

WILD TROUT TRUST

River Lugg
Midland Flyfishers

Herefordshire

2025



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Key Findings

- The extensive fishery Midland Flyfishers has on the Lugg is split between two beats, with great potential for an abundant fish population and wild trout community seen during the visit.
- The upstream beat, Meadow, had several issues, especially with rates of bank erosion limiting development of riparian habitats that would benefit the river. The overall form of the channel is good however, with pools, riffles and glides present.
- Sections of modified river were present, especially at the top end of Meadow beat, where habitat enhancement would help improve these sections.
- The downstream beat, Upper Kingsfield, had some superb examples of river processes interacting with woodland to create quality habitat for trout across all life-stages.
- Some wider issues had potential to impact Upper Kingsfield, specifically how near cultivated farmland was to the river and a large weir downstream of the fishery that will limit movement of fish into and out of the fishery.

1. Introduction

The Wild Trout Trust was approached by the Midlands Flyfishers club (MFF), requesting a visit to assess the status of river habitat along their section of the River Lugg immediately down stream of Mortimers Cross, Herefordshire.

A visit was subsequently undertaken by Ed Noyes, Wild Trout Trust Conservation Officer Midlands and West, on the 13th of March 2025. Three Midland Fly Fisher members accompanied the visit. The walkover assessment covered approximately 3km of the Lugg and bifurcated channels, guided by the MFF member who leads delivery of river management activities along this reach.

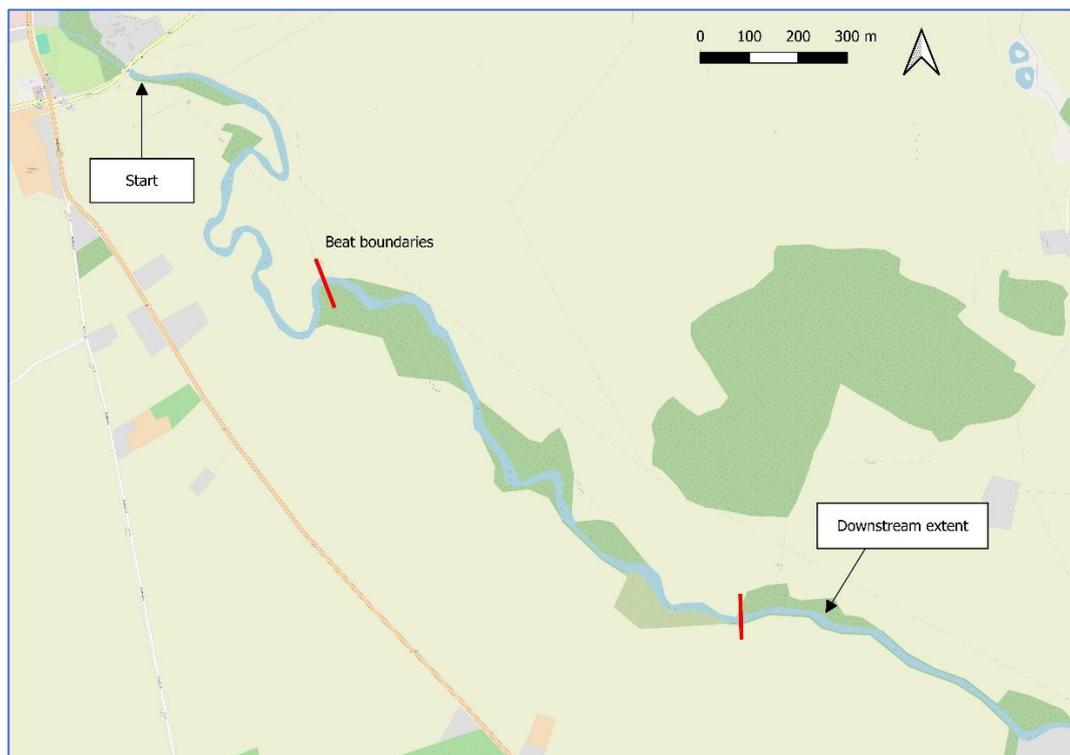


Figure 1. Overview of the Midland Flyfishers section of River Lugg reviewed in this report.

Comments in this report are based on observations from the day of the visit and conversations had with the MFF members present during the walkover. Additional desk-based review of maps and online data has been included to further inform what was seen and discussed.

Specific locations in the report are identified using decimal latitude and longitude (e.g. **56.044896098, -3.16176523829**), which can be pasted straight into Google Maps to identify locations. National grid references are used elsewhere. 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. Standard convention is applied throughout the report to bank identification, i.e. the banks are designated left-hand bank (LHB) or right-hand bank (RHB) whilst looking downstream.

2. Background

A true river of the Welsh Marches, the River Lugg flows in a general west to east direction from Wales into England, before turning southward around Leominster. It rises from Pool Hill, just north-west of Llangynllo in Powys, confluencing with the River Wye around 63 miles downstream at Mordiford, near Hereford.

Catchment geology in the upper and middle Lugg is dominated by Mudstone and Siltstone, with plentiful deposits of glacial and alluvial sands, gravels and silts in the valley bottoms. The upper catchment is encapsulated by hilly and elevated landscapes of high relief (up to 450m elevation), where land use is predominantly forestry and livestock farming.

Mortimers Cross marks a point in the Lugg catchment where the landscape changes to more broadly rolling hills of lower elevation and wide flood plains, and a more mixed land use of arable, livestock and fruit farming.

Typical of watercourses in this region with high gradient headwaters, Lugg river levels are responsive to rainfall or run-off from snow melt. Once the catchment becomes saturated and soil-moisture deficit exceeded, the Lugg is a relatively 'flashy' river through long periods of the year, where high-water levels and floods rise and fall both regularly and rapidly. The annual hydrograph from the river gauging station at Byton shows this, along with a seasonal buffering effect against rainfall from late spring and throughout the summer, where vegetation, irrigation and a usually higher soil moisture deficit lessen the effect of rainfall on water levels and flows until the autumn. Once frequent or intense rainfall returns after the summer growing season, the river returns to a far flashier flow regime. Critically, this highlights the background conditions the fish assemblage present in the Lugg at Mortimers Cross must utilise to complete their life-cycles and any bottlenecks within this. For long term trends and interactive graphs, River Lugg rainfall and river level data can be explored here: [Hydrology Data Explorer - Byton](#)

Designations:

In England, the Environment Agency (EA) classifies waterbodies using Water Framework Directive criteria to describe the state of water quality and aquatic ecology. The multiple parameters measured for this provide an overall score from poor to excellent, with the final scoring being dependent on the lowest scoring component recorded. The Lugg at Mortimers Cross has an overall score of 'Moderate':

Table 1. Waterbody details

River	Lugg
Waterbody Name	Lugg - conf Norton Bk to conf R Arrow URL: Lugg - conf Norton Bk to conf R Arrow Catchment Data Explorer Catchment Data Explorer
Waterbody ID	GB109055042030
Current Ecological Quality	MODERATE Fish = moderate; Invertebrates = high; Macrophytes = moderate; Phys-Chem = High/ Phosphate = moderate
U/S limit inspected	SO 42681 63663
D/S limit inspected	SO 44064 62552
Distance inspected (KM)	c. 3km

The River Lugg is also designated a statutory Site of Special Scientific Interest (SSSI) by Natural England for almost its entire length. It is further designated a Special Area of Conservation (SAC) in the lower third of the catchment, as part of the wider River Wye SAC it directly links to. Several fish species are cited as reasons for these designations. The SSSI lists Atlantic salmon, bullhead, brook lamprey and twaite shad as primary reasons for designation; the SAC adds the sea and river Lamprey to its list.

The Lugg is also designated statutory 'Main River'. As such, activities along or within the river are regulated and permitted by the Environment Agency.

Fishery overview:

There is a routine EA fish monitoring site by the bridge at Mortimers Cross, at the top of the MFF fishery. The full results from these semi regular (6-year) surveys can be seen in the Fish and Ecology data explorer, here: [EA Ecology & Fish Data Explorer](#)

The species recorded in these surveys are typical of a rain fed, semi upland section of a watercourse in its middle/upper reaches or 'trout and grayling' zones; brown trout, Atlantic salmon, grayling, stone loach, bullhead, minnow, eel, brook lamprey, 3-spined stickleback.

Understanding fish species and each of their life stages present is extremely helpful for validating habitat assessment and guiding subsequent recommendations (Figure 2). However, limited knowledge on the approach the EA survey teams take to the site or habitats sampled means a little caution should be taken when interpreting results without knowing any bias; it is likely the lack of brown trout in the surveys is contributing to the 'Moderate' classification.

Midland Flyfishers rod catch data is also highly valuable for tracking size classes of fish (ages) and relative numbers of fish present within the fishery each year – and where these are being encountered.

The MFF Lugg fishery does not stock fish, relying on naturally produced wild fish to populate the river for angling. However, the adjoining club upstream does still stock brown trout which then disperse into the MFF fishery; MFF have had conversations with the upstream club about considering stopping this. Stocked fish are proven to cause various levels of disturbance within a fish community that can be negative to both wild fish populations and angling opportunities. In some cases, this adds to predation rates of juvenile salmon, wild trout and grayling, increasing the perceived need to stock fish. These predation and disturbance effects extend to other key fish species that can be expected in this part of the catchment and cited as part of the SSSI. Given the potential for high quality wild trout (grayling and salmon) habitat throughout the upper and middle Lugg, stocking to support angling activities is not necessary, if the right management interventions are in place. WTT has offered to support any future conversations around this, including providing case studies where fisheries have moved from stocking trout to wild fish only, with great success. A discussion on stocking on the Lugg is contained near the end of in this 2015 WTT report: https://www.wildtrout.org/assets/reports/Lugg_2015.pdf

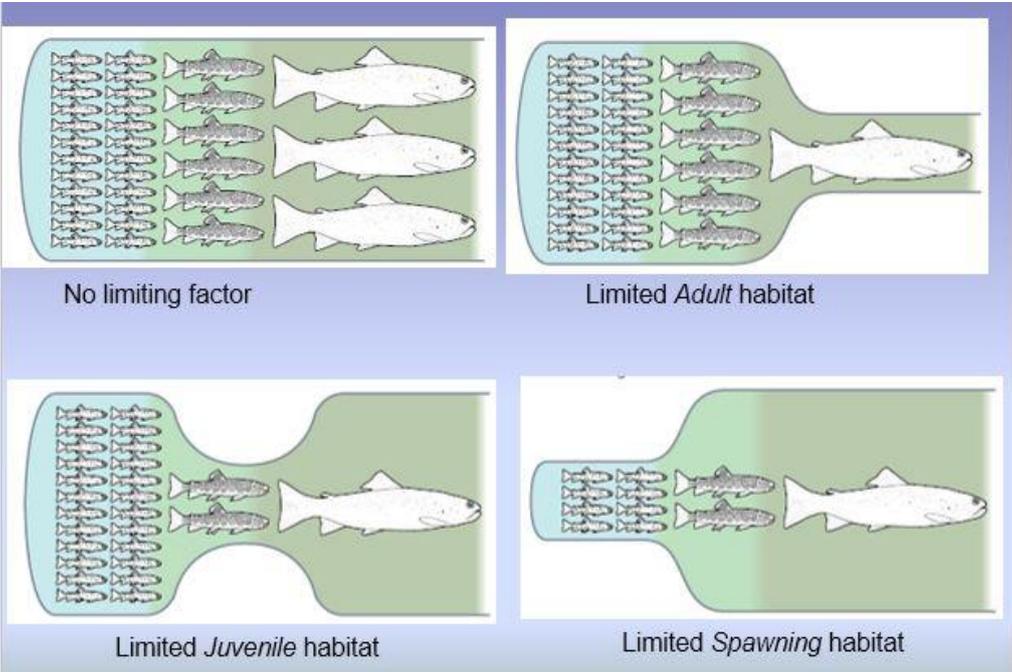


Figure 2. The physical habitat, flow conditions and connectivity of physical habitat will dictate the dynamic of trout populations in the fishery (and all other fish species) – what is available for sustaining the population, how many fish and at which age group, dictating how abundant that population is for angling. Brown trout are superb indicators of river and catchment health as a result.

3. Habitat Assessment

The walkover started at the most upstream extent of the fishery, proceeding in a downstream direction. The fishery is split into two primary beats; "Meadow" incorporating the upper half of the fishery, and "Upper Kingsfield" which encompasses the remainder downstream.

The river level on the day was slightly elevated, at the tail of receding winter flows, perhaps 20cm above average summer/base-flow. The bed was visible through shallower sections, although the river had slight colour to it still precluding complete visibility into the deeper pools.

3.1. Meadow Beat

The top of the Meadow beat enters into a reach of similar river habitat for the first few hundred metres (Photo 1 to 4). This has been modified at some point; straightened and deepened with perched banks. Dredging likely occurred to convey flow away from the road bridge upstream, judging by the spoil line from dredging on the right-hand bank top. The additional bank height created by this further disconnects the river from the flood plain, limiting how quickly the river can spread flood water out from the channel as it would naturally. Where flood waters are contained by high banks, high velocity flows in the channel are hostile to fish and flow energy is focussed on excessive erosion and accelerated physical habitat change. A review of historic maps suggests this channel modification is possibly relatively recent (within the last 40 years) as maps prior to this show a more sinuous channel, indicative of natural river process (Figure 3, below).

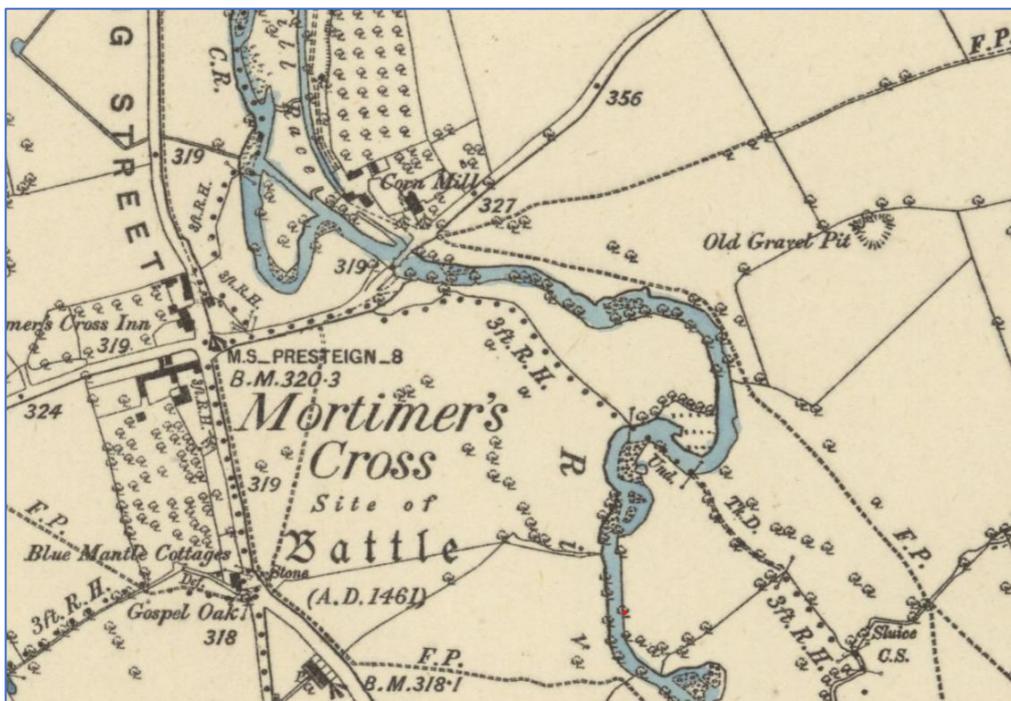


Figure 3. Historic maps, such as this one from 1885, show a more sinuous river channel downstream of the bridge, suggesting it hadn't been heavily modified at

this point (maps available at: <https://maps.nls.uk/> reproduced with the permission of the National Library of Scotland).

The modification of the channel has meant a loss of natural channel habitat formation (side bars, riffles, pools etc) and created deeper, slower water, likely to be selected by stocked trout entering from upstream. Despite this, some beneficial features have been retained. Both banks are lightly wooded, with a line of similarly aged alder along the left-hand bank. Some fallen trunks or leaning boughs have been retained on the LHB to provide highly beneficial, low over-hanging cover. This overhead structure will encourage residency by wild brown trout, especially larger adult specimens in this deep glide and pool habitat.



Photo 1. The top of the Meadow Beat (52.268209 , -2.8399465). The channel here is modified, but beneficial trailing branches in the channel will help provide some important habitat structure for the trout population.



Photo 2. An elevated bank top from dredging spoil, which further disconnects the river from the floodplain. The fencing that was installed here is perfect for allowing natural bankside vegetation to develop, both defending against erosion and providing beneficial riparian habitats. Importantly it allows regeneration and perpetuity of bankside trees. The fence here has clearly suffered from flood damage, highlighting one of the challenges for developing and protecting buffer areas on flashy rivers like the Lugg. If possible, moving the fence back into the field will increase the volume and complexity of beneficial riparian habitat.



Photo 3. Low overhanging vegetation and branches creates excellent cover for holding trout, and critical for providing refugia from avian fish predators and otters. It also provides refugia for fish as river levels rise during floods by dissipating flood water energy. This effect can be replicated elsewhere along this section by introducing large woody material from bankside trees to the channel (see recommendations).



Photo 4. The alders at (52.267920 , -2.8386397) provide important protection to this elevated bank-face through their root systems. However, where stands of similarly aged trees exist, some coppicing work will help diversify the age of growth and allow light through for regeneration, aiding longevity of the protection. Material generated by this work can be used at other locations for habitat and bank protection interventions.

Moving a little further downstream, it is clear where Meadow fishing beat gets its name, as the surroundings open out into grazed floodplain grassland (photo 5). In conjunction with this, the channel begins to regain some natural function and starts a long series of sinuous meanders, with multiple erosional and depositional features forming habitat features along the way as a result (geomorphological process).

The initial upstream section at (52.266907 , -2.8370991) is still overly deep and flows directly into the apex of a very acute meander bend (Photo 5). While this sinuous channel planform creates some very beneficial in-channel habitat features, it also provides an example of a classic challenge that occurs between balancing river processes and farming in this region. Where the surrounding floodplain is very closely grazed by sheep, and very close to the edge of the river, there is little significant vegetation to consolidate the riverbanks and regulate the rate at which the river erodes the banks. The floodplain material of rivers in the Marches region is generally unconsolidated alluvial and glacial depositional material and highly erodible when exposed. As a result, the river erodes into the outside of meanders at a far greater – (accelerated) rate compared to if established, vegetated, riparian buffer strips existed along the bank, especially containing mature trees. This can be a difficult scenario to rectify, evidenced where fencing has been previously installed and is now at the edge of the riverbanks or

suspended over the outside of bends in the river (Photo 22). The magnitude of floods (especially through the winter) and subsequent rate of erosion on exposed banks is too rapid for vegetation to mature in buffer areas and important tree root systems to develop to a level where they protect the bank before the next flood happens and erodes further bank material away. The buffer zones are relatively narrow along parts of the beat due to proximity of grazing, so the physical area isn't available to absorb erosion before it reaches the fenceline. This is where using locally available woody material to form a protective barrier as a temporary measure to slow erosion while bank top interventions establish can be extremely useful. All through the open grazed area of meadow beat there were some excellent sources of material that could be used to create revetment with natural materials (and additional channel habitat), and generate a suitable buffer zone, discussed in the recommendations section of this report.

After controlling erosion rates, the additional benefit of generating tree growth will be shading of the river. With periods of hot weather increasing in frequency and intensity in recent years, ensuring rivers are suitably shaded is becoming a major consideration when reviewing bank-side habitat. As cold water adapted species, populations of trout, salmon and grayling will be reliant on river temperatures being maintained below certain thresholds during hot periods in the future, as the climate continues to get warmer. By shielding rivers from the most intense periods of summer sun, tree shading will regulate how quickly and how much river water warms up.



Photo 5. Coming out of the straightened, but lightly wooded upper section of the beat, the surroundings open out to grazed floodplain. The channel in this initial open section is still overly deep due to modification.



Photo 6. The outside of the acute first meander bend (52.266304 , -2.8368802). The rate of erosion here is clearly too rapid to allow riparian vegetation to develop properly – especially trees, where root systems are by far the best thing for binding riverbanks together throughout the year. The arrows indicate the proximity of standing wood that could potentially be used to protect this bank, while the fence is reinstated and bankside tree growth established. Without this, this meander will continue to march into the field at an accelerated rate.



Photo 7. Fenceposts perched right on the top of the bank, which has slumped due to erosion pressure over the winter. Clearly there is little space for vegetation to develop here that will slow the erosion down and limiting the initial purpose of the fence.

As a result of the river meandering, some excellent in-channel habitat features start at this point as a series of pools, riffles and glides are formed through geomorphological process as the river deposits eroded material downstream (Figure 4). The variety in depths and areas of differing flow speed are crucial for creating the habitat diversity needed for river fish species at differing life stages, along with supporting a wide range of aquatic invertebrates that will form an important food resource for all fish species present at this point in the Lugg.

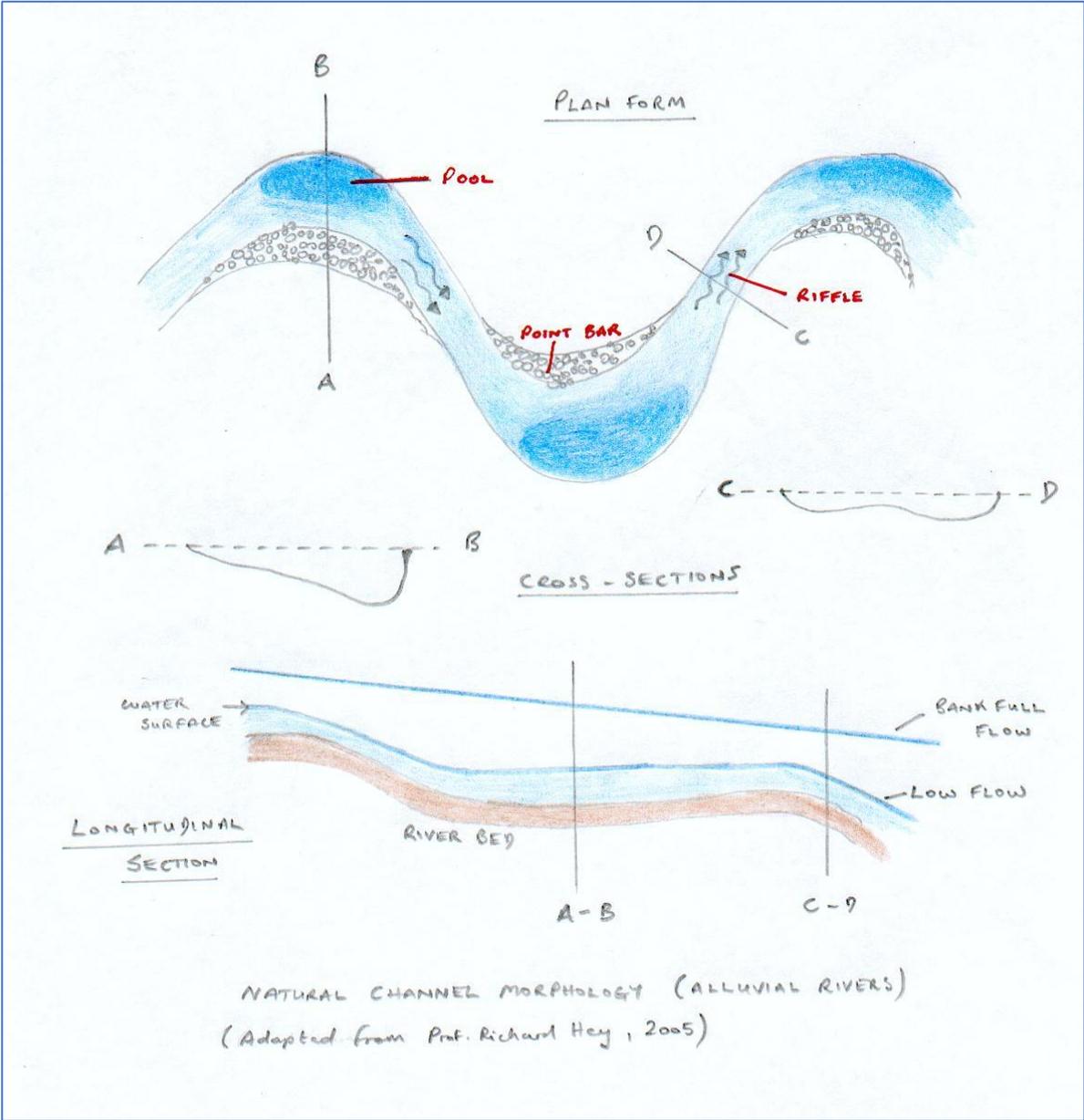


Figure 4. This infographic shows both the 'birds-eye' (planform) and cross-sectional view of a healthy, dynamic and meandering river. The subsequent habitat and flow diversity created through bed level change supports the greatest range of flow loving aquatic fish and invertebrate species possible.



Photo 8. Although devoid of critical bankside cover, the deposition from the erosion in the first meander creates a change in bed level and flow through the downstream glide; in combination with the deep pool, this provides both feeding and refugia opportunities for trout and other fish species at different life-cycle stages (52.266357 , -2.8372664).



Photo 9. A lone bankside willow at NGR provides an example of how useful tree roots are for binding the bank throughout the Meadow beat. Re-pollarding this would generate material to use for bank protection measures in the adjacent area.

In response to the initial large meander in the Meadow beat, the river continues an excellent series of meanders downstream. The next meander arrived at was also pointed out as a concern regarding the volume of erosion occurring on the exposed outside of the bend (Photo 10). As this is heading into a stand of tall alder trees at its downstream end, it will be controlled by their roots systems here. However, upstream, into the apex of the bend, the bank is bare and there is the chance the erosion could encourage the river to break-out behind this stand of trees. This isn't an issue from a river process point of view, but the result will make land use difficult and likely an unacceptable scenario compared to encouraging the river to remain in a single main channel along the route it is currently taking.

The amount of timber that is readily available by this meander means there are options for using some of it to defend the outside of the bend, reestablish the fence line and encourage tree growth in the buffer area between the river and the fence.



Photo 10. (52.266836 , -2.8377385) The rapid erosion in this meander resulting from a lack of bankside trees and other vegetation. Erosion will continue to eat away at the grazing land if left as it is, and the river may split behind the stand of trees immediately downstream. Additionally, a lack of defined low flow channel in an over-widened section left from high erosion rates is unlikely to form habitat trout and grayling can utilise much once river levels drop to low 'summer' levels due to lack of complexity and cover (high percentage chance of being predated).



Photo 11. On the downstream end of the bend, some large woody material has got caught up on standing timber at 52.266889 , -2.8379745 as the river erodes into the small block of woodland. This is excellent in-channel cover for fish and provides an important resource for aquatic invertebrate diversity, while immediately driving channel and flow diversity downstream. Some large stems have been removed from the trees here, which could have been put to good use in the eroding bay just upstream. If some of these trees can be used, they provide very useful material for bank protection, adjacent to the erosion in photo 10, making moving of material to where it is needed easier.

Heading downstream again, the middle of Meadow beat is a good example of what happens when a riparian buffer is allowed to develop, and how it naturally moderates the rates of erosion and amounts of river channel movement. This, coupled with riverbed level changes creating flow diversity, generates some of the better areas of habitat available in this beat. Interestingly, this section, where channel movements are regulated and in the absence of much tree canopy cover over the river, aquatic plants were present, not really seen elsewhere in the fishery on the date of the visit. Again, this is another excellent river habitat feature for both trout and salmon (especially juveniles) and something that will drive aquatic invertebrate diversity and abundance.



Photo 12. The vegetation on the RHB (near distance) is a great example of what can be achieved by allowing space for bankside vegetation to regenerate (52.266383 , -2.8387792). The tree growth is particularly beneficial. An excellent cross-sectional form to the channel here allows connectivity to the flood plain, with a deeper outside to the slight bend, tapering up to the start of a side bar on the inside of the bend. Over-hanging vegetation on the bank on the outside of the bend will certainly encourage trout to take up residency here.

The *Ranunculus* seen at 52.266548 , -2.8386859 is an excellent river plant indicator species, which should be abundant in the Lugg if given the conditions for it to thrive (Photo 13). Reasonable water quality, steady flow velocity and locations where flood waters can dissipate to the flood plain quickly due to low bank heights, will allow it to continue to proliferate here. High energy flows and mechanical removal by large movements of bed material during floods creates too hostile an environment for it (such as in modified, deepened channels). The structure of the leaves and configuration on the stem gives a high surface area for invertebrate habitat and feeding (especially blue-winged olives, gammarus and black-fly larvae), protected from high flows. The same structure and gaps underneath the fronds are a magnet for all river fish species, especially juvenile salmon, trout and bullhead. In low flows, the in-channel vegetation helps constrain flows, keeping them energised, gravels clean in channels between the plants and specific feeding lies for trout along their edges.



Photo 13. Lush fronds of Ranunculus will provide high quality physical habitat that is very attractive to fish species and a range of invertebrates. Indicative of good river process at this location. The far bank (LHB) is currently unprotected from stock with no mature riparian buffer.



Photo 14. More regeneration of tree growth where a buffer has been able to develop (52.265727 , -2.8389187). Emergent reed provides further bank protection and diverse habitat structure along the water's edge. Note the two swans in the distance; they can graze heavily on ranunculus growth so an eye should be kept on whether they are causing excessive damage to this.



Photo 15. The pool at the downstream extent of this picture creates a prime location for adult salmon to lie up in prior to spawning on the tail-out of the glide as it lifts into the short riffle in the middle of the photo (52.265247 , - 2.8392942). Large trout may utilise this too. Updating fish surveys in the fishery, either through arrangement with the EA or through bespoke sampling with WUF or WTT, will help inform which fish species are spawning and recruiting to the wild fish population, and where in the fishery. This could also be conducted to record fish response to any future habitat works carried out (before/after).

The remainder of Meadow beat downstream returns to a similar situation seen at its top end; erosion and fences too close to the bank top, plus lack of developed riparian vegetation as a result. However, the 'blue-print' of channel form and in channel habitat features created are very good, and the sinuous, meandering planform of the river will maintain these river processes and the pool, riffle and glide habitat features in response.

There are some specific locations where improvements could be considered to benefit the fish community in the river:



Photo 16. (SO 42831 63362) Open, but good habitat features for trout around this pool approaching the meander in photo 15, with in-channel and overhanging tree growth and marginal emergent reed cover. Additional bankside trees to increase shading will help regulate temperatures in the river here and provide additional cover and invertebrate food resources.



Photo 17. The thin strip of beneficial marginal vegetation on the far (RHB) may disappear in the next few floods as this undercutting bank collapses at (52.264965 , -2.8389401). The young tree at the top end needs to be retained and protected so it can grow into something substantial for future river habitat.



Photo 18. Immediately downstream of the location in photo 17, is a complete contrast in habitat along the far bank (52.264991 , -2.8385539). The network of willow provides solid bank protection and erosion regulation. The tangle of stems pushing out into the channel provides critical refuge and cover for fish species present. The large woody debris caught up in this further enhances the feature. The large alder at the downstream end provides some shade to the channel, its location on the margins of the river means roots will be exposed in the channel providing superb habitat for trout. Again, this is likely a valuable location for spawning salmon and large trout in the main river, with the amount of cover available in the pool immediately adjacent to an uplift into a riffle downstream.



Photo 19. Pressure from accelerated erosion persists throughout the reach downstream. It won't take many floods for this bank to erode under the fence in this section and collapse it (52.265457 , -2.8380497). There may be enough material available from pollards in the flood plain to contribute to a revetment structure here. There are options to consider, such as using root wads or stakes and other material to form a revetment to slow the rate of erosion down, discussed in the recommendations section. Then, whether to plant a line of trees back from the bank top near the existing willow, so they have time to mature before the river erodes through to them, or move the fence back and attempt to establish trees nearer the existing bank top.



Photo 20. An exposed bank rapidly eroding on the outside of the next meander down (52.264853 , -2.8373630). The alder stand in the middle distance may provide some potential material for an intervention to slow erosion rates here.



Photo 21. Regeneration of riparian trees is evident at 52.264643, -2.8377492, where erosion is regulated by existing young tree growth and emergent reed at the upstream end. Good spawning opportunities for salmon on the tail-out of the glide on the right of the picture.



Photo 22. A fence line now overhanging the water at 52.263704, -2.8371377, where the rate of channel movement has out-paced vegetation development.



Photo 23. The end of Meadow beat, where it meets mature woodland (52.263751, -2.8361753). The river will retain its course here for a very long time due the wooded bank side regulating channel movements during floods. This section could be enhanced in-channel with introduction of some large timber out of the bankside woodland, along the margins of the watercourse.

3.2 Upper Kingsfield

The nature of the fishery and river habitat changes right from the start in the Upper Kingsfield beat. Predominantly wooded, sensitive management has allowed excellent natural dynamics between river channel process and large in-channel woody material to develop. This beat holds some prime examples of how wild river environments in the region should look (and still function as a fishery). The quality and variety of habitat features present will be supporting a thriving fish community. To validate this, comparative fish surveys between Meadow and Upper Kingsfield beats would be very useful. Also, recording water temperature differences between open areas of Meadow, exposed to intense summer sun, and shaded sections in Upper Kingsfield. The extensive shade through this beat will be keeping the river cool here, essential for survival of cold-water trout and salmon during periods of intense heat. The results of any monitoring could be enlightening, given the stark difference between the two beats, and support a great case study for why letting river and riparian habitat develop through trees, woody material and vegetation, rather than over manage or remove it, works. In a wider context, it is quite likely Upper Kingsfield is a key reach for trout and salmon production in the main Lugg, which will benefit sections of river upstream and downstream as juvenile and adult trout seasonally disperse to the wider catchment. The following photos and captions (photos 25 to 68) explain what was seen on the day of the visit:



Photo 24. A small field drain enters the Lugg on the LHB at 52.264283 , - 2.8361002, where the two beats meet. The erosional bay that has formed will provide good high flow refugia for all fish species present by creating a back-water feature.



Photo 25. The first example of inspired river management in Upper Kingsfield (52.264335 , -2.8357462); leaving large trees that have come down where they are. The resulting habitat is excellent; undershot flows have scoured a deep hole under the tree, providing first class fish holding cover, the deposition from the scour immediately downstream creates excellent riffle habitat for spawning, fry and invertebrates, coupled with the trailing marginal vegetation. Large cross channel trunks will also help regulate flood flow energy, by 'slowing the flow' as river levels rise and interact with the structure.



Photo 26



Photo 27

Photo 26 and photo 27. (52.264348 , -2.8356603) A very good example of exactly how felled material can be used to enhance river habitats. Keeping the main trunk on the bank will help keep the feature in place. The mass of smaller branches in the channel will provide key habitat for both juvenile and adult trout along marginal areas, and important resources for aquatic invertebrates. The benefit of willow, shown in photo 27, is that it will 'take' when submerged, regenerating further growth and root systems along the river margins. The main stem of this tree can be secured from being washed away in floods by using cable or rope (see recommendations). This helps alleviate flood risk concerns.



Photo 28. The left-hand bank becomes bare and exposed a little further around the bend (52.264329 , -2.8354887). Given the arable land use and absence of stock, a line of trees could be planted back from the bank top, to establish root systems before future erosion reaches them.



Photo 29. Potentially difficult to fish, this section of river at 52.264168, -2.8351185 provides good habitat complexity through bed level change and

woody structure. The overhead and trailing branches are primary habitat features selected by adult trout. The blend of some open water still provides opportunities to cast at feeding fish, once they leave the denser cover used for resting up. Having areas of complete refugia in thick cover for fish from angling will certainly help retain numbers of fish and larger specimen individuals in the fishery. It will also provide a superb buffer for fish populations against avian predation.



Photo 30



Photo 31



Photo 32

Photos 30, 31 and 32. Another quality combination of habitat diversity and features, driven by interaction between bed morphology and large woody material around this pool. The tree that has leant into the river here provides key overhead structure for adult trout; the submerged limbs enhance the quality of this feature even further. Positioned adjacent to a deep pool, and coupled with back eddies, slacks and other trailing branches, this area is valuable to a range of fish species present at various sizes and ages.

The next section of watercourse downstream entered yet another diverse combination of good quality habitat features (photos 33 to 37). The channel gradient and morphology change as the river and woodland began to strongly interact, the river creating anastomosed channels in response to large woody material in and around the channel. Specifically for trout, this reach provides opportunities for spawning in patches of suitable substrate deposited at the tail of deeper scour pools and glides, with good juvenile habitat in the immediate vicinity. The addition of channel bifurcation and side streams, in conjunction with complex woody material and trailing branches means there is scope for fry and parr to survive in places throughout this section. A very valuable section of river to the immediate fishery and wider Lugg.



Photo 33. (52.263895 , -2.8340156) The coarse substrates deposited here provide opportunities for spawning. The complex woody 'trash dam' at the downstream end will slow flows, assist the deposition of spawning material, regulate winter flow energy over spawning locations and provide holding cover for pre-spawning adult fish. Anywhere a large amount of woody material accumulates, care should be taken that it doesn't evolve into an impenetrable barrier for fish as more material accumulates. Generally winter floods should create flow pathways through the dam and remove old material as other fresh material gets caught up. The river bifurcates and splits at this point, the additional channel is discussed in section 3.2.1.



Photo 34. Exposed areas of coarse sediment highlight the range of material sizes available for salmon, trout and grayling to spawn in at this point in the Lugg.



Photo 35. Sensitive habitat management was evident in Upper Kingsfield, adjacent to where a side channel splits from the main flow at (52.263941 , - 2.8337581). Essential cover for juvenile trout has been created here by placing a complex and fine mesh of branches over shallow riffles and marginal areas in the channel, using a couple of small trees. These extremely beneficial habitat features can be retained through a selection of options (staked, secured etc), explained in the recommendations section.



Photo 36. (52.263862 , -2.8333719) Another side channel feature. The overhead structure formed by smaller branches, the larger underwater limbs, shallow

depths and slower flow velocities make this a prime and complex habitat area for juvenile trout (parr) to take up territories in. Smaller fish, with their lesser swimming ability, will be protected from average flood flows here. Pinning some finer branched material from adjacent shrubs or trees into the RHB (bottom left of the picture) will provide further enhancement for young-of-the-year trout that drift into here from spawning locations upstream.



Photo 37. Again, addition of further 'bushy' material from the crown of small trees or shrubs pinned along the marginal edge on the far side (LHB) of this channel will further enhance this area for both trout fry and parr.

Heading a little further downstream (SO432631 to SO432631), the river habitat becomes even more complex, high quality and able to support all life stages of fish species present and a great diversity of aquatic invertebrates. Clearly some very sensitive and considered management has happened around these river dynamics, which has augmented positive habitat formation and river processes as the watercourse interacts with the woodland (Photo 38 to Photo 42).



Photo 38. Habitat diversity for all life stages of fish...



Photo 39....driven by interplay with woody material and trash dams...



Photo 40....and more trash dams....



Photo 41....Driving channel braiding (anatomisation) as the river finds its way through this natural and dynamic situation in the woodland.

The 'shaggy' and 'messy' habitat through the middle of Upper Kingsfield may be seen as impenetrable and difficult to fish. However, taking an enlightened approach, it makes this section of the fishery very good for producing a wild fish population. These fish will disperse and both juveniles and larger adults will take up residency in other parts of the fishery where fly fishing is more accessible.



Photo 42. This fallen tree creates an impressive piece of bank protection, prime marginal habitat and maintains geomorphic process and further channel habitat formation in the main channel.

Exiting the myriad of watercourse in the woodland, the Lugg naturally returns to a larger, single thread channel again in a slightly more constrained river valley. However, naturally forming and dynamic habitats were found throughout the remainder of Upper Kingsfield, again due to positive river channel processes and interaction with large woody material (and considerate management by the fishery).



Photo 43. Once 'greened up' with leaves in the late spring, this draping and trailing branch network, coupled with the trailing vegetation along the far bank will provide essential habitat for trout fry and parr at (52.263945 , -2.8329545).



Photo 44. (52.264020 , -2.8327587) As the valley sides steepen off the LHB, this elevated and exposed bank face has started to erode due to a back eddy formed during floods. A thick seam of river 'gravels' can be seen clearly, which the river will be eroding and depositing as part of natural processes to form channel habitats downstream . The network of roots adjacent to the deep pool provides valuable adult trout habitat. Folding and pinning some of the available standing wood adjacent to the erosion feature will help regulate the rate of erosion.



Photo 45. (52.263810 , -2.8328311) While beneficial to have overhanging cover, this fallen willow could also be used to provide bank protection and additional habitat benefits in conjunction with Photo 47, below.



Photo 46. The back eddy eroding into the far LHB could be filled by pulling the fallen willow around and pinning it in the hole (see recommendations for potential techniques).



Photo 47



Photo 48

Photos 48 and 49. A mid channel bar formation, coupled with large and brashy woody material adjacent is providing excellent flow diversity and a wide range of habitat opportunities for fish and aquatic invertebrate life.



Photo 49



Photo 50

Photos 50 and 51. (52.263515 , -2.8328902) A great example of natural interaction between river and woodland, creating quality, dynamic, river habitat. Also, how natural river habitats can regulate increasingly intense floods; the cross channel trunk will slow down elevated flows, the downstream marginal trunks will further dissipate flood energy, reducing both rates of erosion and how quickly water heads to downstream locations. Moderating flood flows is critical for maintaining aquatic biodiversity, especially as flood intensity and frequency has increased in recent decades.



Photo 51. The bifurcated channel discussed in 3.1.1 rejoins the main channel of the Lugg; still lots of dynamic river habitat and large woody material interaction in both channels (52.262831 , -2.8321767).



Photo 52. The channel becomes much larger in the downstream half of the beat, once all the anastomosed and bifurcated river channels have converged. Trailing tree limbs and brash add some habitat diversity to a now far more uniform channel. It is likely the woodland and excellent habitat upstream provides some moderating effect on flood water energy by slowing flows, allowing features such as this in the larger downstream channel to stay in place, when flows increase.

Halfway down the beat, the high ground off the LHB has been cultivated for spring crops, leaving bare soil exposed on a slope. A significant period of rain is likely to create pathways of soil laden runoff straight into the river. The buffer strip at the toe of this field may alleviate some of the issues, but dependant on volumes of rainfall. Fine particles of soil entering the river clog gaps in river gravels, reducing the ability for fish to spawn successfully in them, and suppress aquatic invertebrate diversity. Applications of fertiliser or legacy levels in the soil will enrich the water with nutrients, creating further issues with algae, clogging of gravels, loss of aquatic plants and affecting oxygen levels. Engagement with Natural England Catchment Sensitive Farming, FWAG or WUF farm advisors would be helpful for advising alternative management and payment schemes that can reduce risk further here while still producing crops.



Photo 53. (52.261917 , -2.8312969) Beneficial pool habitat with root systems but only a thin buffer strip between the cultivated field and river here.



Photo 54. (52.261116 , -2.8304386) Cultivation down the hill slope and exposed soil pose a direct impact to the river during usually wet spring periods. The wide buffer strip will afford some protection but is still likely to allow silt through if a period of continuous rain is experienced.



Photo 55



Photo 56

Photos 55 and 56. (52.261418 , -2.8307819) Paleochannels exist in the large cultivated field across the floodplain on the right-hand bank. Flood waters break out across the field and into the old channels left by the river migrating across the floodplain. A wall has been constructed on the bank top at the downstream end of this process to try and stop flood water heading to this point, which increases the height of the bank and disconnects the section of river below from the floodplain.



Photo 57. A large pool on a sweeping bend at 52.260682 , -2.8301167 marks the return of some diversity in the now larger river channel. Rip-rap boulders, tree roots and trailing branches provide cover and make this a valuable feeding habitat that could hold a number adult trout. Excellent features to be retained.



Photo 58. In conjunction with sinuosity returning to the channel planform, glide and riffle channel habitats are formed as the river erodes and deposits bed material again. Salmon may spawn at this location in the right conditions.



Photo 59. Submerged logs and tree trunks provide perfect holding habitat for trout and grayling. This is located very beneficially on the outside of a bend at 52.260737 , -2.8295159. Additional woody material could be folded in over the high bank face and pinned to help moderate erosion.



Photo 60. (52.260409 , -2.8287756) A fantastic combination a very large timber interacting with the channel. The lodged and submerged trunk against the eroding left-hand bank will provide excellent structure for trout to lie under, while feeding on invertebrates brought down by the flow. An additional trunk could be imported and installed in the eroding bay, perhaps packed with brashy material to slow the erosion here. Coupled with bank top planting of suitable tree species to future proof bank stability.



Photo 61. The suspended log jam of fallen trees highlights how quickly flow energy gets dissipated by large woody material in the channel, and will continue to do the same when river levels rise during floods. The structure provides superb cover and will attract trout at all river levels; refugia from flood flow, predation and intense sunshine.

Toward the very end of the Kingsfield Beat (52.259456 , -2.8276277) the river channel has been modified (straightened and dredged), along the approach to the weir at the bottom of the fishery. The presence of elevated banks, which are now consolidated with vegetation and tree growth, means there is little room for the channel to recover currently (photos 62 and 63). This modified channel geometry will rapidly convey flood water downstream, intensifying flood issues, in complete contrast to the anastomosed river through the woodland sections upstream, which will slow flood waters down. The fishery boundary finishes before the water impounded by the weir becomes an issue (but is immediately adjacent downstream), which drowns out quality river habitat by backing the water up and slowing it down. Some habitat features still exist in the channel where gravel deposits are still exposed by flow, and will be utilised by fish present, most likely bullheads, smaller trout and grayling.



Photo 62. Straightened channel at the bottom of the beat.



Photo 63. (52.259278 , -2.8272200). Bankside material could be cut and heeled into the channel to create some marginal cover here. More ambitiously, some root wads could be pushed into the bank to create some sinuosity in the straightened channel.



Photo 64. (52.258423 , -2.8245807) The weir below Upper Kingsfield beat. Despite the low-cost baffle system installed on the face of the weir to ease salmonid fish passage, this is a significant barrier to river process and fish migration in the Lugg (Figure 5). Salmon and trout life cycles will be strongly disrupted by this feature as they cannot move freely up or downstream, and river habitat impoverished downstream as replenishing bed material gets stuck behind the weir. The vertical toe at the bottom of the sloping weir face means fish will find it very difficult to get into the baffle system at lower flows. A revisit to look at options for remediating issues caused by this weir (ideally partial or full removal as a first option) would be hugely beneficial to the Lugg generally, and fishery upstream.

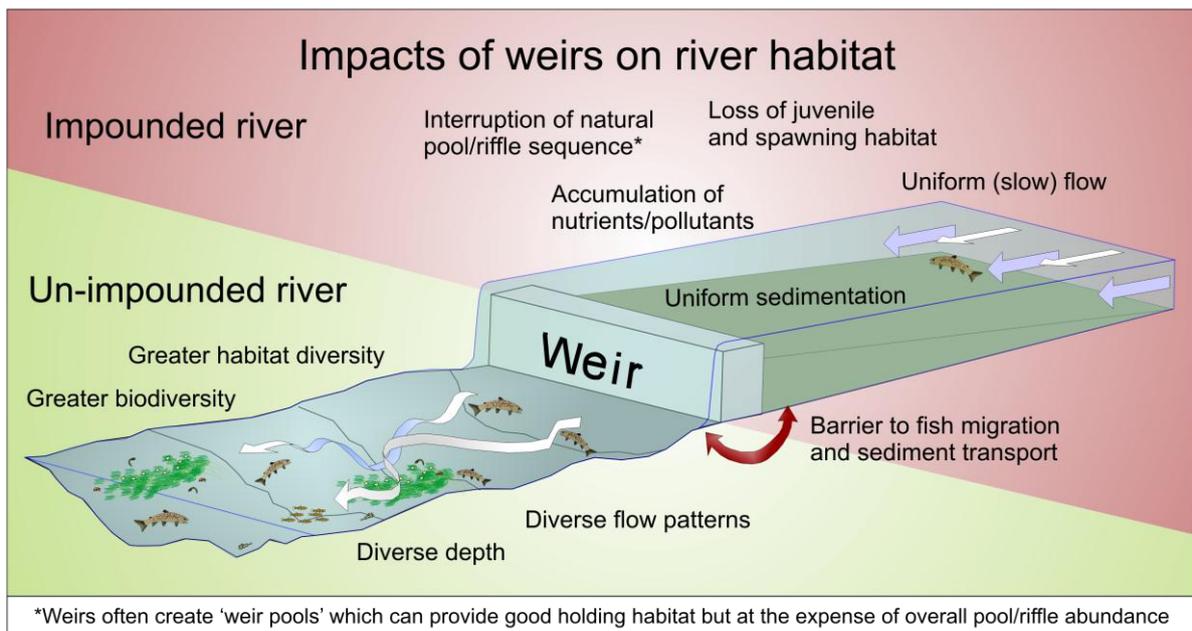


Figure 5. This diagram highlights the impacts weirs – or river barriers – have on river habitat development and fish populations.

3.2.1 Bifurcated stream in Upper Kingsfield

This section of watercourse splits at 52.263767 , -2.8357408 to form the furthest branch of watercourse into the right-hand bank, through the wooded section of Upper Kingsfield. This side stream interacts even more closely with large woody material than the other channels previously reviewed. The result is some deep pools, heavily covered by tree limbs, plus large woody material in the flow creating riverbed morphological response and subsequent riffle glide and run habitats. This section was walked in an upstream direction on the way out of the fishery.



Photo 65. Complex habitat through shallower water will provide excellent trout parr habitat, along with a huge range of habitats for aquatic invertebrates in this section (52.262769 , -2.8332464).



Photo 66. (52.263409 , -2.8337989) A heavily protected pool; ideal habitat that will hold large adult trout and salmon. Ensuring this fallen wood is retained will

benefit the wider fishery. Having some truly difficult places for predators and anglers to exploit should mean some great fish make it through to spawning, benefiting the fishery by increased numbers of progeny in the future.



Photo 67. (52.263531 , -2.8343890) A large trunk has forced the flow underneath it, blowing gravel and pebble substrate up into a riffle. This could offer a potential spawning location, with a secure pool for pre-spawning fish to lie up in.



Photo 68. Further fallen limbs creating scour and gravel deposits in short riffles at (NGR). Spawning opportunities for larger fish exist in front of the trunk in this picture.

3.3 Conclusion

The fishery is split into two distinctly different beats habitat wise; Upper Kingsfield with some exemplary river habitat (and management) examples that could be a case study for other rivers in the Welsh Marches region, Meadow beat with much potential for beneficial restoration and conservation actions. Despite the good quality habitat in Upper Kingsfield, it still has some specific areas to keep an eye on, particularly trash dam formation and permeability for fish, and protecting the river from surrounding agriculture where some buffer zones are limited in effect. Upper Kingsfield is very likely an important 'trout production' zone, where juvenile fish (1-2 years old) will emigrate from for certain, to populate other areas of the river upstream and downstream. The Upper Kingsfield beat will also offer quality angling potential for larger grown on trout and grayling, if the current 'hands off' sensitive management continues. In Meadow beat, if the river can be allowed more space to develop riparian habitats throughout its length, this has potential to host a plentiful population of wild trout and grayling. Allowing riparian tree growth to develop will be especially important for keeping the river cool in hot periods and developing habitats as large woody material develops along the banks and interacts with the river. It has great potential to support salmon spawning and juveniles too, especially if the weir can be remediated below the fishery to provide better access.

4 Recommendations

- Refer to photo and habitat descriptions in the report above for details on issues/beneficial scenarios for where suggestions will apply.
- Continue to develop tree planting and bank protection work to reduce erosion rates throughout Meadow beat, working with landowners. This will allow riparian and marginal habitats to develop. In conjunction, widen buffer areas to allow mature riparian areas to develop, which will naturally stabilise erosion rates in the long term. See the appendices below for additional discussion and recommendations on erosion and grazing.
- Install large woody material and brash interventions to defend areas against accelerated erosion in Meadow beat. These will need to use substantial material at their foundation, pinned and wired to stop them washing out. Root-plates may work in places too. Willow material can be used to create growth through structures and bind banks together, but care should be taken not to encourage it to become overly dominant along the beat. A selection of approaches for defending against rapid erosion are available (Figure 6) and more

information is available on the Wild Trout Trust website, here: [Complete_Feb22_2010_FINAL_USED.indd](#) and here: [Habitat Improvement | Wild Trout Trust](#)

- Select suitable trees for use in revetment work, and those that can be pollarded, to provide additional brash in the floodplain along Meadow beat.
- Wye and Usk Foundation has delivered some successful examples of protecting banks against accelerated erosion elsewhere in the Lugg and Arrow catchments – exact details of location can be sought from WUF to provide case studies and confidence in success of large wood and brash bank protection techniques.
- Maintain fishery catch records as they exist. Some analysis to categorise annual catches of trout vs size brackets may give an indicative picture of fishery performance each season (i.e. are juvenile trout and grayling being encountered, suggesting future stocks, or are they notable by their absence). This will help guide habitat improvements. Temperature can also be recorded, either by angler spot checks, or installation of a small data logger. Both will also help inform when river temperatures (above 19°C) are not good for salmonid angling during the season.
- Continue with sensitive management of access as seen in the Upper Kingsfield beat. A subtle angler access route, with subtle and suitably located access and egress points to the river will minimise impact on surrounding bankside habitat. Maintaining the superb in-channel woody material while cutting of the occasional problematic stick or branch for fishing will maintain angler use of the beat and interest in the river.
- Work with surrounding landowners to ensure the river is suitably protected from surrounding cultivated land. Engagement with suitable catchment-based land management advisors can support this. The Wye Catchment Partnership will list key contacts [Home - Wye Catchment Partnership](#)
- Work with downstream riparian owners to identify ownership of the large weir. Given previous work to install low-cost baffles here, existing information should be available. Catchment partners and WTT can support with engagement and how to approach remediating this barrier to fish movements and river process, which will benefit MFF waters upstream. Figure 5 shows one example of a solution.



Figure 6. Installation of large timber, packed with brush and possible planted with willow whips will slow erosion rates down. This provides time for vegetation to develop on the bank which will naturally regulate erosion. Moving the fence away from the bank top and tree planting back from the edge of the bank will develop very beneficial root systems to bind the bank in the future.



Figure 7. One example of how steel cable can be used to secure large timber in the river, such as this tree kicker (more information: [Habitat-Sheet-Kicker.pdf](#)). Combinations of cable, wire and anchors will ensure features are flood resilient.



Figure 8. An example of weir alteration and rock ramp being used to remediate a river barrier and reconnect the watercourse. On the Lugg, given the incised and modified channel upstream of the weir below the fishery, removing the weir would be the best option, but retaining a bed check would ensure channel stability following the work.

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.
- WTT Project Proposal
 - Where recipients require a more substantial restoration project developed, involving larger capital delivery and exterior funding, WTT may be able to develop recommendations from this document into outline proposals, indicative costs and designs to take forward for funding. Often this can be in collaboration with other catchment conservation partners, such as Environment Agency, Rivers Trusts and Wildlife Trusts.

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-dvd or by calling the WTT office on 02392 570985.

An important source of income which helps to fund the WTT's work is our [Annual Spring Auction](#). The auction is our biggest fundraising event and includes fishing days, tackle, books, art and more. Many of our AV and PV recipients subsequently help us with auction lots each year, and we're very grateful for this extra support. To donate a lot, please contact Christina via office@wildtrout.org.

6 Acknowledgements

The WTT would like to thank the Environment Agency for supporting our advisory and practical visit work in England.

7 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.

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.

Appendices

Bank Protection

Bank erosion is a natural process that is important in supplying a river with sediment, such as the gravels used by fish for spawning. However, erosion often becomes a problem when it is accelerated by grazing and/or trampling, through the associated reduction of vegetation and vital root structure, and physical damage to the bank. Past channel alterations (dredging and straightening) and hard bank revetments can also exacerbate erosion by deflecting and focussing flows onto adjacent areas of bed or bank, as can in-channel structures which interrupt sediment transport. Somewhat counterintuitively, the simplest bank protection measures are often the most effective, like excluding livestock or using soft, diffuse structure to turn the high flow-energy area into a lower energy area.

In the following example, fencing to exclude livestock, tree planting and light regrading by hand with spades is all that was required to restore bank stability. The work was undertaken by the Glaisdale Angling Club as a work party, following and advisory visit and recommendations from WTT. The first picture is taken looking downstream, with the following before and after photos looking upstream.





Brash Bank Protection

Brash bank protection entails installation of brushwood/branches to protect the bank face, prevent undercutting, and retain any slumped material long enough for vegetation to establish. Brash is installed with the butt ends upstream, working in a downstream direction, so the butt of each branch is fed amongst the branches upstream to create an interlocking matrix. Stakes are then driven into the matrix to secure it in place, with longer branches fastened over the top with low-tensile wire to preventing lifting in high flow. It can be beneficial to use live willow within the matrix as it will usually take root and grow in damp sediment. Grass seeding and tree planting can help too, but are often unnecessary. Green bank protection methods still require livestock exclusion to treat the issue as well as the symptoms.

Contrary to popular belief, the hard, tidy lines of many bank protection measures (including willow spiling) can be counterproductive, and often simply deflect flow energy onto other areas of the bed or bank – much as hard, artificial bank revetment does. This is why willow spiling can often fail in its first year or two, after which the bushy growth can begin to protect the bank. It is far better to protect a bank from day 1, leaving a scruffy, brashy edge to bank protection that baffles flow and encourages deposition of fine sediment. That deposition can even rebuild the bank, providing a nutrient-rich growing medium for the vegetation that will ultimately stabilise the bank. A nice scruffy margin is also far better for fish and invertebrates which will utilise the structure as refuge.



Above - Live willow being very loosely woven between the posts of the bank protection. Unlike the hard lines of traditional willow spiling (or hard revetment), this provides diffuse protection from day 1, and is unlikely to create erosion elsewhere. Note the valuable in-channel structure for fish and invertebrates.

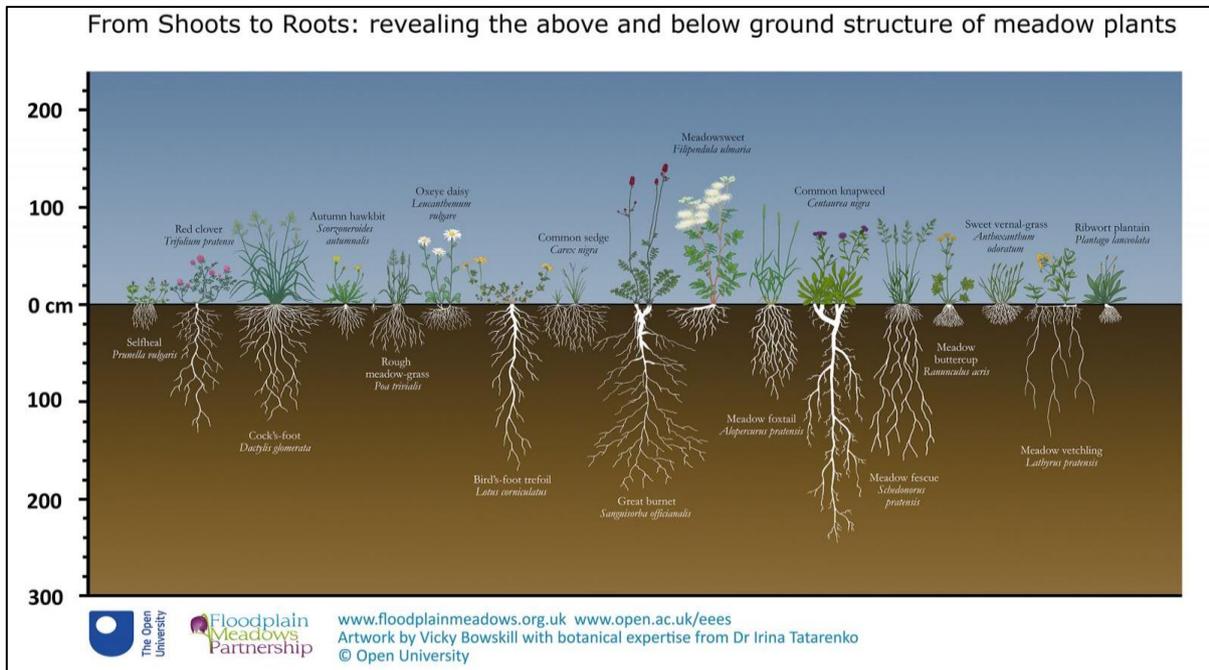
The following sequence shows how installation of a brush mattress not only halted major erosion but dissipated flow energy sufficiently to facilitate deposition of river sediment, infilling the erosion void in less than one winter. Several years down the line, the area is now a stand of willow and regenerated alder. The contribution fencing made should not be underestimated, as although the brush fixed the erosion scar, the fencing prevented livestock from perpetuating the erosion issue.





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.uk/about-meadowwildlifeshoots-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 reseeded or planted. 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.