Walkover Assessment

River Gaunless – Tributary of the River Wear

County Durham

Date – 21/01/15

1.0 Introduction

This report is the output of a site visit undertaken by Gareth Pedley of the Wild Trout Trust, to the River Gaunless on the 21st Jan 2015. The visit was attended at the request of the Wear Rivers Trust to assessment habitat quality and recommend actions that could be taken to improve salmonid habitat. Comments in this report are based on observations on the day and discussions with Steve Hudson, of the Wear Rivers Trust.

The length of river walked is broken into two sections owing to the presence of a landowner in the central section who was not interested in being involved with any environmental improvement projects. The upper section was walked in a downstream direction (D/S), from the weir Nr Station View, West Auckland (NZ 18127 26452) to the footpath bridge that crosses the river (NZ 19639 26208), c.200m d/s of the Hummer Beck confluence (a total distance of c.2.4km). The lower section was also walked in a downstream direction, from the A6072 road bridge crossing (NZ 20445 26835) to Dovercote Hill bridge crossing (NZ 21150 28014), a distance of c.2.7km.

Normal convention is applied throughout the report with respect to bank identification, i.e. the banks are designated left hand bank (LB) or right hand bank (RB) whilst looking downstream. Location coordinates are given using the Ordnance Survey National Grid Reference system.

Below is a link to a Google Earth map containing locations for all pictures taken on each waterbody during the walkover. This may be of assistance for reference when reading the report.

River Gaunless.kmz

Both waterbodies inspected are classed as being 'poor' for fish under the Water Framework Directive (WFD), meaning that there were significantly lower densities of fish (and potentially species) present than would be expected.

	Waterbody details Upper Section	Waterbody details Lower Section
River	Gaunless	Gaunless
Waterbody Name	Gaunless from source to Hummer Beck	Gaunless from Hummer Beck to River Wear
Waterbody ID	GB103024072690	GB103024072730
Management Catchment	Wear	Wear
River Basin District	Northumbria	Northumbria
Current Ecological Quality	Poor (Poor for fish)	Good Potential (Poor for fish - Heavily Modified WB)
U/S Grid Ref	NZ 18127 26452	NZ 20445 26835
D/S Grid Ref	NZ 19639 26208	NZ 21150 28014
Length of river inspected (km)	2.4	2.7

Updated WFD classifications (Frear, P. (2015), pers. comm. [email], 14th January)

2.0 Catchment Overview

The River Gaunless flows in a North-Easterly direction from its source, Nr Eggleston, on the edge of the North Pennines, across the Low-lying land of the Northumbrian Coal Measures to its confluence with the River Wear at Jock's Bridge, Bishop Auckland. The geology of the catchment is predominantly sandstone, siltstone and mudstone.

Through the sections inspected, the River is primarily under the control of private landowners and tenants in the middle reaches, and the local council at the upstream and downstream ends where the land is more urban. There are currently no angling interests along the inspected reach; however, Ferryhill and District AC used to hold the fishing rights in some areas (Hudson, S. (2015), pers. comm., 21st January 2015).

3.0 Habitat Assessment

3.1 Upper Section - West Auckland to Hummer Beck

At the upstream limit of the section inspected, between West Auckland and St Helen Auckland, the channel is realigned and impounded by a medium-sized weir (c. 450mm) (Fig. 1). This weir may be passable in higher flows but the vertical fall and shallow water over the weir make it a significant obstacle to most fish in normal flows. The impounded reach upstream has largely filled in with substrate supplied from upstream and so presents only a small impact to sediment supply downstream. However, the straightened nature and uniform width of the channel (increased gradient/lack of flow diversity) in this area reduces the localised scour and deposition processes found in unmodified, meandering channels. For these reasons, finer gravel substrate suitable for salmonid spawning and deeper pool features are lacking for some distance (Fig. 2).

Deeper water and finer gravels are, however, observed locally around the weir pool and, correspondingly, this was the only area that redds were observed in the reach. Far from being a positive feature, this is more likely to suggest that spawning fish were simply stranded below the weir and had to make use of the only gravel available. Evidence of the historic channel straightening can be seen in the adjacent field, where a light snow covering makes the contours of the sinuous paleo-channel more visible (Fig. 3).

Figure 1. Weir at upstream end of the reach inspected which poses an obstacle to fish passage.

Figure 2. Straightened section of river with little diversity of water depth and coarse (large cobble) substrate.

Figure 3. Evidence of a previous sinuous paleo-channel.

Realignment of the channel continues downstream into St Helen Auckland, where a lack of low level cover in areas suggests historic channel maintenance for land drainage (Fig. 4 & 5). Some small bankside shrubs were present, presumably established since the last maintenance, but in general the area has a lack of marginal cover and structure (low/trailing branches).

Through the housing estate, access to the river is impeded by an unsightly concrete fence (Fig. 6), seemingly for no reason. It is possible that promotion of the river's value as an asset to the local community and removal of the fence could better engage local residents with the river. There is, however, a risk that increased access could lead to abuse of the water course currently protected by the fence, so the community engagement aspect would be required.

Figure 4. Straightened river section lacking low-level and in-channel/trailing cover.

Figure 5. Bankside trees present but a general lack of low cover.

Figure 6. Concrete fence shielding the river from sight of the houses on the RB.

Areas of bank protection afforded by mature alder trees have focussed bed scouring and developed deeper pool habitat, although the lack of low/trailing branches is still very apparent (Fig 7). A low pipe crossing significantly restricts channel capacity (Fig. 8); a fact that may support the case for increasing low-level and in-channel structure in the area, as the pipe is likely to be the over-riding restriction in terms of channel flood conveyance. Downstream of the pipe the channel widens slightly, facilitating the retention of a finer gravel (likely liberated by bed scour below the pipe). The gravel bar formed provides an important potential salmonid spawning area. Collapsed crack willow (*Salix fragilis*) alongside the bar represents the natural occurrence of a type of habitat that could be replicated in other areas to increase low cover with minimal impact upon flood conveyance.

Figure 7. Deeper pool habitat created where root protection along the bank has facilitated some bed scour.

Figure 8. Wider channel facilitating retention of finer gravels (potential salmonids spawning habitat), with a fallen willow alongside.

Moving downstream, out of the conurbation of St Helen Auckland, a short section of relatively high quality in-channel structure is present, along with associated scour pools and healthy flow diversity (Fig 9).

Figure 9. Good tree cover along a more diverse channel.

A short distance downstream, grazing becomes an impact along both banks, particularly the left (Figs. 10 & 11) and is a significant factor in the lack of trees and low cover in many areas, as the grazing prevents natural regeneration. With a lack of vegetation and tree root structure the banks are much more susceptible to high flows and notable erosion was present, sometimes on both banks (Fig. 11).

The impact of channel maintenance and realignment reduces significantly through this section and a more natural, meandering planform is present (Fig. 12). There is some evidence of straightening but this is most likely due to historic management of land boundaries and land drainage. In general, the river is actively recovering a more natural planform. With the more sinuous planform and reduced gradient a greater diversity of mobile substrate was present, providing high quality salmonid spawning habitat. Although limited, in areas large woody debris (LWD) retains the mobile substrate and further enhances spawning habitat (Fig. 13).

Figure 10. The start of grazing d/s of St Helen Auckland.

Figure 11. Significant grazing and lack of trees and herbaceous vegetation, leading to destabilization of both banks.

Figure 12. A more sinuous planform facilitates beneficial scour, creating pool habitat and reworking the substrate to greatly improve spawning habitat.

Figure 13. LWD retaining gravel and enhancing spawning habitat.

A reasonably successful attempt at bank protection appears to have been made with a line of willows around one outside bend, providing bank stability and habitat enhancement (Fig 14).

Figure 14. Planted willows provide bank protection and habitat. The habitat could be further enhanced by laying some willows into the channel.

In stark contrast to the soft willow protection, hard armouring has been employed on the river bed and banks in the area around the A688 Road Bridge, with the whole channel constrained within rock netting (Fig. 15). Natural substrate is retained over the top in most places, however, and some semblance of in-channel/bed features exist.

In the first section downstream of the bridge, the channel appears to have been dredged/realigned and is over capacity for a short distance before returning to a more natural planform and hydromorphology. In general, the exclusion of stock has greatly stabilised the river banks, although some areas of erosion are occurring on the bends and where the fence has been installed too close to the bank (Fig. 17), or has not been properly maintained, allowing stock to graze and destabilise the river bank (Figs. 18 & 19). Some tree planting has been undertaken in this section, but a lack of low cover along the bank remains as most of the trees have been planted back from the bank (presumably to establish before being lost to erosion).

Figure 15. An appalling use of hard engineering, with the entire bed and banks constrained within rock netting.

Figure 16. Stock excluded allowing improved vegetation cover, but some signs of dredging. Hinging the tree into the channel would greatly enhance in-channel habitat.

Figure 17. Area of erosion requiring fence repair/relocation.

Figure 18. Ford and water gate requiring repair.

Figure 19. Erosion requiring fence repair and relocation (possibly due to poor fence maintenance and stock accessing/grazing the bank).

Towards the downstream end of this section Hummer Beck confluences with the Gaunless (d/s limit of the WFD waterbody) and provides a notable sediment input to the river. A short distance upstream of the confluence on the Beck an obvious point source for fine sediment was noted (Fig. 20), but inspection further upstream revealed that the Beck is already carrying a high sediment load by that point. Observation of the bed showed the Beck to comprise a significant portion of silt and sand.

Downstream of the beck, to the d/s limit of the section (footpath bridge), grazing continues to have a negative impact upon the river banks. This issue is due in part to poor maintenance of boundary fences in some areas and a complete lack of fences in others.

Similarly, the section downstream of the bridge that wasn't walked would also greatly benefit from fencing, which, if given a large enough buffer, would probably allow the section to recover naturally into high quality salmonid habitat.

Figure 20. A boggy spring area in the field (background) which creates a source of sediment to the river.

Figure 21. Heavily silted bed of the Hummer Beck.

Figure 22. The middle section (not walked) where a generous buffer strip would facilitate natural recovery.

3.2 Lower Section - A6072 Road Bridge to Dovecote Hill road bridge

Downstream of the A6072 the river is very much more incised, flowing between deep banks and with a relatively uniform bed profile (generally deep and lacking riffles) (Fig. 23). The banks open out in areas (Fig. 24), but even in these areas a lack of shallow gravel and spawning habitat prevails. Adult and larger juvenile trout habitat is of a reasonable quality through these areas due to the deep water in conjunction with a relative abundance of bankside trees and rank vegetation.

Water quality/clarity has greatly deteriorated by this section when compared to that of the upper section, suggesting an issue somewhere within the intervening, un-inspected section. There is a high probability that this is, at least in part, due to the heavy grazing and associated erosion of that section. As such, a walkover of the middle reach would be highly beneficial.

A small tributary joins the Gaunless just downstream of the road which carries sediment-laden water from both field and road drainage (Fig. 25). Further downstream another field drain also enters the river and appears to be supplying ochreous water via a large soak away area/outflow area (Fig. 26). This is, in fact, likely to be greatly reducing the impact of the outfall as the large area and slow transition is likely to be allowing oxidisation to occur (causing the colouring) before it enters the Gaunless, at least at low flow. It may, however, be worth investigating the chemical impact on the river in low flows (particular pH). A brief investigation of old maps identifies the location of a disused colliery on the hill above, which is almost certainly the source.

Further downstream two areas of boggy land around natural springs also create sediment inputs to the river. The impact of these are greatly exacerbated by livestock poaching of the area (Fig. 27).

Figure 23. Deep water in an incised channel with high banks d/s of the A6072 with a lack of shallow riffle areas. Also note the water discoloration.

Figure 24. An area of more open banks, but the lack of shallow water and gravel bars remains.

Figure 25. Small tributary/drain supplying further sediment laden water.

Figure 26. Large area of ochreous discharge that is very likely draining the old mine workings further up the hill.

Figure 27. Boggy, poached area in field creating a sediment source.

Figure 28. Natural spring and boggy area creating a sediment source.

Approximately 1km downstream of the bridge the valley opens up and the character of the river changes. With high flows able to spill onto the floodplain a greater portion of finer substrate is retained and gravel bars and riffles are again present (Fig. 29).

While the substrate is relatively mobile and of a suitable size for salmonid spawning it is significantly compromised by a high fine sediment content. This greatly reduces its attraction for spawning salmonids and will significantly lower the survival rate of any eggs deposited within it. The issue is further exacerbated by increased livestock access from this area onwards, downstream. Horse access to both banks, apparently via the LB, and associated heavy grazing is inhibiting anything but a sparse covering of grass from becoming established and significantly contributing to bank erosion (Fig. 30). In the same field there is also a very poorly located outfall that is likely to result in erosion and may also be supplying silt laden water to the river (Fig. 31).

Figure 29. Wider, shallower channel downstream of the high banked, incised section. Gravels are present in this area but are significantly compromised by high sediment loading.


Figure 30. Significant bank erosion, primarily due to horse grazing.

Figure 31. Poorly located outfall.

On the right bank, where another field drain discharges to the river, grazing and poaching result in another sediment input to the river (Fig. 32). The presence of good marginal cover and in-channel structure provided by trees does, however, provide some aspects of good adult trout (*Salmo trutta*) habitat (Figs. 32 & 33).

Further downstream, discoloured water and foam associated with a flap valve outfall suggest another potential pollution source (Fig. 34), although the exact content and therefore impact could not be ascertained.

Excessive grazing remains a problem for the remainder of the river section walked, with an obvious impact on not only the pasture land but also the bankside trees, as evident by the heavily browsed willow branches (Fig. 35). Aside from the grazing issues and sedimentation, the actual river morphology through most of this section is of a relatively high quality, with pools, riffles and meanders (Fig. 36). However, the hydromorphology of the lower 350m is significantly impacted by realignment to a significantly straightened course (Figs. 37 & 38) and by being constrained within a geotextile lined and rock armoured channel.

One more outfall enters the river through this straightened section and as with the others upstream, supplies sediment laden water (Fig. 39). Owing to the location of the outfall, alongside the A68, the outfall may be from a road drain.

Figure 32. Field drain sediment source in an area with good in-channel structure. The bed is, however, smothered with a significant sediment burden.

Figure 33. High quality pool and in-channel structure habitat in an otherwise degraded river section.

Figure 34. Potential pollution and likely sediment source.

Figure 35. Evidence of heavy grazing pressure, with horses having to resort to browsing the willows.

Figure 36. Area of relatively natural channel morphology, but still compromised by grazing/erosion.

Figure 37. Signs of the past channel realignment, with the geotextile channel lining evident on both banks.

Figure 38. Straight uniform, armoured channel with little habitat diversity and coarse substrate.

Figure 39. The farthest downstream outfall, which delivers yet more sediment to the Gaunless.

4.0 Recommendations

4.1.1 Fish passage improvement (NGR: NZ 18127 26452)

Ideally, the weir in West Auckland should be removed, to reinstate connectivity for fish passage and sediment transport through the river, however, some local residents are against removal as it once supplied a mill. This should not necessarily be a deterrent as often with discussion and explanation of the issues posed by a weir, stakeholders can be convinced that removal is the appropriate option.

If further determined negotiations for removal of the weir are not successful, a rock-ramp easement could be employed to *aid* fish migration. This could be installed on the downstream side of the weir, or at either side as a bypass channel. It must be conceded, however, that an easement will not fully mitigate the weir’s impact and an ongoing maintenance issue of the weir and easement will remain.

Fish passes and easements are great fishery management tools, but are too often employed on structures requiring removal. Removal is always the best option from an ecological and cost perspective.

4.1.2 Tree management

Hinging/laying of trees (particularly willow) along the length of the river would be beneficial to increase low cover. The method involves cutting part way through the stem/trunks which allows them to be laid into the channel (Figures 40 & 41), in the same way a hawthorn hedge is laid. This is a quick and easy method which replicates the naturally occurring habitat shown in Figure 8. Where tree canopies are well above the water level (over 1m), sporadic coppicing can also be undertaken to encourage low level re-growth. Where possible, any existing low cover should also be retained during the process.

Consideration should be given to the exact location and of the tree management, as the river has historic flooding issues; however, the presence of Spring Gardens Dam and Hydro Brake upstream significantly attenuates peak flows and greatly mitigates the already small risk of strategically placed structures.

Figure 40. Hinged willow.

Figure 41. Hinged hazel.

Planting of trees along the river margins would be beneficial along many areas of the watercourse, both through formal tree planting and by driving 400-600mm willow whips into any areas of damp bank, leaving c. 1/3 protruding.

Willow can also be employed effectively to stabilise areas of eroding bank (eventually achieving a similar effect to that shown in Figure 14). This is achieved by driving whips into the ground at 400-800mm spacing throughout areas of unstable bank. Areas that could particularly benefit from this treatment include the eroding bank face in Figure 18, and other locations around that area.

Location	**Action**			**NGR**
	Hinging	Coppicing	Planting whips	
West Auckland (Figs. 4 & 5)	LB	LB		NZ 18323 26622 & NZ1843126608
West Auckland		LB		NZ 18528 26547

(Fig. 7)				
Fields downstream of West Auckland (Fig. 14)	RB			NZ 19074 26381
Downstream of A688 (Fig. 16)	LB			NZ1928626365
High eroding bank near failed fencing (Fig 18)			Both banks	NZ 19408 26201
Downstream of A6072 (Fig. 23)	LB	LB		NZ 20531 26798

N.B. - The success of any tree planting is likely to be highly dependent upon the presence of fencing to protect the trees/shrubs from livestock.

4.1.3 Fencing

One of the surest ways to improve riparian and in-channel habitat along most reaches is to exclude livestock from the river bank to allow the establishment of trees, shrubs and herbaceous vegetation. This will enhance habitat by providing cover and structure, while also stabilising the river banks and greatly reducing erosion rates. In some areas previously installed fencing also needs to be repaired to prevent livestock access to the riverbank.

Location	**Action**		**NGR**	
	Installation	Repair	U/S	D/S
D/S St Helen Auckland (Fig. 10)	Most of both Banks	LB at D/S limit	NZ 18782 26482	NZ 19204 26371
D/S A688 (Fig. 17)		LB	NZ1936826272	NZ1936826272
Water gates and fence (Figs. 18 & 19)		Both banks	NZ 19408 26201	NZ 19506 26208
(Fig. 20)	Exclude livestock from area of boggy ground		NZ 19463 26129	
(Fig. 22) Section not walked	Both banks		NZ 19639 26208	NZ 20445 26835

Second field D/S A6070 Road bridge (Figs. 27 & 28)	RB	RB	NZ 20784 26779	NZ 20939 27305
Area around (Figs. 30 & 31)	LB	RB	NZ 20762 27290	NZ 20842 27354
(Figs. 32, 35 & 36)	Both banks for the lower 2km	RB Top section	NZ 20939 27305	NZ 21032 27832
As described in the assessment, it may also be beneficial to remove the concrete fence (Fig. 6) and promote the river as an asset to the local residents, rather than the degraded feature it historically represents and that has to be shielded from sight.				

4.1.4 Brash Revetment

In areas where fencing has been undertaken and where bank erosion is a particular issue wired brash revetment could also be installed to help protect the bank while it becomes vegetated (This method works very well in conjunction with planting of willow whips). The method involves the creation of a brash mattress, over-wired and secured with posts (see Figs. 42 & 43) which acts as a diffuse barrier to flows, protecting the bank and increasing deposition of fine sediment which then assists the colonisation of vegetation. This method would be ideally suited to the area of erosion in Figure 18. In deeper areas, larger overlapping brash/tree kickers along the bank toe can help.

Figure 42. Mixed, freshly cut brash mattress.

Figure 43. Christmas tree brash mattress with the posts and wire fixings clearly visible.

5.0 Acknowledgement

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

6.0 Disclaimer