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Advisory Visit
River Penk, Perton (Revisit 2021)

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River	River Penk
Waterbody Name	River Penk from source to the Saredon Brook
Waterbody ID	**GB104028046680**
Management Catchment	Trent Valley Staffordshire
River Basin District	Humber
Current Ecological Quality	Poor
U/S Grid Ref inspected	SO8733299653
D/S Grid Ref inspected	SJ8593500118
Length of river inspected	1.8 km

1 Summary

- *Riparian vegetation associated with the urban River Penk has experienced regeneration (in some cases supported by planting activities following previous Advisory Visit reports) and growth which is perceived very differently by local stakeholders*
- *Broad distinctions can be made between parties who advocate tidying/removal of vegetation versus those valuing the biodiversity benefits associated with a structurally-diverse flora.*
- *Wellbeing benefits of green-space* ***may*** *be related increased biodiversity. HOWEVER, those benefits rely on visitors being able to notice and recognise the different varieties of plant and animal present. Interpretive signage can highlight that diversity and increase the probability of achieving benefits to society.*
- *Significant and extensive constraints continue to act on the ecological health and diversity of the watercourse – principally arising from hard-engineering of the channel, lack of physical variety, the presence of a series of online lakes (imposing both barrier and elevated nutrient-level impacts) and overall water quality*
- *Quantifying both the flood-risk and ecological benefits of re-meandering (with floodplain reconnection) of an identified section of the Penk is necessary to arriving at a true cost/benefit assessment*

2 Introduction

The Wild Trout Trust were invited by representatives from Wild About Perton to give follow-up advice on a section of the River Penk previously visited in 2017, in light of developments subsequent to advice from that time. Throughout the report, banks are designated as right (RB) and left (LB) while facing downstream and locations are specified using the National Grid Reference system.

2.1 Background

Following previous Advisory Visit reporting, some light coppicing has been undertaken. Though not explicitly linked to coppicing, certain sections of the watercourse have also generated additional riparian growth of small trees/shrubs and a range of understory plant species. Local perception of the vegetation regeneration is markedly divided between "for" and "against" camps.

3 Habitat Assessment

The reach assessments are reported, sequentially, in a downstream progression from the road bridge at SO87332 99653 (Fig.1).

Figure 1: River Penk emerging from beneath Yew Tree Lane road bridge.

Nitrate levels are reported to be elevated but not phosphates based on citizen science monitoring. Similarly, volunteer invertebrate monitoring records very high numbers of *Gammarus* (freshwater shrimp) and also some *Baetis* (olive mayfly) larvae as stand-out observations. The tree canopy (Fig. 2) will be an important source of leaf-litter for the *Gammarus* – given their status as important stream detritivores.

Figure 2: As well as deciduous leaf-litter, areas of dense tree canopy provide important cool-water refuge habitat for small, shallow streams during warm weather.

Areas that, following previous Advisory Visit work, are now used for engagement activities (including invertebrate sampling with local schoolchildren) have also received some supportive planting by Wild About Perton members (e.g. Fig. 3).

Figure 3: Unmown buffer strip with some supportive planting of riparian vegetation. Prominence of nettles is consistent with elevated nitrate levels.

Examples of habitat potentially suitable to gravel-spawning species were noted at SO8717799729 (Figs. 4 and 5).

Figure 4: Small scour-pool created by the pinch-point maintained by vegetation-consolidated banks

Figure 5: Gravel deposit arising from localised bed-scour which created the pool – potentially providing gravel-spawning species with an opportunity to breed.

The heavily armoured/artificial riverbed channel downstream (Fig. 6) contains vegetation growth which is of concern to local residents. However, the incised nature of the channel below the level of the flood plain actually creates a large volumetric capacity.

Figure 6: Artificial channel with heavily rock-armoured bed. The straightened channel serves to divert the watercourse past residential buildings across the road from the RB.

As just one example of heavily-engineered channels noted during these visits, the biggest constraint on ecological quality is the completely straight, uniform channel which has little potential to create varied habitat structures. The land bordering the LB appears to have the space to accommodate a significantly more meandering channel. However, discussions around such river restoration work (which would also deliver flood-risk mitigation) appear to meet with resistance on the basis of costings.

In terms of concerns over flood risk posed by in-channel and riparian vegetation, the presence of a trash screen covering the culvert entrance (and the culvert capacity itself) at the downstream end is likely to pose the most significant limitation on flood-water conveyance (Fig. 7). In addition, the extremely incised nature of the channel affords no opportunity for floodwater storage in the space available alongside the LB. Instead flood-flows are encouraged to race directly into the pinch-point of the culvert.

In addition, the housing on the RB seems likely to have been built over the historic course of the Penk. Consequently, during high rainfall, it is common in such scenarios for the surface water to attempt to follow that original pathway of the watercourse. Those elements are far more likely to be significant factors in determining the risk of flooding of those adjacent properties than maintenance of a completely smooth, artificial drainage channel. Removing some of the material forming these steeply-incised banks would create flood storage capacity with a restored stream flowing through the middle. This would create significant local (and downstream) flood-risk-reduction benefits.

Figure 7: Trash screen and culvert entrance - note the diameter of the culvert relative to the "bank full" cross-sectional area of the incised channel. Re-meandering upstream of this culvert and simultaneously improving connectivity with the available floodplain would provide significant ecological benefits while reducing flood risk and creating a stream that is of high amenity value, rather than a ditch.

Figure 8: The grassed area pictured to the right of the channel (true LB) is potentially space available for re-meandering and floodplain re-connection opportunities.

Confirmation of the following via formal hydrological modelling would provide a true characterisation of flood risk:

- Relative influence of culvert capacity versus channel "roughness" and other factors to flood risk at this location
- Impact on return period of flooding for adjacent properties if the channel was re-meandered and re-connected with the (non-residential) flood plain adjacent to the Left Bank (Fig. 8)
- Overland flow pathways can be modelled to assist in quantifying flood risk to properties under each scenario

Obtaining the above information would be essential to resolve debates on flood risk (or flood benefits) associated with the in-channel vegetation – and potential benefits of re-meandering and floodplain reconnection.

Moving to a downstream location where the Penk emerges from another culverted section to discharge over a perched headwall (Fig. 9).

Figure 9: Lake inlet receiving the River Penk as it emerges from culverting.

Installing a kind of "mini rock-ramp" to mitigate this barrier may significantly improve longitudinal connectivity for fish. However, passage through the culvert would also need to be assessed in order to inform on the value and scale of any undertaking to improve fish mobility.

After skirting around the lake to the outlet, the concrete bed of the outlet channel was immediately apparent. The smooth, uniform surface provides very little opportunity for diverse communities of plants and animals to thrive (Fig. 10).

Figure 10: Just inches deep and flowing over a smooth, flat concrete bed at SO86129 99823 – very poor habitat for most stream organisms.

In the absence of the encroaching vegetation (Fig. 10), the situation would be even worse from an ecological perspective. Similarly, the re-colonisation of the channel since previous the Advisory Visit to this site (Fig. 11) is providing the main ecological benefit to a concrete drainage chute.

Figure 11: Vegetation recolonising the artificial drainage channel that forms the River Penk at SO 86091 99847.

However, local opposition exists even to plants growing within the comparatively open stretches - such as those shown in Fig. 12.

Figure 12: More open section of channel - which still draws complaints requesting vegetation removal.

Part of the explanation of this could be found in research suggesting that wellbeing benefits from exposure to nature depend on the species identification abilities of people using green spaces (e.g. Dallimer et. al. 2012 "*Biodiversity and the Feel-Good Factor: Understanding Associations between Self-Reported Human Well-being and Species Richness*" Bioscience, Vol. 62 (1) pp. 48-55). In other words, if an individual's perception of the variety of species encountered in an area falls well below the actual variety present, then the link between biodiversity and wellbeing is broken.

The above observation implies that interpretive signage to draw attention to the variety of plant species present (and the associated, dependant fauna) may help to provide an objective view of the ecological value of the Penk. However, the vegetation under discussion still exists within the context of a (physically) severely-degraded and artificial drainage channel. The natural limit imposed on biodiversity by straight, uniform, concrete channels cannot be ignored and any step-change in improved biodiversity would require significant stream restoration interventions. Investigations of what lies beneath the concrete bed would be a first step in breaking out that channel to enable a more natural and diverse channel to be formed.

Further perceptual improvements may be possible to achieve by the capture and removal of wind-blown litter entering the outflow from the lake. One option may be to string a simple floating trash-boom across the entrance to the outflowing channel. With regular volunteer retrieval/recycling/disposal of such litter, the aesthetic appeal of the channel (and lake) could be improved.

Although still forced to follow an artificial course downstream of the channel shown in in Fig. 12, there is a return to more natural substrate. In this area some light coppicing has been carried out (e.g. Fig. 13).

Figure 13: Coppiced riparian tree at SJ85935 00118.

Further diversification of the habitat in this reach could be achieved by laying coppiced trees at an angle across the channel. Keeping the thick end of the trunk on the bank (and if necessary anchoring to its stump) and wedging/keying the crown end into the opposite bank would be a useful mimic of natural, stable dead-fall. The angled gap below the trunk would encourage localised bed-scour and increase the structural variation in the habitat. Ensuring that trees lay at a slight downstream angle would favour material deposition at the downstream end of such structures. This helps to avoid the gap beneath the trunk from becoming blocked.

Maintaining a number of access points (via mown “rides”) to the river banks through a, generally, unmown buffer strip may help to foster engagement with the watercourse. Again, pairing such access points with interpretive signage could help to achieve the best wellbeing and appreciation gains for the watercourse. Maintaining at least a 1-m unmown buffer-strip running parallel to the stream would control bank erosion and also maintain good cover habitat for aquatic species.

Further downstream again, below another on-stream lake, the straightened channel appears to have been diverted along (rather than across) topographical contour lines. Alternatively, flow may be impounded downstream and simply "backed-up" to the lake outflow. Consequently, there is an almost complete lack of gradient to support flowing water habitat during most conditions (Fig. 14). In the absence of possibilities to return the channel to a more natural course and remove impounding structures, these completely still sections are best treated as part of the adjoining lake habitat.

Figure 14: Almost no flow at normal water levels – essentially stillwater habitat.

4 Recommendations

Legal permissions must be sought before commencing any works 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 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 habitats discussed in this report.

Assuming that all legal requirements have been met for relevant activities, a summary of the recommended actions are:

- Use the contents of this report to frame discussions on local stakeholder aspirations for the Penk including:

  - The perceived and desired function in relation to flood mitigation, green-space wellbeing and measurable ecological condition (based around whole river-corridor biodiversity)
  - Seek funding to objectively model and assess the costs and benefits of re-meandering (with improved flood-plain connectivity/floodwater storage) in the area shown in Fig.8.
  - Explore options to "break out" concreted sections of channel
- Depending on the results of discussions on aspirations for diverse riparian and in-channel vegetation and habitat, consider the installation of interpretive signage to aid recognition of floral diversity
- Signage should also make the important link that many charismatic animal species (from butterflies to voles and bats) rely on the increased diversity of plants
- Consider retaining and using coppiced material to mimic large woody material deadfall habitat (e.g. Fig. 15)
- Investigate opportunities to improve longitudinal connectivity between lake, culverted and open sections of the upper Penk
- Continue the excellent citizen science monitoring of water quality and invertebrate communities
- Consider buying (or even making) a simple floating trash-boom to aid collection and removal of litter from lake outflows.

Figure 15: A lodged cross-channel log to mimic natural dead-fall shown in spate conditions. Note the gap between the riverbed and the underside of the log for the majority of the trunk.

5 Further information

The WTT may be able to offer further assistance such as:

- WTT presentation/Q&A session
    - Where recipients are unsure about the issues raised in the AV report, it is possible that your local conservation officer may be able to attend a meeting to explain the concepts in more detail.

In these examples, the recipient would be asked to contribute to the reasonable travel and subsistence costs of the WTT Officer.

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 material, enhancing fish populations and managing invasive species.

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

6 Acknowledgements

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7 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.