HABITAT ADVISORY VISIT TO THE RIVER BABINGLEY, HILLINGTON, NORFOLK.

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1.0 Introduction

This report is the output of a site visit undertaken by Vaughan Lewis, Windrush AEC Ltd to the Hillington syndicate's fishery, River Babingley, Norfolk on 11th November 2005. The visit was sponsored by English Nature, as part of the 'Cinderella chalkstreams' initiative

Comments in the report are based on observations on the day of the site visit, and discussion with syndicate members. 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.

2.0 Background

The Babingley is a base rich river, with its water quality strongly influenced by the local chalk geology. The river rises east of Flitcham Abbey, flowing in a generally westerly direction, before meeting the River Great Ouse to the north of King's Lynn. The river was described in 1937 by E.C. Keith as 'in my opinion, the best chalkstream in Norfolk ……a miniature Test. There is ample weed of the finer varieties, a good flow of water and no mud. ……the Babingley at its best is deep, clear and in all respects excellent' (see *Chalkstream* by Charles Rangeley-Wilson).

More recently, the river was described as 'a spring fed stream, more or less impervious to storm and cloudburst, with a bottom that ranges through clay, silt, chalk and gravel. Its waters are mainly clear, with a carpet of weed and a wall of cress, but occasionally (for reasons that no expert has yet explained), it will flow for days with a grey bloom' (see *The Haig Guide to Trout Fishing in Britain* Ed: David Barr). Barr notes that 'The cream of the fishing is in the top waters. Here the river runs through woods ….. and through meadows….. There is no artificial stocking; prolific breeding still takes place in the gravelly runs or up some of the small clear tributaries. The brightly marked brown trout average ten ounces, with very occasional monsters from the bigger pools (or Broadwater) that threaten the three pound mark.'

3.0 Habitat Assessment

The upper limit of the Hillington fishery was marked by the crossing of the river by the B1153. A short section of mixed gravel riffle, suitable for brown trout *Salmo trutta* spawning was present downstream of the bridge, with the river then dropping some 1m over a weir. Brown trout have been noted migrating upstream over this weir by syndicate members.

Water level and flow within the river were low, a reflection of the generally dry weather experienced during summer 2005.

Upper limit of the fishery, showing mixed gravel substrate

Below the weir, the river gradually widened to form a large Broadwater, created by the historic impoundment of the river. The Broadwater had a main channel, bifurcating into two arms at its downstream end. Moderate numbers of brown trout were observed in the Broadwater, ranging in size from 10cm in length (0+ fish) to over 2kg in weight. Syndicate members suggested that recruitment of trout appeared to have declined in the recent past, with numbers of small to medium sized fish much reduced. One suggestion for this decline was the increased presence of cormorants *Phalocrocorax carbo* at the fishery.

View of Broadwater looking upstream from LB arm

The habitat within the Broadwater was generally poor. The bed was heavily coated by fine sediment to a depth of (apparently) up to 1m. As a consequence, the depth of the water remaining was generally less that 0.5m and in some cases, considerably less. A mix of filamentous algae and diatomaceous algae covered much of the bed of the Broadwater, with rooted macrophytes limited to small stands of starwort *Callitriche* Spp.

The LB of the Broadwater was fenced to prevent access to cattle grazing in adjacent fields. The RB was ungrazed. Large numbers of duck were present on the Broadwater, with considerable numbers of geese known to flight onto the lake during the winter period.

Bed of Broadwater showing thick layer of sediment and associated filamentous algae

Members of the syndicate reported that a grey –blue bloom has often been seen in the water during the mid-late summer. This appeared to be similar to that referred to by Barr in his book.

Past practice for managing the Broadwater included periodic flushing of silt downstream by manipulation of the downstream sluices.

Water exited the Broadwater via the RB arm. As a consequence, instream enhancements undertaken by the Environment Agency on the LB arm downstream of the Broadwater were rendered redundant.

LB channel downstream of the Broadwater, now largely deprived of flow

The RB channel downstream of the Broadwater was overgrown with emergent vegetation in places, although there were some small sections of gravel potentially valuable for spawning and juvenile brown trout.

Section of reasonable quality gravel on RB arm downstream of the Broadwater

The RB and LB arms combined some 100m downstream. The single channel than ran into a section of parkland wood dominated by yew *Taxus baccata* and box *Buxus sempervirens.* This section of the river was over-wide and heavily silted, with very poor, relatively homogenous instream habitat. This was due to a combination of suppression of marginal vegetation by over-shading from riparian trees, and the presence of an impounding sluice downstream.

An old redundant duck decoy was present downstream of the sluice. The channel was gradually reforming, by down-cutting through the soft sediment and by limited growth of marginal vegetation.

The channel then divided, with the Queen's Stream flowing away from the fishery on the RB. An abstraction for agricultural production on the Sandringham Estate was present on the RB of the main Babingley, with water level raised to facilitate abstraction by a wooden sluice.

Several other small sluices were present further downstream on the Babingley. Water level was artificially elevated on at least two of these by wooden boards.

The make up of the woodland changed in this downstream section of the fishery, with parkland trees giving way to a mix of ash *Fraxinus excelsior,* sycamore *Acer pseudoplatanus,* field maple *Acer campestre,* hazel *Corylus avellana* and alder *Alnus glutinosa*. These were casting extensive shade over much of the river channel, with suppression of marginal vegetation growth, and an over-wide channel, with a heavy coating of fine sediment over the bed the result over long lengths of the fishery.

Despite this, there were sections where gravel quality appeared adequate for trout spawning, with the presence of large numbers of 0+ and 1+ fish testament to spawning success.

Near to the downstream limit of the fishery, shade had been reduced along a short section of bank by coppicing of riparian trees. In concert with the removal of all of the boards from the downstream sluice, this had created a length of excellent habitat. The growth of marginal vegetation was strong, narrowing the channel, resulting in clean, well sorted gravel interspersed with stands of submerged vegetation including water crowfoot *Ranunculus* spp, and horned pondweed *Zannichellia palustris.*

Section of excellent habitat resulting from reduction in shade, and removal of downstream sluice boards

5.0 Recommendations

- The life of the Broadwater as a fishery is limited if no remedial action is taken. A combination of high nutrient loading (from upstream and local agriculture, and the large numbers of ducks/geese present) and the detention of fine sediment will result inexorably in succession to alder/willow carr or reedbed. Estimates of how long this process will take are difficult, but it likely that the fishery value of the Broadwater will be very low in twenty years time.

- The previous practice of periodic flushing of the Broadwater is likely to be illegal under section 90 (1) (a) and (b) of the Water Resources Act 1991 (this specifically prohibits the ‘removal from any part of the bottom, channel, or bed of

any freshwaters a deposit accumulated by reason of any dam, weir or sluice holding back the waters …and does so by causing the deposit to be carried away in suspension in the waters'. In addition, the practice is likely to be counter productive during the winter period, with mobilised sediment deposited on areas used by trout to spawn or by juvenile fish.

- The grey-blue colouration of the water during the summer may be due to one or more processes. Similar colouration has been noted in a number of other chalk/limestone systems. Generally, it is the result of the diffraction of light by particles of calcium carbonate. These can be formed both by changes in the volume of carbon dioxide rich groundwater flow entering the system, and as a result of the photosynthetic activity of submerged water plants and algae.

- Options for useful remedial action to the Broadwater include:
    - Undertake de-silting, either using hydraulic excavators, or by suction dredging. Both options would be expensive, with large volumes of wet sediment needing to be stored, de-watered and spread locally. In the absence of further remedial action, infilling of the Broadwater with fine sediment would continue, with a further dredging operation inevitably required in the near future.
    - Construct a discrete channel for the Babingley within the existing Broadwater, exiting at the sluices at the downstream limit of the LB arm. This is a practical option, with the banks of new channel being defined using locally excavated granular soil retained by a palisade of coir fibre and/or faggots. Correctly sized, the new channel would erode deposited sediment within it, eventually exposing clean gravel substrate. This option would isolate the Broadwater from the flow of the Babingley, reducing the input of damaging fine sediment and nutrient. The existing water level in the Broadwater would be retained by the existing sluices, with additional water bled into the system periodically or as required via an additional sluice installed from the upstream limit of the new channel. This would allow the Broadwater to continue to function as a stillwater fishery, until natural succession precluded this.
    - The third, preferred option would be to excavate a completely new channel for the Babingley in the LB field adjacent to the Broadwater. This channel would be cut from above the weir at the upper limit of the fishery, discharging into the existing channel downstream of the LB sluices. This would fully utilise the available gradient within the new channel. Careful planning would be required to ensure correct sizing of the channel with respect to the available flow, with a meandering profile increasing habitat diversity. This option would be neutral with respect to flood risk, with an increase in capacity over the length of the new channel, with unchanged conveyance upstream and downstream during peak flood events. Financially, this option is likely to prove the cheapest of those discussed, with all excavation undertaken in the dry and minimal additional materials required.

- Coppicing or 'singling' of riparian trees in sections of heavily shaded channel can be of great benefit. Coppicing and pollarding of trees are traditional and potentially valuable methods of managing trees. Wildlife associated with coppiced trees depends on

maintaining a diversity of light and shade, so blocks of trees should be cut in rotation. Fringing marginal vegetation resulting from coppicing is of great importance to the survival of juvenile salmonids.

The length of the coppicing cycle can vary between six and fifteen years, with a short cycle preventing development of mature trees, encouraging vigorous root growth and the dappled shade required by some specialist flora and fauna. This regime may well be suited to reaches of river where fly fishing is practised, allowing maximum room for casting. Species that can be successfully coppiced include hazel *(Corylus avellana)*, alder, and *(Fraxinus excelsior)*.

An alternative strategy for previously coppiced trees is 'singling'. This involves selecting the most upright stem for retention and cutting out the remaining stems close to the stool. This is a less risky option where there are concerns over regeneration due to grazing stock.

The ratio of shaded to open bank receives attention in the literature. The *Forests and Water Guidelines* (Forestry Commission 1991) recommends maintaining about half the length of the stream open to sunlight, with the remainder under dappled shade to create desirable conditions for a diverse aquatic ecosystem. The *Guidelines* further state that it is particularly important to maintain open ground to the south of the stream to allow more light to penetrate and to increase the water temperature for better aquatic plant and invertebrate growth. Hunter (1991) recommends 40-60% tree shade to maintain cool water for trout. Another suggestion is provided in Mason et al (1988). Trees on the south side of the river should be managed to give gaps of approximately 20 m in length at 70 m intervals to permit macrophyte growth.

- Where the club has control of the in channel sluices, it is recommended that all boards should be removed permanently from these structures. This will allow the free flow of water, gradually reducing channel width and siltation and, in combination with a reduction in shading, the promotion of instream weeds. These processes will combine to improve the abundance and quality of habitat suitable for spawning and juvenile trout.

- It is recommended that Large Woody Debris (LWD) should be introduced and stabilised in the channel 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.

- Establish a regime of cleaning spawning gravels each September. This can be achieved by either manual raking, or by the use of high-pressure water jets. Care must be taken to clean riffles rotationally, with only short sections being treated annually. It must also be recognised that this option may well favour increased spawning success of the earlier breeding native brown trout to the detriment of the later breeding, introduced rainbow trout. It is important that the EA are contacted prior to any cleaning of gravel, due to the possible discoloration of water in the river resulting from the operation. The same concerns dictate that downstream neighbours should also be forewarned of the operation.

- Cormorants are likely to be having some impact on the fish stocks of the Broadwater. Cormorants are fully protected under the Wildlife and Countryside Act 1981. Ideally, increased cover within the Broadwater would reduce the incidence of predation of trout. Suitable cover could include tree trunks and bundles of brushwood. In addition, bankside scaring techniques can be of use. These include ultra sonic bird scarers, gas guns and scarecrows. In the event that these options proves ineffective, then it is possible to apply to DEFRA for a licence to use shooting of cormorants in conjunction with non-lethal deterrents. Details are available at http://www.defra.gov.uk/

- Note that all works to the bed or banks of the river or within 8m of its banks may require the written consent from the Environment Agency under the Land Drainage legislation. It is imperative that all relevant consents are obtained by the club prior to the commencement of any works.

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