Habitat Advisory visit to the River Aire on behalf of Bowland Game Fishing Association undertaken by Vaughan Lewis, Windrush AEC Ltd
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ENGLISH NATURE

1.0 Introduction

This report forms the output of a site visit to the River Aire, near Kirkby Malham, Yorkshire on 18 June 2005 on behalf of Bowland Game Fishing Association. Information in the report is based on observations on the day of the visit and additional comments provided by club members.

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

2.0 Fishery Description

The upper limit of the fishery was at Aire Head, upstream of the village of Hanlith, Yorkshire, with two small tributary streams, the Malham Beck, and Translands Beck combining to form the River Aire at this point. The club was concerned that the habitat in the Malham Beck had declined recently, with a dense algal growth present on the bed of the stream, perhaps indicating nutrient enrichment. The beck was not visited on the day of the site visit.

The catchment was of a primarily karstic limestone geology, with extensive sheep farming the dominant land use. Contours were steep, with significant surface run-off during rainfall events supplementing the base groundwater flow.

Increases in the density of sheep over time may have increased erosion of the land, with associated mobilisation of solids across the catchment, whilst the use of modern synthetic pyrethroid (SP) sheep dips have the potential to inflict serious damage on the population of macroinvertebrates present in the river.

A large (2m+) impoundment had been historically constructed at Aire Head in order to impound a head of water sufficient for the operation of Scalegill Mills. Although club members have seen brown trout *Salmo trutta* ascend the impoundment on occasion in very high water, its height would, in all normal circumstances, make it impassable to upstream migrating fish. Migration of trout parr in a downstream direction would however be possible.

Impoundment at Aire Head

Water flow into the high level Scalegills Mill leat was controlled by two large iron and wood sluices immediately upstream of the impounding weir. Latterly, flows along the mill leat have been restricted by closure of the sluices, with only a ‘sweetening flow’ allowed to pass along the leat.

Controlling sluices at the upstream limit of the mill leat

Downstream of the weir, the channel was heavily shaded by riparian trees largely sycamore *Acer pseudoplatanus* and ash *Fraxinus excelsior*. Some of these trees were of a considerable age, providing a significant landscape feature within the national park.

There was some limited erosion on the LB as a consequence of sheep grazing.

The river had a steep gradient, with a very well developed pool-riffle regime. The bed of the river was dominated by cobbles and boulders. Substrate size was generally in excess of the optimum for trout spawning, with a paucity of smaller gravel.

There was a lack of Large Woody Debris (LWD) in this and the lower reaches of the river. As a consequence, some of the shallower riffle areas were relatively unsorted and homogeneous in nature. This reduced their value for both spawning and juvenile fish.

Downstream of the mill, the gradient of the river lessened. The RB land use was dominated by grazing pasture. Shading by riparian trees remained significant in some sections, although there were lengths of less shaded channel present.

River below Scalegill Mill

Parkland with heavy grazing pressure downstream of Hanlith Hall

Below the minor road bridge adjacent to Hanlith hall, the LB of the river was heavily sheep grazed parkland, with significant loss of marginal vegetation and associated erosion. Mature parkland trees cast significant shade over this section of the river.

The bed remained mobile and dominated by hard substrate, with some areas of smaller gravel more suited to brown trout spawning.

Downstream of Newfield Bridge
This reach of the club's water was approximately 1km below Airton. The characteristics of the river were very different from the headwaters at Aire Head. The channel had been heavily modified over time, with a gently meandering planform resulting. The gradient was significantly reduced, although the pool- riffle regime remained well defined. Substrate was dominated by moderately sorted gravel, with an increased percentage of gravel suitable in size for spawning brown trout (10mm – 40mm diameter). Sections of exposed gravel were present in the marginal areas, with oystercatcher *Haematopus ostralegus* and common sandpiper *Actitis hypoleucos* associated with this habitat.

Land use was dominated by intensive sheep grazing on both banks.

River Aire downstream of Newfield Bridge. Note heavily grazed banks

There was a paucity of riparian trees and associated LWD in this reach, reducing the sorting of bed material.

In order to address both the erosion of the banks and the lack of trees, the club had fenced off a number of small bankside areas and subsequently planted these with a

mix of native tree species. Unfortunately, sheep had gained access to some of these, grazing the banks and allowing erosion to continue. As a consequence, fencing had fallen into the river and the enhancement failed. More positively, the sheep proof fencing had remained intact on other enclosures, with the result that both the bankside vegetation and trees had become well established. Riparian habitat in these sections was excellent with clear benefit visible to the channel.

Failed (LB) and successful (RB) fencing/tree planting

In an attempt to increase instream habitat diversity in the shallow riffle lengths of this reach, the club had constructed a number of small boulder/gabion weirs. These had created some small pools downstream, but in some cases were causing limited lateral erosion of the banks and siltation of upstream areas.

Constructed boulder weir. Note the erosion on the RB

Below the small footbridge, the river was fenced on the LB of the river. The resultant regeneration of vegetation on the bank was excellent, proving the benefit of this type of management. The RB which remained unprotected and grazed had little marginal vegetation.

Fenced LB and unfenced RB below footbridge. Note contrasting vegetation

3.0 Fish stocks

The upper river had a self-sustaining stock of brown trout. No stocking is undertaken by the club in this reach of the river. Club members were concerned that there were fewer trout present in the upper river, with small fish a particular concern.

Stocking of the lower reaches of the river was undertaken annually, with some 60 11" – 12" brown trout stocked. Minnow *Phoxinus phoxinus* and bullhead *Cottus gobio* were also known to be present in the club's reaches of the Aire.

All stocked fish are marked and members are asked to return unmarked (i.e native reared) fish.

4.0 Recommendations

- The impoundment at Aire Head prevents upstream migration of the majority of brown trout over a wide range of discharges, effectively isolating adult trout in the downstream reach. This is likely to have had, and will continue to have, a significant impact on recruitment due to exclusion of adult trout from a significant length of potential upstream spawning. There is a also a concern that if the club are correct regarding the decline in quality of the Malham Beck, trout spawning in this reach may be affected, further reducing recruitment to the upper river. The Environment Agency should be asked to carry out an investigation into the status of the Malham Beck, particularly its water quality.

- In addition, the weir reduced downstream migration of coarse sediment, including

gravel of a suitable size for trout spawning. Partly as a consequence of this interruption of geomorphological processes, the reach downstream of Aire Head had limited gravel of a size suitable for trout spawning. It is likely as climatic change increases peak rainfall events, the amount of suitable sized gravel in this reach will decrease further.

- If the hypothesis identifying the paucity of spawning gravel as a habitat bottleneck is correct, it may explain the apparent lack of small fish in this reach. One possible way to overcome this habitat bottleneck is through the use of a deep substrate incubation box.

In essence, these are gravel filled boxes, approximately 0.6m in each dimension, which are filled with suitably sized gravel and seeded with 10,000 - 20,000 trout eggs. A water feed at the bottom of the box allows the eggs to incubate and hatch. Once they reach the swim-up fry stage, they leave the box via the overspill pipes, stocking themselves into the river. In effect, they are naturally reared fish without the unhelpful behavioural modifications associated with hatcheries. Such a system could be established on one or more of the impoundments within the river and mill leat, using the head loss across them to drive the boxes. More details on incubation boxes can be found on the Wild Trout Trust web site www.wildtrout.org or in Volume 2 of the Trust's magazine, *Salmo trutta*.

The fact that the club has stocked numbers of hatchery reared fish into a contiguous river reach should permit the use of viable hatchery origin eggs in the incubator, although the possible presence of white clawed crayfish *Austropotomobius pallipes* would require the supplier of trout eggs to meet English Natures precautionary principles for protection of this species. Eggs for Malham Tarn where white clawed crayfish are present (upstream of the River Aire) have been provided in the past from the Lathkill in Derbyshire which meets EN's guidelines for stocking into waters known to contain white clawed crayfish.

- It is recommended that, subject to the requirements of the owners of Scalegill Mill, water flow along the high level mill leat should be minimised. The mill leat is functioning as a level dependent habitat, to which a loss of flow is not likely to prove critical. The prioritisation of flow along the main River Aire will be the benefit of a wide range of species present, particularly during periods of low flow.

- Data should be obtained from the Environment Agency of any fish population and macroinvertebrate monitoring undertaken within the upper River Aire. The results shown by these data should be discussed with the Agency, particularly with respect to any decline in macroinvertebrate diversity and abundance that could be attributed to synthetic pyrethroids. The Agency should be asked to provide copies to the club of any future surveys undertaken.

- Lengths of the river were overshaded by riparian trees. It would be of benefit if a regime of rotational coppicing/pollarding could be established alongside sections of the watercourse. The aim of this should be to produce 'dappled' shading over the water's surface, allowing the growth of vegetation on the banks, whilst retaining valuable tree root systems. The ecological and landscape value of the mature trees

should not be underestimated. A felling licence may be required from the Forestry Commission for coppicing/pollarding of riparian trees.

- Grazing pressure from sheep was significant, particularly in the lower reaches of the club's fishery. There was a change in grazing in the lower fishery from cattle to sheep following the foot and mouth outbreak in 2001. There is little doubt that the current grazing regime is causing significant damage to the fishery, by over-widening of the channel, removal of over-hanging vegetation, mobilisation of fine sediment and prevention of establishment of riparian trees. The club has attempted to reduce grazing pressure by fencing small sections of river bank and subsequently planting trees within the enclosures created. In order to continue this work, it is recommended that either:

    - The club seeks to take control of the grazing rights within the riparian fields and controls grazing pressure in order to minimise bank erosion. This is the preferred option, both in terms of cost, aesthetics (no fencing required) and ecological benefit (careful management of the fields would increase their floristic diversity considerably)
    - Fencing is erected along affected reaches in order to prevent stock access to the river bank. It may be necessary to provide drinking areas for the sheep within the fenced area. Management of vegetation growth within the fenced area will be required in order to provide access for anglers fishing the water. The use of temporary electric fencing might be considered to be appropriate in the sensitive landscape of the national park. Willows already established in some of the original fenced areas could be used as 'donors' for future replanting. Rotational coppicing of these well established trees would not only provide an abundance of whips/stakes that could be used to establish trees in newly fenced areas, but would also allow the regrowth of valuable fringing vegetation in the areas of reduced shading.

The fenced area downstream of the footbridge offers an exemplar of the benefits to be gained from removal of grazing pressure.

- **In areas where a good growth of vegetation has been established following fencing/cessation of grazing**, it may be possible to introduce and stabilise Large Woody Debris (LWD) in order to promote controlled bed scouring. The benefits for retaining LWD are clearly laid out in the recent EA R&D document, "Large Woody Debris in British Headwater Rivers". Key conclusions of the report include:

    - An increase in both mean flow depth and velocity and variability of both parameters.
    - The development of high physical habitat diversity both in-channel and in the floodplain. Removal of LWD reduces both habitat quality and availability for juvenile and adult brown trout.
    - Although active LWD dams may impair upstream migration of fish at low flows, they rarely do so at high flows.
    - LWD have significant benefits to the control of run-off at the catchment scale.
    - River and riparian management has important effects on the distribution and character of dead wood accumulation within the river system.

Practical management options to increase LWD include making use of fallen timber in order to create simple flow deflectors by wiring/staking these to the bank. These can be used to scour relatively homogeneous riffle areas in order to create deeper pools used by adult fish, and offer an effective and natural alternative to constructed gabion groynes. The resultant small pools can provide shelter areas adjacent to riffles during spawning periods, increasing the numbers of spawning fish.

It is important that the Environment Agency is made aware of any adopted policy to retain LWD in the channel, in order to prevent its removal during routine management operations undertaken by the Agency.

- The constructed weirs should be removed or modified so as to prevent upstream impounding. In some case, lowering of the height of the weir should prove adequate, whilst in other situations, the removal of the central section of the weir will allow free passage of water, whilst protecting the banks from erosion.

It is recommended that the use of LWD should be promoted in order to increase diversity in channel morphology **in areas where fencing/cessation of grazing has allowed regeneration of dense marginal vegetation. (see LWD above).**

- Note that all works to bed or banks of the river or within 8m of its banks require the written consent from the Environment Agency under the Land Drainage legislation. The introduction of any fish or eggs into any inland water requires the consent of the EA under the Salmon and Freshwater Fisheries Act, 1975. It is imperative that all relevant consents are obtained by the club.

In addition, the location of the River Aire within the Yorkshire Dales National Park provides another layer of legislative protection to the river. All proposed works should be discussed with the national park authority before their implementation.

5.0 Disclaimer

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