WILD TROUT TRUST

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Advisory Visit

Pix Brook, Bedfordshire

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Key findings

- The upper brook contains excessive aquatic plants which contrasts with the lower brook.
- The upper brook has a scarcity of gravel to form a diverse bed profile. Reasons for this disparity should be investigated.
- Better floodplain connection should be sought in order to justify a reduced maintenance regime.
- Flail cutting of vegetation in early July should not take place due to the presence of breeding birds which are protected under the Wildlife and Countryside Act, 1981. Enquiries should be made to establish the person or body undertaking the maintenance work to establish a more sympathetic approach.
- The right bank is poorly vegetated and friable for much of the length. Allowing some shrub and tree species to grow will aid bank strength and stability.
- The lower brook severely lacks habitat diversity. There is a pressing need for large woody material to be added to improve habitats and river processes.

1.0 Introduction

This report is the output of an Advisory Visit (AV) undertaken by Rob Mungovan of the Wild Trout Trust to the Pix Brook, near Arlesey, on 7th July 2020. The landowner (of part of the land), and Wild Trout Trust member, was present for the visit. Comments in this report are based on observations on the day of the visit.

The purpose of the visit was to advise on the suitability of the brook for wild brown trout. Normal convention is applied throughout the report with respect to bank identification, i.e. the banks are designated left bank (LB) or right bank (RB) whilst looking downstream.

2.0 Catchment Overview

Tables 1 & 2 summarise the Water Framework Directive (WFD) data for the Pix Brook. The brook is designated as a heavily modified waterbody and is classified as 'moderate' ecological potential. Parameters that make up the classification include 'high' for dissolved oxygen, 'good' for invertebrates and 'high' for temperate; all factors that influence the brook's potential to support brown trout. However, the overall rating is brought down by the 'poor' for phosphates. A Reason for Not Achieving Good (RNAG) is given as 'sewage discharge (continuous)' which will lead to water quality challenges and excessive plant growth.

The Pix Brook rises in the East Anglian Chalk National Character Area (NCA), but the location of the AV was near to the East Anglian Chalk boundary with the Bedfordshire and Cambridgeshire Claylands NCA, hence the outcrop of clay marl. The brook should be considered as a small chalkstream with a steady baseflow. However, the presence of Letchworth Garden City and associated urban runoff at the head of the brook is likely to have given rise to a flashy drainage characteristic.

The brook flows from Letchworth in a northerly direction before its confluence with the River Ivel near to Henlow.

	Waterbody Details
River	Pix Brook
WFD Waterbody Name	Pix Brook
Waterbody ID	GB105033037730
Management Catchment	Ouse Upper and Bedford
River Basin District	Anglian
Current Ecological Quality	Overall classification of **Moderate** for 2016
U/S Grid Ref Inspected	TL 19867 37500
D/S Grid Ref Inspected	TL 19366 37822
Length of River Inspected	650m

Table 1 - Data from https://environment.data.gov.uk/catchment-planning/WaterBody/GB105033037730

Cycle 2 classifications

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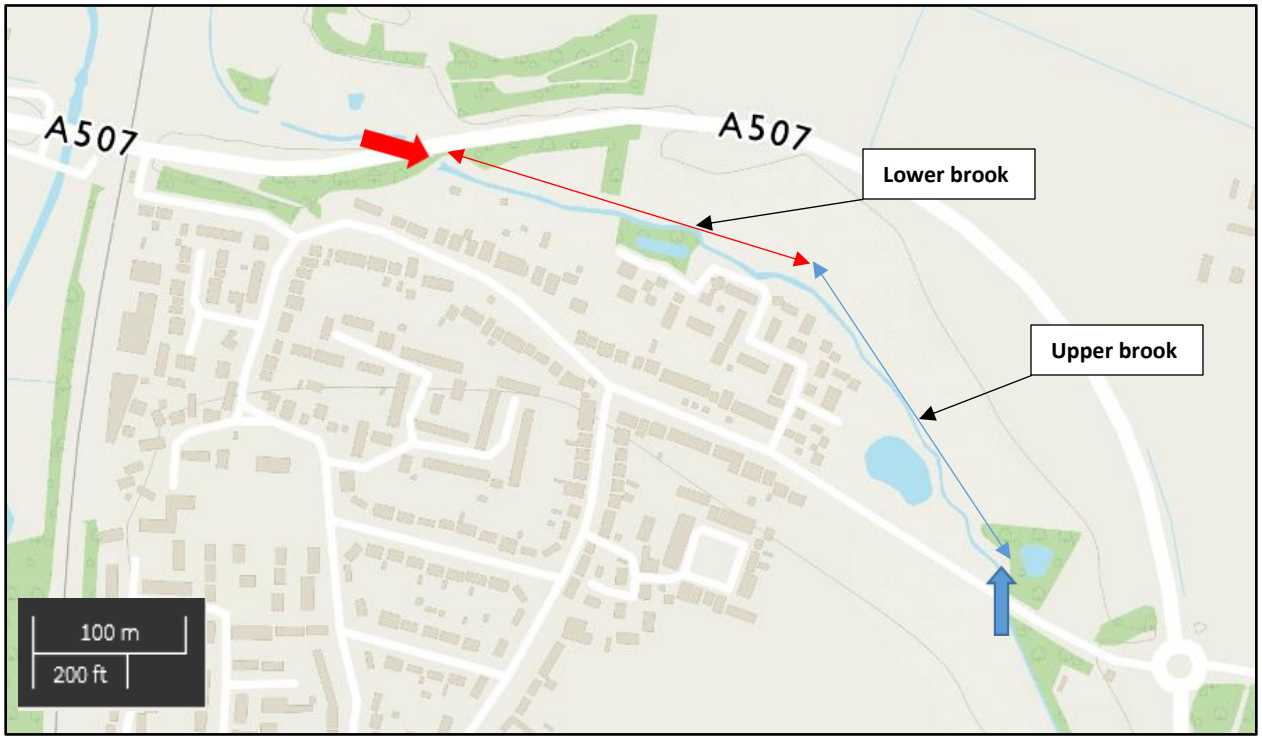
Classification Item	2013	2014	2015	2016
Overall Water Body	Moderate	Moderate	Moderate	Moderate
Ecological	Moderate	Moderate	Moderate	Moderate
Supporting elements (Surface Water)	-	-	Good	Good
Biological quality elements	Good	-	Good	Good
Invertebrates	Good	-	Good	Good
Hydromorphological Supporting Elements	Supports Good	Supports Good	Supports Good	Supports Good
Physico-chemical quality elements	Moderate	Moderate	Moderate	Moderate
Acid Neutralising Capacity	-	High	High	High
Ammonia (Phys-Chem)	Poor	Moderate	Moderate	Good
Biochemical Oxygen Demand (BOD)	Moderate	Good	Good	Good
Dissolved oxygen	High	Good	High	High
pH	High	High	High	High
Phosphate	Poor	Poor	Poor	Poor
Temperature	High	High	High	High
Specific pollutants	Moderate	Moderate	High	High
Chemical	Fail	Fail	Fail	Good
Priority substances	Good	Good	Good	Good
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment
Priority hazardous substances	Fail	Fail	Fail	Good

Table 2 - Data from https://environment.data.gov.uk/catchment-planning/WaterBody/GB105033037730



Map 1 – The Pix Brook, Arlesey. Blue arrow is upper limit of AV, red arrow is downstream limit of AV. © Ordnance Survey.

As a minor watercourse, the Pix Brook does not support a fishery, but a good number of young chub were observed during the visit. Given that brown trout have been recorded downstream in the Ivel Navigation and River Ivel, it is reasonable to assume that they should have the capacity to colonise the brook given free passage, suitable water quality and habitat.

3.0 Habitat Assessment

3.1 Upper Brook

The channel of the brook is overly uniform, with an average width ~2m and a depth ~0.4m. The banks are generally vertical, and past re-engineering has created a 2-stage channel providing a maintenance berm ~1m above the current water level (pic 1). Recent rainstorms have left a water mark which showed the berm not to have been inundated (pic 2).

Pic 1 – The brook showing the 2-stage channel to the RB.

Pic 2 – The brook has risen in rainstorms.

Whilst is was not possible to assess the full diversity of emergent flora due to the recent flail cutting, common comfrey, common reed and occasional

pendulous sedge were present. The bed of the brook was covered by aquatic plants dominated by watermilfoil, *Potamogeton* Sp, algae (pic 3) and very occasional lesser water parsnip. These aquatic plants provide cover for occasional silver fish (guessed to be roach or small chub). The occurrence of aquatic plants is important as they naturally retain a head of water, increase in-channel cover for fish, increase the extent of aquatic habitat available for invertebrates and provide shade. Shade is crucial in regulating water temperature (an issue likely to become increasingly important in hot dry summers) and for suppressing the growth of in-channel and marginal plants. The recent flail cutting has removed the shade provided by tall vegetation and has enabled flow to move down the brook, as opposed to being held back and spilling on to its floodplain (or in this case, the berm of the 2-stage channel).

Pic 3 – The brook's aquatic flora is dominated by water milfoil and algae, suggesting nutrient enrichment,

There are small deposits of gravel over a clay marl bed. The uniform width, combined with the engineered 2-stage channel, suggests that this reach has been subject to past realignment and dredging. The RB supports limited plant and shrub diversity, assumed to be a consequence of bank maintenance and the friable soil structure. In contrast, the LB has a healthy diversity of trees and shrubs, with an understory of herbs and grasses, which maintain bank

strength allowing undercutting to develop (pic 4). The undercut bank provides cover for fish and is a source of gravel input to the reach (pic 5).

Pic 4 – An undercutting bank provides valuable habitat for a range of fish species and biodiversity.

Pic 5 – Gravel covers areas of the bed, with small patches of clay marl exposed (grey colour). in others.

Stone turning revealed an encouraging array of aquatic invertebrates including mayfly larvae (*Baetis* sp.), cased and caseless caddisfly larvae, freshwater shrimp, freshwater limpets, snail eggs and flatworms. This supports the WFD classification of 'good' for the brook's invertebrates. In turn, aquatic invertebrates will support fish communities as they are consumed.

Pic 6 – A diverse array of aquatic invertebrates are present.

The upper brook can be described as a long glide with little in the way of bedform or channel width variation. A significant lack of large woody material (LWM) was noted in the reach reducing the availability of cover for fish and invertebrates. LWM is extremely important in a river, increasing the available surface area on to which a biofilm (algae, bacteria and other microbes) can grow. In turn, the biofilm is a source of food for invertebrates, thus increasing the total biomass that a river can support. LWM also provides refuge for fish from high flows and predators.

Fallen trees and branches within a river are natural occurrences. They are important for initiating bed scour, sediment sorting and transfer, followed by deposition according to particle mass. These processes enable the development of riffles and pools which in turn provide important fish spawning and refuges areas. The lack of these features limits the brook's potential to support brown trout.

The adjacent land use of the LB is a flood attenuation area with a balancing pond receiving water from the nearby housing estate. The land has been successfully planted with wildflower seed mixes (pic 7). A small body of open water is present which is dominated by reedmace, together with lower growing emergent plants such as flowering rush and water plantain.

Pic 7 – The brook runs alongside a flood attention area which also doubles as an informal nature reserve.

The quantity of flow in the brook was surprisingly good considering the dry spring. The brook's velocity was reasonable with flow diversity present as a result of the aquatic plants (pic 8). Flow diversity is important for supporting a range of aquatic invertebrates and potential spawning habitat for brown trout. In contrast, some slow flowing areas are accumulating fine sediment (pic 9) with the bed becoming smothered by fine silt, thus reducing the range of niches for aquatic flora and fauna. The depositional areas tended to be deeper and illustrate how the brook is trying to revert to its true, shallower, form.

Pic 8 – The brook's gradient combined with aquatic plants created flow diversity.

Pic 9 – Silt smothers the bed in deeper-water areas.

The brook then flowed alongside a housing estate on its LB which prevented access. A footbridge and public path enabled access to the right bank (not

within the control of the recipient of the AV). The nature of the brook became markedly different with a much greater accumulation of gravel (pic 10).

Pic 10 – The downstream end of the upper part of the brook, note the gravel bed.

3.2 The Lower Brook

The lower brook retains its artificially uniform width of ~2m but the bed becomes dominated by deep deposits of relatively well-sorted gravel, supporting shallow riffles (pic 11). In places bank scour is occurring due to a lack of tree roots to maintain stability. The scour has also produced small pockets of deeper water (pic 12), in which small chub were seen (sometimes 10+, up to ~20cm). Deeper 'pool' habitat is present as a result of trees roots and bank protection work deflecting flow off a meander leading to increased bed scour. This habitat is important to the chub and could be utilised by brown trout, particularly when in combination with trailing vegetation (pic 13). Trailing vegetation and branches are particularly important as overhead cover for a wide range of fish, especially brown trout; they create small areas of shelter and increase the available number of lies within a river. Branches also present opportunities for invertebrates to fall into the channel where they become food for fish; those that extend into the water may also provide a

means for some aquatic invertebrates to emerge from the river and to return beneath the water to lay their eggs.

Pic 11 – Riffle habitat is present where the gravel bed bars have formed.

Pic 12 – Bed and bank scour produces pockets of deeper water which provide refuge for fish (red arrow).

Pic 13 – Deeper 'pool' habitat (red oval) provides refuge for many small chub.

The shallow glides contain poorly sorted gravel with small stands of marginal branched bur reed. Bur reed can often choke the channel of small brooks and it was encouraging to see it retained as a marginal plant where flow and bedform prevent its ingress to mid-channel (pic 14).

The eroding right bank provides a source of gravel to the brook (pic 15). In time, with better sorting and cleansing by flow, it may become suitable for trout to spawn upon. Dredging of the channel will disrupt and set-back the process. The body responsible for the current flail cutting may have intentions to dredge the channel and dialogue should be initiated to see how the reach can be better maintained for flood risk management and biodiversity.

The current lack of in-channel habitat such as LWM, undercut banks and aquatic plants will be limiting the potential of the brook to retain brown trout.

Pic 14 – Branched bur reed occurs on the LB and (encouragingly) did not dominate brook.

Pic 15 – The gravel bed could provide spawning opportunities for brown trout if cover could be increased.

Pic 16 – The only piece of LWM seen in the brook. This kind of feature could be replicated in other gravel-rich areas to encourage bed scour, sorting and deposition, to diversify the bed profile.

4.0 Recommendations

- The lower brook does not contain the excessive aquatic plant growth that the upper brook has. Causes of this may be removal by high flows or disturbance by dogs and people, or simply the effect of partial shade. One would expect chalkstream plants of water crowfoot, lesser water parsnip and starwort to be prevalent. Observations of the brook upstream and downstream should be made to see if the plants are present and to identify causes as to their absence. If the underlying reasons can be understood, and addressed, it may be possible to translocate the plants into the reach from elsewhere in the brook (do not bring in plants from other watercourses).
- The upper brook lacks the gravel bed present lower down. Reasons for this disparity should be investigated. Causes may be past dredging combined with a lack of supply from upstream and from the banks. If no natural supply is available, then gravel placement to restore the brook's bed form should be considered.

- Better floodplain connection should be sought. The current maintenance berm could be lowered to allow inundation at a lower flood level. That would bring flood risk management benefits to the downstream community, and possible justify less maintenance of the brook allowing natural processes to prevail.
- Flail cutting of vegetation in early July should not take place due to the presence of breeding birds which are protected under the Wildlife and Countryside Act, 1981. Common reed is likely to support reed and sedge warblers and dense marginal vegetation will be used by moorhens and mallard ducks. Enquiries should be made to establish the person or body undertaking the maintenance work to try to secure a more sympathetic approach.
- The RB margins are poorly vegetated and friable for much of the length. The bank could be re-graded and sown with a suitable wet grassland seed mix to establish a stronger sward. Allowing some shrub and tree species to grow will further strengthen the bank. Ultimately, the close flail cutting is removing marginal plants and leading to bank collapse. The collapsing bank results in a detrimental input of silt to the brook. The LB illustrates that stability can be achieved.
- The lower brook is relatively devoid of habitat but possibly has the best potential for brown trout due to its more rapid flow and gravel bed. There is a pressing need for LWM to be added (in various forms) to initiate bed scour together with sediment transport and sorting. LWM will increase underwater cover and aquatic invertebrate production. LWM could be added to the brook by the following means:

    Brushwood ledges (pic 17): provide complex cover at and below water level. Brash from tree thinning is pinned against the bank and is securely wired down or held with battens. The brushwood lattice provides niches for invertebrates and small fish, aids silt entrainment and provides a rooting substrate for plants to establish. In time (~3yrs), a brushwood ledge will become a vegetated berm if exposed to full sunlight. Vegetated ledges can also help to address bank erosion.

    Flow deflectors (pic 18): can be used to increase flow diversity and bed scour. They can be simple log deflectors or tethered tree stems. The complex flow they create results in bed scour, depth cover, sediment sorting and sediment transport.

Tree hinging (pic 19): is a simple approach to managing the tree stock whilst providing cover at water level. Trees (large or small) are cut to produce an effect similar to hedge laying. Species such as willow and hazel respond particularly well. Laying retains a living hinge that secures the cut stem to the tree stump. With the tree-top laid at water level, it provides excellent over-head cover, flow deflection and, if beneath the surface, increased habitat for aquatic invertebrates and cover for fish against predators.

Pic 17 – A low-level brushwood ledge.

Pic 18 - A flow deflector used to focus flow and scour into the centre of the channel.

Pic 19 -This willow limb has been hinge-cut to lay at water level.

5.0 Making it Happen

It is a legal requirement that (most) works to an 'Ordinary Watercourse' like the Pix Brook require written consent from the Lead Local Flood Authority prior to their implementation, either in-channel or within 9 metres of the bank.

The Wild Trout Trust can provide further assistance in the following ways:

- Walking the river to river to undertake project scoping, followed by the production of a Project Proposal report.
- Assisting with the preparation and submission of a Land Drainage consents (for Ordinary Watercourses) to take forward habitat improvement works.
- Running training days to demonstrate the techniques described in this proposal.

We have 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 stocks 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.

The WTT website library has a wide range of materials in video and PDF format on habitat management and improvement:
www.wildtrout.org/content/library

6.0 Acknowledgement

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7.0 Disclaimer

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