River Stour, Stourhead, Wiltshire

An Advisory Visit by the Wild Trout Trust November 2014

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Introduction

This report is the output of a Wild Trout Trust visit undertaken on a number of small lakes at the headwaters of the River Stour on the Stourhead Western Estate near Stourton, Wiltshire (national grid reference (NGR) ST 75752 34497 to ST 76995 33300). A walk-over of the site was requested by Mr. John Parfitt, who manages the local fishing syndicate, Gasper Fly Fishing Association. The visit was primarily focussed on assessing habitat for wild trout (*Salmo trutta*) and identifying fishery management issues.

Comments in this report are based on observations on the day of the site visit and discussions with Mr. Parfitt and his son-in-law, Mr Dave Higgs. 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.

Figure 1: Map showing the location of the water visited

Catchment and Fishery Overview

The River Stour is a 60.5 mile (97 km) long river which flows through Wiltshire and Dorset. It rises from greensand springs at Stourhead where it is impounded into a series of artificial lakes, and drains south east through the Blackmore Vale to Gillingham and Blandford Forum. At Blandford, the river breaks through the chalk ridge of the Dorset Downs, and from there flows south east into the heathlands of South East Dorset. At Wimborne Minster it is joined by the River Allen and finally is joined by the River Avon before it flows into the English Channel at Christchurch Harbour.

Over its course, the Stour flows over three distinct geological formations. Initially rising from sandstone, the Stour flows through a predominantly clay catchment which transitions to white chalk of the Dorset Downs near Blandford Forum. Near Wimbourne Minster the catchment geology changes to a mixture of sand, silt and clay. The change in geology changes the physical and chemical characteristics of the river which in turn affect the river's ecology.

The Stour supports a diverse range of fish species including barbel (*Barbus barbus*), chub (*Leuciscus cephalus*), perch (*Perca fluviatilis*), pike (*Esox lucius*), dace (*Leuciscus leuciscus*), roach (*Rutilus rutilus*), rudd (*Scardinius erythropthalmus*), bream (*Abramis brama*), trout (*Salmo trutta*) and even salmon (*Salmo salar*) which are making a comeback after stocks crashed in the 1970s.

As with many rivers, there is increasing fish species diversity with progress downstream, the headwaters supporting only a limited range of species including brown trout. On the Stourhead Western Estate, the headwaters of the Stour are impounded into a sequence of small, on-line (connected to the river) lakes. Although fish passage is generally poor, preventing downstream populations from accessing the headwaters, self-sustaining populations of brown trout are present in some of the lakes. These populations probably spawn on the gravel stream bed upstream of the lake inlets.

Table 1: Water Framework Directive information (from Environment Agency website)

Site details	
Waterbody Name	STOUR (Headwaters)
Waterbody ID	GB108043022490
Management Catchment	Dorset
River Basin District	South West
Current Ecological Quality	Moderate Status
Biological Quality:	
A characteristic or property of a biological element that is specifically listed in Annex V of the Water Framework Directive for the definition of the ecological status of a water body (for example composition of invertebrates; abundance of angiosperms; age structure of fish).	
OVERALL BIOLOGICAL QUALITY	High
Macro-invertebrates	High
General Physico Chemical Quality:	
OVERALL PHYSICO CHEMICAL QUALITY	Moderate
Ammonia	High
Dissolved Oxygen	High
pH	High
Phosphate	Moderate
Hydro Morphological Quality:	
OVERALL HYDRO MORPHOLOGICAL QUALITY	Not High
Hydrology	Not High
Morphology	Good
Specific Pollutants Quality:	
OVERALL SPECIFIC POLLUTANTS QUALITY	High
Ammonia	High

Habitat Assessment

For the purposes of this report the water visited will be described from the upstream extent of water visited, to the downstream extent visited.

The upstream-most lake visited, Convent Pond, is heavily silted with an infestation of duckweed (Figure 2). The silt in the pond is most-likely a build-up of decaying leaf litter. Eutrophication (an excess of nutrients) arising from the annual input of leaf litter is likely a significant factor in the duckweed infestation. Other factors include the lack of other aquatic plants to compete with the duckweed and the sheltered location of the pond reducing wind-blown movement of the water.

Figure 2: The upstream-most lake is heavily silted with an infestation of duckweed

An overabundance of trees, particularly on western banks can limit the natural mixing effect of wind on the surface of lakes. Wind acting on the surface can also help to concentrate leaf litter at one end of the lake, potentially making silt management easier to tackle. However, bankside trees around watercourses play an important role in regulating temperature. On-line lakes (stillwaters connected to a river system) can have a significant impact on the ecology of the river. In addition to dams acting as barriers to fish passage and substrate transport, the open slow-flowing water is more-easily warmed by the sun. This warming can reduce the concentration of dissolved oxygen and increase the frequency of algal blooms. Shade from bankside tree cover is therefore very important as it can help to regulate water temperature. It is essential to achieve the right balance of tree cover around stillwater habitats to ensure that shade and cover is provided but that leaf litter and wind screening are as limited as possible.

The siltation is most acute at the upstream (western) end of the lake (Figure 3). The natural river upstream has a clean gravel bed but sedimentation in the lake is inhibiting fish passage, potentially depriving fish in the lake from access to spawning habitat.

Figure 3: Siltation is most acute at the upstream (western) bank.

At the downstream end of the lake, flow discharges back into the stream via an impassable culvert. The dam is a complete barrier to fish passage and any fish in the lake must therefore be considered an isolated population. Improving connectivity at the upstream end of the lake will be an important measure in promoting a self-sustaining wild trout population. Options for de-silting the lake and controlling the duckweed are explored in the *Recommendations* section of this report.

The second lake downstream, Tucking Mill Pond, is reported to hold a small population of brown trout. The lake has not been stocked for approximately 20 years so the existing population must be self-sustaining. The lake had an abundance of bankside cover in the form of low branches on the southern and northern banks, sedge beds on the eastern bank (Figure 4) and a cluster of overgrown and partially-submerged willows on the western bank (Figure 5).

Figure 4: The upstream-most lake from the eastern bank.

Figure 5: Willows growing in the shallows of the western bank.

As well as providing shade, bankside trees also provide overhead cover. Brown trout instinctively favour overhead cover as it offers a certain degree of protection from predators such as piscivorous birds. However, an abundance of trees also means an abundance of leaf litter which will be a major contributor to sedimentation. Trees also provide shelter from the wind. Some clearance of the willow thicket dominating the western (upstream) end of the lake would improve angler access and also help to increase the lake's exposure to the prevailing wind.

In addition to the fishery, the lake is also used to feed ducks for an annual shoot. A substantial volume of grain was observed on the southern bank and in the margin of the lake. The bank was also heavily eroded by waterfowl footfall (Figure 6). The volume of grain observed and the severity of the erosion suggests that feeding is over-intensive. Over-feeding ducks could have negative impact on water quality. Birds have a relatively fast metabolism and consume and excrete relatively large volumes of organic material. An increased density of wildfowl can contribute to eutrophication in the lake. Bacterial decomposition of submerged grain could also impact on water quality and the bank erosion is contributing to the lakes fine sediment load.

Figure 6: Wildfowl feeding could be having a negative impact on the quality of the fishery.

The lake is fed by a small stream which flows out from a culvert to the west. The gravel bed of the stream is smothered with fine sediment for approximately 60 metres upstream (Figure 7), probably as a result of the impoundment at the lake slowing flows and allowing fine sediment to drop out of suspension. Near the culvert outfall a small patch of clean gravel was observed (Figure 8). The culvert (Figure 9) is over 100 metres long. Traversing upstream through the culvert would require a prolonged period of physical exertion which makes it a significant obstacle to fish passage. The culvert is also probably a behavioural barrier (research suggests that salmonids may be dissuaded from entering dark culverts (Kemp *et al*., 2006, Weaver *et al*., 1976). Therefore this small patch of gravel may be the only viable spawning habitat available to the trout population.

Figure 7: Fine sediment smothering the stream bed

Figure 8: A small patch of clean gravel near the culvert outfall appears to be the only available spawning habitat.

Figure 9: The outfall of the culvert is not a barrier to fish passage but the length of the culvert makes it a significant obstacle which trout are unlikely to successfully traverse.

Upstream of the entrance to the culvert the stream is relatively fast-flowing over a clean gravel bed (Figure 10). Improving connectivity between this habitat and the lake downstream could significantly boost trout recruitment.

Figure 10: Upstream of the culvert the stream exhibits some very good quality spawning habitat.

The third lake downstream, Lynch Pond, is relatively open to the elements compared to the two lakes upstream. The reduced tree cover and the silt trap effect of the upstream lakes appeared to have reduced the volume of leaf litter, and the resulting rate of sedimentation. The lake appeared to have a good depth and trout were observed rising on the day of the visit. However, sedimentation at the upstream (northern) bank is a classic sign of stream-fed siltation. The sedimentation has caused bankside vegetation to encroach on the lake, reducing the size of the lake over time and potentially impeding upstream access for trout (Figure 11). It is possible that although the inflow from the stream is relatively small, it may be a point source of leaf litter and fine mineral sediment.

Figure 11: Lynch Pond with a dense bed of marginal plants at the inflow (background).

Above the lake the stream has an abundance of good quality spawning habitat but the encroaching vegetation, a mixture of branched bur reed (*Sparganium erectum*), sedges (*Carex* spp.), rushes (*Juncus* spp.) and common reed (*Phragmites australis*), choke the in-flow and trap leaf litter washing downstream (Figure 12). Annually removing trapped leaf litter at this location will help to reduce the rate of sedimentation and could improve upstream access for fish. Another alternative could be to divert the stream through an existing secondary high-flow channel (Figure 13). The advantage of diverting the flow could be that the high flow channel may require less annual maintenance as it is more shaded and less likely to become choked with vegetation. However, the leaf-trapping action of the reed bed will be reduced if the main flow no longer passes through it, potentially making management of silt more difficult.

Figure 12: Leaf litter trapped in encroaching vegetation

Figure 13: Diverting flow through the secondary in-flow channel could be an alternative action

Removing the existing reed bed is not recommended as it probably provides important juvenile trout habitat and boosts biodiversity as well as helping regulate nutrient levels. Instead, de-silting the pond and increasing depth at the western bank, near the existing vegetation (so the depth rapidly increases to approximately 1 metre) could help to reduce the rate of any further encroachment.

The final lake downstream, Lower Kennels Pond, is also relatively exposed but some good cover is provided by low branches from bankside alders (Figure 14). Access is relatively good compared to the other waters visited, potentially making some mechanical de-silting options more practicable. Unfortunately, habitat connectivity is poor both upstream and downstream. Upstream fish passage is blocked by an impoundment at a small pond on private property and the outflow from the lake is also a complete barrier to fish passage. The lack of access to clean gravel habitat presently prohibits the lake from supporting a self-sustaining wild trout population. Whilst the best long-term scenario is to fully reconnect the lake to the river, options to achieve this are likely to be prohibitively expensive in the short term.

Figure 14: Lower Kennels Pond from the Southern bank

In terms of operating a functional fishery, the best option for the short term may be to stock the lake with triploid (non-breeding) trout on a put-and-take basis. The good access could enable the lake to be used as a day-ticket fishery which could help raise funds for other habitat improvements on the other waters visited. With this in mind, it may be worthwhile stocking the lake with rainbow trout (*Oncorhynchus mykiss*) as opposed to brown trout as this will allow anglers to clearly differentiate between the wild and stocked parts of the fishery and ensure that no wild fish are taken. This could also be achieved by stocking with clearly-marked stocked brown trout but rainbows may provide a more varied angling experience for members, are cheaper and avoid issues associated with marking.

When stocking waters with fish, it is important not to over-stock and ideally to ensure that after the initial stocking, fish are replaced as they are taken rather than in one big annual stocking. Over-stocking increases the risk of disease and attracting excessive numbers of mobile predators such as cormorants. Trickle-stocking will also help to limit the impact of any potential disasters such as disease outbreaks or pollution events. However, it will be more costly to ask a fish farmer to deliver more, small batches of fish for stocking. It may also be the case that only early season stocking of the ponds at Stourhead is possible since they may become a hostile environment for trout as the summer progresses and water temperatures increase. Ensuring that the lake has sufficient depth to moderate water temperature in summer months will be crucial. As a general rule of thumb, about a third of the lake should be over 3 metres deep.

Conclusions:

From a purely ecological perspective, the best option for the River Stour would be to reconnect all of the headwaters to the river downstream by removing or bypassing all impoundments (dams) on the system. This would open up access to spawning habitat to downstream trout populations. However, so high up in the catchment, this would probably result in the loss of a viable angling fishery.

However, better connecting the existing lake and river habitats with fish passage improvements should be a medium-term goal for safeguarding and improving the wild trout population.

In the short term, improving access to spawning habitat where possible, and controlling sedimentation in the lakes will be the best means of maintaining a feasible wild trout fishery.

Stocking with triploid trout may be an option to create a working fishery on the lower lake. However, any stocking in the other lakes is likely to harm the existing trout populations and so efforts should be focussed on habitat improvement only.

Recommendations:

In order for the waters visited to achieve their full potential as good quality habitats, capable of supporting healthy, self-sustaining populations of wild brown trout, the following actions are recommended:

1. Commence tree works around the top two lakes to help control the annual volume of leaf litter and to expose the lakes surface to prevailing (south-westerly) winds. Care should be taken to ensure that adequate shade and low-growing branches over the water are retained.

2. Initiate a programme of silt removal from the lakes. There are a number of techniques available to achieve this goal, the right ones for each lake will depend heavily on access and associated costs. Chemical treatment of the organic component of silt (e.g. with chalk-based products such as Siltex) may be the most cost-effective solution where poor access makes mechanical removal options impractical. It is understood that discussions between Mr. Parfitt and Shaun Leonard of WTT highlighted the options for treatment of the siltation issue and concluded that some partial Siltex treatment may be attempted on the lakes. Mr. Leonard described the likely annual reduction in silt depth from Siltex treatment (perhaps only 1 or 2 cm), that these treatments work only on the organic fraction of any silt load, that there is a need for annual retreatment if some benefit is observed and that there is a risk of algal blooms in ponds that are effectively fertilised by the Siltex treatment. However, there are many modern technical innovations in silt removal and it is recommended that quotations for mechanical removal are obtained from companies that specialise in aquatic management.).

3. Engage with the Estate owner and explore the possibility of ceasing duck feeding on Tucking Mill Lake. The potential impacts on the fishery of an

increased wildfowl population in the general area may not necessarily be limited to the lake where feeding occurs.

4. Duckweed on Convent Pond can be initially removed by skimming the surface with a boom to collect it in one location and netting it out with a large hand net. An alternative technique is to pump water from the surface and letting it drain back into the pond from a short distance from the bank edge (so that the duckweed remains on the bank). Reducing the volume of sediment in the pond also will help to reduce concentrations of excess nutrients, in turn helping to control the duckweed. It is worth remembering, however, that aquatic weed treatment such as this has to be an ongoing job because the duckweed will return. It is rather similar to maintaining a garden lawn where regular cuts through the growing season are needed to keep the grass short.

5. Better connect the Tucking Mill Pond with the river upstream by removing the culvert and replacing it with a clear-span bridge where farm access between the fields is required. Excavating the pipe should be a relatively simple task that can be undertaken with a small 360 excavator or tractor equipped with a digging bucket. At present the pipe is in a straight line and so once removed, a more sinuous plan form will need to be created. The new channel will need to be shaped to closely resemble the depth, width and sinuosity of the natural channel upstream and downstream of the culvert. It is possible that a natural gravel seam is present at the depth of the pipe but it may be that new gravel will need to be introduced. This will provide an opportunity to shape a sequence of riffles and pools into the channel. In addition to new gravels, introducing some fixed woody features such as small logs will help to diversify flow patterns and keep gravels scoured clean of fine sediment.
   The Wild Trout Trust may be able to supervise such a project as a free 'practical visit'.

6. Clear the inflow of Lynch Pond to facilitate access to spawning habitat upstream. Alternatively, consider diverting the inflow through the secondary channel (Figure 13). This channel is less likely to become

encroached by marginal plants, reducing annual maintenance, but the lack of vegetation could also allow more leaves into the pond, potentially accelerating the rate of sedimentation.

7. Consider establishing a stocked catch-and-take day-ticket fishery at Lower Kennels Pond. Profits from day tickets could help towards covering the cost of managing sediment and habitat works throughout the rest of the fishery. Further advice should be sought on the viability of the lake to support a commercial fishery. A good starting point would be to review Environment Agency fishery management advice (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/290646/sw2-045-tr-e-e.pdf)

Making It Happen

The creation of any structures within most rivers or within 8m of the channel boundary (which may be the top of the flood-plain in some cases) normally require formal Flood Defence Consent (FDC) from the Environment Agency. This enables the EA to assess possible flood risk, and also any possible ecological impacts. The headwaters of many rivers are not designated as 'Main River', in which case the body responsible for issuing consent will be the Local Authroity. In any case, contacting the EA early and informally discussing any proposed works is recommended as a means of efficiently processing an application.

The WTT website library has a wide range of free materials in video and PDF format on habitat management and improvement:

http://www.wildtrout.org/content/index

The Wild Trout Trust has also 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 debris, enhancing fish stocks and managing invasive species.

The DVD is available to buy for £10.00 from our website shop http://www.wildtrout.org/product/rivers-working-wild-trout-dvd-0 or by calling the WTT office on 02392 570985.

There is also the possibility that the WTT could help via a Practical Visit (PV). PV's typically comprise a 1-3 day visit where WTT Conservation Officers will complete a demonstration plot on the site to be restored.

This enables recipients 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 (if required) expenses of the WTT attendees.

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.

Disclaimer

This report is produced for guidance; no liability or responsibility for any loss or damage can be accepted by the Wild Trout Trust as a result of any other person, company or organisation acting, or refraining from acting, upon guidance made in this report.

References:

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