Walkover Assessment

Lumley Park Burn – Source to Herrington Burn

River Wear, Co Durham

Date – 18/02/15

1.0 Introduction

This report is the output of a site visit undertaken by Gareth Pedley of the Wild Trout Trust, to the Lumley Park Burn (LPB) on 18th February, 2013. This was the second visit to LPB; a previous assessment has already been undertaken for the waterbody downstream (see WTT website www.wildtrout.org/av/lumley-park). The visit was attended at the request of Wear Rivers Trust, to conduct a walkover assessment from the upstream limit of Hetton Park, following the course of Hetton Burn downstream along the Rainton Burn, and then Moors Burn, to the Herrington Burn.

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 (D/S). Location coordinates are given using the Ordnance Survey National Grid Reference system. If you have Google Earth installed on your computer, a .KMZ file showing all walkover pictures is available in Table 1 and may assist reading of the report.

Table 1. Overview of the LPB waterbody details

LPB.kmz **Click link for Google Earth map**	**Waterbody details**
River	Lumley Park Burn (Moors Burn/Hetton Burn)
Waterbody Name	Lumley Park Burn from Source to Herrington Burn
Waterbody ID	GB103024077580
Management Catchment	Wear
River Basin District	Northumbria
Current Ecological Quality	Moderate (Moderate for invertebrates - not assessed for fish)
U/S Grid Ref	NZ3504247633
D/S Grid Ref	NZ3198050819
Length of river inspected (km)	c. 5.5km

This section of the LPB (Lumley Park Burn from source to Herrington Burn) has been classed as a heavily modified waterbody, and assessed as having moderate ecological potential under the Water Framework Directive (WFD) classification. The waterbody is currently 'moderate' for invertebrates, the only biological quality element assessed. This means that there were lower numbers and/or diversity of these present in EA surveys/sampling than would be expected (http://environment.data.gov.uk/catchment-planning). This report will assess the suitability of habitats for fish within the waterbody, identifying pressures and possible mitigation measures that can be undertaken to improve habitats.

2.0 Catchment / Fishery Overview

The LPB lies at the edge of the Northumbria Coal Measures Natural Area. This natural resource has been well exploited historically, as demonstrated by the altered land topography, and in the ochreous discharges which enter the Burn and other watercourses around the middle and lower River Wear catchment (www.naturalareas.naturalengland.org.uk).

Periodic snap-shot chemical samples give results that are either "good" or "high" for most of the routinely-analysed pollutants – including ammonia. The "moderate" result for phosphate supports the view that Combined Sewer Overflows (CSOs) and misconnections could be impacting upon water quality. The Burn often exudes a sewage-like odour and has been subject to periodic fish kills over recent years, which again suggest that discrete events are still impacting upon its ecology.

Evidence from the intermittent fish-kill events (where dead fish have been observed), local observations and Wear Rivers Trust electrofishing surveys suggest that the Burn supports populations of minnow (*Phoxinus phoxinus*), stickleback (*Gasterosteus aculeatus*) and stone loach (*Barbatula barbatula*). Observations of numerous redds throughout the waterbody also strongly suggests the presence of salmonids, probably brown/sea trout (*Salmo trutta*). This is likely to be, at least in part, due to the significant improvement to fish passage downstream, undertaken by Wear Rivers Trust (identified in the previous report). Further assessment of the juvenile salmonids on the waterbody through electrofishing would be beneficial.

3.0 Habitat Assessment

3.1 Hetton Park to Rough Dene Burn

At the upstream end of Hetton Park a pipe culvert prevents further upstream fish access on the Hetton Burn (Photo. 1). The pipes are narrow, long and gradually increase in gradient. Even when water depths are sufficient, velocities within the pipes well be in excess of salmonid swimming capabilities. In addition, a step at the end of the culvert and stepped apron also inhibit access to the pipes.

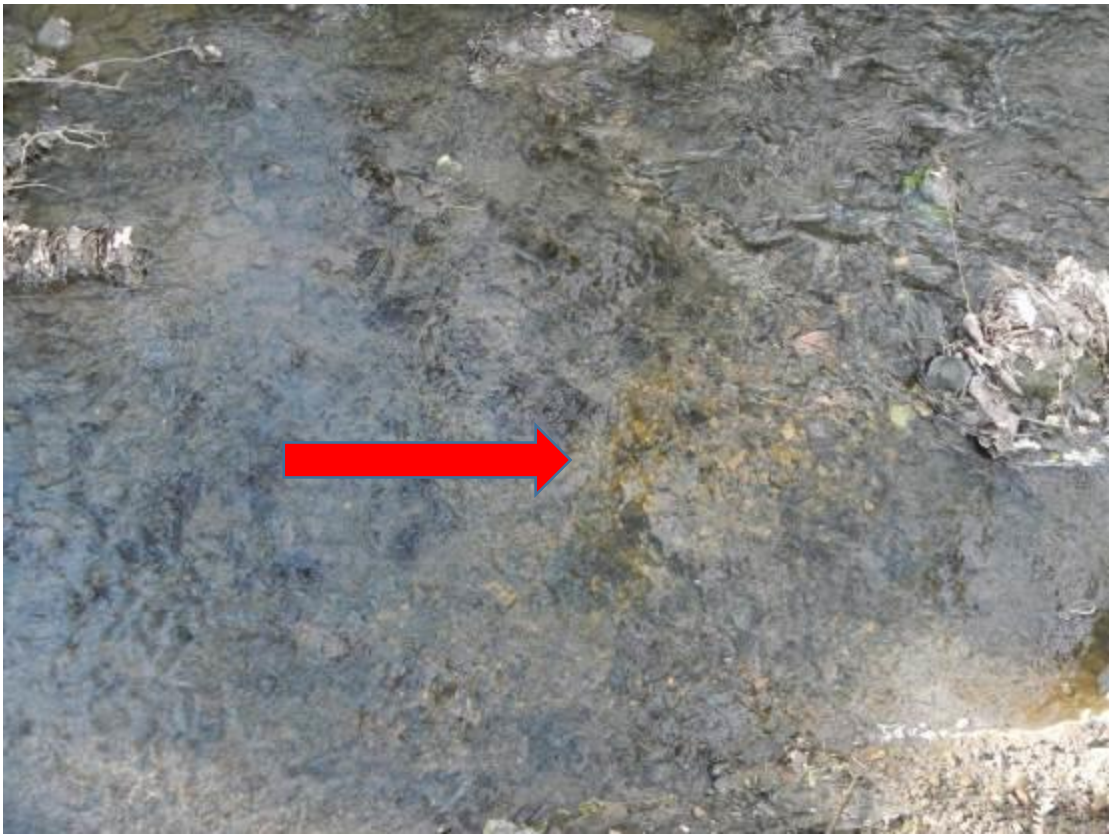
Photograph 1. Upstream limit of fish access on the Hetton Burn.

Even here, at the upstream limit on the walkover, the Burn shows signs of excess sedimentation, and a sewage-like odour emanates from the notably grey water. Reasonably high quality, low-level cover and structure are available in areas, within and along the watercourse (Photo. 2) but, in places, shading limits the growth of herbaceous vegetation and understory and the banks are relatively bare. Increasing and retaining overhanging/trailing shrubs and LWD within the channel would be greatly beneficial. Not far downstream a CSO with a concrete apron poses another obstacle to fish passage, due to a step and shallow water (Photo. 3).

Photograph 2. Low cover and structure along a deeper pool. Note the distinctively grey tint to the water.

Photograph 3. Vertical step and shallow water across the apron of a CSO limit fish passage.

Even within the park, signs of salmonid spawning were present on any suitable substrate (Photo. 4), although the grey coating on the rocks signifies fine sediment that coats the bed and infiltrates the gravel. Fine sediment reduces through-flow of water within the gravel, smothering the eggs and reducing egg survival rates.



Photograph 4. Small salmonid redd (red arrow) on the first suitable sized substrate. Grey sediment coating on the bed is likely to reduce egg survival rates.

The issue of fine sediment entering the Burn from upstream should be addressed separately, but increasing the level of structure within the channel accentuates scour and deposition processes and helps to sort and maintain high quality silt-free substrate.

An area of erosion has led to bank slumping and loss of land (Photo. 5). Mowing up to the edge of the bank limits vegetation growth and increases erosion by reducing root structure in the bank which also inhibits re-grading (similar to grazing). Allowing a buffer to increase vegetation cover and trees in this area should reduce erosion rates. Further downstream, another CSO poses a similar problem to the first, with the step and shallow apron posing an issue for fish passage (Photo. 6). Several redds were observed in the short distance downstream of the structure, likely signifying that it is an obstacle, but also that the localised scour has cleaned and sorted the gravels to a favourable state for spawning.

Photograph 5. Area of erosion that could be addressed by increased vegetation.

Photograph 6. Another CSO poses an obstacle to fish passage. The brown line represents a possible baulk-style easement that could be employed.

Around the entrance to the wood in Hetton Park is a sharp bend showing previous signs of erosion, with willow spiling employed to address the issue (Photo. 7). The work appeared to have worked to an extent, with erosion reduced on all but the lower end. As with many attempts at willow spiling, however, some of the cross pieces have failed to take, leaving the bank exposed. Bank protection could be significantly improved by cutting some of the willow re-growth into short sections and planting them into the bare earth. This would also promote low cover along the bank.

Photograph 7. Willow spilling to protect the outside bend.

Within the wood, the channel gradient reduces slightly and the habitat improves, particularly where the Burn is more sinuous, facilitating more significant scour and deposition features. Overhanging, mature trees and undercut roots, along with LWD all provide valuable habitat features (Photo. 8). Areas of inset berms are also evident, where deposited fine sediment has become vegetated (Photo. 9).

Also within the wood, signs of channel realignment are evident as a paleo-channel runs alongside a straight section of current channel, the latter flowing under the footpath bridge and re-joining the paleo-channel alongside the path (Photo. 10).

Photograph 8. Overhanging trees and undercut banks provide good fish cover and shelter.

Photograph 9. Vegetated berms alongside the channel.

Photograph 10. Looking upstream, the straightened, current channel (left) and the paleo-channel (right).

The remainder of the wood downstream lies within Hetton Bogs Site of Special Scientific Interest (SSSI). This is a very low gradient willow carr area in which the channel of the Burn has become almost completely choked by willow and sediment deposition, forming a large reed bed area, rather than a formal channel in many places (Photo. 11). This is listed as a priority habitat in Natural England's inventory, as observed on Magic Maps (http://magic.defra.gov.uk/).

In this area, high flows have also forced localised downward scour, leading to the channel becoming significantly incised within a very narrow (c.300mm x 600mm) channel, which starts as a vertical step into the clay and humus (Photo. 12). The step poses an obstacle to fish passage in low-medium flows, but being a relatively natural feature (although possibly influenced by other interventions in the area) the decision of whether to ease the obstacle is somewhat complex. In addition, it may be that future erosion will begin to relieve the obstruction.

Photograph 11. Areas of the wood are so choked with willow and sediment deposition that there is no formal channel.

Photograph 12. In contrast to Photo 11, bed erosion in this area has led to a narrow channel incising c.600mm into the clay and humus and creating an obstacle to fish passage.

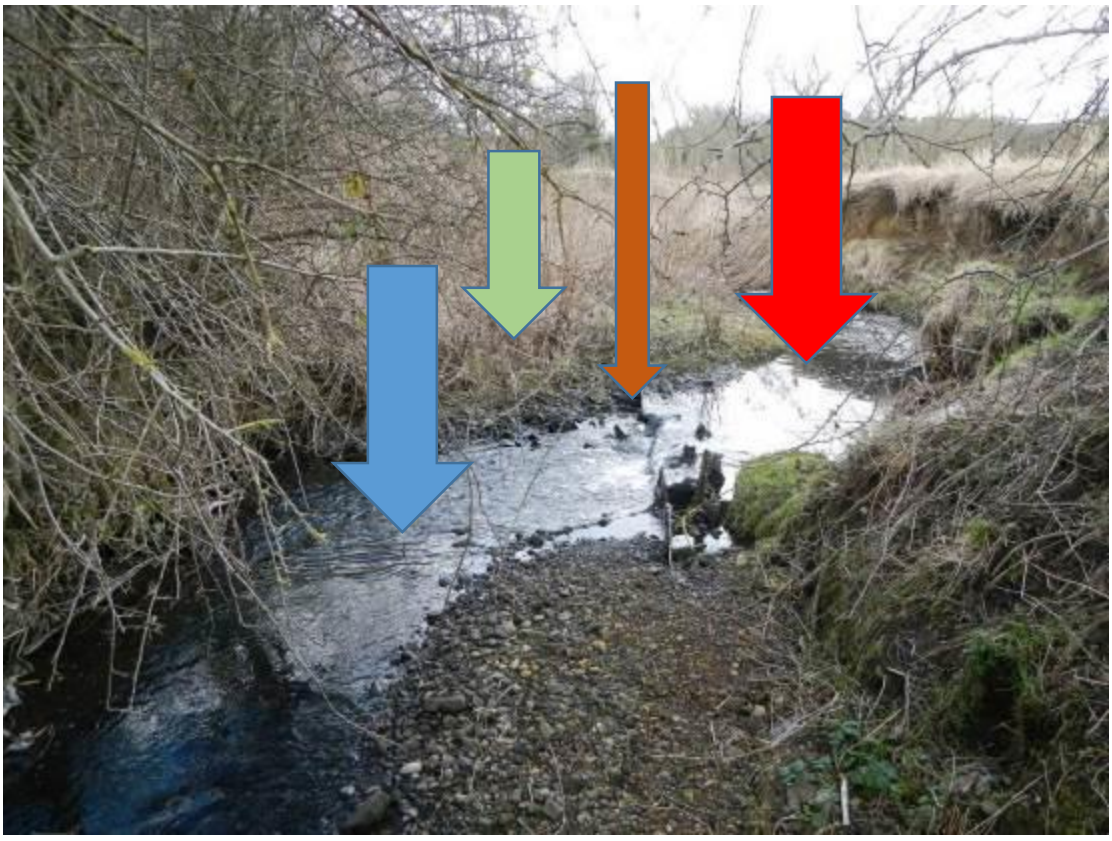
3.2 Rough Dene Burn to A690

Downstream of the wood, land use reverts to grazing for one field, and the straight, over-capacity channel is testament to previous land drainage and dredging activity (Photo. 13). Grazing pressure is noted here but does not appear to be having an impact on all bank sections. However, significant sediment input is evident via the Rough Dene Burn, which forms one of the field boundaries, and suggests that livestock are poaching the banks on that tributary (photo. 14).

Downstream of Rough Dene Burn signs of past shutter-board bank protection is evident, as is the capacity of a constrained channel to break out given time (Photo. 15). Flows have worked behind the boards, which have then greatly exacerbated bank erosion.

Photograph 13. Straightened, over-capacity channel.

Photograph 14. Rough Dene Burn (right) supplying additional sediment.



Photograph 15. Looking upstream – the line of original channel (blue), line of failed shutter–board bank protection (Brown) and line of newly eroded channel behind originally

protected bank line. The green arrow represents a vegetated gravel bar formed by natural deposition.

Although straightened, the channel in this section does support some areas of spawning gravel, supplied, at least in part, by the bank erosion and reworking of material depicted in Photo. 15, upstream.

Photograph 16. Substrate suitable for salmonid spawning.

At the downstream end of the field, the Burn enters another short wooded section along Hetton Houses Wood. Here again, the habitat improves in the absence of grazing and channel modification. Bankside trees natural LWD and a sinuous channel provide cover and assist erosion and depositional features, cleaning and sorting the gravel substrate (Photo. 17).

Following the short section of woodland, the Burn flows through a more open area, where a gas pipe crossing has resulted in the bed being raised through armouring to protect the pipe (Photo 18). It would be hoped that modern pipe crossings would be sunk well below the bed to avoid this issue. At least the work has incorporated three sympathetic bed-checks to maintain the bed level downstream. This has prevented the raised area from becoming significantly perched and reduced the obstacle created to fish passage (likely as an unintended positive consequence of protecting the pipe, rather than in consideration of fish passage). The crossing still poses an obstacle.

Photograph 17. Improved habitat where trees and LWD are present.

Photograph 18. Gas pipe crossing (red) armouring (blue) and one of three bed-checks (green) to prevent the pipe and armouring becoming perched.

Occasional bends provide scour and deeper pool habitat, particularly where tree roots protect the bank and divert erosional forces into the bed (Photo. 19). The canopy of the trees also provides valuable low-level cover.

Photograph 19. High quality, covered pool habitat.

On a large area of bank erosion downstream without any tree protection which was threatening the footpath, two tiers of willow spiling have been installed, successfully halting the erosion (Photo. 20). The spiling installed is now at a stage requiring maintenance and the vertical shoots/branches should be treated in one of three ways. They could be laid down along the bank and into the channel to diffuse flows acting upon the bank; they could be woven back into the structure where possible, or they could be cut into short sections and re-planted into any bare areas of bank. A combination of all three options may give the best overall benefit.

Photograph 20. Effective use of willow spiling.

Another smaller area of bank erosion could also be addressed with the use of willow. Planting of willow whips in these exposed areas would increase structure in the bank (particularly as the willow takes root) thereby stabilising the bank and greatly inhibiting erosion (Photo. 21).

Photograph 21. Bank erosion that could be addressed with planting of willow whips.

At the downstream end of this section the Burn enters another wooded section, with many houses backing onto the Burn. Through this section some reasonable habitat prevails; however, the area is a perfect example of how bank revetment and land boundaries are maintained out of public sight, and without consent (Photos. 22 & 23). Use of the Burn for garden waste disposal was also commonplace, with crass cuttings, leaves and tree prunings simply thrown down the bank (Photo 22).

Alongside the gardens is also the first point during the walkover that Japanese Knotweed (*Fallopia japonica*) was observed (Photo 24). This should be treated with herbicide (by a trained and permitted individual) as a matter of high importance to prevent its spread downstream.

Photograph 22. Inappropriate use of concrete filled bags as bank protection. A likely cause of one/some of the numerous fish-kills on the Burn.

Photograph 23. Garden waste (left of shot) simply thrown down the bank.

Photograph 24. First sighting of Japanese Knotweed

Downstream of this point the houses maintain a more formal Burn frontage, so the short section to the A690 was not walked.

3.3 A690 to Herrington Burn

The Burn emerges on the D/S side of the A690 from a large double culvert (Photo. 25). Brief inspection revealed it to be set below the bed level, now supporting a natural substrate throughout its length, relatively day-lit and hopefully posing no significant issue to fish passage.

Proceeding downstream, the Burn flows alongside an industrial area and down through Gilpin Wood. There are numerous signs of past tree/channel maintenance in the form of cut stumps and branches (Photo 26). This is likely to have been undertaken by the Environment Agency to reduce perceived flood risk. However, as much of the land in the area is open, at least on one bank, and culverts (Photo. 26) are likely to form the major bottlenecks to any flow; it may be that a more pragmatic approach will prevail in future and beneficial overhanging branches and LWD can be left untouched.

Photograph 25. A690 Road Bridge culvert – no apparent significant obstacle to fish passage.

Photograph 26. Cut branches – signs of past channel maintenance.

Where trees have been left unmanaged they provide valuable bank and in-channel structure, with deep pools and undercut banks – ideal trout habitat (Photo. 27). Leaning and collapsed branches enhance these features, along with depositional bars (Photos. 27 & 28). Such features could be promoted through willow planting and hinging/laying in other areas to further improve habitat and reinstate features lost through historic channel maintenance. Very selective coppicing could also be employed to reinstate low-level regrowth and increase cover.

Photograph 27. High quality, deep pool habitat with leaning branch and undercut root cover. Encouraging low-level foliage would further improve habitat quality.

Photograph 28. Fallen willow limb facilitating beneficial sediment deposition and encouraging channel sinuosity/complexity.

From the downstream limit of the wood (NZ 33249 49396), habitat quality becomes severely degraded by the impact of very intensive horse grazing through uncontrolled access to the Burn for the following 540m downstream to the A1052 (Photos. 29-32). This is undoubtedly one of the most serious areas of impact on the whole waterbody. Habitat is greatly suffering from a significant input of sediment, through erosion and poaching, and through intensive grazing of bankside trees and vegetation, leaving little or no cover.

The presence of a railway sleeper bridge approximately half way through the fields would provide stock and human access even if the watercourse were buffer-fenced. The addition of another small access bridge may also be required across the small tributary that joins the Burn in Photo. 32. There may also be issues of deliberate vandalism of any fencing that is installed, to allow grazing of the buffered areas that become established. Much of the grazing already occurring in this area appears to be unconsented.

Photograph 29. Serious habitat degradation through grazing (foreground). A stark contrast to the relatively high quality habitat in the fenced woodland upstream (background).

Photograph 30. Severe bank erosion through grazing and livestock (horse) poaching. All vegetation is also grazed almost to death.

Photograph 31. Sleeper bridge over the Burn that could facilitate buffer fencing of the watercourse. Note again the serious lack of bankside vegetation.

Photograph 32. Significant bank erosion and sedimentation of the watercourse through horse poaching and major overgrazing.

Downstream of the A1052, a short section of the Burn has some degree of fencing, although the protection afforded is minimal as obvious signs of formal access points and livestock grazing/poaching are present, with the fencing in some areas seemingly used as the boundary for an additional grazing unit (Photo. 33). Further downstream, unrestricted stock access to the watercourse resumes and no bankside vegetation remains (Photo. 34).

Unexpectedly, gravels of a suitable size for salmonid spawning are present, although they are significantly impacted by the mass sedimentation supplied from upstream to the extent that salmonids are unlikely to attempt to use them (Photo. 35).

Photograph 33. Fenced section of watercourse D/S A1052. Livestock grazing and poaching is almost as heavy within the fencing as outside it (red arrows).

Photograph 34. Uninterrupted horse grazing for the riverbank D/S of the fenced section.

Photograph 35. Gravel is present in the grazed area but is so compromised by sedimentation from upstream that it is unlikely to be used by salmonids for spawning.

Downstream of the grazed areas, some semblance of bankside vegetation resumes, albeit along a realigned section of the Burn, with a significant lack of habitat variability. Some areas of sediment deposition add a little variation to the channel, but at present are far from sufficient to provide valuable habitat (Photo. 36). If funding were available, the large areas of open, unimproved grassland and alder carr along this reach could be incorporated in a restoration project to re-meander the channel; the enhancement to both habitat quality and aesthetics of the area should outweigh any inconvenience through altering access routes.

Photograph 36. Straightened section of Burn with very poor habitat, although a few natural depositional features are becoming established. This section could possibly be re-meandered if funding were available.

If money is not available in the short-term for a full channel restoration, there are certainly improvements that could be initiated. Habitat along the open banks would greatly benefit from the planting of trees, and existing trees (Photo. 37) could be laid down into the channel to increase structure in the channel, kick-start erosional and depositional processes, and thereby enhance channel morphology. In a similar way, live willow branches and LWD could be installed within the channel. The minimal infrastructure in the immediate area of the channel limits potential flood risk.

Photograph 37. Uniform, low quality habitat that could be enhanced by planting and laying.

The prescription of tree planting and laying branches applies for the remainder of the waterbody as a measure to replicate the valuable natural habitat already forming in the area (Photo. 38). In the farthest downstream area (D/S Sedgeletch Road - NZ3250550761) there is the additional consideration that unconsented horse grazing again becomes an issue (Photo. 39). This is something that is unlikely to be prevented, but the impact can be minimised by confining planting and live willow work to the opposite bank.

In the lower 350m of the waterbody, there is again potential for a more significant channel restoration project (Photo. 40). In addition to the minor habitat improvements, there is scope for re-meandering of the straightened channel into an area of wetland along the RB. This could reinstate all of the lacking habitat features, at least in that short length. Alternatively, a less beneficial, but worthwhile project could be to, at the very least, lower the RB to allow high flows to enter the wetland area and provide a more natural flow regime within the currently embanked reach.

At the confluence of the Herrington and Moors Burns, turbidity in the Moors Burn was considerably greater. This demonstrates the impact that sedimentation occurring on the Moors Burn is having upon waterbodies downstream (Photo. 41).

Photograph 38. Natural willow regeneration providing cover and structure in a degraded, channel. This type of feature could be easily replicated to enhance the habitat in other areas.

Photograph 39. Unconsented horse grazing on the RB continues for the rest of the waterbody.

Photograph 40. Straightened section that would benefit from planting and in-channel structures, including laying willows (background). There may be the possibility of a re-meandering or bank lowering project on the RB to even greater effect.

Photograph 41. The Moors Burn (foreground) carrying notably more suspended sediment than the Herrington Burn.

4.0 Recommendations

4.1 Re-meandering in-channel structures

Where neighbouring land is suitable, full-scale re-meandering of realigned Burn sections should be undertaken to reinstate natural geomorphological processes. Initiating these kinds of improvements is likely to be a long-term goal, potentially involving medium to high budget projects. However, this should not be seen as a deterrent as many similar projects are underway around the country. It may be that funding via the Environment Agency could support such projects (particularly Flood Risk and Coastal Management (FRM) money), or that they could be incorporated into future developments through the Wear Catchment Partnership Project. Sunderland City council have also offered to fund a feasibility study into aspects such as Sustainable Urban Development and habitat improvements in the area, as part of a local Green Infrastructure programme (Hudson, S. (2015), pers. comm., 05th March).

In the shorter-term, and in areas where the channel cannot be re-meandered, assisting the natural channel recovery which is already underway would be greatly beneficial and would help counteract a history of unsympathetic channel maintenance and realignment. To encourage new areas of scour and deposition, in-channel structure and increased bankside vegetation will be key. Introducing LWD and structures like tree kickers (live and dead) will concentrate flows in certain areas of the channel (usually towards the centre), and scour deeper pool habitat, while also creating slacker areas within the margins where deposition will increase (Photo. 42, and also naturally occurring in Photo. 37).

Photograph 42. Note the narrowing effect through significant sediment accumulation (centre and right of shot) in the sheltered area downstream of the tree kicker.

Photograph 43. Cabling for a tree kicker.

Table 2. Locations in which re-meandering and, or in-channel structures would be beneficial			
Location	**Action**		**NGR**
	Re-meandering	Tree kickers	
Upstream end of Hetton Bogs LNR (around Photos. 8 & 9)		Y	NZ3495948234 – NZ3483548417
Throughout the horse grazed fields (Photos. 29-32 & 34)		Y	NZ3325749399 - NZ3291150306
Area around and D/S of Photo. 36 (RB and LB)	Y	Y	NZ3291150306
Area around Photo. 37 to Herrington Burn		Y	NZ3291150306 - NZ3198050819
Area around Photo. 40 on the (RB)	Y		NZ3228250767 – NZ3198050819

4.2 Fencing

In all areas where livestock (particularly horses) have access to the watercourse, fencing should be installed to provide an un-grazed buffer. Grazing is one of the most significant impacts acting upon the Lumley Park Burn system and addressing this issue is paramount in improving the habitat of this waterbody and the waterbody downstream. In some areas the grazing may be difficult to stop, but nonetheless, efforts should be made.

Table 3. Locations in which fencing should be undertaken	
Location	**NGR**
Around Photos. 13 & 14	NZ3457448611
Throughout the horse grazed fields (Photos. 29-32 & 34)	NZ3325749399 - NZ3291150306

4.3 Tree Work

4.3.1 Spiling Maintenance

In the two areas previous willow spiling work is now at a stage that would benefit from maintenance (Photos. 7 & 20). In these cases,

weaving some of the willow back into the structure and laying some branches into the channel would be beneficial.

4.3.2 Planting

Planting is recommended throughout the burn wherever there is a lack of low cover (Photos. 9, 18, 36, 37, 38 &39) and also in the heavily grazed areas (Photos. 29-34), if fenced. It will be of particular use if trees are planted in clusters along straight channel sections and trained into the channel to redirect flows. As such it would be beneficial to plant alternately along each bank, with gaps between. Willow whip planting would also be ideal to help reduce areas of bank erosion (Photos. 21 & 5). Subsequent maintenance of planted trees may be required in sensitive areas.

The quickest and easiest way of planting is with willow, 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, wet 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; 30-40cm of whip protruding from the ground is sufficient.

4.3.3 Laying

Where trees are already established along the bank side habitat improvements can often be attained through laying some of the branches down into the watercourse to increase low cover and structure within the channel. This would be particularly beneficial in the area downstream of the A690, alongside the industrial estate (Photos. 26-28) and at the lower end of the waterbody (Photos. 37 & 38).

The method is usually limited to species that can be easily manipulated without snapping (e.g. willow, elm, hazel, hawthorn and small alder), but some others can be laid carefully. Small to medium shrubs tend to work best, although quite large willow can be successfully laid.

The process involves cutting part way through the stem/trunk (a bit at a time) until it can be forced over into the channel (Figures 43 & 44). The depth of the cut should be limited to that which is required to bend the limb over, to retain maximum strength and health.

Photograph 43. Hinged willow.

Photograph 44. Hinged hazel.

4.3.4 Coppicing

Where trees are present but the canopy is well above the water level (over 1m), coppicing can be undertaken to encourage low level re-growth and rejuvenate the tree (also promoting a dappled light regime). This treatment should be undertaken sparingly, as tree canopies also provide habitat for many other species and create valuable shade over a watercourse. When undertaking coppicing, existing low cover should also be retained and care should be taken to ensure that work does not disturb nesting birds, as this would constitute an offence under the Wildlife and Countryside Act.

Table 4. Locations in which tree management could be undertaken

Location	**Action**				**NGR**
	Spiling Maintenance	Planting	Laying	Coppicing	
Hetton Park (Photo. 5)		Y			NZ3497347967
Hetton Park as short distance D/S of Photo. 6		Y			NZ3493548033
Hetton Park willow spiling (Photo. 7)	Y	Y	Y		NZ3495948234
Wood D/S end of Hetton Park (Photo. 9)		Y			NZ3483648401
Hetton Bogs SSSI (Photo. 18)		Y			NZ3440848605
Hetton Bogs SSSI Spiling (Photo. 20)	Y	Y	Y		NZ3428848564
RB D/S of spiling SSSI (Photo. 21)		Y			NZ3423648549
Woodland D/S of A690 (photos. 26-29)		Y	Y	Y	NZ3373048857 - NZ3325749399
Throughout the horse grazed fields (Photos. 29-32 & 34) - if buffer fencing is undertaken		Y (if fenced)	Y		NZ3325749399 - NZ3291150306

4.4 Fish passage

While improvements to fish passage at the three-pipe culvert at the upstream limit of the section walked (upstream end of Hetton Park) are infeasible, easing fish passage over the steps and shallow aprons at the CSOs further downstream in Hetton Park ((Photo. 3 - NZ3506447852) & (Photo. 6 NZ3495648198)) would be worthwhile. This should ideally be undertaken by infilling the scour pool on the downstream side with a rock ramp type easement and some kind of baulk to increase water depth over the apron (Photo. 6); however, owing to the relatively short section of available habitat upstream, it may be that simply increasing depth over the aprons and focussing flow with a baulk (possibly with the inclusion of an adherent nappe on the step) would be a better use of funding.

4.5 Japanese Knotweed

Japanese knotweed was observed at the following locations and should be treated with herbicide, by licensed personnel to prevent it spreading.

Location	**NGR**
Alongside the gardens downstream of the Hetton Bogs SSSI (Photo. 24)	NZ3391148726
40m upstream of the Moors Burn – Herrington Burn confluence	NZ 31994 50803

More information on these and many other habitat enhancement and restoration techniques can be found in our various publications on the Wild Trout Trust website, under the library tab (http://www.wildtrout.org/content/library).

5.0 Making it Happen

Wear Rivers Trust are well equipped for delivery of options covered within this report, as demonstrated by their increasing portfolio of environmental projects; however, should additional advice or support be required, the Wild Trout Trust may be able to offer additional assistance through one or more of the following methods:

- WTT Project Proposal
    - Further to this report, WTT can devise a more detailed project proposal report. This would usually detail the next steps to take and highlighting specific areas for work, with the report often forming part of a flood defence consent application.
- WTT Practical Visit
    - Where assistance is required to carry out the kind of improvements highlighted in an advisory visit report, there is the possibility of WTT staff conducting a practical workshop for a club. This would consist of 1-3 days' work with a WTT Conservation Officer teaming up with interested club members to demonstrate the habitat enhancement methods described above. WRT would be asked to contribute only to reasonable travel and subsistence costs of the WTT Officer.

6.0 Acknowledgement

The Wild Trout Trust wish to thank the Environment Agency for the support and funding that made this visit possible.

7.0 Disclaimer

This report is produced for guidance and not for specific advice; 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.