WILD TROUT TRUST

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Project Proposal

Amerdale Estate, River Skirfare & Cosh Beck

September 2020

1.0 Introduction & Rationale

The Amerdale Estate (Littondale) requested input from the Wild Trout Trust to assess issues and recommend solutions for habitat improvements along the uppermost reaches of the Skirfare and one of its major tributaries, Cosh Beck. This report was compiled by Prof Jonathan Grey from observations and discussions held during several site visits (including a rudimentary electric-fishing baseline survey) in late summer 2020.

The waters of the Estate fall within the waterbody 'Skirfare from source to Heselden Beck'; waterbody ID GB104027069250, Fig 1. The overall classification for the waterbody in 2019 under the EU Water Framework Directive was 'Poor' driven entirely by a failing in the biological quality element 'Fish'. All other biological elements were at 'High' or 'Good'. This is rather an anomaly as the Reason for Not Achieving Good status has been assigned to natural hydrology, presumably driven by the periodic retreat of short sections of the river below ground during dry spells. Quite how a natural reason can result in a failure is not entirely clear at present.

Skirfare from Source to Heselden Beck Overview

Download Water Body as CSV / GeoJSON

Overall classification for 2019
Poor

Id	GB104027069250
Type	River
Hydromorphological designation	not designated artificial or heavily modified
NGR	SD8609877971
Catchment area	1872.649 ha
Length	11.043 km
Surveillance Water Body	No
Catchment area	18.726 km2

Fig 1. https://environment.data.gov.uk/catchment-planning/WaterBody/GB104027069250

Throughout the report, normal convention is applied with respect to the beck bank identification, i.e. left bank (LB) or right bank (RB) whilst looking downstream. Upstream and downstream references are often abbreviated to u/s and d/s, respectively, for convenience.

2.0 Habitat Assessment

The following images are used to exemplify available habitat and highlight issues and opportunities around the channel(s).

2.1 Cosh Beck

Fig 2. Looking u/s (upper) and d/s (lower) along Cosh Beck nestled in a naturally narrow valley. There was scant shade provided by a small copse of mature aspen (on the southern RB) and a handful of goat willow and ash at the bank edge. Grazing / browsing is preventing the natural regeneration of tree cover and reducing diversity of herbage along the banks. The channel was dominated by pool-riffle-cascade sequences.

There are advanced plans for a mixed plantation of 300 acres across the upper moorland from the Estate boundary to the watershed and extending behind the conifer plantation in the upper image (lowest extent indicated by the dashed white triangle) which will certainly slow the flow and improve hydrology from that part of the catchment. However, that planting regime will not extend to the beck bank.

Trout (2+) and bullhead were captured here.

Opportunities: The drystone wall on the RB forms the boundary with a neighbouring property. Fencing off the LB for this ~750m reach to at least 10m or where there is an appropriate contour to ease access for machinery, and subsequent planting with appropriate native and locally sourced trees will provide multiple ecosystem benefits (shade / shelter / cover / leaf litter input and eventually wood / natural flood management).

Fig 3. A reach of Cosh Beck in between those owned by the Estate, used here to exemplify the exposed nature (lack of shade) especially where it was running across bedrock. During summer low flows and warmer temperatures, the limestone slabs have the capacity to warm the water markedly, and climate change scenarios predict that this will only increase in the next few decades.

Any opportunities to encourage planting of tree cover (see Fig 4), even along a very narrow riparian strip such as between the track and the channel, should be explored as the benefits will accrue primarily d/s. However, increased cover throughout this reach might embolden more trout to use it or move through it.

Fig 4. Haithwaite's Tree – an example of how a single goat willow can fully span the channel on these reaches, providing important shade and low cover, intercepting debris during spates and introducing leaf litter during the autumn. Here, the channel was dominated by limestone bedrock, highly susceptible to warming.

Fig 5. The confluence of Foxup (LHS) and Cosh Becks to form the Skirfare. The appearance of dense stands of butterbur and nettle at Foxup Farm suggests a source of nutrient enrichment which should be investigated and curtailed. There were no access issues for fish passage on either tributary at the confluence.

2.2 River Skirfare

Fig 6. From the confluence for ~580m, the LB of the Skirfare was better protected from grazing than the RB, albeit by a rather narrow riparian buffer or in some places directly by a drystone wall. Mature trees were mostly sycamore with occasional lime and ash, some of which were exhibiting signs of *Chalara* (ash dieback).

Opportunities:

- **Bolster the riparian tree fringe on the LB to diversify the composition, size and age structure**
- **Keep a watching brief on the ash trees to ensure they do not compromise existing walls or fences, and potentially be prepared to fell & retain *in situ* (via cabling) to maximise benefit at that location.**
- **Fence the RB for the full extent (~700m) with a minimum buffer of 10m, taking advantage of any existing walling and fencing framework but ensuring its integrity is sound to prevent livestock access. Gated access will be required along the public footpath, but superb opportunities for engagement re the conservation enhancements via discrete signage.**
- **Extend new fencing on the LB (~200m) to the Estate limit above Halton Bridge.**
- **Plant small copses of native trees within the newly protected buffer zones.**
- **Full protection for the riparian buffer strip will negate the requirement for many of the watergates on each field boundary which otherwise require regular upkeep / replacement.**

Fig 7. El Dorado. On the RB at SD 87639 76387, two parallel spring-fed tributaries emerged from the hillside and flowed ~120-150m to the mainstem Skirfare. The channel forms were naturally sinuous and contained gravel of an appropriate size (15-40mm) for spawning but were clearly exposed to the influence of sheep grazing, poaching and silt / nutrient enrichment.

Despite being <1m in average width, electric-fishing revealed 7 young-of-year trout (inset) and a 2+ individual, indicating potential as a nursery beck.

Opportunities: -

- **To bolster fishery potential, these seemingly insignificant becks need protection as there is generally a dearth of good spawning / fry habitat in the mainstem Skirfare.**
- **Fencing to exclude livestock, planting with low scrubby species to provide shade and shelter, and the introduction of some large woody debris to help retain and sort gravel substrate.**

Fig 8. From Halton Bridge d/s, there was significantly more evidence of the Skirfare having meandered but then being prevented from doing so by walling, certainly of the LB. The lower image shows a paleo channel returning back to the extant channel – the continuation of which was visible in the field beyond the drystone wall.

These lower reaches were almost devoid of any cover except for ~12 mature sycamore and ash trees. A much wider floodplain incorporated a substantial area of spring-supplemented marsh on the RB.

The channel in the straightened sections was steeper and hence flow was more powerful and uniform in character (continuous riffle or glide), and with a lack of stabilising roots from trees and diverse herbage in the banks, had eroded laterally to become consistently wider and shallower than would naturally occur. The only variety in channel substrate was provided by occasional contact with seams of limestone bedrock near to the bridge (upper image).

Not visible in these images, but there were two becks that had been condemned to 'drains' via straightening, partial culverting and perching, crossing the fields of the LB in the lower image.

See Fig 9 overleaf for additional images

Fig 9. Sinuosity in the Skirfare channel. As the channel has regained some dynamism and been allowed to meander, the natural processes of erosion and deposition have created a series of deeper pools on the outside of the bends complemented by bars of cobble and gravel on the inside. These bars are vital habitats for specialist fauna, particularly ground beetles and spiders, while the deeper pools give ample cover to the larger trout.

Sheep and cattle currently have unfettered access to both banks for the majority of this reach (the three trees in the lower image indicate the d/s Estate boundary), and the vegetation was depauperate as a result. In addition, there was evidence of slumping and erosion scars forming caused by trampling and tracking of animals across the steeper slopes (top left of upper image)

Opportunities: -

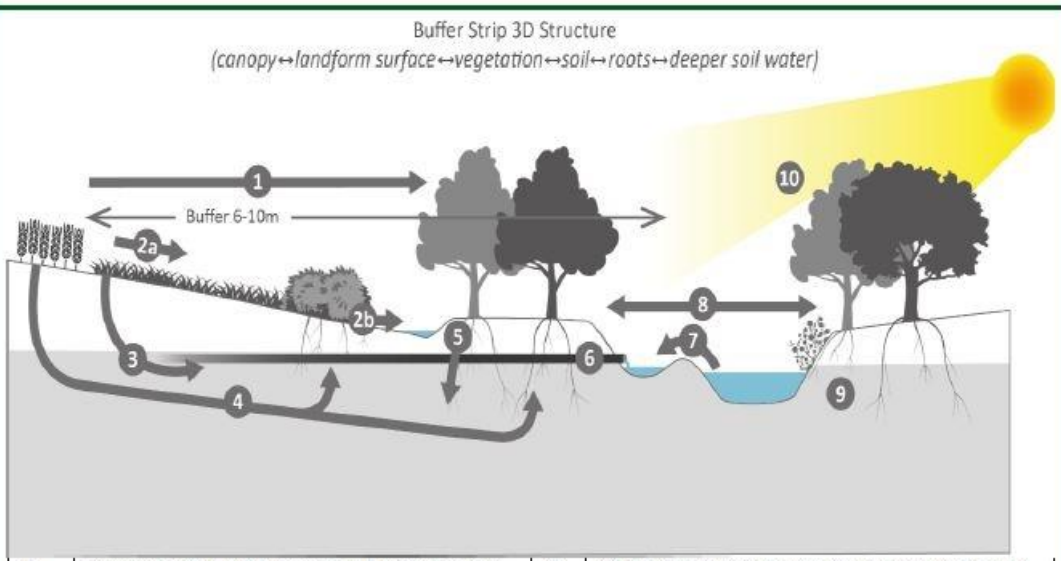
- **Removal of all grazing pressure on this parcel of land to allow excessive erosion to recover and facilitate the recovery of the marsh area which was heavily poached.**
- **Removal of the walling revetment on the LB to facilitate full and natural recovery of the channel by giving it the freedom to move where it wants. Additional reduction of material at the head of other paleo-channels, to better reconnect the channel with the floodplain and to allow dissipation of energy under spate flow.**
- **De-culverting and re-wiggling of the two small becks to restore natural characteristics and extend potential for spawning, akin to El Dorado in Fig 7.**
- **Woodland creation on the floodplain beyond just a riparian 'strip' – this could be quite diverse encompassing wetter hollows as well as drier bank tops and hummocks.**

3.0 Recommendations

The main issue to overcome is the accelerated rate of delivery of water to the channel, currently exacerbated by grazing and trampling reducing the diversity of vegetation (incl. trees) within the catchment, as well as the modification (straightening) of channels to increase conveyance for drainage. Obviously intertwined with the lack of diversity of vegetation is the reduced resilience of the banks to erosion and a lack of shade, both crucial ecosystem services that are urgently needed to combat and mitigate against climate change.

Hence, creation of ample buffer strips via livestock exclusion and kick-starting the development of those buffers with augmented tree-planting (because of a depauperate seed bank) will be most beneficial. Giving the river or tributaries sufficient space within those buffers to return naturally to a more sinuous channel form by simply removing the constraining walled revetments will be most cost effective. Other ecosystem benefits such as floral diversity for pollinators, better soil structure for infiltration, hydraulic roughness to slow the flow, and leaf litter subsidy to the channel (amongst many others) will rapidly accrue with the restoration of a fully functional riparian 'corridor'.

A useful summary figure of the 3D-structure of buffer strips and the main processes and functions involved has been produced recently by the Forestry Commission and the Environment Agency; see Fig 10 overleaf.



1	Interception by the tree canopy of airborne spray drift of agrochemicals	6	Stopping direct discharges from soil artificial drains allows time for processing of pollution in margins
2	Surface runoff is controlled by particle trapping by vegetation, water soaking in amongst roots and in extreme cases by hollows created by resculptured ground profiles.	7	Altered bank profiles can increase connection between the channel and a floodplain resulting in diverse soil wetness and sediment trapping
3	Slowing passing water and promoting infiltration allows time for natural processing of nutrients and contaminants by soil microbes and plants	8	Enhancing interactions between land and water ecosystems promotes healthier streams
4	Nutrients can be taken up and locked away in growing vegetation	9	Banks can be stabilised from erosion and collapse using tree roots
5	Increasing the content of soil organic matter aids natural attenuating processes in soils	10	Increased shading helps reduce thermal stress to aquatic life on hot sunny days

Fig 10. Potential elements of a 3D-buffer structure (reproduced with permission: https://www.gov.uk/government/publications/3d-buffer-strips-designed-to-deliver-more-for-the-environment)

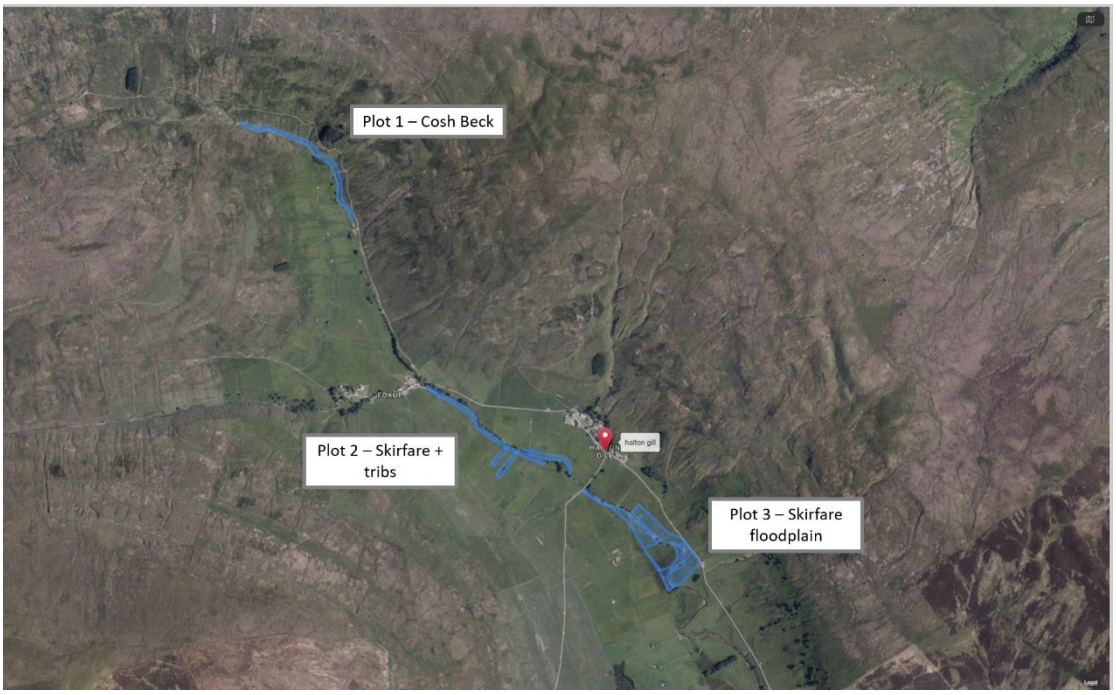


Fig 10. Overview of potential buffer strip creation for the Amerdale Estate outlined in blue.

The proposal effectively covers three separate plots as depicted in Fig 10 above and which will be summarised below.

3.1 Plot 1 – Cosh Beck

Due to the naturally steep, narrow and unmodified nature of the channel here (Fig 2), and the existence of a drystone wall extending the full length of the RB, the proposal for Plot 1 is relatively simple. Installation of livestock exclusion fencing along the full length of the LB combined with tree planting on both banks, thereby extending the planned creation of the mixed plantation at Eller Carr to benefit the beck. The minimum width considered should be ~10m but given the poor nature of grazing, perhaps consider extending to the track which would make installation and maintenance of fencing considerably cheaper / easier. Requirement for gated access to remove any straying stock and for planting.

~0.9km of fencing + sundries; 1000 trees

3.2 Plot 2 – Skirfare & tribs

Ref to Figs 6&7. Extension of a buffer fence along the majority of the RB of minimum width 10m to encompass public footpath, which will require new gates to retain access, plus removal of short sections of defunct fencing and watergates. Installation of buffer fence on shortish section of LB to take advantage of the wall position and to reduce the rate of (currently) excessive erosion. Protection of the two spring-fed tributaries on the RB from source to confluence will require livestock exclusion plus two small clear-span bridges to accommodate the footpath.

Planting of a greater diversity of trees as copses throughout the buffer zones (aspen, alder, bird cherry, blackthorn, hawthorn, rowan & spindle) to counter the predominance of ash, plus the addition of goat willow specifically along the two springs to get low, bushy cover *in situ* rapidly will be required to kick-start renaturalisation.

Introduction of large woody material within the tributaries by pinning in locally sourced boughs / trunks (See 'How to' videos from WTT: https://www.wildtrout.org/content/how-videos) to maintain and increase sinuosity, as well as to retain and sort gravels, can be achieved easily. Both becks would benefit from addition of appropriately sized gravel (15-40mm) to compensate for that stripped out historically.

~1.96km of fencing + sundries; 1500 trees; 20 tonnes of ~20mm mixed limestone gravel; ~30x 2m woody deflectors + rebar.

3.3 Plot 3 – Skirfare floodplain

The most d/s area incorporates more elements – ref to Figs 8&9. Reconfiguring field boundaries and complete removal of stock access to the flood plain area will be required to achieve most benefit.

Removal of the drystone wall and revetments constraining the LB of the Skirfare (and either rebuilding it or replacing it with fencing set back and parallel to the true edge of the floodplain as determined by gradient) will release the main channel to re-meander as well as allowing for the deculverting and return of two small tributaries to their paleo-channels. Minor plant work will be needed to encourage the reconnection of the current channels with the paleo-channels. The tributaries will benefit from addition of woody material and gravel as previously described in Plot 2.

Installation of a fence-line on the true edge of the floodplain on the RB will retain the better-quality grazing but leave the nascent marsh and floodplain to develop. This will require consideration for footpath access.

The widest point (southern and eastern sides) of the floodplain would benefit from planting with relatively dense coverage of native trees, with the marsh area and the more classical buffer strip on the RB (western side) remaining open and with small copses, respectively.

~0.8km of fencing + sundries; 4500 trees; plant hire; 20 tonnes of ~20mm river washed gravel; ~30x 2m woody deflectors + rebar; potential cost of relocating drystone wall ~250mx1.8m.

4.0 Making it Happen

Works within river require assessment and permission from the relevant authority for flood risk assessment, in this case North Yorkshire County Council. The Environment Agency assumes this responsibility for the Skirfare from Litton. Littondale is a Conservation Area for Barns & Walls, and hence the Historic Environment Team at the Yorks Dales National Park Authority should be approached regarding the proposals for walling. Early engagement with those authorities can often help with the smooth progression of a potential project and open funding opportunities. There are numerous avenues currently for the funding of trees and the infrastructure required to protect them.

WTT can help draw up more detailed funding plans, as well as oversee the installation of features perhaps via a series of practical demonstration days.

5.0 Disclaimer

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