Walkover Assessment

River Wear – Frosterley Angling Club

July 2014

Contents

1.0 Introduction

This report is the output of a site visit undertaken by Gareth Pedley of the Wild Trout Trust to Frosterley Angling Club waters on the River Wear 15th July 2014. Comments in this report are based on observations on the day of the site visit and discussions with Peter Elsbury (Frosterley Angling Club).

Frosterley AC is a long-established club (99 years old) which controls fishing on the River Wear from an upstream limit near the Kielder transfer. The section visited, however, extends from a point c.200m upstream (u/s) of the road bridge to Bridge End (NZ 02102 36848), downstream (d/s) to the lower limit Nr. Kingfisher Caravan Park (NZ 04822 36838).

The club consists of 18 local adult members and 8 juniors, with additional members from outside the area. Members predominantly fish for migratory salmonids, although some also fish for resident brown trout. Club rules allow fly, trotted worm or spinning, although spinning is not permitted before the 1st July, and not in low water conditions. A bag limit of 2 fish per day >250mm (10”) can be taken and as the club has not stocked the river in the last 15 years (it is stocked at Stanhope upstream), the majority of any fish taken are likely to be wild.

In addition to the river fishery, a catch and release stillwater fishery is also operated at Harehope Quarry. This is stocked to maintain numbers, although it is suspected that some brown trout from the adjacent Bollihope Burn are likely to have found their way in during historic flood events.

The aims of the visit and this report are to:

- assess habitat within the identified sections
- identify priority areas for in-stream habitat improvements;
- provide sufficient details to support a Flood Defence Consent application to the Environment Agency
- produce an approximate bill of quantities for the proposed works.

2.0 **Upper Section –** Upstream of Bridge End Road Bridge (NZ 02102 36848)

The first area visited is a relatively wide, open reach of river with an abundance of juvenile salmonid habitat provided by shallow glides and riffles (Fig. 1). The coarse gravel and cobble substrate also provides potential spawning habitat for larger sea trout and salmon. Overhanging trees on the RB provide valuable low-level cover, and overhanging and trailing willows (*Salix* spp.) on the left bank (LB; defined when looking downstream) provide cover and shelter for fry from high flows and predators.

Figure 1. Aerial cover on the RB (left of shot) and trailing willow in the RB margin (right of shot)

Active hydrogeomorphology and substrate supply in this wide section of river has led to the formation of large gravel and cobble bars (Fig. 2 & 3). This process occurs as the channel naturally adapts its capacity to the flows it receives, depositing material in the lower velocity. The narrowing effect created by deposited materials then helps to maintain deeper channels and pools that will form the low flow, summer channel (Fig. 2).

In the absence of trees and herbaceous vegetation, the right bank (RB) face is suffering from excessive erosion (Fig 2 & 3). The high proportion of grass along the bank suggests a history of grazing, which reduces plant species diversity and the extent of root structure it contains, increasing bank erosion. A seam of bedrock along the bank toe (Fig. 2) has assisted in stabilising the bank by holding some slumped bank material in place long enough to re-vegetate. The lack of trees and shrubs along the bank face mean that it remains at risk from erosion. The area in Figure 3 is also unstable and, without attempts to stabilise it, the bank is likely to continue to erode; widening the channel and potentially leading to shallowing. This is an important consideration as pool formation is often reliant upon stable banks forcing scouring flows into the bed to create depth, rather than laterally into the bank and increasing channel width.

The fact that the LB is now fenced should assist its recovery, allowing regeneration of trees and vegetation, but at present there remains a lack of trees on upper bank. This leaves a lack of cover and root structure within the lower bank.

Figure 2. Low flow channel (background) created by gravel and cobble deposition (foreground). The

area of bare bank face (background) also shows how material has slumped and is now sitting on a bedrock shelf, where it has begun to re-vegetate

Figure 3. Large gravel deposition (foreground) and unstable, eroding RB (background)

3.0 **Middle Section–** Old pumping station (NZ 03311 36763) to concrete ford (NZ 03536 36877)

The large eroding area of the RB upstream of the old pumping station (Fig. 4) may be attributable to removal of a weir at this location. This will have lowered the bed and water level as material stored upstream is liberated on subsequent high flows, destabilising the un-vegetated bank. Leverage created by the weight of mature trees (now washed out) above the destabilised bank will have eventually caused them to slump into the channel. A current lack of tree root protection within in the bank is allowing further erosion and slumping of materials, and contributing to shallowing of the pool. Erosion immediately downstream is also likely attributable to the weir, as a legacy of the limited sediment supply from upstream while the weir was in situ. Bankside trees are still present here (Fig. 5) but significantly undercut and susceptible to slumping which will further destabilise the bank. Back-eddying created by the remnant concrete wing-walls will also be increasing erosion.

Figure 4. Destabilised bank and erosion upstream of the old pumping station

Figure 5. Undercut bank, probably a result of reduced sediment supply while the weir was in situ and back eddying d/s of the concrete wing-wall

Downstream, bedrock protects the bankline and has forced bed scour to create and maintain a deep pool along the toe of the bank (Fig. 6). In contrast to the juvenile habitat provided by the many shallower riffle and glides, these natural deeper areas provide a vital holding habitat for adult fish, both resident and migratory. There is a lack of aerial cover in this area so pruning of any overhanging branches should be avoided to retain cover.

Figure 6. Deeper pool area along a bedrock cliff (background) with shallow juvenile habitat (foreground)

Where a concrete ford crosses the river downstream it poses an obstacle to the free transport of bed materials, and for fish passage. While the structure is small, the vertical step from shallow water, and shallowing effect of spreading river flows across the full width of the ford, make it an obstacle that will inhibit fish movements, especially in low water conditions. Any delay to fish movements is likely to increase stress levels and place them at increased risk of predation. The fixed bed level across the full channel width is also likely to be limiting bed scour upstream and leading to sediment from upstream in-filling and shallowing the pool.

Figure 7. Concrete ford that poses an issue to fish movement and sediment transport

4.0 **Lower section –** D/S of concrete ford (NZ 03536 36877) to Caravan Park (NZ 04822 36838)

Downstream of the ford another bedrock pool provides excellent deep-water adult trout habitat, and is further enhanced by the presence of a trailing willow shrub on the LB (Fig. 8). This not only adds to flow disturbance in the pool (promoting greater physical diversity and associated benefits to flora and fauna) but also provides valuable shade, cover and structure in which fish can shelter and evade predators. The shrub is also a valuable source of terrestrial invertebrates and a great refuge for emerging aquatic insect species.

Figure 8. Excellent pool habitat, enhanced by overhanging/trailing willow

On the LB, livestock access is leading to increased bank erosion. While stock density appears to be extremely low, the physical damage of the cattle climbing in and out of the channel is denuding the bank of vegetation and causing areas to slump (Fig. 9). This leaves open, bare sections of bank that are placed at greatly increased risk of erosion in high flows, especially on the sandy, friable soils present.

Figure 9. Even low density grazing can be a cause of increased bank erosion

On the LB downstream, bankside willows provide a potential source of woody debris to the channel. The larger species, such as crack willow (*Salix fragilis*) are likely to collapse into the channel under their own weight over time Fig. 10; they will then provide valuable flow disruption, cover and shelter within the channel. Smaller shrub species also enhance the river margins through increased low cover and structure, and having a denser structure, they slow marginal flow velocities, creating refuge areas and increasing marginal sediment deposition (Fig. 11). This not only helps to store materials but also allows the river to adapt its width to the flows it receives and facilitates channel narrowing where required. This in turn maintains a channel width that creates scouring of the bed to maintain pool depth.

Figure 10. Tail of a pool where LB willows provide a source of woody debris and cover

Figure 11. Dense marginal vegetation provided by the willows provide valuable cover, shelter, flow disruption, and facilitate sediment deposition, helping to maintain channel widths

Juvenile habitat is abundant throughout Frosterley AC waters, providing good on-growing areas for all salmonid fry and parr (Fig. 12). While these areas are unlikely to hold many adult trout, particularly in low flows, they are vital to the health of fish stocks through juvenile production. Trailing and low-level cover was in relatively short supply in many such areas, predominantly due to the wide cobbly nature of the channel and margins, but would be a valuable addition if marginal trees could be encouraged over the channel.

Figure 12. Good juvenile habitat where a greater level low-level and trailing cover would be beneficial

Moving downstream, the lack of low-level and trailing cover along the bank continues, probably a consequence of past tree maintenance (Fig. 13). Some willow shrubs are colonising the LB (right of shot), which, in time, should enhance the shallower margin area for fry; however, the deeper water along the RB (right of shot) is significantly lacking in any low cover which greatly decreases its carrying capacity, especially for larger fish.

Figure 13. A notable lack of low-level and trailing cover along the RB (left of shot)

At the very downstream end of the section walked a long, deep pool provides more good adult holding habitat, but again, has a lack of low-level and trailing cover (Fig. 14). It is likely that some low branches will be broken from the tree trunks during high flows, particularly from brittle sycamores (*Acer pseudoplatanus*), but the pronounced lack of such branches suggests a history of pruning and maintenance.

Figure 14. Good quality adult holding habitat, again lacking in low cover

5.0 Recommendations

5.1 Tree management

5.1.1 Planting trees

Willow planting would be beneficial in all areas where low-level tree cover is lacking along the bank line, to increase low level and trailing cover. The cheapest and most effective method to plant willow is by pushing short sections of willow (cut from willow whips/branches of a living tree/shrub) into the ground around the water line and in areas where bank stabilisation is required. The greatest success will be achieved in damp areas where the shrubs will get plenty of water. This work can be undertaken at any time of the year, but will have the greatest success if undertaken within the dormant season, ideally late Jan-early March shortly before spring growth (can be done Nov-March).

The technique is to drive 400-600mm (c.16-24”) sections of willow into soft, wet earth/sediment, leaving only 1/3 of the whip protruding from the ground to minimise the distance that water has to be transported up the stem. Any diameter of branch can be used for this but 10-30mm (1/2 - 1”) is ideal.

It is preferable to source willow locally, from adjacent areas of the bank. This ensures that it is suited to the conditions and helps to avoid potential issues with transportation of non-native species. Both crack willow and osier willow are present locally on the riverbanks and each can be used to good effect, but the smaller shrub varieties such as sallow/goat willow (*Salix caprea*) are usually the best for these habitat enhancements as they remain small and low to the water and require less maintenance.

- Planting would be particularly beneficial in areas with bank stability issues:
    - RB upstream of Bridge End (Fig. 2 & 3: NGR - NZ 02185 36826), throughout the unstable areas
    - RB upstream of old pumping station (Fig. 4: NGR - NZ 0331936744) along the unstable bank face
    - LB downstream of existing willows in sandy deposition (Fig. 11: NGR - NZ 0378836890)
    - RB, around the Kingfisher caravan park (Fig. 13: NGR - NZ 04452 36856) – this treatment would be even more beneficial if undertaken in conjunction with some coppicing to let light in

5.1.2 Laying trees

Where trees are already established along the bank side, significant habitat improvements can be attained by laying some of the branches/trunks down into the watercourse to increase low cover and structure within the channel. This method is generally limited to species that can be easily manipulated without snapping (e.g. willow, elm, hazel, hawthorn and small alder). For this reason, small to medium shrubs tend to work best, although large willow can be successfully laid.

The process involves gradually cutting part way through the trunk until it can be forced over into the channel (Figure 15). The depth of the cut should be limited to only that which is required to bend the limb over, thereby retaining a substantial hinge to provide maximum strength and health of the tree. This treatment can also be undertaken on any planted willows, once they have reached a suitable size.

Figure 15. Hinged willow

- Laying would be particularly beneficial on the LB, laying one or several of the large leaning willow trees (Fig. 9: NGR - NZ 0378836890). They could be laid along the riverside of the smaller willow shrubs to increase the low cover extending out into the channel and provide valuable flow disruption.
- Similar treatment would be beneficial on the larger willows on the LB in Figure 13 (NZ 0378836890) (back right of shot).

5.1.3 Coppicing trees

Coppicing of bankside trees, particularly where the lower branches have been lost through past maintenance is highly beneficial to promote lower level regrowth (16 a & b). These pictures of work on the River Dane, Cheshire show how low-level regrowth cab be promoted. Better effect would, however have been gained if the coppicing were undertaken on a rotation, only coppicing one in every 3-4 trees per year to maintain height diversity.

- This treatment would be beneficial on the perched sycamores around the old pumping station (Fig. 5: NGR - NZ 03346 36749) to relieve pressure from the undercut bank and reduce the chance of the bank collapsing.

- Coppicing should also be undertaken along any areas where the tree canopy has been lifted by past pruning and maintenance, but would be particularly beneficial along the Kingfisher Caravan Park section (Fig. 13: NGR - NZ 0378836890).


a

b

Figure: 16 (a) Shortly after coppicing and (b) a few years after coppicing (picture courtesy of the Environment Agency)

5.2 Brash bank protection

Brash revetment works by increasing roughness in the channel and dissipating flow energy in the area, reducing scour and, often, increasing deposition via materials falling out of suspension from the water column where flows are slowed.

- Once the weight has been taken out of the perched sycamores near the old pumping station by coppicing (Fig. 5: NGR - NZ 03346 36749), it may also be worth installing some brash bank protection into the undercut

5.3 Ford removal

- It is recommended that the concrete ford (Fig. 7: NGR - NZ 03536 36876) between the two bridges, downstream of the pumping station is removed. It is currently acting as sediment trap and raising the bed level in the pool upstream. The structure is also an obstruction to fish migration (particularly juveniles), hampering progress of fish, placing them at greater susceptibility to predators and preventing optimal habitat utilisation.

5.4 Buffer fencing

Buffer fencing prevents physical damage to riverbanks by livestock and promotes a diverse mix of vegetation to become established. A diverse variety root and foliage structures is vital to provide maximum bank protection. Stock exclusion also reduces soil compaction and allows greater infiltration of water, reducing runoff and nutrient input to the river.

- Buffer fencing would be highly beneficial in reducing the rate of erosion along the cattle-grazed field upstream of the Kingfisher Caravan Park (Figs. 8, 9 and 10: NGR - NZ 0378836890).

5.5 Treat Japanese knotweed

- Japanese knotweed should be treated wherever present along the river, as it is a highly invasive and detrimental species.
- Stands were noted alongside the old pumping station (LB) (NGR - NZ 03330 36775) and along the railway upstream of Bridge End road bridge.

It should be noted that the only effective method to treat knotweed is with herbicide (the use of which requires consent near a watercourse). Other methods such as cutting, pulling or strimming should not be attempted, as the plant is actively spread and can re-establish from even small fragments.

5.6 Harelaw Bridge Footings

A short distance downstream of Frosterley AC waters is a significant barrier to fish migration caused by Harelaw Bridge footings (Figs. 17 & 18: NGR - NZ 05519 36868). This structure was probably once much less of an issue as bed check weirs downstream are likely to have maintained the bed level downstream. However, the weirs have now washed away, allowing bed material d/s of the bridge to wash out, leaving a perched apron that is a significant barrier to fish passage. Attempts have been made to improve fish passage with a rock-ramp type fish easement but subsequent high flows have washed out most of the structure and the bridge again poses a challenge to movement of both adult and juvenile fish.

It is recommended that Frosterley AC pursue the issue of fish passage with local Environment Agency fisheries staff and Wear Rivers Trust to ascertain if a more permanent solution can be found. Pressure and support from a local AC on this issue is likely to encourage more action to be taken.

Figure 17. Looking upstream at the obstacle posed by Harelaw Bridge footings

Figure 18. Harelaw Bridge footings, with rock-ramp remains in the background

6.0 Summary recommended actions

Action	Location	Number of structures	Materials	Cost (£)
Planting	Along all open sections Fig. 2 & 3 (NZ 02185 36826) Fig. 4 (NZ 0331936744) Fig. 11(NZ 0378836890) Fig. 13 (NZ 04452 36856)	whips/pegs distributed throughout the reaches	Willow sourced from riverbank	Just time to cut the branches and plant them
Tree laying	Fig. 10 (NZ 0378836890) Fig. 13 (NZ 0378836890)	2	Willow present on riverbank	Just volunteer time to lay the branches with a handsaw
Coppicing trees	Fig. 5 (NZ 03346 36749) Fig. 13 (NZ 0378836890)	2		c.£250/ day tree surgeon or WTT CO. + volunteers to handle materials
Ford removal	Fig. 7 (NZ 03536 36876)	1		C. £5-10k
Japanese knotweed	NZ 03346 36749			Contractor costs or possible assistance from Wear Rivers Trust
Investigate options for fish passage improvement at Harelaw Bridge	Figs 17 & 18	1		£10k-£100ks
TOTAL				**Mainly volunteer time**

If Google Earth is installed on your machine, a map of the locations where actions are proposed can accessed using the file accompanying this report, which resembles the icon below.

River Wear - Frosterley.kmz

7.0 Disclaimer

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