River Ray & Tetchwick Brook – BBOWT Reserve Blackthorn

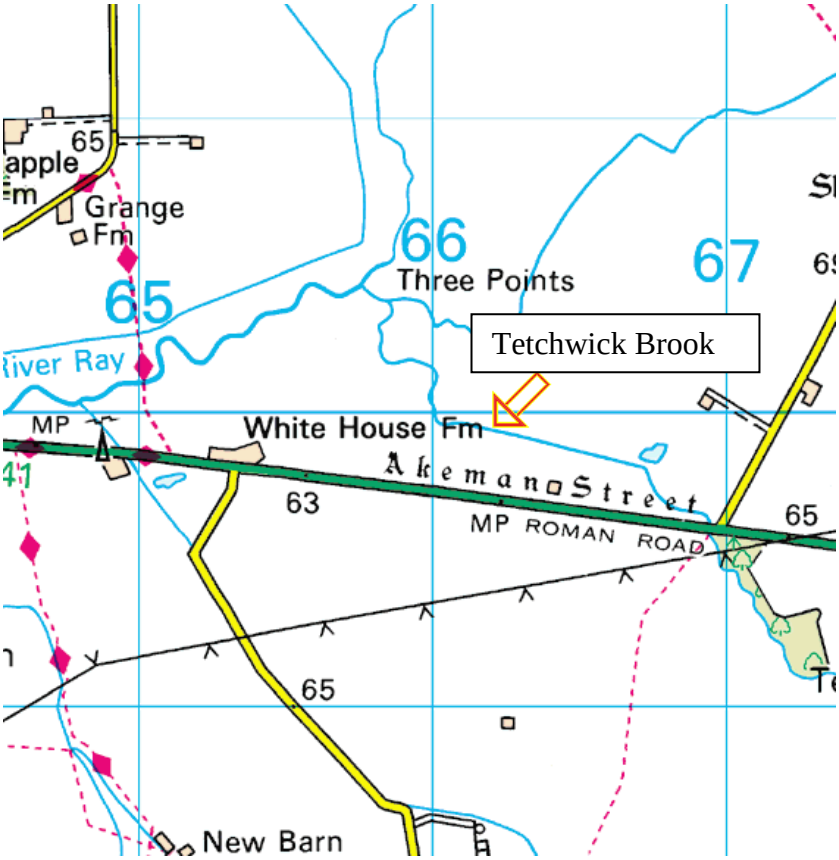
An Advisory Visit by the Wild Trout Trust – November 2014

1. Introduction

This report is the output of a Wild Trout Trust visit to the River Ray and Tetchwick Brook, near Blackthorn in Oxfordshire. The request for the visit came from Mr. Andy Collins, who is the Upper Ray Warden for the Berks, Bucks and Oxon Wildlife Trust (BBOWT).

BBOWT is the local catchment host for the River Ray system under DEFRA's Catchment Based Approach initiative. BBOWT, together with other partners, is keen to explore opportunities to improve the River Ray and Tetchwick Brook, to help meet Water Framework Directive objectives for the river corridor.

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 River Ray and Tetchwick Brook tributary

2. Catchment and fishery overview

The Tetchwick Brook is a small, heavily modified headwater tributary of the River Ray. The Ray rises on the western slopes of Quainten Hill and is predominantly surface fed over a local geology dominated by calcareous mudstone and clay deposits.

The Tetchwick joins the Ray in an area locally known as Three Points, where the Gubbinshole and Broadmoor Ditch system also join the Ray. All three streams flow through the BBOWT Meadow Farm Reserve, a site supporting rare 'ridge and furrow' flower meadows and designated as a County Wildlife Site. http://www.bbowt.org.uk/meadowfarm. From here, the Ray flows for approximately 20 km, via the 200Ha wetland at Otmoor, before joining the Cherwell at Islip.

Both the Tetchwick Brook (WFD Ref GB106039030070) and the Ray (GB106039030090) are failing to meet quality objectives as set out in the River Basin District Plans under the European Water Framework Directive. A number of factors have been highlighted with problems associated with physical channel modification, diffuse pollution and the presence of non-native species such as American signal crayfish (*Pacifastacus leniusculus),* all identified by the Environment Agency (EA) as issues adversely impacting on the River Ray. The locally flat geology and natural hydrology have also been cited by the EA as reasons why these streams are currently failing to meet good ecological status.

The option to try and restore some semi-natural morphology to some of the heavily degraded sections has been considered by BBOWT, with attempts made to reconnect the Tetchwick Brook into an old paleochannel which has unfortunately been unsuccessful.

Very little information is available on local fish stocks, although no salmonid species are though to be present. It is likely the upper Ray and its tributaries support modest densities of coarse fish species such as roach, pike and perch, as well as so called minor species such as minnow and stickleback. The obvious lack of gradient and gravel will be restricting spawning options for species such as dace, chub, gudgeon, bullhead and brook lamprey.

3. Habitat assessment

3.1 Tetchwick Brook.

The upper section of the Brook is heavily impounded (photo 1) by a ford structure (photo 2) that was constructed and then modified in an attempt to force water out of the old straightened channel (photo 3) and into an old paleochannel (photo 4).

In most river and stream environments the action of impounding, or raising the bed to create upstream depth is usually considered to be damaging and often results in a loss of morphological features such as pools, riffles and glides. The

exceptionally flat nature of the local topography means that even without any impoundment, the Tetchwick Brook will always be more akin to linear pond, or ditch habitat, especially during the summer months and following periods of prolonged dry weather.

Photo 1 Impounded section of the Tetchwick Brook approximately 100m above the ford/dam: a good environment for fish like roach, perch, pike and eel.

Photo 2. The downstream face of the ford structure looking up towards the top of the structure.

Photo 3. Looking downstream of the ford at the straightened channel

Photo 4. Gently meandering paleochannel running to the north of the existing modified channel.

Downstream of the ford, the channel is very straight and trapezoidal in cross-section, suggesting a legacy of past drainage works. At the time of the visit, the thick hedge-like margin of thorn trees were being coppiced to promote more local foraging opportunities for wading birds.

The wetted stream channel is comparatively wide and the whole reach consisted of a long, flat-bottomed shallow glide (photo 5). Without further intervention, the available light that can now hit the channel bed will promote vigorous growth of emergent species such as reed canary grass and branched burr reed.

Maintaining emergent reed growth in river margins is a good way of providing habitat for invertebrates, cover for fish and reducing bank erosion. However, in engineered channels where the average flow discharge is too small for the existing channel width, emergent plants often grow in central channel locations, sometimes completely occluding the channel (photo 6).

Photo 5. Typical section of the Tetchwick Brook which is wide and shallow and lacking any discernible evidence of flow. The low willow growing out of the toe of the RB is promoting some "open water" via shading.

The elevated nutrient status of the Brook is promoting heavy weed and algal growth wherever the channel is in direct sunlight. Where the channel is blocked, the surface film is also occasionally covered with duckweed (*Lemna* spp, Photo 7).

Photo 6. Heavy emergent reed and grass growth will block the channel in high summer

Photo 7. In places the surface is covered with duckweed, a potential issue impacting on dissolved oxygen concentrations.

3.2 Ray

The section of Ray inspected was again heavily modified, sitting down in a deeply incised channel. Habitat quality for fish was marginally superior to the Tetchwick Brook, with open water habitat maintained by extensive tree shading. However, the intense shading and lack of in-channel cover will be an issue for primary food production and the lack of cover afforded will leave fish vulnerable to predation.

Only a short section of the Ray was inspected but there is scope for enhancing in-channel habitat by punching the odd hole in the shade canopy and using the woody material to peg into the channel to provide a source of food for grazing invertebrates and cover for small fish.

4. Conclusions

It is unfortunate that attempts to divert the Tetchwick Brook back into an old paleochannel failed. Even if it were possible to raise the water levels sufficiently high to feed into the old channel, it would still be extremely difficult to create a sustainable habitat synonymous with classic flowing stream conditions because of the increased length of the meandering channel and the chronic lack of available gradient. In managing the Brook, it will be essential to have the objectives for the land high up on the list of conservation priorities. As passionate and committed "fish folk" this is a very difficult message for the WTT to convey.

In making these recommendations, it is acknowledged that the primary nature conservation objectives for this site will be focused on preserving and improving the extremely valuable wild flower meadow systems, rather than the ecology of the streams themselves. Although important, it is essential that objectives for the stream do not damage the primary ecological objectives for the adjacent meadows.

Elevated winter water levels, flooding out across the ridge and furrow meadow system is considered to be desirable but excessive summer flooding could prove to be very damaging for the site. Managing water levels that are in-tune with the natural rhythms of the seasons, although in many ways desirable, will increasingly becoming more difficult, especially with the extremes in rainfall patterns that we now seem to regularly experience. In a semi-natural river system, with a modicum of gradient, it is usually possible to manipulate the channel shape to ensure that the river functions over a wide range of flow conditions. This will be much more difficult on the Tetchwick Brook, where there are extremes of flow in a very flat landscape.

The WTT never advocates the use of level control structures impounding water courses but perhaps, in this particular case, conservation objectives can be met more easily if there were the ability to control water levels, both for in-channel ecology and for the management of the meadow systems.

The Tetchwick Brook has precious little potential for flow loving, gravel spawning fish species. Indeed the only section that looked capable of supporting viable fish

stocks was the impounded section located upstream of the ford. This section appeared to be favourable for some fish species such as weed and root substrate spawners like roach, perch and pike. The reach also provided favourable habitat for eels.

I should stress here that for 99% of our visits we would generally advocate lowering any impoundment to promote habitat for a wider range of fish species. Similar advice aimed at these streams will not guarantee success and may result in the loss of some habitat that is currently capable of supporting a viable fish community.

One option on the Tetchwick Brook is to install a series of level control structures and back the levels up on the long straight section to create linear pond habitat. The current margins that have been cleared of thorn trees could be re-profiled to create a low, wet berm, ideal for a range of wetland plants and suitable for winter wader foraging. The deeper water should ensure that no full channel reed encroachment takes place, preserving some "open" water habitat.

It is critically important to ensure that any level-control structures will also permit free migration for fish, including eel. A single impoundment (or even two) may result in an unacceptable head-loss between the impounded water and the levels on the downstream side. For coarse fish species, a head differential between upstream and downstream water levels of no more than 100mm should be the aim. For this reason, a series of structures might be appropriate.

In addition to controlling the head, a narrow central notch should be cut into the level boards to create a small flume of water to facilitate fish migration. To help any eels wishing to migrate, the top edges of any level control boards should be set at a slightly lower-level to promote a drizzle of water through bristle brush matting.

Installing a series of level control structures contradicts most of the objectives set out in the Water Framework Directive. A detailed consultation with the Environment Agency to discuss this option is therefore essential. If carefully designed, it will be possible to peg in summer water levels to provide a viable environment for fish and to control the excessive reed growth promoted by the elevated nutrient levels and shallow water. During the winter months the levels can be manipulated for controlled meadow flooding but also to ensure that in a very wet year there is no summer meadow flooding, or excessive backing up of the stream in what is a very flat catchment.

Options for the main Ray should be very different. Here the channel has some potential for flow-loving fish species. Punching out the odd clump of shading thorn trees and laying them (hedge laying style) into the margins of the channel will provide improved cover and some diversity in stream flow patterns. The techniques for pegging in brushwood and woody debris flow deflectors are set out in the WTT River Habitat manuals, which can be downloaded from our web site at www.wildtrout.org

5. Recommendations

- Review conservation and WFD objectives for the Tetchwick Brook with the Environment Agency.

- Commission a biological and fishery survey of both the impounded and unimpounded reaches of the Tetchwick Brook.

- Explore options for raising water levels in the entire straightened section of the Tetchwick Brook and the creation of a low wet, marginal berm. Perhaps the objective should be linear pond habitat with valuable wet margins, rather than flowing stream habitat.

- Commission a topographical survey to establish the number and height of any series of level control structures required to maintain some open water habitat.

- Ensure that provision is made in the design for both coarse fish and eel migration.

- Undertake tree thinning on the southern bank of the River Ray and use material to create brushwood cover pegged into the river bed margins. This work is ripe for undertaking as part of a River Habitat Workshop. The WTT is able to support BBOWT in running such an event. One route for funding such an event would be for BBOWT to apply to the Rivers and Wetlands Community Days programme, funded by Thames Water PLC, hosted by WTT; further information here: http://www.wildtrout.org/content/rivers-and-wetlands-community-days. Note that the next deadline for submission of applications for this funding is 2 February 2015.

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.

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