Advisory Visit

River Blackwater, Kells Angling Association

Co. Meath, Eire

17-20th November, 2008

1.0 Introduction

This report is the output of a site visit undertaken by Tim Jacklin of the Wild Trout Trust to the River Blackwater, Co. Meath, Eire on 17th – 20th November 2008. Comments in this report are based on observations during the site visit and discussions with Noel McLoughlin, Pat McLoughlin, Stephen McManus, Morgan Brennan and Brendan Moran of Kells Anglers Association (KAA).

Normal convention is applied throughout the report with respect to bank identification, i.e. the banks are designated left hand bank (LHB) or right hand bank (RHB) whilst looking downstream.

2.0 Fishery Overview

The River Blackwater is the major tributary of the River Boyne, with a 735 km^2 catchment. It is a limestone river and is fed by Lough Ramor, Co. Cavan, before flowing in a south-easterly direction, skirting the north of Kells and joining the River Boyne at Navan. Kells AA control about 12 miles of the River Blackwater from near the outflow from Lough Ramor at Nine Eyed Bridge, down to below Maudlin Bridge (Figure 1).

The Blackwater forms part of the River Boyne and Blackwater Special Area of Conservation (SAC). SACs are prime wildlife conservation areas, considered to be important in a European as well as an Irish context; they are selected and designated under the EU Habitats Directive (transposed into Irish law under the European Union (Natural Habitats) Regulations 1997).

The site synopsis for the River Boyne and Blackwater SAC can be found at: http://www.npws.ie/en/media/Media,4226,en.pdf . The following points from the synopsis (dated 2003) are relevant to this report:

- *The site is a candidate SAC selected for alkaline fen and alluvial woodlands, both habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive – Atlantic Salmon, Otter and River Lamprey.*

- *The Boyne and its tributaries is one of Ireland's premier game fisheries and it offers a wide range of angling from fishing for spring salmon and grilse to sea trout fishing and extensive brown trout fishing. Atlantic Salmon (Salmo salar) use the tributaries and headwaters as spawning grounds.*

- *The Blackwater is a medium sized limestone river which is still recovering from the effects of the arterial drainage scheme of the 70's. Salmon stocks have not recovered to the numbers pre drainage.*

- *Fishing is a main tourist attraction on the Boyne and Blackwater and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. The Eastern Regional Fishery Board have erected fencing along selected stretches of the river as part of their salmonid enhancement programme. Parts of the river system have been arterially dredged. In 1969 an arterial dredging scheme commenced and disrupted angling for 18 years. The dredging altered the character of the river completely and resulted in many cases in leaving very high banks. The main channel from Drogheda upstream to Navan was left untouched, as were a few stretches on the Blackwater. Ongoing maintenance dredging is carried out along stretches of the river system where the gradient is low. This is extremely destructive to salmonid habitat in the area. Drainage of the adjacent river systems also impacts on the many small wetland areas throughout the site. The River Boyne is a designated Salmonid Water under the EU Freshwater Fish Directive.*

Lough Ramor is not part of the SAC designation, but is a proposed National Heritage Area (pNHA). In 1995 pNHAs were published on a non-statutory basis, but have not since been statutorily proposed or designated. They are subject to limited protection through Rural Environmental Protection Scheme (REPS) plans, vetting of forestry grants by the National Parks & Wildlife Service, and a requirement for Planning and Licensing Authorities to recognize the ecological value of pNHAs. See http://www.npws.ie/en/ProtectedSites/NaturalHeritageAreasNHAs/ for more information.

The River Blackwater contains wild brown trout and has a run of salmon; coarse fish are also present including roach, bream, pike, gudgeon and

minnows. The river is currently closed to angling for salmon as part of conservation measures introduced to protect stocks.

KAA have around 140 full members, and issue day tickets to visiting anglers. Day ticket rules stipulate catch-and-release fishing for trout using barbless hooks. Club members can take fish up to a daily bag limit of 3 fish over 12 inches in length, although it is thought that most members practice catch-and-release. KAA own the fishing rights to the majority of the river apart from a couple of short sections.

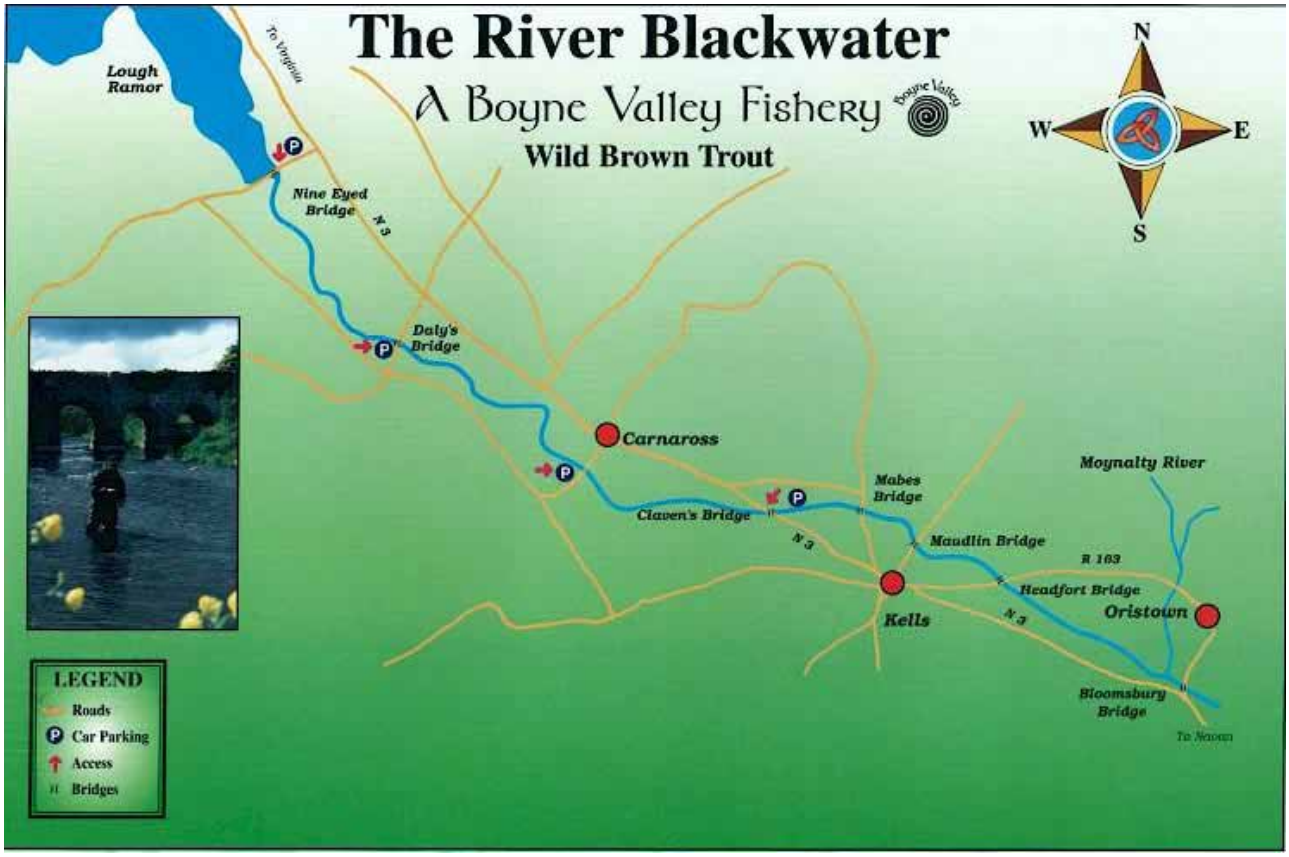

Figure 1 (From Eastern Regional Fisheries Board website http://www.fishingireland.net/fishing/salmonandtrout/meath/kellsblackwatermap.htm)

3.0 Habitat Assessment

Day 1 (Maudlin Bridge – Claven's Bridge)

The visit began at Maudlin Bridge (Grid Ref. SA 79065 37617) progressing upstream (Photo 1). The river was carrying approximately 2 ft of extra water. The river here has a good structure with a pool and riffle sequence, and a gravel and cobble substrate. Water crowfoot *Ranunculus* sp. was present. Both banks were grazed, the RHB by horses and the LHB by cattle. The LHB was fenced (electric), although this had not prevented grazing right up to the river, where the bank was quite heavily trampled (Photo 2).

A stream (McCormac's Stream) joined the river on the LHB (SA 78686 38061). This stream was dredged in about 1980 as part of a land drainage scheme by the Office of Public Works (OPW). The stream has recently been culverted under a new road which is under construction (the M3 Kells by-pass; Photo 3). Upstream of the culvert the RHB was lined with trees (alder, holly, and willow), many of which were leaning over the stream; the LHB was grazed and unfenced. Despite the extra water in the stream, it was slow flowing and had a uniform width and depth (Photo 4). The substrate was largely silt overlaying some gravel, with some starwort *Callitriche* sp. and forget-me-not *Mysotis* sp. present. Prior to the dredging the stream had a gravel bed, abundant water crowfoot *Ranunculus* sp. and abundant juvenile trout (KAA members, pers. comm.). The stream was also inspected further upstream (by about 1 mile) where a minor road crosses; here the habitat was better and a gravel substrate was present indicating land drainage works had not carried on up to this point.

Back on the main river, upstream of the confluence with McCormac's Stream, there was an area of good instream habitat leading up towards Mabes Bridge. There is a steeper gradient to the river at a bedrock outcrop, and two vegetated islands in the channel. Some instream islands and shoals have been removed from the river in this section, although it has not been subject to arterial drainage (Photo 5).

The river margins here are fenced and there is a good strip of tall herbage and shrubs alongside the river (LHB). On the RHB is an arable field and beyond that a new housing estate (built within the last 5 years; Photo 6). A river crossing for the new road is under construction just downstream of Mabes Bridge. Leading up to Mabes Bridge the water is shallow and streamy

with good growth of *Ranunculus.* There is a midstream island and good low cover along the RHB in the form of trees and shrubs.

Between Mabes Bridge and Claven's Bridge (SA 75995 38393) the instream habitat is very good (Photos 7 & 8). There is a pool and riffle sequence, and some excellent examples of stable large woody debris (LWD). The river has wide, wet margins colonised by reeds and rushes, and there are vegetated islands present. KAA feel the river has narrowed considerably in this reach, with the rushes encroaching on the channel; it is felt this is due to a flashier flow regime following arterial drainage further upstream – i.e. a less sustained flow of water to maintain the channel width.

Large Woody Debris

The presence of LWD has been shown to be extremely important in several respects:

- An increase in the variety of flow patterns, depths and localised velocities.
- Development of high in-channel physical habitat diversity
- Significant benefits to the control of run-off at the catchment scale. Woody Debris helps regulate the energy of running water by decreasing the velocity. Thus the 'travel time' of water across the catchment is increased.

LWD is a general term referring to all wood naturally occurring in streams including branches, stumps and logs. Almost all LWD in streams is derived from trees located within the riparian corridor. Streams with adequate LWD tend to have greater habitat diversity, a natural meandering shape and greater resistance to high water events. Therefore LWD is an essential component of a healthy stream's ecology and is beneficial by maintaining the diversity of biological communities and physical habitat.

Traditionally many land managers and riparian owners have treated LWD in streams as a nuisance and have removed it, often with uncertain consequences. This is often unnecessary and harmful: stream clearance can reduce the amount of organic material necessary to support the aquatic food web, remove vital in-stream habitats that fish will utilise for shelter and spawning and reduce the level of erosion resistance provided against high flows. In addition LWD improves the stream structure by enhancing the substrate and diverting the stream current in such a way that pools and spawning riffles are likely to develop. A stream with a heterogeneous substrate and pools and riffles is ideal for benthic (bottom dwelling) organisms as well as for fish species like wild trout.

On the RHB for much of this section there is an Industrial Estate. A number of minor but undesirable pollutions were seen along this stretch including:

- A small brook entering the river through this estate was found to have a grey tinge to the water and evidence of sewage debris in it. Turning a few stones revealed some freshwater shrimp and a caseless caddis (species moderately tolerant of organic pollution). This may be the discharge from the sewage treatment facility for the business park referred to in the documents pertaining to the plans to improve Kells sewage works (see page 28).
- Oil leaching from some stored plant in a compound (Photo 9)
- A surface water drain with silt and debris; this had recently been the subject of a pollution that had been investigated by the EPA and resolved.

Just downstream of Claven's Bridge a small tributary enters the river on the LHB. The mouth of the stream is masked with rushes and reeds and this would benefit from clearing to give free access for fish. The stream was inspected further upstream next to Sean McGee's house, where two trout were disturbed just below the road culvert. There is a small weir upstream of the road, alongside house, which presents an obstacle to fish moving upstream to spawn at this time of the year (Photo 10).

Photo 1 View downstream from Maudlin Bridge

Photo 2 Trampled LHB upstream of Maudlin Bridge

Photo 3 Road construction and culvert crossing McCormac's stream

Photo 4 McCormac's stream upstream of the new road

Photo 5 Midstream islands between Maudlin and Mabes Bridges

Photo 6 New housing development and surface water drainage

Photo 7 Stable LWD in the channel – excellent habitat

Photo 8 Good habitat upstream of Mabes Bridge – low banks and wet margins.

Photo 9 Industrial estate on RHB upstream of Mabes Bridge. Oil was leaching towards the river from the plant in the compound, and poorly treated sewage effluent was entering the river from this estate.

Photo 10 Weir on a small tributary – an obstacle to spawning fish

Day 2 (Claven's Bridge – upstream of Carnaross Bridge)

Rathbrack's Stream, a small tributary stream culverted under the N3 road (SA 74227 39336), was inspected. It would be difficult for fish to pass under the road because of the perched culvert pipe (Photo 11). This point is only two or three fields away from the confluence with the main river. The stream looks organically polluted, having brown algal growths on the stones; a brief hand search for invertebrates revealed only freshwater shrimp *Gammarus pulex.* A hedge line follows the stream and it is quite overgrown and shaded. The stream has quite a steep gradient and a good gravel bed. A couple of small bridges created from concrete pipes were observed; these were passable by fish but could become perched in time.

Back on the main river above Claven's Bridge is a weir and sluice at the potable water intake operated by Kells Urban District Council. There are sludge tanks here which discharge to the river on a daily basis. Kells AA have involved the EPA and Fisheries Board regarding this and have been advised that the discharge is within the limits of the consent for the water works. The club are having water samples independently checked.

There is no screen at the water intake to prevent entrainment of downstream migrating fish (such as salmon smolts) into the water intake flume (Photo 12); this is surprising given that salmon are one of the species listed on Annex II (Habitats Directive) for which this site is designated a SAC.

Upstream of the water works is a stretch of good habitat containing the Sheep Pool (a deep, salmon-holding pool). The stretch is characterised by wide, wet river margins colonised by reed canary grass *Phalaris* sp.and reed sweet grass *Glyceria* sp.; there is some good stable LWD in the river channel, and a variable depth profile with high riffle areas caused by bedrock outcrops, and deeper pool areas (Photos 13-15). Near the large house being constructed on the LHB is an area designated a sanctuary for juvenile fish by the club; no fishing is permitted here and there is excellent in-stream habitat in the form of willow scrub growing alongside and in the river channel on vegetated gravel shoals and side bars (Photo 16).

In front of the big house on the LHB is a recently landscaped garden with bare earth. Alder trees have been removed along LHB and it is recolonising

with willow. An old river diversion to provide water to a property has been extended to create a pool in front of the new house.

Further upstream is an area known as Lugawooly. Here the banks are wooded and there is some nice juvenile salmonid habitat with shallow water and LWD (Photo 17); this gives way to a deep pot where the river hits a bedrock cliff on the RHB and makes a sharp right turn. This is a deep area known for holding salmon and large trout. Upstream of here the river widens into a broad riffle with good spawning gravel; salmon have been observed spawning here (Photo 18).

Upstream of this point (at SA 74587 38670) the river has been the subject of an arterial drainage scheme carried out around 1980-81. The drainage scheme involved lowering the bed level of the river; a trench was dug alongside the river, and the river bed excavated and filled into the trench, which was then covered in topsoil. There are extensive areas of boulders, cobbles and gravel evident on the bank from this process (Photos 19-20). The in-stream habitat changes significantly from this point upstream:

- there is little variation in the width of the river; it becomes generally narrower than the downstream section with a very uniform width and cross-sectional profile (trapezoidal);
- there are no low, wide, wet margins as seen on much of the lower river;
- in some sections, a series of low weirs were installed every 100 – 150 metres at the time of the scheme to create pool areas, giving a stepped long-profile to the river bed. These were not evident during the visit because of the high water levels;
- there are very few (if any) features such as midstream islands, gravel shoals and side bars;
- there is little in-stream vegetation such as water crowfoot *Ranunculus* sp. compared with the pre-drainage situation;
- there is little LWD in the river channel
- there are fewer trees alongside the river

Unfortunately, the river level prevented observation of the river bed. The club advise that there is a gravel substrate between the low weirs.

Further upstream at Jack Brady's farm, some new stock fencing and water drinking troughs have been erected alongside the river, possibly under a REPS (Rural Environmental Protection Scheme - http://www.agriculture.gov.ie/schemes/REPS4/REPS4FamersHandbook_LowRes.pdf). The fencing is located very close to the top of the bank (Photo 21), certainly within the minimum 1.5 metres specified under measure 3 of REPS. Within the farmyard there are some fuel tanks sited very close to the river, with no bund around them, posing a risk of pollution should there be a leak or spillage (Photo 22).

A tributary, the Sheeny River enters on the RHB upstream of Jack Brady's. Twenty years ago a serious pollution resulted from a farmer washing out spraying tanks in the Sheeny River and a large number of fish were killed. The Sheeny River has a gravel bed and a good gradient and flow, providing good trout and salmon spawning habitat (Photo 23)

On the main river downstream of Carnaross Bridge there are willows growing out over the river from the RHB providing good low cover (Photo 24); these have recolonised since the drainage scheme. Downstream of this the river is deep and slow down towards Jack Brady's farm, and is known salmon holding water. There are no low weirs/groynes in this section, and the river has a gravel bed. Two or three cormorants were observed feeding on the river here.

Upstream of Carnaross Bridge, the LHB is rough grazing (unfenced) with some scrubby gorse and hawthorn; the RHB is cattle grazed and fenced close to the river. The previous dredging activity is evident here from the trapezoidal channel cross-section and bank profile; the bridge itself illustrates the narrowed channel – the river previously flowed under three arches, but now only two (Photos 25-26). There are low weirs installed throughout this reach (from the drainage scheme) from SA 72326 39686 (roughly the site of the former eel weir) up to the next bridge (Harton's Bridge). There was a large willow fallen in the river at the site of a former weir and eel trap (removed as part of drainage scheme).

The next field upstream of the fallen willow used to be wide, wet berm pre-drainage, and gives some indication of the level by which the river bed has been lowered (Photo 27). The river is deep along this stretch (un-wadeable at summer level). Ash trees have been planted along LHB which is fenced. At the upstream end of this section, near Harton's Bridge is a cascade where there is a bedrock outcrop (Photo 28); other such areas in this reach were removed with explosives during the drainage programme.

Upstream of Harton's Bridge the river is slow and deep. The river had a similar character pre-drainage, but previously the banks were wet and spongy, and floodplain contained extensive areas of flooded grassland during the winter. There is still some wet grassland evident and lapwing, whooper swan and snipe were observed. The club report few trout in this section, (but big ones). Coarse fish are plentiful and lilies grow here; there is a sandy bed and a depth of 10-12ft deep with some areas deeper. The river retains this character upstream to new M3 road crossing (Photo 29).

Photo 11 Culvert carrying Rathbrack's stream under the N3 road – an obstacle to fish passage

Photo 12 Potable water intake – a screen should be installed here to prevent salmon smolt entrainment

Photo 13 Wet vegetated river margins

Photo 14 Large Woody Debris creating valuable habitat diversity

Photo 15 Faster water cascading over bedrock outcrops

Photo 16 Vegetated gravel shoals and side bars

Photo 17 Good habitat around Lugawooly

Photo 18 A known salmon spawning area at Lugawooly

Photo 19 The former river bed now part of the bank as a result of dredging

Photo 20 Boulders on the bank from arterial drainage operations

Photo 21 Fencing very close to the river edge

Photo 22 Poorly sited fuel storage tanks

Photo 23 Sheeny River

Photo 24 Downstream of Carnaross Bridge

Photo 25 Carnaross Bridge with dry arch (RHB) as a result of drainage scheme

Photo 26 Uniform width, trapezoidal channel.

Photo 27 This meadow was a wet margin adjacent to the river (at the right of the picture) prior to land drainage

Photo 28 Bedrock cascade downstream of Harton's Bridge

Photo 29 Slow, deep section above Harton's Bridge

Day 3 (Downstream of Daly's Bridge – Lough Ramor; Headfort Bridge area)

Around Daly's Bridge the channel gradient is steeper and there are stretches of faster flow and broken water (Photos 30-31). Downstream of the bridge the river has been dredged from the RHB. The field nearest the bridge is open, grazed and unfenced, giving way to stands of sallow and willow on both banks. The banks are very high as a result of drainage (Photo 32). The steep channel gradient near the bridge gives way to slow, deep canal-like flow with progress downstream towards the new M3 crossing (yesterday's finish spot). This section has very sluggish flow in summer.

There is a gravel quarry on LHB with a drainage ditch feeding into river (SA 70539 41460). The water in the ditch was clear and eel grass and starwort *Callitriche* sp. were growing. Water hog louse *Asellus aquaticus* were present amongst the weed.

Upstream of Daly's Bridge the river is generally slow and canal-like, with just the odd faster run. The banks are very steep and high. At the Crosswater River confluence (SA 68854 42507) on the RHB a drop of approximately 2 metres can be seen over the last 30m of the tributary; this indicates the level by which the main river bed was lowered (Photo 33).

The Crosswater River has a gravel bed and good in-stream habitat; it is a known spawning river for salmon. Caseless caddis (*Rhyacophila* sp.) and shrimp were present. The river was inspected at two crossing points further upstream and there was good habitat at both sites.

Above the Crosswater confluence , the Blackwater is slow, deep and wide for about a mile up to Nine-eyed Bridge (Photo 34), the outflow from Lough Ramor. Stillwater plant species such as Canadian pondweed *Elodea Canadensis* and broad-leaved pondweed *Potamogeton natans* are present here, and freshwater mussel shells *Anadonta* sp. were found on the bank. Immediately downstream of the bridge is a crump weir flow gauging station.

Lough Ramor is a large (7.4 km^2) lake which is described in the River Boyne Water Quality Management Plan (1997) as hypereutropic [sic], having high total phosphorus concentrations and very large phytoplankton populations. The same report describes *significant organic pollution in a number of incoming streams which also exhibit poor biological quality…In general,*

water quality of the feeder streams was found to have deteriorated since the mid-1970s. Lough Ramor was hypertrophic in the 2004-2006 assessment (EPA 2008) and has been consistently classified as such since 1976.

The *Boyne and Liffey Catchment - Status Report at September 2003* (Meath County Council 2003) shows the EPA's provisional biological sampling results for the Boyne catchment for 2003. Sites on the Blackwater downstream of the lough are classified as moderately polluted, improving to slightly polluted with progress downstream. This indicates the effects of the lough on water quality in the river, and evidence of this was also noted by O'Connor (2006) during lamprey surveys.

At the downstream end of the Kells AA water the river was inspected in the vicinity of Headfort Estate. At Headfort Bridge the river is impounded by a weir, creating an ornamental lake on the Estate golf course. The weir has a fish pass which was blocked with debris at the time of the visit. Downstream of the weir is a swift run leading into a couple of pools; the substrate is gravel and cobble, and the channel has an asymmetrical cross-sectional profile, with deep water against RHB. This gives way to the incised, trapezoidal channel and slow, deep, flat glide habitat associated with the land drainage scheme; this continues for 10 miles to Navan.

There is quite a lot of tree cover (mainly willows) along this section, which combined with the steep banks and deep water make it difficult access for fly-fishing. Mayfly (*Ephemera danica*) hatch on this section of the river, and there is also a hatch on Lough Ramor, but nothing in-between. This is unusual because the river habitat is at its best upstream of Headfort Estate, and any water quality issues from the lough would be likely to affect the Mayfly in the lough as well. Kells AA members feel there has been a general decline in fly hatches on the Blackwater in recent years.

The discharge from Kells Waste Water Treatment Works (WWTW) was inspected on Headfort Estate Golf Club accompanied by the course superintendent. The WWTW discharges into a small stream close to its confluence with the river. There are obvious problems with the volume of the discharge into the stream and with storm overflow capacity at the works. The stream at the river confluence (where there is a short culvert) was covered in floating scum and the adjacent banks were strewn with sewage debris (Photo 35).

The Kells WWTW was visited and a discussion held with the site caretaker. The works is an activated sludge plant constructed in 1986 for a population equivalent (PE) of 8,000. The current PE entering the plant is estimated to be 5,555. The plant is due to undergo optimisation works in 2009, including the provision of stormwater tanks and a new outfall to the River Blackwater. Documents relating to the proposed works and the application to the EPA for a discharge licence are available for inspection on the EPA website at:

http://www.epa.ie/terminalfour/wwda2/wwda-view.jsp?regno=D0127-01

(Click the *view applicants documents* link).

In addition to the optimisation works planned for 2009, the Kells Sewerage Scheme has been approved to provide a major upgrade of the existing sewerage scheme as part of the Water Services Investment Programme 2007-2009. This scheme is due to be completed in 2013.

Photo 30 View downstream from Daly's Bridge

Photo 31 View upstream from Daly's Bridge

Photo 32 Steep, high banks, with willow and sallow, downstream of Daly's Bridge

Photo 33 Steep gradient of the last few metres of the Crosswater due to the lowered bed of the Blackwater

Photo 34 Nine-Eyed Bridge and the flow gauging weir

Photo 35 Weir below Headfort Bridge, with blocked fish pass on right of picture

Photo 36 Floating scum on the tributary receiving the outflow from Kells WWTW (the stream is culverted under the earth bund in the foreground into the river behind the photographer)

Day 4 (Lough Ramor and tributary streams)

As mentioned above, Lough Ramor (Photo 37) has been classified as hypertrophic since the late 1970s. Nutrient inputs from municipal and industrial discharges and from agriculture is the main source of pollution, leading to excessive growth of phytoplankton and blue-green algae (cyanobacteria) (EPA 2008). The concentration of pig farming in County Cavan and associated slurry spreading is of particular concern as a source of nutrient input to the Lough.

A number of tributaries of the Lough were inspected, the largest of which was the River Lear which drains the area around Bailieborough. The river has a history of poor water quality because of organic pollution of agricultural origin. The section of river from the Lough up into the town of Virginia appeared to have excellent instream habitat, including a gravel bed, pool-and-riffle sequence, instream macrophytes and a diversity of depths and flow patterns (Photo 38).

The Eastern Regional Fishery Board (ERFB) have a hatchery alongside the Lear in Virginia and the staff based there kindly provided access to the weir (Photo 39) upstream of the hatchery (which was currently not being used for fish propogation). Unfortunately this weir is a very large structure, impounding the river for a considerable distance upstream, and forming a major obstacle to fish moving upstream. There is a rudimentary fish pass on the weir (in a state of disrepair), and salmon have been recorded passing the weir, but there is no doubt this structure severely limits the Lear's value as a spawning tributary of the Lough. The weir was constructed many decades ago for milling, but the head of water is now used solely to supply the ERFB hatchery. ERFB staff said the river had been subject to arterial drainage further upstream.

The Killinkere River was inspected on the western edge of Virginia (Photo 40). This river appeared slower and deeper than the Lear, possibly as a result of drainage, although staff at the ERFB said there were some good trout populations in this river and its tributaries. Kells AA members were aware of pollution incidents on this river arising from wrong connections of foul water sewers to surface water drains on new housing developments.

Photo 37 Lough Ramor

Photo 38 Lear River, Virginia

Photo 39 Weir on the Lear River at Virginia

Photo 40 Killinkere River

Two further small tributaries were visited, one entering the Lough to the east of Virginia (on the Kells road), and one on the Oldcastle road to the west of the Lough. The former appeared to have good instream habitat, whereas the latter was in an incised channel, possibly as a result of drainage; there was a smell of slurry being spread in this area.

4.0 Conclusions

There are two main factors limiting the wild trout populations in Kells AA waters, namely water quality problems emanating from Lough Ramor and the degraded habitat in the River Blackwater as a result of arterial drainage.

The water quality problems at the outflow from the Lough are because of excessive nutrient enrichment, leading to unstable dissolved oxygen levels, excessive growth of filamentous algae, reduced diversity of macrophyte and macroinvertebrate communities, and reduced fishery potential.

Arterial drainage works on the river have reduced the lateral heterogeneity of the channel, and severely impoverished the in-stream habitat for salmonids. There is a stark contrast between the drained stretches of river and the unaffected reaches closer to Kells. Unfortunately, high river levels during the visit prevented observation of the river bed and its structure and composition, and a further walkover survey at low water levels is recommended.

Both these factors need to be addressed in a co-ordinated way by the appropriate responsible bodies, with the awareness and support of the local community.

5.0 Recommendations

· The river's water quality must be improved if its salmonid fish species, lampreys, white-clawed crayfish and other macroinvertebrates are to flourish. Without an improvement in water quality, these ecological and economically important resources will remain at risk.

A full audit of likely inputs of organic enrichment should be 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 phosphate stripping at wastewater treatment plants, and the implementation of good agricultural and forestry practice to minimise diffuse source inputs.

The club should continue to actively lobby the appropriate authorities to tackle water quality issues, and should contribute to consultations on proposals which affect the river, including the implementation of the Water Framework Directive (http://www.wfdireland.ie/ and http://www.erbd.ie/index.html), and the proposed upgrade of sewerage infrastructure.

· A walkover survey should be carried out at low water to assess the potential for habitat restoration in the arterially drained sections of the Blackwater. A lack of larger fish compared with pre-drainage conditions has been described by club members, suggesting that adult habitat may be limited. There are a range of restoration options possible (depending upon the findings of the low-water walkover survey), many of which are described by O'Grady (2006). These could include bank reprofiling to create a shallower gradient on the inside of bends, and restoration of the thalweg and pool-riffle sequences by using channel constrictors, rubble mats and two-stage channels. Records of the physical nature of the river channel pre and post drainage should be available from the Office of Public Works (OPW) Engineering Services Section, and these would be invaluable for informing a baseline survey and restoration plan.

The club should enlist the help of staff from the Central and Regional Fisheries Boards with experience of habitat restoration on drained rivers. The aim should be to draw up a costed enhancement plan for the Kells AA stretch of the Blackwater. The SAC status of the Blackwater means there are many synergies between habitat restoration for salmonids and for species of conservation interest, including lampreys, eels, white-clawed crayfish and otter. The National Parks & Wildlife Service (www.npws.ie/en/) and other interested bodies should be involved in the project planning process.

· The maintenance dredging of the river undertaken by the drainage authorities is counterproductive to the development of strong populations of both brown trout and Atlantic salmon. Extraction of gravel shoals, midstream islands and large woody debris (LWD) from the channel removes important structural elements from the channel to the detriment of salmonid populations.

Greater regard should be given to the necessity for the work and its impact on the river's ecology, particularly given the SAC status of the river. Given the greatly incised nature of much of the Blackwater's channel, it seems doubtful whether 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 dredging to take place for farming purposes. The SAC status of the river means NPWS should be consulted prior to any dredging works on the river, and it would be useful for the club to liaise with this body to see if they are aware of recent maintenance dredging, and if so, their justification for allowing it. The Habitat Regulations governing SACs state a precautionary principle should be followed and "no adverse effect" of an operation needs to be demonstrated before it can go ahead.

· Large Woody Debris (LWD) should be retained in the river channel wherever possible. There are some excellent examples of LWD in the undrained section of the river, and similar structures in the drained section would be of great benefit to habitat diversity. LWD could be deliberately introduced to the drained section in the form of tree trunks, root wads or whole trees, although the availability of such material could be a problem.

Introduction of LWD would benefit not just trout and salmon but a range of species, including crayfish and lampreys (Photo 41). O'Connor (2006) surveyed the Boyne catchment for lamprey. Overall lamprey populations and their habitats are considered to be at favourable conservation status on the Blackwater. However, lamprey densities were significantly lower on drained and polluted sections and lamprey and habitats populations here are considered below favourable conservation status. Lamprey populations in the Blackwater are currently threatened by ongoing pollution problems and drainage maintenance.

In the conclusions of the report, O'Connor (2006) states:

Lamprey habitats can be encouraged to form by installing deflectors made of stone or logs along the sides of rivers. The deflectors create alcoves or backwaters where silt and other debris will settle. Planting of aquatic vegetation such as Sparganium erectum in these areas will further encourage silt to settle and shading can be created by planting Salix spp. on the bank. The root structures of the willows and reeds create ideal cover for ammocoetes. These areas should be fenced off from livestock and allowed to accumulate woody debris and silt.

Such structures could be installed along with LWD which would benefit salmonids, and it would make sense to undertake such works in collaboration with organisations promoting lamprey conservation.

Photo 41 LWD introduced and cable-wired to secure (River Goyt, Staffordshire, UK)

· A more detailed look at spawning tributaries should be undertaken to make sure fish have free access to these. Small barriers could be removed (if practical) or overcome with the construction of simple pre-barrages (Figure 2).

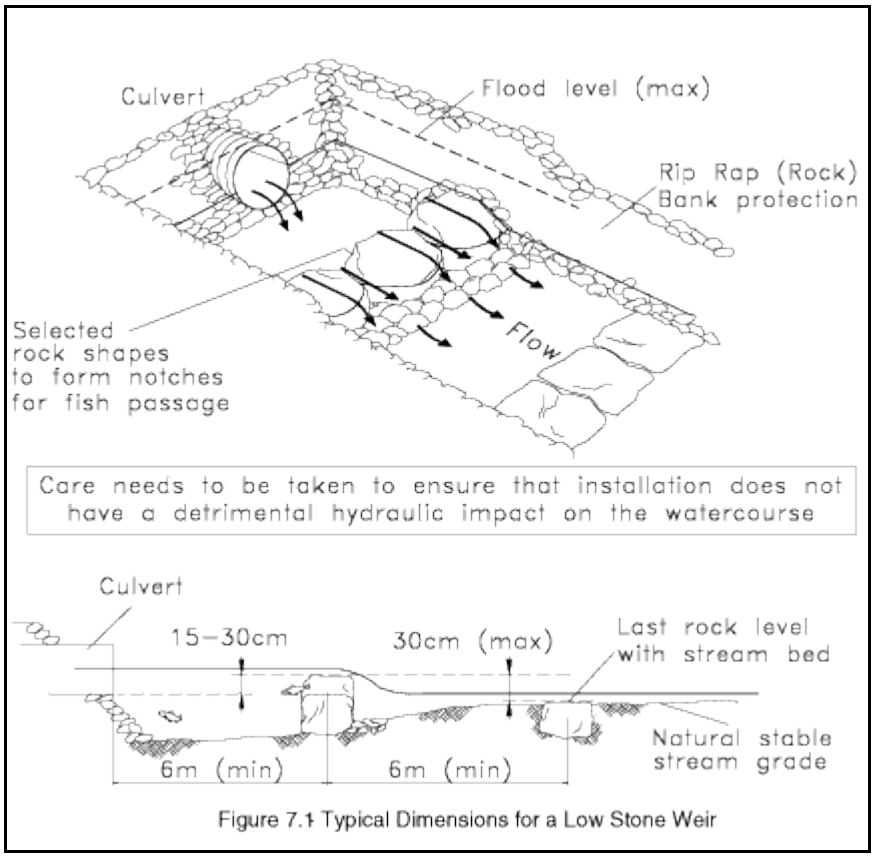

Figure 2 Pre-barrages for culverts (from Scottish Executive, 2000)

Most of the small tributaries seen on this visit were in culverts at road crossings. Culverts can prevent upstream migration of fish when the outflow from the culvert becomes perched above the downstream river level, or where water flowing through the culvert is very shallow. The Scottish Executive (2000) provides some guidelines on improving fish passage at new and existing culverts (see References). It is recommended that culverts on Blackwater tributaries are assessed and improved, particularly where the new M3 is being constructed, as it will be cheaper to ensure they are fish friendly during construction rather than afterwards.

· The lower section of McCormac's stream could be improved by the introduction of gravel and by fencing out livestock. Constructed riffles

should ideally be no less than 20m in length, with longer lengths increasing the feature's value as a spawning and nursery zone. The riffle should comprise of a depth of at least 30cm of spawning gravel (mixed 15-40mm diameter gravel) with a sub-layer of larger cobbles. The weight (tonnes) of stone/gravel required to complete a riffle can be calculated using the formula:

T = **L** x **W** x **D** x **1.8**

Where:

T = Total weight of material required in Tonnes

L = The length of the riffle in metres

W = The wetted width of the river at the site of the riffle in metres

D = The depth of gravel required to achieve a finished summer water depth of approximately 0.25m over the riffle The riffle should have a slope of approximately 1:100 between its upstream and downstream limits. Construction of riffles will require the assistance of a specialist contractor and hydraulic excavator.

Other considerations include obtaining the necessary consents from the relevant drainage authority. They should be able to confirm whether this type of work requires consent under the land drainage legislation. It is also important to agree that the introduced riffles will not be removed during any subsequent maintenance operations by the authority. There may be a need for a basic flood assessment or even hydraulic modelling as part of the consenting process. For these reasons and the general complexity of riffle installation, it is recommended that assistance be sought from the WTT, Fisheries Board or a reputable fisheries consultant at the planning stage.

· The club should 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 Partnership website at www.riverflies.org, or from Bridget Peacock at riverflies@salmon-trout.org. Suitable nets for sampling macroinvertebrates can be obtained from Alana Ecology www.alanaecology.com Tel: 00441588 630173.

· Much of the drained section of the Blackwater downstream of Lough Ramor has few bankside trees or bushes, and it would benefit from the planting of some native species in a few areas. This could be done in conjunction with in-channel improvements and would benefit a range of species (including the sub-imago stages of upwinged flies (Ephemeroptera) by providing perches for moulting). Leaf litter from trees is also a vital food source for many aquatic invertebrates – especially during winter when living plant material is scarce.

· Ideally barriers to fish migration on the larger watercourses should be removed or mitigated. The weir on the River Lear in Virginia prevents access to a large catchment area for fish in Lough Ramor, and is no longer used for milling. Consideration should be given to removing the weir, or at least lowering the height and providing a suitable fish pass facility.

6.0 Making it Happen

The Wild Trout Trust can provide further assistance in the following ways:

- Advisory Visit Bursary - funds are made available each year to 'kick-start' projects that have been the result of an Advisory Visit. Typically contributions range from £500 - £1500. Recipients of this bursary are encouraged to use the WTT funds as a catalyst to lever further funds from other organisations, landowners, etc. Funds are available all

throughout the year and are topped up each year with proceeds from our fundraising auction.

- Partnership Fund - Along the same lines as the AV Bursary the WTT has funds to contribute to larger partnership projects. Often these contributions are very important in helping build project proposals where cash “without strings” is often in limited supply. For example we contributed £18,000 to a project on the Monnow in Herefordshire, UK which helped to build a £1 million multi-partner catchment restoration project. We also contributed £1,000 to a project on the River Swift in Leicestershire which facilitated a £30,000 contribution from the UK Environment Agency. We encourage recipients of partnership funds to lever a 5:1 gearing ratio, e.g. WTT £1,000 other partners £5,000.

  The WTT would be happy to consider contributing to a partnership project between the club, fisheries and wildlife agencies, landowners, public bodies, etc. to restore the habitat on the Blackwater.

- Rods for Conservation - We are able to provide Sage or Hardy rods at significantly discounted rates to be used to raise funds for projects. Clubs purchase the rod from WTT for around £180 (rrp £570) which can then be used in raffles and auctions. Typically projects can expect to raise £1000, dependant on the fundraising effort.

- Advice and support in formulating a worked-up project proposal and assistance with the preparation of consent applications.

- Works could be kick-started with the assistance of a WTT ‘Practical Visit’ (PV). The WTT will fund the cost of labour (two-man team) and materials. Recipients will be expected to cover travel and accommodation expenses of the advisors. The use of specialist plant will be by separate negotiation. This would be most appropriate for certain aspects of the recommendations, e.g. creating gravel spawning areas in McCormac’s stream, rather than the larger aspects such as restoration of the drained sections of the main river.

Note: Recipients of the programme must have received a WTT AV and have obtained the appropriate consents from the drainage authorities, landowners, etc., prior to arrangements being made to undertake the PV.

Applications for all the above should be made to Tim Jacklin via projects@wildtrout.org

7.0 Disclaimer

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. In channel works are likely to require written consent from the appropriate flood risk management and drainage authorities prior to undertaking any works. Accordingly, no liability or responsibility for any loss or damage can be accepted by the Wild Trout Trust as a result of any other person, company or organisation acting, or refraining from acting, upon comments made in this report.

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