Chalgrove Brook

A Project Proposal by the Wild Trout Trust - April 2016

1. Introduction

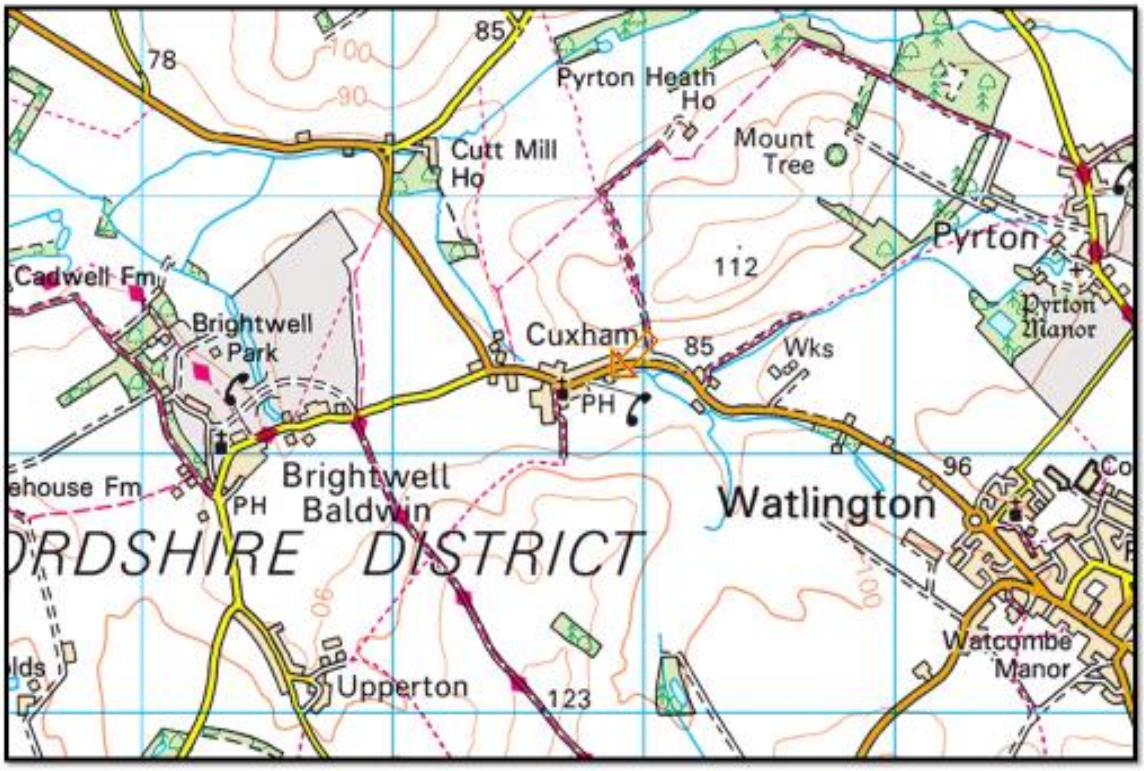
This report is the output of a site visit to Cuxham Mill on the Chalgrove Brook, near Cuxham in Oxfordshire. The site is located at National Grid Reference SU668952. The Chalgrove Brook is classified under the Water Framework Directive as Waterbody ID no. GB106039023740.

The site meeting was organised by members of the River Thame Conservation Trust and the Watlington Environment Group, as active members of the local River Thame Catchment Partnership. The site meeting was held to explore options for improving access for fish migration at the site of an 18th century milling impoundment.

Brown trout, *Salmo trutta,* are known to populate the Chalgrove Brook although the population is thought to be vulnerable following sporadic pollution incidents. Upstream of Cuxham Mill, there is approximately 2km of high quality spawning and nursery habitat that is currently unavailable for fish residing below the mill. Trout are known to inhabit the upper reaches of the stream but joining up habitats by improving access for migrating fish will help to make the local population far more resilient and able to bounce back rapidly following any unfortunate incidents.

Comments in this report are based on observations on the day of the site visit and discussions with Jeanette Wooster (Environment Agency Catchment Coordinator), Andy Killingbeck (Environment Agency Fisheries Technical Specialist), Mike Chadwick and Rick Bennett (Watlington Environment Group, WEG), Emily Godfrey (River Thame Conservation Trust, RTCT) and Eilidh Ferguson (Land owner).

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 Cuxham Mill ©streetmap.

2. Catchment overview

The River Thame is a 60 km lowland river that rises to the north east of Aylesbury in Buckinghamshire and flows west and then south to join the River Thames just upstream of Shillingford. The Thame is a low gradient, low energy river and is characterised by its relatively deep channel and gently meandering planform draining mainly clay soils.

The Chalgrove Brook tributary by contrast is fed by groundwater springs rising from the chalk aquifer at the western foot of the Chiltern Hills near Watlington. As a result, the Brook is characterised by clear water and stable flows. The comparatively steep gradient and underlying geology of chalk and flint gravels have combined to provide the Chalgrove Brook with its own chalkstream ecology that is very different to that found in the main River Thame.

The Brook flows for approximately 10km in a mainly northwest direction to join the Thame at Stadhampton. It is believed that the population of wild brown trout residing in the Chalgrove Brook is the only salmonid population that currently exists in the River Thame Catchment.

3. Habitat assessment

Habitat quality within the Chalgrove Brook for flow loving, gravel spawning fish species is considered to be good. The Brook has been diverted and re-aligned

over long stretches but the combination of a clean gravel bed and a supply of clean, cool groundwater has enabled a population of wild brown trout to exist. Deeper, pool habitat is at a premium but the upper reaches above Cuxham in particular provide excellent opportunities for spawning and for supporting juvenile trout.

Long reaches of the Brook are heavily shaded, which has contributed towards providing a safe refuge for trout from predators, as well as helping to keep the water cool and well oxygenated. Ideally, the shading should be more dappled and where possible generated by low, overhanging branches, rather than high level shading from tall trees.

It is not known what other fish species are present within the Chalgrove Brook. The presence of the trout population was highlighted following an unfortunate mortality which occurred in the autumn of 2014 and was subsequently found to be caused by the release of a natural toxin (saponin) derived from horse chestnuts.

This toxin is found in horse chestnut fruits and can be released following a certain chain of events. The Brook will be particularly vulnerable following a dry spell in the autumn, when base flow is low. High winds have the potential to release large numbers of fruits which can potentially be crushed on the adjacent road and then the residue flushed into the Brook following any heavy rainfall event. Unfortunately, the presence of an avenue of horse chestnut trees in this location will mean the Brook will always be vulnerable to further mortality incidents.

Photo 1. Typical section of the Chalgrove Brook above Cuxham. Shallow gravel riffle habitat providing a good nursery environment for juvenile brown trout. A dearth of deeper pool habitat is an issue that needs to be resolved.

4. Habitat improvement options

Efforts to improve in-channel habitat in the reach immediately downstream of Watlington have already begun via a WTT River Habitat Workshop. It is understood that further work has been carried out under the leadership of Mike Chadwick and the WEG, ably supported by RTCT and the EA.

Redoubling efforts to ensure that spawning gravels are well sorted and relatively free of fine sediment could help to promote significant improvements in egg-to-fry survival. This work should be coupled with actions to ensure that adjacent shallow water habitat is packed with complex cover such as coarse woody material, trailing marginal plants and where light penetration permits, submerged weed. Providing more cover in very shallow water immediately adjacent to and just downstream of optimal spawning sites will help to boost survival of juvenile trout. The provision of low-level overhead cover is important, as is the presence of small pockets of deeper water to provide a safe refuge for adult brood stock.

To open up these areas for access to adult brown trout on spawning migrations it will be essential to provide improved access over the weir impoundment at Cuxham Mill.

5. Project actions

A fish passage solution is definitely required at this site to enable trout to be able to access approximately 2km of high quality spawning and nursery habitat that exists in the reach between Cuxham and Watlington.

The proposal is to modify the weir structure at Cuxham to enable brown trout and possibly other native fish species to be able to freely migrate up and down the river. The proposed solution is based on the principle of installing a low-cost easement, rather than a full blown, technical fish pass. The principles behind the construction of an easement is that it relies on the concept of creating improved opportunities for fish migration but not necessarily providing a guaranteed opportunity to migrate under all prevailing flow conditions.

The provision of a full blown, technical fish pass at Cuxham would cost in the region of £20,000 to £30,000 to install and comes with strict legal implications for on-going maintenance and management. The easement option may well be just as effective at getting fish to where they need to be at critically important times of the year but will be much easier and simpler to construct and does not entail the legal ramifications which accompany the construction of a formal fish pass.

Improved eel passage should also be considered at this site, even though high quality habitat for eels upstream of Cuxham Mill is very limited. If the EA has records of eel being present in the lower reaches of the Chalgrove Brook then perhaps installing a bristle brush pass at this site should also be considered as an integral part of the project.

The options to help improve fish migration over the old milling structure at Cuxham are numerous. This proposal will concentrate on a low cost solution that involves three main elements:

1. To slow water velocities and create increased swimming depth at the downstream tail of the weir to enable fish to be able to swim onto the weir slope. This can be achieved by installing a pre-barrage to slightly raise the downstream river bed levels.

2. To reduce water velocities on the slope itself and provide resting zones.

3. Concentrate flow into a solid plume of water at the head of the weir to enable fish to swim through a gap at the head of the weir impoundment.

5.1 Pre-barrage

In order for fish to be able to swim onto the tail of the weir ramp, it will be necessary to raise downstream water levels by approximately 150mm. This can be achieved by building a naturalistic rock/riffle ramp onto the bed of the stream in the location approximately outlined in photo 1.

This area is where the coarse bed material blown out from the plunge pool at the foot of the weir forms a natural hump in the bed. The proposal is to increase the height of the hump by installing a mattress of coarse stone/cobbles and top dressing it with imported 20-40mm flint gravels. It is estimated that approximately 5 tonnes of stone and approximately 10 tonnes of gravel would be required. Access to the site with a small machine would be ideal but if necessary this quantity of material could be imported by barrow.

In addition to slightly raising the water levels, the riffle ramp can be designed to provide further habitat opportunities. No additional flood risks to the mill property are involved due to the high gradient of the channel below.

5.2 Low cost baffles

To enable fish to be able to swim up the existing weir slope (photo 2) it will be necessary to install a series of baffles, these could be constructed of hardwood, or UV stable plastic.

There are numerous configurations possible but the most pragmatic solution is to install a series of off-set baffles. The configuration of the baffles is depicted in photos 3 and 4.

Photo 1. Weir tail. Blue zone indicates approximate location of the stone/gravel pre-barrage.

Photo 2. Weir slope.

Photo 3. Low cost baffle system constructed in oak on the Costers Brook in West Sussex.

Photo 4. Plastic baffle pass installed on an EA owned crump weir.

A similar design would work well at Cuxham due to the gradient of the slope. Baffles can be cut to size on site and bonded to the concrete slope by drilling and anchoring with chemi-fixed threaded stainless rod and bolted in place with rebated nuts, or bolted in with right angled support brackets.

5.3 Weir head invert.

The upper weir apron (photo 5) can be modified to reduce the head loss by cutting a notch through the central section and shaping the downstream face to encourage a laminar plume of water with sufficient depth for fish to be able to swim through the notch.

Photo 5. Combination of notch, shaped exit and baulks to create additional depth.

The width of the notch should be at least 300mm and the depth of the notch needs to be equal to the height of the first downstream baffle for the easement to be effective. The notch can cut out using a large disc cutter and chiselled out roughly by hand. Care must be taken to ensure the notch is not cut through the entire depth of the concrete to ensure that the integrity of the wing walls is maintained.

6. Budget Estimate.

1. Pre-barrage

Materials £1000
Labour £750

2. Weir baffles

Materials £2000
Labour £3000

3. Notch modifications

Materials £200
Labour £300

4. Design, drawing, consenting and project management to include site supervision.

   £2000

   Estimated total project cost: £9250

Acknowledgement

The Wild Trout Trust would like to thank the Environment Agency for their continued support of the advisory visit service.

Disclaimer