WILD TROUT TRUST

wildtrout.org

Advisory Walkover, Nov 2023

Snaizeholme Beck: GB104027069350

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1.0 Introduction

A short walkover was conducted by Prof J Grey of the Wild Trout Trust in conjunction with the Woodland Trust site manager, Alec Pue. The rationale was to assess instream and riparian habitat from an aquatic perspective. Outputs from this report can be used to inform and support future management or applications for funding.

Throughout the report, normal convention is applied with respect to 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. The Ordnance Survey National Grid Reference system is used for identifying locations.

Snaizeholme Beck has been assessed as achieving Good Ecological Status under EU Water Framework Directive criteria – summary statistics are recorded, here.

However, an electric fishing survey for Hawes & High Abbotside Angling Association conducted by WTT in 2023 around the Snaizeholme & Widdale becks confluence and the lower reaches of each revealed no young of year trout. WTT has produced two Advisory Reports since 2021 on the state of Upper Ure tributaries which include reference to these becks.

2.0 Habitat Assessment

The walkover started towards the d/s limit of the Woodland Trust site on the packhorse bridge at a pinchpoint where the channel was naturally constrained within the valley (Fig 1). Immediately u/s on the eastern side (RB), a track ran parallel to the channel, and appeared to have been formalised historically using dredged material; the channel was probably also straightened at the time given the position of the wall to the east (See Fig 2). For the first 50m or so from the packhorse bridge, this was probably sufficiently far removed from the channel (in terms of height) but it was clear from Fig 2 satellite imagery that the channel had begun to meander to the east over time, and the track had probably been adjusted to accommodate it (note gap in the wall running N-S opposite the deposition bar; Fig 2). A return to a more sinuous and dynamic course should be aspired to as it will increase the channel length, reduce the gradient, create a more diverse habitat mosaic instream and revert to a more natural riparian flora.

Fig 1. Looking u/s from the starting point of the walkover at SD 82887 85842. A natural pinchpoint in the valley was an obvious site for an old packhorse bridge.

One section of the track had recently been directed by WT away from the channel to service a refurbished barn (dashed line; Fig 2) providing an opportunity to curtail any further use of the 'old' track near to the channel. A further opportunity to consider is the viability of removing even more of the constraint of the track along the channel by rerouting it along a postulated dotted route from closer to the packhorse bridge (Fig2).

Fig 2. An unconsolidated deposition bar of boulder, cobble and gravel points to the dynamic nature of the channel here, highlighted by the white arrow in the satellite image. Historically, a track was formalised using material from the riverbed, running close and parallel to the channel on the RB and the channel straightened. A new track to the barn has been laid further away (indicated by the dashed line), but it is worth considering whether it could be moved even further (eg on the dotted trajectory from the bridge), allowing for renaturalisation of the riparian zone. NB flow direction: south to north.

The unconsolidated deposition bars of rock, cobble & gravel hint at the dynamic nature of the channel at this location – loosening any obvious boulder revetment put in place to protect the old track will rekindle the true spatial and temporal dynamism of the channel once more. Similarly, the LB of another straightened reach just u/s (labelled 2 in Fig 3) should be examined for any obvious boulder armouring and returned, dispersed within the channel, if found.

Fig 3. Looking d/s at the tail end of a straightened reach (labelled 2 in the satellite image). That labelled 1 is the u/s extent of the straightened reach in Fig 2. The channel is trapezoidal in cross-section within each reach and relatively featureless because of the historical modification. The channel highlighted within the blue rectangle appeared more natural with sinuous meanders and is discussed in Figs 4-5. NB flow direction: south to north.

The area with greatest potential for restoration appeared to be that highlighted by the rectangle in Fig 3 and exemplified in Figs 4-5. The gradient was low (Fig 4) and the depth of the fine peaty soil above any coarser alluvial substrate evident in the incised reach (Fig 5) suggest it was a depositional zone (either bog or shallow lake) for a considerable period in the past. LIDAR data point to an even more sinuous and hence longer course with several paleochannels to the east of the extant channel (Fig 6). Hence, one might speculate that the extant channel may have originally been a drain run straight through the centre of the boggy area relatively recently to increase viability for pasture. Current Ordnance Survey mapping of the area indicates the main flow path as being that of the paleochannel, not the extant channel also suggesting the change has been recent. The incised nature would tend to support the supposition of a drain, and the meanders and narrow point bars observed could be indicative of the channel beginning to recover. Given the overgrazing of the banks that occurred prior to WT ownership and lack of root matrices in the highly erodible soil, those nascent meanders would have developed at an accelerated rate.

It should be noted that straightening of the channel both d/s (Fig 3) and u/s (eg Fig 8) of the boggy area would exacerbate the incision of the extant channel by increasing conveyance. Indeed, historic land management practices across the whole of the upper catchment coupled with increased frequency and duration of rainfall events in recent decades would all contribute. The wider aspirations of slowing the flow across the entire site need realising to aid recovery.

Fig 4. Looking u/s from afar at the low gradient and relatively broad floodplain of the meandering section highlighted in Fig 3.

Fig 5. Meanders within the section highlighted from Fig 3. The channel was highly incised, probably resulting in part from the straightening of the channel reaches downstream accelerating flow velocity and increasing erosive power within an area which was clearly more depositional in the past (based upon the fine soils above the coarser alluvium). More frequent and intense rainfall events in recent decades, and historic land management practices of drainage and grazing resulting in a lack of tree cover, will have undoubtedly contributed.

In terms of rehabilitation, returning the flow to the paleochannel to the east would be a major coup, almost doubling the channel length from 180 to 350m. This could be achieved by identifying the exact location where the extant and paleochannel diverge to determine as suspected if the paleochannel was deliberately blocked. Windblown trees including root plates could be packed into the u/s end of the extant channel as well as any rock and cobble from the (re)opening of the paleochannel to divert and encourage flow to return – see Recommendations. Windblown trees could also be used to introduce sinuosity within the straightened reach of the paleochannel.

Fig 6. Upper - examination of the area using the 2022 1m LIDAR derived Last Return Digital Surface Model Composite produced by the Environment Agency, suggests that the extant channel is much straighter, shorter and incised (blue arrow) than one of the more recent paleochannels which almost doubled-back on itself and flowed more to the eastern edge of the valley. However, even the paleochannel appears to have been straightened at some point (white rectangle). Lower – photo taken from SW side of the extant channel with white arrows to indicate the former, longer path across this depositional area.

Further south and up the valley, at SD 82665 85109, there was more evidence of channel modification to cater for an old field boundary and watergate (although that was no longer evident; Fig 7). Spate flows had consumed and rearranged much of the stone material and the channel was diversifying nicely by braiding around several deposition bars. Whilst the physical recovery of the channel was good to see, such wide and shallow areas would be extremely susceptible to warming in summer, so it will be vital to consider riparian tree cover wherever possible to mitigate for climate change.

Fig 7. At SD 82665 85109, there were signs of modification to the channel to accommodate a cross-valley boundary; larger boulders and remains of watergates within the channel which were now diversifying flow by braiding around multiple small deposition bars.

Fig 8. At SD 82621 85021, another suspiciously straight reach of beck running parallel to drystone walling on the LB and with some evidence of large boulders within the RB. Again, the straighter reaches lacked physical diversity in cross-section and bed form, reducing the variety of habitat niches.

Further straightened sections of channel were evident u/s (Figs 8-10) typically associated with old drystone wall boundaries. It is most likely that the channel was straightened and armoured with boulders to each bank first to prevent it from wandering, and then the drystone walls erected adjacent and parallel afterward. Unsurprisingly, because of increased conveyance, there was evidence of exacerbated erosion at the d/s extent of all the straightened reaches. Historic shackling of the channel into a straighter course should be unpicked.

Fig 9. U/s of the reach in Fig 8, the amount of large boulder material to the RB was more notable on the outside of a bend and it appeared that historic boulder armouring may have been breached – the 'islands' in the upper image – as the channel has started to renaturalise.

Any boulder material used for armouring could be redistributed within the channel; for example, placed in low piles alternately to either bank to encourage sinuosity. Addition of some windblown trees with root plates would also accentuate physical diversity as well as introduce submerged cover, given the lack of riparian cover at present.

The erosion caused by the historic straightening should not be cause for concern. Indeed, erosion and subsequent deposition of material is a component of hydrogeomorphology sorely missing from many of the Dales' rivers as it is the source and supply of vital gravel often locked-up behind armament or trapped u/s of weirs.

Fig 10. Two examples of nascent erosion to the LB, in part natural because each was the outside of the bend and hence where flow was fastest, but also likely exacerbated unnaturally by straightening u/s, and the proximity of fencing which has focussed stock trampling and grazing at the bank top and hence weakened the integrity of the soils. It would be ideal to simply remove or adequately set back the fencing (off the floodplain) and allow the erosion to proceed.

In several locations, old walling boundaries had been replaced with fencing (Figs 9 & 10). These were generally where the channel had migrated and undermined the wall, and the cheaper fencing was substituted as close as possible to the channel. Such action generally proves to be a false economy as it restricts the space available for livestock to move between the channel and the fence, thereby focussing trampling and grazing pressures to weaken the bank and make it more susceptible to erosion and further land loss. If fencing or walling is still required under the new management regime, then it is advisable to site it well back from the channel and any potential (re)meander zones. One aspiration discussed was to manage the valley 'floor' via conservation grazing using appropriate hardy breeds of cattle. Care will be needed to monitor the level of grazing and poaching disturbance, especially on the wetter slopes. For example, in the upper panel of Fig 11, erosion scars of bare earth were visible on the RB. These are typically caused by livestock traversing the slope and plucking off any new growth trying to establish. Without livestock disturbance, over time the slope would adjust to a stable angle of repose aided by the colonisation and rooting of plants.

Fig 11. Upper - at SD 82380 84477, the confluence of the two main tributaries, and lower – looking u/s on Grove Sike which was the smaller. From here, the characteristics changed markedly reflecting the geology and gradient. Ideally, the proposed stock management for conservation type grazing should be arranged so that there is no need for watergates across channels which always require ongoing maintenance.

Upstream of SD 82380 84477, the confluence of the two main tributaries towards the head of the valley (Fig 11), the channels appeared less modified. Indeed, because of the changing gradient and more frequent interaction with seams and slabs of the underlying geology, the habitat became dominated by pool-cascade features (Fig 12), although it should be noted that Grove Sike (not walked; Fig 11) was of slightly shallower gradient for further.

Some of the cascades, such as those falling directly onto further seams of bedrock, would prove challenging to fish passage because of the lack of depth of water from which to leap. Yet, often, the pools in between such cascades contain trout because they are relatively deep and secure lies. So whilst u/s movement may be greatly restricted for much of the year, there may still be components of the trout population(s) eking out an existence in seemingly inaccessible locations. Only an electric fishing survey will reveal the limits of distribution which would be useful to establish a baseline, certainly before any proposed NFM work is carried out that might be detrimental to ecology.

The sides of the gills and sikes were naturally steeper and would lend themselves to the establishment of shrub cover which would help to bind the soils and provide further shade and leaf litter subsidy for the channels. The grass in the riparian zone here appeared even shorter with fewer rushes than d/s and hence provided even less respite from the sun. All the exposed boulders within the channel would warm rapidly in summer, conducting heat to the water, and highlighting the importance of a functional riparian flora to help keep the water cool as well as slow the flow via hydraulic roughness. Every opportunity should be taken to augment cover with tree planting in the gills and on steeper slopes.

Fig 12. The uppermost reach of the walkover on North Scar Gill, within 200m of the confluence (Fig 11) and probably towards the upper limit for fish. The channel was much steeper and exhibited pool-cascade characteristics over large boulders or seams of underlying bedrock. Whilst naturally challenging for fish passage, the availability of focal flow paths between the rocks, and deeper pools in between, should allow some trout to access and reside at this point.

Many of the watercourses were small and some were undoubtedly ephemeral, but these take on a disproportionate ecological importance relative to their size; the capillaries of the arterial network. The few that were examined in brief were generally well vegetated relative to their width (refuge from / reduction of spate flow, full sun, and predation) and contained clean gravel of appropriate size for spawning trout (Fig 13). Hence, compared to the main channel, they may be much safer nurseries for eggs and swim-up fry. Even if they dry up in summer, the fry will have emerged and developed in early spring and emigrated to deeper, more permanent water d/s.

However, some of the lower reaches of these small tributaries appeared to have been straightened near to the confluence with the main channel and/or realigned where tracks crossed. Each of these actions would have degraded their potential for spawning and fry habitat, so rehabilitation work should be considered wherever that had occurred.

Fig 13. Many of the watercourses such as Fell Sike at SD 82610 85029 were small and relatively well vegetated, with substrate notably clear of fine silts. The importance of these small and even ephemeral channels should not be underestimated if fish can access them. They may only be important spawning and nursery habitats for 4-5 months over winter.

Track crossings were discussed on site, using a recently completed twin-culvert pipe as an example (Fig 14a&b). The ideal situation would be a clear-span structure, be that a bridge or an appropriately oversized and sunken culvert, to accommodate the entire wetted channel width and some bank on either side. Hence, there should be ample capacity for elevated spate flow and a natural substrate throughout.

Fig 14a. Twin culvert pipes discussed on site. On the u/s side, there was already evidence of deposition of larger boulders (esp. at left-hand pipe) under high spate flow when the capacity of the pipes would have been exceeded and water had backed-up. These created a perch at the u/s side, visible as the cascade of water into the right-hand pipe. Ongoing maintenance issue.

Fig 14b. Twin culvert pipes discussed on site. On the d/s side looking u/s, it was evident that the pipes had been buried to a certain degree and the angle of slope sufficiently low to retain bed substrate. A watching brief is required for potential development of scour below the pipes which could lead to bed lowering and perching of those pipes.

Examples of best practice can be found within the SEPA publication – see Fig 15.

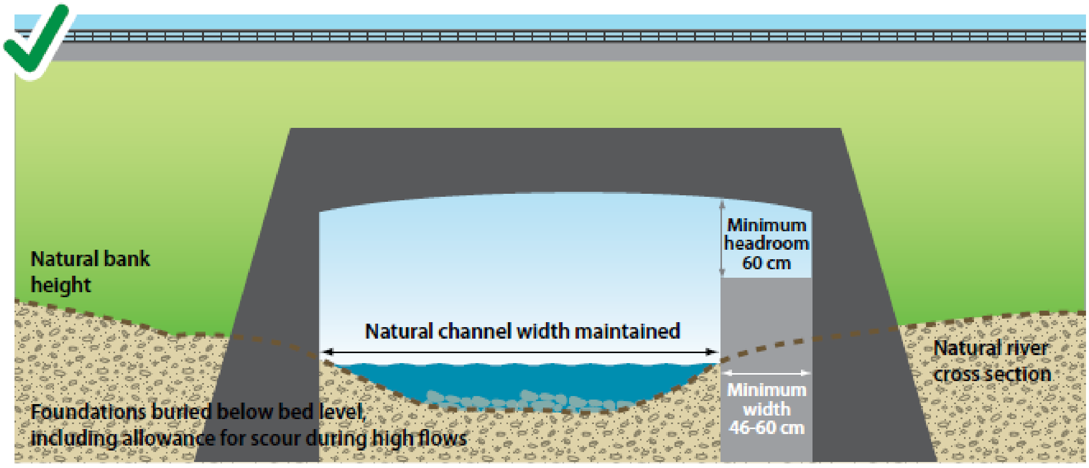

Fig 15. Figure (35) extracted from the SEPA good practice guide (Engineering in the water environment: River crossings). A structure should span the entire wetted width of the channel and accommodate spate flows, ideally with some natural bank on either side to facilitate mammal movement.

3.0 Recommendations

The Woodland Trust's Snaizeholme holding presents a fantastic and exciting opportunity for (sub)catchment-scale nature recovery with associated ecosystem goods and services. Many such schemes have a land-centric focus which may indeed impart multiple benefits to the waterbody but they rarely consider the physical attributes of the channel network from the outset. Even relatively close to the source, there was still plenty of evidence of historic modification (straightening and realignment) which has increased conveyance and degraded the habitat. Hundreds of years of grazing has also left the riparian zone relatively depauperate in biodiversity and dysfunctional. Currently, it is incapable of buffering the numerous channels from extremes of sun and spate flow, of providing leaf litter resource as a terrestrial subsidy to the aquatic ecosystem, and denuded of the large woody material so important in maintaining physical diversity.

It is understood that WT is already working in partnership to slow the flow from the moorland at the very top of the system, and directly to plant the swathes of trees around the 'horseshoe' of the valley head and into some of the gills. These are both key elements to improving the habitat within the channel (ie retaining gravel rather than it being stripped out, reducing the flashiness of response to rainfall and ameliorating summer flows, and keeping water cool). Ultimately, the re-establishment of trees will also lead to more woody material in channel and energy subsidies from leaf litter. This is the sort of advice WTT imparts on a regular basis.

It is also understood that the valley 'floor' and lower slopes will be managed by conservation grazing, in part for breeding waders. This is a contentious issue and a difficult one to balance. Preventing the establishment of any trees within the riparian zone will maintain the aquatic ecosystem in sub-optimal condition, and the catchment wide benefits to aquatic biodiversity and ecosystem goods and services will never be realised. The riparian zone is one of the most abused habitats on the planet and because it is inextricably linked with the waterbody, that degradation is linked to the severe declines that have been reported globally in recent years. "*Freshwater species are declining at an alarming rate of 76%—much faster than terrestrial or marine species—and freshwater habitats are in worse condition than those of forests, grassland, or coastal systems*" (WWF, 2023). If there are ways to keep the conservation grazing to a bare minimum along the riparian corridor, such as 'No Fence' collar systems, then these should be explored. A rigorous watching brief to monitor, for example, concentrated areas of poaching leading to fine sediment pollution should be maintained.

Finally, it is understood that the site is being explored (and quite rightly so) for further NFM potential, and whilst such work may bring benefits to aquatic systems by slowing the flow, it does need to be conducted with the 'natural' element of NFM to the fore if ecology is not to be disrupted. For example, fish passage has been compromised in streams with formalised 'log-stack' leaky dams. WTT advocates the use of whole trees ideally with intact root plates (ie simulating natural tree fall), introduced to channels either to deflect flow or to create messy, dispersed log-jams as leaky dams. The benefits of these to NFM are more difficult to assess or model but, being truly natural analogues, there is no ecological detriment. It would be advisable to conduct an electric fishing survey of any watercourses which may be considered for NFM options – WTT can coordinate.

With the above in mind, there is considerable scope to restore the main channel (and any lower reaches of smaller tributaries that have been straightened):

1. Paleochannel reconnection
   The LIDAR image from Fig 6 has been repasted here to help outline the proposal for gold standard channel restoration.

   The dashed white line indicates the paleochannel to be reconnected. The white rectangle indicates the u/s section of the extant channel which should be blocked with windblown trees and their root plates (ideally), packed into a dense log-jam matrix. Any boulder or rock used to block the paleochannel should be removed with appropriate plant and relocated to augment the log-jam, and encourage return of flow to the paleochannel. As noted earlier from the LIDAR, even the paleochannel appears to have been straightened in one section (dashed rectangle), so it would be worth investigating this prior to any reconnection and installing some LWM arranged to deflect flow and increase sinuosity – see below. Since the disconnection of the paleochannel seems to have occurred very recently, the idea here is not to 'rewiggle' or over engineer *per se*, but to simply block the extant straighter channel and encourage a return to a former course.

2. Unleashing straightened sections

   Most of the straightened sections appeared to have been pinned in place using boulder revetment or armament along the bank toes. Many of them also had drystone walls built in parallel. The simplest restoration would thus be to remove the revetment and use it within the channel, and arguable the wall material could be used in a similar manner as much will have been robbed from the channel originally. It could be:

   i) Dispersed throughout the reach to encourage a modest bed-level raise and hence better lateral connection with the floodplain. Increased hydraulic roughness would help slow the flow and create excellent parr habitat.
   ii) Relocated to form a low berm opposite and slightly u/s of the (now exposed) bank from where it was removed, to encourage flow deflection toward that bank, induce erosion and ultimately increased sinuosity.
   iii) Used to form low berms on alternating sides to encourage greater sinuosity.

   The use of any of these techniques could be tailored to specific locations, for example to encourage spate flow to return to paleochannels or spill onto the floodplain earlier in the hydrograph, and hence contribute to NFM aims.

3. Addition of Large Woody Material (LWM)

   The essential component of hydrogeomorphology missing from the Snaizeholme (and wider Dales) landscape is natural tree fall into channel(s). Whilst the aspiration is to re'wood' the slopes, it will be decades or centuries before natural tree fall contributes to this process in any meaningful way. With an ample supply of windblown conifers on neighbouring estates, there is an opportunity to kickstart processes by translocating and introducing entire trees with root plates. Key to their stability within the mainstem channel will be:

i) Keeping them as large and structurally complex as possible ie retaining side branches & roots.
ii) Using multiple trees in clusters to confer greater stability.
iii) Identifying more depositional areas for their introduction.
iv) Tried and tested anchoring techniques (eg cabling to each other; ground anchors; partial burial) can be used if necessary.
v) Individual trees could be laid into and along the lower straightened reaches of some of the smaller tribs (with the root plate at the u/s end to kickstart some remeandering and introduce low / submerged cover.
vi) Some trees could be laid perpendicular to overland flow paths out on the floodplain to increase temporary storage of water.
vii) Adding some live goat willow or other appropriate willow species whips or stakes to the mix would also help to stabilise the 'dead' woody material.

The approach of the Stroud NFM project working with natural processes is highly relevant.

4. Track crossings

In a fragile landscape, it is essential to keep vehicles out of watercourses and any track crossings should conform to best practice, ie clear-span with sufficient bank space to accommodate spate flow in the channel, or over-capacity culverts buried sufficiently deep to accommodate a natural bed substrate.
See the SEPA guide - Engineering in the water environment: River crossings.

The becks are classified as ordinary watercourse and hence North Yorkshire Council is the responsible authority for considering flood risk. WTT has managed several projects across Yorkshire with similar permitting requirements.

4.0 Acknowledgement

The Wild Trout Trust would like to thank the Environment Agency for their continued support of the advisory visit service, in part funded through monies from rod licence sales. The advice and recommendations in this report are based solely on the expert and impartial view of WTT's conservation team.

5.0 Disclaimer

This report is produced for guidance; 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 guidance made in this report.

Legal permissions must be sought before commencing work on site. These are not limited to landowner permissions but will also involve regulatory authorities such as the Environment Agency – and any other relevant bodies (e.g. Natural England and Forestry Commission) or stakeholders. Alongside permissions, risk assessment and adhering to health and safety legislation and guidance is also an essential component of any interventions or activities in and around the watercourse.