Upper Penk, Wolverhampton:
Advisory Visit

	Upper Penk (Visit II): Pear & Partridge to culvert under Wrottesley Park House footpath
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	SJ8603200506
D/S Grid Ref inspected	SJ8647400966
Length of river inspected	0.8 km

Wild Trout Trust Report – Following a Site Visit on 29/08/2017

1. Introduction

A site visit and habitat appraisal was carried out at the request Keith Elder, chair of Wild About Perton, on headwater sections of the River Penk between Perton and the A41/Wergs Road. The surveyed reach fell within the upper River Penk from source to the Saredon Brook which is captured under the Water Framework Directive (WFD) waterbody reference GB104028046680: (http://environment.data.gov.uk/catchment-planning/WaterBody/GB104028046680).

This waterbody is classified as being of Poor Ecological Potential under the Water Framework Directive assessments. That classification is primarily due to ratings of "poor" for fish, phosphate, macrophytes and phytobenthos combined, as well as "moderate" for invertebrates, and dissolved oxygen. Surprisingly, given the extensive channel modification, the hydromorphological status is assessed as "supports good". Upon visiting the waterbody, a clear mismatch to the observed condition of the channel is readily apparent; with hydromorphology being one of the most obviously degraded elements of the channel.

This report refers to a reach between an upstream limit at SJ 86032 00506 and a downstream limit at SJ 86474 00966. Observations at particular grid references are reported sequentially from upstream to downstream and this reflects the order in which they were surveyed.

Throughout the report, normal convention is followed with respect to bank identification i.e. banks are designated Left Bank (LB) or Right Bank (RB) whilst looking downstream.

2. Habitat Assessment

At the upstream limit of this visit, a small, sandy channel was visible with relatively varied riparian plants and trees (Fig. 1).

Figure 1: Native understory plant species associated with varied tree canopy at SJ 86032 00506.

Although the channel has been artificially straightened, the development of surrounding woodland canopy and bankside understory vegetation provides ecological value. The channel has narrowed to a more natural width (appropriate to its rate of discharge and bed-slope) and a range of species have recolonised following historic channel realignment. However, the sandy nature of the catchment and the straightened planform of the channel result in very limited structural variety within the substrate. This, coupled with the apparently poor water quality results for phosphate and dissolved oxygen, will significantly limit the diversity of aquatic species.

Just downstream, a section of the Penk runs through Penk Meadow. This is a diverse area of grassland managed by South Staffordshire Council and Wild About Perton. Managed rides are regularly cut along designated paths, whereas the surrounding vegetation is mown annually to promote maximum diversity – in combination with the surrounding woodland of Smiths Rough (Fig. 2).

Figure 2: Interpretive signage detailing the management and notable species of Penk Meadow.

The single line of trees associated with both banks of the Penk in this area (Fig. 3) could provide additional benefit through light rotational coppicing. This would generate greater variety in the light/shade regime experienced in the channel and understory vegetation. The bank-side trees are regenerating some sinuosity in the channel (Fig. 3) – and are consequently valuable. However, the relatively uniform shade throughout the reach is likely to constrain species diversity. Allowing the coppiced trees to re-grow in a more staggered fashion will create valuable low-level cover, more varied (dappled) light. The staggered regrowth, combined with remaining veteran trees, will ensure the continued valuable input of nutrients from falling leaves each autumn. Given the straightened nature of the channel, it will be important to allow some in-channel roughness to develop through a combination of coarse and large woody material. In the absence of such roughness (particularly in association with straightened channels) leaf litter will not be retained within the reach during high flows. The loss of that material limits those

parts of the river corridor foodweb that depend on leaf litter. In many streams, that is a very significant component of aquatic and terrestrial foodwebs.

Figure 3: Dense stands of similar-sized/aged trees produce quite uniform, dense shade. At the same time, their value in regenerating greater structural diversity in the channel is apparent - as is the essential trapping of leaf litter by coarse woody material.

The most damaging practice noted during the visit was the dredging of the stream-bed and dumping of arising material in a bund along the bank-tops (Fig. 4). The spoil consists of fine silt/sand and masses of pea-mussel shells (Figs. 4 and 5) and, of course, any other species living on the riverbed. The bunds formed by the spoil will act to reduce the connectivity of the channel to its (meadow) floodplain which is well away from any building development. It will also increase the discharge of floodwater that reaches the next bottleneck directly downstream (covered later in this report).

Consequently, no flood-risk benefit (other than erroneous publicly-perceived benefit) is achieved by these actions. At the same time, there is obvious damage to the ecology of the river since anything colonising those areas is periodically mechanically removed. To compound that damage, the overall cross-sectional capacity of the channel is increased to far above the naturally-arising dimensions. While this may give the illusion of significantly-increased additional floodwater capacity, the increase is extremely small compared to the available capacity on the floodplain. Somewhat ironically, the available storage benefit of that floodplain is effectively cut-off by the formation of the bunds created from dredged material. In addition, the increased cross-sectional area dramatically slows the flow velocity under normal conditions. This, in turn, promotes deposition of silt and sand –

counteracting the efforts of dredging until the natural equilibrium dimensions are quickly re-established. Dredging also increases the "demand" for upstream material to fill the vacuum that is created – which can have destabilising effects on the upstream and downstream channels as illustrated in this simple video:

https://youtu.be/OAZ_BuyM41s

Overall, the dredging in this tiny watercourse is having a clearly negative ecological impact – while, at best, having no beneficial impact on flood risk.

Figure 4: Nettles growing out of a bund comprised of nutrient-rich silt and pea mussel shells at SJ86181 00675.

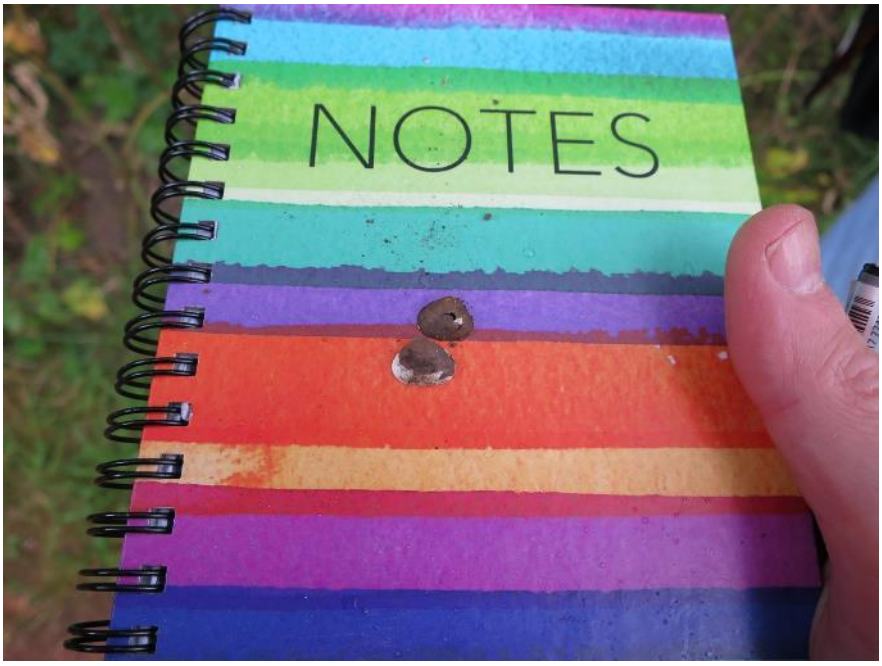

Figure 5: Two halves of a pea mussel shell - taken from the tens (or hundreds) of thousands present in the dredging spoil.

The dredging is clearly at odds with the meadow management regime. It should be challenged as robustly as possible – particularly in light of the conditions just a few hundred metres downstream (considered subsequently in this report).

In contrast to the damaging management practices, there were some good examples of in-channel structure generated by natural deadfall of woody material (e.g. Fig. 6). This provides more diverse niche opportunities (structural) as well as vital nutrient resources (energetic) benefits.

Figure 6: Fallen wood creating more diverse habitat, providing additional substrate and roughness (as well as being a source of nutrients in itself). Note that the deep, uniform shade is still evident here.

Again, in common with the whole reach falling within Penk Meadow, the tree canopy structure produces a dense and fairly uniform shade (Figs. 6 and 7). As already highlighted, a very light rotational coppice (whereby a small percentage – e.g. 5 to 10% of trees are cut each year and then allowed to regrow) would promote a more biodiverse river corridor. Furthermore, the woody material that arises from coppicing can be used to produce habitat features both within and adjacent to the channel. Wood habitat piles or beetle-banks can be created in the terrestrial habitat, while nature-mimicking woody material within the channel can generate localised bed (or even bank) scour to produce greater in-stream structural variety. Coarse and large woody material introduced (and securely anchored) will also increase channel roughness to aid retention of nutrients. . It is, though, important to always retain some areas of dense shade to protect watercourses from low flow/high summer temperature events. See "Recommendations" for further details.

Figure 7: River (left of frame) adjacent to footpath - showing the straightness of the channel as well as the dense, uniform shade.

The importance of varied light and shade is evident in the land that falls outside the woodland (e.g. Fig. 8 at SJ 86355 00875). Where agriculture or other land-management practices remove most or all of the shading to a small river, there is a strong tendency for the channel to become completely choked with vegetation. This is particularly the case when channel modifications produce very slow flows.

In watercourses with more varied flow, as well as patches that are too shaded for aquatic plants to thrive, a much more varied patchwork of plants, substrate

material and current velocities can develop. Structural and biological diversity will tend to map onto each other.

Figure 8: Where tree canopy is completely removed, the soft nutrient-rich riverbed and shallow, slow-flowing water quickly becomes choked with emergent vegetation.

The choked channel condition is uniformly evident between SJ 86355 00875 and a largely blocked culvert entrance at SJ 86474 00966 (Fig. 9) and, while this marshy vegetation will provide habitat for some species, there is very limited value for fish.

This condition also highlights the futility of dredging activities in the adjoining upstream section. Increasing the supply of water (in terms of both volume and rate) to this section by increasing channel capacity upstream will not result in increased conveyance during spate conditions. There is a naturally, very low, limit to the rate at which water can escape the vegetation-choked channel and culvert.

In terms of potential habitat improvements in this lower section, the historic importance of the culvert which takes the Penk under the footpath from Wrottesley Park House should be investigated. The culvert and path seem to be associated with an original gated access point for the estate. However, if it were possible, the removal of that culvert may enable the river to be returned to a more natural planform and capacity. In the process of producing that, unblocked, channel, it may be possible to speed the flows to avoid the complete domination of the wetted channel by vegetation. In support of that, a channel of natural (i.e. relatively narrow) width could be augmented by installing a series of felled trees (or material arising from the same). The timber should be anchored in such a way to mimic

natural deadfall. As well as more diverse physical structure, the shade associated with the underside of those felled limbs and trunks would also help to control the recolonization of the channel by aquatic plants.

Figure 9: Culvert entrance partially blocked by plant growth.

Recommendations

No amount of habitat improvement can overcome poor water quality. At the same time, even the cleanest water can only support a low diversity of species when access to critical habitat is lacking. Consequently, a list of priority actions to consider for the reaches examined in this report are:

- Investigate the sources of elevated phosphate in the Upper Penk (these may originate from enriched silts from online lakes, agricultural land-use, waste-water and more)
- Pursue a long-term solution to elevated phosphate through the Environment Agency and standalone projects where necessary
- Campaign to have the dredging of the Upper Penk stopped and, if deemed necessary, replaced with Natural Flood Risk management measures: https://www.gov.uk/government/publications/working-with-natural-processes-to-reduce-flood-risk-a-research-and-development-framework
- Investigate the potential to remove the culvert under the Wrottesley Park House footpath and replace with bridge (preferably) or ford
- Undertake light, rotational coppice work (aim to preserve around 60% of the canopy cover): http://www.shropshirehillsaonb.co.uk/wp-content/uploads/2010/10/Management-of-Riverside-Trees-Feb-2013.pdf
- Use material arising from coppicing to:

- Create log-pile habitat in Penk Meadow: https://www.buglife.org.uk/activities-for-you/wildlife-gardening/create-your-own-dead-wood-habitats
- Introduce securely-anchored woody material to the stream in the form of small tree "kickers": https://vimeo.com/72720550
- Lay, wedge and securely anchor larger trunks/limbs across the channel in the open-canopy areas to create low shade and structural diversity (Figs. 10 & 11)

Figure 10: Cross-channel log under "bank full" spate conditions

Figure 11: Cross-channel log example in normal flows

Although assistance from the Wild Trout Trust is in high demand, it may be possible to provide support in setting up and helping to deliver the habitat work aspects of the above suggestions. The most appropriate vehicle for is likely to be

working with local Environment Agency, Wildlife Trust and Groundwork representatives who are already engaged in active partnership works with the Wild Trout Trust in Staffordshire. Wild About Perton is well placed to join that partnership network in order to pursue possible improvement projects on the Upper Penk.

Contacting Dr Paul Gaskell on pgaskell@wildtrout.org is the easiest way to set up involvement with the partnership network. A full list of Wild Trout Trust contacts is also maintained on this page: http://www.wildtrout.org/content/contact-us

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