Habitat Advisory visit to the River Slate, Co. Kildare, Eire.

Undertaken on behalf of Rathangan District Angling Association by Vaughan Lewis, Windrush AEC Ltd

June 2008

1.0 Introduction

This report forms the output of a site visit to the River Slate Co. Kildare, Eire on 24 May 2008 on behalf of Rathangan District Angling Association. Information in the report is based on observations on the day of the visit and additional comments provided by club members.

Rathangan District Angling Association (RDAA) control the fishing rights on approximately 25 kilometres of the River Slate and its tributaries, which form part of the River Barrow system. The club has noted serious declines in the quality of the river during the past 5-10 years, with both trout numbers and macroinvertebrates appearing to have declined dramatically.

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 first reach visited was downstream of Millbridge, adjacent to the Preston Brook housing development in Rathangan. During the early 1990's, Dr Martin O'Grady visited this section of the river and undertook an electrofishing survey, during which only two trout were apparently caught. Subsequent to this, a number of improvements were undertaken, including the cleaning of gravel spawning riffles, the introduction of additional spawning gravel and a one-off removal of pike by electrofishing, largely to improve conditions for the spawning and recruitment of salmon. A repeat electrofishing some years later produced some 400 trout in the same reach, indicating that habitat quality was probably limiting the trout population at this time. Further evidence that water quality was probably adequate during the 1990's was provided by the strong and diverse invertebrate population found at the site.

Approximately 5 years ago, the club noticed a significant decline in both trout stocks and the invertebrate population with a serious decline in both caddis and blue winged olives noted. Despite this decline, hatches of mayfly *Ephemera danica* have been regularly noted on the river in recent years. There was a considerable increase in the growth of filamentous algae and diatoms on the riverbed; both were very apparent on the day of the advisory visit, with large clumps of filamentous algae reaching up to the surface.

River Slate at Rathangan. Note steep gradient, well-fenced banks and clumps of filamentous algae in the background

Habitat quality in this reach was generally good. The river had a relatively steep gradient, with abundant shallow gravel runs suitable for spawning brown trout *Salmo trutta* and Atlantic salmon *Salmo salar*. However, pool habitat was relatively limited, largely due to repeated removal of any Large Woody Debris (LWD) from the channel by the drainage authorities. One large tree had recently been removed from its stable position in the channel where it had scoured a pool of some 1m deep. This was a good example of both the benefits of LWD (several trout were visible in the scoured out pool) and the regrettable policy of the removal of woody debris from the river.

There were some small clumps of water crowfoot *Ranunculus* Spp. present, although the abundance of this species had also apparently declined during the past 5 or so years. Previous to this, the local council had to undertake an annual cut of the weed to maintain a free channel within the river. There were patches of unbranched bur-reed *Sparganium emersum* present in the channel, indicating slower, more nutrient rich conditions. The banks were fenced on both sides, preventing access to the river for grazing stock.

LWD removed from the channel recently

Upstream of Millbridge, the river again had a relatively steep gradient and abundant lengths of spawning riffle. Much of the gravel was overlain by a layer of fine sediment and diatoms. There was significant cattle erosion on both banks, with the presence of a spreader on the RB suggesting disposal of cattle muck in fields adjacent to the river. Large amounts of filamentous algae were present in the river, indicating enrichment. The reach between Millbridge and Owensbridge was generally regarded as a sanctuary area from angling in the past, in recognition of the large numbers of resident small trout. More recently, the numbers of trout have apparently declined, as has the population density of white-clawed crayfish *Austropotomobius pallipes.*

The Town Stretch running upstream to Murphy's Bridge was generally quite open on the RB, with some shading provided by LB trees. The channel was generally shallow, with a dense growth of filamentous algae and diatoms over much of the riverbed. This reach used to sustain high numbers of Trichoptera (caddis flies), with spectacular evening hatches of sedge. This is apparently no longer the case. A handful of small brown trout were observed in this reach. These were generally around 20cm-30cm in length.

The Iron Bridge reach was traditionally an excellent spawning area for both trout and salmon. However, recent dredging work has severely reduced the instream habitat quality. Large volumes of gravel and stone were removed from the channel, leaving it overwide, uniform and lacking in shallow riffle areas vital for spawning and juvenile salmonids.

Dense beds of filamentous algae and diatoms in the Town Stretch

Recently excavated gravel used to make up a track on LB u/s of Iron Bridge.

Downstream of Aga bridge, the fisheries board had constructed a series of small deflectors from stone. Whilst these had created some improvement locally, their impact on the total reach was minimal, with far more extensive works required in this fairly uniform stretch to create a real difference to habitat quality.

Filamentous algae was again very visible in this reach, with stock grazing also an issue. The LB of the river was overgrazed by sheep in places, with very little cover remaining. The RB was shaded by extensive bankside growth of shrubs and trees, particularly hawthorn. There was a large raised berm visible on the LB indicating where the dredged spoil had been deposited historically.

Below Aga Bridge. Note grazed LB, tree covered RB and extensive algal growth instream.

At Drumsru, the upper reaches of the Slate were heavily incised due to past dredging work, with a good gravel bed present. This was historically an important spawning reach. Small fish were visible in the channel but it was not possible to positively identify them. The channel was dominated by emergent vegetation, particularly un-branched bur-reed, yellow water lily *Nuphar lutea* and filamentous algae.

A tributary stream, the Pluckerstown Stream, joined the main river in this reach. Water quality had apparently also declined in this stream over recent years, with large amounts of filamentous algae present, and a greeny hue present in the water. New housing erected at Ballyteague was suggested as the potential source of the poor water quality. Habitat in the stream was otherwise good, with a steep gradient and plenty of suitable sized spawning gravel.

3.0 Water Quality

There is little doubt that the apparent decline in the fishery status of the Slate can, in part, be attributed to its moderate to poor water quality. Visually, the impacts of elevated organic and nutrient enrichment were very apparent. There were considerable accumulations of sediment overlying the hard bed of the river, whilst the abundant growth of filamentous algae and diatoms was all too obvious.

Extensive growth of filamentous algae, both on the river bed and the water surface

The Environmental Protection Agency (EPA) categorises watercourses in Ireland using a 'Quality Rating' (QR) system, based on Biological Quality Classes, as assessed by regular macroinvertebrate sampling. The QR system runs from 1-5, with 1 representing a grossly polluted watercourse, and 5 a pristine, unpolluted stream. The majority of the Slate system is categorised as 3-4, with a few reaches achieving either 3 or 4. The worst sections of the river are in the headwaters near Robertstown and Prosperous, which achieve a QR of only 2 or 2-3.

Putting these assessment in context is enlightening: a river with a QR of 3-4 would be expected to be 'slightly polluted, with occasionally elevated biochemical oxygen demand, luxuriant growth of filamentous algae, potential problems associated with abstraction of water and perhaps most importantly, to put game fish 'at risk'.
A QR of 2 is classed as 'heavily polluted, with a usually high BOD, low (sometimes zero) dissolved oxygen, significantly elevated phosphate, abundant sewage fungus and filamentous algae, with fish usually absent'.

The EPA thus categorises much of the headwaters of the Slate as likely to be unsuitable to support any fish, with the rest of the river likely to place game fish 'at risk'. As a consequence, it is entirely predictable that not only have the brown trout stocks of the river declined, but that the economically and ecologically important salmon spawning tributary of the River Barrow fishery has also been severely compromised by poor water quality.

What is unusual is that the water quality in the headwater streams is poorer than that of the downstream reaches. Local opinion is that this is due to the rise in single and multiple dwelling developments in the upper reaches of the river, and the impact of their poorly installed and regulated discharges into the river. There have apparently been several hundred new houses built in these areas during the past few years. Much of the upper river runs through areas of peat that offers little soakage or tertiary treatment. Another possible source of organic enrichment may include the application of fertiliser onto farmland or forestry plantations.

Further downstream, the effluent quality from Rathangan Waste Water treatment plant was historically appalling (Data provided by Kildare County Council). Up until December 2006, ammonia levels discharged into the river regularly exceeded 15mg/l with peaks of 31mg/l recorded during summer periods on at least 2 occasions. Other parameters were also exceptionally high (phosphate levels of 19. mg/l and suspended solids of 1004 mg/l). Effluent of this exceptionally poor quality would not only promote huge algal growth but would almost certainly directly result in a significant fish (and probably crayfish) mortality. Data recorded subsequent to March 2007 showed a great improvement in effluent quality, with no ammonia figure recorded exceeding 0.5mg/l. This improvement coincided with upgrade works undertaken at the plant. However, suspended solids levels are still intermittently high, with peaks of 64 mg/l recorded in May 2007. Phosphate levels also remain high, regularly exceeding 2 mg/l, with a peak of more than 8 mg/l. These levels are more than sufficient to promote strong algal growth in the Slate.

4.0 Fish stocks

Stocks of brown trout in the Slate catchment have apparently declined over the past 5 or so years. However, the absence of any quantitative electrofishing data made it difficult to gauge the level of any such decline. Rod caught fish used to average around 0.25kg, with individual specimens up to 2kg. No stocking of brown trout has taken place in recent yards.

Runs of migrating Atlantic salmon have remained strong, with spawning season 2007-08 generally accepted as being one of the best in recent years. The Slate is acknowledged as an important recruitment area for salmon in the Barrow catchment, although it was not possible to assess the hatch rate of deposited ova and the survival of fry in the absence of any quantitative data.

Other species present in the Slate include stone loach *Barbatulus barbatulus*, bullhead *Cottus gobio*, and eel *Anguilla anguilla*, with the latter two species being of conservation concern in a European context. Anecdotal evidence suggests that the numbers of stone loach have also declined in recent years.

Of equal importance is the presence of a well-established population of white-clawed crayfish. This increasingly rare species is included in the International Union for the Conservation of Nature (IUCN) Red-Data book in recognition of its fragile conservation status in a worldwide context.

5.0 Recommendations for habitat management

The key to improving fish stocks in the River Slate lies in improving both the river's water quality and addressing limiting habitat factors. A number of recommendations for future work are made below:

· The water quality of the Slate is moderate/poor (slightly to heavily polluted as defined by the EPA). The river's water quality must be improved if its population of salmonid fish species and white-clawed crayfish are to flourish. Without a major improvement in water quality, these ecological and economically important resources will remain at risk.

It is important that a full audit of likely inputs of organic enrichment is undertaken. This should include the obvious point source inputs, including drainage and wastewater treatment discharges, along with diffuse source inputs. Once identified, actions should be put in place to reduce their impact on the river. These actions might include the enforcement of planning conditions with respect to sewage discharges from single of multiple development sites, the installation of a phosphate stripper at Rathangan wastewater treatment plant, and the implementation of good agricultural and forestry practice to minimise diffuse source inputs.

· The regular dredging of the river undertaken by the drainage authorities is entirely counterproductive to the development of strong populations of both brown trout and Atlantic salmon. There is no doubt that this management has reduced and impoverished habitat diversity in the Slate. Regular extraction of LWD from the channel has removed an important structural element from the channel, and largely eliminated instream cover for fish.

Future dredging work would ideally be undertaken in a more sensitive manner, with greater regard to both the necessity for the work and its impact on the river's ecology. Given the greatly incised nature of much of the Slate's channel, it seems doubtful whether much of the work that has been undertaken in the recent past actually delivers real benefit for flood defence purposes. Recent changes in agricultural economics, particularly with regard to the EU payments system, also cast doubt on the need for regular dredging to take place for farming purposes. It would be instructive to undertake some quantitative hydraulic modelling of past and proposed dredging work in order to fully understand its impact on the river's flood dynamics.

· There was a general dearth of Large Woody Debris (LWD) in the river, leading to a lack of cover and a paucity of deeper pool areas suitable for adult fish in some sections of the river. The simplest and most robust method of increasing local scour of the bed, and hence increasing habitat diversity, is by felling carefully selected bankside trees into the river. The selection of suitable trees requires consideration of a number of issues including:

- Location. The felled trees should be located in areas with a bed dominated by gravel or cobble substrate suitable for spawning salmonids. This will ensure optimum benefit. Areas of bedrock should be avoided, as there will be no meaningful change to the bed profile.

- Fixing of the felled timber. By far the best fixing can be obtained by partially cutting through the selected tree and 'hinging it' into the water. By locating the end of the hinged timber behind and upstream of an existing tree on the opposite bank, a very firm fixing is thus obtained at both of its ends. A Tirfor winch is a very useful tool for this type of operation. Short of the impact of a massive flood event, the stability of the felled tree will then be assured. Further security can be obtained by drilling through the trunk of both ends of the felled tree and securing them to standing trees using cable laid wire.

- Bats. Trees with significant amounts of ivy growing up them and those trees which have holes in their trunks or major limbs, can harbour colonies of bats. To avoid risk to these protected mammals, trees should be selected for felling that have limited or no growth of ivy, and which do not contain holes suitable for bats.

Other considerations include obtaining the necessary consents from the relevant drainage authorities. They should be able to confirm whether they deem tree introduction of this type to require consent under the land drainage legislation. It is also important that agreement is reached that the introduced trees will not be removed during any subsequent maintenance operations by the authority.

Trees should be felled only by a properly qualified and insured tree surgeon. Whilst this type of felling is not a difficult operation, it has the potential to be very dangerous if undertaken by inexperienced workers. It is recommended that a small number (<5) of trees should be felled in the first instance. This will give both the angling club and the relevant authorities the opportunity to monitor both their efficacy and impact on river flows

· As an alternative to LWD, simple groynes could be constructed from locally derived rocks. These should extend approximately one third of the way across the channel, and should be set facing upstream in order to reduce the risk of bankside erosion. Further details on groyne construction and the use of LWD are provided in the Wild Trout Survival Guide that has been sent to the club secretary following the advisory visit.

LWD deflector staked in place in an upland stream.

· A potential source of semi-natural fish would be the use of a deep substrate incubation box. Basically, 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 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. There are a number of issues that should be considered before deciding to use this form of stock enhancement.

Firstly, recent research has highlighted the risks of introgression of fish farm genes into wild stocks of trout, to the long-term detriment of recruitment and survival of fry. Discussion of this issue can be found online at the Environment Agency (http://www.environment-agency.gov.uk/) and WTT websites (www.wildtrout.org). It is also doubtful whether either the eggs or fry emerging from the boxes will thrive in the poor water quality that can be expected in the river. However, more positively, deep substrate incubation boxes have been found to be a great mechanism for raising the profile of rivers, and for increasing both awareness of key issues (water quality and habitat), and the involvement of local people in addressing them.

More details on incubation boxes can be found on the Wild Trout Trust website or in Volume 2 of the Trust's magazine, *Salmo trutta*.

· Where stock had unrestricted access to the banks of the river, there was little cover, or shade, with the banks physically damaged in some reaches. Erection of temporary (electric) or permanent (post and wire/netting) fencing would prevent this

happening in the future. This is a relatively cheap and easy management option that has considerable benefit to the river.

· The club should also consider undertaking some basic monitoring of macroinvertebrate populations in the river. This involves taking a series of three minute 'kick-samples' of the riverbed. A fine meshed net is placed on the bed of the river, which is then disturbed using the sampler's feet for a total of three minutes, sampling all habitat types in proportion to their abundance in the channel. The samples are then placed in a labelled container (they can be preserved with alcohol if required for future sorting).

Samples are then subsequently sorted into invertebrate families. Each family is assigned a score under a system known as the Biological Monitoring Working Party (BMWP) with the highest scores reserved for the most pollution sensitive families. Scores for all families are then added together, to give a total for each sample taken. This score can then be compared to a predicted score based on elevation, geographic location, gradient, and general habitat of the site. Deviation of the sample from the predicted score would be indicative of a water quality or perhaps flow, perturbation. Further details of 'DIY' sampling strategies can be obtained from the Riverfly website at http://www.riverflies.org/ Suitable nets for sampling macroinvertebrates can be obtained from Alana Ecology www.alanaecology.com Tel: 00441588 630173

· Additional funding for some of the work recommended might be forthcoming from the Wild Trout Trust who holds small 'pump priming' pots of money for projects of this nature. There is also a scheme whereby a top quality rod can be purchased by the club at cost price and subsequently raffled to raise funding. The Trust also operates a 'Practical Visit' scheme whereby a river restoration specialist undertakes up to 2 days work at the site in order to demonstrate techniques that are suitable to address the issues raised in this report. It may be that the WTT could arrange for a PV to be undertaken to show best practice with respect to felling and fixing trees in the channel as described above. This could perhaps be arranged to be a collaborative exercise with the local fisheries board, with the mutual exchange of ideas of benefit to all parties. A good location for this to take place might be in the reach below Aga Bridge. Contact Tim Jacklin at the Trust at project@wildtrout.org for further details.

· This report is produced for guidance only and should not be used as a substitute for full professional advice. No flood risk assessment has been undertaken as part of this report. Accordingly, no liability or responsibility for any loss or damage can be accepted by Windrush AEC Ltd as a result of any person, company or other organisation acting, or refraining from acting, upon comments made in this report