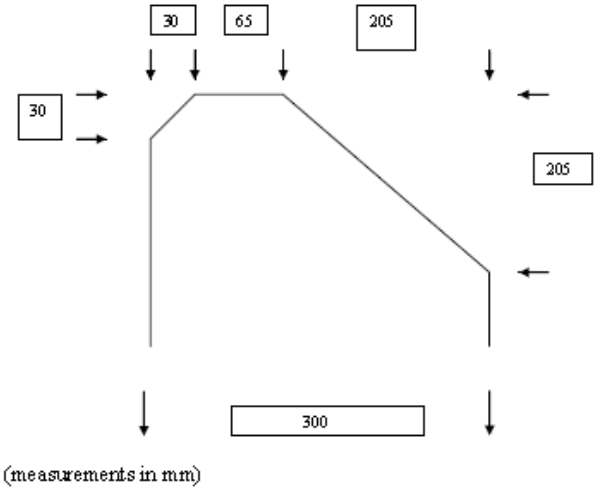
Concrete or stone weir crests can be notched by making a series of closely adjacent cuts with a stone (circular) saw, then using a chisel/bolster and hammer to remove the cut material. Sandbags are used to create a workable depth of water. Appropriate training, risk assessment and protective equipment should be used.

The aim should be to create a notch with a smooth-based, radiused notch which passes an unbroken plume of water (no entrained air). This makes it much easer for fish to pass using burst-speed swimming, rather than leaping, allowing a much greater range of species and sizes of fish to pass successfully.

This is normally achieved by having sufficient thickness of cross-wall and providing a curved or 250 -300mm radiused profile:



An alternative means of creating an adherent nappe can be to use a chamfered profile, which is sometimes easier to attain. Scaling up the profiles in these structures gives possible profiles for use in other thicknesses of cross-wall, for example that shown below for a 300mm thick wall.



Notches are effective in narrow crested, vertical weirs where the head difference between upstream and downstream water levels is ≤0.5m and there is a suitable depth of water below the weir - a depth of at least twice the head difference is required. Notches must be at least 0.3m wide for trout and large coarse fish.

Retrofitted fish passage improvement: new pre-weir (foreground), raising water levels at the existing weir (background) with a radiussed notch in each.