WILD TROUT TRUST

Upstream Extension of Sid Advisory Visit

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River Sid Devon

This report is the output of a site visit undertaken 29 November, 2022 by Bruno Vincent of the Wild Trout Trust, along the River Sid in Devon, at the request of the Sid Valley Biodiversity Group. It forms an extension to a previous Advisory Visit by the same author dated 19 April, 2021 which can be found here . https://dulavx8rjuiml.cloudfront.net/avreports/BVSidAV_2021-10-18-102137_ivev.pdf

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. Lat:Long reference system is used for identifying locations.

A complete interactive map of the walkover data from both visits can be found here.

https://storymaps.arcgis.com/stories/01f4384eb3904ddca9b87a71bc1af935

Catchment / Fishery Overview

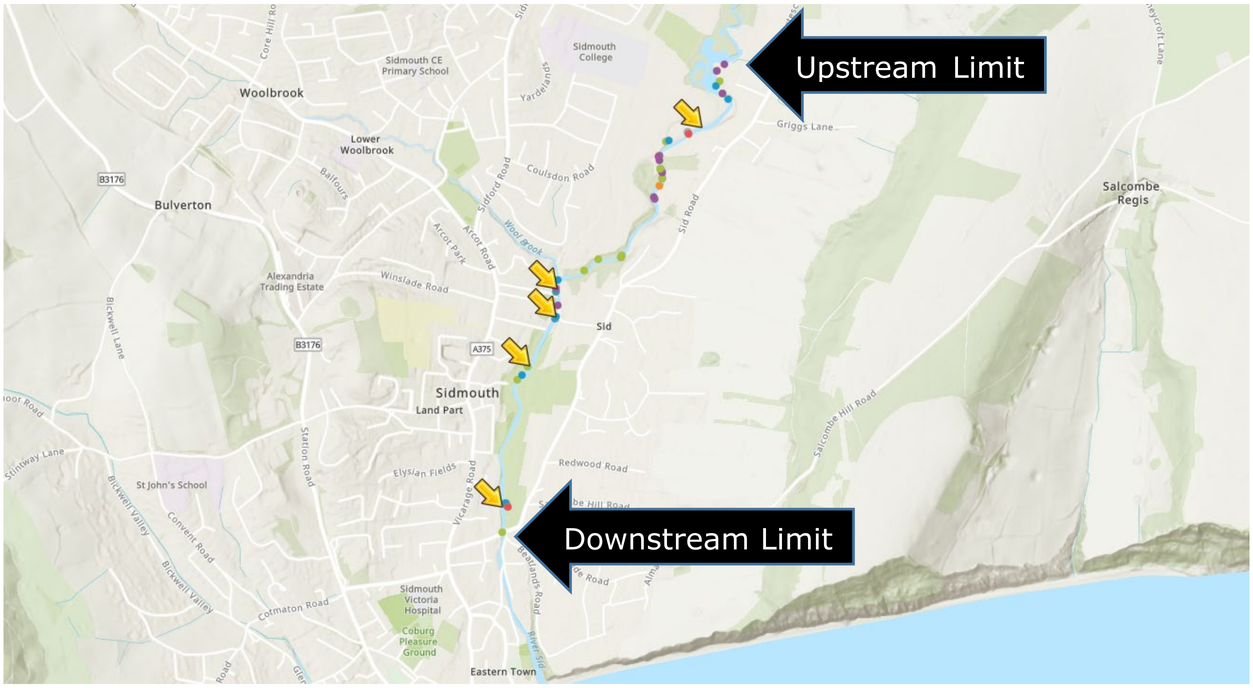
The River Sid drains a catchment of *c*3900ha over its 16km length. Rising around Burnt Common to the East of Ottery St Mary, it flows south, through the village of Sidbury, to the town of Sidmouth where it discharges into the English Channel. The Sid has three main tributaries: the Roncombe Stream, the Snod Brook and the Woolbrook.

Artificial straightening above Sidmouth has disconnected the river from its floodplain and energised the channel. Historic milling and land creation are the primary reasons for such straightening. Though milling has ceased, the densely populated town of Sidmouth has spread onto the floodplains.

The previous report recommended greater channel sinuosity to add length to the river, thereby reducing gradient. This assessment was challenged by the Environment Agency (EA) geomorphologist on the basis that the high energy river and lack of space on the floodplain would lead to channel instability and excessive rates of erosion if re-meandering were attempted.

The lower Sid is therefore locked into its incised setting and so interventions must work to try to improve the current situation, not re-engineer it.

Habitat Assessment



Map 1 An overview of the entire reach inspected in both walkover visits. Yellow arrows indicate major weir locations

The habitat observed was similar to that downstream and covered in the previous report. Deeply incised and straight with numerous check weirs to arrest the gradient.

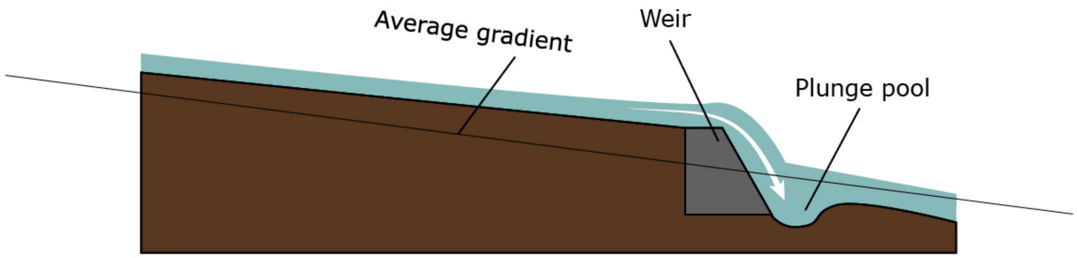
Another large weir, called Fortesque Weir, presents a total barrier to upstream passage of salmonids. Many other smaller check weirs were also observed. The majority of the channel was artificially straight and constrained with little or no accessible floodplain.

The top of the reach bordered a geomorphologically diverse habitat with dynamic meanders through a wooded plain. As mentioned in the previous report, the over-steep gradient, caused by straightening, is drawing excessive volumes of sediment downstream, causing incision and eventually losses of the upstream habitat.

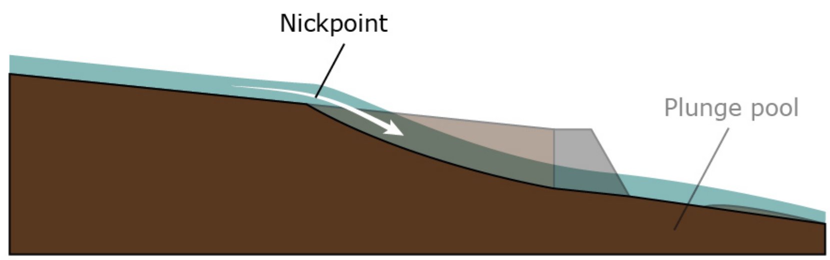
This effect is creating what is known as a nickpoint; broadly, a sharp change in the gradient in the river. It can be caused by underlying geology as in the case of a waterfall, which remains relatively unchanged due to the harder upstream bedrock. In the case of man-made changes affecting geomorphology, such as weir removals or channel straightening, the nickpoint migrates upstream, essentially in an attempt to even out the created gradient change.

As shown in the diagram below, this is achieved by bed level erosion (where possible) and either bank slumping (as a result) or bank erosion due to the increased velocities.

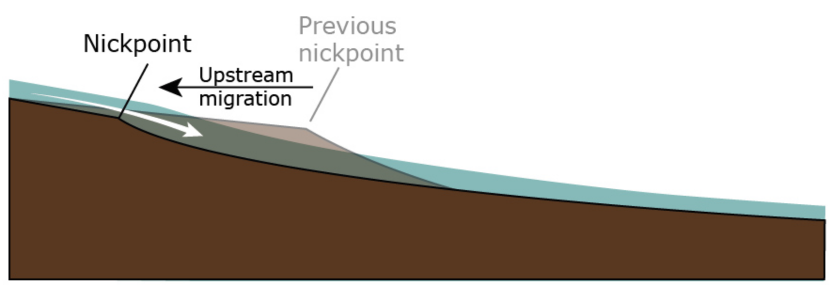
Essentially, the altered river downstream pulls material from upstream in an attempt to achieve a natural gradient.



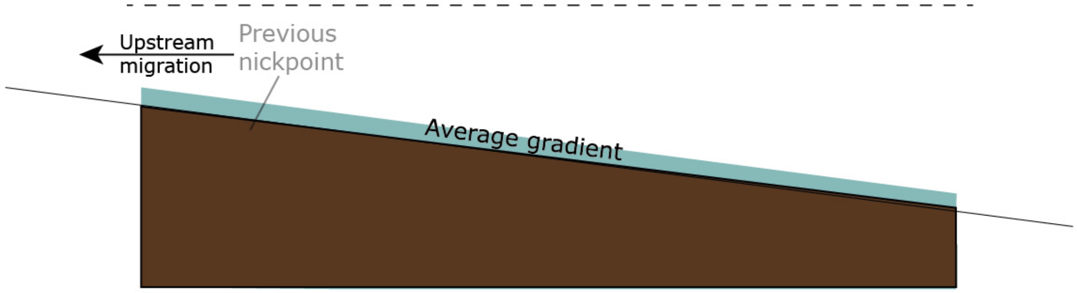
Weir arrests gradient creating a step between regions of lower gradient at different heights.



Removal of the weir washes sediment, previously trapped behind, downstream, filling in the plungepool. This creates the nickpoint.



Increased flow at the nickpoint erodes the bed, essentially allowing the nickpoint to migrate upstream through redistribution of sediment.



Eventually equilibrium is found and the gradient becomes stable.

The diverse and geomorphologically complex reserve upstream of the inspected reach may, in time, be drawn downstream, providing sediment to equalize the gradient. However, with such a straightened, steep channel to the sea, such sediment is not given sufficient opportunity to deposit in the river, passing through to the sea.

Map 2 A LiDAR map of the naturally meandering river above the reach inspected. The red shape roughly indicates the route of the channel on the day of visit. The isolation of the old meanders to the west is not uncommon, but the pace of change and sudden loss of habitat diversity is cause for alarm.

The many check weirs along the Sid are evidence of attempts to interrupt the extreme gradient and hold sediment somewhat in place. As such, they must remain in place and only be manipulated in such a way as to increase fish migration.

Adding new large boulders to existing structures could also be employed to maintain (or marginally increase) their individual heights whilst adding flow diversity and reducing the gradient over the weir. With care, this could be done without significantly impacting the passability of each weir for fish.

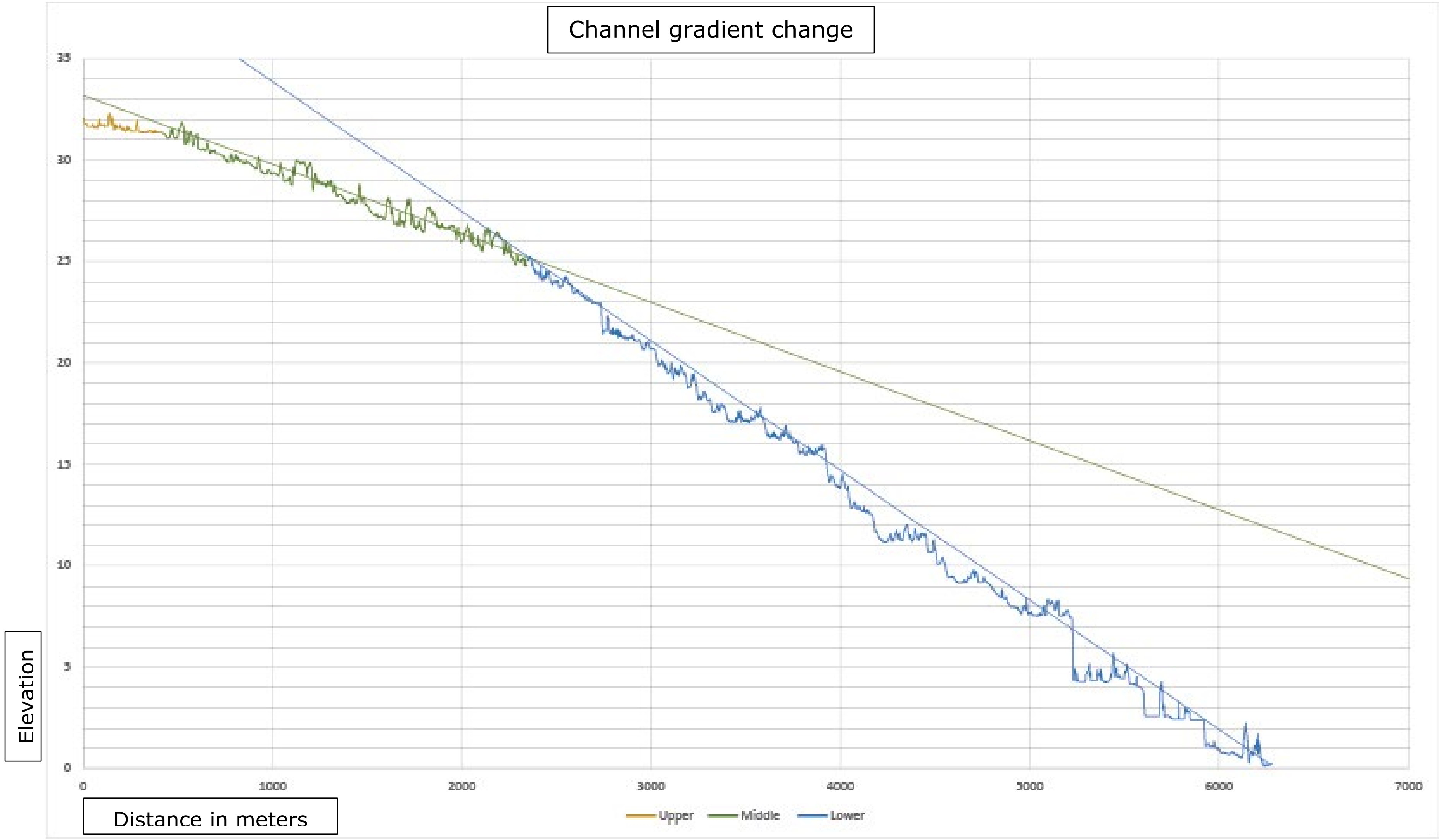


Figure 1 The profile of the Sid from the A3052 bridge to the sea. The green trend line indicates the average gradient through the meandering reserve, with the blue trend line showing approximately twice the rate of fall downstream. Spot heights taken from LiDAR DTM along channel.

The rapid morphological changes have deposited large amounts of sediment on what was recently the main channel. The fine sediment accumulating here has apparently carried buddleia seeds, which are now flourishing.

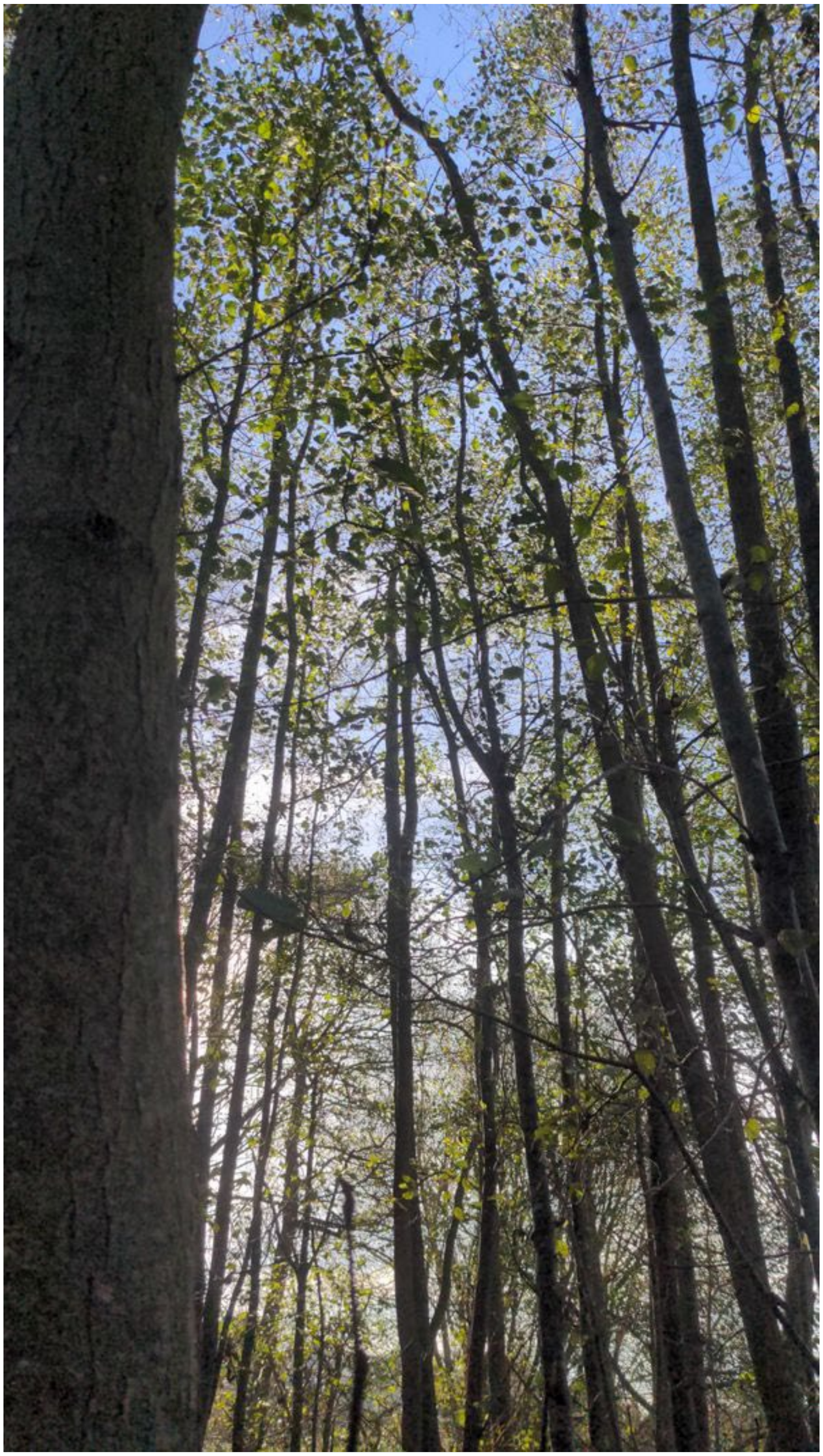
50.69690866 -3.22586566

Apparently, a new channel route as of one week ago, although map data suggest it has taken this course previously. The steep gradient is visible here, only arrested by small outcrops of bedrock.

50.69672992 -3.22620241

A fallen tree is restricting the channel, with the potential to cause erosion on the LB, but this has been accepted and will find old channels within the wooded section downstream. The channel diversity this has created is adding to the habitat value, but similar man-made interventions must be sensitive as the lateral erosion they may cause could create unwanted land loss.

50.69672933 -3.22620117



Very tall and cramped tree growth on relief/paleochannels. This needs thinning for tree health, but arisings could be used as large woody material in channel to disrupt sediment transport.

50.69644061 -3.22605739

Though pleasingly unkept with trailing cover, the channel gradient is extreme and pulling itself straight. With plenty of accessible floodplain in this area, adding woody debris to the channel will help hold back gravel, creating better habitat and improving floodplain connectivity. This alder will soon end up in the river and presents as a good opportunity to hinge D/S into the margin.

50.6963007 -3.22622681

Reasonable instream habitat but the high levels of coarse and also fine sediment suggest this area is changing fast.

50.6960632 -3.22592355

Plenty of channel diversity, but significant tree loss is likely through bank collapse. Though this will provide habitat and structure to absorb energy, it is symptomatic of a rapidly changing river course. Again, another candidate for hinging D/S.

50.69606559 -3.22591796

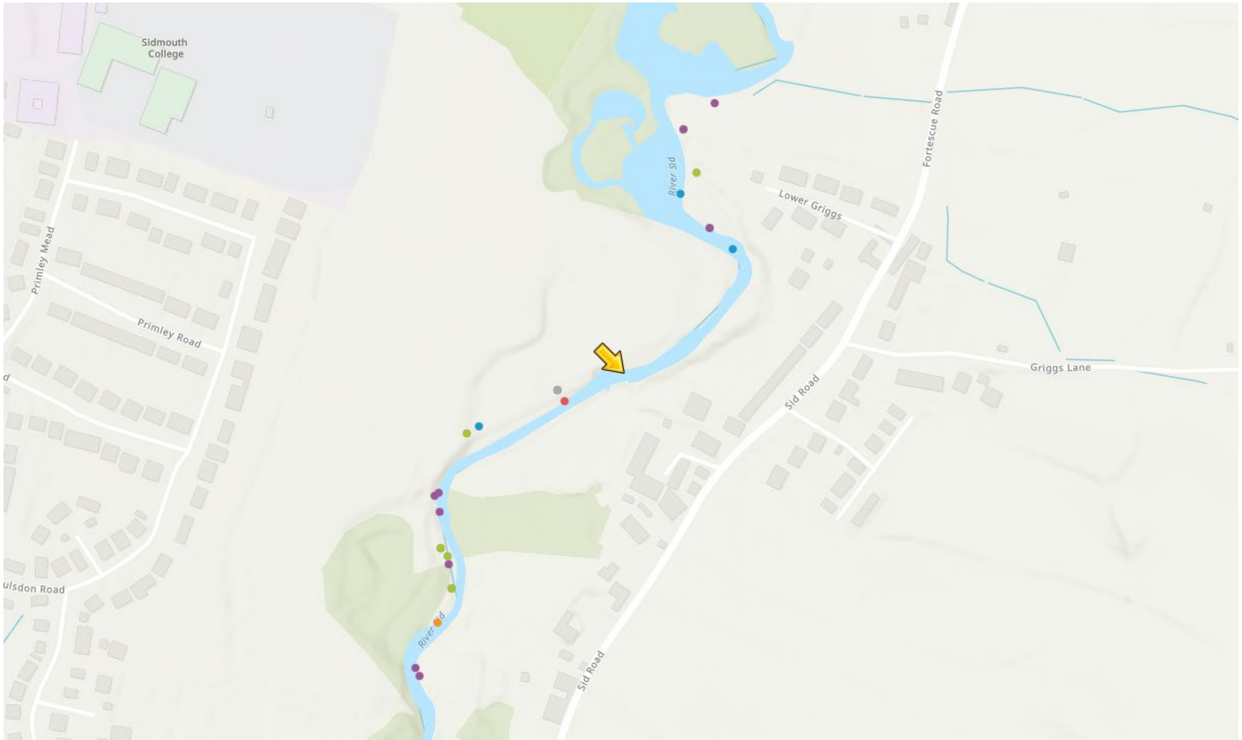
A swing bench sits on a patch of land that is at risk from erosion (red circle). Green engineering in the form of a brushwood or LWD structure could protect this land whilst providing habitat and refuge, but ultimately the river is on a course toward the edge of the LB floodplain.

50.69592165 -3.22566722

Fortesque Weir

Not accessible due to the construction site, a large weir, ~1.5m height is seen upstream. This is considered impassable to fish passage and will have a negative effect on natural river function. Equally, it is holding the extreme gradient in check and so is likely essential. Sadly, the new bridge had presented an ideal opportunity to either address the weir or at least design a bridge around future alteration. Efforts should be made to find the best solution.

50.69489954 -3.2274672



Map 3 Map showing the location of Fortescue Weir (yellow arrow).

A drawing of the new Skinners Farm Foot Bridge.

50.69497305 -3.22754045

Plan view of the Skinners Farm footbridge.

50.69497362 -3.22754271

The proximity of the bridge and its footings to the weir upstream exclude the most favourable solutions for fish passage and natural river function. However, establishing dialogue with the bridge engineers is encouraged to layout a feasible scope of alteration.

As a ‘loose structure’, the weir could be better engineered. The ford upstream and the bridge downstream might add complexity to any fish passage solutions, but consultation should be instigated. Once the construction site is opened, closer inspection will be needed.

A straightened and incised two stage channel. The edges of the original flood plain are visible on the RB (not clear in photo) suggesting that the river is sitting ~1m below its historic level.

50.69472895 -3.22837358

A small check weir that poses little impedance to migratory fish. However, it is an unnatural structure, designed to slow sediment transport; as such it could be improved with greater variance in flow paths.

50.69468329 -3.22850652

Another small structure, though difficult to photograph, it appears to have broken up over time. This could be beneficial in terms of natural river function, but detrimental due to increasing erosive forces on the bed.

50.69427707 -3.22880583

Despite sweeping through a couple of reasonable bends, the river still drops at an alarmingly fast rate. This check weir is likely necessary to interrupt the gradient and thankfully represents a rock ramp formation that would be OK for fish passage. It could be improved with the movement of select boulders though this should be analysed in lower flows.

50.69425912 -3.22885055

Very similar to the previous photo, this check weir is more akin to a rock ramp. Careful replacement of some boulders, with a test, evaluate and reiterate process will maximise the potential for easy fish passage.

50.69415324 -3.22878967

Looking upstream at a cascade of four weirs, including the previous photos. This also marks the upstream limit of the previous Advisory Visit walkover.

50.69385314 -3.22870742

A good example of how large in-channel structures can have a larger downstream effect. The two boulders mid-stream have reduced energy enough to allow a gravel bar to form mid-stream. For the most part, the river inspected was without much complex structure (other than the check weirs), leaving homogenous habitat along much of the reach.

50.69340028 -3.22881147

An outfall that was previously unnoticed. Investigation as to its purpose and necessity is advised.

50.69096538 -3.232263

A fallen willow lies across another boulder weir. Though not visible on the far bank due to access, it is likely sending greater flows over the LB half of the weir. This should improve migration potential in lower flows, but will likely cause unwanted erosion on the LB.

50.69128848 -3.23161272

Recommendations

- Commission a Fluvial Audit, to identify where the source of nick point erosion is occurring.
- Add imported boulder to weirs in combination with manipulation.
- Assess Fortesque Weir once bridge construction is complete
- Add LWM to increase channel diversity and increase hydraulic roughness.

Disclaimer

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