# HABITAT ADVISORY VISIT, AMPNEY BROOK

## UNDERTAKEN BY VAUGHAN LEWIS, WINDRUSH AEC ON BEHALF OF CHARLES NEWINGTON-BRIDGE FEBRUARY 2004

## 1.0 Introduction

This report is the output of a site visit undertaken by Vaughan Lewis, Windrush AEC Ltd, to the Ampney Brook, Gloucestershire on 7th February 2004. The visit was sponsored by the Wild Trout Trust as part of its commitment to support the biodiversity of brown trout rivers throughout the British Isles.

Comments in the report are based on observations on the day of the site visit, discussion with Charles Newington-Bridge and Chris Bell (Environment Agency). Further information was obtained from Environment Agency, Thames Region reports.

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 Geology and water resources

The fishery of the Ampney Brook is intimately linked to the geology of the catchment and groundwater abstraction for potable water supply.

The upper reach of the brook, from its source (SP 068 047) to Ampney Park (SP 062 023) is situated on a section of unconfined Great Oolite (GO) limestone. However a fault dissects the valley, creating a spring connection with the Inferior Oolite (IO). This section of river is and has been historically, a winterbourne. This fact is reflected in the local name for this section, the Winterwell.
The Winterwell is primarily fed by a system of large, IO springs. Its groundwater catchment is markedly larger than its surface water catchment. As a consequence, during the winter recharge period, the Winterwell receives large volumes of water from the IO aquifer into its relatively small channel; in effect, the Winterwell acts as a "valve" for an extensive section of the I.O. Channel flows during this period are often relatively peaky and can match those seen in the much larger channel of the River Coln. During summer, the Winterwell section loses water to the GO until Ampney Park is reached. By this location, the river is usually dry.

At Ampney Park, the river traditionally accretes flow from a series of dip slope GO springs. The next section downstream, between Ampney Park and Ampney St.Peter (SP 081 011), may have connections with the underlying GO. Consequently groundwater is believed to break through the underlying clay cover to feed the brook. However, groundwater levels are believed to be affected by abstraction from the confined GO at both Latton and Meysey Hampton.

Downstream of Ampney St.Peter, the river runs over gravels overlying Oxford Clays. There is a loss of flow to the gravel during periods of low flow, further depleting stream flows. As a consequence of abstraction from the GO at Latton and GO at Meysey Hampton, the whole length of the Ampney Brook downstream of Ampney Park, some 12 km, is affected by abstraction.

Flows in the Ampney Brook are gauged at Ampney St Peter (SP 077013) and Sheepen Bridge (SU 105950). EA confidence in the accuracy of these gauge weirs at

low to medium flows is high. At high flows, the Sheepen Bridge weir can become drowned out, leading to inaccuracies.

Sustainable reductions in abstraction from the sources at Latton and Meysey Hampton have been agreed by Thames Water Utilities Ltd (TWUL) and the EA under the recent periodic review process. However, the granting of a drought permit to TWUL in late 2003 allows increased abstraction for a time limited period from Meysey Hampton, temporarily negating the benefits of this agreement.

As a result of a combination of abstraction and climatic conditions, the Ampney Brook has periodically dried up. Over the last 20 years, this is believe do have happened on at least 5 occasions, with the last being late summer 2003, when the Brook dried up from its source to downstream of Sheepen Bridge, with an associated loss of all fish.

**3.0 Habitat**

Habitat quality throughout was generally excellent, with a well-developed riffle and pool regime within the sinuous channel. Gravel quality was moderate to good, although as in all lowland rivers, the relative abundance of fine silt is of concern due to its impact on the hatch rate of trout eggs.

The re-growth of submerged weeds following the drought has been remarkable, with strong stands of water crowfoot *Ranunculus spp.*, water forget-me-not *Myosotis scorpioides*, and starwort *Callitriche* spp. present.

**Upper section of the AV reach**

The upper fishery was fringed with deciduous trees casting a generally dappled shade. Some short sections of the channel were however, heavily shaded. There was some large woody debris (LWD) present in the channel at discrete locations.

**Middle section of the AV reach.**

Below the ford, the river ran through semi-improved pasture/old water meadow, with light to moderate grazing pressure from sheep. This had resulted in a reduction in the growth of emergent and riparian vegetation and some local bank erosion due to block failure.

Below the grazed fields, agricultural usage changed to arable cropping. There was clear evidence of ploughing very close to the edge of the Brook, with associated erosion of its banks.

**Ploughing to the edge of the Brook and associated erosion towards the lower end of the fishery**

There were considerable amounts of LWD in the stream, with some well established, stable debris weirs across the width of the channel.

**4.0 Fisheries status**

Brown trout (*Salmo trutta)* are the key species present in the Cotswold limestone rivers. They are important indicators of the well being of a watercourse due to their sensitivity to water quality perturbations, and more particularly, their flow related requirements for key lifestages. Fishery data from the Ampney Brook are extensive, with a number of whole river assessments having been undertaken as part of the Environment Agency's routine 5 year rolling electrofishing survey programme.

In addition, strategic surveys of targeted key sites were undertaken during 1989, 1990 and 1991, specifically to study the impact of low flows on the fish fauna of these rivers.

During the baseline survey in 1988, significant numbers of fish were found in the Brook viz:

<u>Reach 1 (Source to Ampney St Peter)</u>

The biomass found in two upstream sites (AMK1- AMK2) was poor, ranging from $4.34gm^{-2}$ - $5.88gm^{-2}$. Recruitment of brown trout at these sites was very poor, with biomass at both dominated by rainbow trout and large (stocked?) brown trout. The

EA's Fishery Classification System (FCS) gave this Reach a F/e classification for brown trout confirming its poor fishery quality. Species richness was 3.5 (d). The survey report suggests that the reason for these restricted fish populations was low summer flow, affecting the fish populations both directly and indirectly through deterioration in habitat quality.

Habitat sensitivity to changes in flow is generally high in this reach.

Reach 2 (Ampney St.Peter to Thames)

The two upstream sites in Reach 2 show some improvement over those in Reach 1, with slightly increased biomass figures (6.84 $gm^{-2}$ - 10.54 $gm^{-2}$) and evidence of some recruitment of brown trout during winter 1986/87. Habitat at these two sites was subjectively assessed as better than that found in Reach 1.

The two downstream sites (AMK5 and AMK6) produced good biomass figures for a small stream (21.27 $gm^{-2}$ and 24.9$gm^{-2}$ respectively). These sites were dominated by rheophilic coarse fish, with the relatively high biomass probably sustained by migration from the nearby River Thames. FCS confirms the quality of these sites for rheophilic (gravel spawning) coarse fish, classifying the Reach as B/a in comparison to all and to other similar sites respectively in England and Wales.

Habitat sensitivity to changes in flow is generally moderate to high in this reach.

The empirical evidence for the impacts of low flows on the Brook's fishery could not be clearer in the subsequent surveys undertaken. Six sites were examined variously as part of the 1989, 1990 and 1995 surveys. Of these, only one, Ampney Crucis (1995) was found to contain either fish or water. Even in this location, the small remaining stock of fish was confined to isolated pools adjacent to a road bridge.

The abandonment of the fish farm at Ampney Crucis during the early 1980's can also be directly attributable to the low flows in the Ampney Brook. Despite provision of back-pumping, water supply to the farm from the Brook was insufficient to guarantee trout production on an economic basis.

The Rivers and Streams of Gloucestershire Report[3] notes only that "brown trout and rainbow trout (escapees from the hatchery) were common along the upper half of the Brook and 3-spined stickleback were noted at Ampney Crucis".

No fishery surveys have been undertaken of the Winterwell section of the Ampney Brook. Given the importance of winterbournes to other limestone and chalk rivers, it is likely that the Winterwell contained important sections of brown trout spawning and juvenile habitat.

The presence of bullhead (*Cottus gobio*) and brook lamprey (*Lampetra planeri*) found throughout the Ampney Brook during the 1988 survey is significant. Both species are cited under Annex ll of the EC Habitat and Species Directive (92/43/EEC) and are named in the UK Biodiversity Action Plan.

Recorded river water quality, as measured chemically and indirectly through biological monitoring, was consistently good in the Ampney Brook during the period 1988 - 1995.

In summary:

- Clear evidence exists of the direct impacts of low flow on fish stocks and fishery quality in the Ampney Brook; no fish were found in the Brook during the 1989, 1990 and 1995 surveys due the absence of water at the sites examined. Habitat in both Reaches is generally highly sensitive to changes in flow.
- There is evidence that fish stocks assessed during the 1988 survey were poorer in Reach 1 than in Reach 2. This is possibly as a result of the impact of low flows, indirectly on habitat quality and directly on fish stocks. No successful recruitment of brown trout was evident in Reach 1.
- Rheophilic coarse fish populations in Reach 2 are good when compared to those in similar rivers in England and Wales. The impact of the Sheepen Bridge gauging weir on migration of fish from the River Thames is likely to be significant.
- Water quality in Brook was consistently good during the period 1988 - 95

Despite the poor results seen during these surveys, Charles Newington-Bridge noted the presence of brown trout >0.5kg during spring/early summer 2003 in the AV reach. It is likely that these fish are the progeny of fish stocked by riparian owners post 1995.

## 5.0 Key Issues

### 5.1 Habitat Management

The Ampney Brook is a structurally excellent example of a small limestone river. In-stream habitat is diverse, with an abundance of habitat for all life-stages of brown trout. There are however a number of management issues that warrant attention in order to optimise the Brook's brown trout population.

- Bank Erosion

The present grazing regime is having some adverse impact on the middle reaches of the fishery, with ploughing close to the bank edge similarly affecting the lower fishery.

A reduction in the amount of riparian vegetation can be very damaging to fisheries interests in a number of ways. Juvenile trout rely heavily on this habitat component for cover during their early weeks. Strong root systems typical of reeds and sedges are particularly valuable in providing structural support to banks and preventing excessive erosion, and mobilisation of damaging fine sediment. Densely fringing marginal vegetation has significant benefits in the control of diffuse source run-off of nutrients and sediment form surrounding land to watercourses. The loss of land through erosion will also have an impact of farm income over time.

It would therefore be of great benefit to enter the riparian fields into an agri-environment scheme such as the new Environmental Stewardship scheme, in order to

reduce both the poaching of banks by stock and ploughing too close to the river. Agri-environment schemes provide farmers with payments to manage land for general environmental benefit, with specific payments available to fence riverbanks against stock grazing and to create un-cultivated buffer strips alongside arable cultivation. Information on these schemes is available from the local DEFRA office.

- Shading

There was evidence of some localised overshading of the channel. This shade is restricting the growth of marginal vegetation, with associated damaging impacts on the rate of erosion, the provision of marginal cover for fry, and water flow velocity. In order to reduce overshading whilst retaining the valuable erosion protection provided by tree root systems, thinning of the riparian tree canopy at selected locations could be undertaken..

Rotationally coppicing can be undertaken in order to create an overall dappled shade over the river. Cutting on the south side of the channel is particularly beneficial, as light incidence is greatest from this direction. The conservation value of the existing trees should not be under-estimated and great care should be exercised in the selection of trees to be cut. A felling licence is required from the Forestry Authority for all significant tree felling, including coppicing. Timber arisings from the coppicing could be utilised to create stick pile otter holts. These are used by otters for temporary lying up or in exceptional circumstances, for breeding.

- Large Woody Debris (LWD)

Where possible Large Woody Debris (LWD) should be retained in the channel. Large woody debris (LWD) is an integral component of stream ecology. The benefits for retaining it 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.

The report also provides recommendations for the management of LWD, the most important of which is "although there are certain situations that may require wood removal to eliminate stream blockage, the wisest management is no management". Building on this simple truism, it is recommended that before any future work to remove LWD from river channels is undertaken, the wider implications of the proposal on the whole river system are considered, rather than just the potential (in many cases unproven) benefits to salmonid populations. In addition, the impact of planned riparian tree work on the supply of LWD to the river should be considered. In some circumstances, it may be beneficial to allow trees to fall into the channel, provided the risk of increased flooding is acceptable.

- Gravel quality

The quality of gravel over the whole fishery could be improved by breaking up the often concerted upper surface (a consequence of the limestone geology of the river) and the removal of accumulated silt within the gravel interstices. These mechanisms have been proven to significantly improve the hatching success of brown trout eggs.

A regime of cleaning spawning gravels each September should be established. 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 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.

**5.2 Fish stock management**

The drought of 2003 is believed to have resulted in a total fish loss from the Ampney Brook. The chance of natural re-colonisation is very remote. The gauge weir at Sheepen Bridge is a significant barrier to upstream migration of fish from the River Thames. In addition, repeat fishery surveys of the Upper Thames have failed to establish the existence of a viable trout population in the river.

As a consequence, there is on practical alternative to re-stocking if trout stocks are to restored in the Ampney Brook.

The EA has agreed that the 'Native' brown trout designation of the Ampney Brook under the terms of the Trout and Grayling Strategy, will be temporarily removed in the absence of any trout in the Brook. This allows restocking to take place with viable, hatchery origin brown trout.

Options for restocking are manifold, with re-introductions of juvenile or adult fish possible. It is however, recommended that re-establishment of the brown trout stock is undertaken using deep-substrate incubation boxes.

These are gravel filled boxes, approximately 0.6m in each dimension that are filled with suitably sized gravel and seeded with 10,000 - 20,000 trout eggs. A water feed at the bottom of the box (using a head difference created by a sluice or riffle) allows the eggs to incubate and hatch. A box could usefully be located at the site of the ford, utilising the head difference across the upstream and downstream reaches.

Once they reach the swim-up fry stage, fish leave the box via the overspill pipes, where they could be collected in a small trap box and transferred into the river or allowed to enter the river unaided and disperse. In effect, these are naturally reared fish without the unhelpful behavioural modifications associated with hatcheries.

Of additional importance is the fact that the now fishless Ampney Brook offers an unusual opportunity to assess the long term survivorship of brown trout originating from incubation boxes. Previous experience on the Hughenden Stream, Bucks showed this to be excellent.

It is acknowledged that changes in climatic conditions in conjunction with the continued, albeit reduced, groundwater abstractions, may result in a recurrence of the drying up of the Ampney Brook and negation of efforts to establish a self-sustaining brown trout population.

Consent is required from the EA under Section 30 of the Salmon and Freshwater Fisheries Act,1975 prior to the introduction of any eggs or fish into the Ampney Brook.

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*.