Advisory Visit

Ullswater Tributaries near Watermillock

River Eden Catchment

Undertaken by Gareth Pedley (WTT)

Key findings

- Historical straightening of the watercourses in many areas has reduced their length, increased their gradient and reduced their habitat quality.
- Livestock access to the watercourses is leading to increased erosion and input of fine sediment which infiltrates the coarser bed material, further reducing habitat quality for fish spawning and invertebrates.
- The long history of sheep grazing has reduced the diversity of plant species and led to a lack of tree regeneration.
- Fish passage is possible despite the culverts located on the tributaries that flow under the A592
- There is great potential for an estate-wide scheme to restore the habitat of the area while continuing to farm sustainably.
- There is a great opportunity for a multi-organisation approach to delivering improvements on the estate.

1.0 Introduction

This report is the output of a site visit to two small northern tributaries (Parkhouse/Kirkstyle Gill and an unnamed watercourse) of Ullswater (GB30228955), in the River Eden catchment. The visit was undertaken at the request of the riparian owner, and the director of the Ullswater Catchment Management Community Interest Company, to offer potential options for a new, ecologically focussed management regime for the land and watercourses. The visit was undertaken on the 20th March 2019.

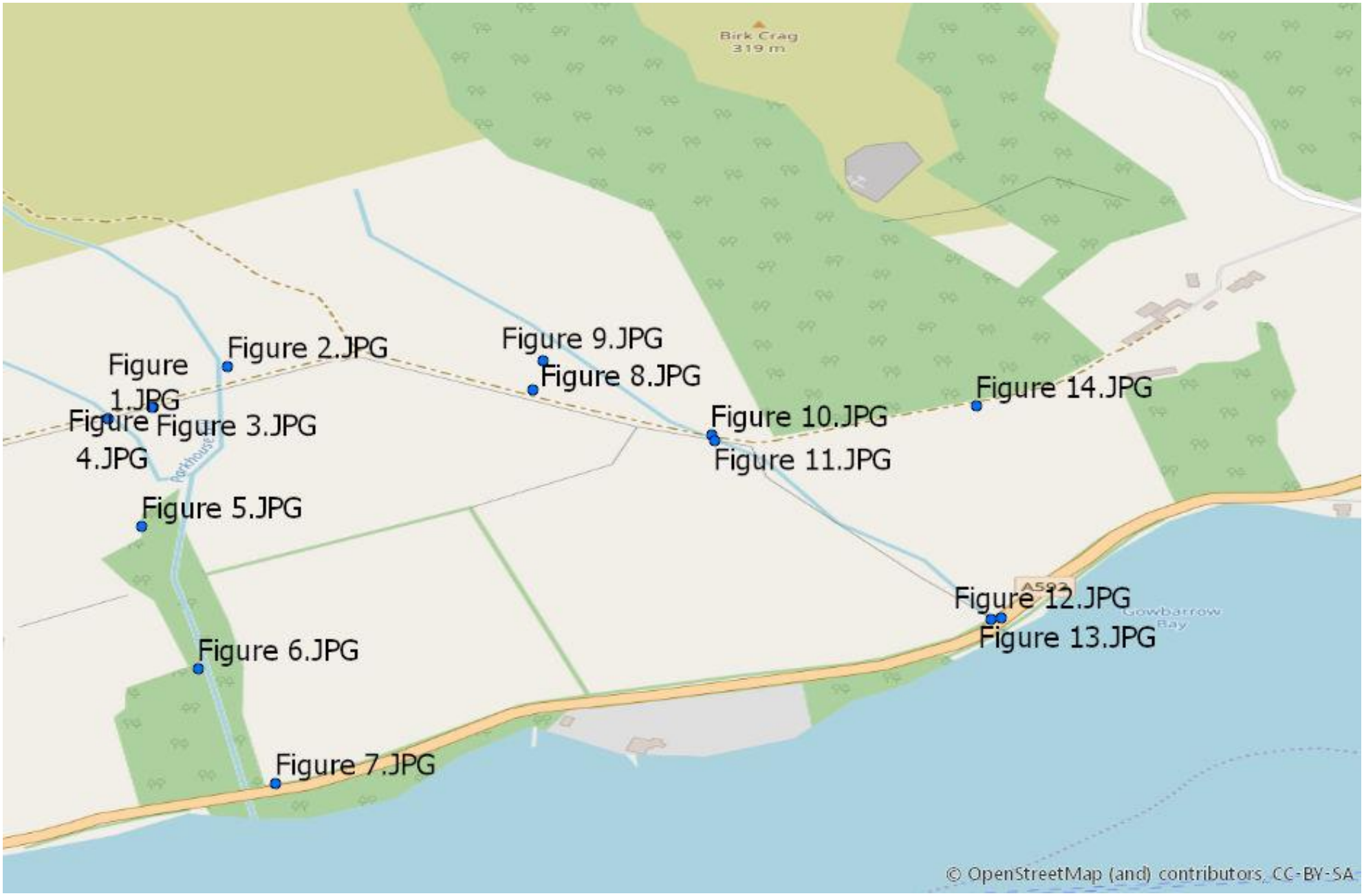
Normal convention is applied throughout this report with respect to bank identification, i.e. the banks are designated left bank (LB) or right bank (RB) whilst looking downstream. The Ordnance Survey National Grid Reference system is used for identifying specific locations.

2.0 Catchment overview

The watercourses originate in an area of tough igneous rock (Birker Fell andesite) before flowing over softer sedimentary rock (predominantly Tarn Moor mudstone) for most of their length. The surface deposits/soils are till, an unsorted range of clay, sand and stone left behind by glaciers. This geology creates the steep fells, drained by naturally low productivity, rugged watercourses that are well-suited to upland species of invertebrates (stoneflies, some caddis and mayflies) and salmonids (trout and salmon).

A long history of upland farming in Cumbria has greatly impacted upon the form and function of the land and watercourses which drain it. Many areas have been heavily grazed for generations, preventing the natural regeneration of trees and herbaceous vegetation. Often, the becks and rivers have been straightened in attempts to improve land drainage. Sometimes the intended improvements have been achieved, but often the gain in workable land is reduced by the residual low-lying, paleo-channels which remain wet; lying at the bottom of the slope, they often continue to collect water. In the process, the straightened watercourses have been severely impacted by the loss of channel length, resulting in increased gradient bed slopes with poor in-channel habitat quality and diversity.

The individual watercourses visited do not appear to have been assessed under the Water Framework Directive so they will simply fall under the Ullswater Lake classification, as such there are no data publicly available on the ecological or chemical status. The Environment Agency and/or Eden Rivers Trust may hold data on the becks but this report will focus on the observations made during the visit. An overview map of the site and photograph locations is provided in Map 1 (next page).



Map 1. Location of Photographs taken during visit.

3.0 Habitat Assessment

3.1 Parkhouse Gill

Starting at Parkhouse Gill & Kirkstyle Gill (the most westerly tributary of Parkhouse Gill) within the sheep pasture, the channels appear to be unnaturally straight (Figs 1 & 2). Although running from relatively steep fells, the area in question is slightly lower gradient than upstream and downstream (visual inspection and Ordnance survey maps), so would be expected to meander more (steeper watercourses naturally meander less because of their increased flow energy). In addition, the watercourses do not seem to follow the low points of the valley, instead following a straighter line across the slope. This suggests the watercourses have been artificially straightened and / or realigned. Surprisingly, this kind of channel modification work often pre-dates even the oldest readily available maps.

Signs of additional drainage (Fig 1) and low points of wet ground (indicated by rushes) within the adjacent fields hint at possible past locations of the watercourse(s) (Fig. 3). A straight ditch also appears from the ground in the field downslope between the gills, potentially draining from the land where watercourses originally flowed, with those past channels still acting like sub-surface drains. The ditch (Fig. 4) and additional field drains (Fig.1) now drain the adjacent lower-lying land.

Figure 1. The straight channel of Kirkstyle Gill (NY42482121): erosion is creating some sinuosity, but the channel remains far straighter than would be expected. Livestock access has led to a lack of tree regeneration (only old, mature trees) and impoverished botanical diversity, which is contributing to poor quality bankside habitat, increased erosion (through a lack of protection and root structure) and detrimental fine sediment input to the watercourse. Note the pipe/field drain (red circle) and incised channel.

Figure 2. The channel of the other upper spur of Parkhouse Gill (NY42572127). Note the extended straight section (highlighted by the line of mature trees) and lack of pools/depth variation.

Figure 3. The straightened channels of Kirkstyle Gill and the other upper spur of Parkhouse Gill lie to the far left and right of shot, respectively, with lower-lying areas within the field between (NY42522122). Further, more detailed inspection (including LiDAR) would be beneficial to better interpret the hydrology and geomorphology of the area.

Figure 4. Immediately downslope of the field in which the low-lying land/possible historical channels were observed, a watercourse appears from nowhere within a small enclosed plantation (NY42522121). This water possibly represents residual flow from past channels that still collect water from the adjoining land upslope.

Naturally meandering channels are vital in maintaining high quality stream habitat. Scour and deeper areas characteristically develop on the outside of bends where erosive forces are greatest; deposition occurs in areas of slower flow, where there is less energy to transport material, typically the inside of bends. The steep, uniform channels in many areas tend to lack significant flow diversity, restricting the development of discrete morphological features such as deeper pool habitat. In areas where the gradient is particularly high and there is a lack of sediment retention, channel incision (downcutting of the bed) can also occur (as can be seen in Fig. 1). Even on straightened watercourses, bends will to begin to reinstate through lateral erosion, but it can take a long time and involve the redistribution of large volumes of detrimental fine sediment (soil).

At the sites visited, sections of channel are clearly destabilised by grazing pressures and the associated lack of vegetation with well-established root systems, leading to increased bank erosion. The result is further reduced habitat quality and diversity for many invertebrate species and salmonids (trout and salmon). Livestock exclusion from the watercourses and restoration of channels should feature in the future management plans for the land (see ***Recommendations***). This could provide additional benefits through channel roughening, and floodplain reconnection, increasing the transit time of water across the land attenuating peak flows. This perfectly

natural, temporary inundation of the land poses no management issues and can even improve the productivity of pasture land through the deposition of fine sediment and nutrients.

Downstream of the straight watercourse sections, Parkhouse Gill enters a less intensively managed section and the habitat quality improves greatly. Although being considerably steeper, the watercourse is more energetic and diverse. The first section is protected within the extent of the small plantation before flowing through mature woodland (Fig. 5), where habitat quality improves further, although failure of the enclosure fence now allows livestock access, which will degrade the habitat if not reinstated (Fig. 6).

Naturally occurring in-channel woody material provides massive habitat benefits for aquatic and terrestrial wildlife, providing food and shelter for a range of species. The increased channel roughness slows flow and creates discrete areas of beneficial scour that helps develop valuable deeper pool habitat and maintain the bed material free from fine sediments.

Figure 5. Much higher quality watercourse habitat is evident within the mature woodland section (NY42512106). Habitat diversity is greatly increased where livestock access has been restricted historically. Natural additions of woody material, along with leaf litter, provides vital nutrients to the beck that nourish invertebrate populations and the fish which prey upon them. Note that even the straighter sections exhibit greater channel and flow diversity than the straightened sections upstream.

Figure 6. High quality, naturally rugged upland beck habitat that almost certainly supports trout and possibly even the occasional juvenile salmon (NY42552088). As a bare minimum, livestock fencing should be reinstated but improvement of the tree species structure within the woodland would also be beneficial.

The age structure and species composition of trees within the woodland is sub-optimal, being relatively uniform and dominated by sycamores. Additional management of the woodland to improve the understory would be beneficial (particularly in the heavily sycamore dominated lower section towards the A592 road). It is understood that the Woodland Trust are already involved at the site and can also advise on tree management. Any work should consider the vital synergies with the aquatic environment, taking location-specific advice from specialists (ecology and fisheries). Retaining, and encouraging (through ring-barking of less desirable trees) standing deadwood would be beneficial, as would deploying some of the procured woody material into the channel to increase roughness, providing habitat and flood management benefits. If carefully managed, areas of increased light penetration within the woodland could facilitate a greater diversity of native species (natural regeneration and planting). However, much of the shading along the watercourse should be retained to preserve vital water temperature regulation and preventing over-warming.

The A592 road culvert (NY42572071) towards the confluence of the beck and Ullswater is very steep, potentially limiting fish passage opportunities, but does retain a relatively natural bed. The aperture is small and likely prone to occasional blockage and fluming of high flows, reducing its passability, but under certain flow conditions fish can ascend beck.

Figure 7. The A592 road culvert on Parkhouse Gill: passable, but some obstruction to fish, primarily due to the steepening of the bed immediately upstream due to retention of coarse sediment at the structure. Ideally, the structure would be larger to allow free passage of fish and sediment, but it is passable to most fish in certain flows.

3.2 Unnamed tributary

A similar scenario was observed along the next watercourse east (NY 42814 21279), where some semblance of a sinuous channel remains, although clear signs of past attempts at straightening and ditch creation are evident (Fig. 9). The straight channel downstream, flowing alongside low, wet ground adjacent to the LB highlights the past channel alterations (Fig. 10). As with the neighbouring watercourse, the stream is showing signs of recovery and is developing increased sinuosity but lacks the expected natural channel diversity. As a bare minimum, excluding livestock from the watercourses would allow tree regeneration (as facilitated by woodland enclosures further upstream), but the ideal scenario would be a more aspirational corridor restoration scheme.

A culvert at the downstream end of the field (NY 42976 21172) greatly impedes fish access up the watercourse and should ideally be replaced with a clear span bridge or sunken culvert (Fig. 11). The channel downstream was not inspected in detail but is clearly straightened and of poor habitat quality (Fig. 12). Increasing the sinuosity of the watercourse would be beneficial. At the very downstream end of the watercourse, the culvert carrying the A592 road is not an issue, being comparatively large with adequate water depth and natural bed to allow uninhibited fish passage (Fig. 13).

Figure 8. The red line represents a straight channel that has been artificially cut across the natural meander. This is visible from aerial photography.

Figure 9. Looking downstream at another section of almost certainly straightened channel. The low boggy area to the left of shot is the suspected location of past meanders, while the watercourse now flows straight, predominantly to the right side of the tree line. Again, note the lack of herbaceous vegetation (only grass and rushes) and tree regeneration as a direct result of a long history of sheep grazing.

Figure 10. Crossing point and poaching that undoubtedly supplies excess fine sediment to the watercourse in wet conditions (NY42962123). Note the high-quality gravelly substrate of the watercourse that could contribute to good habitat within a restored, sinuous channel.

Figure 11. Perched culvert that will greatly inhibit fish access to the channel upstream, reducing its potential as a salmonid spawning and juvenile nursery area. Replacing this structure with an appropriately-sized clear span bridge, or large bore sunken culvert would improve fish passage and sediment conveyance and reduce the potential for blockage and maintenance issues.

Figure 12. The straightened watercourse in its lower reaches, just upstream of Ullswater. Over time, some small meandering has begun to re-establish, but the watercourse remains far straighter and, therefore, shorter than it should be, running parallel with the wall.

Figure 13. Free fish passage is afforded by the natural bedded A592 culvert on the unnamed tributary, with ample water depth and low flow velocity.

4.0 Recommendations

With the estate now under new management, there is a great opportunity to look at the ways the land is used and developed to benefit the owners and wildlife of the estate. The recommendations of this report focus primarily on the watercourse related improvements but with reference to the broader ecology and land management, for which input from other specialists should be sought (Woodland Trust, Natural England, the Environment Agency, Eden Rivers Trust, and Ullswater Catchment Management CIC, among others). Clearly, the maximum benefits will be achieved by a holistic approach incorporating the specialist advice available from all parties, for which these recommendations can hopefully form a starting point. As such, it is recommended that Natural England (Kath Marsh) and Eden Rivers Trust are contacted for advice on specific stewardship options that might be applied to the land to help facilitate the required habitat improvements. Land based payment schemes have already played a key role in facilitating previous river restoration projects on the Eden catchment (and elsewhere).

4.1 Channel restoration

To counteract the impact of past channel straightening and other land management issues, restoration of the watercourse to create more naturally sinuous channels is recommended. This report provides an initial scoping of the options, with several sites on both the Parkhouse Gill and unnamed watercourse having potential for significant habitat improvement. It is therefore recommended that further, more detailed site inspections and background research using freely-available LiDAR maps (**Li**ght **D**etection **A**nd **R**anging - a technique which provides detailed topography of the ground, helping to identify former channels) are undertaken to ascertain the potential for channel improvements at the following:

- **Kirkstyle Gill** (NY 42315 21360 - NY 42492 21212)
- **Parkhouse Gill** (NY 42483 21434 - NY 42572 21247)
- **Unnamed tributary** – upper (NY 42741 21345 - NY 42976 21172)
- **Unnamed tributary** – lower (NY 43019 21063 - NY 43160 20929)

4.2 Livestock exclusion

Livestock exclusion from the watercourses is recommended as an urgent management action to reduce erosion pressures and allow the regeneration of a naturally diverse flora. However, rather than simply creating narrow buffer strips along the watercourses via livestock exclusion, the project could be expanded to incorporate river restoration and woodland regeneration to provide even greater benefits for livestock and wildlife.

Breaking the land up into more sheltered land parcels has been shown to improve the growth and welfare of livestock, creating valuable wind breaks and greatly increasing the infiltration of rainwater into the ground (rather than surface runoff). Livestock watering could be afforded by pasture pumps, solar pumps, ram pumps or a combination, depending upon the location and stock to be watered.

In addition to the general planting of more woodland habitat, a particularly boggy area of land (suspected to be a spring) could be developed into wet woodland (Fig. 14). Again, providing shelter benefits within the field but also a valuable, scarce habitat type on land that is currently sub optimal for livestock grazing.

Figure 14. A wet area of ground (thought to be a spring) where the creation of wet woodland habitat could have multiple benefits (NY 43159 21188).

4.3 Culvert replacement

Most of the culverts inspected are adequate, and although they would ideally be larger to reduce the potential for blockage, the cost of upgrading is likely to be prohibitive, particularly for the A579 road structures. However, the culvert on the unnamed watercourse at NY 42976 21172 would be worth improving to reinstate free fish access. This would be particularly pertinent if channel improvements are undertaken to the watercourse upstream and downstream and it could potentially be included as part of an improvement project.

5.0 Next steps

WTT may be able to offer further assistance such as:

- Assistance in the planning and development of channel restoration projects on the estate.
- Liaison with the other interested parties who may wish to be involved and/or contribute.
- Delivery of detailed restoration designs for the sites to identify the potential for restoration.
- Advice and assistance on funding.
- Input to the development of the plans for a broader land management scheme.
- Habitat improvement works and location-specific advice/assistance, in-conjunction with other organisations.

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

www.wildtrout.org/content/wtt-publications

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

The DVD is available to buy for £10.00 from our website shop http://www.wildtrout.org/product/rivers-working-wild-trout-dvd-0 or by calling the WTT office on 02392 570985.

6.0 Acknowledgement

The WTT would like to thank the Environment Agency for their continued support, through partnerships funded using rod licence income.

7.0 Disclaimer

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