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AVISORY VISIT TO THE GRANTHAM ANGLING ASSOCIATION FISHERY AT BELTON HOUSE, RIVER WITHAM, LINCOLNSHIRE UNDERTAKEN BY VAUGHAN LEWIS, WINDRUSH AEC. SEPTEMBER 2005

1.0 Introduction

This report forms the output of a site visit undertaken on 7 September 2005 to Belton House, River Witham, Lincolnshire on behalf of Grantham Angling Association (GAA). Information for the report was gathered during the site visit. Additional information was provided by club members and representatives of the Environment Agency. Throughout the report, normal convention is followed, with banks identified as RB (right bank) and LB (left bank) when facing downstream.

The Belton House fishery is owned by the National Trust and let to GAA. The fishery runs for approximately 1.5km downstream of Manthorpe Mill. Within the estate boundaries, the River Witham holds important populations of the nationally rare white-clawed crayfish *Austropotomobius pallipes* and water vole *Arvicola terrestris.* Both species are subject to varied degrees of statutory protection under the Wildlife and Countryside Act 1981 (as amended) and the Countryside and Rights of Way Act, 2000.

2.0 Habitat assessment

The Witham at Belton House had a moderately meandering planform, and had been heavily modified in the past. Impoundment for the creation of an ornamental grotto and land drainage had resulted in incision of the river channel, loss of much of the hard substrate and local overwidening/overdeepening.

Instream habitat was dominated by a mix of deep pool, deep glide and shallow glide habitat, suitable for adult and juvenile trout. However, there were very few sections of gravel dominated riffle habitat present in the reach. There is little doubt that this has, and will continue to, limit recruitment of brown trout *Salmo trutta* to the fishery.

There was extensive growth of marginal emergent vegetation, in particular, branched bur-reed *Sparganium erectum.* The almost total lack of any riparian trees in the upper and middle reaches of the river meant that the channel was generally unshaded, promoting the growth of instream and marginal vegetation. The few alder trees present appeared to have *Phytopthora* infection. Growth of the marginal vegetation was most vigorous where poaching by sheep had pushed volumes of clay and fine sediment into the channel. In places, emergent growth had narrowed the channel significantly, increasing water velocity sufficiently to partially scour fine sediment from the bed.

Some sections of the river remained significantly over-wide, particularly where shallow glide habitat was dominant. The bed in these areas was unsorted, with a generally homogenous profile and uniform overlying layer of fine sand and silt present.

Section of extensive bank slippage, largely attributable to overgrazing by sheep. Note also extensive growth of emergent vegetation

Fine sediment coating the bed of the river

Land use on both sides of the channel was unimproved/semi-improved grassland. Comments from Phil Smith (EA biodiversity officer) confirm the significant botanical value of this grassland. The meadows were being managed by intensive sheep grazing. It was not clear whether this was a suitable regime to optimise the conservation value of the fields. What was apparent however, was the very significant damage that sheep grazing was causing to the riverbanks. Impoverishment of the riparian vegetation has caused weakening of the banks, with consequent significant bank slippages common. Large blocks of clay were noted in the river, with fine sediment coating much of the riverbed.

The water level in the river was artificially controlled, by means of a sluice at the grotto at the downstream limit of the reach. The resulting unnatural water levels have not been beneficial to riverine habitat and associated species. It is understood that, at times, water levels are lower during the winter period than during the summer. This has resulted in important marginal areas and bed sediments being exposed during the vulnerable winter period, whilst impounded water levels in the summer period have encouraged the deposition of fine sediment.

3.0 Recommendations

- Of prime importance for both the general improvement of habitat quality, and for the provision of optimum conditions for the success of proposed enhancements, is the reduction in over-grazing of the riverbanks by sheep. Whilst *controlled* erosion is an important feature of natural geomorphological processes, the erosion noted at Belton was both excessive and ecologically damaging. The present grazing regime should be modified, either by a significant reduction in stock density, or more likely, by fencing of the riparian zone. This could be facilitated using either permanent fencing or temporary electric fencing. Ideally, the latter system should be employed, not only preventing damage to the river margins, but also allowing controlled grazing of the water meadows, promoting their botanical interest.

- It is also important to establish an ecologically beneficial protocol for the management of river water level. Continuation of the present management regime that promotes fluctuating water levels would increase ecological damage, with key species of conservation interest including white-clawed crayfish, water vole and brown trout likely to be adversely affected. It is recommended that the National Trust's conservation advisor, English Nature and the Environment Agency should be involved in the establishment of an agreed management regime.

- The discharge from Manthorpe Pumping Station should be regularly monitored. The storm water discharge from the works has, in the past, discharged large volumes of 'rags', into the river. Results from statutory samples taken by the Environment Agency are placed on a publicly register that can be inspected at the Agency's offices.

- In combination with channel narrowing, bed raising should be used strategically in order to reduce the cross-sectional area of the channel, thus increasing water velocity. The creation of gravel-dominated riffles would also increase the availability of this valuable and under-represented habitat type. A range of species is associated with gravel riffles, including spawning/juvenile brown trout and white-clawed crayfish.

In general, it is recommended that riffles should be constructed to be a minimum of 15m in length. Each riffle would increase the retained head, probably by between 15cm-30cm, with the extent of this backwater effect being assessed as part of the detailed design process. By a combination of careful placement of riffles and judicious channel narrowing, the hydrological continuity between river channel and floodplain meadows could also be increased.

Optimum conservation benefit is obtained if the depth of gravel in each riffle exceeds 50cm, with a range of macroinvertebrate species requiring a hyporheic zone of this depth to reproduce successfully. In order to optimise spawning conditions for brown trout, water velocity should be between 25cm/sec – 75cm/sec, with a water depth varied between 25cm and 60cm. Gravel and stone will need to be imported onto the site from the nearest quarry, with the price likely to be in the region of £10-15/tonne delivered. A large hydraulic excavator will be required to place the stone in the river, at a cost of around £250/day for a machine and driver.

Narrowing of the channel is recommended along key sections of both fisheries. The physical extent of the narrowing will be dependent on changes in depth resulting from associated bed raising (see above), with the combined effect of these two prescriptions achieving an agreed cross-sectional area for the reach (probably around 3-4m^2). The narrowing may take the form of a simple extension of the present bank into the channel, the creation of a two-stage channel within the current bank line, the construction of mid-channel islands or a combination of these. Whichever option is pursued, careful profiling of the new banks can enhance habitat for a range of species of conservation interest, including water vole.

All materials used should, wherever possible, be biodegradable with a combination of chestnut/hazel/willow faggots and spiling, coir fibre revetment products and locally derived backfill key constituents of the narrowing.

The cost and detailed planning required for the implementation of the recommended enhancements should not be underestimated. A sum in excess of £20,000 will be required in order to have a significant impact on even a single river reach. Given this, it is recommended that a partnership project should be promulgated, with likely participants including the Environment Agency, the Wild Trout Trust, landowners, and Anglian water. Funding may be available from any of the potential partners, and Landfill Tax, Aggregates Levy, or agri-environment schemes.

- The few areas of gravel riffle present could be improved by sorting of the substrate in order to increase bed diversity and improve spawning conditions. There are a number of ways of doing this, with perhaps the best being the use of paired ‘v’ shaped wooden groynes. These are simple structures that can be constructed by staking a pair of large wooden logs to the bed in a ‘v’ shape, in the centre of the riffle, with the apex of the ‘v’ facing upstream. The upstream face of the paired groynes should be filled with large stone and gravel in order to reduce flow under them; the intention is to force water over the groynes, scouring the bed downstream.

Wooden 'v' shaped groyne installed on gravel riffle. Note gravel backfill upstream of groyne and pool scoured downstream

- The sorting of bed material and in particular spawning gravel could also be further improved by strategic positioning of Large Woody Debris (LWD), in the form of tree trunks and limbs. These will from time to time naturally fall into the river. Unless flood defence requirements dictate, they should not be removed. Rather, they should be stabilised and trimmed to allow angling access whilst retaining the bulk of the woody debris in the river. LWD has a significantly beneficial role to play in increasing variation in bed profile, providing cover for a range of invertebrates and fish, and detaining leaf litter for subsequent consumption by shredding macroinvertebrates.

LWD can actively be encouraged into the river in strategic locations (generally on riffles or shallow glide areas) by selective felling of trees. Leaving a 'hinge' at the base of the trees during felling will allow control of the placement of the timber, and will also act to stabilise the tree by keeping the tree butt attached to the bank. Ideally, the top of the fallen tree would be angled in an upstream direction in order to reduce the risk of bankside erosion.

- The lack of trees present on the upper and middle reaches of the river should be addressed by planting of mixed species along the channel banks. These should include ash *Fraxinus excelsior* and hawthorn *Crateagus monogyna.* The likely presence of *Phytopthora* precludes the planting of alder. All trees planted will require substantial protection from grazing stock and deer.

- Note that all works to bed or banks of the river or within 8m of its banks requires 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.

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