



## **River Wylfe – Smallbrook Meadows Nature Reserve**



**An Advisory Visit by the Wild Trout Trust – July 2012**

## **1. Introduction**

This report is the output of a Wild Trout Trust visit undertaken on the River Wylfe at Smallbrook Meadows Nature Reserve, national grid reference (NGR) ST8844. The visit was requested by Neil Pullen, who is the Reserves Manager for Wiltshire Wildlife Trust (WWT). The visit was primarily focussed on options to enhance the river through the nature reserve for both wild trout *Salmo trutta* and water voles *Arvicola amphibius*.

This section of the River Wylfe (headwaters) is classified as being in Moderate Ecological Condition under the Water Framework Directive and is identified in the Environment Agency's River Basin District plan as water body ID no. GB108043022520.

Comments in this report are based on observations on the day of the site visit and discussions with Neil Pullen and David Kelly from WWT and Roz Walker from the Sutton Veny Estate.

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.

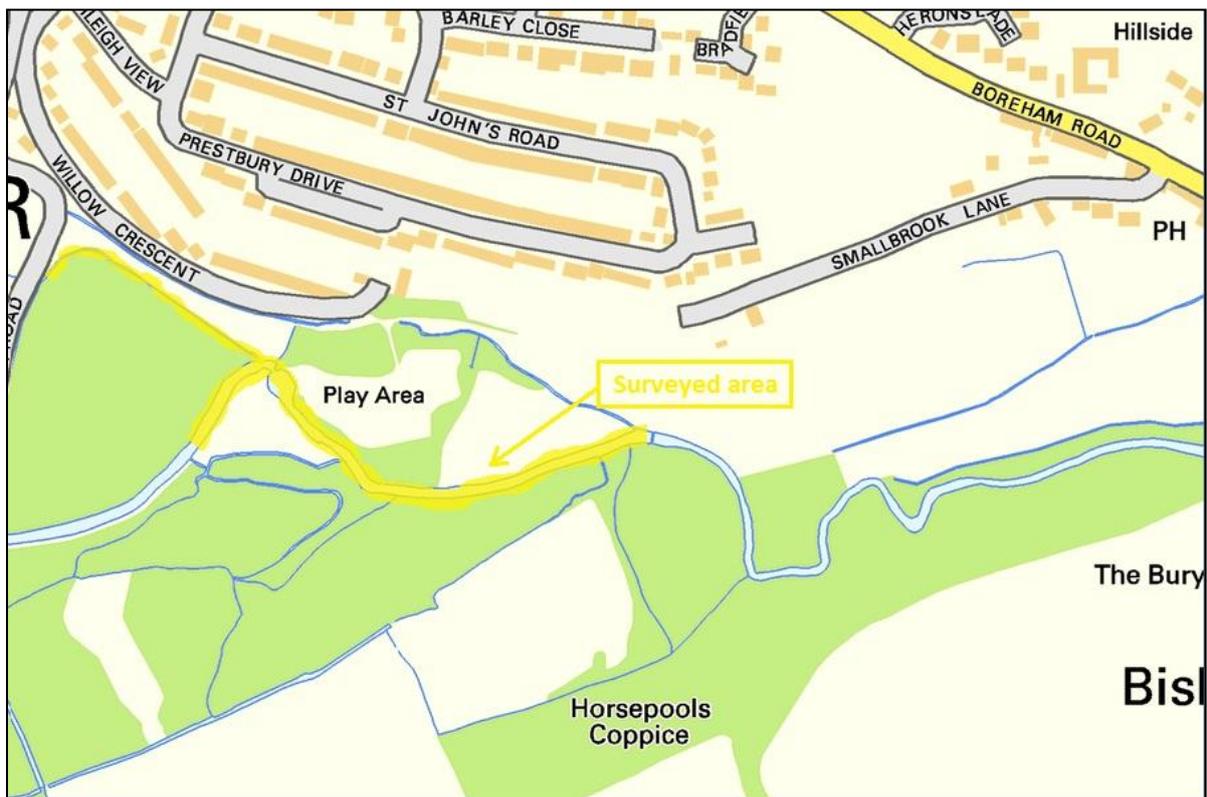
## **2. Catchment and fishery Overview**

The Wylfe is a tributary of the Hampshire Avon and is designated as a SSSI and SAC as part of the Avon system. It rises on the southern outskirts of the village of Maiden Bradley flowing North through the Deverill valley to Warminster where the river arches east across the southern boundary of the town, before heading south west through the Wylfe valley between the A36 and the Wessex Main [railway] Line towards Salisbury. The Wylfe joins the Nadder at Wilton, flowing on into the Hampshire Avon at Salisbury.

Long reaches of the Wylfe have been modified and diverted over the years and it no longer follows its natural path through some parts of its valley. There are

several pumped groundwater abstraction sites within the Wylve catchment and abstraction is a major concern for fishery and wildlife interests.

Smallbrook Meadows Nature Reserve is located on the southern outskirts of Warminster and is owned and managed by WWT. Upstream and downstream of the reserve the river is sympathetically managed as a wild trout fishery (part of the Sutton Veny Estate), but the Wylve flowing through the reserve is largely unmanaged.



The river Wylve and Were brook within Smallbrook Meadows Nature Reserve

### 3. Habitat assessment

The Wylve through Smallbrook Meadows Nature Reserve appears to have once been heavily modified and controlled but has been left noticeably unmanaged for a number of decades, resulting in an amalgamation of artificially straightened and naturally meandering channel. The semi-dismantled remains of bridge footings and root systems from riparian trees have pinched the channel in places, resulting in localised scour and subsequent pool-riffle formations.

The nature reserve is situated on the left bank of the river, whilst the right bank consists of undisturbed wet woodland belonging to the Sutton Veny Estate. The land on the left bank, where the Wylde enters the nature reserve, comprises an unmanaged and semi-inundated poplar plantation, with a thick understory of stinging nettles. This section of the river is inaccessible to people during summer months, when the dense nettle beds form a substantial deterrent. The banks are in a stable condition, with very little erosion and a diverse marginal floral community. The river here is protected from the impacts of people and dogs accessing the channel, but is also unable to receive the potential benefits of monitoring and management that could be bestowed upon it if it was slightly more accessible (photo 1).



**Photo 1: The inaccessible and unmanaged section of channel where the Wylde enters Smallbrook Meadows Nature Reserve**

Downstream of the poplar plantation, the river bends sharply to the right and is met by a small carrier channel, before gushing over the sill of the remains of a derelict brick structure and into a wide pool.

The small carrier is actually a small brook known as 'The Were' and flows from the western outskirts of Warminster, through the town and a long culvert under

Morrisons supermarket car park. The Were emerges from the culvert at the Lake Pleasure Grounds and flows through a straightened drainage channel to Smallbrook Meadows, where it is allowed a more natural meandering path. The Were then flows through a short culvert to pass under Smallbrook Road and on through the poplar copse to its confluence with the Wylde.

The basic physical characteristics of the Were (a small perennial stream with relatively fast flows), and its location, as a small tributary on the upper Wylde make it a potential spawning stream and nursery for wild, gravel spawning fish. However, a weir near the confluence is likely to be acting as a barrier to fish passage.



**Photo 2 : The small weir on the Were near its confluence with the Wylde**

A wide bay is situated next to a deep scour pool directly downstream of the aforementioned derelict brick structure. Flow accelerates through the structure and eddies on either side as the channel widens out.

This part of the river (NGR ST881441) is popular with local dog walkers and children and is one of the key attractions of the nature reserve. However, the left bank of the bay is suffering from severe erosion caused by dogs scrambling up and down the bank and a wide shallow bay has formed as the steep bank has

migrated back. The bank here appears to have been eroding for quite some time and has been eroded back to higher ground, leaving a large area of bare soil. This exposed face will continue to erode unless the problem is addressed, and the considerable and sudden drop in height from the upper bank to the shallow bay below could be a health and safety risk to visitors.



**Photo 3: Severe erosion caused by dogs clambering out of the bay. This is a regular occurrence happening several times a day.**

Immediately downstream of the bay, the river meanders around to the left through an overhanging patch of willow scrub. This section of channel has been left completely wild and the low overhanging branches provide excellent cover for fish. This section is also an important undisturbed refuge from the noise and activity in the bay upstream.

The coarse woody debris in the channel provides an important nursery habitat for fish fry as well as clearly defining erosional and depositional zones that separate clean gravels from sediment deposits. This is an important process that differentiates the physical characteristics of the channel, increasing habitat diversity and biodiversity potential.



**Photo 4: The remnants of an old structure (possibly old bridge abutments or the remains of a box culvert) pinch the channel – increasing flow velocity and promoting weed growth**

As the channel emerges from the dense vegetation, the canopy opens out and sunlight is able to reach the river bed. Swathes of water crowfoot (*Ranunculus spp.*) grow on the gravel bed and flows accelerate through another derelict structure – possibly the remains of a concrete bridge.

The combination of adequate sunlight and fast flows is vital to the establishment of a healthy in-channel macrophyte community and throughout the reach water plants such as lesser water parsnip (*Berula erecta*), and water crowfoot have established wherever such conditions are present.

Downstream from the derelict structure, the river is pinched by the root systems of two large alder trees on either bank. This has created a scour pool in the bed and a long riffle as scoured-out gravels have deposited downstream. A sweeping double meander has developed, scattered with clumps of submerged weeds.



**Photo 5: The riffle formed from gravel deposits scoured out from the pool. Water crowfoot and Starwort (*Callitriche spp.*) grow in the fast flows and open sunlight.**

A footpath follows the river on the left bank and another eroded bay has formed from dogs accessing the river (NGR ST883441). This bay is also likely to continue to erode unless it is protected.



**Photo 6: Further erosion from dogs entering and exiting the channel. Heavy shading over the bank has restricted marginal plant growth and left the banks bare and vulnerable**

From the bay downstream to the boundary of the reserve, the channel is straightened with a uniform width. The left bank is populated by tall alder trees that shade the channel, limiting the growth of in-channel weeds. The over-shading also prohibits growth of marginal plants and leaves the banks exposed and susceptible to further erosion.

The root systems of these trees grow out into the river and act as flow deflectors introducing flow diversity to the straightened reach. In the flows deflected and accelerated by the roots, gravels have been scoured and naturally sorted so as to become suitable for gravel spawning fish. In the slack backwaters behind the roots, sandy deposits have built up. Where tree roots do not protrude into the channel the straightened reach is lacking in flow variation and habitat diversity, and the bed is largely shrouded in a uniform blanket of sandy sediment.



**Photo 7: Dense tree cover provides a solid root structure in the left bank that protects the bank from erosion but also over-shades the channel and inhibits marginal and in-stream plant growth.**



**Photo 8: Tree roots branching out into the channel deflect flows and increase heterogeneity in geomorphology and habitat diversity**

The banks on either side of the channel through the straightened reach are relatively steep and there is very little marginal habitat. The water can be easily accessed from the left hand bank and more small bays have been created by dogs scrambling in and out of the water. The easily accessible channel is vulnerable to poaching, and illegal fishing has been observed throughout this reach.

The right hand bank through the straightened reach is interspersed with what appear to be water vole burrows. The bank is almost completely undisturbed and although the land is heavily wooded, the majority of the trees stand a few metres back from the bank edge. The steep undisturbed right hand banks are ideal for water voles, but the lack of marginal vegetation on the left bank means that cover and food supplies are not as abundant as they could be.

At the downstream extent of the straightened reach the channel widens as it is joined by a semi-inundated ditch that may have once been the original channel. The river bed is choked with sediment that has dropped out of suspension as the river slows through the widened channel. The river here is also very heavily shaded.



**Photo 9: The over-wide and over-shaded section of river near the downstream boundary of the reserve. The mirror smooth surface of the water highlights the lack of flow diversity (and therefore habitat diversity) present.**

#### **4. Conclusions**

Overall the river through Smallbrook Meadows Nature Reserve appears to provide good quality habitat for both wild trout and water voles. There are however, some significant bottlenecks that are preventing the river from achieving its full potential for these species and biodiversity in general.

These bottlenecks are as follows:

- Over-shading of the channel in general
- A lack of flow variation through the overly-straightened reach
- A general lack of marginal vegetation
- Excessive adult trout mortality caused by illegal fishing
- Severe erosion leading to over-widening of the channel and the introduction of excess sediment into the system.

In addition to the above bottlenecks, the Were brook is unable reach its potential as a spawning stream whilst the weir at the confluence continues to act as an obstacle to fish passage.

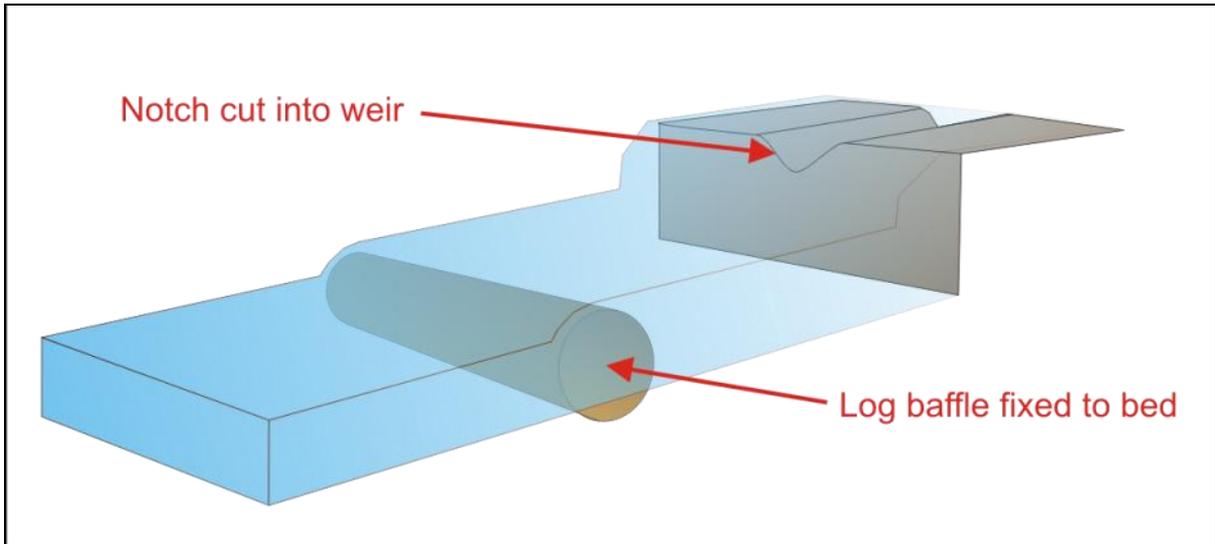
With some careful management the Wylve through Smallbrook Meadows Nature Reserve could be transformed into a bright and green summer habitat that also provides optimal spawning opportunities for flow-loving, gravel spawning fish during winter months.

Sympathetic tree works would not only allow more light into the channel but would also provide the raw material for habitat enhancements on-site and significantly streamline the cost of such enhancements.

A few simple tried-and-tested techniques using woody debris from tree works could have a dramatic effect on the in-stream habitat, whilst translocated plants from the wetland areas within the reserve could be used to vegetate the banks and provide much needed habitat and food for water voles. A dense margin would also protect the banks from erosion and make access more difficult for poachers.

The weir at NGR ST881441 (photo 2) does not appear to serve any particular purpose. Its removal should be considered the priority option for restoring habitat and fluvial connectivity between the Wylve and the Were and opening up new spawning habitat for native brown trout.

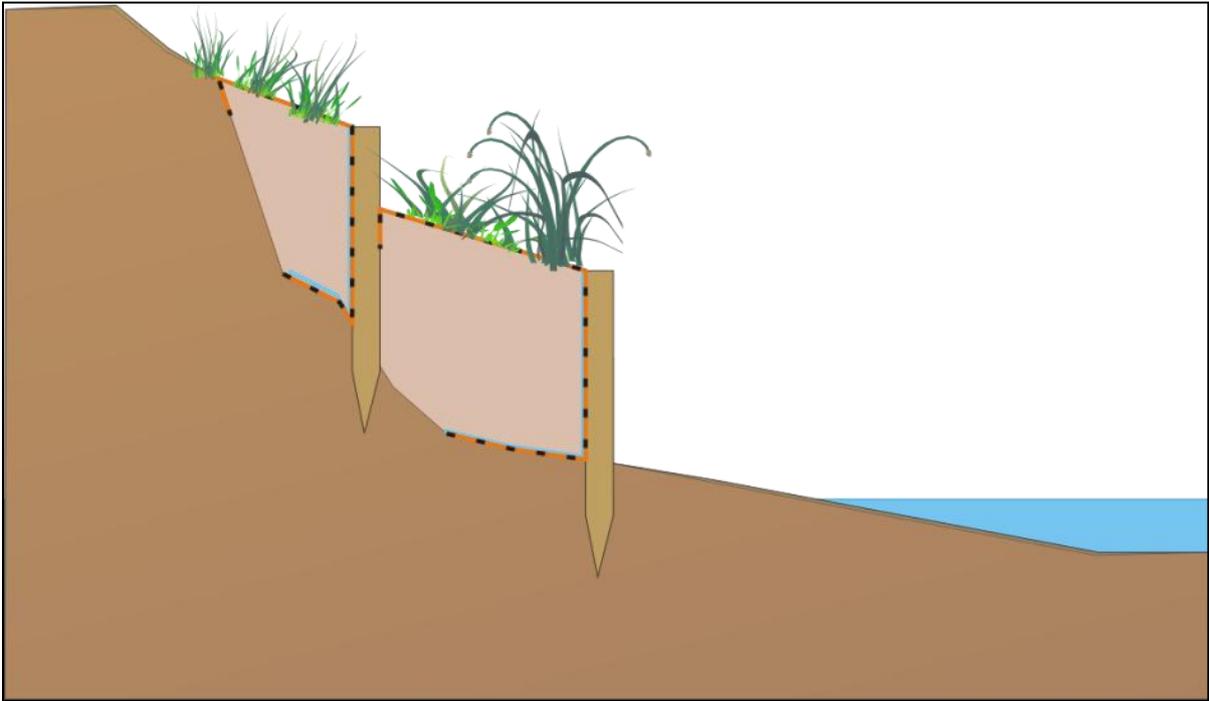
As a secondary option, the weir could be made passable for fish by notching the concrete crest and baffling the water downstream with a small log baffle to reduce the head loss. This option however, will not fully restore connectivity.



**An example of a simple easement to allow fish to pass over the weir and access the Were brook (secondary option).**

The eroded bank at the bay (NGR ST881441, photo 3) needs to be repaired and protected from further erosion. Owing to the steep gradient and height of the bank above water level, a design to stabilise the slope should also include measures to reduce the health and safety risk associated with the sudden drop.

A simple terrace design constructed using sweet-chestnut stakes and geotextile could be back-filled with site-won soil. This should be designed so that the height of the terrace above the water is significant enough to discourage dogs accessing at this point whilst also reducing the overall height of the bank above water level.



**An example post and geotextile terrace design back-filled with soil and planted with marginal species of local provenance.**

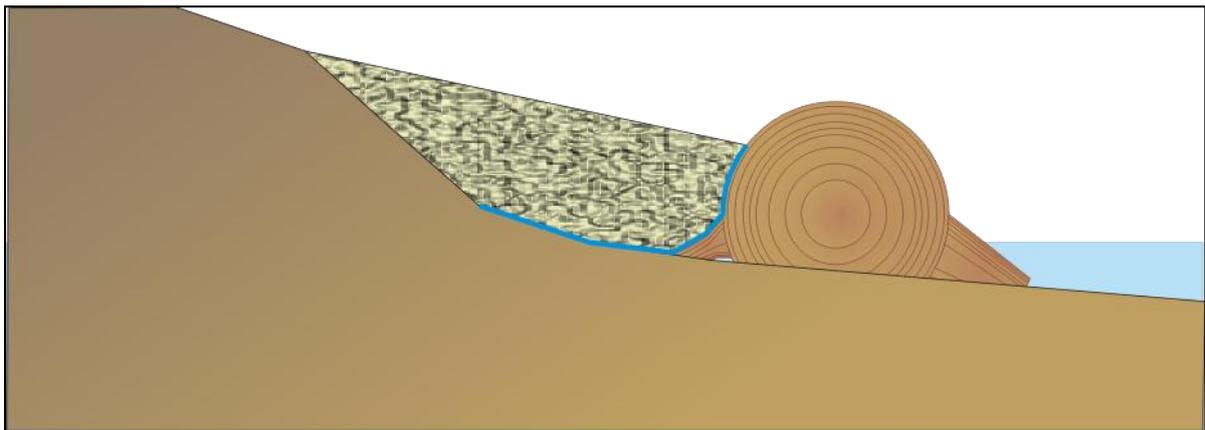
The bay would still be accessible to dogs via an adjacent section of bank that is already reinforced by rubble and the remains of a concrete structure. Here the bank has a shallow gradient and is much less vulnerable to erosion.



**Photo 10: An alternative area for dog access protected from erosion by rubble and a shallow gradient.**

Downstream of the pool the overhanging willow could perhaps receive some careful and sympathetic maintenance to conserve good throughflow but this would only require a very light pruning.

The second eroded bay (NGR ST883441, just upstream of the straightened section) is also in need of some repair and protection. This area is another popular spot for dog walkers and a suitable repair design would have to protect the bank whilst also allowing for dog access. A nearby alder over-shading the channel could be simply felled across the bay, trimmed, and fixed in place. This would not only form the skeleton of a repair structure but the extra sunlight would encourage growth of marginal and in-channel flora.



**An example log and geotextile bank protection back-filled with gravel**

Similar cases of erosion caused by dogs have been successfully abated by the installation of hard-wearing dog access steps or 'dog dips'.

[http://www.youtube.com/watch?feature=player\\_embedded&v=VRQKTA3gyQY](http://www.youtube.com/watch?feature=player_embedded&v=VRQKTA3gyQY)

Throughout the straightened reach, further tree works are required in order to allow more light into the channel. Ideal light conditions consist of a roughly 50:50 ratio mosaic of open sunlight and dense shady cover. Too much open sunlight and fish populations can become threatened by summer temperatures, predation and invasive plants; too much shade and river plants are unable to grow – depriving the river ecosystem of its primary production.

Upstream of the nature reserve a section of the Wylfe is exposed to much more sunlight. The river bed and marginal zone are densely populated with a variety of native plants. This section of river is also teeming with wild trout.



**Photo 11**The Wylie upstream of Smallbrook Meadows. An abundance of sunlight entering the channel has allowed aquatic and marginal plants to flourish.

The stark contrast between the river just upstream of the reserve and the overly shaded and straightened reach within the reserve illustrates the potential the river has for aquatic and marginal plants when direct sunlight is allowed into the channel. In fact, the river through the reserve has arguably more potential than the reach upstream as tree roots and the remains of old infrastructure have helped to diversify flow patterns, providing a more varied physical habitat with patches of fast flow perfect for water crowfoot.

Thinning out the trees on the left bank will also provide materials for further in-channel habitat enhancements. Large woody debris (LWD) deflectors constructed from larger boughs and logs can be installed in the channel to further diversify flow patterns, create localised scour to maintain healthy spawning gravels and locally increase flow velocity that will encourage the growth of flow-loving plant species.

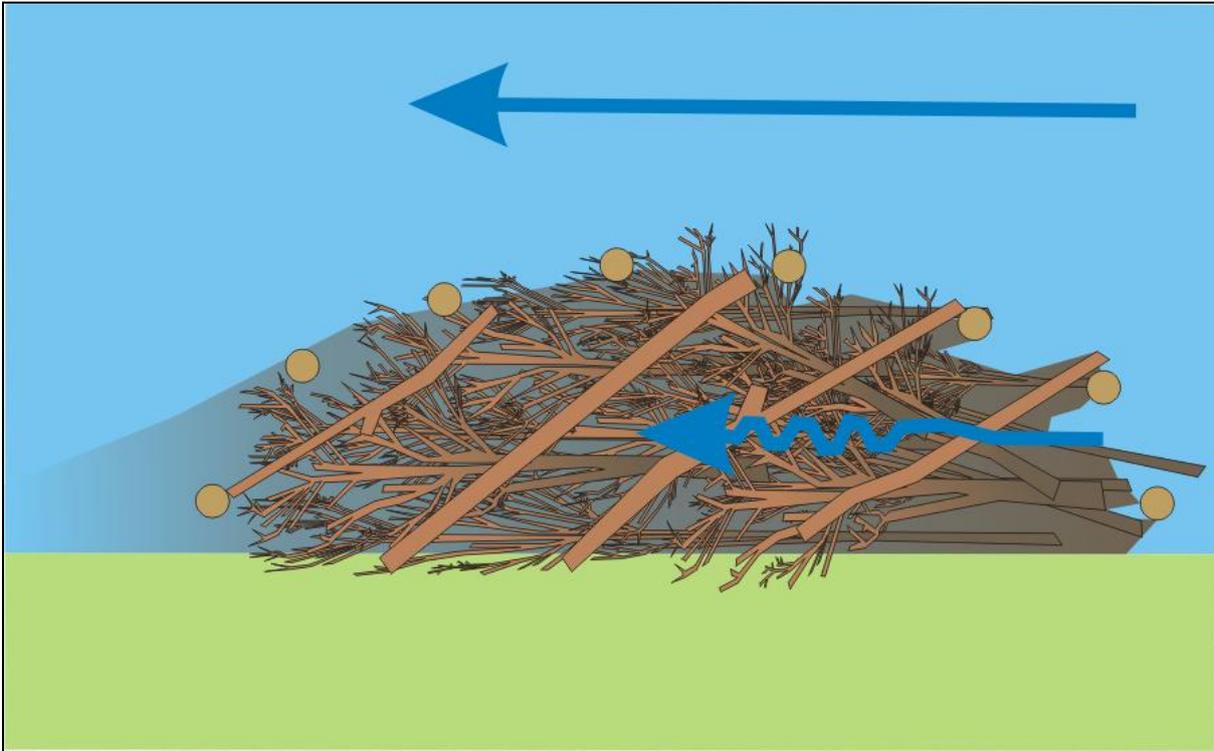


**An example log deflector fixed to the bed with chestnut posts and fencing wire**

Brash from tree works could also be used to create coarse woody debris (CWD) mattresses that will act as sediment traps and provide great habitat for marginal species such as yellow flag iris (*Iris pseudochorus*), sedges (*Carex sp.*), reed canary grass, (*Phalaris arundinacea*), purple loosestrife (*Lythrum salicaria*) and meadowsweet (*Filipendula almeria*). All of these species and more are already growing naturally within the reserve and could be simply translocated to the riverbank to help establish a dense marginal habitat.

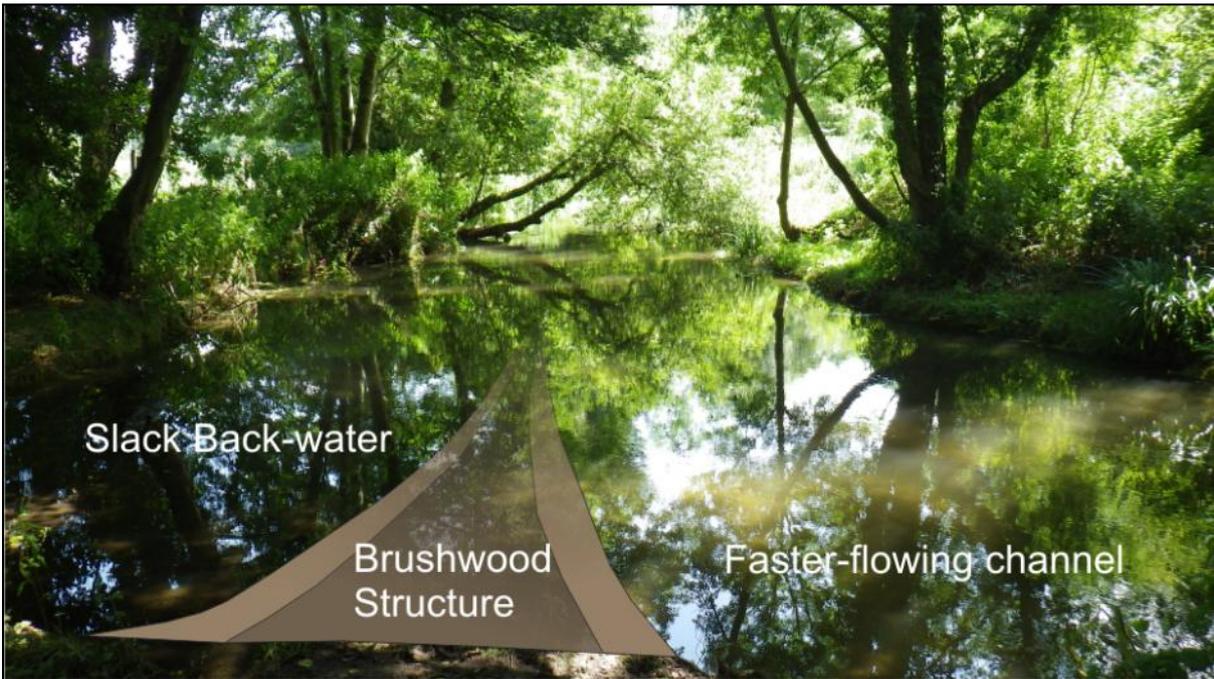
Vibrant, diverse and dense beds of marginal vegetation would not only improve the aesthetics of the river through the reserve but would also boost biodiversity by providing habitat for invertebrates such as banded demoiselle, dragonflies, and mayfly and would also provide shelter and food for water voles and cover for wild trout.

Constructing marginal mattresses populated by dense vegetation in areas of bank currently exploited by poachers could protect the wild fish stocks by making angling difficult from the left bank.



**A 'brushwood mattress' slowing flow velocity causing sediment to drop out of solution and accrete within the structure (blue arrows indicate flow).**

Near the downstream boundary of the reserve, the wide and silted section of the channel could benefit from a simple in-channel CWD structure to divide the channel into two defined faster-flowing and slack backwater zones.



**Suggested location for a brushwood structure separating the flowing channel from a slack backwater.**

This would not only clean the gravel bed through the faster flowing section of river (important for wild trout), but would also provide a large backwater habitat for coarse fish species, amphibians and emergent plants.

## **5. Recommendations**

The following actions are recommended in order for the river Wylfe through Smallbrook Meadows Nature Reserve to achieve its full habitat potential:

- Remove the weir to restore habitat connectivity for fish and invertebrates, and to restore a natural sediment transport regime.
- Repair and protect the heavily eroded bank at the bay and formalise dog access.
- Undertake selective tree works along the left bank through the straightened section of the river with an aim to open up patches of canopy and allow more sunlight into the channel.
- Use the trunk of one felled tree in combination with a geotextile liner and gravel back-fill to repair and protect the smaller eroded bay upstream of the straightened section.
- Use trunks and boughs from the tree works to create a number of flow deflectors in channel to improve flow diversity, scour clean gavels and help promote in-channel weed growth.
- Use brash material from the tree works to create marginal mattresses against parts of the left bank and in open sunlight through the straightened section. These mattresses should be allowed (or helped) to develop into dense marginal beds that will provide habitat for a variety of species, food and cover for water voles whilst also helping to protect the wild trout population from poachers.

- Erect information signs near the river informing local people of the importance of the river habitat (SSSI, SAC, water voles, connectivity etc.), problems associated with dogs continually scrambling up and down the banks, and what to do if they see people fishing illegally (EA Incident Hotline 0800 80 70 60)

## **6. Making it happen**

There is the possibility that the WTT could help to start an enhancement project. We could help to draw up a project proposal (PP) which could be used to support any application for Flood Defence Consent. The PP might also be used as a document to be shared with potential partners as a vehicle for raising project funds.

Alternatively, physical enhancement works could be kick-started with the assistance of a WTT 'Practical Visit' (PV). PV's typically comprise a 1-3 day visit where approved WTT 'Wet-Work' experts will complete a demonstration plot on the site to be restored. This will enable project leaders and teams to obtain on the ground training regarding the appropriate use of conservation techniques and materials, including Health & Safety, equipment and requirements. This will then give projects the strongest possible start leading to successful completion of aims and objectives.

Recipients will be expected to cover travel and accommodation expenses (if required) of the PV leader.

There is currently a big demand for practical assistance and the WTT has to prioritise exactly where it can deploy its limited resources. The Trust is always available to provide free advice and help to organisations and landowners through guidance and linking them up with others that have had experience in improving river habitat.

## **Acknowledgement**

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

## **Disclaimer**

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