Advisory Visit

River Rib, Upp Hall nr Braughing, Hertfordshire

November 2019

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Key issues

- The River Rib at Upp Hall is a degraded chalk stream with much potential to be enhanced to bring benefits to its wild trout population, the fishery and its overall aesthetics.

- The need to stock the river with trout should be reviewed by the syndicate. Analysis of catch returns should be the first step of the review process.

- The upper fishery should be maintained through minimal intervention to act as a reserve for the river's wild trout. Stocking should not take place in the upper reach

- There appears to be a paucity of gravel supply in the upper fishery. The placement of gravel would enable the riverbed to be restored to provide wide riffle habitats that could energise the pools.

- The weir should be removed to allow winter flow to cleanse the bed of fine sediment and to initiate coarse sediment transfer.

- Fallen woody material (sticks, branches and trees) should be retained, and made secure, where it poses no flood risk.

- Many parts of the river, especially the lower fishery, exhibited an incised channel. Re-grading of the banks to create a 2-stage channel could address the current poor bank profile.

- The Himalayan balsam and giant hogweed must be controlled to prevent them from creating serious dominance problems.

- Much of the river has sub-optimal habitat. Habitat enhancement measures could be deployed to enhance the river's low-flow channel. A simple habitat enhancement scheme could be worked-up between the syndicate and WTT to address the poor habitat.

1.0 Introduction

This report is the output of a site visit undertaken by Rob Mungovan of the Wild Trout Trust to the River Rib at Upp Hall, near Braughing. A member of the angling syndicate was present for the duration of the visit which was undertaken on the 20th November 2019. Comments in this report are based on observations made on the day.

The purpose of the visit was to advise on the suitability of the river for wild brown trout, and to consider measures that could be implemented to improve habitat for them.

Normal convention is applied throughout the report with respect to bank identification, i.e. the banks are designated left bank (LB) or right bank (RB) whilst looking downstream.

2.0 Catchment Overview

Table 1 summarises the Water Framework Directive (WFD) data for the River Rib, with an overall classification of 'moderate' ecological status. Parameters that make up the classification include 'good' for fish, 'good' for invertebrates and 'moderate' for macrophytes and phytobenthos (the lowest scoring attribute usually driving the classification).

The Rib is a medium sized (25km long) chalk stream with brown trout populations in its middle to upper reaches, and coarse fish present towards its confluence with the River Lee.

The catchment falls within the South Suffolk and North Essex Claylands National Character Area. It is a mixed landscape with ancient woodlands, small meadows and arable farming. The overall character is of a gently undulating, chalky boulder clay plateau with gravel and sand deposits beneath the clay.

The Rib has been modified by humans for centuries. A mill once stood at Upp Hall with a relict sluice gate the only trace of its existence.

As with many chalk streams in the region, abstraction for public water supply has had an impact on river flow (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/792373/Upper_Lee_Abstraction_Licensing_Strategy.pdf . At the time of the visit, the river was recovering from drought conditions with the flow visibly low.

	Waterbody details
River	River Rib
WFD Waterbody Name	Rib (from confluence with Quin to Lee Navigation)
Waterbody ID	GB106038033360
Management Catchment	Lee Upper
River Basin District	Thames
Current Ecological Quality	Overall classification of **Moderate** for 2016
U/S Grid Ref inspected	TL 39112 24370
D/S Grid Ref inspected	TL 39251 23469
Length of river inspected	1.06km

Table 1 Data from https://environment.data.gov.uk/catchment-planning/WaterBody/GB106038033360

Cycle 2 classifications

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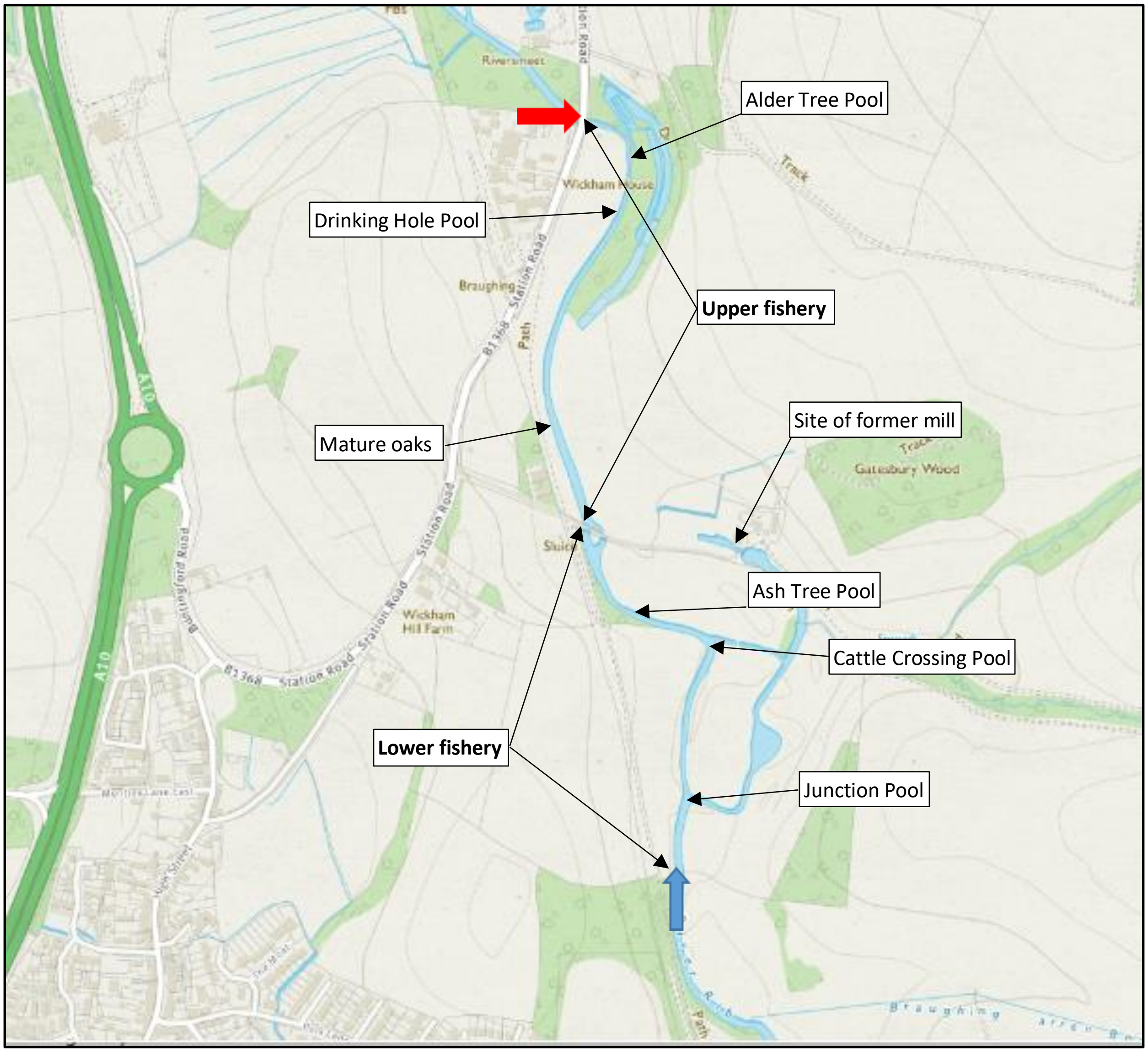
Classification Item	2013	2014	2015	2016
Overall Water Body	Poor	Poor	Moderate	Moderate
Ecological	Poor	Poor	Moderate	Moderate
Biological quality elements	Poor	Poor	Moderate	Moderate
Macrophytes and Phytobenthos Combined	Good	Good	Moderate	Moderate
Fish	Poor	Poor	Good	Good
Invertebrates	Good	Good	Good	Good
Hydromorphological Supporting Elements	Supports Good	Supports Good	Supports Good	Supports Good
Hydrological Regime	Does Not Support Good	Does Not Support Good	Does Not Support Good	Does Not Support Good
Morphology	Supports Good	Supports Good	Supports Good	Supports Good
Physico-chemical quality elements	Moderate	Moderate	Moderate	Moderate
Ammonia (Phys-Chem)	High	High	High	High
Dissolved oxygen	High	High	High	High
pH	High	High	High	High
Phosphate	Poor	Poor	Poor	Poor
Temperature	High	High	High	High
Specific pollutants	High	High	High	High
Chemical	Fail	Fail	Good	Good

Table 2 Data from https://environment.data.gov.uk/catchment-planning/WaterBody/GB106038033360



Map 1 – The River Rib at Upp Hall near Braughing. Red arrow is upper limit, blue arrow is downstream limit of visit © Ordnance Survey.

The Upp Hall fishery is a small syndicate of 10-12 members who control angling along ~1km of the Rib. The syndicate stock the river annually with up to 200 brown trout of 10-11 inches plus a few larger fish. Previously ~200 fingerling grayling were stocked but they have not been seen.

No signs of water voles were seen during the visit, but they were not specifically looked for. No signs of otter were found even though bridge structures were checked for spraints.

Signal crayfish were reported to be present, but none were seen, nor were their burrows observed in the banks. Signal crayfish pose a threat to native biodiversity through disease transfer and competition. Signal crayfish must not be moved to other watercourses.

3.0 Habitat Assessment

The fishery had a distinct feel of 2 halves and for the purpose of this report, it has been divided into the upper and lower fisheries.

3.1 Upper fishery

The visit started at the top of the fishery at the B1368 bridge. River levels appeared low with previous water marks on the double-arched bridge indicative of a once much higher flow. However, it was reported that the flow was typical of that experienced in recent years. The river only flows through 1 of the arches now.

The river's wet-width was ~4m but the proportion of open channel was nearer to 1m, with trailing vegetation narrowing the width, increasing the flow rate and providing habitat (pic 1). The bed was a mix of poorly sorted, silty gravel. The river flow was barely enough to flush fallen leaves from the bed.

Pic 1 (TL 39124 24365) – The upper part of the river was significantly narrowed by marginal vegetation.

~20m downstream of the bridge, the first notable pool was encountered, Alder Tree Pool. The pool provided depth cover with tree roots providing underwater cover. A willow tree had partially collapsed into the head of the pool from the LB (pic 2) and provided good cover, both above and below water. Other than the one willow trailing into the water, there was a general lack of fallen branches and tree limbs.

The occurrence of branches and tree limbs, together with the organic matter that they collect, may look "messy" to some but the presence of such material is of great importance within rivers. Collectively such material is referred to as Large Woody Material (LWM). LWM leads to an increase in the surface area on to which a biofilm (algae, bacteria and other microbes) can grow. In turn, the biofilm may become a source of food for invertebrates, increasing the total biomass that a river can support. Messy rivers will support much more wildlife. LWM also provides underwater cover, offering protection for fish against otters or fish-eating birds. LWM can also provide natural flow deflection which may increase a river's velocity assisting cleansing of the gravel bed. Where LWM presents no flood risk it should be retained. Where possible, branches, tree limbs and even fallen trees should be secured in the river margins to provide habitat.

Trees are hugely important for rivers, with their canopies providing summer shade which aids water temperature regulation (thus providing a degree of climate change resilience). A high number of terrestrial invertebrates inhabit tree canopies and some of those will fall on to the water to become food for fish. Trees also drop organic matter into rivers (whether it be leaves, twigs or larger limbs) which provide valuable structure, cover and food for aquatic invertebrates, initiating nutrient cycling and increasing the diversity of food webs. Tree roots are also crucial in maintaining bank cohesion and stability.


Pic 2 – Alder Tree Pool, a partially collapsed willow provided cover.

The land use adjacent to the river is largely pasture grazed by sheep. Small copses and tree belts abut the river. The intensity of grazing was low and did not appear to be causing damage to the river. Tall marginal vegetation of great willow herb and reed canary grass was present, which in addition to providing important marginal cover for fish, also provides cover for a wide range of both terrestrial and aquatic invertebrates (pic 3).

Himalayan balsam plants were noted along the entire river. Giant hogweed was observed from downstream of the site bridge. Both Himalayan balsam and giant hogweed are invasive non-native species (INNS) which have the capacity to dominate native flora, suppressing soil-binding grasses. When the balsam or hogweed plants die-back in winter they leave riverbanks bare and prone to erosion. The balsam is at low enough numbers to make hand pulling an effective means of control. Giant hogweed must not be hand-pulled due to it containing a toxin that causes skin irritation upon exposure to sunlight. Giant hogweed should be controlled by glyphosate application by an appropriately certified operator, correctly permitted. The seeds of balsam can remain viable for 3 years, those of hogweed for up to 5 years.

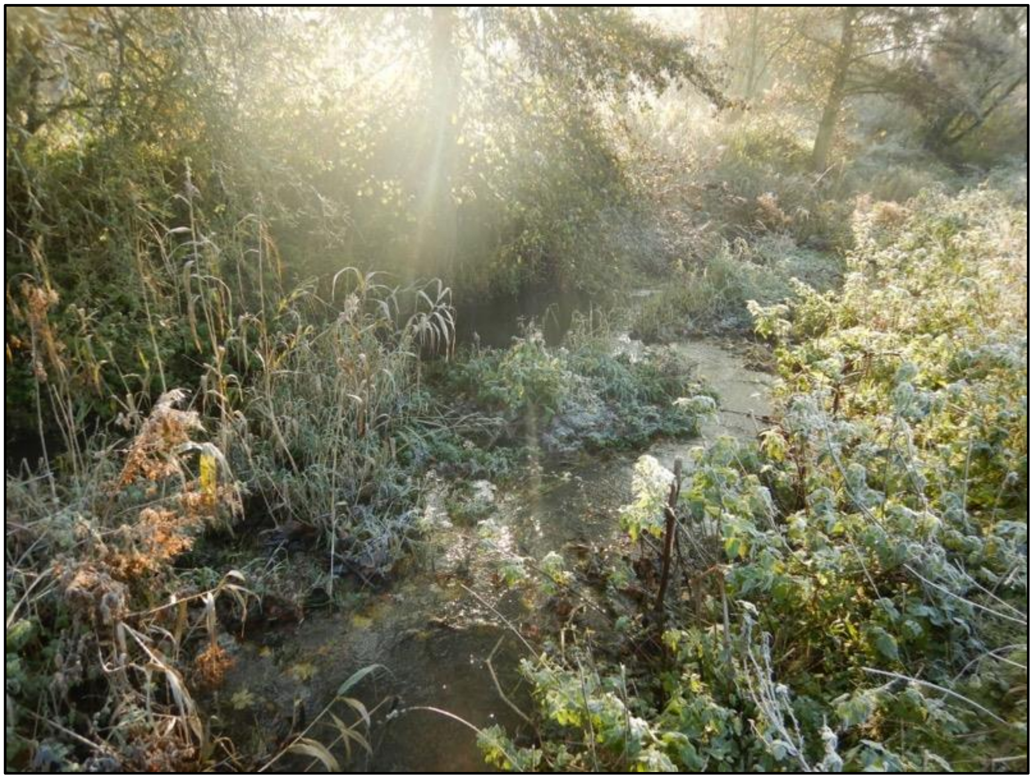
Pic 3 (TL 39163 24302) – Riparian vegetation provided marginal cover. Note the high volume of fine organic sediment smothering the riverbed.

Nettles tended to dominate the riparian vegetation along much of the river, a likely consequence of dredging followed by the spreading of nutrient-enriched spoil upon the riverbanks.

The river appeared very over-grown and challenging to fish. Open water occurred as short glides, often no more than 1m in width. The glides had gravel present, but it contained a high proportion of fine sediment making it unsuitable for brown trout to spawn upon (illustration 1). However, the reach is likely to hold wild fish, particularly juveniles. If the numbers of wild trout are to be increased, then it is important to sustain the habitat conditions that those fish require and not to open-up the river simply so that anglers can cast to water which *might* hold a fish.

Furthermore, the fishery is stocked with trout each year. The stocking of trout into a river capable of producing wild fish should be curtailed, particularly if the anglers practice catch-and-release.

At TL 39164 24291 the river's gradient increased resulting in a greater degree of sediment transport and sorting. A number of mid-channel gravel bars were present which had been colonised by brooklime and fool's watercress (pic 4). Complex flow patterns were forced around the stands. This type of habitat, although challenging fishing, is of high value to trout fry and parr, with the juvenile fish sustained in shallow fast-water habitats preventing them from contact with adult trout found in the pools (who have canabalistic tendancies).



Pic 4 (TL 39164 24291) – Mid-channel vegetated gravel bars provided good juvenile trout habitat.

A fallen willow was encountered at TL 39150 24253 (pic 5). The tree provided excellent cover, and the debris which had collected against it created a flume of water, creating bed scour and sediment sorting. The willow tree is still alive and should be left in its entirety.

Immediately downstream of the fallen willow the first plant of water crowfoot was observed. Water crowfoot is important for retaining a head of water, creating flow diversity, increasing cover, and as a spawning substrate for many coarse fish. The plant is typical of clean, swift-flowing rivers. Low-flow conditions make crowfoot susceptible to grazing by birds (such as ducks and swans) as the reduced water velocity requires less energy to be expended as they feed. Creating faster water conditions will not only benefit the trout, but also the river plants that they tend to be associated with.

Pic 5 (TL 39150 24253) – This collapsed willow should be retained as cover. If limbs need to be removed to aid casting then ensure that many are retained for cover above water, and that all are retained below water.

The river has evolved a noticeable 2-stage channel with a vegetated berm, following repeated years of low-flow (pic 6). Vegetated berms provide important sink points for fine sediment. Without vegetation fixing sediment, it may be deposited on the riverbed where it can degrade invertebrate and fish habitats, or it may be deposited in pools causing them to shallow. Vegetated berms provide natural channel narrowing that is in balance with the river flow (as it has been created through the processes of erosion and deposition), and enable a low-flow channel to evolve. This improves a river's resilience to climate change, especially prolonged periods of drought. High flows may scour away berms leaving a widened river cross-section again, with the potential for the process to repeat depending on flow experienced over time.

Pic 6 (TL 39138 24229) – The river has narrowed to create a significant vegetated berm (red arrow) resulting in the 2-stage channel.

A cattle drink (Drinking Hole Pool) was observed and had clearly been present for many years. Due to the low intensity of grazing, the cattle drink did not act as a source of fine sediment input and presented no problem to the fishery.

Several low-growing and leaning sallows were encountered (pic 7). They provided useful shade to the river and kept areas of river open from vegetation encroachment, thus aiding angling access. The management of shade requires careful consideration. In hot periods shade can bring benefit, but when excessive, it limits the growth of marginal plants which are important for retaining bank strength and controlling fine sediment input. The sallows could be manipulated to address the lack of flow diversity.

One of the sallows had also collected wrack against it, causing water to flume around it. Evidence of recent bed scour was observed with gravel having been sorted and sand deposit downstream (pic 7).


Pic 7 (TL 39101 24173) – The sallows created scour, with sand sorted from the gravel.

At TL39083 24134 the river's gradient reduced, and its depth became greater with fine sediment smothering the bed again. Branched burr reed was present. It is a plant indicative of a river that has been dredged, with an ability to dominate over-wide channels suffering from low energy and an excess of fine sediment.

The lack of flow diversity was compounded by tall riparian trees casting shade, restricting marginal vegetation (pic 8). Again, the need to balance shade for water cooling with the benefit of light to initiate marginal growth must be considered carefully. Tree hinging is a technique favoured by the Wild Trout Trust for managing riparian trees and delivering instant woody cover at water level. Trees (large or small) are cut to produce an effect like hedge laying. Species such as willow and hazel respond particularly well. Laying retains a living hinge that secures the cut stem to the tree stump so structural strength is retained. With the tree-top laid at water level, it provides excellent over-head cover, flow deflection and, if beneath the surface, increased habitat for aquatic invertebrates and cover for fish against predators.

Pic 8 (TL 39071 24097) – Riparian trees, especially the leaning willow, could be hinge-cut to create flow diversity to an otherwise over-wide reach of river.

Several mature pollard oak trees were growing from the RB with branches extending over the river. The bed at this point was notably shallower than the length above it. It is possible that the presence of the mature oaks prevented dredging from taking place, which has protected the riverbed. The presence of a high volume of poorly sorted coarse substrate (pic 9) presents an interesting opportunity to use flow deflectors to re-energise the reach, to initiate sediment transport and sorting.


Pic 9 (TL 39069 24041) – The river beneath the mature oak trees is wide and shallow with poorly sorted gravel.

Another collapsed willow provided important cover and flow variation (pic 10). Again, the willow had collected wrack against it which, in addition to causing water to flume over and under the partial blockage, was also causing water to move laterally. The lateral flow had led to bank erosion resulting in the supply of gravel to the river. In time, this action will lead to increased channel sinuosity, bedform variation and flow diversity which is all benefical for the river and its trout.

Bedform variation produces flow variation, enabling the river to transport fine sediment depositing it in the margins and even upon the floodplain during flood flows. But fine sediment which is not transported may smoother the gravel bed, reducing the number and diversity of niches for aquatic invertebrates. Importantly, trout need clean and stable gravel (particularly in the size range 10-40mm) to spawn upon. With their eggs remaining in the gravel for up to 100 days before completing incubation and development from alevins to fry, trout eggs are very susceptible to mortality from siltation or physical disturbance. Illustration 1, in the appendix, shows the life cycle of the brown trout.

Pic 10 (TL 39090 23968) – This willow tree appeared to have formed a blockage, but flow is in fact accelerated under, over and around it leading to valuable bed and bank scour.

A well-established vegetated berm was present on the RB and through vegetation encroachment, it had narrowed the open water to little more than 1m (pic 11). However, the narrowing resulted in an increased water velocity which supported the largest stand of water crowfoot observed in the fishery. It was encouraging to note the patches of clean, well-sorted gravel (pic 12), suitable for trout to spawn upon (the best seen up to this point). It is also heartening to know that even in an exceptionally low-flow year, the Rib has the capacity to sustain flow-sensitive plants, which in turn will assist the survival of flow-loving animals like trout.

It is possible that the berm and gravel are a result of previous habitat enhancement work Advisory Visit 2004: https://www.wildtrout.org/assets/reports/2004Rib.pdf as ~20m downstream, a line of posts and faggot bundles were seen extending out from the LB which supported a similar vegetated berm.


Pic 11 (TL 39098 23951) – A wide vegetated berm forming a 2-stage channel.


Pic 12 (TL 39102 23945) – Clean and well-sorted gravel suitable for trout to cut redds into.

The river then flowed beneath the fishery access road (pic 13). The bridge once formed a sluice that pushed water down a take-off channel for milling. The take-off channel has now been filled and the sluice largely removed. The bridge has channels within it which had previoulsy held boards to retain a head of water. The boards have been removed for several years now. That is beneficial for two reasons: the boards would have restricted the movement of fish, and the impounded water would have retained a greater amount of fine sediment which would have smoothered the gravel bed. The bridge no longer presents a barrier to fish movement. Free passage should be maintained at all times, especially in low-flows. It may be tempting to replace boards in low-flows but there is a risk that impounded water will become warmed reducing its suitablity for trout (and if the temperature rise does not kill them, it will certainly make them less willing to feed, affecting sport in the fishery).

The bridge also contained the remnants of an EA gauging station, now considered to be defunct.

Pic 13 (TL 39123 23884) – The bridge footings and historic sluice arrangement no longer present a barrier to fish movement.

3.2 Lower Fishery

Downstream of the bridge the river widened out to a large pool (pic 14). The pool is reported to be up to 1.8m deep, and in combination with extensive tree cover on the RB, it provided good cover for adult trout. Unfortunately, the LB was reinforced with sheet steel piling and offered little in the way of habitat apart from the trailing ivy. Due to the depth against the LB, it would not be simple for the syndicate to place any habitat enhancement measures in this sheet-piled area.

Pic 14 (TL 39126 23874) – A deep pool offering good cover for adult trout amongst the trailing branches.

At the end of the pool a large gravel bar was present. The gravel was clean, reasonably well-sorted (albeit with a higher volume of sand than one would wish) and had high-velocity water moving over it, suitable for trout to spawn. Interestingly, the LB had been subject to past habitat enhancement work as a line of posts were still visible (pic 15), and were believed to have once held faggot bundles. A quick win for any spawning fish would be to replace the faggot bundles and/or to fix LWM to the remaining posts to provide cover. It could be argued that such work is maintenance of the previous structures and thus avoids the need to secure further permits or exemptions.

After the long gravel riffle, the river flowed into a reach dominated by extensive common reed. Whilst the plant is not necessarily what a fishery might want (due to its dominance and ability to “close-off” a river) it provides valuable habitat for fry emerging in early spring when other river plants are yet to establish. The network of flow pathways amongst the reed will provide essential cover, protection from high flow and visual seperation preventing trout fry from competing with each other as they establish territories.

Pic 15 (TL 39139 23837) – A long gravel riffle suitable for trout to spawn upon.

The river flowed with a mix of gravel-rich glides (pic 16) and deeper silty pools. Marginal plants, of branched burr reed, fool’s watercress and water forget-me-not provided cover with brambles and nettles trailing to water level. Starwort was the dominant aquatic plant. The flow was generally slower than one would expect for a river supporting trout, but that is thought to be a consequence of the current drought status of the area. The return of better flows would do a lot to re-energise many of the pools.

Pic 16 (TL 39139 23793) – Branched burr reed (now died-back for the winter) provided cover adjacent to a shallow glide.

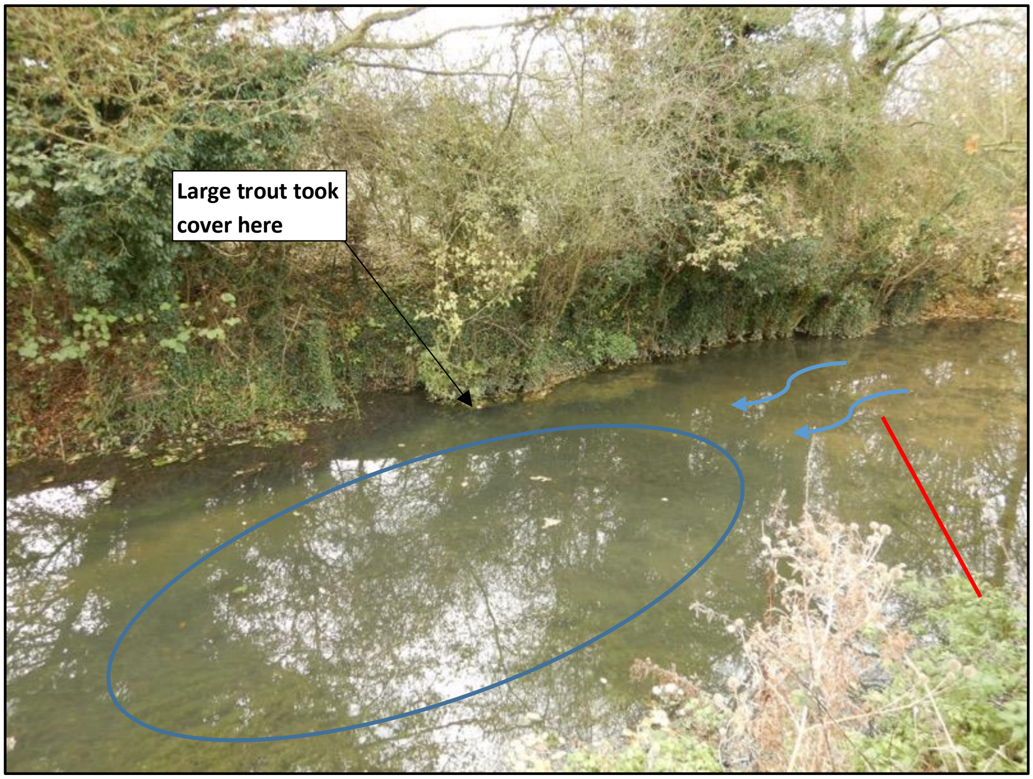
Several flow deflectors were observed at Ash Tree Pool (pic 17) and had clearly been in the river for many years. Some of the deflectors extended to mid-channel yet their effect on flow was minimal. Again, in a normal flow year they may be effective. However, there was little evidence of them having a notable impact upon the riverbed as no scour holes were evident and the substrate was poorly sorted. Many of the flow deflectors were in a state of decline and need replacing to make them effective when (or if) flows improve. Using tree stems as opposed to faggot bundles would increase their longevity and effectiveness.

Pic 17 (TL 39180 23781) – Ash Tree Pool, showing a pair of opposing flow deflectors, now in a state of decline.

It is considered that much of the river is now vastly overwide for the flow conveyed most of the time. Flow deflectors set for past flow now appear to have minimal effect. The best trout habitat was observed where the river was narrowed, often to little more than 2m. The lower reaches of the river are suitable for further channel narrowing through the creation of vegetated berms leading to the establishment of a 2-stage channel (pic 18). This could be done relatively simply with the use of a large excavator pushing the bank down and out against a line of brushwood faggots to establish a new toe-of-bank. The 2-stage channel enhances the low-flow situation whilst retaining a wider cross-sectional area to convey flood flows. Some parts of the lower fishery already had this type of feature and further work should build upon what is present.

Pic 18 (TL 39207 23771) – This length of bank could be pushed down and into the river, to create a narrowed low-flow river with a 2-stage channel.

The only trout seen during the visit was a large fish of upwards of 2lb (45cm+). It was disturbed from a pool and immediately took cover beneath trailing ivy (pic 19), clearly the fish knew its bolt hole. Careful hinging of the riparian trees could increase the extent of cover and flow variation at that location. The pool itself could be enhanced through the positioning of a flow deflector, or re-shaping of the bank to concentrate flow at the head of the pool to create flow diversity.



Pic 19 – A rather slow pool which harboured a large fish. The pool (blue oval) could be enhanced by pinching in the flow at the head of the pool (red line).

At Cattle Crossing Pool, the river took a 90-degree turn, scouring a deep pool with a high volume of gravel deposited downstream forming riffles and glides. The pool offered good adult trout habitat with a partially collapsed willow tree providing cover and bank protection. The gravel glides and riffles provided excellent juvenile trout habitat with watercress forming mid-channel islands which increased the extent of important marginal cover (pic 20). The gravel was clean and well-sorted with little fine sediment. This reach is likely to be an important spawning and nursery area for the river's wild trout population.

Pic 20 (TL 39279 23721) – Gravel riffles and glides provide important spawning and nursery habitats for trout. The gravel was clean and well-sorted (inset).

After ~40m of important trout recruiting habitat, the river became deep and slow again with good cover provided by shrubs trailing to water level on the RB. The depth of the pool habitat was maintained by a crudely constructed weir (pic 21). The weir had become blocked forcing water against the LB. The weir was stopping sediment transport and is believed to be why the gravel from the reach above has not moved along the reach, creating further valuable recruitment habitat. The weir should be removed to allow better coarse sediment transfer and the evolution of natural river features of shallow glides and riffles interspersed with deeper holding areas. At the very least, the weir should be reconfigured to focus its main flow in the centre of the channel to initiate bed scour. This could be done by removing a central part of the weir (notching) down to bed level.

Weirs disrupt the natural process of sediment transfer along a river, acting as traps for coarse sediment (refer to illustrations 2 & 3 below). With a paucity of coarse sediment supply, the riverbed is prone to down-cutting (or incision) as bed material is washed downstream without a regular supply from upstream.

Pic 21 (TL 39254 23656) – The weir, which instead of focussing flow in the centre of the channel, is now causing bank erosion and impounds the reach above it.

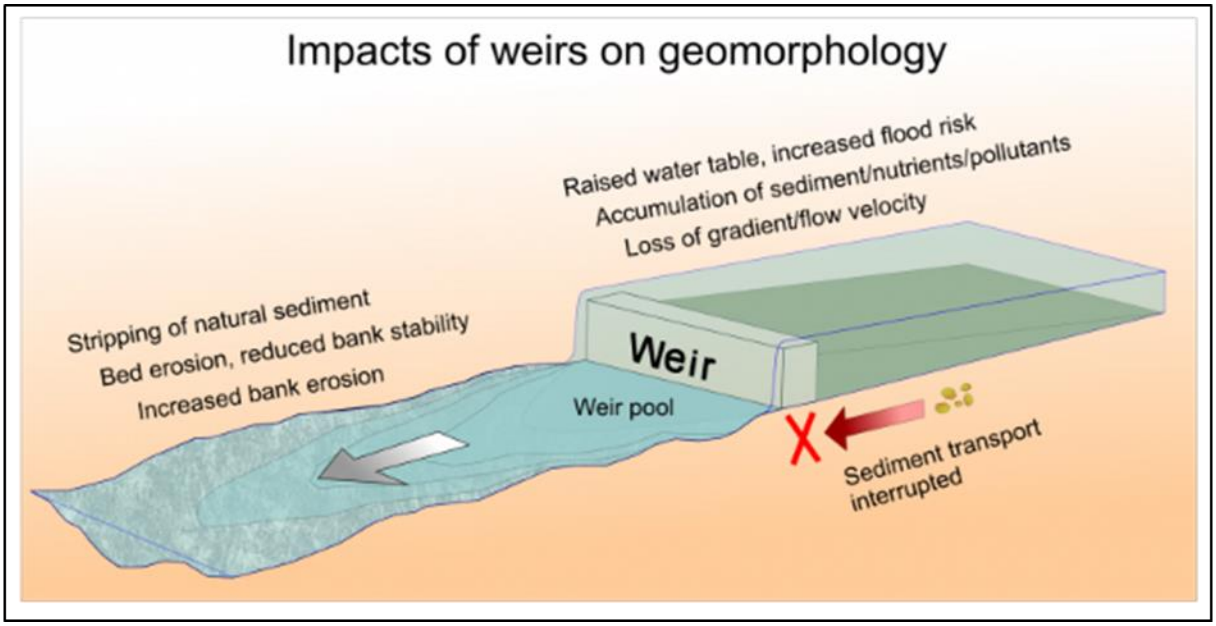


Illustration 2: The impact of a weir on river morphology.

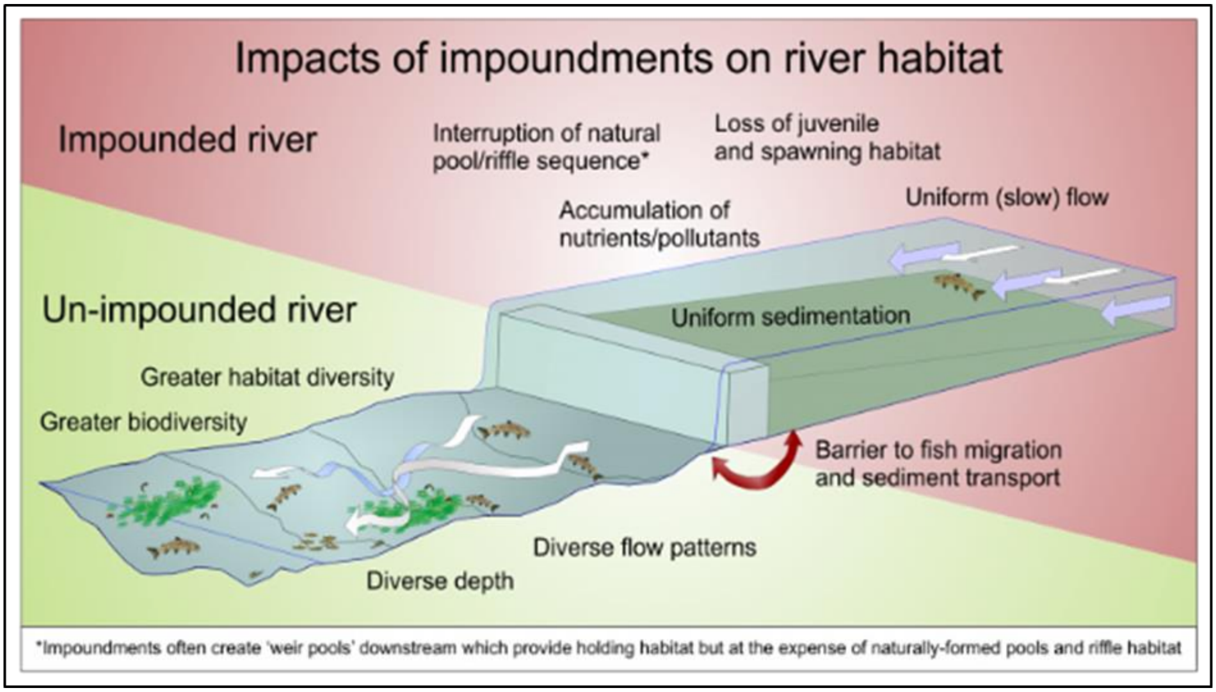


Illustration 3: The impact of a weir on river habitats.

At Junction Pool, the bed shallowed and marginal vegetation encroached into the channel leading to natural narrowing (pic 22). The process could be enhanced through bank re-grading, pushing the bank down and out into the channel. If the bank material contains a high proportion of gravel, it may be possible to omit the use of faggots to establish a new toe-of-bank.

Pic 22 (TL 39259 23561) – Junction Pool, marginal vegetation narrowed the channel. It could be assisted by pushing the bank down and out to form a new berm.

Other reaches of the river remained as an incised channel with little flow diversity (pic 23), dense marginal growth and slow velocities. These reaches require bed raising through the introduction of gravel to increase water velocity, flow and sediment transport.

Pic 23 (TL 39252 23520) – Some reaches were over-deep and require the introduction of gravel to bring about restoration.

It was surprising that so few trout were observed. The low flow, in addition to long lengths of sub-optimal habitat, is likely to have restricted their distribution. Furthermore, it is possible that with multiple low-flow winters, fish spawning and recruitment has been poor. It was noted that the previous Advisory Visit (2004) commented on the numbers of wild trout seen, particularly in the reach above the site access bridge. That was not the case for this visit. The river requires habitat enhancement measures and further restoration to make it resilient to the low flows that it experiences more frequently.

3.3 Stocking of the River Rib

The introduction of large stock fish into a small river that can only support a limited number of wild fish will be introducing competition for food and space. The stocked fish are also very likely to congregate in the slower pool habitats, where they will compete with the river's wild adult fish. If a river is to sustain higher numbers of fish, its carrying capacity must be increased. That can be done through habitat improvement.

Whilst many fisheries still stock with domesticated farm-reared fish, increasingly more are benefitting from investing in better habitat management and a cessation of stocking, and enjoy the benefits as a result in the shape of increasing numbers of wild trout. Many are finding it a more enjoyable experience to fish for wild fish in a river that this in balance with its environment.

The following text has been produced by my colleague Gareth Pedley and encompasses many of the issues associated with trout stocking which may help to inform the syndicate:

The native trout populations of Britain possess great genetic diversity, being the product of several separate colonisations following the last ice age. Many are now further distinct from each other, having adapted to their local environments over time. The natural genetic variability of these populations makes them amazingly resilient and adaptable to changing environmental conditions, which they should continue to do providing human impacts upon them and their habitats can be limited.

However, over the last 150 years, human impacts upon fish populations has increased exponentially, with major issues arising from the way in which we manage land and rivers. To compound these issues, direct interference with wild fish populations also increased, with large numbers of hatchery bred fish being introduced to rivers. The artificial mating that occurs within a hatchery bypasses vital chemical and visual aspects of mate selection; a process that exists to ensure genetic compatibility and maximise the fitness of wild fish. Stocked fish (both diploid and triploid), are also affected by domestication and natural selection for the farm environment, even within one generation in the hatchery (so this includes fish from wild brood-stock schemes). After all, farmed fish are the individuals that have survived within a concrete raceway, earth pond or tank etc. and are therefore poorly adapted for the very different conditions of a natural river. Adaptation to a farm environment is cumulative, with genetic diversity, natural behaviours, and survival rates when released to the wild all decreasing with each generation in captivity.

Stocking fish therefore produces a 'no-win' situation: if they don't successfully reproduce in the wild, or are infertile (triploids), they are simply a negative impact upon the ecosystem; if they do survive long enough to breed, their offspring have much poorer survival than the offspring of wild fish. However, stocked fish do still temporarily take up space and resource within a river that could have been used by wild fish. Naïve stocked fish also make an easy target for predators, potentially increasing predator survival rates, attracting greater *densities of predators, and increasing the negative impact they have on a river.*

So, what is the other option?

Natural rivers (without stocking) have a far greater capacity to produce and hold healthy fish populations. As stated, they were successfully producing an abundance of fish for a long time before we started interfering.

A major key to the success of wild salmonids is their life strategy: over-production of offspring that are then subject to density-dependant mortality. The greater the habitat availability in any year, the greater the number of trout that will survive, thereby mitigating for mortalities and annual fluctuations in the population. This also means that populations can be easily increased by improving habitat quality.

As soon as they emerge from the gravel, trout fry disperse throughout the available habitat, constantly competing to maintain territories. This ensures that the fittest, dominant fish control the best lies, with easy feeding for low energy expenditure. They will then remain there until they challenge for a new territory or are displaced by a more dominant individual. Wild fish production therefore ensures habitat is fully utilised and a river holds the optimal number of fish, with the available space being naturally repopulated each year. Such efficient habitat utilisation is impossible to achieve through artificial stocking or alongside stocking, because stocked fish disrupt the wild population structure and hierarchies.

While wild fish constantly defend their adopted territory and strive to stay within it, stocked fish have little affinity or suitability to the arbitrary reach in which they are stocked. A large proportion of fish stocked into rivers therefore leave the stocking location or lose condition and die within a short time (particularly during high flows). Consider where the thousands of fish previously stocked into fisheries are at the beginning of each season and why there is even a requirement to restock. In contrast, un-stocked wild fisheries provide some of the best fishing early season, as the fish begin feeding post-spawning.

Consequently, most angling clubs actually report increased catches after ceasing stocking, as demonstrated by the ever-increasing number of case studies on the WTT website - www.wildtrout.org/content/trout-stocking. There is sometimes a lag period as the wild fish population begins to recover *but an increase in juvenile numbers is often evident from year one. Anecdotal evidence from an increasing number of fisheries also suggests that grayling stocks proliferate once stocking ceases.*

An excellent video produced by Wild Fish Conservancy North West documents how the state of Montana in North America ceased stocking after realising the major negative impact it was having: www.youtube.com/watch?v=U_rjouN65-Q&app=desktop

4.0 Recommendations

The upper fishery had a feel of a smaller river, it is possible that spring flow contributes baseflow to the lower reach, thus increasing its flow without being seen. However, a smaller river is not of concern to trout, it is habitat diversity and habitat quality that they require. The upper fishery should be maintained through minimal intervention to act as a reserve for the river's wild trout. Stocking should not take place in the upper fishery.

Stocking of the river should be reviewed by the syndicate. The first step should be to obtain catch returns to see if the stocked fish are being caught, if not then it is doubtful that they are contributing to the value of the fishery. Secondly, the number of fish stocked into the river should be reduced to lessen pressure upon the river's wild trout. If stocking is ceased, then funds will be available to spend on further habitat enhancement and restoration work, thus increasing the river's holding capacity for wild trout.

The upper fishery tended to exhibit deep glides covered by trailing marginal vegetation, with occasional deposits of gravel. There appears to be a paucity of gravel supply in the upper reach. The placement of gravel would enable the riverbed to be restored to provide wide riffle habitats that could energise the pools.

The weir should be removed to allow winter flow to cleanse the bed of fine sediment and to initiate coarse sediment transfer. If the weir must be retained to hold a head of water for adult trout, then the main flow should be focused in the centre of the river and impounding structures should not extend across the entire channel width. Natural pool habitats can be evolved by fixing trees across the channel to force the flow down against the bed, initiating scour and mobilisation of coarse sediment (pic 24).

Pic 24 – A fallen tree can produce similar results to a weir when flow scours a hole beneath it. The fallen tree does not prevent sediment transfer and provides numerous habitats.

The river retained some good LWM features which provided crucial cover in otherwise featureless lengths. The use of tethered LWM (such as large branches and tree-tops), combined with tree-hinging could bring about exciting flow improvements, initiating bedform variation with benefits to the trout population and overall fishing experience.
A scheme could be worked-up to provide suitable habitat enhancements. The delivery of such work could be implemented by the syndicate under guidance from WTT. Simple habitat enhancement and restoration techniques could be deployed using:

- Brushwood ledges: these features can be created following tree works. A brushwood ledge provides complex cover at, and below, water level. Brash from tree thinning is pinned against the bank in alternating directions or increasing stem thickness, and is securely wired down or held with battens. The brushwood lattice provides niches for invertebrates and small fish, aids silt entrainment and provides a rooting substrate for plants to establish. In time (~3yrs) the brushwood ledge will become a vegetated berm if exposed to full sunlight.

Pic 25 – A low-level brushwood ledge created following tree thinning. They can be particularly effective for enhancing low-flow rivers.

- Flow deflectors: these features can be used to increase flow diversity and bed scour. They can be simple log deflectors or tethered tree stems. The complex flow that arises creates depth variation, cover and aids sediment sorting. Due to the low flows, the position of flow deflectors needs careful consideration to avoid impounding upstream reaches, and to ensure that the structures are effective.

Pic 26 - A flow deflector used to focus flow and scour into the centre of a river.

- Tree-hinging would be a simple first approach to managing some of the tree stock whilst providing cover at water level (pic 27). The process and benefits of tree-hinging has already been discussed on page 15.

Pic 27 - An example of tree hinging, a simple and effective technique for increasing cover in a river.

The lower reaches of the river tended to have an over-wide cross-section. Bank re-grading to create a 2-stage channel could be used to bring about low-flow enhancement (pic 28).

Pic 28 – An excavator can be used to re-grade banks, pushing existing material down and out into the channel.

The Himalayan balsam and giant hogweed must be controlled to prevent them from creating serious dominance problems. Himalayan balsam should be controlled through hand pulling to remove it (roots included where possible), and the hogweed should be controlled through the application of glyphosate by an appropriately certified person. Commencing control at the top of the fishery would allow the plants to be removed in a strategic manner, lessening the amount of seed that is washed downstream. Control will need to be undertaken over many years.

The River Rib at Upp Hall is a degraded chalk stream with much potential to be enhanced to bring benefits to its wild trout population, the fishery and its overall aesthetics. The fact that a large fish was observed suggests that smaller ones went unseen. It would not take too much effort to enhance the river using the approaches described in this report, and to conceive a more involved restoration project to address the incised form of the river, particularly in the lower fishery. The WTT could work with the syndicate to produce a project proposal.

5.0 Making it Happen

It is a legal requirement that (most) works to 'Main River' sites like the River Rib require written EA consent prior to their implementation, either in-channel or within 8 metres of the bank.

The Wild Trout Trust can provide further assistance in the following ways:

- Assisting with the preparation and submission of an Environmental Permit to the EA (formerly referred to as Land Drainage or Flood Defence consents), or by identify appropriate exemptions to take forward small-scale habitat improvement works.
- Running training days to demonstrate the techniques described in this proposal.

We have 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 material, enhancing fish stocks 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.

The WTT website library has a wide range of materials in video and PDF format on habitat management and improvement:
www.wildtrout.org/content/library

6.0 Acknowledgement

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

7.0 Disclaimer

This report is produced for guidance; no liability or responsibility for any loss or damage can be accepted by the Wild Trout Trust as a result of any other person, company or organisation acting, or refraining from acting, upon guidance made in this report. Accordingly, 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 comments made in this report.

8.0 Appendix

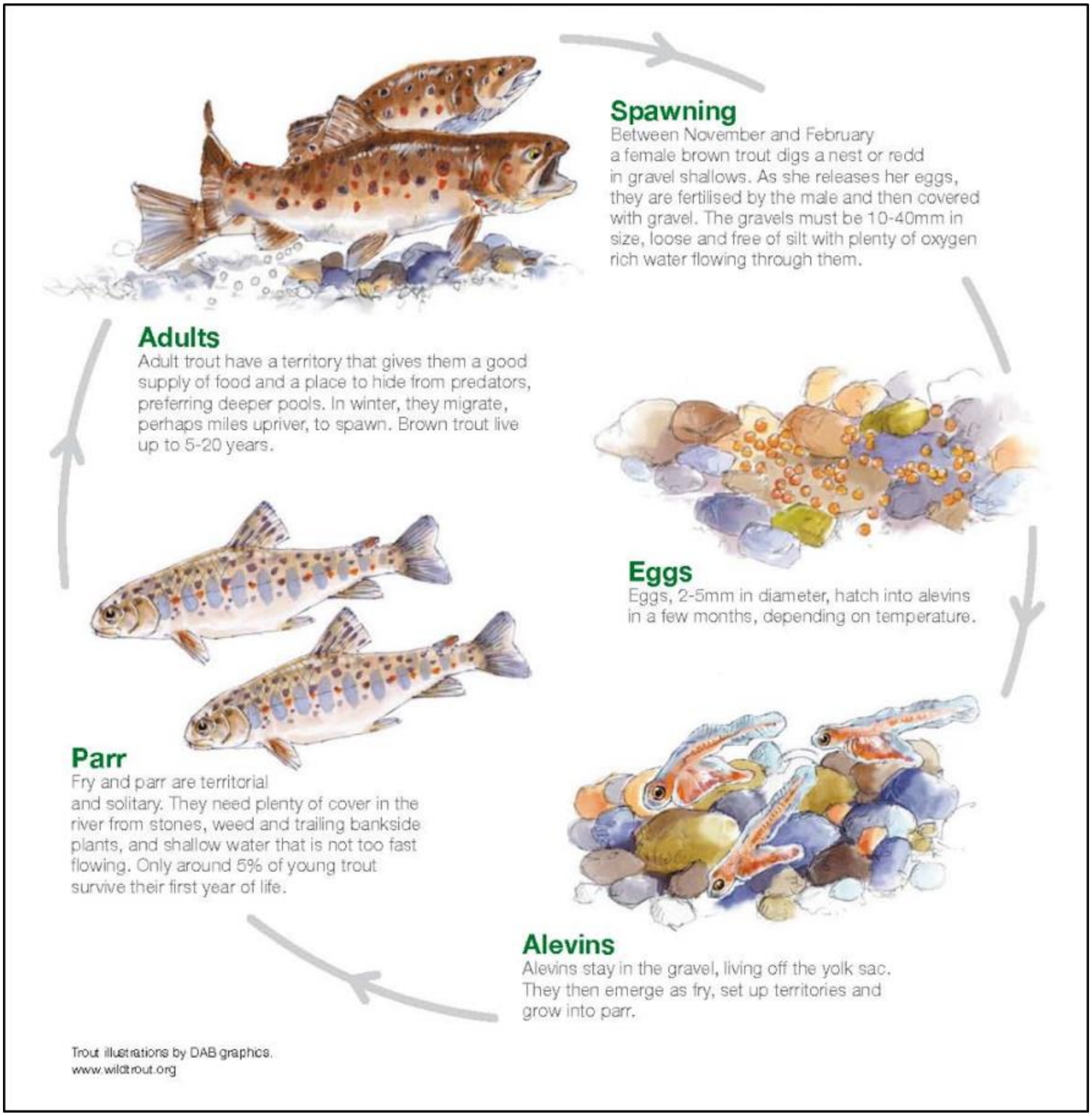


Illustration 1 – The life cycle of the brown trout.