Pont and Blyth Investigation

River Blyth – from Hartford Bridge to Tidal Limit

(Waterbody ID - GB103022077050)

Date – 01/03/12

1.0 Introduction

This report is the output of a site visit undertaken by Gareth Pedley of the Wild Trout Trust to the River on 23 February 2012. Comments in this report are based on observations on the day of the site visit.

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.

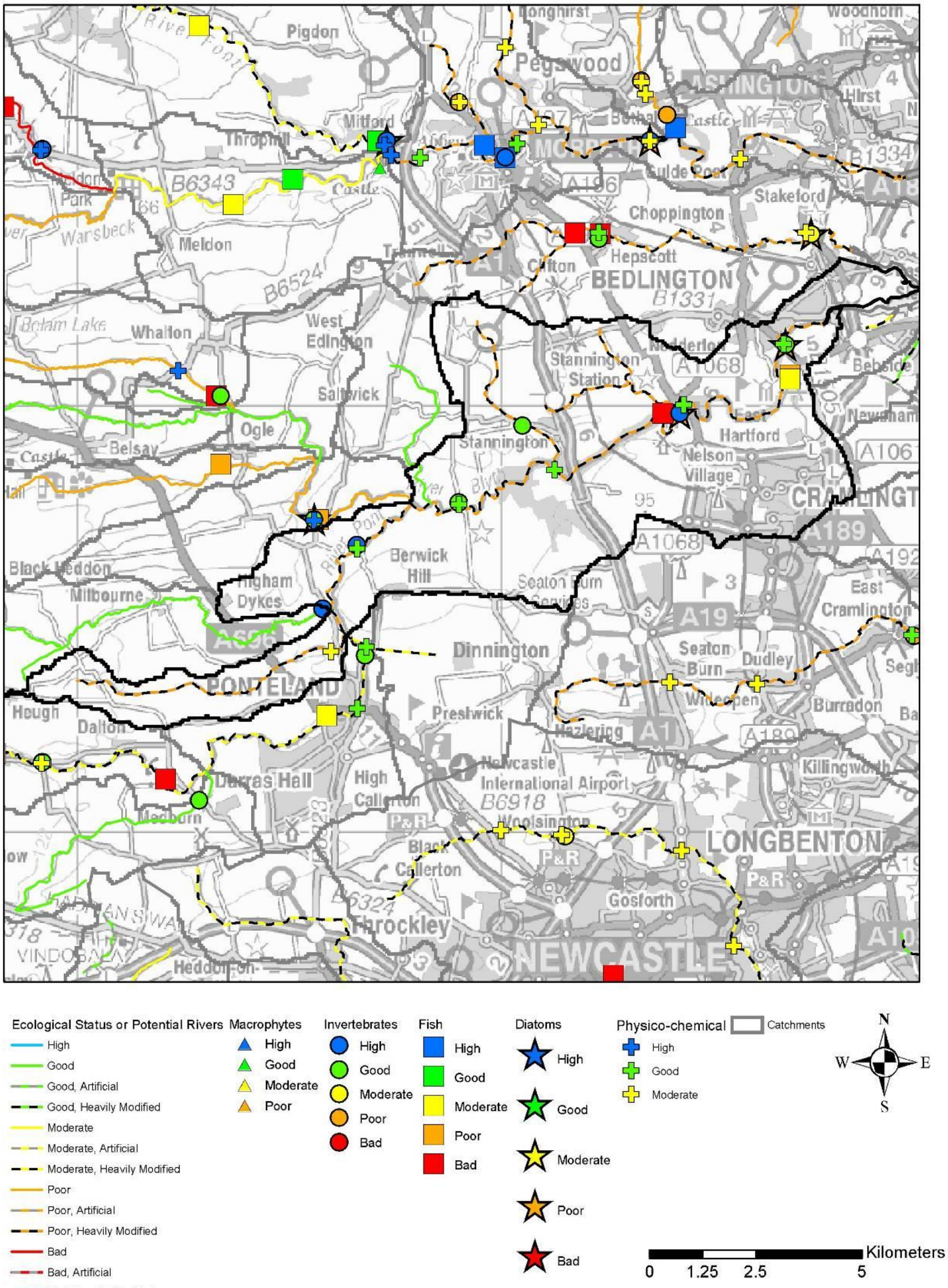
The walkover assessment was undertaken from Hartford Bridge (NZ2427779989), following the course of the river downstream to the tidal limit at Furnace Bridge, Bebside (NZ2766882052).

The waterbody has been assessed as poor for fish under the Water Framework Directive (WFD) classification which suggests that less fish are present than would be expected. The waterbody is also classed as heavily modified.

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.

A map showing the extent of the waterbody and brief detail on its WFD designation can be found on the next page.

Ecological Status or Potential for GB103022077050



2.0 Habitat Assessment

The first 100m downstream of Hartford Bridge is notably impounded by the Hartford Gauging Weir, which also creates a significant obstruction to fish passage through the river system (Picture 1). Although only around 1m high, the steep c.45^{o} angle, sheer face, and lack of water depth over and below the weir, make it impassable to most (if not all) fish in low to medium flows.

It is known that larger migratory salmonids can ascend the weir during high flows, but the structure poses a major behavioural barrier, only passable in specific flow conditions. The weir is also likely to be a significant obstacle to brown trout (*Salmo trutta*), grayling (*Thymallus thymallus*), eel (*Anguilla anguilla*), lamprey (*Lampetra fluvitalis and L. planeri*) and minor species.

Picture 1. Hartford Gauging Weir, a significant obstacle for fish passage on the river.

An important consideration with weirs of this nature is their impact on resident fish, inhibiting their exploitation of the various habitats required throughout their lifecycle. This is a major issue on many rivers, but on a river such as the Blyth, with other anthropogenic habitat degradation, the issue has increased significance. If this weir is no longer used for gauging, full removal should be considered, or alternative methods for flow gauging explored. If this is not possible, a fish pass is essential.

Downstream of the weir habitat quality improves significantly for salmonids, but there is a notable lack of fine and medium gravel substrate. Bed composition is dominated by bedrock and cobbles for the first c.1500m downstream, with numerous riffles, glides and small pools within fissures in low lying areas of the rock. This is similar to the reach upstream of Hartford Bridge, but with areas of significantly narrower channel throughout the reach (6-9m wide), which create more dynamic flow and greater velocities (Picture 2). From c.500m downstream wider pools of c.10-15m also occur.

Picture 2. Diverse flow within a narrow channel, which creates good quality salmonid habitat. Note the retention of some mobile substrate to the left of shot, downstream of the LWD, in an otherwise smooth bedrock channel.

The bedrock and cobbles provide good habitat for most stages of the salmonid lifecycle, with some sheltered margins for fry amongst cobbles.

Good habitat for larger fry and parr was present in amongst the larger cobbles and boulders found in the faster riffles. Some longer, deeper pools were present, but due to the immovable nature of the bed they were limited in number. There were however, sufficient pockets of deeper water between bedrock outcrops to provide holding habitat for larger fish.

There was little in the way of salmonid spawning substrate, although coarser gravels and cobbles do accumulate towards the tail of some pools. Due to the rocky bed and dynamic channel, much of the gravel and finer substrate is likely to be washed through in higher flows as there are few features to retain it.

As with the upstream section, if the amount of LWD and trailing marginal trees could be increased there would be a much greater potential for retention of transient gravel throughout the reach. The increased structure along the margins would shelter areas from peak flows, where gravels and finer sediments could accumulate, in addition to the aerial cover they provide. Gravel retained would then have the potential for providing at least some spawning habitat within the reach, which is currently in very short supply. This same process is also likely to be the best method for creating varied channel width, and therefore increased habitat diversity.

As in other sections, there appears to have been a culture of removing LWD and marginal tree branches, which is assumed to an attempt to reduce flood risk, and/or possibly over zealous pruning by anglers. Most of the work appeared to have been undertaken some time ago, but there were signs of more recent pruning and removal of LWD around the houses at NZ2469879667, although the location of the properties did not appear to render them at risk from flooding.

It is suggested that an increase of structure within the channel is promoted, where there is a minimal impact on flood risk. There is not likely to be a particularly high risk within this section, due to the nature of the valley and remoteness to any infrastructure.

It is recommended that living trees and shrubs be retained, as they are naturally anchored in situ. Simple natural methods could also be employed to retain larger material and LWD in place, as seen in picture 3, where a tree has fallen into the River and the tip branches are creating excellent structure within a deeper pool. As the majority of the tree is on the bank and braced against other trees it should be retained in place by the force of water acting on the fallen limb, which will pin it against the upright trees. Although this example is promoting structure and flow within a pool, replication of this scenario in shallower areas could be employed to retain gravels and promote retention of spawning substrate. In areas where the flood risk is greater, trees and branches could be retained with steel cable, and/or posts, or live trees of a suitable species (willow, hazel etc) could be hinged.

Picture 3. Fallen tree, being retained in place against other trees. The LWD created is restricting the channel, increasing flow diversity and providing structure within the pool that will vastly increase fish holding capacity.

Without the additional cover provided by the fallen tree in picture 3 the habitat would be of significantly lower quality as the wide slow nature of the pool provides limited cover or flow diversity. The tree branches provide some increased flow diversity, cover and shelter for fish and invertebrates to inhabit.

Downstream of the houses on the LB were two outfalls discharging to the river (upper NZ2477479647, and lower NZ2485279850). The upper of these appeared to be discharging a high level of nutrients, and although the volume was not high at the time of the visit, this should be investigated, as there was a notable odour and accumulation of sewage fungus (Picture 4).

Picture 4. High nutrient discharge at NZ2477479647.

Further downstream a cluster of salmonid redds were observed (Picture 5). The area was not typically that of a salmonid spawning site, but the absence of suitable substrate appears to have necessitated utilisation of any suitable sized substrate. Unfortunately, the location means that some redds were already becoming exposed by receding water levels and their production is likely to be lost. This again highlights the importance of retaining gravel within the wetted channel if successful recruitment is to occur.

The habitat in this area was generally good, aside from the continued absence of low level aerial cover from bank-side trees, which has left the pools very open in many areas (Picture 6).

Picture 5. Salmonid spawning redds in the river margin, becoming exposed by receding water levels.

Picture 6. Conspicuous lack of low level branch cover, typical of much of the first 1000m of this section.

Towards the lower end of the bedrock reach, low level tree and shrub cover increased, primarily through an increase in the number of willow (*Salix sp.*) and hazel (*Corylus avellana*) and alder (*Alnus glutinosa*) trees/shrubs. This is possibly due in part to the opening of the valley on the RB allowing more light penetration. These species may have been somewhat inhibited by the more densely wooded nature of the valley further upstream, which is shaded by mature ash (*Fraxinus excelsior*) and sycamore (*Acer pseudoplantus*).

It appeared that little or no pruning of these trees has recently occurred, suggesting that much of the tree pruning may have been undertaken a long time ago and recent growth has been left unmanaged. It is advised that pruning of the low branches is avoided in all reaches, but coppicing of the occasional tree to encourage low level re-growth would be beneficial; as would hinging and training some of the branches down into the water.

c.1600m below Hartford Bridge the exposed bedrock becomes a less significant feature of the bed, and although still present in areas and influencing the bed topography, a notable increase in the amount of mobile (gravel and cobble) substrate occurs. This has facilitated the growth of some water crowfoot (*Ranunculus sp.*) beds, which provide another vital habitat feature.

Weed beds not only provide cover for both juvenile and adult salmonids, but numerous invertebrate species, notably the blue winged olive (*Serratella ignita*). Water crowfoot is also beneficial in increasing water velocity during periods of low flow, by restricting the channel volume.

In this area the first significant gravel beds were encountered, which hosted an abundance of salmonid redds. Most of these were large, but were possibly created by resident trout. This again demonstrates the significant lack of suitable spawning areas, with large numbers of fish forced to utilise the same area. This can lead to over-cutting of redds and sub-optimal recruitment. There were some areas of reasonable quality fry and parr habitat close-by, so some successful juvenile production is to be expected.

At a point approximately 2km downstream of Hartford Bridge the river character changed again, to a slow, straight channel, incised within its banks. It appears that the river has been realigned and dredged (Picture 7) for much of the 1km length down to Humford Weir (Picture 9, NZ2613079746). Old relict river channels were observed on either side of the river, perched above the current channel (Picture 8). The poor habitat present on this section is compromised further by the impounding nature of the weir. (It is possible that some of the channel upstream, in the reach already discussed, has also been realigned, as it is very straight, but the bedrock has restricted the extent of incision and makes it hard to ascertain)

Picture 7. Deeply incised channel with virtually no flow, typical of the reach above Humford.

Picture 8. An obvious relic river channel, set back from the current river course.

The habitat within the impounded reach is of very poor quality for salmonids, being better suited to coarse fish, due to the significant depth and lack of flow. Marginal tree cover and LWD in this reach was some of the most extensive observed on the Blyth, but even where most of the channel was obstructed by a large debris dam, little flow velocity was created. The level of impoundment from the weir means that, unless it is removed, the whole length affected by the impoundment will always remain unsuitable for salmonids, with natural recovery of the reach impossible.

Picture 9. Humford Weir poses a significant barrier to fish passage and is a major impoundment to the River for up to 1km upstream.

Humford Weir poses a significant barrier to all fish species present in the River Blyth, and although large migratory salmonids can ascend the Weir in certain flows, the specification of the pass is well outside the Environment Agency’s Fish Pass Manual V 2.0 guidelines.

On the day of the visit the entrance to the pass was at least 60cm from the river level, making the jump required well above the advisory maximum of 30-45cm for migratory and non migratory trout, pool traverse passes. This would remain the case, even with a significant raise in tail-water level. Two of the traverses between pools within the pass are also greater than 50cm, and as tail-water level is likely to rise more rapidly than head-water, this is likely to create a further obstruction for any fish that can enter the pass.

The dimensions of the pass are further outside the capabilities of juvenile trout, grayling and minor species, for which the weir and pass are a complete barrier in almost all flows.

For this reason it is strongly advised that the removal of Humford Weir is fully investigated. Little of the original structure appears to remain and most of the current weir comprises concrete. So, with no infrastructure upstream to be compromised by resultant channel re-grading, removal represents the obvious option. Investigation will be required to identify if any scheduling or listing exists for the structure, to ascertain whether removal is possible, but in the absence of such restrictions the weir should be removed, or at the very least lowered, or notched.

If removal is not possible there is a route that could be created through the concrete wall on the LB that is the full depth of the weir at that point. Some bank re-enforcement, or a managed retreat and some realignment of the footpath might be necessary.

The issue for fish passage was further demonstrated within the first 100m downstream of the weir, where a vast array of different sized salmonid spawning redds were observed on the first suitable sized gravel (Picture 10). Most of the 13 obvious redds were that of large salmonids, but the five smaller redds were smaller, possibly those of smaller, resident trout.

The accumulation of gravels that supports the spawning area can be primarily attributed to two features within the channel; first, the presence of an old bridge footing towards the centre of the channel; and second, the presence of LWD on the LB at the head of the pool upstream, which will have reduced peak flows down the LB side.

Although this is one of the two most significant areas for spawning on the Blyth, and likely to support some natural recruitment, it is vital to understand the negative impact of Humford Weir in restricting such a large proportion of the River's natural production to the bottom 4km of the river system. Although significant areas of habitat upstream are of poor quality, allowing recruitment to be more naturally spread over other suitable areas of the catchment would potentially lead to better production through reduced competition and better habitat utilisation.

The shallow riffled areas below the weir were the first place for a considerable distance that supports water crowfoot beds, which became a regular feature within the channel wherever flows and substrate were suitable.


Picture 10. One of the two most significant spawning area on the main River Blyth. The lighter patches are gravel that has been displaced by salmonids in the process of creating redds.

Between Humford Weir and Humford Stepping Stones the River increases in width to between 12m and 17m wide. Some longer pools were present within this reach, where again, the habitat quality becomes reliant upon LWD and trees to provide cover and flow diversity. This was perfectly demonstrated by one of only two fish seen rising all day, inhabiting a lie directly behind an accumulation of LWD (Picture 11).

At Humford Stepping Stones the second significant spawning area was observed, directly upstream of the crossing, with further redds on the riffle upstream. The gravel aggregation on which the spawning has occurred can be mostly attributed to the presence of stepping stones, which are acting in a similar way to that described with LWD, by creating areas of both slack and faster water (Picture 12).

Picture 11. LWD within the channel creating a trout lie in what would have otherwise been a sluggish featureless channel. The trout's rise form can be seen slightly above, centre of the shot.


Picture 12. Area of spawning upstream of Humford Stepping Stones.

Downstream of the stepping stones the gradient increases, creating a narrower channel with a similar character to that below Hartford Gauging Weir. The channel reduces in width (6-8m), and becomes shallower, with a predominantly coarse cobble and boulder substrate (Picture 13). Approximately 400m downstream of the stepping stones the river becomes straight and incised and appears to have been realigned. Habitat within the reach has not unduly suffered, but a relic channel can be seen, perched on the RB, suggesting that the river would originally have cut across the bend. Ground level data also supports this hypothesis.

Throughout the lower reach to the tidal limit, the varied and natural character again provides ideal habitat for all stages of the salmonid lifecycle, barring spawning, which is provided to some extent, in the reach above. Some small areas of gravel were observed, but none appeared extensive enough to have supported significant spawning.


Picture 13. Habitat typical of the lower reach (Humford Stepping Stones – Tidal Limit).

Some areas of fine gravel, suitable for grayling spawning are thought to be present, as grayling have been recorded within the reach for many years, but they are in notably short supply. The two main spawning areas already highlighted may support some grayling production, but are unlikely to be sufficient. This would suggest that areas of the catchment above Humford Weir may also be contributing, making the population heavily reliant, on downstream migration and again highlights the impassability issue at Humford Weir, which prevents exploitation of spawning habitat upstream.

Cover from both trees and LWD was significantly greater than in any other reach, with extensive willow and hazel growth along the margins. These create some structure within the channel, but also provide ideal low level cover over the channel when in leaf. It is vital that these features are retained to protect the value of the habitat and although extensive, an increase of this type of cover, and LWD (particularly in-channel, rather than marginal) would further improve the habitat.

3.0 Recommendations

The section from Hartford to the tidal limit is subject to less physical channel modification than those found upstream. Even where modifications have occurred, they have been mitigated by the underlying bedrock.

The two primary issues are Hartford Gauging Weir (NZ2435880050) and Humford Weir (NZ2613579746). Consideration of the possibility for removal of both of these structures is strongly recommended. The potential restrictions are likely to be, scheduling, or listings on Humford Weir and the potential requirement for gauging at the Hartford site. It may be possible that more advanced, modern gauging techniques with a reduced impact on the channel could be employed for gauging at the Hartford.

The other major issue within the section is the management of trees and logs within the channel (LWD) and tree pruning. If these vital natural habitat features can be retained, and where possible increased, the fish and invertebrate carrying capacity of the section is likely to be increased.

Investigation should also be made into the potential pollution from the outfall entering the river at NZ2477479647.

4.0 Disclaimer

This report is produced for guidance only and should not be used as a substitute for full professional advice. 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.