Habitat Advisory visit to the River Dikler, Lower Swell, Gloucestershire Undertaken on behalf of the Wild Trout Trust, Vaughan Lewis, Windrush AEC Ltd

June 2012

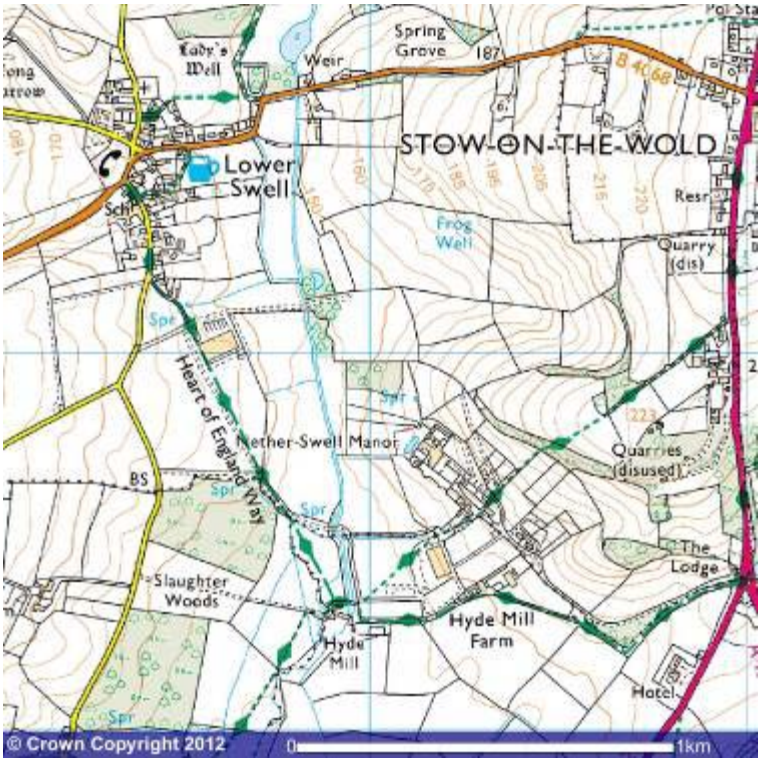
1.0 Introduction

This report forms the output of a site visit to the River Dikler, Lower Swell, Glos. on 21th June 2012 on behalf of the Wild Trout Trust. Information in the report is based on observations on the day of the visit and additional comments provided by the owner's agents, Paddy Hoare and Luke Wilson.

Throughout the report, normal convention is followed, with right bank (RB) and left bank (LB) of the river identified when looking downstream.

2.0 Habitat assessment

The estate's holding on the river runs from below the main road crossing at Lower Swell to a few hundred metres upstream of Hyde Mill, a distance of some 1.5km.



The plan-form of the river was relatively straight, probably due to the historic construction of Hyde Mill. Land use was dominated by intensive grassland, with the present owners running a dairy herd. The river was well-fenced on both sides, creating a vegetated margin >5m along its entire length. The estate has recently had a visit from John Field of Gloucestershire Wildlife Trust, who has a specific interest in water voles. He undertook a survey of the reach, which identified signs of water voles at a number of locations, underscoring the value of these margins to wildlife.

It is understood the new owner is planning to enter much of its land into the Higher Level Scheme (HLS) which provides payment to landowners for maintaining parcels of their land in a condition favourable to the conservation of key species.

The channel had a relatively steep gradient, with the substrate dominated by sand, gravel and cobbles. There was abundant habitat for spawning brown trout and the resultant juveniles. Instream cover was provided by a mixture of submerged and emergent weed species, including water crowfoot. The root systems of the abundant bankside trees

provided lies for adult fish, with their fallen limbs and trunks adding Large Woody Debris to the channel, useful not only as cover, but also by increasing the diversity of the riverbed. The tree canopy shaded much of the river.

Typical section of the upper river showing tree cover and well-fenced margins

Towards the upper end of the fishery, there were two significant obstructions to fish migration. The first was a concrete ford. The level at which this had been installed means that only a very shallow flow of water passes across the ford, effectively preventing fish migration except during very high flows. The inclusion of small submerged culverts within the concrete slab was meant to improve fish passage. However, they are undersized, with a high flow velocity and will not be readily used by trout or other fish species.

Concrete ford preventing fish migration

The second obstruction to passage was a weir forming a natural swimming pool at what appears to be the site of a former pumphouse.

'Swimming pool' weir with former pumphouse on right of picture

The swimming pool has become heavily silted, with the water only a few centimetres deep upstream of the weir. The new owner has expressed a desire to renovate the feature by de-silting the channel upstream of the weir. Downstream of the swimming pool, the instream habitat remained excellent, with extensive beds of water crowfoot growing over gravel dominated shallows. However, the channel was overly incised, due to past dredging. Evidence of the dredging was provided by the raised levees particularly on the RB. These reduced hydrological connectivity between the river and its flood plain. Excavation of the levees showed that they contained a high proportion of gravel and cobble, originally from the riverbed.

Excellent instream habitat with water crowfoot. Note elevated true RB (left of picture) **due to deposited dredgings**

Further downstream, the gradient of the river decreased as the influence of the Hyde Mill impoundment became more obvious. The silt burden in the channel became deeper, with an increased growth of emergent vegetation across the channel.

Channel upstream of Hyde Mill

Hyde Mill itself presented a total barrier to migrating fish, effectively isolating fish populations upstream and downstream of the mill.

4.0 Fish stocks

Table 4.1 Fish density at Upper and Lower Swell sites as recorded in Environment Agency electrofishing surveys

SITE	Density (nm^{-2}) recorded during survey (Date)										
	1986	1989	1993 /4	Sep 2001	Mar 2002	Sep 2002	Apr 2003	Sept 2003	Apr 2004	Sept 2004	April 2005
River Dikler @ Upper Swell				0.056			0.022	0.08	0.022	0.032	0.024
River Dikler @ Lower Swell			0.227	0.149	0.055	0.145	0.07	0.283	0.073	0.35	0.152

Table 4.2 Fish biomass at Upper and Lower Swell sites as recorded in Environment Agency electrofishing surveys

SITE	Biomass (gm^{-2}) recorded during survey (Date)										
	1986	1989	1993 /4	Sep 2001	Mar 2002	Sep 2002	Apr 2003	Sept 2003	Apr 2004	Sept 2004	April 2005
River Dikler @ Upper Swell				15.5			3.82	9.9	4.2	4.75	3.45
River Dikler @ Lower Swell			21.3	11.3	5.7	13.4	7.57	11.6	7.1	16	11.14

Fish populations in the upper River Dikler have been recorded by the Environment Agency (EA) and its predecessor bodies for more than 25 years. Data have been collected by routine catch depletion electrofishing surveys at Upper Swell and within the Estate's holdings at Lower Swell. Results from these surveys are shown in Tables 4.1 and 4.2 above. They clearly show a healthy fish population within the Lower Swell site, with brown trout the dominant species. Recruitment of trout at Lower Swell has been generally good throughout the years, with peak densities of nearly $0.3nm^{-2}$ as good as any site in the Cotswolds. Other fish recorded as present include eel, bullhead and brook lamprey.

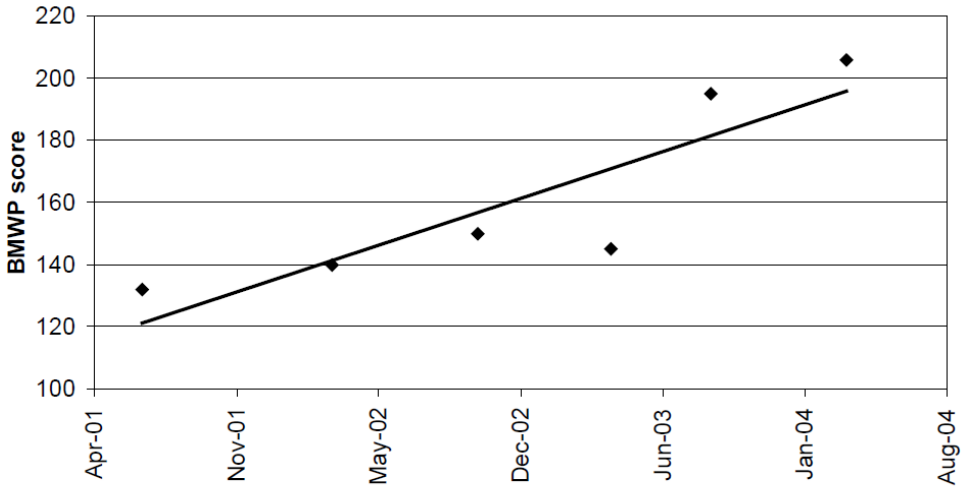
The lower density and biomass figures recorded at the Upper Swell site are attributed largely to poorer habitat quality.

5.0 Water quality

Water quality in the upper Dikler remains good/fairly good. There have been issues in the past with elevated phosphate levels. The upper Dikler only achieved 'marginal' status with respect to its River Quality Objective in 2004.

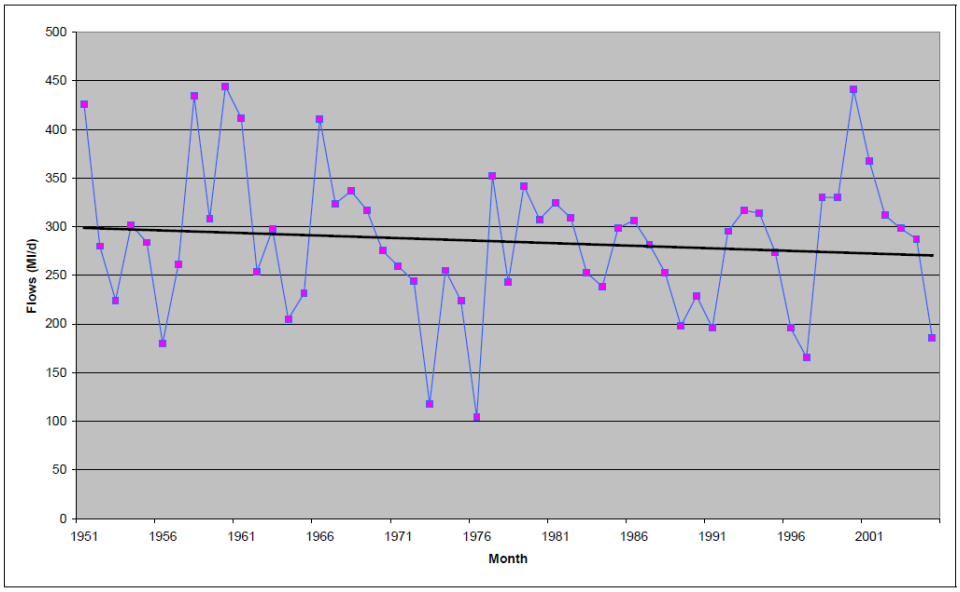
Water quality is also reflected in the macro-invertebrate fauna present in the watercourse. Using the results from a 3-minute 'kick' sample from the river, invertebrates are scored depending on their pollution intolerance; the species most sensitive to the effects of pollution are given the highest score. The results are weighted to reflect the relative abundance of each invertebrate group, with the final results expressed as a Biological Monitoring Working Party (BMWP) score. Typically, a good quality stream in the Cotswold would be expected to have a BMWP score of >150. Fig. 5.0 shows that the river has exceeded this figure since mid-2002, rising to a score of nearly 200 in summer 2004.

Figure 5.0 BMWP scores for Lower Swell



6.0 Water resources

Figure. 6.1 Annual average flow recorded at Newbridge gauging station (Standlake) (1951-2005)



Data from Newbridge gauging station at the downstream limit of the River Windrush show a significant decline in average rainfall since the early 1950's. Detailed analysis had linked this decline causally to the reduced rainfall in the west Cotswold during this period. A similar impact on flows is therefore to be expected within the River Dikler catchment.

There is a Thames Water abstraction at Lower Swell that diverts spring flow by gravity into public water supply. A study of the impacts of this abstraction on the River Dikler was undertaken by contractors on behalf of the EA in 2005. It concluded that current rates of abstraction have reduced the flow in the Dikler. However, no evidence could be found that showed any impact on the ecology of the river as a result of the abstraction. The report also concluded that there is a risk of ecological damage if the rate of abstraction increases. Monitoring of abstraction, river flow and the river's ecology continues to be undertaken by the EA.

7.0 Recommendations

- Some coppicing work has already been carried out by the river. It would be useful to continue this along the whole length of the fishery. Care should be taken not to remove too much shade. An ideal mix is probably a 60:40 split, in favour of shaded channel. Try and stagger the coppicing so that there are trees at all stages re-growth, with cutting carried out over say 5 years. Timber arising from the coppicing can usefully be used to introduce LWD to the channel. Best practice is to try and 'hinge' and fix timber in place. Alternatively, fix in places using wooden stakes and wire (see pictures below).

Existing LWD. Note scour and cover created

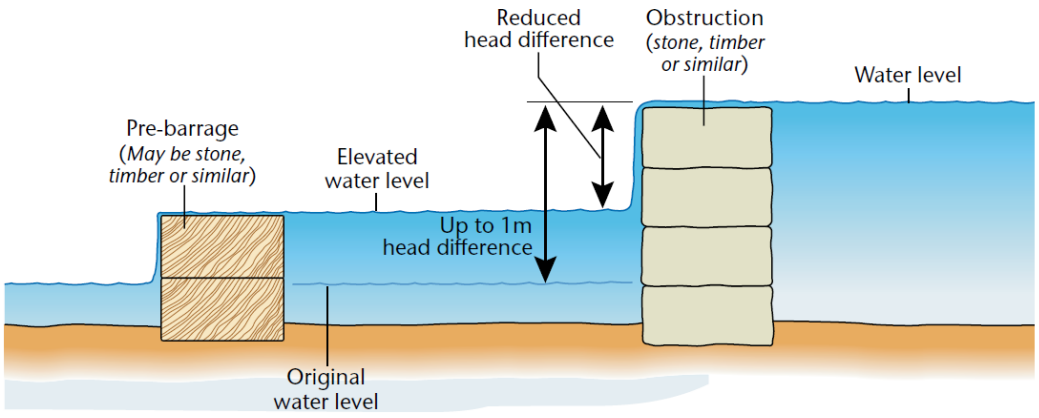
Cut and hinged timber

Additional post and wire fixing

- Brushwood can be made into bundles and pinned in place in marginal areas either parallel to or at an angle to the banks. These bundles are excellent at providing cover for fish fry and invertebrates. They can also be used to accumulate silt and help narrow over-wide sections of channel

- Addressing the presence of the three obstructions to fish passage is important. Without this work, the fish populations in the river will remain fragmented. The obstruction caused by the concrete ford can be overcome (subject to the structural stability of the ford) by cutting a central notch in the structure, some 0.5m wide and 300mm deep. The gap will allow fish passage at all flows. Safe passage of vehicles can then be created by spanning the gap with suitably sized steel or wooden bearers.

- The ideal solution to migration across the 'Swimming Pool' weir would to remove it totally. However, if there is a requirement to retain the structure, then a simple pre-barrage should be installed, raising the water by around 300mm. This should be adequate to allow fish to move across both the pre-barrage and 'Swimming Pool' weir.



Pre-barrage installed below a weir

OBSTRUCTION IMPASSABLE TO MIGRATING FISH

INSTALLATION OF PRE-BARRAGE (BOULDERS) REDUCES HEAD DIFFERENCE ACROSS THE OBSTRUCTION, ALLOWING FISH TO PASS OVER IT

- The impoundment at Hyde Mill could most easily be addressed by using an existing channel as a bypass as discussed on site. This would involve either constructing a 'rock ramp' easement below the sluice connecting the main river and bypass channel above Hyde Mill, or modifying the culvert that connect the two channels near to this location. Some more detailed design work would be necessary before deciding on which option to pursue. It may be possible to help fund some of the work involved with addressing all 3 obstructions using money from the DEFRA funded Catchment Restoration Fund which would come via the local Cotswold Rivers Trust (contact Trevor Cramphorn at http://cotswoldsriverstrust.org/)

Bypass channel and sluice. Rock ramp could be used to create passage through the sluice

Culvert that connects RB of bypass stream to main river u/s of Hyde Mill. Another potential bypass route

- Further guidance on habitat improvement techniques can be found in the Wild Trout Trust habitat manuals which are available on the website www.wildtrout.org under the Library tab

- The reach discussed in this report lies upstream of the main river watercourse limit which is at Hyde Mill. As such, much of the basic work recommended does not require Land Drainage consent. However, the installation of a pre-barrage for the Swimming Pool, providing a central notch in the concrete ford, and the creation of a by-pass channel should all be referred to the Environment Agency for comment, and possible consent. There is also a requirement for the

landowner to abide by all other statutory and common law, including the statutory protection of water voles and nesting birds.

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