WILD TROUT TRUST

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Advisory Visit

River Erme, Devon

October 11, 2021

Summary

- Erosion issues observed are the result of artificial straightening and a lack of bankside vegetation. Fencing to establish a riparian buffer will reduce erosion pressures while improving bankside and in-river habitat.
- The straightened reach downstream of Sequers Bridge should be allowed to adjust naturally, bringing back a more meandering planform.
- Better use should be made of the disconnected woodland downstream of the bridge by scraping back some of the retaining bund.
- Investigations should be made to remove or bypass Head Weir for the benefit of geomorphological processes and downstream migration of salmonids. There will be a significant increase of upstream migration too.
- Maintain tidal reach light touch management. Fallen trees are good for the river and should be left in place wherever possible.
- Buffering of small streams around the estate and introduction of formalised cattle watering through solar or pasture pumps would be beneficial.

Introduction

This report is the output of a site visit undertaken by Bruno Vincent along the lower River Erme in Devon at the request of the Flete Estate.

The report covers a visit to the Head Weir and approximately 0.4km of walkover of the Erme upstream. A notional examination of small streams and the tidal reach below the weir were also made in lesser detail.

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.

River	River Erme
Waterbody Name	Lower Erme
Waterbody ID	GB108046005040
Management Catchment	Erme
River Basin District	Erme
Current Ecological Quality	Overall status of Moderate ecological status based upon an overall ecological potential of Moderate and a Failing chemical potential
U/S Grid Ref inspected	SX 63195 51868
D/S Grid Ref inspected	SX 63057 51583
Length of river inspected	~380m

Table 1. Overview of the waterbody. Information sourced from: https://environment.data.gov.uk/catchment-planning/WaterBody/GB108046005040

Under the Water Framework Directive (WFD), the Environment Agency classify the Erme as Moderate with specific issues such as failing levels of mercury and its compounds.

Catchment / Fishery Overview

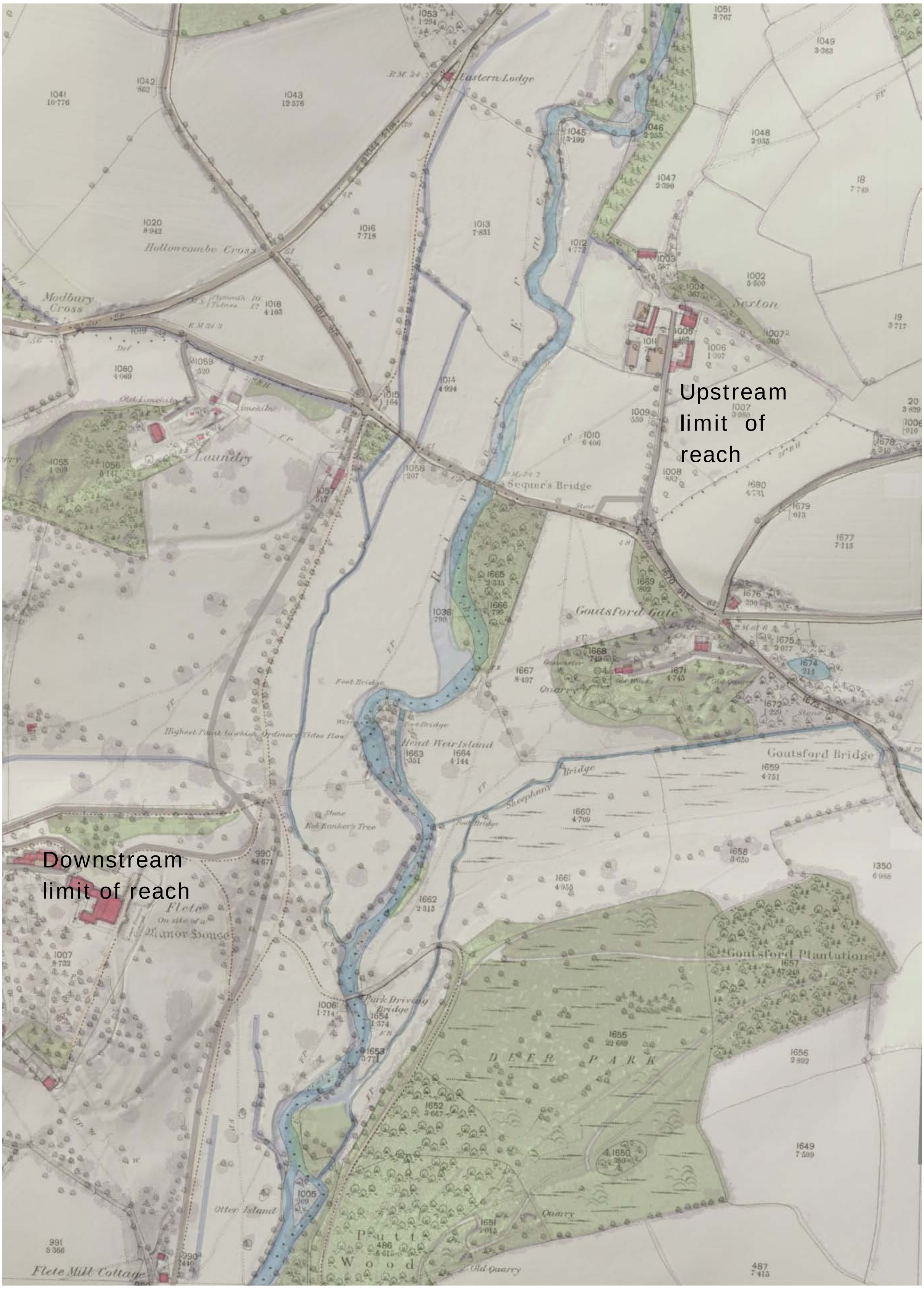
The Erme drains a catchment of around 71.3 km^2. Rising on the Southern slopes of Dartmoor, it flows south for 21km before discharging into the English Channel to the East of Plymouth Sound. The Erme is joined by the Ludbrook, Sheepham Brook and Redlake streams upstream of the location covered by this report, and Ayleston Brook downstream.

The Erme is renowned in the area for its run of seatrout and a shoal of seven 2lb+ fish were observed directly above the limit of this walkover.

The Erme estuary is designated an Area of Outstanding Natural Beauty (AONB) and a Site of Special Scientific Interest (SSSI) has been designated from the mouth of the estuary upstream to the upstream limit of this report. The SSSI cites;

> *"...fine examples of estuarine, saltmarsh, freshwater and oak-hazel woodland habitats. It supports an important breeding bird community and, additionally, provides feeding and roosting grounds for waterfowl on passage and in winter."*

The Flete Estate is keen to increase biodiversity as a major part of the estate's future management.



Map 1 Recent mapping data overlayed with old mapping showing the current course of the Erme (light blue) and its path around 120 years ago (dark blue). Note the two points of recent erosion downstream of the bridge (red circles).

Habitat Assessment

The walkover covers approximately 380 metres from the Head Weir, upstream to Sequers Bridge. Other notional examinations were made to woodland on the LB where a distinct paleochannel exists and the tidal reach downstream of the Weir. The latter exhibits reasonably natural hydromorphology (except for interrupted gravel supply), with meandering planform and good mosaic of riparian tree cover. The tidal reach was generally of good quality and so focus has been given to the impounded reach above.

Head Weir

Figure 1 Head weir viewed from the RB. The face of the weir is degrading and will only worsen over time.

At SX 63057 51583, Head Weir is an old Crump weir standing approximately 3.5 metres high (Figure 1), unnaturally forming the u/s limit of the tide. This has stood for centuries and likely provided a navigable water upstream to Sequers (sackers) Bridge. Barges were able to dock and unload on a side channel to the east of Head Weir at high tide, transferring their load to be taken upstream.

In the flows witnessed (medium low), the majority of the weir face was wetted, with a significant run on the LB created by an arrangement of constructed pools.

This 'fish pass' is a surprisingly natural looking route for upstream migration, its success evidenced by the renowned sea trout run on the Erme. It is however an artificial barrier to migration, removal or bypass would be the most ecologically beneficial solution. Upstream migration is only one of a suite of other significant issues caused by weirs;

- Delays to downstream smolt migration.
- Delays to upstream fish spawning migration
- Increased fish predation.
- Interruption of sediment transport.
    - o Including associated downstream erosion.
- Impoundment of flows.
    - o Potentially flooding valuable spawning and juvenile habitat.
    - o General degradation of riverine habitat.

See appendix for further information.

The face of the weir is also degrading, with a significant hole visible near the RB. This will snare high flows, increasing forces acting upon it, leading to further deterioration of the structure. Considering the ecological impediment to the river, it is suggested that the detrimental impact of the weir is given serious consideration, and options to redress the issue are implemented.

Figure 2 The large pool above the weir showed relatively good habitat considering the impounding effects of the weir but is still far from its potential. Unconstrained flow is the ultimate aim for a river and weir removal, bypass or lowering, would improve the reach considerably. SX 63052 51610

Moving upstream a large deep pool (Figure 2) created by the impoundment sat within a sharp meander. The extra flow energies around the outside (RB) have created some channel diversity with a variety of structure and gravel sizes. Again, this would have far greater habitat value without the impoundment of the weir and would likely be poorer habitat during periods of low flow, rather than following a spate as witnessed.

The LB is well vegetated with a mix of tree species but the RB is suffering bank erosion particularly where banks are grazed bare.

Figure 3 A stand of alder coppice on the RB. Removing will only increase erosion on an already vulnerable bank. Laying some smaller stems (or felling and securing, as alder is inconsistent as a hinged tree) along the bank in a downstream direction, maintaining a number of single 'standards' will bring shade, roughness, refuge and bank protection while creating greater casting room for anglers. SX 63085 51638

A conversation was had about removing a stand of alder (Figure 3) to improve casting room. This would further reduce the minimal vegetation and increase bank erosion as a result.

A compromise would be to hinge (or fell and secure) some, but not all, of the coppice growth along the bank in a downstream direction. The single trees left will grow up, more akin to a standard, and the lain trees will create channel roughness, high flow refuge for fish and improved bank stability. See appendix.

A better result for angling access would be to remove the impoundment, thereby reducing the depth of the channel making wading easier. The increased flow will sculpt a smaller, deeper course within the main channel allowing more focused areas to target fish while providing shallow areas to stand.

Inadequate fencing on the RB is a concern throughout the reach. An electric fence sits a metre from the bank with a visible browse line just shy of the edge. Installing better stock fencing greater than five metres back from the bank will allow a diverse buffer to establish. With a protected buffer the benefits of biodiversity increase; reduced soil loss, improved bank stability and ultimately valuable channel shading will balance the minor reduction of grazing land and produce better in-river habitat and bankside habitat.

Some stands of Himalayan balsam (Figure 4) were growing. As an invasive plant, it out-competes native vegetation, leaving bare soils when it dies back in the autumn, making the banks even more susceptible to erosion. Though a catchment wide program of eradication is the best ultimate course of action, starting at the upstream limit and working downstream, it is still worth pulling plants as they appear throughout the year.

Figure 4 Himalayan Balsam was evident on the banks of the Erme. A catchment wide program of eradication from the top of the catchment down, is the best course of action, but seasonal removal should not wait until then. Pulling or cutting (cut close to ground level, below the lowest node, before flowering in June. A repeat cut may be needed, and the site revisited after 2 weeks to check for regrowth). SX 63085 51638

Figure 5 Mixed species of riparian trees stretching out across the river channel. SX 63085 51638

On the LB, stands of alder and sycamore lay across the water's surface (Figure 5). This provides excellent shade for photophobic species like trout and a supply of terrestrial invertebrates falling from the branches for them.

Figure 6 The hard revetment of where the side channel penstock once stood. SX 63085 51638

At SX 63085 51638 the penstock for the barge dock is visible on the LB (Figure 6). The hard construction is deflecting flow downstream unabated. In combination with issues upstream, this is likely exacerbating the RB erosion upstream of the Weir.

Figure 7 The well vegetated LB (note dilapidated fencing between trees) and the browsed RB. SX 63147 51628

Upstream at SX 63147 51628 similar issues exist with a browsed RB though the well shaded LB is a positive feature (Figure 7). Gaps in the LB tree cover show a dilapidated fence on the bank edge. Repairing or replacing this and moving back greater than 5 metres will help to reduce erosion pressures on the outside of the meander. There is the risk of erosion undermining mature trees creating a cascade of bank losses in the future. Though a natural process, this should not be accelerated through artificially bare banks due to stock browsing.

Figure 8 The 'confluence' of the paleochannel and the overly wide current course of the Erme. SX 63171 51656

At SX 63171 51656 the river widens dramatically with the appearance of a confluence though no stream currently enters here (Figure 8). It was later found to be caused by a combination of the paleochannel through the LB woodland and the end of an artificial bund running downstream from the bridge.

Figure 9 The LB field is heavily browsed, not limited by the strand of electric fencing. This reduction of bankside vegetation is causing increased erosion and a degradation of habitat quality. Better stock fencing situated more than 5 meters back from the river will improve river habitat quality and erosion rates. SX 63140 51721

Single strand electric fencing close to the bank, is only preventing cattle poaching (Figure 9). The banks are browsed as heavily, as the field behind, preventing species diversity and deeper-rooted plants from establishing and holding the soils together.

Lateral erosion is a natural river process. An equilibrium of erosion and deposition at bankfull flows allows the creation of the most efficient channel, something that all resident flora and fauna have adapted to inhabit.

The sudden increase of erosion (in this case caused by stocking and insufficient fencing) in one place, temporarily upsets this equilibrium, potentially causing knock-on issues elsewhere and reducing habitat quality as a result.

Figure 10 The start of the 'Sanctuary Zone'. Fallen trees have been left in the channel and fish were finally seen. SX 63157 51780

At SX 63157 51780, tree cover on both banks begins to increase with a number of fallen trees left in the channel (Figures 10 and 11). This was described as a sanctuary zone and the only trout of the day were witnessed here. The value of this fallen wood was clear as all fish witnessed swam out from behind these structures, including a large trout of at least 400 millimetres. This benign neglect is to be applauded but volumes of wood in-channel could be increased to build even better habitat.

Figure 11 Good wood in the channel on both banks. The overwide and shallow channel here will benefit from increasing the size of such structures and accepting the resulting lateral erosion. SX 63169 51805

Figure 12 Downstream of Sequers bridge, the channel is straight, overwide and uniformly shallow. The small trailing branches on the LB were holding the only trout witnessed on the survey. Note stone revetment to the RB. SX 63188 51847

The channel form in this area (SX 63188 51847) was unnaturally straight (Figure 11), held back by stone revetment on the RB and a bund on the LB. It was also overly wide and shallow with uniform bed depth. This 'motorway' of flow is also a contributing factor to the erosion witnessed at SX 63140 51721 as all the energy moves swiftly through this section before hitting the RB.

Allowing some lateral erosion on both banks to build back some meandering would bring a number of benefits;

- An increase of bank length.
- Reduced erosion.
- Better habitat.

Should this include breaking the LB bund, it would also improve connection to the small flood plain and paleochannel, creating a wet woodland habitat thereby reducing conveyance.

Again, the impoundment of the weir is also contributing to reduced habitat quality. Removal will increase flows allowing a natural 'low flow channel' to establish. This will likely wind its way within the current, overwide channel maximising habitat value for the entire fishery.

Figure 13 Younger trees on the RB could be pulled over into the channel in a downstream direction. The resulting pinch of the channel will scour out deeper pools, bringing much needed

channel diversity to this reach. Allowing lateral erosion into the LB will bring a more natural, meandering form, in turn reducing erosion forces downstream. SX 63188 51847

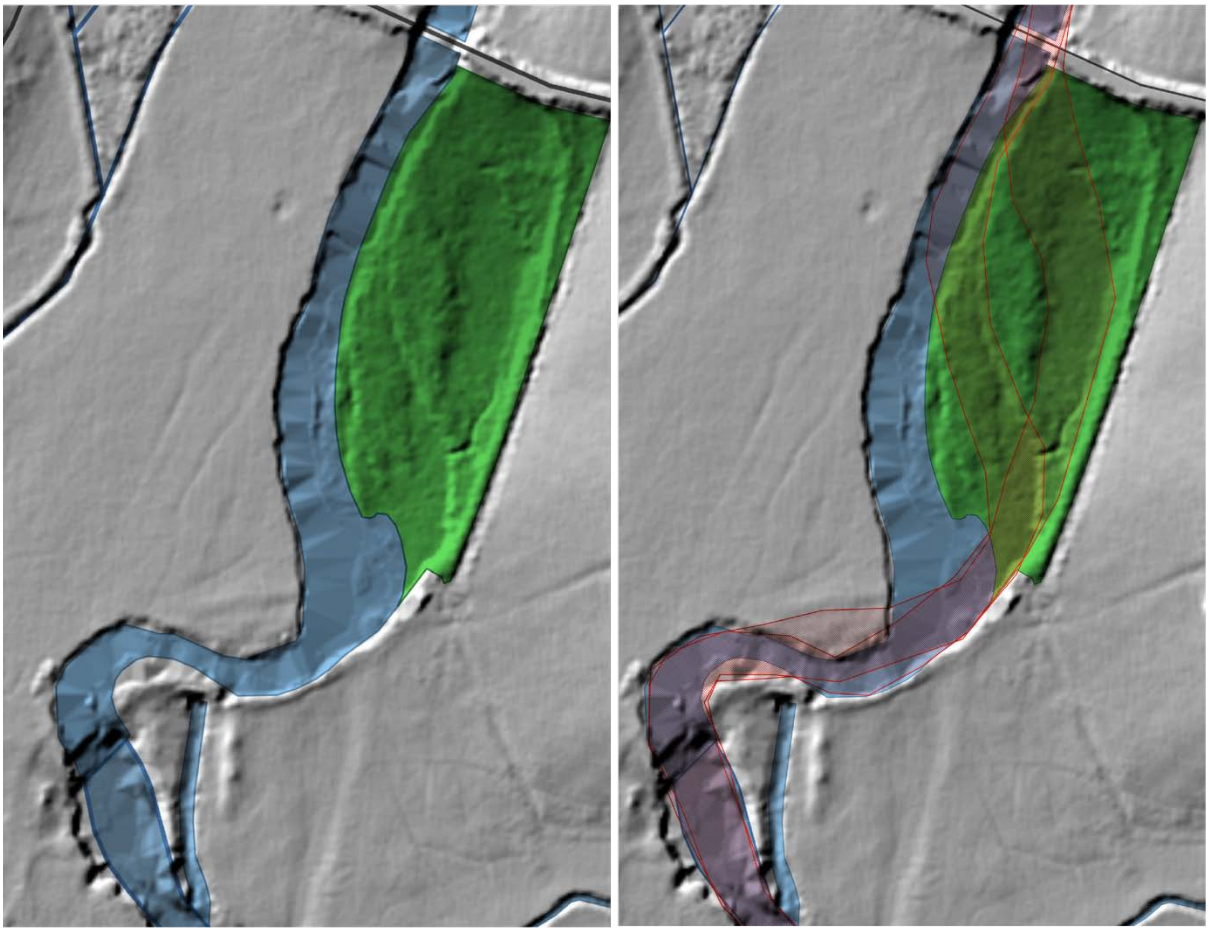
To begin with, there are a number of young ash that could be toppled into the channel from the LB (Figure 13). Investigations to scrape back the LB bund and remove the RB revetments should be undertaken to fully realise a restoration in this area.

Figure 14 The suspected paleochannel found within the. RB woodland. Examinations of LiDAR DTM data and old maps, confirm this assumption. SX 63206 51751

Walking into the woodland to investigate the bund, a clear paleochannel was discovered. A winding channel, holding a little water (Figure 14), courses through to SX 63171 51656. Works to the bridge likely included the downstream straightening and bund, disconnecting this area from flow.

Re-establishing a route through the woods would bring the river instantly to the trees something that is much more immediate than growing new trees next to the river.

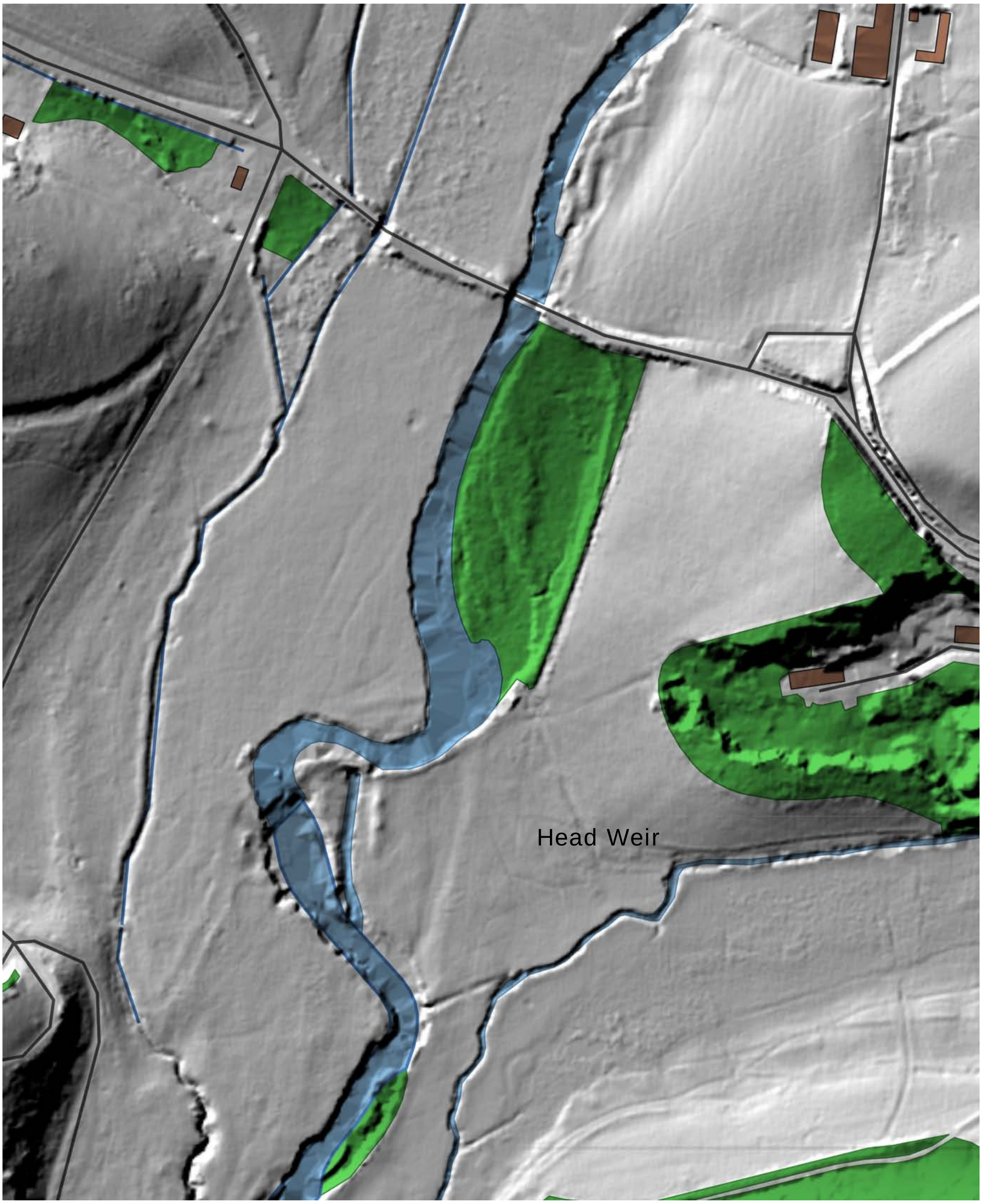
Given the SSSI status of the site (and other designations), such a scheme would require consultation (with Natural England) to ensure the features for which the SSSI is designated were enhanced or as a minimum, undamaged. Regardless removing the bund (in at least one area) will wet the paleochannel in medium to high flows allowing a wet woodland to establish and fine sediments to drop out, improving water quality.



Map 2 (Left) LiDAR Digital Terrain Model and right with likely paleo channels highlighted. Note how the straightening of the reach downstream of the bridge is slowly forcing the river form in a southerly direction into the valuable arable land.

Tidal Reach

The tidal reach below the weir was surveyed with random spot checks and was found to be of good, natural, unconstrained form. Good balance of shading and riparian vegetation were seen with some wood lying within the channel. The interrupted bedload caused by the weir is the likely cause of some incision witnessed and visible in LiDAR data (Map 3), something that would be improved with weir removal or bypass. Despite this, the habitat value was reasonably good and should be maintained as is, with little to no intervention.



Map 3 LiDAR of the area of the report. Note the deeper, steeper banks of the channel immediately downstream of the weir in comparison to the banks upstream. This is likely due to incision caused by an interrupted gravel supply.

Small Stream

Map 4 A poached area of one of the small streams that run through the estate (SX 62986 51472).

Small streams such as this should not be ignored as they hold significant spawning potential. Clean gravels are required for successful spawning and excessive fine sediment inputs will suffocate eggs preventing such success. Poaching from cattle, being given unrestricted access to the stream, has caused a significant amount of fine sediment to settle on the bed.

Creating a buffer either side of the stream, with appropriate fencing, will prevent stock access and filter other run off. The increased diversity of bankside vegetation would also greatly enhance juvenile salmonid habitat. Cattle drinkers could be installed to organise specific sites for their water, but other solutions such as pasture or solar or mains pumps would be a better and safer investment, particularly if water was held in header tanks and drawn down to troughs when/where necessary.

Recommendations

Impounded reach

Though many statutory designations are in place; SSSI, AONB, Register of Parks and Gardens of Special Historic Interest, some of which may hinder complete river restoration, the grandest plan should still be a goal to aim for.

Working from the bridge, downstream;

1. Remove revetment allowing some lateral erosion into the RB, complementing it with a narrowing of the channel on the opposing bank. the latter could be achieved by pulling over young to medium age trees, back filling gaps with coarse woody material from the arisings or other nearby material.
2. Scrape through the bund to allow access to the woodland paleochannel in moderate flows. This will begin to re-sculpt the old channel.
3. Hinging (or fell and secure) alder in a downstream direction along the bank, leaving a few large stems to grow on into ‘standards’.
    a. Failed hinges (alder is inconsistent at holding its hinge) can be secured with cable or even lodged.
        i. See appendix.
4. Weir removal or bypass: The river is attempting to find its way past the Weir on the RB. Allowing this erosion will eventually breach, giving back an unconstrained path to the sea, retaining the weir structure and any heritage value it may have. A more expensive but immediate solution would be to remove the weir but investigations as to the effect of lowered water levels and river bed regrading of the reach below the bridge would be needed.
    a. The cheapest and safest solution would be a gradual approach, either staged reduction (with total removal the ultimate goal) or gradual degredation and bypass.
5. Buffer fencing throughout. With the introduction of Environmental Land Management Scheme (ELMS), payments for increased riparian buffers are likely and could partially offset the reduced grazing land. Biodiversity, bank stability and river habitat improvements will add yet more Natural Capital value.

Tidal Area

The tidal reach needs little proactive management and should be maintained as-is as much as possible. Lateral erosion and fallen trees are all natural processes in such an unconstrained (apart from the reduced sediment transport caused by Head Weir) channel. Allowing such meandering and leaving fallen wood in the river will maximise the potential of the reach.

Small Streams

All the small streams seen were suffering from cattle poaching pressures. Establishing a better formalised watering of livestock will reduce fine sediment issues and contribute to the spawning potential of the catchment.

Making it Happen

The WTT may be able to offer further assistance:

- WTT Project Proposal - further to this report, the WTT can devise a more detailed project proposal report. This would usually detail the next steps to take and highlight specific areas for work, with the report forming part of an Environmental Permitting Regulations application.
- WTT Practical Visit - where recipients are in need of assistance to carry out the kind of improvements highlighted in an advisory visit report, there is the possibility of WTT staff conducting a practical visit. This would consist of 1-3 days' work, with a WTT Conservation Officer teaming up with interested parties to demonstrate the habitat enhancement methods described above. The recipient would be asked to contribute only to reasonable travel and subsistence costs of the WTT Officer. This service is in high demand and so may not always be possible.
- WTT Fundraising advice - help and advice on how to raise funds for habitat improvement work can be found on the WTT website - www.wildtrout.org/content/project-funding
- In addition, the WTT website library has a wide range of free materials in video and PDF format on habitat management and improvement:
- 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 stocks and managing invasive species.
- The DVD is available to buy for £10.00 from our website shop or by calling the WTT office on 02392 570985.

Acknowledgement

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.

Disclaimer

Appendix

Hinged Woody Material

Figure 15 Hinged willow on the River Test. Hazel, small willows and small alders can be hinged into a river, creating diversity of flow and in-stream cover for fish. The trees are hinged in a similar manor to hedge laying, where the tree is partially cut through at the base and laid into the margins. Chestnut stakes and fencing wire can be used to secure the trees in place. Willow will survive perfectly well even with 70% of the branches submerged; however, hazel and alder should be laid to retain much of the structure above water level.

Figure 16 Another example of a tree successfully hinged into the margins of a river to improve habitat diversity.

Lodged Woody Material

Figure 17 Lodged woody material, the most natural of methods to mimic naturally fallen trees, wedged in another tree to secure it with no other materials required.

Weirs and their impacts

Weirs create a wide range of detrimental impacts upon the form and function of our watercourses, often significantly degrading the quality and connectivity of the habitat they support.

They impound water, reduce flow diversity and often create extended stretches of slowly-moving and/or uniform water that is detrimental to flow-loving species. These conditions may temporarily provide deeper-water habitat for limited numbers of adult trout and certain other species (until the deep water inevitably fills with sediment), but are generally unsuitable for many beneficial invertebrates, and gravel spawning fish, fry and juveniles. Weirs of all sizes also create obstacles – sometimes complete barriers – to fish passage, preventing many species from moving up and down rivers freely to fulfil the habitat requirements of their different life stages.

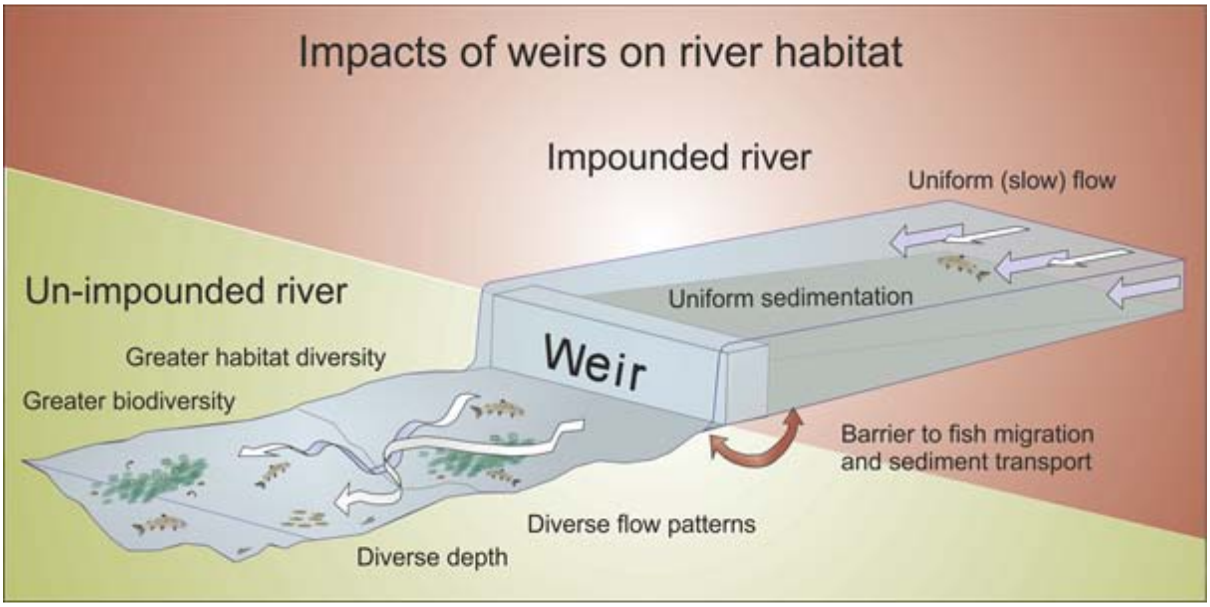


Figure 18: An illustration showing the impacts of weirs on habitat quality

Within the reduced energy and gradient of an impounded reach, fine sediment carried in suspension drops out of the water column uniformly across the stream bed, where habitat quality and diversity become severely degraded (Figure 18).

Weirs also interrupt the natural transport of coarse river material like gravel and cobble (Figure 19). This can cause the river downstream to become depleted of sediment, and can increase bed and bank erosion downstream as the supply of gravel and cobbles from upstream is interrupted.

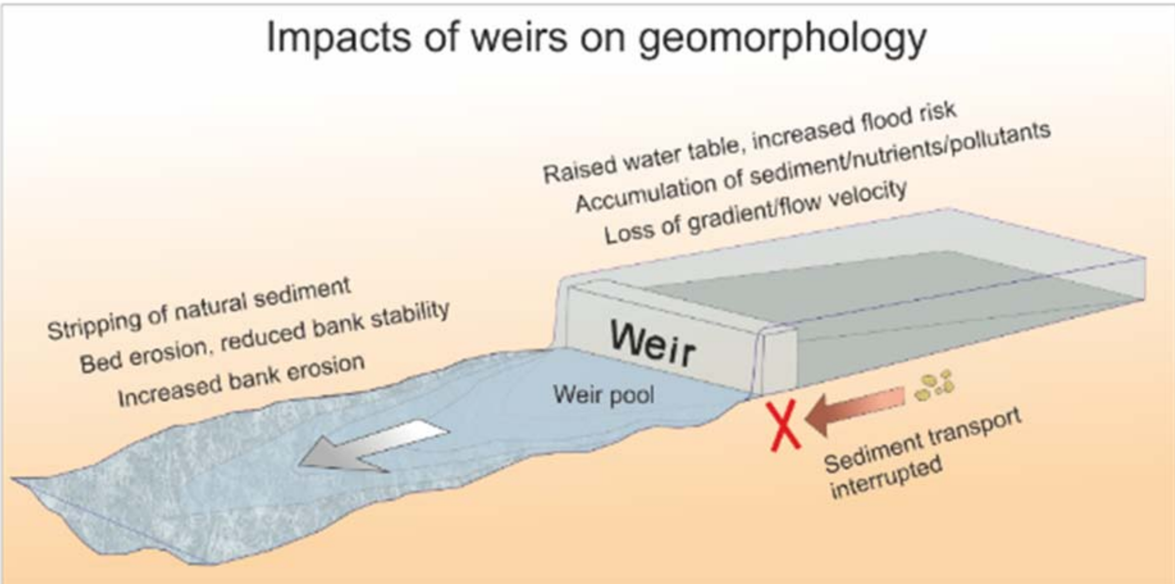


Figure 19: An illustration showing the impacts of weirs on river geomorphology

The impact of weirs and other obstructions is cumulative, with the habitat degradation and fragmentation issues massively amplified as the number of obstructions increases. More information about weirs, and the benefits of removing them, can be found on the following links:

https://www.wildtrout.org/content/weirs-culverts-and-barriers

http://urbantrout.blogspot.com/2018/02/why-presume-to-remove-weirs-with-river.html

https://www.americanrivers.org/threats-solutions/restoring-damaged-rivers/how-dams-damage-rivers