

WILD TROUT TRUST

Advisory Report

Dolwen Reservoir

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1.0 Introduction

This report is the result of discussions with Gavin Jones, member of the syndicate which fishes Dolwen Reservoir, a site owned and operated by Dwr Cymru Welsh Water. No site visit was possible because of coronavirus travel restrictions; comments in this report are based on telephone discussions and observation of photographs and videos, and may require amendment.

Normal convention is applied throughout the report with respect to bank identification, i.e. the banks are designated left hand bank (LHB) or right hand bank (RHB) whilst looking downstream.

2.0 Catchment / Fishery Overview

Dolwen Reservoir is near Llanefydd within the catchment of the Afon Elwy, North Wales. It was constructed in 1907 and is roughly square-shaped with a dam at its northern end and is approximately 19 acres in area. The reservoir is fed by three small, spring-fed feeder streams, the most significant of which is in the south-eastern corner and drains the area upstream from Plas Cwtta.

The reservoir overspill is located in the north-western corner and is currently undergoing civil engineering works, during which the reservoir water levels have been drawn down (cover picture, Figure 1). The works are due for completion in autumn 2020. The outflow from the reservoir runs into another reservoir, Plâs-uchaf, about 500m downstream.

Dolwen reservoir is fished by an angling syndicate which has held the lease since 2013. During this period it has become apparent the reservoir holds a population of brown trout which have been observed spawning in the main feeder stream during winters up to 2017 (when the reservoir was drawn down for work on the spillway?). The reservoir has been stocked in the past with rainbows (and browns?), and fishing is by fly, spinning and worm. For the last three years, whilst the engineering works take place, there has been no stocking and a catch-and-release has policy has operated (C&R has always been in place for brown trout). Last season, only brown trout were caught.



Figure 1 Engineering works on the reservoir spillway

3.0 Habitat Assessment

The key factor in maintaining a self-sustaining population of brown trout in the reservoir is the feeder stream, specifically

- ensuring adult fish have access to suitable spawning habitat at the right time of year (autumn/winter)
- ensuring juvenile trout can hatch and leave the feeder stream into the reservoir.

Flows within the feeder stream are seasonal and it often dries up completely during the summer; in contrast it can flow strongly after periods of heavy rainfall, such as last winter (2019/20). Up until recently, access for adult fish into the feeder stream was limited by the presence of a culverted section of stream thought to be part of a sediment trap which had become completely in-filled (Figure 2 - Figure 7).



Figure 2 View upstream to footbridge during high flows (January 2020), showing the downstream headwall of the sediment trap (foreground, acting as a weir).



Figure 3 View downstream from footbridge (January 2020), showing location of downstream headwall (arrow)



Figure 4 View from a similar position to Figure 3 during lower water conditions showing position of headwall (arrow) and water flowing into a culvert pipe in the right bank (inset).



Figure 5 Outflow from the culvert pipe shown in Figure 4 downstream of the headwall. Trout were spawning here at the time the video was taken.



Figure 6 View downstream from the headwall taken at the same time as Figure 4 and Figure 5, showing brick pillars with slots for boards and the reservoir beyond the trees in the background.



Figure 7 The same culvert pipe outflow as Figure 5 and Figure 6 during summer low flow. Trout fry are present here and similarly directly opposite in the mouth of a similar pipe through the left bank (which is blocked in the above pictures).

In recent weeks, work has been carried out to remove the downstream headwall of the gravel trap and excavate accumulated sediments down to the originally constructed bed level (which is paved with slate), as shown in Figure 8 and Figure 9.



Figure 8 The sediment trap area currently, following recent excavation works which have exposed the original side walls and paved base of the structure. Reference points relative to above pictures are footbridge and the inflow ends of culvert pipes (arrows). Upstream view.

The work appears to have revealed another headwall at the upstream end of the gravel trap, beneath the bridge. A ramp of gravel has been left in place here either deliberately or because the machine could not access beneath the bridge. It appears that the gravel trap was designed to work by creating a sump between two headwalls where gravel being carried in spates settled out (and could be removed), and lower flows were diverted around the sump via culvert pipes through each bank (presumably to allow maintenance).



Figure 9 Wider view of Figure 8, showing level board structure, just downstream of former headwall position and culvert outflow pipes (arrows).

There are pros and cons to the recent works to the sediment trap.

The removal of the downstream headwall has potentially increased upstream access for trout to a greater length of the feeder stream. This is subject to closer inspection of the apparently steep drop and ramp of sediment under the bridge in Figure 8; this appears to be a barrier to fish movement as it stands, and the high flows required for fish movement are likely to move the gravel ramp leaving an even more significant migration barrier.

The channel dimensions of the sediment trap are greatly over-capacity for the stream's flow. This will lead to the accumulation of sediment here (as per its original design), but not to the same extent as previously now the downstream headwall has been removed. This will provide a spawning substrate for trout, but it is likely that the flow within the over-wide channel will be insufficient for spawning. Wide, shallow flows will not sort the gravel (flushing through finer sediments) or provide the stimulus trout need to spawn; similarly, the flows may not be adequate for egg survival and successful hatching.

Previously observed spawning in the Figure 5 video shows fish attracted to the flow being flumed through the narrow culvert pipe and a ramp of clean gravel just downstream. These are the type of flow and substrate conditions that need to be mimicked to provide good spawning conditions. In order to do this the channel through the sediment trap needs to be remodelled to pinch the flow and encourage a mosaic of scour and depositional areas. Some suggestions are outlined in recommendations section.

Further upstream on the feeder stream, above the footbridge, the channel is fenced off from livestock which is very beneficial for stream habitat. The absence of grazing promotes a healthy riparian zone which provides overhanging cover habitat for juvenile trout; shade to keep water temperatures down (important in shallow streams); and a subsidy of terrestrial invertebrates for trout food.

One issue with the fencing is shown in Figure 10 where it crosses the stream. The barrier to stock getting through the fence via the river channel (which is vital to maintain the above benefits) has caused an accumulation of debris which has in turn caused natural stream sediments to settle out upstream. This would not necessarily be a problem if it were a natural woody

dam (they are temporary, usually passable by fish at high flows and the habitat benefits tend to outweigh the negatives), but this situation threatens the integrity of the fence.



Figure 10 Debris dam behind the post-and-rail panel.

To tackle the issue, the barrier under the fence could be replaced with a swinging gate arrangement (see recommendations) which lifts during high flows. However, this is not immune to debris accumulation and would require regular checking to make sure it is not wedged open, allowing livestock access and losing the benefits of the fencing.

Another key consideration in protecting the brown trout population in Dolwen is providing habitat for the juveniles. Mortality rates of trout in their first year of life are naturally very high, but this is greatly influenced by the availability and quality of habitat. The feeder stream is small and prone to drying out, so there is limited opportunity for juvenile trout to grow-on there and they are likely to drop down to the reservoir at a small size. Providing good quality juvenile habitat in the margins of the reservoir, especially in the vicinity of the feeder stream delta, is therefore important. This could consist of large stones, tree stumps, brushwood mattresses, scrub willows – anything to provide cover and refuge from predation.

4.0 Recommendations

Feeder stream

- Remodel the channel of the feeder stream through the gravel trap area by removing the upstream headwall, re-grading the channel into the walled area, introducing large boulders and re-introducing some of the excavated gravel. The aim should be to create a series of pools and narrow flumes of water (Figure 11). The gaps between boulders are important; bearing in mind the observations in Figure 5 (12" culvert pipe?) a gap of around 300mm should be aimed for into each pool.

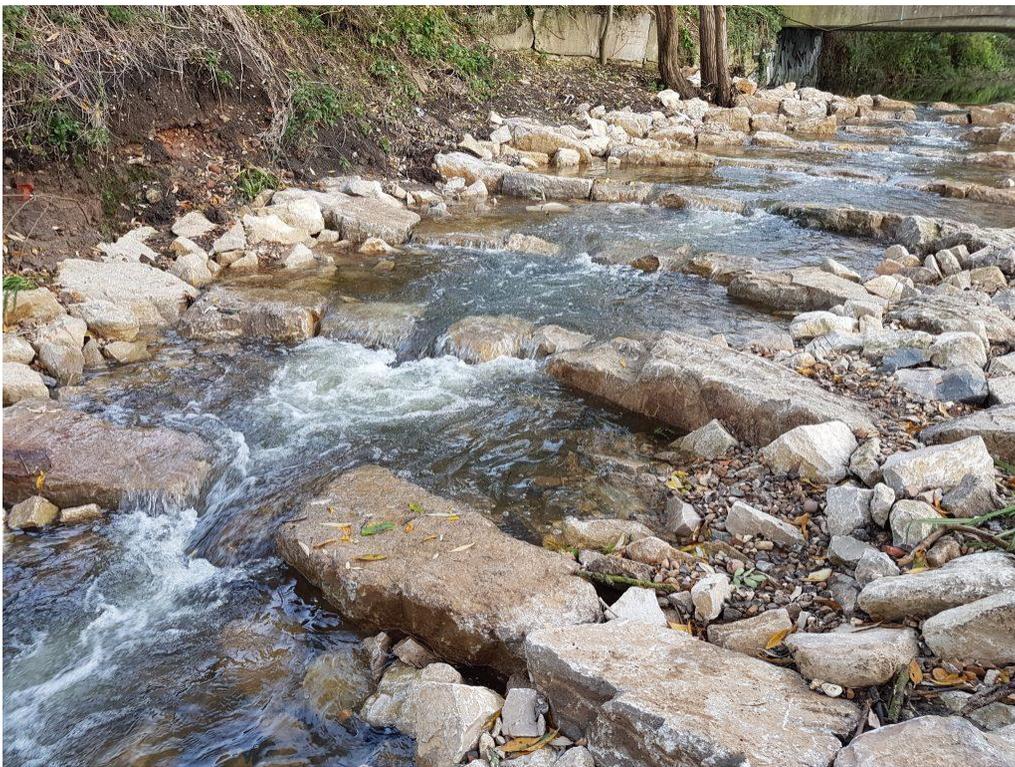


Figure 11 A rock ramp fish pass consisting of crescents of boulders with narrow gaps between and a matrix of mixed sizes of cobble and gravel between. Something similar could be created within the gravel trap, but with more variety in boulder placement and flow pattern.

- Replace the fixed post-and-rail under the fence in Figure 10 with a swinging gate (Figure 12). Keep an eye on it (and the fence as a whole), especially after floods to ensure it is still impassable to livestock.



Figure 12 A swinging livestock barrier/drinking area across the Afon Aled. Scaling down a design like this would be appropriate.

Reservoir

- Provide habitat for juvenile fish in the margins of the reservoir around the mouth of the feeder stream (maybe 50m on each side). Large stones, anchored trees/root balls, brushwood bundles or loose mattresses and scrub willows could be used and structured to take account of the normal variation in water levels, for example by having rocks/boulders further from the bank, brushwood structures in the shallower margins and living scrub willow overhanging from the bank.

The examples below are largely from rivers, but the same principle applies.



Figure 13 Brushwood fixed in the margins with posts and wire.



Figure 14 Trees pinned in the margins. Drilled and fixed with re-bar pin. Fence posts and wire could also be used.



Figure 15 Secure fixing with posts and wire. Drive posts 95%, loop wire around the posts and staple behind each post, twist wire loop in centre (e.g. with screwdriver or 6" nail), drive posts fully (wire may untwist slightly, but prevents snapping), staple on top is optional. NB use mild steel wire (about 2.5 mm), not high tensile.



Figure 16 The boulder/cobble margin illustrated here would provide good juvenile trout habitat if submerged in the margins of the reservoir.

The fishery

- Review the rules on permitted angling methods. There are many studies which show the mortality rate of trout caught and released on bait is significantly higher than those caught and released on fly or lure (spinning). The population of brown trout in Dolwen appears to be small and vulnerable, so minimising angling related mortality by not using bait is recommended. Catch-and-release should continue and a summary of good practice can be found here <https://www.wildtrout.org/content/catch-and-release>.

5.0 Making it Happen

The above guidance has been provided without a site visit and it is recommended that one is undertaken to review and sense-check the advice.

Further WTT assistance may be available to develop the ideas for improving the feeder stream and silt trap area and advising on construction.

We have 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.

The WTT website library has a wide range of materials in video and PDF format on habitat management and improvement: <http://www.wildtrout.org/content/library>

6.0 Disclaimer

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