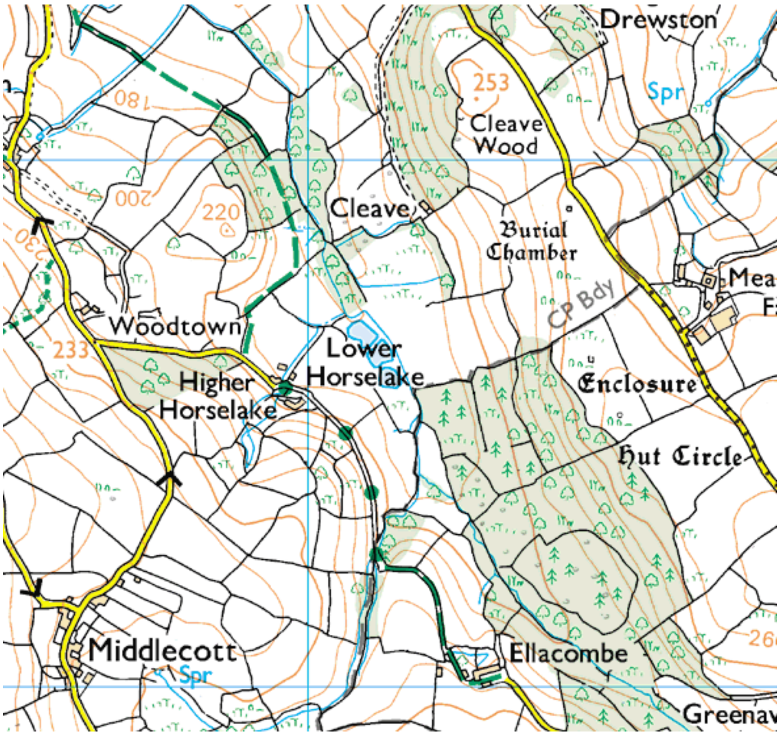
Higher Horselake Farm – Teign tributary

An Advisory Visit by the Wild Trout Trust – August 2014

1. Introduction

This report is the output of a Wild Trout Trust visit to a chain of on-line lakes and small stream at Higher Horselake Farm near Chagford in Devon. The stream rises a short distance (less than 1km) upstream of the farm and flows for approximately 3km before entering the Teign below Chagford.

The request for the visit was made by Mr. David Duerden, who has recently purchased the farm. Mr. Duerden owns approximately 0.5km of the stream which is intercepted by a chain of three on-line lakes, all of which are derelict. Mr. Duerden is keen to explore options for managing both the stream and the lakes and seeks advice on options for developing at least one of the ponds as a viable fishery.



Higher Horselake Farm Location Map

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.

The contents of this report cover a 500m section of stream and the on-line lakes from National Grid Reference SX720867 up to SX722864. This particular tributary is not listed as being assessed under the Water Framework Directive. The confluence of the stream with the Teign is, however, listed as being in Good Ecological Status in water body I.D. number GB108046008550.

2. Catchment and fishery overview

Upper Horselake Farm is located in the Dartmoor National Park but is outside of the sensitive moorland sites designated as a Special Area of Conservation and Site of Special Scientific Interest.

The local geology consists of well-drained, loamy soils overlying igneous rock. The small stream running through the land appears to be typical of a small Devon spate stream, with a light brown tinge of colour indicating the slightly acid nature of the catchment.

Small streams such as this one support valuable spawning and nursery sites for salmonid fish species and may well be a critically important resource contributing stock for the main River Teign.

3. Fishery potential and habitat assessment

3.1 Stream above lakes

The original course of the stream has been significantly altered. As well as being heavily modified, the stream also flows in two parallel channels. Multiple or braided channels can sometimes be found on spate streams; however, it is unusual to have parallel channels flowing through steep sided valleys where the natural flood plane is comparatively narrow. Usually the water finds a common route down the slope and gently twists and turns as the stream carves out a route via softer and more erodible geology.

The twin channels running up above the lakes have been modified with the northern arm being semi-natural and the straighter, southern arm dug out at some time in the dim and distant past. It is difficult to speculate why the stream was modified but presumably the reasons are linked with the creation of the three, small, on-line lakes.

Habitat quality within the stream channels was considered to be good for trout, particularly on the natural channel where the stream has formed classic pool, riffle and glide regimes. The streams were well shaded with occasional shafts of light hitting the channel. The bed was mainly fine silts and gravels with occasional outcrops of coarse gravel in the 10-50mm range – ideal for trout spawning. A cursory look under some large stones revealed prolific numbers of olive (mayfly) nymphs, shrimps and caddis larvae (photo 1), all indicating very good water quality conditions.

Small brown trout were seen in the middle pond and both stream channels. As the total length of stream running up above the lakes is very modest (less than 1km), it is likely that wild fish have migrated up from below the lakes and spawned in the reach above. It would seem unlikely but just possible, that a small resident population of brown trout could have survived in the upper reaches above the lakes after the initial lake construction. It is more likely that occasional broodfish are able to run up out of the small refuge areas within the ponds. Another possibility is that occasional sea trout have managed to bypass the lakes on the back of a big autumn flood and helped to augment the stock.

Sea trout favour tiny side streams for spawning and will push up as far as possible in the autumn when water is available. The lakes have no defined flood elevation capacity and in a big rainfall event it is likely that significant quantities of water flow around the dam structures making fish migration possible.

Photo1: Large numbers of caddis larvae clinging to the underside of a stone in the feeder stream. A good indicator of high quality water.

The stream itself is in relatively good condition. Making sure that at least some direct sunlight reaches the channel is helpful and having a relaxed approach to woody debris (LWD) within the channel will also be important.

LWD is a general term referring to all wood naturally occurring in streams including branches, stumps and logs. Almost all LWD in streams is derived from trees located within the riparian corridor. Streams with adequate LWD tend to have greater habitat diversity, a natural meandering shape and greater resistance to high water events. Therefore LWD is an essential component of a healthy stream's ecology and is beneficial by maintaining the diversity of biological communities and physical habitat.

Traditionally, many land managers and riparian owners have treated LWD in streams as a nuisance and have removed it, often with uncertain consequences. Stream clearance can reduce the amount of organic material necessary to support the aquatic food web, remove vital in-stream habitats that fish will utilise for shelter and spawning and reduce the level of erosion resistance provided against high flows. In addition, LWD improves the stream structure by enhancing the substrate and diverting the stream current in such a way that pools and spawning riffles are likely to develop. A stream with varied bed material and pools and riffles is ideal for benthic (bottom dwelling) organisms as well as for fish species like wild trout.

3.2 On-line lakes

It is not known how old the lakes are and why they were constructed. The water level control structures give no clue as to the age of the ponds although the water passes through modern plastic culvert tubes which obviously are not synonymous with ancient stew ponds! It is possible that these pipes have been installed comparatively recently and does not necessarily indicate that the ponds are a recent creation. Determining when the lakes were created is important and will help to influence management decisions going forward. Currently all three lakes are heavily silted, which to me indicates either they were constructed a very long time ago, or that the stream when in spate carries a very high sediment loading, or possibly a combination of both.

Normally when confronted with a chain of lakes it is usual for the upstream lake to act as a sediment trap for the downstream lakes, giving them a level of protection that on some systems means that siltation becomes a very slow process. In this case the large downstream lake is also full of deposited sediment.

The dams and culverts connecting the lakes were all in very poor condition (photo 2) and in some cases water was completely bypassing the intended culverts, which were partially blocked in favour of an eroded subterranean route. This could lead to complete dam failure.

Photo 2. Water flowing under the connecting culvert – not through it.

All three lakes support significant quantities of aquatic plants both submerged and emergent. The rich and luxuriant nature of the plant growth indicates that the valley floor is nutrient rich. The source of nutrient may well be coming in via the feed stream but steep sided valleys that lead down from both sides might also provide nutrients form point source locations such as private sewage systems, farm yards or possibly via diffuse sources where water filters through fertilized fields towards the top of the valley. This should be investigated in a little more detail as although the standing water was not packed with algal species (often an indication of excessive nutrient loading) the sheer quantity of macropyhte growth might present some future difficulties, particularly if significant investment was made in returning one of the lakes to what is hoped could be a viable fishery.

Photo 3. Bottom lake looking towards the dam, supporting luxuriant weed growth.

One area of concern surrounds a plant observed mainly on the top pond but is highly likely to be present in all three (Photo 4). The plant is known as New Zealand Pygmy Weed or Australian Swamp Stone Crop (*Crassula helmsii*). As the names suggest, this is a non-native species and one that has been flagged up by DEFRA as a designated Non Native Invasive Species.

This plant is highly invasive and can grow in damp ground right through to fully submerged situations. Its control is extremely difficult as new plants can propagate from small scraps of the 'parent' plant. Professional advice on its eradication should be sought. A start point is the EA's new guide on aquatic plant management (see http://www.wildtrout.org/news/managing-plants-riversand-ponds-useful-new-guide-published. Dr. Jonathan Newman at the Centre for Ecology and Hydrology is a recognised expert in the control of aquatic plants: http://www.ceh.ac.uk/staffwebpages/drjonathannewman.html

Photo 4. Stonecrop coating the margins of the top lake and one which should be eradicated if at all possible.

More information can also be found at: www.nonnativespieces.org

Help and further advice with regard to dealing with this plant can be obtained from the Dartmoor National Park Authority, The Environment Agency or Natural England.

4. Conclusions

There are a number of management options to consider ranging from the "do-nothing" right through to restoring all the lakes. The do nothing option isn't without some merit; lakes, ponds and pools that succeed to wetland bog are often botanically rich and a haven for wildlife. The presence of ornamental and non-native species detracts from the value of this possible scenario. Properly connecting up the stream for improved fish passage would be a wonderful enhancement.

Restoring one lake, modifying the inlet channel and creating a functional bypass channel would be an option that creates opportunities to develop a viable fishery, maintains some wetland habitat and gives opportunities to improve fish migration, as well as manage the downstream sediment burdens which have filled all three lakes.

Before embarking on any particular design, it is recommended to carry out some research and commission a survey of the site. Viewing historical maps may help to identify the period when the lakes were originally constructed. If they are in excess of hundred years old then the levels of siltation may not be of direct concern when contemplating restoration. If however the lakes were relatively recently constructed then managing the sediment burden from the inflowing stream will be of greater importance. Digging out the bottom, largest lake would seem to be the most sensible option and will allow the top ponds to continue to trap at least some sediment as well as provide the shallow wetland habitat that will attract wildlife. However, if these top lakes remain on-line with the stream, they may need some periodic maintenance (e.g. small scale desilting) to ensure they retain a settling function to protect the bottom lake.

A survey of the bottom lake is required to determine the depth of deposited bed material and also to ascertain how deep the lake could realistically be dug if taken down. Ideally, stillwater trout fisheries need to have some deep, cool refuge areas which help to buffer against the impacts of low flow and warm water temperatures. As a rule of thumb, trout fisheries should ideally be dug to a depth of at least 3m over 25% of the lake area. Shallow margins and bays are also important to promote productivity in the natural food chain. Shallow, weedy margins will help to promote fly life and the margins should gradually slope off to deeper areas, with the deepest zone usually in front of the middle of the dam area. Investing in the construction of a monk sluice with removal level control boards is always recommended should an emergency drain-down be required.

If the local geology allows for the desired water depth to be achieved then the requirement for a prolific supply of cool inlet water is not so important. The shallower the pond is, the more reliant it would become on the flow via the inlet stream to maintain oxygen levels and keep the temperatures suitable for trout. If the lake can be made sufficiently deep then all that is required is enough flow to offset evaporation and maintain level. The more water that is bypassed, the more sustainable the lake becomes.

Finding a new route for the bulk of the stream flow, particularly in spate conditions would be the ideal scenario. Having a control structure on the stream above the bottom lake and having the ability to divert water away from the lake and connecting back up with the stream below would improve the stream ecology and protect the lake from rapidly filling back up with sediment. A topographical levels survey may help to identify a suitable route for a bypass channel.

Any new channel should be naturalistic, with varied plan-form and bed topography. A critically important aspect of design will be to manage the gradient so that the bed and banks are stable and to facilitate free fish passage. This may well require the construction of low stone check weirs to manage the gradient and facilitate improved fish migration.

This potentially represents a significant environmental, as well as a fishery opportunity. An early consultation with the local Environment Agency is recommended. If the survey indicates that the project is possible, then key issues to discuss are disposal of dredged material, design of the bypass channel and flow/level control structures. Large-scale earthworks often require Local Authority planning permission although there is a strong case to suggest that dredging work is maintenance and therefore beyond the remit of the planning regulations. A written pre-development enquiry to the EA and the LA will help to point you in the right direction regarding any formal permissions or consents that might be required. Find out from the local EA whether or not the stream is designated as “a main river watercourse”. If it is, then the EA will require a formal Land Drainage Consent application for any work within 8m of the banks. Do not be slow to promote this project as an environmental enhancement.

Exploring the potential options for lake restoration is your first step. Issues such as stock management are relatively easy compared with creating the right environment for them.

For the lake to perform as a viable still water fly fishery some degree of stocking may be required. Some small wild fish will hopefully drop back into the lake and grow on but it is important that any stocking contemplated does not adversely impact on local wild stocks. Health certified, sterile brown trout are available from fish farms. It might be possible to gain consent from the EA to introduce rainbow trout which will be cheaper to buy and arguably a better sporting fish in an artificial lake environment. Stocking once or twice a season with a maximum of 50 fish should provide good sport and augment the catch of any small wild brown trout that may drop back from excess production in the stream. A written consent for stocking fish into the wild is required from the EA.

5. Recommendations

- Seek professional advice on control of the Australian Swamp Stoencrop.
- Manage the stream with a light touch. Coppice the odd tree to promote shafts of light over shallow runs and leave woody debris in the channel where possible.
- Carry out some research into the age of the lakes.
- If they are very old then proceed with plans to reinstate the bottom lake.
- Carry out a levels survey of the bottom lake and surrounding land.
- Investigate the nature of the underlying geology. If the lake is only three foot deep overlying granite then a trout fishery isn’t a viable option.

- Plan a suitable route for a new bypass channel. A new channel could be constructed within the boundaries of the existing lake.

- Construct a monk sluice on the dam and an inlet structure that ensures the majority of the flow bypasses the lake.

- Manage the gradient in the bypass channel with a series of low (less than 200mm head loss) rock weirs to facilitate improved fish migration. Low weirs should be well spaced and no closer together along the stream than 6 times the channel width.

- Submit plans to the EA and your LA as an enquiry rather than application for permissions. This will save time and money and safeguard against the likelihood that well developed plans submitted for formal consent will be rejected.

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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