River Thaw, Vale of Glamorgan, South Wales

An Advisory Visit by the Wild Trout Trust March 2017

Contents:

1. Introduction

This report is the output of a visit undertaken by Luke Kozak on behalf of the Wild Trout Trust on approximately half a mile of the River Thaw above Llandough bridge upstream to the sewage treatment works (from SS 99583 73166 to SS 99608 73517) and 500 meters of its tributary the Factory Brook at Llanblethian (from SS 98381 73722 to SS 98157 73651). A walk-over of the sites was requested by Christian Pedersen of Cowbridge and District Angling Association (CDAA). The visit was primarily focussed on assessing habitat for brown trout and sea trout (*Salmo trutta*) and biodiversity in general. Sally Curran-Parry and Scott Hand from Natural Resources Wales were also present on the day to walk the river and discuss current issues.

Map 1: Walkover survey locations

Comments in this report are based on observations on the day of the site visit. Throughout the report, normal convention is followed with respect to bank identification i.e. banks are designated Left Bank (LB) or Right Bank (RB) whilst looking downstream.

2. Catchment and Fishery Overview

The River Thaw rises in the hills south of the M4 near the village of Llanharry in The Vale of Glamorgan and flows for 20km in a south easterly direction before entering the Bristol Channel at West Aberthaw. The upper catchment is formed of a series of relatively steep sided valleys capped by clay and comprised of pasture. It is joined by a small tributary, the Factory Brook at Llanblethian, and farther south several small tributaries, before being joined by its largest tributary the Kenson River at the village of Burton near East Aberthaw. The main underlying geology is limestone and mudstone, overlain by alluvial deposits of silts, sands and gravels. The river is classed as calcareous or 'lime rich' in nature. The river Thaw and its tributaries run mainly over lowland pasture with the exception of the urban conurbation of Cowbridge in the upper reaches, and at West Aberthaw where the main River Thaw flows through a semi industrial environment. The River Thaw supports a healthy population of fish species but is noted by anglers for its brown trout. Historically the Thaw has supported a population of sea trout (sewin) although current quantitative fish data was not available.

Under the water framework directive (WFD) the whole of the Thaw catchment is classified as a single waterbody. The 2015 classification shows that all elements are at Good or High with the exception of phosphate; the first of the three maps in Appendix 1 shows the locations of three phosphate sampling points, all of which were failures. Although fish are scored as high, this is based on a single survey (2011) at a site above Cowbridge which is less affected by the pressures observed in the lower catchment during this walkover survey. The Thaw waterbody is classed as a Heavily Modified Water Body because of historic channel modification i.e. channel straightening, dredging and impoundment by weirs.

3. Habitat Assessment

3.1 Factory Brook

The section of Factory Brook surveyed emerges from a relatively steep clay valley. During the survey a large farm thought to be largely concerned with sheep was visible in the distance on the higher ground above Llanblethian. The survey reach was almost completely tree lined along the right bank (RB), with the predominant species being willow *(Salix* spp*.)* along with a mixture of thorn bushes, ash *(Fraxinus excelsior)* and sycamore *(Acer pseudoplatanus).* The left bank (LB) has been sympathetically cleared by the riparian owner and left over branches were observed, piled up along the LB. Some structured clearing of tree growth along the RB would be beneficial and is explained in more detail later in

the report. There were several natural limestone outcrops in the river bed that cause a series of steps and plunge pools. Of note were at least three manmade structures, a dual concrete piped culvert in the middle of the reach, and what appeared to be block limestone remains from the former milling industry, visible among heavy tree growth at the downstream end of the reach. There also appeared to be the remnants of a stone footbridge half way along the reach and inspection of the deed plans confirmed this. All three structures are having an impounding effect on the river with associated build-up of sediment visible immediately upstream.

Dual concrete pipe on Factory Brook causing impoundment

Impoundment of a watercourse is detrimental to the life cycle of brown trout and sea trout, particularly when fish are unable to pass over obstacles blocking the channel in normal flow conditions. Removal of these impoundments will undoubtedly improve overall habitat on the brook by improving flow conditions, allowing free movement of sediment, and improving fish passage.

Inspection of stones on the riverbed revealed freshwater shrimp (*Gammarus pulex*), caseless caddis (*Rhyacophilidae*) and several species of mayfly nymphs (*Baetidae*). Although numbers of aquatic invertebrates appeared to be low during the survey, more detailed and regular monitoring would be a good way to determine overall abundance.

The riverbed was largely comprised of limestone gravels and occasional boulders however, many stretches were noticeably smothered with deposits of fine sediment and it was impossible to tell the true quality of localised gravel distribution. Discussions revealed that the riparian owner had cleared several heavy blockages of large woody debris that were suspected to have caused the build up of sediment along the reach.

It became evident that one section of the left bank had been lowered with an excavator, creating a backwater area with a diverse range of marginal plant

species. The habitat created appeared to be unique in the section of brook surveyed and will provide excellent refuge for juvenile brown trout in the future. This type of habitat also lends itself well to watervoles (*Arvicola amphibius)*, currently thought to be almost absent on the brook and main river Thaw in recent years due to habitat loss and mink (*Neovison vison)* predation.

Half way along the reach the riparian owner had dug a shallow wildlife pond that is currently not connected to the river. The pond has been left to colonise with plant and animal species naturally and currently has a small amount of submerged willow growing in one area. The landowner commented that the pond is largely fed by run-off from adjacent fields and that it dries up in the summer months. The pond then becomes boggy and doesn't appear to hold water.

Shallow ponds can provide excellent habitat which will attract a number of amphibians and invertebrates over time. The pond would benefit from some planting of native marginal and submerged pond species that will further improve conditions for wildlife. Additional planting may also help to soak up excess nutrients from field run-off. A planting recommendation list can be found in the appendix (section 2) at the end of the report.

3.2 Main River Thaw at Llandough

The section surveyed was below the town of Cowbridge running from the road bridge at Llandough upstream to the sewage treatment works just south of Llanblethian.

Upon entering the first field next to the bridge a cattle feeding area was immediately visible. The bank edge had been severely poached by cattle and much of the bank was visible lying in the river channel. Immediately upstream of the feeding area, the poaching has been so acute that only a sheer vertical bank face was left. It is quite possible that many of tons of soil could have been washed in from this area over time. There were also visible streams of effluent from slurry leaching into the river that appeared to be caused by congregations of cattle standing next to the feeding station.

Severe poaching at the roadbridge at Llandough

Erosion of the bank in this area needs to be addressed as a priority. Vertical banks are unable to be colonised by marginal plants and when left exposed to high flows can quickly become unstable. This problem is likely to become worse because of the sandy friable soil type in this area. Simple fencing off of the riverbank and installation of a formal cattle drink could quickly improve erosion of this type and prevent future problems. There is also scope for installing a pasture pump which prevents the need for the cattle to enter the river altogether. Poaching of riverbanks is a common problem on many rivers and can be solved by a simple open discussion with the landowner. More often than not, an offer of mutual funding between fishing club and landowner for fencing is a good way forward. When planning fencing, it is important to retain a buffer strip a minimum of 5m back from the river edge. This will allow the river bank to recolonise with marginal plants that will help to stabilise soils and slow erosion in the long term. It will also provide a rough overhanging edge that will provide beneficial cover for all stages of the life cycle of brown trout and the invertebrates which form their prey.

Tree cover was very dense on the RB in the lower half of the reach and some strategic thinning of tree cover would be beneficial. This would allow light penetration to the channel and promote marginal and aquatic plant growth. However, it is important to do this in a structured way that retains some shading over pools and riffles. On a more positive note, there was an apparent abundance of naturally fallen large woody debris (LWD) in the same wooded section. Bankside trees, limbs or branches that fall or are washed into the river play an important role in natural river processes, sorting and scouring gravels, and creating backwaters immediately downstream. The habitat complexity provided by woody debris supports a range of invertebrate prey items for

juvenile salmonids. The increased velocity of water over, around and underneath LWD often has the effect of sorting gravel directly downstream, which brown trout and sea trout may find suitable as spawning substrate. During spates, brown trout will often use large logs or branches as a refuge protecting them from high flows. Large tree trunks or submerged branches in this area should be retained where possible as long as they don't pose a serious flood risk.

LWD can also be beneficial refuge for fish during drought conditions, providing overhead cover from predators such as otters (*Lutra lutra*) and herons (*Ardea cinerea*) when water levels are low. Additionally, the river bed itself in the wooded section was very flat and the channel over-wide. This could be because of historic dredging activity but without historical evidence is difficult to prove. Therefore this wide flat section would also benefit from some additional LWD, strategically secured into the bed to promote some complex flow patterns, scouring of gravels and creation of backwaters.

Options for enhancement using LWD and guidelines for tree thinning work are described in the recommendation section.

4. Recommendations

In order for the Thaw and its tributary The Factory Brook to achieve their full potential for biodiversity and good quality habitat, capable of supporting healthy, self-sustaining populations of wild brown trout, the following actions are recommended:

4.1 Tree shading and light penetration

(Factory Brook and River Thaw at Llandough)

Whilst bankside trees are useful in terms of instream habitat and bank protection against erosion, the effect of a continuous overhead tree canopy or 'tunnelling' can block out much of the available light, limiting the development of marginal and submerged plant communities. Many plants, particularly submerged macrophytes, rely on abundant sunlight and flow speed in order to flourish. Therefore, a structured coppicing regime that improves light penetration to the channel and bank in some of the most heavily shaded areas is recommended. Both reaches discussed in this report would benefit from regular rotational coppicing. The coppicing of any diseased trees, particularly Alder is recommended and may reduce infection in adjacent trees. It is also recommended to retain any large mature trees with fissures or cracks or heavy ivy growth. Often these trees support large communities of invertebrates and mammals, particularly bats and nesting birds which are legally protected.

The tree thinning work should focus on coppicing and felling bank-side trees particularly over the most densely shaded areas, preferably rotating the work over a 4-5 year period and creating a canopy of varying heights and sizes. An approximate 'rule of thumb' is to allow 50% dappled light, particularly over riffles, retaining 50% shade over the rest of river as a whole. It is sensible to leave slightly more shading over pools as these act as refuge areas for all life cycles of brown trout during low flows. Retaining some tree shading can limit extremely high 'spikes' in water temperature, reducing mortality caused by low dissolved oxygen levels.

Heavy tree growth at Llandough, some structured coppicing along RB (left of picture) would be beneficial.

Retaining large mature or ancient trees is important as they can support large communities of mammals and terrestrial invertebrate species. Large or complex shaped boughs or branches arising from tree works can be used for pinning into the river and are a good way to reuse woody material won from coppicing work. With good planning and a team of volunteers, this can be done at the same time as coppicing, removing the need to lift heavy pieces of wood from the channel. Allowing light to penetrate the channel will encourage the development of a varied marginal plant community. Sedge plants such as *Carex pendula* can provide a 'rough and scraggly' edge which is erosion resistant and makes excellent overhanging cover for trout and invertebrates. Increased light penetration will also encourage the growth of submerged macrophytes which can support a range of aquatic invertebrates that are likely to improve wild trout and sea trout production in the Thaw and Factory Brook.

4.2 Woody debris

Large woody debris can provide valuable habitat for salmonids and invertebrates in the channel and is an effective and relatively inexpensive way of

enhancing habitat. With an abundance of bank-side trees available on the Thaw and Factory Brook, there is plenty of opportunity to employ the following techniques:

- Utilise woody material that has already fallen into the channel by pinning it into the bed using chestnut posts and heavy gauge mild steel wire. Or alternatively, by using steel rebar to pin LWD in places where the riverbed is very hard.

- Use large boughs or branches from tree works and pin into channel to create scouring and sorting of gravels and provide cover and refuge for all life cycles of salmonids.

- Brash and smaller coarse woody debris (CWD) trimmed from tree works can be packed in behind larger boughs to create a complex matrix of branches which accrue silt quickly if positioned in depositional zones. A larger branch pinned upstream of smaller branches can act as a baffle, slowing flows and depositing silt over brash immediately downstream.

- Hinging of large branches or trees that are close to the water is a good way of introducing 'living' material into the channel. The tree can be partially severed leaving a 'hinge' attached so the tree or branch can still grow. Willow is an excellent tree to work with in this way because of its 'bendy' properties. Once hinged into the channel in the desired direction, it can be pinned to the bed accordingly. Hinging larger trees will require a qualified chainsaw user. Some smaller material can be hinged using hand-saws. Large hinged boughs may need to be additionally secured with multi strand steel rope and crimps or strong (non rot) rope in order to be secure during flood conditions.
  N.B.
  Any hinges that snap or are severed during processing can be secured to substantial bankside trees or stumps using steel rope and crimps.

Hinged 'tree kicker' attached with steel rope and crimps

(*Photograph courtesy of Theo Pike at www. urbantrout.net*)

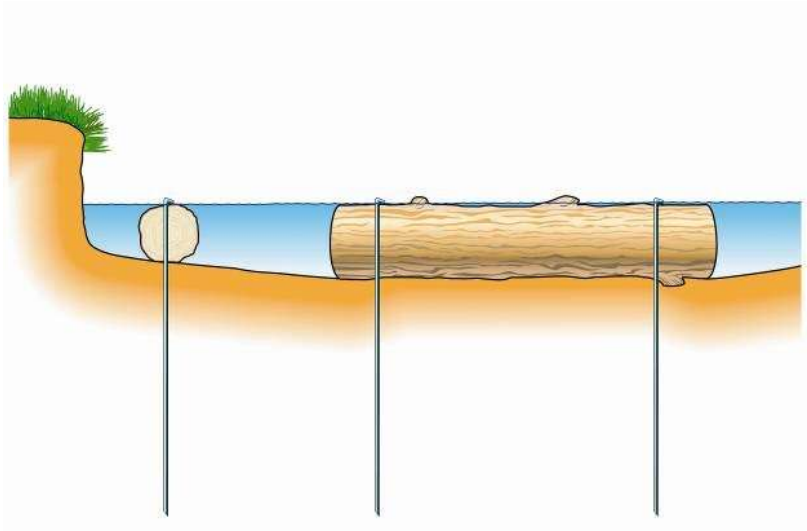
Pinning with chestnut posts and wire

A post should be driven into the river bed on either side of the log or branch until firm (If the bed is hard then a pilot hole for the post should be driven using a sledge hammer and iron bar). Loop the galvanised fencing wire around the posts either side of the log and use fencing tacks (preferably large) to pin the wire to the posts. Leave several inches of slack wire above the log (this allows the wire to tighten down onto the log during post driving). Drive one post into the bed part way, then drive second post in until wire starts to tighten over the log. Do not over-tighten the wire. Eventually the wire should tighten over the log, pinning it to the river bed. It can be made easier if you have the weight of several people standing on top of the log to hold it down whilst the posts are being driven. Always use the personal protective equipment when working in this way i.e. hard hat gloves and eye protection. Always use extreme caution when using a manual post pounder in the river. Manual handling guidelines and basic training are recommended for this kind of river work.

Superb existing LWD at Llandough, some structured coppicing along banks downstream here would be beneficial).

Pinning with steel rebar

In some areas it may not be practical to drive chestnut posts into the river bed because of hard substrate. In this case, large woody debris will need to be pinned using an alternative method. Using metal rebar is an effective and secure way to attach large boughs firmly to the river bed.



Example of LWD fixed with steel rebar

Select the piece of LWD intended for use so that it naturally balances on the river bed without moving.

Rebar thickness and length should be appropriate for the job and chosen according to the size of the LWD being used. If the LWD is likely to encounter high flows then thicker rebar of longer length is recommended. It is easier to sledgehammer thicker rebar above 16mm in diameter as it is more rigid. As an example; a piece of LWD with a diameter of 300mm and a length of 2.5 meters should be secured with at least two 1m lengths of steel rebar. This would leave at least 700mm driven into the bed.

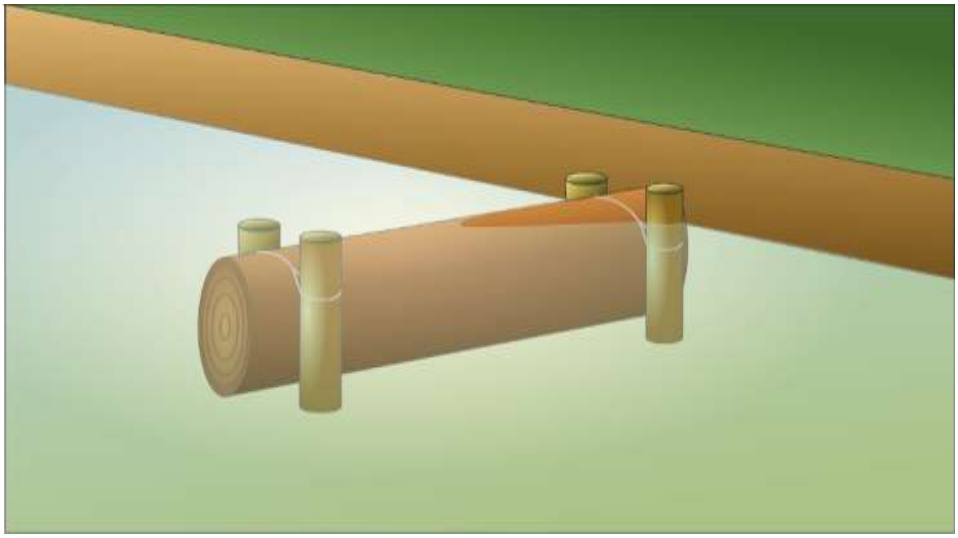
Auger or drill holes just big enough for the rebar into the wood in appropriate places, this is usually at either end and with a piece of rebar and additional pieces for every subsequent 1.5m in length.

Offer LWD to river bed in appropriate position, making sure pre drilled holes are visible (this may need a team of two three or four people if the wood is heavy).

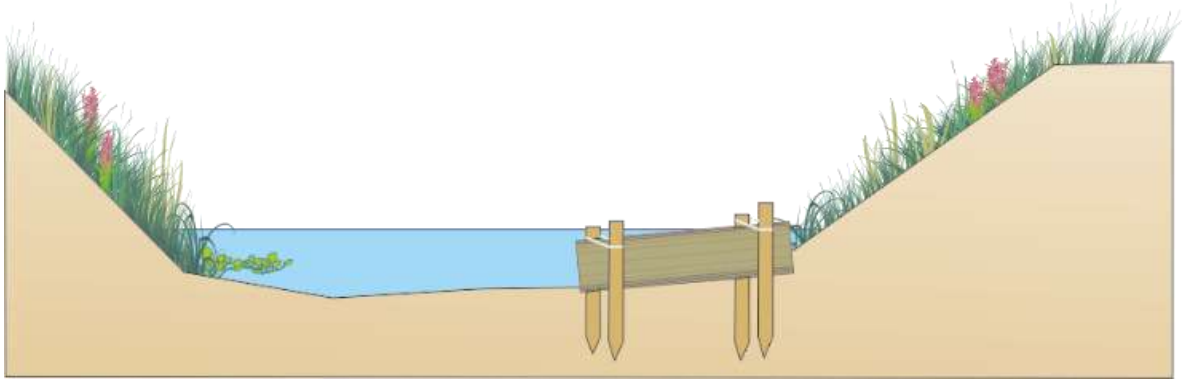
Drive rebar through holes and into riverbed until top of rebar meets LWD, making sure that the LWD is secured and doesn't wobble or move.

N.B. It is also important to have a means of stopping the LWD lifting off of the rebar in high flows; this can be done in one of two ways.

Talk to a steel fabricator and spot weld a washer on to the top of the rebar or alternatively heat and flatten, or bend, the end of the rebar so it is slightly bigger at the top, this will similarly reduce the likelihood of the LWD coming away from the rebar under high flows. It is recommended that CADAA seek professional advice and training before undertaking this kind of work.



Close-up drawing of pinned LWD



Pinned log deflector with paired posts and fencing wire

Log deflector pinned with posts and wire (angled upstream, creating bed scour)

Alder tree with 'living hinge' still attached (angled downstream)

Large hinged Alder tree (Willow is just as good and often responds well to hinging)

4.3 Sewage treatment works (STW) and Riverfly monitoring

STWs are present on many rivers and water companies are licensed to discharge treated effluent into the watercourse. The licences (issued and regulated by Natural Resources Wales) set the required water quality standards. Problems may occur when licence conditions are contravened, causing pollution in the water course. This can result in a reduction in dissolved oxygen levels and

elevated ammonia levels (which is toxic to aquatic life). STWs serving larger settlements have phosphate stripping facilities, but smaller STWs do not so may cause nutrient enrichment within the receiving watercourse.

Aquatic invertebrates can act as an early warning against pollution from STWs as their numbers and diversity will quickly be depleted after pollution incidents. Therefore, it would be beneficial to monitor invertebrates regularly in the areas adjacent to STWs using the quantitative techniques recommended by the Riverfly Partnership (Anglers Riverfly Monitoring Initiative). Information can be found here: http://www.riverflies.org/rp-riverfly-monitoring-initiative

Any significant decreases in aquatic invertebrate abundance and diversity can be discussed with your local National Resources Wales officer. There is also an NRW hotline for any pollution incidents that may occur (0300 065 3000).

4.4 Fencing and land management

The main issue on the Thaw at Llandough is the lack of adequate fencing. Livestock have poached much of the LB, particularly on the lower beat, there was also some evidence of poaching and bank collapse on the LB on the upper beat nearer the sewage treatment works. This could be addressed in two simple ways. Firstly, an open discussion with the current landowner to install stock fencing that creates a buffer strip of ideally at least 5m extending back from the bank edge. This should still allow fishing access and leave enough space for a marginal plant community to flourish. This problem should be addressed as a priority before the banks deteriorate further. Secondly, it would be beneficial to install a purpose built cattle drink with appropriate fencing to keep the livestock in one spot rather than damaging the banks. It is worth noting that the cattle drink should be appropriately placed and the work carried out by experienced contractors. Many cattle drinks fail or don't function well because they are badly sited and poorly constructed. Alternatively, small density herds can be trained to use pasture pumps and can be excluded from the river channel altogether.
Some information and examples are shown in the Appendix (Section 3)

A number of ditches were observed in the lower field on the LB on the River Thaw at Llandough, several of the ditches were directly connected to the main river. Installation of fencing to create buffer strips and exclude cattle in these areas would encourage growth of a vegetated margin of trees and plants, reducing sedimentation caused by livestock during grazing. Some additional planting of willow or alder along these ditches would also improve habitat connectivity and further stabilize soil in the flood plain.

4.5 Removal of impoundments
(Factory Brook)

The dual concrete pipe impoundment on the Factory Brook is impounding the river, causing sedimentation upstream. The culvert pipe is also limiting the ability of the brook to meander naturally. The bottom section of the culvert pipes could easily be dry in low flows or depths could be so shallow that fish would not be able to pass up or downstream. Both pipes could easily be removed using either an excavator or telehandler with lifting chains. The culvert pipes apparently served as a bridge that is now serving no useful function because of dense bank side tree growth, and therefore should be removed. Ownership of the pipes should be determined and the pipe removal should be discussed with the landowner on the RB before works begin.

There were also a number of limestone steps and historic remains along the Factory Brook that appeared to be causing some impoundment. Several of the limestone steps were obscured by heavy tufa deposits making it difficult to see whether they were natural or man-made. Many of these impoundments could be made less severe and more fish-friendly by adjustment by hand. There is no need to entirely remove each impoundment. Simple modification using a small team of willing volunteers with metal bars for levering and sledge hammers could easily adjust impoundments. Works should focus on cutting a gap of at least 600mm wide and 600mm deep in the middle of each structure and allowing the water to plunge through, therefore allowing the river above and below to connect in a shallower gradient that allows fish passage through the middle. Care should be taken to place one or two large stones in the plume of water to act as a baffle for fish to rest behind during high flows. Alternatively, experienced river contractors using a petrol powered road breaker could be used to break up any heavy large stones; any natural limestone spoil could be incorporated into the river bed locally.

N.B.

The stone footbridge and former milling remains on the Factory Brook may be of historic importance. It is recommended to seek consultation from a local archaeologist before any work begins.

Concrete or any man made materials should not be broken up and left on the river bed and experienced contractors should be employed if works extend to using heavy machinery.

5. Making It Happen

The creation of any structures within most rivers or within 8m of the riverbank (which may be the top of the flood-plain in some cases) normally requires formal Environmental Permit from National Resources Wales. This enables the NRW to assess possible flood risk and any possible ecological impacts. The headwaters of many rivers are not designated as 'Main River', in which case the body responsible for issuing consent will be the Local Authority. In any case, contacting the NRW early and informally discussing any proposed works is recommended as a means of efficiently processing an application.

The WTT website library has a wide range of free materials in video and PDF format on habitat management and improvement:

http://www.wildtrout.org/content/index

The Wild Trout Trust has also produced a 70 minute DVD called 'Rivers: Working for Wild Trout' which graphically illustrates the challenges of managing river habitat for wild trout, with examples of good and poor habitat and practical demonstrations of habitat improvement. Additional sections of film cover key topics in greater depth, such as woody debris, enhancing fish stocks and managing invasive species.

The DVD is available to buy for £10.00 from our website shop http://www.wildtrout.org/product/rivers-working-wild-trout-dvd-0 or by calling the WTT office on 02392 570985.

There is also the possibility that the WTT could help via a Practical Visit (PV). PV's typically comprise a 1-3 day visit where WTT Conservation Officers will complete a demonstration plot on the site to be restored.

This enables recipients to obtain on the ground training regarding the appropriate use of conservation techniques and materials, including Health & Safety, equipment and requirements. This will then give projects the strongest possible start leading to successful completion of aims and objectives.

Recipients will be expected to cover travel and accommodation (if required) expenses of the WTT attendees.

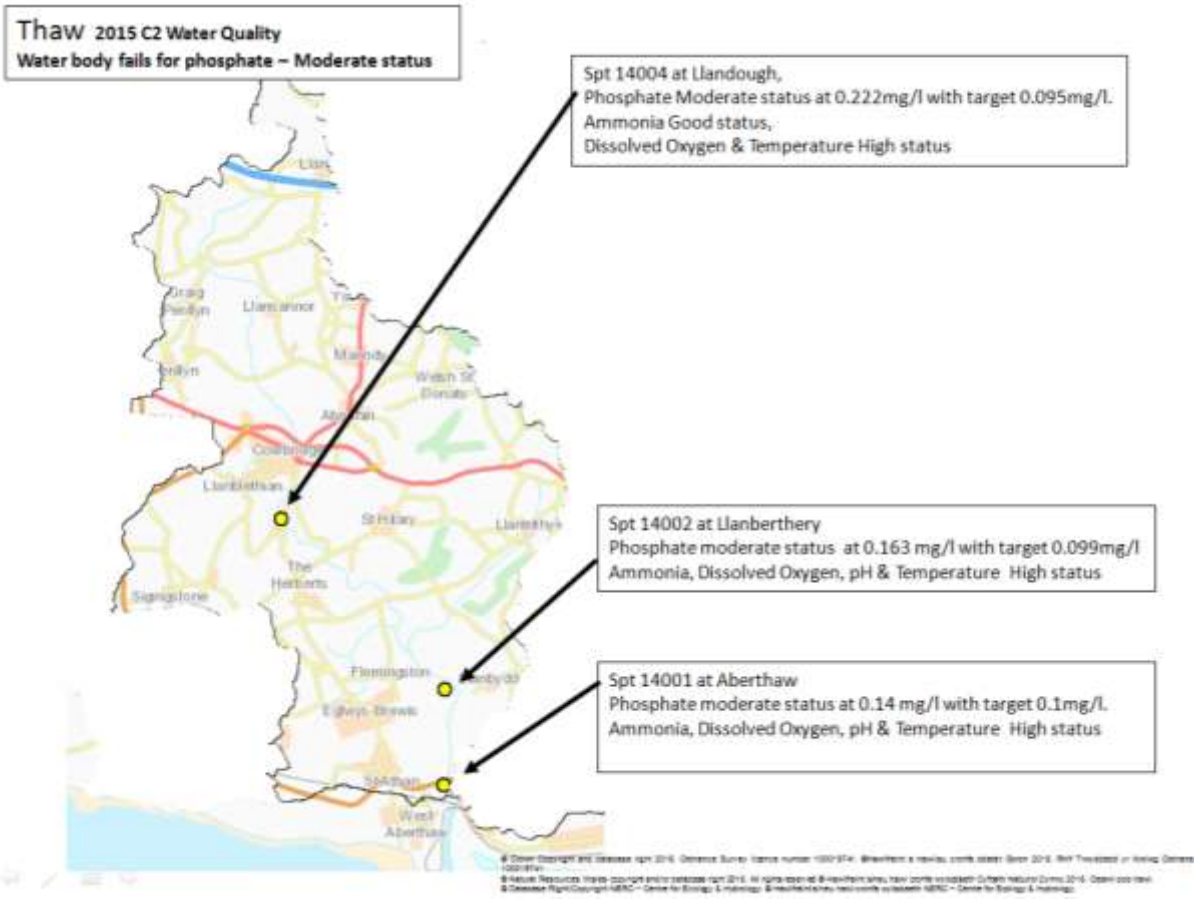
There is currently a big demand for practical assistance and the WTT has to prioritise exactly where it can deploy its limited resources. The Trust is always available to provide free advice and help to organisations and landowners through guidance and linking them up with others that have had experience in improving river habitat.

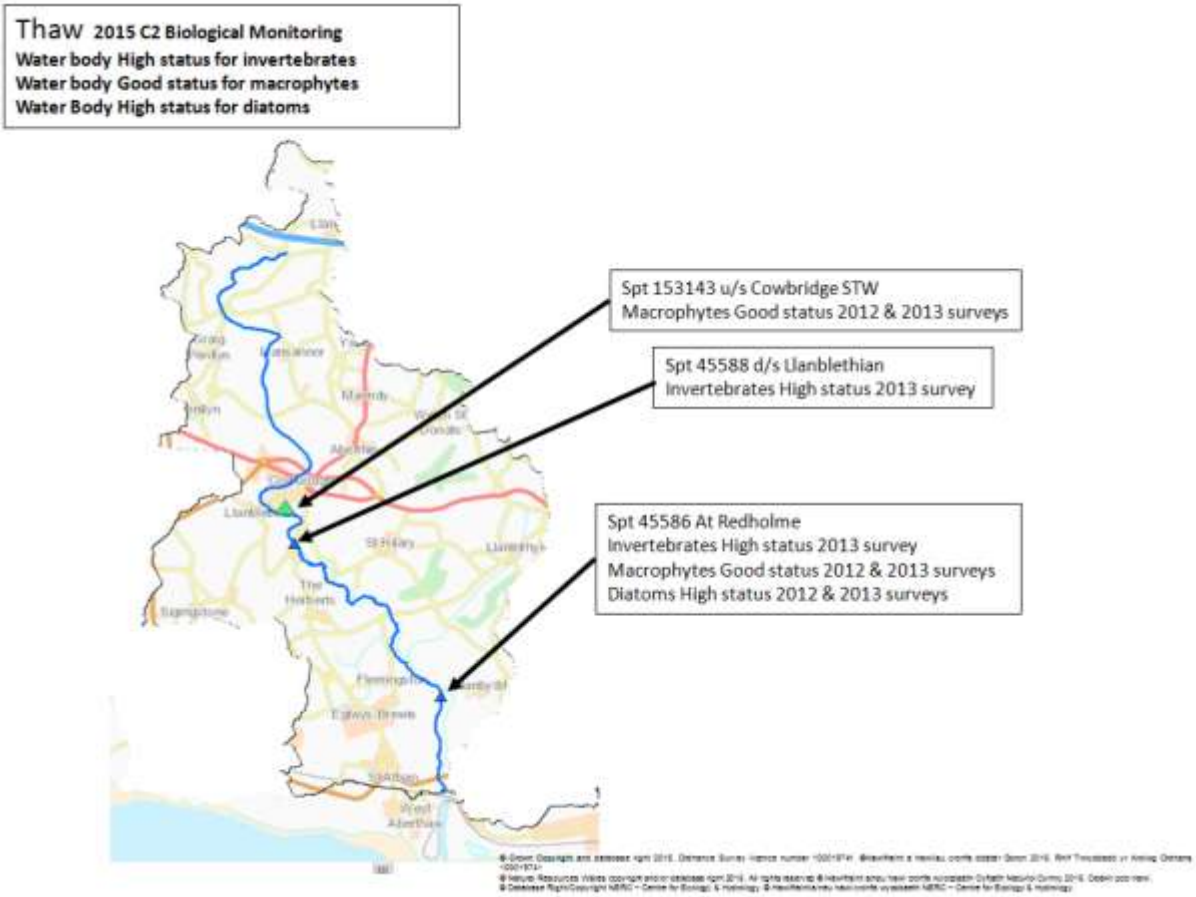
Disclaimer

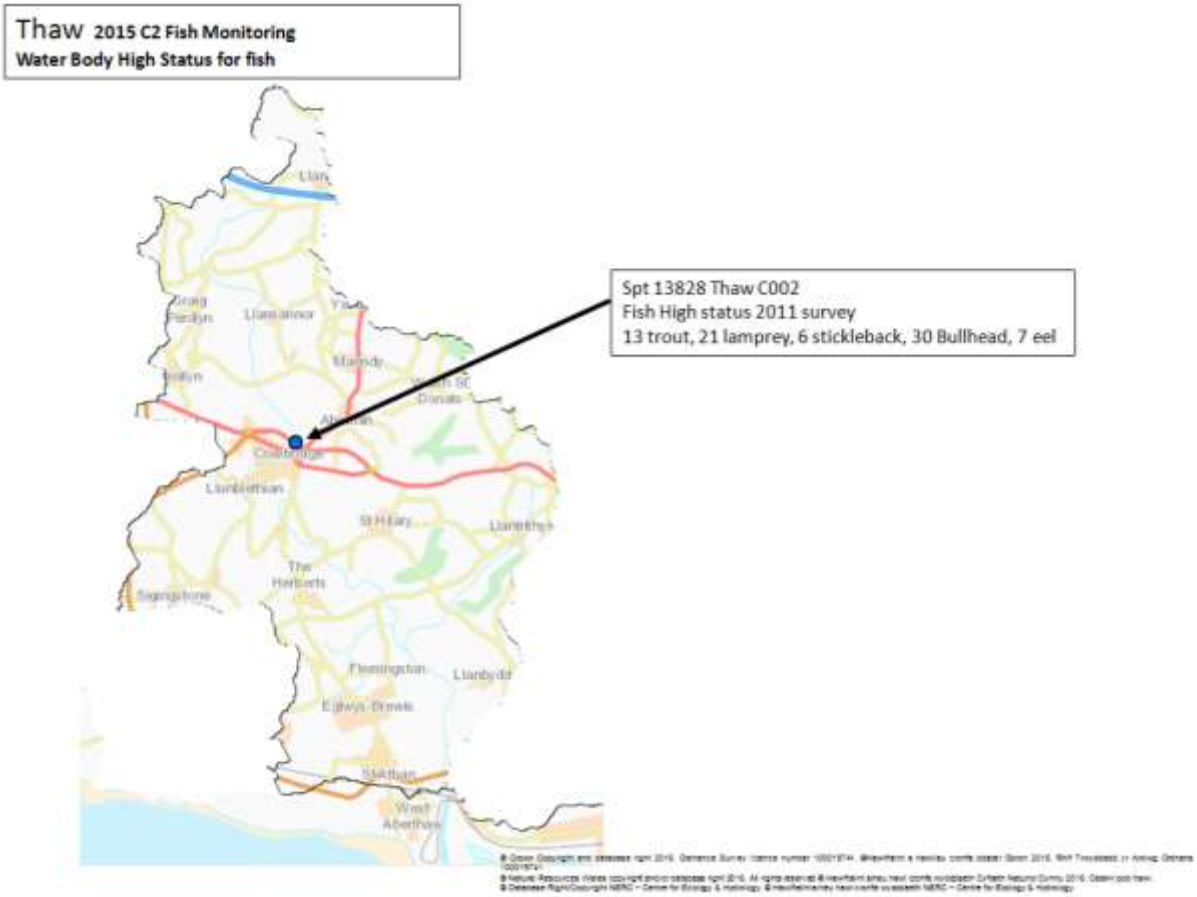
This report is produced for guidance; no liability or responsibility for any loss or damage can be accepted by the Wild Trout Trust as a result of any other person, company or organisation acting, or refraining from acting, upon guidance made in this report.

6. Appendix

Appendix 1: Natural Resources Wales R. Thaw WFD maps




Thaw 2015 C2 Biological Monitoring
Water body High status for invertebrates
Water body Good status for macrophytes
Water Body High status for diatoms
Spt 153143 u/s Cowbridge STW
Macrophytes Good status 2012 & 2013 surveys
Spt 45588 d/s Llanblethian
Invertebrates High status 2013 survey
Spt 45586 At Redholme
Invertebrates High status 2013 survey
Macrophytes Good status 2012 & 2013 surveys
Diatoms High status 2012 & 2013 surveys


Thaw 2015 C2 Fish Monitoring
Water Body High Status for fish
Spt 13828 Thaw C002
Fish High status 2011 survey
13 trout, 21 lamprey, 6 stickleback, 30 Bullhead, 7 eel
Llan
Llansannor
Ystradowen
Marcross
Wenvoe
Dinas
Aberthaw
Cowbridge
Llanblethian
St Hilary
Llanerchi
The Herbers
Segontone
Flemingston
Llanbydd
Eglwys Brewis
Sker Point
West Aberthaw

Appendix 2: Recommended planting for bank stabilization or for Ponds:

Always use NATIVE UK plants, sourced from local provenance from a reputable supplier.

Carex pendula – sedge plant (plant anywhere on bank)

Filipendula ulmaria - meadowsweet (plant in the top half of the bank)

Carex acutiformis – sedge plant (plant anywhere)

Iris pseudacorus – yellow flag iris (plant near the water at the foot of the bank)

Lythrum salicaria –purple loosestrife (plant in the top half of bank – attracts invertebrates)

Lycopus europaeus – gypsywort (plant nearer the water's edge)

Eupatorium cannabinum- hemp agrimony (plant from mid to top of bank).

Edge and marsh plants for wetted areas:
Mentha aquatica-water mint, *Iris pseudacorus*- yellow flag iris, *Veronica beccabunga*- brooklime, *Menyanthes trifoliate*-bogbean, *Alisma plantago aquatica*- water plantain.

The plants listed have dense root networks and will provide erosion resistance whilst being beneficial for invertebrates.

Appendix 3: Cattle drink information

An excellent example of a fenced cattle drink with limestone base.

(Photograph courtesy of Riverside Angling Club)

Fenced drinking bay in the Yorkshire Dales.

***(Photograph Copyright: Deborah Millward-
Yorkshire Dales National Park Authority)***

There is also some excellent information in the WTT's Upland Rivers Habitat Manual. Section 5 deals with installation of sustainable cattle drinking bays and physical interventions such as installing LWD on spate streams. The resource is available for free online and on the WTT website.

Copy paste into your browser:

http://www.wildtrout.org/

http://www.wildtrout.org/sites/default/files/library/uplands_section5.pdf

N.B.
It is vital to consult National Resources Wales before planning any of the physical works described in this report.