Advisory Visit

River Aln

Northumberland

15/06/2015

1.0 Introduction

This report is the output of a site visit to the River Aln in Northumberland, undertaken by Gareth Pedley of the Wild Trout Trust on Monday 15th June, 2015. The visit was requested by Gary Pentleton, Secretary of Aln Angling Association, to advise on future management of the Association waters and how to improve the wild fish populations of the river. Also in attendance, from the angling club were Tom Wilson, Russell Jobson and David Shotton. This report covers observations made on the day of the visit and assesses options for maintaining and developing a wild trout fishery.

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

Table 1. Overview of the waterbody details for the sections of river visited

	Waterbody details
River	Aln
Waterbody Name	Aln from Edlingham Burn to Tidal Limit
Waterbody ID	GB103022076350
Management Catchment	Northumberland Rivers
River Basin District	Northumbria
Current Ecological Quality	Poor ('high' for fish 'good' for invertebrates but the classification is brought down by a 'poor' status for macrophytes and phytobenthos combined)
U/S Grid Ref of reach inspected	NU1966713843
D/S Grid Ref of reach inspected	NU2433010833
Length of river inspected (km)	7

(http://environment.data.gov.uk/catchment-planning/WaterBody/ GB103022076350)

Under the Water Framework Directive (WFD) classification, the ecological status of this waterbody has been classed as 'poor', despite an improvement from 'moderate' to 'high' classification for fish between the 2009 and 2014 assessment. The reason for this is that the waterbody is classed as 'poor' for macrophytes and phytobenthos and the poorest scoring indicator always governs the overall classification. Issues with phytobenthos and macrophytes are not necessarily surprising considering the impoundments on the catchment, reasonably high sediment loading and over-capacity channel (due to past maintenance and realignment), all of which will negatively impact upon them.

2.0 Catchment / Fishery Overview

The Aln rises near Alnham, at the foot of the Cheviot Hills, before flowing in a general easterly direction to discharge into the North Sea at Alnmouth. The upper end of the catchment is upland in nature, supporting predominantly un-improved grazing; however, as the river progresses across the relatively low gradient Northumbrian Coastal Plain, land use moves to semi-improved grazing, with areas of arable crop production.

The underlying geology of the catchment is predominantly sandstone, siltstone and mudstone of the carboniferous period, with some outcrops of carboniferous limestone, predominantly in the Alnwick area. The superficial (surface) geology comprises till and glaciofluvial deposits of sand and gravel, with alluvial sand, silt and gravel throughout the river valley (http://mapapps.bgs.ac.uk/geologyofbritain/home.html). This particular geology provides light, friable soils that are easily erodible, often leading to sedimentation issues on watercourses.

The River Aln supports relatively good runs of salmon and sea-trout, as well as resident brown trout, all of which are targeted by members of the Association. The Association has stocked the river with triploid brown trout for around 8 years, with 250 fish stocked in 2015, a reduction from previous years (500 fish in 2014). Historically, stocking was undertaken in two batches (March and April), but only once this year, in March. Salmon have also been stocked to the river in the past, undertaken by Peter Gray; however, there is apparently no official record of this. It is the desire of many Association members to reduce stocking further and, potentially, cease stocking in favour of promoting a wild fishery.

3.0 Habitat Assessment

3.1 Denwick Bridge to Hawkhill Bridge

Denwick Bridge forms the upstream boundary of Aln Angling Association waters; however, as Denwick Upper Weir (Photo 1), just upstream of Denwick Bridge, will inevitably have an impact upon the river system, it was worth inspection. The weir is one of several on the river from the Capability Brown era that fragment habitat and impound long sections.

A rudimentary pool and traverse fish pass exists around the weir (Photo 2), although the parameters of the pass are well outside current best practice guidelines for migratory and non-migratory fish. The pools are on the smaller side of what is required (reducing the space for fish and flow dissipation), the ascent into the first pool is of greater than optimal height and distance and the step is uneven and elongated, all of which inhibit fish passage (Photo 3). The discharge from the pass is also downstream of the weir toe, likely to avoid the shallow weir apron downstream, but this also means that in high flows fish are likely to pass the smaller fish pass discharge and follow the main river flow to the weir, where they would be unable to ascend.

It was also noted that the upstream inlet to the pass was partially blocked, creating another obstruction and reducing the efficacy of the pass. It is important that this, and any other fish passes, are better maintained in future for the benefit of fish stocks.

These issues are substantiated by the fact that several medium sized salmon (c. 2.5-3.5kgs) were observed to be queuing up in the outflow of the pass, but not attempting to ascend it. These fish were probably taking advantage of the oxygenated water emanating from the pass, but their presence in numbers below the pass indicates that numerous fish had not been able to, or not chosen to, ascend it at the time of the observation.

There is a common-held misconception that migratory fish only move on high water; while fish do move on high water, the fact is that, unobstructed, fish will move at any time, but many barriers actually require higher water to become passable. This is why, once passage is eased at a barrier, fish invariably spend less time below it in subsequent years. Preventing such unnecessary delays at an obstruction reduces the stress that fish incur and reduces their susceptibility to predation – all of which improve fish survival and natural production within the river.

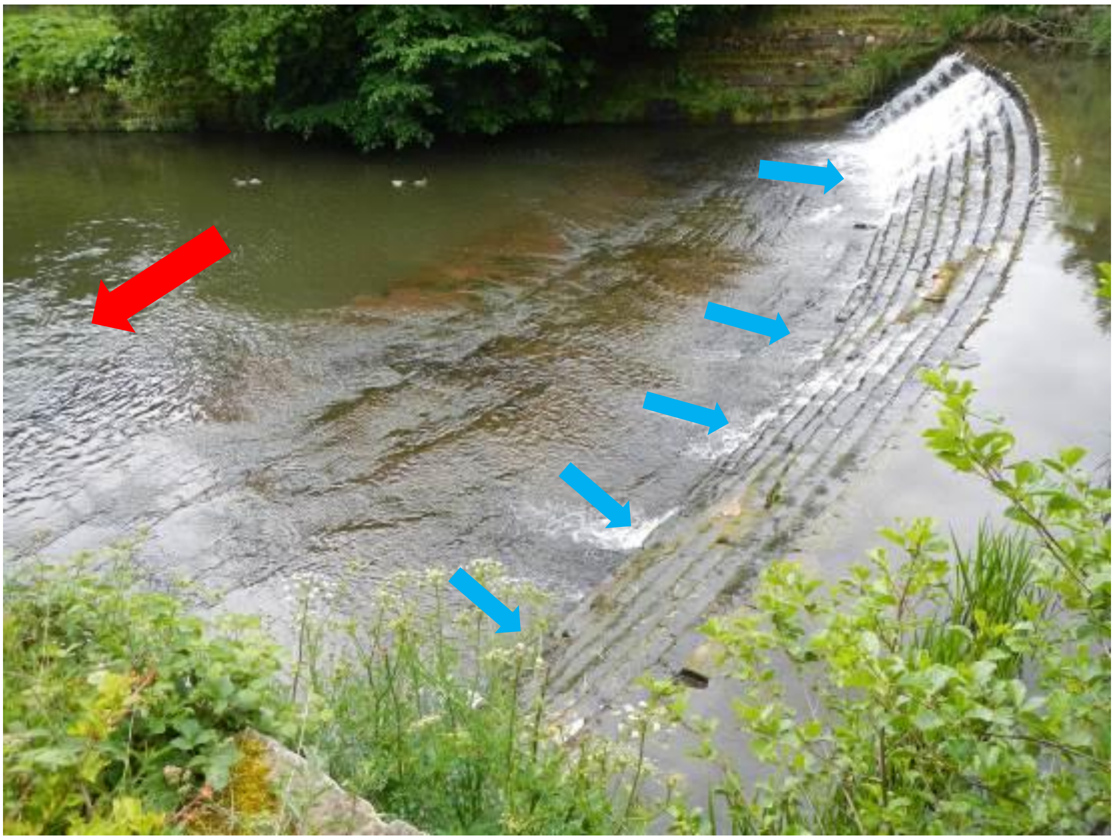

Photo 1. Denwick Upper Weir. The weir is a complete barrier to fish passage but has a pool traverse pass around the LB side. Approximately 8 fish were observed to be queuing up at the outflow to the fish pass in the area marked by a red arrow suggesting a likely issue with fish passage. In high flows, fish are likely to follow the main river flow to the weir and miss the fish pass, only to be blocked by the weir in the area marked by blue arrows.

Photo 2. Pool traverse pass around Denwick Upper Weir. The pool sizes are smaller than ideal for large migratory salmonids; the small pool size also reduces the energy dissipation effect on flows within the pass.

Photo 3. The downstream outlet of Denwick Upper Weir fish pass. The step here is too high and uneven, crossing a multi-level surface. This greatly reduces the ability of fish to enter the pass.

Downstream of the weir is a short impounded section to Lower Denwick Weir (Photo 4) which has a pool traverse fish pass installed on the RB (Photo 5), along with an eel pass on the LB (Photo 6). Both passes have become perched, well above the downstream water level, and are not operating at optimal efficiency (not at all in the case of the eel pass). It appears as though the water level downstream has dropped since the passes were built; however, there is no obvious reason for this to have happened other than low summer flows suggesting the passes were not set to a low summer flow (as per best practice). Modification is required to make them operational in lower flows.

A nappe could be installed on the downstream end of the fish pass to remove the angular step and avoid the cavitation that is occurring behind the discharge, thereby improving its passability. However, ideally, one (preferably two) additional pool(s) should be installed to extend the pass below the downstream water level and reduce the height of the initial jump into the pass. This would also greatly increase its suitability for smaller fish. Attempts have already been made to extend the eel pass, although not far enough to make it passable in the flows observed during the visit. This too requires improvement.

Photo 4. Lower Denwick Weir with a pool traverse fish pass on the true RB (background).

Photo 5. Eel pass on the true LB at Lower Denwick Weir. This is significantly perched above the water level and requires extending to meet the water level in all flows. Past attempts at a temporary fix are now also left high and dry. It is now an appropriate time to undertake a proper fix and extend the pass to the downstream water level as it is currently ineffective.

Photo 6. Discharge of the pool traverse pass at Lower Denwick Weir. The white water visible at the overspill from the lowest pool indicates that there is a gap behind the water (red arrow) meaning that fish have to jump the significant distance into the pool. The installation of an adherent nappe here would allow larger, more powerful fish to swim up within the water column and may serve as a short-term improvement. However, the pass ideally requires one or two additional pools to reduce the significant jump into the pass.

Downstream of the weir, the channel morphology diversifies and the first signs of gravel bars were observed. The channel is over-capacity from past dredging and realignment from its original course, but the natural narrowing effect of the gravel deposition, coupled with encroachment of emergent vegetation, has led to the formation of riffles where fish are reported to spawn (Photo 7). (N.B. The narrowing and deposition is somewhat inhibited on both banks by grazing, which prevents the deposited material from being consolidated by vegetation into new river bank).

The quality of the gravel for spawning is greatly diminished by the heavy sediment loading and an algal coating (Photo 8) which indicates sediment and nutrient inputs must be occurring upstream, especially as they are not alleviated by the long impounded sections upstream which should help to settle both out of the water column.

Despite the sediment and algae, valuable invertebrate communities were observed by stone turning, with cased cassis flies (Trichoptera) and mayfly nymphs (Ephemeroptera) observed. Both of these would, however, benefit from reduced sediment and nutrient inputs.

Photo 7. The first notable, natural geomorphological features, where gravel depositions have begun to narrow the over-capacity realigned channel. The accelerated flow caused by the narrowing creates some potential for fish spawning, but egg and alevin (egg sac fry) survival is likely to be compromised by sediment and algal covering. Preventing livestock access would assist the natural narrowing process.

Photo 8. Large gravels of a suitable size for larger salmonid spawning but the brown appearance is due to a heavy silt and algal loading.

Photo 9. Stone turning revealed both mayfly (red circle) and caddisfly (blue circles) nymphs.

Livestock access to the river bank in this area is having a significant impact upon habitat quality, with heavy grazing preventing the development of a rough herbaceous margin on the LB. Scarring from sheep trampling, which has contributed to the loss of vegetation diversity and promoted a near monoculture of grass (where still present), is also greatly increasing bank erosion and sediment input to the river (Photo 10). Furthermore, as the friable, sandy soils are readily washed away in high flows, the loss of bank material also places the mature trees in jeopardy of washout; these will not be replaced as the heavy grazing is preventing natural tree regeneration. Installing buffer fencing along all grazed sections would greatly reduce the rate of erosion.

Signs of illegal fishing are well-evident on the reach, with the remains of an old net (including mesh, float and lead lines) hanging from a bankside tree. This highlights the fact that poaching on the River Aln is still an issue and something to watch out for, reporting it to the Environment Agency or Police (whichever is applicable) when observed.

Photo 10. Erosion through sheep grazing which leads to loss of land, sedimentation of the watercourse and, ultimately, loss of trees. Note how much of the bank around the tree roots has already been lost, which will destabilise the trees. The lack of natural tree regeneration also means that any mature trees that are lost will not be replaced.

Photo 11. The remains of a poaching net hanging in a bankside tree.

Sections of dredged, straightened channel are obvious throughout the reach, but where low-hanging and trailing trees are present, some potential adult trout and migratory fish holding water is available (Photo 12). Marginal and emergent vegetation helps to pinch the channel and, if promoted, will help the river adjust to more appropriate dimensions as it accumulates and consolidates sediment to form a new, narrower channel.

Photo 12. Some adult fish holding habitat, although the channel is over-wide. Beneficial natural narrowing though the encroachment of marginal vegetation (red arrow) is part of the river's natural recovery process.

Areas of higher quality habitat are also present for both juvenile (Photo 13) and adult fish (Photo 14), although these areas could still be greatly improved. The shallow area upstream of the A1 road bridge would improve further if livestock were excluded from the bank as this would reduce erosion, prevent further channel over-widening and facilitate natural narrowing. The habitat along many other sections, particularly where mature willows (*Salix* spp.) are present (as in Photo 14) could also be improved by laying some or all of the tree into the water to increase the availability of low-level and trailing cover; this would provide shade and shelter for fish along with creating structure in which they can evade predators. In this way, bankside trees and large woody debris (LWD) can greatly reduce piscivorous bird predation.

Photo 13. Juvenile trout and salmon habitat that could be improved by excluding livestock from the riverbanks to reduce erosion and channel over-widening.

Photo 14. Good quality habitat for adult salmonids that could be improved further by laying one trunk of the willow tree into the channel to increase the availability of low and trailing branch cover (as demonstrated by the red outline).

A short section of the river upstream of Hawkhill Bridge was not intended to be walked; however, a decision was made to backtrack up the river as far as an old weir (Photo 15). This was a worthwhile exercise as, although the weir is very low, it still impacts negatively on the river. The structure will certainly be difficult for smaller fish to pass, and potentially for larger fish in low flows (particularly salmon as they are less adept at traversing shallow water than sea-trout). Possibly more significantly, the weir also creates a fixed bed cross-section, impounding the river upstream and preventing scour and natural maintenance of bed dimensions, over-widening the channel, reducing the natural narrowing effect of emergent vegetation and inhibiting sediment transport downstream. For all of these reasons, redundant weirs should always be removed, if possible.

Opposite the weir, grazing resumes on the LB for the length of one field, reducing the herbaceous vegetation and natural tree regeneration; again, fencing here would be beneficial. On the RB around the weir, and for the rest of the section downstream on both banks, to Hawkhill Bridge, bankside vegetation is of a high quality, afforded by a generous buffer strip. However, habitat quality in this area is degraded by the impact of past channel realignment which creates several over capacity, long, straight and slow-flowing pool sections. Tree planting and LWD introduction could help to mitigate these issues.

Photo 15. For the numerous reasons listed above, this weir upstream of Hawkhill Bridge should ideally be removed.

3.2 Hawkhill Bridge to Greenrigg

In the upper section of the Hawkhill Bridge to Greenrigg reach, realignment remains an impact and additional trees and LWD would be beneficial. However, a well-vegetated buffer strip provides excellent habitat for invertebrates, along with a host of other wildlife. The vegetation also provides excellent bank protection and, consequently, there is very little erosion. One notable area of erosion does exist, where a high, steep bank appears to suffer from waterlogging (probably over a band of clay) and undercutting on the outside of a bend, downstream of a long straightened (and so steepened) section that accelerates flows into the bend.

An arable field at the top of the bank may have field drains discharging onto the slope which would further contribute to the waterlogging. Although the bank appears subject to periodic slippage, it is not considered a major concern; the bank material remains relatively consolidated through the abundant vegetation and saplings and the slope is now reaching a more stable angle. Planting the toe of the bank with additional willow whips may further stabilise the toe, but even if small amounts of bank are lost occasionally, the overall impact on the river is likely to be minimal.

Photo 16. Superbly well vegetated river margins afforded by a generous buffer strip.

Photo 17. The base of a slumping bank which appears to be naturally regrading and stabilising over time (red arrow). Willow whip planting in this area would improve marginal habitat and potentially protect the bank toe, reducing erosion and slumping.

Approximately half way down the reach, a small tributary enters the river on the RB. This should ordinarily provide a potential spawning tributary for resident trout and sea-trout; however, recent culvert work has rendered the tributary almost impassable in most flows. This is one of the issues that can occur when appropriate fishery management advice is not given, or not adhered to during the Flood Defence Consenting process.

The issue could very easily have been avoided by simply over-sizing the culvert, so that it could be installed with at least 1/3 of its capacity below the natural bed level. This would allow adequate sediment transport and facilitate the formation of a natural bed (gradient/substrate) through the culvert. This would have prevented a step from developing at the outfall that causes issues with fish passage and ongoing maintenance issues for the landowner/tenant.

This issue should be raised with the local Council permitting team (and the Environment Agency fisheries enforcement team) as it is not acceptable and constitutes an offence under the Salmon and Freshwater Fisheries Act 1975 if fish passibility at the location has been reduced by the new structure. Such developments should be seized by the permitting teams as an opportunity for improving fish passage, as is their duty as a competent authority.

Photo 18. A poorly installed culvert that has resulted in a step and steep, confined channel which greatly inhibits fish passage into a potentially valuable spawning tributary. This issue should be raised with the local Council permitting team and the Environment Agency.

Downstream of the tributary, the river enters a steep, straight section (Photo 19) which, unlike many of the other straight sections, appears to be a natural gorge, as evident by surrounding topography and the higher quality river channel with natural substrate and dimensions. Through this section, excellent flow diversity creates abundant juvenile and adult trout habitats.

The Cawledge Burn enters the river at the downstream limit of this reach and provides another significant potential spawning tributary (Photo 20). The Burn has recently (2014) been reclassified as being in 'good' ecological condition from a classification of 'poor' in 2009. This suggests that the juvenile fish stocks have improved, as they now score as 'high', as do the invertebrate assemblages.

It is understood that fish passage improvement work has been undertaken on the Burn, and this may well have contributed to the improvement. Fish passage on small tributaries is a vitally important and often overlooked factor, affecting fish stocks through both spawning and juvenile habitat/dispersal. Another is sedimentation, which seems to be an issue, as observed by a significant coating of fine sediment on the substrate. This too should be looked into as a brief walkover of the burn may identify the erosion issues and/or runoff that is contributing.

Photo 19. High quality, diverse habitat for all trout life stages through what appears to be a naturally straight gorge section, where little, if any, past channel maintenance appears to have been undertaken.

Figure 20. The Cawledge Burn offers significant potential as a spawning tributary and juvenile nursery area but appears to be impacted by sedimentation.

3.3 Lesbury

A short section of river was inspected between Lesbury Weir and the A1068. Upstream of the weir is a long impounded section where planting additional willows to encroach into the channel, take up capacity to create pinch points and accelerate flows would be beneficial.

The weir itself is an impact upon the river, creating the impounded reach upstream, preventing natural sediment transport downstream and inhibiting fish passage (Photo 21). Unfortunately, the presence of the East Coast Railway main line bridge crossing, which is already showing issues of stability, is likely to be further destabilised by removing the weir and so the decision has been made to retain it. A reasonably effective Larinier-type fish pass has been installed on the weir which at least reduces the issue for the passage of larger fish – something attested to by the fact that migratory fish no-longer accumulate below the weir in large numbers as they used to. This further supports the fact that fish generally only accumulate downstream of an obstruction if it is a real issue for fish passage – not just because of lower flows.

Downstream of the weir, high quality trout habitat is available, with a mixture of shallow gravelly riffles (ideal for many beneficial invertebrate species and fish spawning) (Photo 22), along with good pools and pocket water to hold both resident and migratory fish (Photo 23). Scouring in the weir pool is likely to have excavated and mobilised much of the gravels deposited within this area, somewhat mitigating the interruption of sediment transport there.

It was noted that pruning has been undertaken on some of the trees which has denuded the pool habitat of important low-level cover. This type of pruning should be avoided; it may fishing easier but it permanently lifts the tree canopy, greatly reducing the quality of cover it provides and the fish holding capacity of the pool. Coppicing could be undertaken on these trees to lower the canopy by encouraging low-level regrowth.

A cursory inspection was also made of the lower, tidal section of the river, from the top of the hill between Steppey Lane and Dutches's Bridge (Photo 24). Being tidal, the section is difficult to undertake improvements on but restricting livestock access to the river bank would allow the development of a healthier marginal fringe. Within buffer fenced areas, tree planting to increase shade and cover would potentially allow the relatively open areas to hold more fish, particularly in areas already recognised as holding fish.

Photo 21. Lesbury Weir - now far less of an obstruction since the installation of a Larinier fish pass.

Photo 22. Good juvenile and potential spawning habitat downstream of Lesbury Weir.

Photo 23. Good quality pool habitat that has been degraded somewhat by the pruning of beneficial low cover branches over the pool (red arrows). This type of action should be avoided as it greatly reduces the fish holding capacity of the pool for both resident and migratory fish. Coppicing of the trees could be undertaken to promote low-level regrowth.

Photo 24. Looking down at the tidal river. Stockproof buffer fencing would benefit the grazed banks and planting of mixed deciduous trees (particularly crack willow which will grow over/into the channel) within the buffer would improve cover and shade in the channel.

4.0 Recommendations

4.1 Fish passage

Addressing the significant issue posed by numerous weirs on the River Aln system is of primary importance if fish stocks are to be optimised. As these weirs are of historical importance, and so unlikely to be removed, the impounding effect and loss of habitat is difficult to mitigate, but the issue of habitat fragmentation by inhibited fish passage is something that must be minimised. This is something that should be coordinated between the Angling Association and the Alnwick Castle Estate.

It is understood that fish passage was to be improved on the weirs upstream of Aln Angling Association waters, through the Alnwick Castle section, as part of a series of hydropower developments. Where weirs cannot be removed, the installation of hydropower schemes (which require fish passage provision) can be a way of attaining ecological benefits on a river, providing the turbines are relatively non-destructive Archimedean screws, and that the flows are managed to be conducive to maintaining river habitats and fish passage. This can be one of the few scenarios where hydropower is beneficial to a river; however, for various reasons development of the schemes has stalled, as have the vital improvements to fish passage.

If the hydropower developments are now not going ahead in the near future, improving fish passage at those weirs should be addressed as an urgent issue in its own right that could realise significant improvements to fish stocks.

The same is true for the Denwick weirs (Upper and Lower) which can be clearly observed as issues for fish and eel passage. A non-exhaustive list of improvements that could be made there are listed in Table 2.

Table 2. Fish passage improvements

	Denwick Upper Weir - Pool Traverse Pass	**Denwick Lower Weir - Pool Traverse Pass**	**Denwick Lower Weir - Eel Pass**
Short-term	Clear debris from the upstream inlet		Ensure the upstream inlet is maintained free from debris
	Install a nappe at the downstream entrance to	Install a nappe at the downstream entrance to create a	Extend crawling medium to meet the

	create a chute flow, rather than a cascade	chute flow, rather than a cascade	downstream water level
Long-term	Fully appraise the fish pass design and, ideally, install a pass of more appropriate dimensions for passage of all species.	Fully appraise the fish pass design and, ideally, install a pass of more appropriate dimensions for passage of all species. As a minimum: Install at least one, possibly two additional pools to the lower end of the pass so that it meets the downstream water level.	Extend the eel pass substrate and housing to below the downstream water level at all flows

It is also recommended that the small weir c. 550 metres upstream of Hawkhill Bridge (NGR: NU2115012919) (Photo 15) is removed or at least notched to remove the central 1/3. The Council should also be contacted to discuss the issue of fish passage at the newly installed culvert (NGR: NU2111612226) on the small tributary, as loss of spawning tributaries can have a potentially significant impact upon fish stocks.

4.2 Buffer fencing

It is recommended that stock-proof buffer fencing is installed along all grazed river bank sections to prevent livestock access and promote the kind of healthy, well vegetated and stable river banks present in the un-grazed riverbank sections, as seen in Photos 16, 17, 19, 20 & 21. This will promote natural tree regeneration, improve habitat quality and reduce land erosion to a natural low rate, saving the landowners and tenants from losing land.

Table 3. NGR Locations requiring fencing

Location	Left bank	Right Bank
Downstream of Lower Denwick Weir	NU 19910 13779 - NU 20564 13206	
Between Peter's Mill and Hawkhill Bridge	NU 20892 12841 - NU 21173 13040	

Several fields along the tidal reach		

4.3 Tree Work

4.3.1 Tree and LWD management

Very little management of bankside trees and LWD has been undertaken on Aln Angling Association waters and it is strongly advised that this preservation of vital habitat continues. Far from being neglect of the river, this has maintained vital cover, bank protection and shade, and greatly enhances the habitat and fish holding capacity of the river. Consequently, there are likely to be a greater number of fish currently present than there would be if the tree structure had not been allowed to develop, or if it had been removed or pruned/'tidied up'. Structure (trailing branches and LWD) within the channel will also help reinstate more of the natural channel features (gravel bars, pinch points) by retaining substrate that is supplied from upstream and will further enhance habitats in the future by promoting additional scour and deposition.

It is far better to have slightly tricky access to more fish and better fishing than to remove the features that are holding the fish. To this end, it is recommended that additional trees are planted in open sections of the river and more of the existing trees are hinged/laid into the channel at strategic points, particularly where their introduction to the channel will facilitate sediment deposition or help to accelerate flows on slower over-capacity channel sections.

1.1.1 Coppicing

In any areas where tree canopies have been lifted by pruning (e.g. Photo 23), selective coppicing could be undertaken to stimulate low level regrowth, although this should be undertaken sparingly to preserve mature tree habitat. Coppicing work should be undertaken in the dormant season (ideally Dec - Feb) to prevent killing the tree.

1.1.2 Planting

Planting is recommended wherever there is a lack of low cover and structure along the river margins, e.g. Photos 15 (if fenced), 16 & 24, and particularly where the bank is eroding (Photo 17). Most locally native deciduous species would be beneficial but willow is by far the easiest to transplant and manipulate.

The quickest and easiest way of establishing willows is by pushing short sections of willow whip into the ground. This can be undertaken at any time of the year but will have the greatest success if undertaken within the dormant season, shortly before spring growth begins (ideally late Jan-March).

Whips should be planted into soft, moist earth/sediment so that there is a greater length within the ground than out of it, to minimise the distance that water has to be transported up the stem; c.30-60cm of whip protruding from the ground is sufficient. Planting the whips on an angle can encourage the beneficial growth over the river while also allowing water to be transported up the stem more readily and reducing the chances of the whip drying out and dying. Another benefit of ensuring that more whip is within the ground than above is that it reduces the chances of wash-out if the river floods.

1.1.3 Laying/hinging

Where trees are present, pliable species such as hazel (*Corylus avellana*), elm (*Ulmus minor var. vulgaris*), hawthorn (*Crataegus monogyna*), goat willow (*Salix caprea*) and, in particular, crack willow (*Salix fragilis*) should be laid into the channel at 30^{O} or less to the bank (as shown in Photo 14). Laying trees replicates the natural process that occurs as tree limbs grow out over the river and break/fall into the watercourse, creating valuable habitat and structure within the channel. Undertaking many small habitat improvements such as these will increase the river's fish carrying capacity and overall productivity.

The process involves cutting part way through the stem/trunk, a little at a time (like laying a hawthorn hedge), until it can be forced over into the channel (Photos 25 & 26). The depth of the cut should be limited to only that which is required to bend the limb over, as this will retain maximum strength in the hinge and maintain the health of the tree/shrub. On smaller shrubs, simply cutting the stem/trunk at a very shallow angle and then putting an axe blade into the cut and hitting it with a hammer can also help the laying while retaining a good strong hinge.

Photograph 25. Hinged willow.

Photograph 26. Hinged hazel.

5.0 Fish stock management

The decision to reduce stocking on Aln Angling Association waters is to be commended. Sympathetic, hands-off management of the habitats coupled with improvements to fish passage should assist the Aln in becoming a self-sufficient wild fishery. As observed by fish below stocked size rising during the visit, the Aln already supports a head of wild trout, meaning that it could probably already be managed in that manner without supportive stocking.

The native trout populations of Britain possess great genetic diversity, making them amazingly resilient to changing environmental conditions and able to continually adapt to a wide range of habitats and environmental conditions. This has enabled them to thrive in our rivers since the last ice age (without human interference) and they should continue to do so in the future if we can limit our impact upon them and their habitats.

However, in the latter part of this period (last 50-200 years), the human impact upon those fish populations has increased exponentially, with major issues arising from industrial pollution, the way in which we manage riparian land (e.g. significant intensification of agriculture) and how we manage rivers (e.g. dredging to increase flood conveyance, and denuding vital habitat to reduce perceived flood risk or to ease angler access to rivers). All of these factors have a significant detrimental impact on the wild fish populations that rivers can support. To compound the habitat-related issues, direct interference with wild fish populations also increased, with large numbers of hatchery fish introduced to rivers.

Stocked fish (both diploid and triploid), are affected by domestication and artificial selection, even within one generation in the hatchery (<u>so this includes fish from wild brood-stock schemes</u>). Having grown and survived in an unnatural captive environment (concrete raceway, earth pond or tank) they are poorly adapted for the very different conditions of a natural river. Adaptation to a farm environment is cumulative, with the wild traits (genetic diversity and behaviours), and survival rates in the wild decreasing with each generation in captivity. The forced mating that occurs in a hatchery also bypasses vital chemical and visual aspects of wild selection that exist to ensure mate compatibility and maximise the fitness of wild fish.

It's a *'catch 22'* situation: if stocked fish don't survive long enough to reproduce in the wild, or are infertile (triploids), they are just an additional impact upon the ecosystem (as the river only has a limited amount of food and habitat); if they are fertile and do survive long enough to breed then they have the potential to suppress wild fish production through 'hybridisation', as their offspring (<u>including crosses with wild fish</u>) have much poorer survival than the native, wild fish. Well managed, natural river habitats (without stocking) have a far greater capacity to produce and support healthy fish populations, at all life stages.

From emerging out of the gravel, wild trout disperse throughout the available habitat to find territories appropriate to their individual size and dominance. They constantly compete to maintain a "pecking order" which ensures the dominant fish maintain priority over the best lies, where drifting food is the easiest to intercept for the least energy expenditure. They will remain there (often for years in the case of a large, dominant fish) until displaced by another more dominant individual or until they die (or are killed).

This natural process ensures that the available habitat is always utilised to best effect and the river holds the optimal number of fish, naturally. As salmonid survival is density dependant, the greater the habitat variation and abundance (cover, in-channel structure and flow diversity), the greater the number of trout that will survive each year and the more fish a reach can hold. For this reason, maximising the occurrence of those features and avoiding unnecessary tidying/pruning ensures that the river holds the maximum number of fish possible under the given conditions (something that is not possible through stocking).

In contrast to wild fish, stocked fish are often transient and select less energy-efficient lies; they therefore lose condition and tend to leave or die within a few months (sometimes weeks) of being stocked. In the meantime however, they cause increased competition and potentially displace the wild fish.

It must be remembered that even without stocking, the river will be naturally re-stocked. Wild trout spawning and recruitment means that new fish are produced within, and enter into a river section each year for anglers to catch. The naïve fish may often be the smaller ones, but the overall greater population will provide sport for all sizes of fish. **(N.B. Introducing stocked fish can easily disrupt this balance - e.g. the habitat required for five 0.5kg stocked fish may have originally supported many more wild fish, in a range of sizes from parr upwards)**

Although it may appear counterintuitive, for all of the above reasons, stocking can often lead to *less* fish within a river by suppressing the wild population (particularly if undertaken year upon year) whereas wild fisheries have the potential to support much greater overall fish populations. Consequently, many angling clubs actually report increased catches after ceasing stocking as demonstrated by the ever-increasing number of case studies that on the WTT website link - www.wildtrout.org/content/trout-stocking).

There is also an excellent video produced by Wild Fish Conservancy North West that documents how Montana stopped stocking and greatly increased fish numbers in the rivers – (www.youtube.com/watch?v=U_rjouN65-Q&app=desktop)

To further safeguard natural fish stocks, increased promotion of catch and release fishing is also advisable, for both resident and migratory stocks. This need not be mandatory but will greatly assist in preserving valuable wild spawning stock and improving natural trout production. Consider the fact that the larger fish caught possess the characteristics necessary to survive well in the wild and, if these fish are returned, they have a good chance of attaining even larger size and further improving angling opportunities. They are also likely to have a high reproductive success, contributing to improved wild fish populations.

On fisheries where a very high percentage or complete catch and release is practiced the results are often staggering, with fish produced way in excess of the sizes expected; however, this cannot be achieved if the fish are killed before they have had time to attain their maximum potential size.

6.0 Logbook scheme

To assist with fish stock management, and to gain a better understanding of the performance of the fishery, it is recommended that the Association requests angling logbooks to be completed, to document their catches each fishing session. This is a small task, requiring only that anglers record the length of time fished in each visit and the number of fish caught, to provide a catch per unit effort. Additional size (length) data for the fish and locations fished would also be beneficial, but are not imperative. WTT can help link the Association with other clubs who have already developed effective log book schemes.

7.0 Riverfly monitoring

With a look towards monitoring long-term water quality and the performance of invertebrate communities on the river, it is recommended that volunteers from the Association become involved with Riverfly Monitoring (www.riverflies.org/get-involved). This would involve a few members becoming trained in the sampling technique and invertebrate identification (to a low level), so that the species diversity can be recorded at set intervals over a year, and compared over time. Other clubs and angling associations around the country have found this a very interesting and informative exercise, which has also helped to identify pollution events on their waters that would have otherwise gone undetected.

8.0 Making it Happen

WTT may be able to offer further assistance such as:

- WTT Project Proposal
    - Further to this report, the WTT can devise a more detailed project proposal report. This would usually highlight specific areas for work, with the report forming part of a land drainage consent application.
- WTT Practical Visit
    - Where recipients are in need of assistance to carry out the kind of improvements highlighted in an advisory visit report, there is the possibility of WTT staff conducting a practical visit. This would consist of 1-3 days work, with a WTT Conservation Officer teaming up with interested parties to demonstrate the habitat enhancement methods described above. The recipient would be asked to contribute only to reasonable travel and subsistence costs of the WTT Officer. <u>This service is in high demand and so may not always be possible.</u>
- WTT Fundraising advice
    - Help and advice on how to raise funds for habitat improvement work can be found on the WTT website – www.wildtrout.org/content/project-funding

The WTT officer responsible for fundraising advice is Denise Ashton:

dashton@wildtrout.org

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

www.wildtrout.org/content/index

We have also produced a 70 minute DVD called 'Rivers: Working for Wild Trout' which graphically illustrates the challenges of managing river habitat for wild trout, with examples of good and poor habitat and practical demonstrations of habitat improvement. Additional sections of film cover key topics in greater depth, such as woody debris, enhancing fish stocks and managing invasive species.

The DVD is available to buy for £10.00 from our website shop

www.wildtrout.org/product/rivers-working-wild-trout-dvd-0

or by calling the WTT office on 02392 570985.

9.0 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.

10.0 Disclaimer

This report is produced for guidance only; 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.