Advisory Visit

Afon Clwyd, North Wales

15th June, 2010

1.0 Introduction

This report is the output of a site visit undertaken by Tim Jacklin of the Wild Trout Trust to the River Clwyd, North Wales on 15th June, 2010. Comments in this report are based on observations on the day of the site visit and discussions with Richard Williams, Colin Blythin, David Seager and Allan Cuthbert of Denbigh and Clwyd Angling Club; Katrina Marshall of Environment Agency Wales; and Kevin Lydon, the landowner of one section visited.

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 Catchment / Fishery Overview

The River Clywd rises in the Clocaenog Forest north west of Corwen and flows into the sea near Rhyl on the North Wales coast. The upper reaches occupy a narrow valley which broadens into the agricultural land of the Vale of Clywd near Ruthin. The Vale is a sedimentary basin with a sandstone geology.

Denbigh and Clwyd Angling Club (DCAC, www.denbighandclwydac.org.uk) control approximately 20 km of the River Clywd from Llanfair Dyffryn Clwyd (upstream of Ruthin) to Llannerch Bridge (downstream of Denbigh). DCAC also have fishing on tributaries of the Clwyd, the Clwyedog, Wheeler and Ystrad.

The Clwyd and its tributaries have a run of salmon and sea trout and DCAC manage the downstream sections of their waters for angling for migratory salmonids. Brown trout are fished for in the upstream sections of the Clwyd and DCAC stock the river upstream of the Ystrad confluence with approximately 1000 brown trout per annum; these are understood to be fertile, diploid fish.

It was not possible to look at the entire length of river controlled by DCAC in one day, so short representative sections were inspected at access points.

3.0 Habitat Assessment

The sections of river visited are described below from upstream to downstream.

Bridge near Llanfair Dyffryn Clwyd

The river here is a relatively small upland river, located in a steep sided channel, with large boulders dominating the substrate in the channel. A tributary (Afon Hesbin) enters on the right bank just upstream of the bridge; it is understood that this tributary is ephemeral. There is an aquifer beneath the Vale of Clywd which is abstracted, and this may have an influence on instream flows.

The river here is heavily shaded by mature trees. It was discussed whether felling some of these to allow more light to reach the channel would be beneficial; in this location, there is probably little to be gained because the steep-sided channel will still limit light penetration. Mature trees also provide a valuable role in regulating water temperatures, keeping them within the limits tolerated by trout and salmon during low water and hot weather conditions.

Rhewl

The river here was viewed from the recently re-constructed road bridge. In-stream habitat was good, with a well-developed pool and riffle structure and a good balance of light and shade from riparian trees. Riparian land use was grazing or grass production and there was a good example of well-managed field boundaries alongside the river; these were fenced leaving a wide margin between the river and cultivated land (Photos 2, 3).

Llanychan Bridge

A groundwater abstraction point was located alongside the river on the left bank here; this water is discharged into the river for abstraction further downstream. The river here has good in-stream habitat (pool and riffle structure), and both banks are fenced. The fencing was apparently put in by the farmer in response to the loss of livestock which were perceived to have suffered from drinking contaminated river water.

Water quality was raised as a potential problem at various sites on the upper river, and there was evidence of nutrient enrichment in the form of

extensive diatom growth on the river bed; the river was however very low after prolonged hot, dry weather. A major change noticed by Richard Williams who has decades of experience on the river is the lack of water crowfoot (*Ranunculus* sp.) compared with years gone by. The lack of crowfoot could be due to a number of factors including water quality and flow. It is recommended that more detailed investigations are carried out into these issues, including historical water quality and invertebrate records. A partnership approach between DCAC, WTT, Clywd and Conwy Rivers Trust and the Environment Agency would probably be the way forward. Recent work on invertebrates in rivers in Derbyshire and Staffordshire by Dr Nick Everall (Aquascience) on behalf of Trent Rivers Trust has provided some excellent insights into the impacts on river ecology of water quality and flow. The techniques used have been valuable in elucidating the relative importance and sources of these impacts.

The channel here is very heavily shaded with willow, sallow, alder and ash. This would benefit from some thinning to provide better angling access, and to open up the channel to more light. Sixty percent shade to 40% light is recommended as a guide. The material arising from this thinning could be used for work on other parts of the river.

Photo 1 The Clwyd near Llanfair Dyffryn Clwyd

Photo 2 A view downstream from the road bridge near Rhewl

Photo 3 A well-managed river and field margin - Rhewl

Photo 4 Llanychan Bridge – just above the discharge of flow augmentation by groundwater

Llanynys (Perfa Bridge)

DCAC have carried out some work on the river here recently (upstream of the bridge), clearing out some fallen trees and branches from the river (Photo 5). The management of so-called large woody debris (LWD) is of crucial importance in stream supporting trout and salmon. LWD in rivers is often perceived as a nuisance, causing problems in terms of efficient drainage, flooding (e.g. blocking bridges), and hindering fish migration. However, LWD has been demonstrated to be very important for river ecology in a number of ways:

- It promotes in-stream habitat diversity through the development of variety in flow velocities and river depths (by promoting localised scour);
- It traps leaf litter and other organic matter which provide the base of the food chain for many invertebrate species;
- It provides cover for fish and valuable refuge from predators such as fish-eating birds and mammals;
- LWD can have significant benefits to the control of run-off at the catchment scale by regulating the energy of running water by decreasing the velocity. Thus the 'travel time' of water across the catchment is increased.

There is therefore a fine balance to be struck in the management of LWD within rivers, and this can be the key to good in-stream habitat; from the perspective of healthy river ecology, the presumption should be to leave it in place. A useful tool for decision-making was developed by the West Country Rivers Trust:

1. Is the debris fixed and stable, if yes then continue to 2, if not continue to 5.
2. Is the debris causing excess erosion by redirecting the current into a vulnerable bank? If yes then go to 5 if not then go to 3.
3. Would fish be able to migrate past it (take into account high river flows). If yes got to 4, if no go to 5.
4. **Retain the woody debris in the river**.

5. **Extract or reposition the woody debris.**

   Note: If the debris dam needs to be removed or re-positioned but there is still a significant amount of the root system attached to the bank then it is recommended that the stump be retained for its wildlife habitat value and its stabilising effect on the bank.

Further upstream from Perfa Bridge there was some good marginal cover on the right bank in the form of trees and bushes growing low over the water, and stable woody debris in the margins (Photos 6-8). Cover on the left bank was less prevalent because of grazing access, but some low bushes were present. The presence of cover overhanging the margins and within the channel is very important for the survival of juvenile stages of trout.

This part of the river channel was relatively shallow and uniform, with little in the way of deeper water for holding fish (Photo 9). There is scope here for the introduction of LWD flow deflectors to promote bed scour and create deeper holding areas. This would create some valuable habitat, particularly if it were tied in with the existing low cover over the water. See the recommendations section for suggestions for this length.

A brief search under stones in this part of the river revealed the presence of freshwater shrimp (*Gammarus pulex*), olive nymphs (Baetidae) and a leech. Invertebrate sampling is a valuable tool for monitoring water quality and the Riverfly Partnership (www.riverflies.org) provide training for clubs wishing to take part in the Anglers' Monitoring Initiative. This Environment Agency-recognised scheme is a great way for clubs to keep a watching brief for pollution incidents on their waters.

Photo 5 Large woody debris is an important part of the river's ecology. Retention within the channel is desirable.

Photo 6 Coarse woody debris along the margins here provides excellent habitat for juvenile trout and salmon. This should be retained and could be replicated elsewhere by introducing brushwood bundles.

Photo 7 Good marginal cover on the far bank from overhanging willows and ungrazed vegetation.

Photo 8 Excellent cover being provided by low-growing willows.

Photo 9 Unfortunately past river modification has resulted in a relatively uniform, shallow channel. Installation of flow deflectors to create bed scour would create better habitat, particularly if combined with the existing low cover.

Ystrad confluence

This was the first site visited during the day and we were joined here by landowner Kevin Lydon. The in-stream habitat along this part of the Clwyd is generally very good with a pool-riffle sequence, meandering planform, variety of depths, good marginal cover from trees and their root systems, and natural channel features such as point bars and gravel shoals (cover picture).

Some concern was expressed over erosion of the banks in some locations. The majority of this section has stable banks which are bound together by tree roots (Photos 11,12) but there are sections where trees have been lost and bank erosion is occurring at an accelerated rate (Photo 10). At the downstream end of the section walked, some bank reinforcement had recently been completed on the left bank to protect the footings of a stock bridge; gabion baskets have been installed and the banks reprofiled (Photo 13). The right bank here has also previously been stabilised with gabions.

There are various techniques for stabilising rapidly eroding banks ranging from the 'hard' engineering options using gabions or stone rip-rap through to 'soft' revetment using logs, rootwads, brushwood and living willow. There are pros and cons for both approaches including cost, longevity and the effects on in-stream habitat. Generally the techniques using natural materials provide better in-stream habitat as they can be designed to incorporate cover for fish and invertebrates. Examples of these techniques can be found in the WTT Upland Rivers Habitat Manual.

Whatever approach to bank stabilisation is adopted, the issue of grazing of the banks needs to be considered. All documented techniques specify the protection of the works from grazing once completed, or the work is quickly undone. Currently both banks are grazed by cattle, with unrestricted access to the river. The impacts of grazing on river banks are well documented and can lead to the loss of bankside habitat and increased rates of bank erosion.

At present, the banks of the river here are largely stabilised by a single line of mature trees, mostly alders (Photo 11). Because of grazing, there is no succession of young trees coming through to replace the mature trees as they are lost. Hence when a mature tree does fall in the river, there is little resilience remaining in the bank and the rate of erosion increases.

The density of livestock is therefore critical to the quality of bankside habitat and its management. However fisheries interests may not have sufficient influence compared with the economics of agriculture in the floodplain to reduce stock levels sufficiently. The most common compromise in these situations is the erection of a stock-proof fence along the river; there may be funding available to assist with the cost under agri-environment stewardship schemes.

More details of agri-environment schemes can be found on the Upland Rivers Habitat Manual CD provided on the visit. However, recently the Welsh Assembly Government has announced the replacement of the five existing agri-environment schemes in Wales with a single scheme, Glastir, starting in 2012 (http://wales.gov.uk/topics/environmentcountryside/farmingandcountryside/farming/agrienvironmentschemes/tirgofal/?lang=en).

A factor which complicates the idea of fencing a marginal buffer zone along the river is the presence of the invasive plant species Himalayan balsam (Photo 16). This plant proliferates at the expense of native vegetation, dying back in the winter to leave bare banks vulnerable to erosion. It is currently being controlled by grazing, so fencing would create an additional requirement to manage this plant in an ungrazed area, at least until more desirable vegetation became established.

Some previous works to control bank erosion had been undertaken on this stretch of river by the Environment Agency and predecessors. This includes the use of tree trunks to protect the outside of a meander (Photo 14), and the fencing of a section of field and planting with trees (Photo 15). Both have been successful in limiting erosion and have created some good habitat as well. The tree trunks have provided excellent overhead cover for fish alongside a pool.

Photo 10 Contrasting rates of erosion with differently vegetated banks. Grazing limits the succession of trees which provide good bank protection.

Photo 11 Single line of mature trees along the river margin

Photo 12 Trees and root systems providing a stable bank and good fish habitat.

Photo 13 Recently completed bank revetment with gabion baskets. Continued grazing of this area is preventing marginal vegetation establishing which would help further stabilise the bank. High water could cause erosion problems at the upstream end of the gabions (arrow) and get behind them; this area should be inspected after spates and maintained if required.

Photo 14 Tree trunks placed to protect the banks and providing excellent cover for fish.

Photo 15 Fenced area planted with willows

Photo 16 Himalayan balsam

Bodfari and Llannerch

These downstream beats of DCAC waters on the Clwyd were inspected briefly. Both sections have good quality in-stream habitat with a pool and riffle sequence. This is where fishing for migratory salmonids is most frequently practised.

The Bodfari beat is more shaded by trees than Llannerch. A cormorant was observed feeding in the river at Bodfari; this emphasises the importance of retaining woody debris in the river channel as a refuge for fish from predation. The water discharged into the river at Llanychan is abstracted here at Llannerch.

Afon Clywedog

This tributary of the Clwyd was seen at two points, near Llanynys and further upstream towards Rhewl. In both areas it was evident that the river channel had been heavily engineered. The channel was over-wide, uniformly shallow and embanked on both sides. The river bed was stony, but there were few in-stream habitat features such as deeper pools which would hold fish. The river is little fished by DCAC members although it does produce migratory fish following a spate.

From the map it appears that upstream of Rhewl the Clwyedog runs through a steep-sided, wooded valley; this may provide better habitat than that observed. However, the lower sections of the river would benefit from works to increase the amount of deeper pool habitat available.

Photo 17 Clwyd at Bodfari

Photo 18 Clwyd at Llannerch Bridge

Photo 19 Clywedog near Llanynys – an engineered channel which is over-wide and uniformly shallow, providing poor habitat for salmonids.

Photo 20 Clywedog near Rhewl – equally impacted by channel engineering which has limited the amount of pool habitat.

4.0 Recommendations

- Carry out a detailed investigation into the relationship between water quality and quantity and the abundance of aquatic flora and fauna (particularly water crowfoot *Ranunculus* sp. and invertebrates). Dr. Nick Everall of Aquascience (www.aquascience.co.uk/) has recently completed invertebrate surveys with identification to species level on behalf of Trent Rivers Trust and partners. The analysis of these data has shed light on the nature of the impacts affecting the watercourse studied and their relative importance (e.g. sediment, nutrient enrichment, low flows, pesticides); this has allowed more effective targeting of improvement efforts.

  An initial review of currently available information is recommended, then the formulation of the scope, specification and cost of a detailed investigation. A partnership approach involving DCAC, Clwyd and Conwy Rivers Trust, EA and WTT would probably be the most effective approach.

- Retain large woody debris within the channel wherever practical, using the decision matrix provided above (and in the Upland Rivers Habitat Manual).
- Thin out willow growth at Llanychan to achieve a balance of shade and light over the river channel (60:40 ratio). Use the arisings from this work to create brushwood bundles (Figure 1) which mimic the marginal habitat in Photo 6. Note that willow will strike root if installed shortly after cutting, so depending upon the desired effect it may need to be left for a few weeks before use in the river.

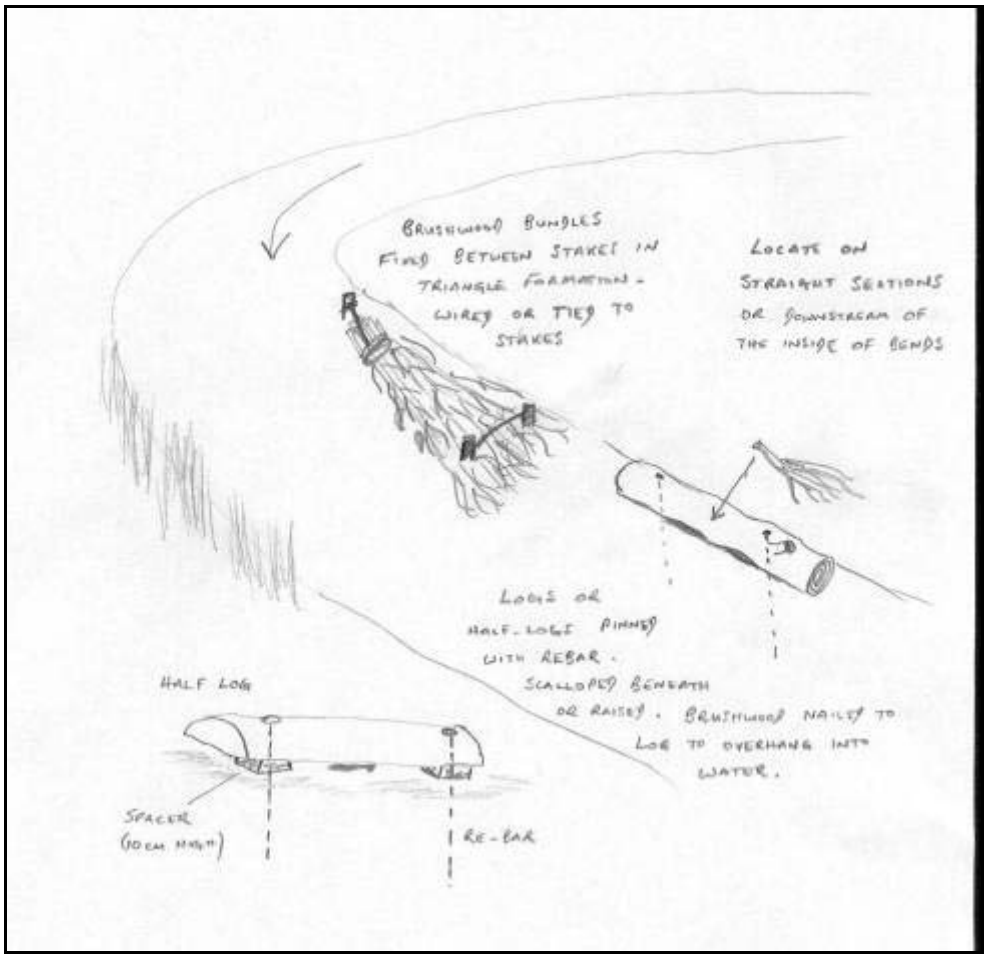

Figure 1

Willows are an ideal species for 'hinging' into the river to create marginal cover (Photo 21). Partially cut through the tree stem (by say two-thirds) leaving a hinge, then bend the tree over into the desired position. This provides a firm anchor which will prevent the tree being washed out in floods.

Photo 21 Willow hinged into the river margins (River Goyt, Derbyshire).

- Install flow deflectors at Llanynys, associated with the existing overhead cover. Logs and rootwads could be fixed here to create bed scour and varied depths more suitable for holding fish (Figure 2, Photo 22). This would be a suitable site for a WTT Practical Visit to demonstrate techniques, subject to land owner approval and consents.

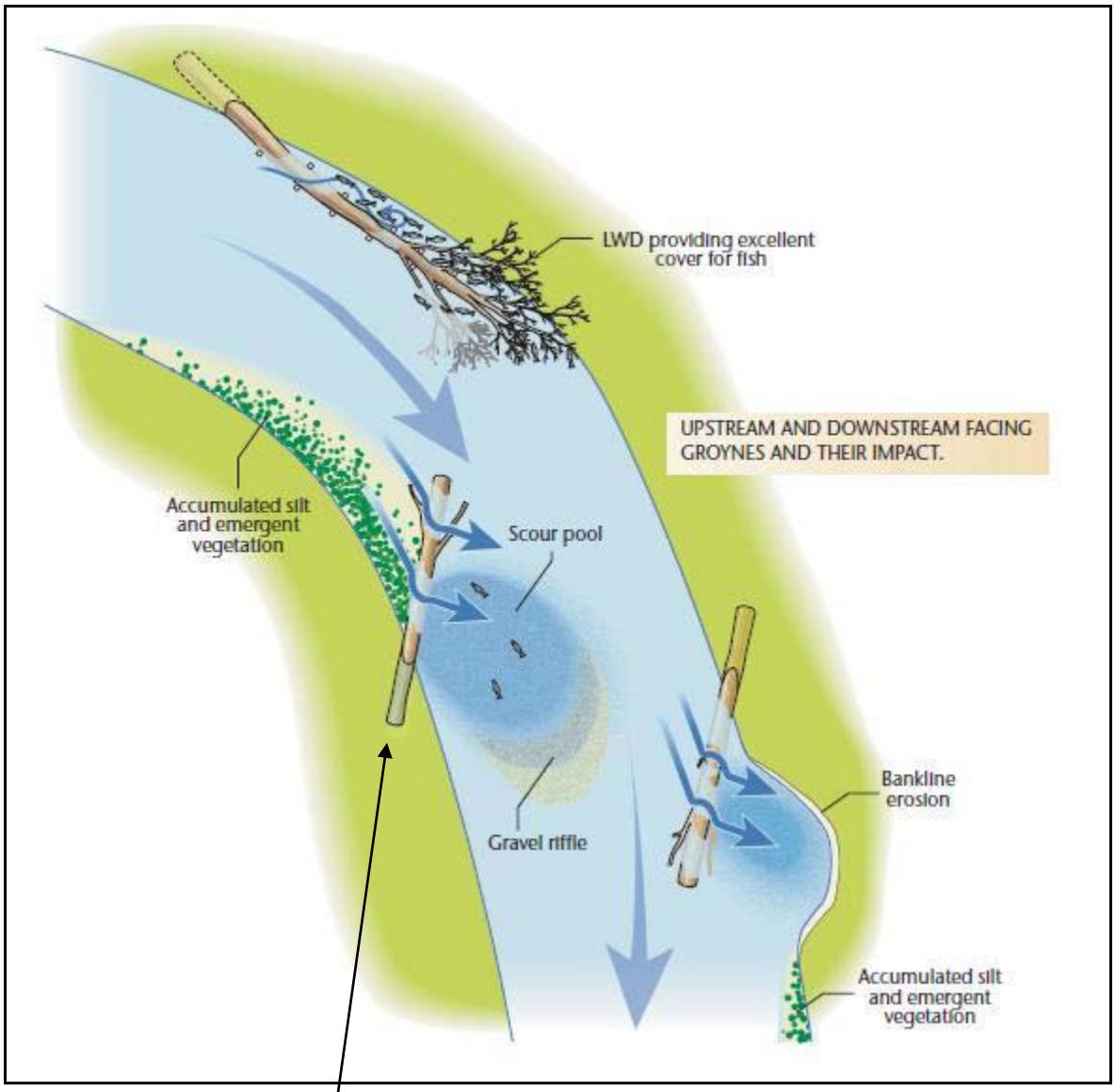

Figure 2 Upstream pointing deflectors will create bed scour and depth variation.

Photo 22 Root wad flow deflector recently installed on a Leicestershire stream

- Downstream of Ystrad confluence. Consider the use of techniques of erosion control outlined in the Upland Rivers Habitat Manual (section 5; www.wildtrout.org/images/PDFs/Upland_Manual/uplands_section5.pdf). The use of rootwads, log and Christmas tree revetment and tree planting would stabilise banks and provide in-stream habitat for fish. It is essential that any revetment works are protected from grazing livestock, so options for fencing should be explored with the landowner.

  Note the caveat above regarding Himalayan balsam and the need to manage this in fenced areas. This is best achieved by hand-pulling before the plant flowers in late June.

- Create pool habitat in the Afon Clywedog using channel constrictors and low weirs constructed from stone or wood. It should be emphasised that the design of 'weirs' should be to concentrate and focus flow downstream of the structure to create scour and maintain pool depth; they are **not** intended to impound water upstream of the

structure. Various examples are shown in Photos 23 and 24 and the schematic diagrams in Figures 4-6 below.

Photo 23 Low weir to focus flows into excavated pool with placed boulder. River Blackwater tributary (Co. Meath, Ireland)

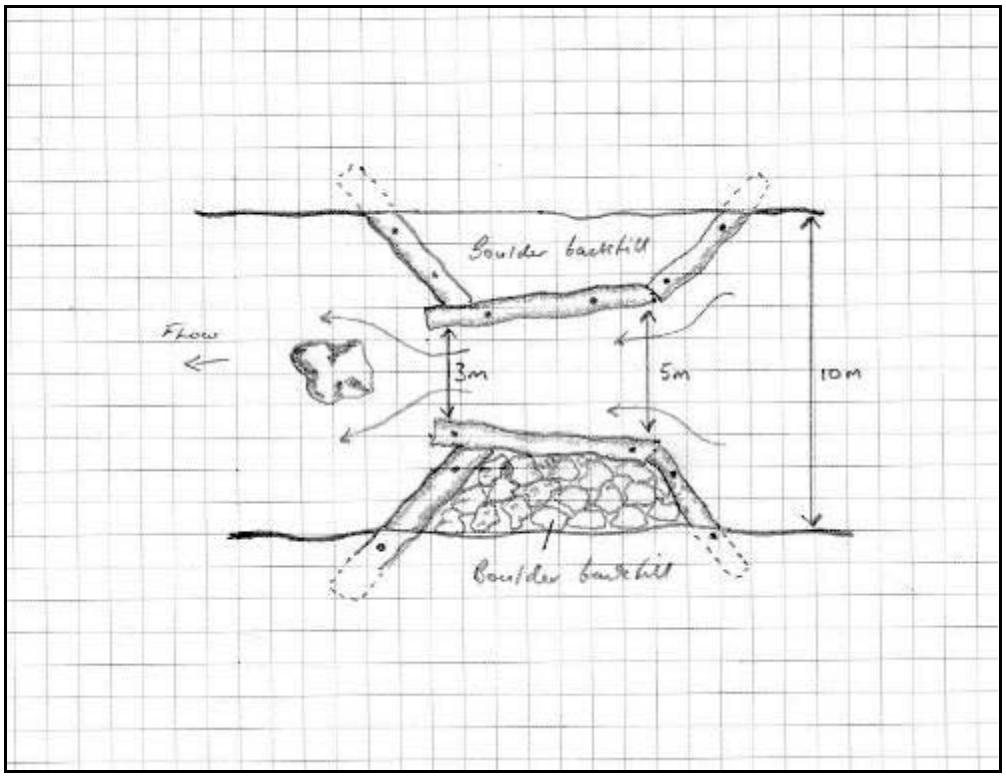

Figure 3 Channel constrictor. Logs not necessary if large boulders are available. Structures can be offset to create sinuous deeper channel.

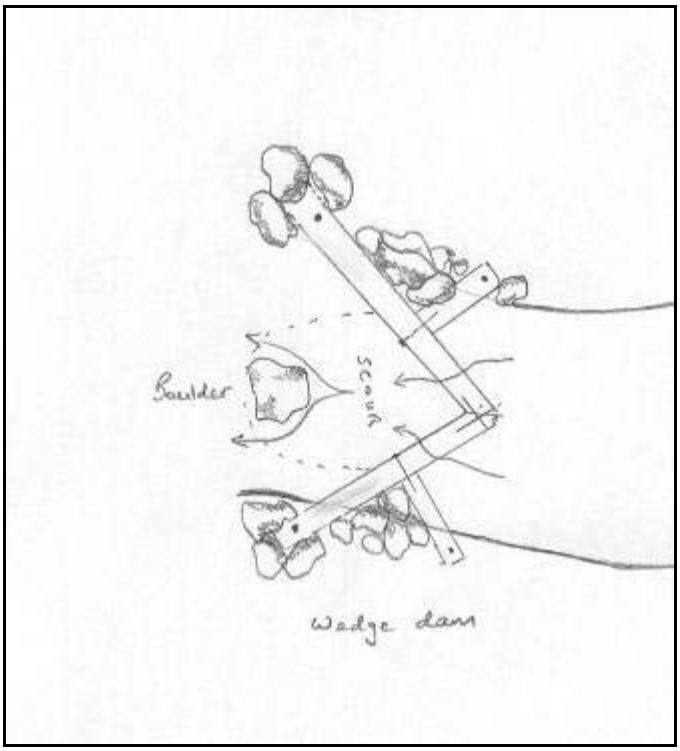

Figure 4 Wedge "dam" constructed from logs and boulders

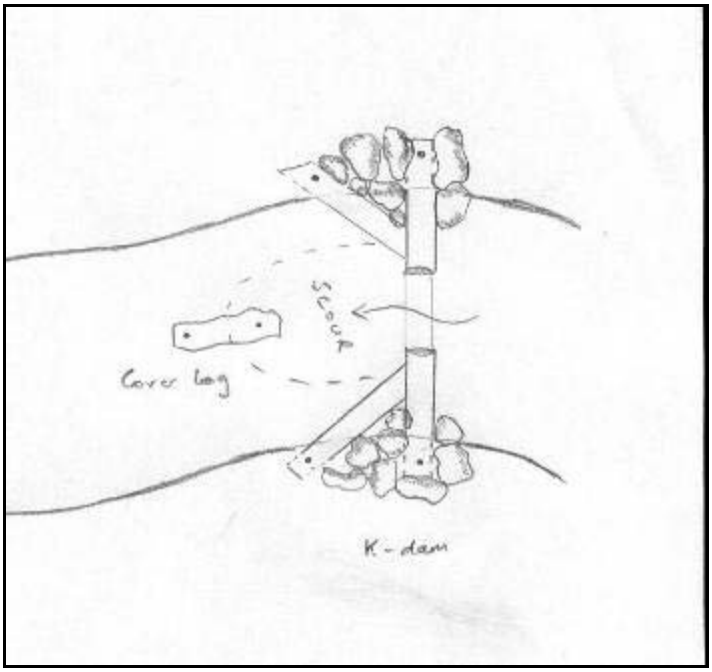

Figure 5 K-dam. Cover log can be substituted with a boulder.

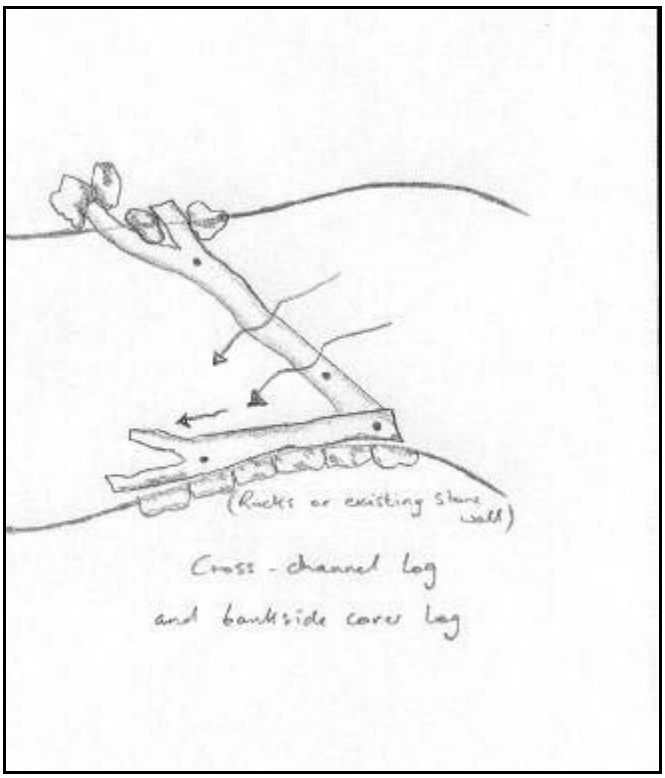

Figure 6 Cross-channel log

Photo 24 Two-stage channel created to restore an over-wide, engineered channel. The red line indicates the width of the channel prior to restoration.

- Take part in the Riverfly Partnership's Anglers' Monitoring Initiative. See www.riverflies.org for further information.
- Change to stocking infertile triploid brown trout rather than the fertile fish currently used. There is an increasing body of scientific evidence that interbreeding between essentially domesticated farmed stocks and wild fish is detrimental and results in fewer river-bred fish surviving in subsequent generations. There is also evidence to suggest that this effect is particularly detrimental to sea-trout stocks, resulting in fewer smolts surviving at sea to return as adults.
- It is a legal requirement that all the works to the river require written Environment Agency (EA) consent prior to undertaking any works, either in-channel or within 8 metres of the bank. Works may also require consultation with and consent from the Countryside Council for Wales (CCW) if they fall within a protected site (e.g. SSSI or SAC).

5.0 Making it Happen

It is recommended that this report is circulated and discussed with Environment Agency Wales and the Clwyd and Conwy Rivers Trust. A partnership approach is most likely to succeed in taking forward the recommendations, and the above organisations may have further information, experience and initiatives to bring to bear.

The Wild Trout Trust may be able to assist within a partnership in the following ways:

- Preparation of a detailed project proposal for in-stream habitat improvements, for example on the Clywedog, or on the Clwyd at Llanynys or the Ystrad confluence.
- A practical visit to demonstrate techniques such as the installation of deflectors at Llanynys.
- Funding via the Advisory Visit Bursary Scheme (up to £1500) or provision of a high quality rod as a fund-raising prize for a DCAC raffle or auction (Rods for Conservation scheme). This money can be used to assist in securing matched funding for projects from other sources.

There is currently a large demand for Wild Trout Trust practical assistance and a realistic timescale for WTT involvement would be in mid to late 2011.

6.0 Acknowledgement

The Wild Trout Trust would like to thank the Environment Agency and Environment Agency Wales for the supporting the WTT Advisory Visit programme.

7.0 Disclaimer