Duke of Northumberland River - Isleworth

A Project Proposal by the Wild Trout Trust December 2015

1. Introduction

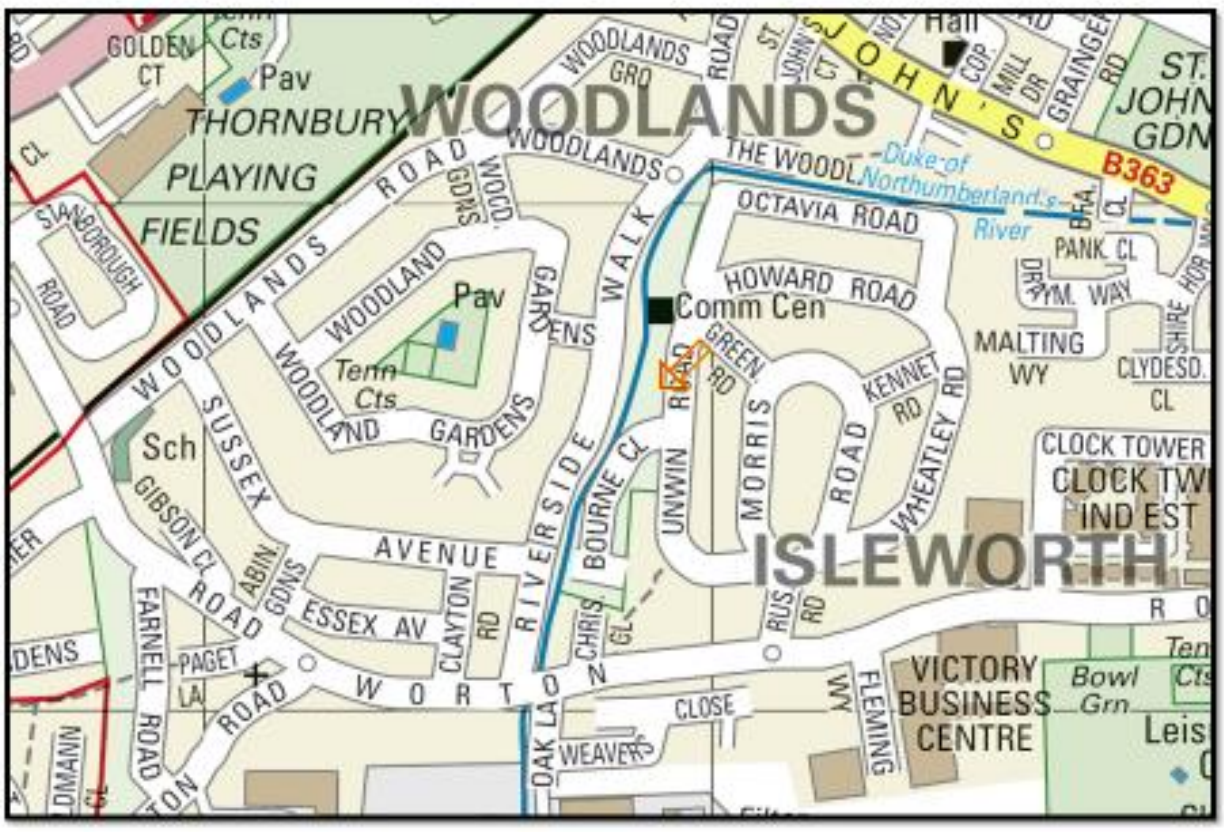
This report is the output of a site meeting and walk-over survey of a 0.5-km stretch of the Duke of Northumberland River in Isleworth, West London. The section inspected runs from National Grid Reference TQ 153754 down to TQ 154760. The river is classified as being in poor ecological condition under the Water Framework Directive assessment (Water body ID no GB106039023030).

The request for the visit came from Mr. Gareth Ryman, who is the Borough Ecologist for the London Borough of Hounslow.

Mr Ryman is looking for opportunities to undertake ecological enhancements to the river corridor and is keen to explore options for in-channel and riparian habitat management.

Comments in this report are based on observations on the day of the site visit and discussions with Mr. Ryman and Chris Slake (Senior Ecologist), Neale Hider (Environment Agency) and Mr. Rob Gray, Chairman of Friends of the River Crane Environment FORCE.

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.



Map 1 Duke of Northumberland River, Isleworth. © Streetmap

2. Catchment overview

The DNR is an entirely man-made river channel and receives water via a distributary channel from the River Colne, which augments flow into the River Crane before giving its name again to the eastern most channel which splits off from the main Crane below Knellor Park.

The DNR is included as part of the River Crane waterbody when classified under the Water Framework Directive (WFD). The DNR is classified as a Heavily Modified Waterbody and is assessed as having poor ecological potential.

3. Habitat assessment

The reach of the DNR inspected ran from just below the boundary of the Mogdon Waste Water Treatment works, under Worton Road and then parallel with Riverside Walk. The reach benefits from a narrow green corridor and a riverside footpath with good access to the river.

As a wholly man-made channel, the river here has a mainly straight channel planform and in the most part a uniform, largely shallow depth profile and uniform cross-section. A short section of the reach running downstream from Worton Bridge is slightly shallower than the remaining downstream section (photo 1), and as a result consisted of mainly riffle habitat, as opposed to the downstream section which is shallow glide. The river supports no deeper "pool" refuge habitat, with water depth greater than 0.5m virtually absent from the entire section.

In one or two locations, in-channel variations in flow patterns are being promoted by the odd piece of woody debris that has been left in the channel following recent tree work carried out adjacent to the RB (photo 2). In addition some changes to flow patterns have also been promoted in the section just downstream of Worton Bridge through the positioning of some blocks of discarded concrete (photo 3). Not ideal, but nevertheless promoting some local sorting of fine river bed sediment and changes to the flow dynamics.

The river banks and margins are an *ad hoc* mix of vegetated earth banks, wooden toe-boarding, with concrete and sheet steel piling evident on the LB. In general, the RB was more stable and natural compared to the LB running adjacent to the Riverside Walk footpath. Here there was evidence of toe-board failure (photo 4) and sections of sterile vertical concrete revetment (photo 5).

The tree canopy is mainly restricted to the eastern (right) bank, consisting mainly of mixed scrubby thorns and some evergreen ornamental species along with sycamore *Acer pseudoplatanus* and occasional mixed willow *Salix spp.* For the most part, the channel consists of shallow, laminar glide habitat running over a fine sediment-laden river bed. Occasional clumps of submerged macrophytes, mainly consisting of fennel pond weed *Potemogeton pectinatus* and small beds of starwort *Callitriche sp* were evident. The odd small patch of marginal emergent plants were also present, mainly consisting of fools cress *Apium nodiflorum,* but generally the square nature of the channel cross section is not conducive to marginal plant colonisation.

Photo 1. Shallow riffle habitat running down from Worton Bridge. Potentially a good spawning site for gravel loving coarse fish species.

Photo 2. Woody debris left in the margins providing some excellent cover and promoting in-channel flow diversity.

Photo 3. More woody debris and a line of stones/concrete promoting some diversity in flow patterns and providing micro habitats for small fish and invertebrates on the upper reaches.

Photo 4. Toe-board failure adjacent to the LB was evident in several locations.

Photo 5. Biologically sterile concrete LB contrasts with the natural tree-lined RB, which providies some excellent habitat and resilient bank protection

Photo 6. Small patch of the undesirable and highly invasive floating pennywort

4. Conclusions

This reach of the DNR is ripe for environmental enhancement. Changes to the physical characteristics of the channel profile would promote improved biodiversity and potentially enhance the river's visual appearance.

It is understood that the flow into the DNR system is regulated and flood risk can be mitigated via the operation of sluice gates at the head of the Colne distributary. This potentially enables a slightly more radical approach to in-channel enhancements than might otherwise be the case in such an urban environment.

A key aspect to consider when planning in-channel enhancements is the make-up of the river bed and bank-side material. The DNR was constructed in the early part of the 17th century and no details or drawings exist as to how the channel was constructed. In all probability the channel was simply hand dug into the local clay/gravel geology but in areas where the channel is perched, for instance in the run-in to any old mill structures, it is possible some sections were clay lined. With this in mind, caution is required when considering any radical alterations to bed topography.

In the few areas where woody debris has been left, habitat quality has been enhanced. With the potential for more trees to be managed adjacent to the RB there is obviously plenty of potential to use the material to enhance in-channel habitat. Large woody debris flow deflectors can easily be position and keyed into the RB to promote enhanced in-channel bed scour. It must be recognised that the DNR has very limited bed gradient and discharge and therefore flow power. A good way forward is to consider pegging in LWD deflectors and then hand digging modest pool habitat adjacent to where the water velocities are elevated off the end of the deflectors.

During the visit the prospect of "pool and run" creation using a tracked 360 excavator was discussed. The technique, often referred to as "dig and dump", would create a much more varied bed topography. However, where there are uncertainties over the nature of the underlying river bed material it may well be appropriate to undertake a less invasive form of shallow pool creation.

Using a combination of woody debris deflectors to promote a flume (to ensure sustainability) at the neck of the pool, hand digging modest sized, elliptical pools (1m maximum depth) and shaping pool tails and side bars with imported 20-40mm angular river gravels, could provide the much needed diversity in bed shape and flow patterns. Digging pools by hand will enable a soft approach to redistributing in-channel bed material. If pure clay is detected then hand digging would easily cease before any potentially damaging excavations are made. A schematic drawing is depicted in fig. 1.

When contemplating the creation of pool and run features it is important to work with the existing shape and width of the existing channel. Provided any new features are well spaced apart (approximately 60m for a channel with a mean width of 10m) then they should be sustainable.

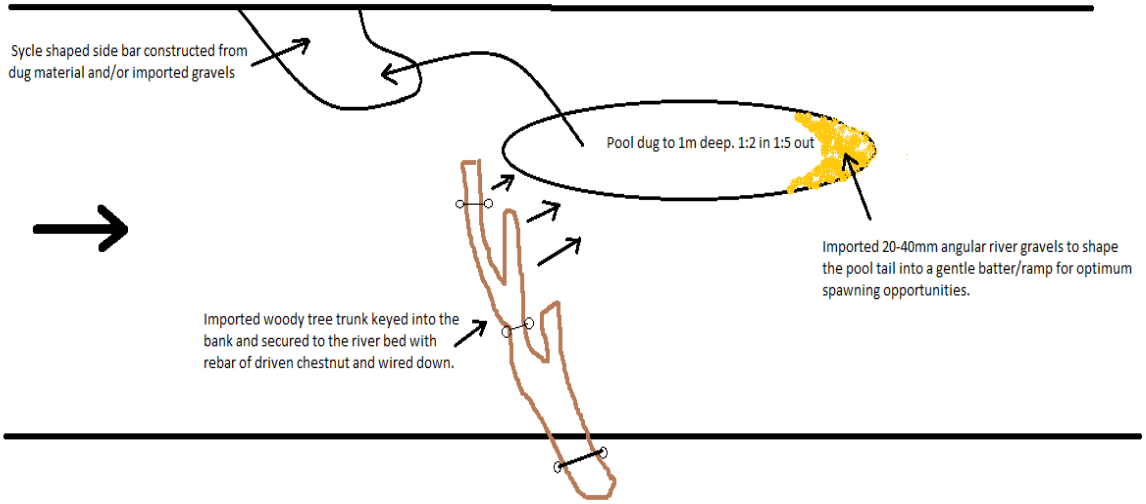


Fig 1. Schematic (not to scale) drawing depicting a typical dig and dump feature but with additional woody debris flow deflector to promote the flume required at the neck of the pool.

Softening the areas of hard revetment adjacent the LB could be achieved by installing tree sweepers (fig. 2) won from the RB and cabled to the toe of the LB using expansion bolts secured into vertical concrete revetment. A combination of brushwood shelves (photo 7), woody debris flow deflectors and one or two modest sized pools could transform the reach and substantially boost its potential for increasing biodiversity.

All of this work could be achieved without the need for plant machinery but even digging modest sized pools by hand will be hard work and require substantial labour. Gravels could be imported onto site in hippo bags and shovelled by hand into a small punt and then distributed into the desired locations.

It is recommended to concentrate on pool and run creation on the flat shallow glide habitat found in the northern end of the reach and simply use woody debris on the shallow riffle habitat to help sort gravels and create micro habitats for small fish and aquatic bugs.

Softening the concrete and toe-boarded margins with brushwood shelves and/or tree sweepers should be a priority action. It is recommended initially to try a range of these techniques and monitor their impact before embarking on a wide ranging enhancement project.

There was some discussion about the merits of creating backwater habitat on a short section of the RB. The height of the banks and the amount of material that would have to be excavated would make this task hugely expensive and very difficult to execute.

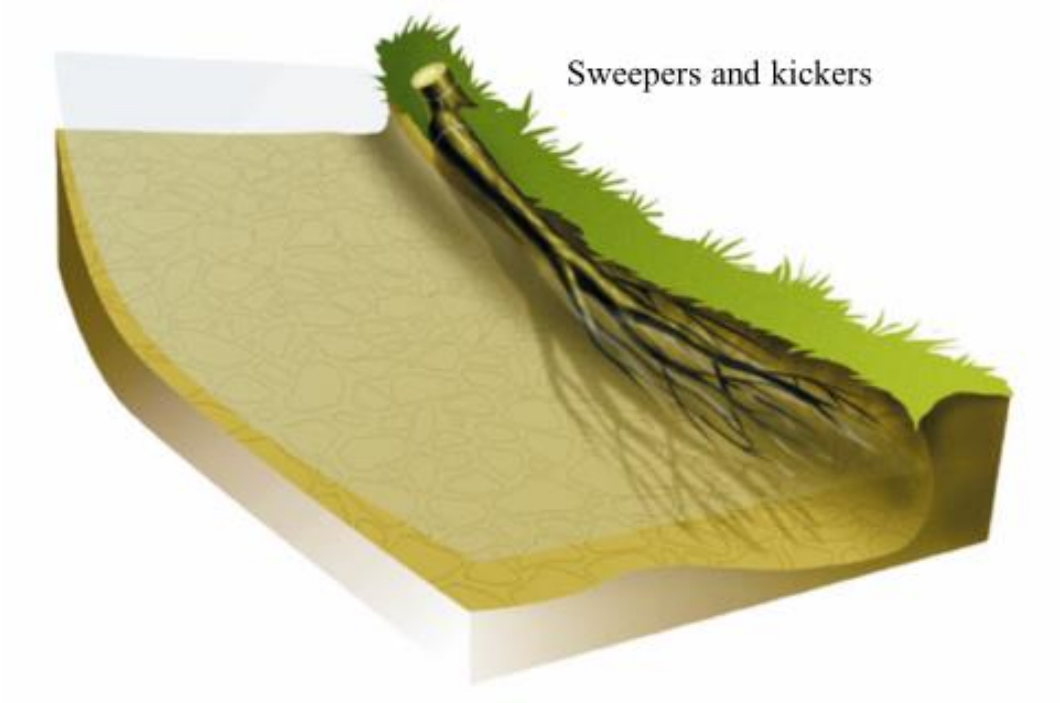


Figure 2. Tree sweeper with galvenised cable used to attache the trunk to a secure stump. Sweepers can easily be secured to a stout fixing eye drilled into concrete revetment.

Photo 7. A brushwood shelf installed into the margins of a river in an urban environment.

5. Recommendations

- **Apply for a Flood Defence Consent to construct a maximum of four pool and run features on the northern half of the Riverside Walk reach.**

- **Initially constructing two features and monitoring their performance would be a sensible way forward, with the opportunity of doing more if the enhancements are deemed successful.**

- **It is recommended to attempt to construct these features manually using hand tools, possibly under the supervision of the WTT as part of a River Habitat Workshop or WTT Practical Visit.**

- **A full services search is required prior to any works where river bed penetration is being considered.**

- **Consider installing brushwood berms or kickers adjacent to areas of vertical bank and in particular next to concrete and sheet steel revetment.**

- **Improvements to gravel quality on the shallow riffle sections can be achieved via the installation of large woody debris onto wide, shallow gravel riffles. It is important to configure LWD flow deflectors in such a way that no additional erosion pressures are put onto vulnerable margins.**

Note: All work within 8m of the top of the bank will require a consultation with the EA and may require a formal written Flood Defence Consent prior to any work being carried out.

Acknowledgement

The WTT would like to thank the Environment Agency for supporting the advisory and practical visit programme.

Disclaimer