Advisory Visit

Black Lynn Burn, Argyll (Waterbody ID: 10304)

25/06/12

Introduction

This report is the output of a site visit undertaken by Paul Gaskell of the Wild Trout Trust to the Black Lynn Burn, Oban on 25th June, 2012. Comments in this report are based on observations on the day of the site visit and discussions with Alan Kettle-White and Daniel Brazier of Argyll Fisheries Trust.

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.

1.0 Catchment / Fishery Overview

The Black Lynn Burn (Water Framework Directive Waterbody ID: 10304) is part of the Knapdale coastal catchment that covers 673 km^2 and includes all the freshwater on the west side of Knapdale Peninsula from Tarbert in the south to Oban and the mouth of Loch Etive in the north. The burn itself is a short watercourse of around 3.5 km in length that runs through the centre of Oban and discharges directly into Oban bay close to the railway station. As a heavily modified watercourse, it has been assessed as currently having "Moderate Ecological Potential" with abstraction and flow regulation by the Tullich Water Treatment Works identified as key pressures by the Scottish Environmental Protection Agency (SEPA).

A number of wild trout were sighted during the visit, apparently a mixture of stream resident fish and finnock (young sea trout on their first return to freshwater). This highlights the Black Lynn Burn's potential importance as a habitat for wild self-sustaining populations of both resident and migratory fish. The urban development surrounding the burn means that there are numerous surface water drains feeding into the river from areas of largely impermeable material. Even so, the "day-to-day" water quality is sufficiently good to support hatches of aquatic invertebrates such as *Seratella ignita* (known to be sensitive to organic pollution).

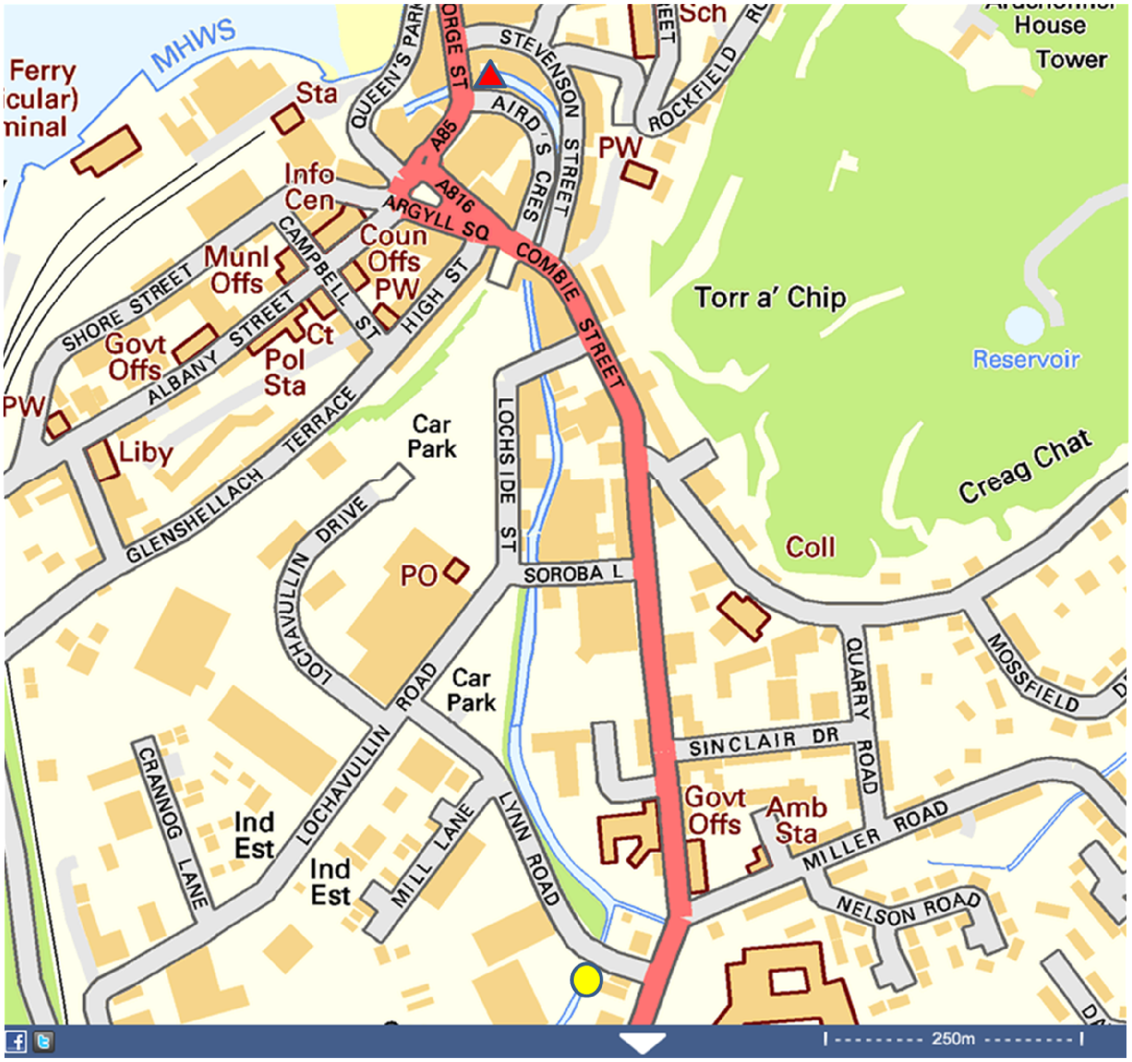


Figure 1: Map of inspected reach from upstream limit at NM86019 29288 (yellow circle) to downstream limit at NM85956 29906 (red triangle)

2.0 Habitat Assessment

A map of the surveyed reach (Fig. 1) indicates the main focus of the habitat assessment and the reach was walked from an upstream to downstream direction. The first point surveyed was beneath the bridge at Lynn Road (NM86019 29288). A small weir of around 30cm in height was impounding a considerable reach of water (Fig. 2). Assuming that ownership issues and the presence of below-ground services (i.e. sewer pipes, gas mains, electricity/telecommunications cables) could be ruled out – removing at least half of this structure down to stream bed level would have great benefits to upstream habitat diversity.

Figure 2: Low weir upstream of bridge at Lynn Road (A) and impoundment of straightened section upstream of weir (B)

The water quality in the burn is sufficiently good to support a range of pollution-sensitive invertebrate fauna (Fig. 3). Consequently, chemical water quality is not expected to be a primary constraint on biodiversity – including pollution-sensitive salmonid fish.

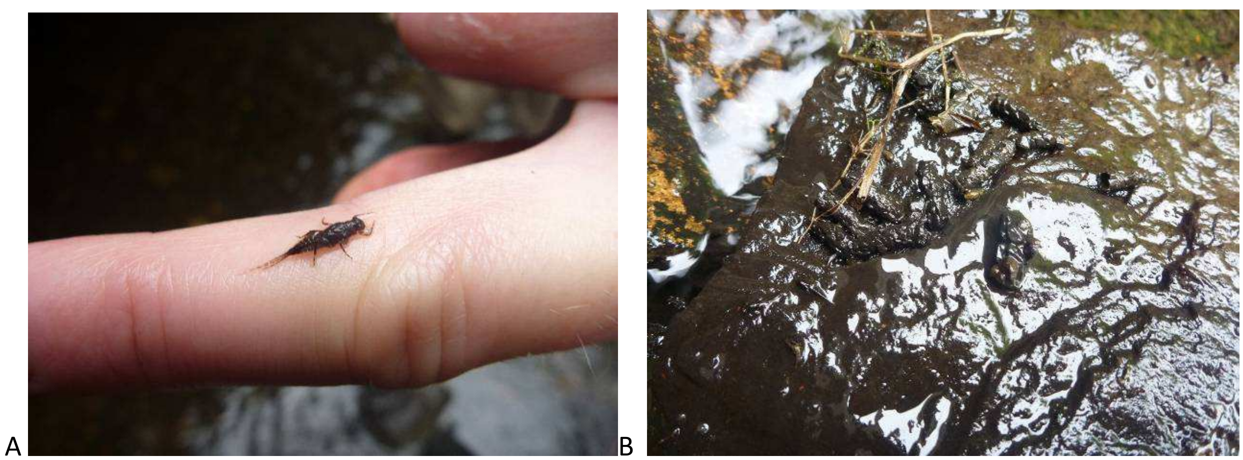


Figure 3: Organic pollution-sensitive taxa including *Seratella ignita* (A) and a mixture of cased caddis larvae, caseless caddis pupal shelters plus metallic pollution-sensitive *Baetis* and *Gammarus spp*. (B)

Instead of chemical toxicity, a physical impact of diffuse-source pollution in the form of over-supply (and/or over-retention) of fine silt and sandy sediment was a more prominent concern. The potentially valuable spawning gravels noted at this location – and throughout the visited reach – were heavily infiltrated by fine sediment (e.g. Fig. 4). In some places, cobble and gravel substrate was buried under several inches of sand and silt to a degree that would not be expected in such a small and relatively briskly-flowing burn draining a limited catchment area.

Figure 4: Even in fast flowing sections, the spaces (interstices) between pebbles were packed with fine sediment. This will reduce the overall number of micro-habitats available for invertebrate species and also significantly reduce the survival of trout eggs laid in these beds.

As well as reducing micro-scale habitat variation (and consequently invertebrate diversity), the blockage of interstitial spaces between gravels prevents the irrigation of eggs with oxygen-rich water. This dramatically reduces the hatching success of salmonid fish eggs – with the majority suffocating before fry are able to hatch. Spawning fish will also detect and actively avoid areas that offer poor survival prospects for their offspring.

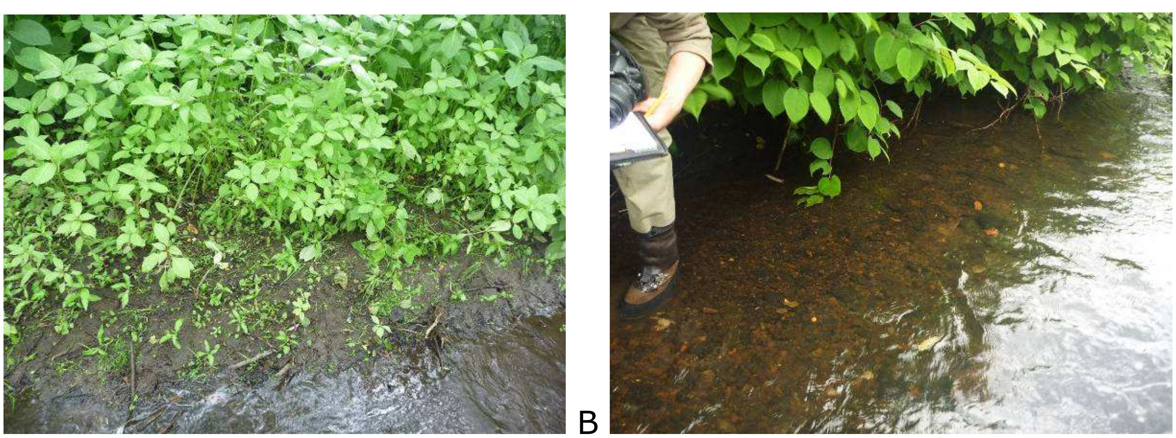
A  B

Figure 5: Himalayan balsam (A) and Japanese knotweed (B) in the reach at NM86021 29330

The presence of substantial stands of both Himalayan Balsam (*Impatiens glandulifera*; Fig. 5A) and Japanese knotweed (*Fallopea japonica;* Fig. 5B) will undoubtedly add to the stream bed-load of fine sediment, through wash-in of bankside soils exposed after winter die-back of the plants.

Section 3.1.1 of the Wild Trout Trust's Urban Rivers Restoration Guidelines (http://www.wildtrout.org/sites/default/files/library/urban_section3_habitat%20projects%20on%20your%20river.pdf) provides details of the impacts and the control of both of these invasive plant species. In brief, the rapid and dominant growth of both species shades out native plant species before an annual winter die-back leaves bare earth banks vulnerable to erosion. Bank erosion alone is unlikely, though, to be the sole cause of any potential fine sediment oversupply. A preliminary visit and comparison between two sites further upstream in the catchment revealed high bed loads of fine sediment in the headwaters upstream of the Pladda Road culvert (NM 8535 2820). In contrast, the bed loads in the headwater reaches around the Glengallen Road industrial units (NM 8480 2810) had a much lower proportion of fine sediment. There is an important role for SEPA to play in tackling this issue – both in terms of identification of suspended sediment sources as well as working with those responsible to control sediment over-supply (see Recommendations).

It is imperative that the above investigation of supply-rate of sediment is coupled with a geomorphology survey. The specific aim of such a survey should be to determine the channel's capacity to redistribute fine bed materials – and consequently produce clean spawning gravels. The extensive straightening and modification of the Black Lynn Burn is likely to significantly hinder its ability to establish zones of substrate deposition and erosion that maximise habitat diversity. It is, consequently, possible that only a moderate supply of fine sediment could result in high levels of infiltration/burying of gravel and cobble substrate.

Although there is an obvious constraint on spawning success, there was some high quality juvenile and adult fish habitat within the inspected reach. Excellent examples of suitable flow, pace and depth, coupled with overhanging and partially submerged herbaceous and woody vegetation, were providing superb nursery habitat for fry and parr (e.g. Figs. 6 - 9).

Figure 6: Overhanging herbaceous cover and gentle marginal flows in the region of NM86010 29341 - ideal for juvenile life stages

Figure 7: Ideal shelter for small fry in the region of NM86010 29341

Figure 8: Glide habitat suitable for parr augmented by good overhead and submerged cover - particularly on the LHB at NM86010 29341 (view is upstream)

Figure 9: Superb parr and young adult trout habitat generated by the trailing crown of a naturally hinged bankside tree just downstream of NM86010 29341

The potential value of these nursery habitats should not be under-estimated – especially in the light of current constraints upon spawning success. Their value can only be increased by any future efforts to release the bottleneck on egg survival. In more rural (agricultural) areas, this type of habitat is often very scarce due to riparian grazing pressures. Its presence here, arising almost accidentally due to the segregation of the river corridor from surrounding land, should be strenuously protected.

Of comparable, if not greater, value are the substantial scour pool and overhead cover features for adult and larger parr provided by large fallen trees (e.g. Fig. 10). Again, with improvements to spawning success, the retention of these features will provide good opportunities for self-sustaining wild trout/sea trout populations. Retaining some complex and "unkempt" sections, away from extensive public access, gives vital refuge during crucial life cycle stages. Providing sustainable access to other (more appropriate) areas represents the perfect balance between providing for healthy wild fish populations and enabling the community to appreciate and value them.

Figure 10: Fallen living willow generating excellent bed-scour pool habitat at NM85990 29363. The flow of water funnelled beneath the submerged wood goes some way to mitigating the heavy silt bed-load by "blowing out" localised clean gravel patches.

Figure 11: Fallen woody debris has produced a deep (>1 m) scour pool below the water surface at NM85969 29394. It is also providing superb shelter and habitat for adult fish and a range of invertebrates

Running working parties (with appropriate provision for public health and safety – see Recommendations) would be an ideal way to remove some of the litter (e.g. Figs. 10 and 11) from this section whilst educating participants on the value of the habitat features. Such working parties could also be an ideal vehicle for highlighting the pressures currently faced by the burn. As an example in this reach – the high loading of fine bed-sediment is particularly evident (Fig.12).

Figure 12: Cobble and gravel stream bed covered by a layer of sandy/silty sediment many centimetres deep just downstream of NM85990 29363

Another very evident combination of pressures can be seen in the section (approx. 80 m in length) alongside the supermarket car park at NM85952 29431. A very dense stand of Japanese knotweed flanks a heavily canalised section of river (Fig. 13). The uniform and canalised nature of the section is a result of engineered straightening of the channel as well as the impounding effect of a downstream structure. Native emergent plant species are still present in the channel itself (Fig. 13), but the banks and surrounding land within the river corridor are dominated by a huge stand of Japanese knotweed. As well as contributing to the bed-load of fine sediments, this domination will dramatically reduce the diversity of both native flora and the fauna that would otherwise be associated with a more varied plant assemblage.

Figure 13: Japanese knotweed on the LHB with the native *Sparganium sp.* growing in the water along the RHB. Picture taken whilst facing upstream

The lower limit of the knotweed-infested section is at the bridge over the burn at NM85972 29560. Below here the channel is entirely artificial – consisting of a concrete bed and retaining walls (Fig. 14). Despite the general lack of cover and diversity within the channel, several small trout and small sea trout (finnock) were visible in this reach. The depth and flow, coupled with debris on the stream bed being just sufficient to meet the needs of a few fish.

It would be possible to improve the survival potential for fish using this reach by providing securely anchored marginal brash and also to generate some sinuosity of flow by promoting localised marginal accumulations of bed material (see Recommendations). The use of expansion bolts drilled into the concrete would provide very stable anchor points for such works. The consideration here would be to ensure that the in-channel structures are sited so as to avoid any impedance of the numerous surface-water drain outfalls. These works, when coupled with trash removal initiatives, would improve both the habitat and also the visual amenity value of this section of river. Augmenting these improvements with interpretive signage and also improving public access – for example via installation of a raised walkway – would be excellent means of engaging the local community with the wildlife and aesthetic value of their burn (Fig. 15).

Figure 14: Artificial concrete channel below NM85972 29560. Habitat works combined with a raised walkway and interpretive signage would provide a great boost to the wildlife and community value of the burn. Refurbishment of the existing footbridge and associate access could provide an excellent entry point to a walkway on the RHB. Photo taken whilst facing downstream.

Figure 15: Installing a hand rail (RHB) and interpretive signs would open up this hidden section of river to sustainable public access.

One of the most serious impacts on the burn is the shallow, sloping concreted section of stream bed at NM85975 29720. Not only is the flow extremely shallow across its full width, but there is virtually no natural substrate or debris retained within this section (Fig. 16). In addition, the height of the upstream limit of this concrete ramp is the cause of the impounding effect that homogenises the habitat in the upstream reach. This combination of factors makes the section a serious barrier for fish to ascend (and therefore make use of) to the spawning and juvenile habitat upstream. It is also of virtually zero value in terms of habitat that can be used by fish and the majority of stream invertebrates that are present upstream.

Consequently, one of the greatest opportunities to generate significant ecological status improvements to the Black Lynn Burn lies in tackling the barrier effect of this section. This will allow the upstream reaches to be used to their maximum potential. Moreover, the improvements to fish passage can also be designed so as to improve the intrinsic habitat value of the problem section itself.

Below this concreted section, the river appears to return to a more natural gradient and recovers some nice natural stream-bed features. It has also benefitted from the addition of aesthetic features along the channel margins (Fig. 17).

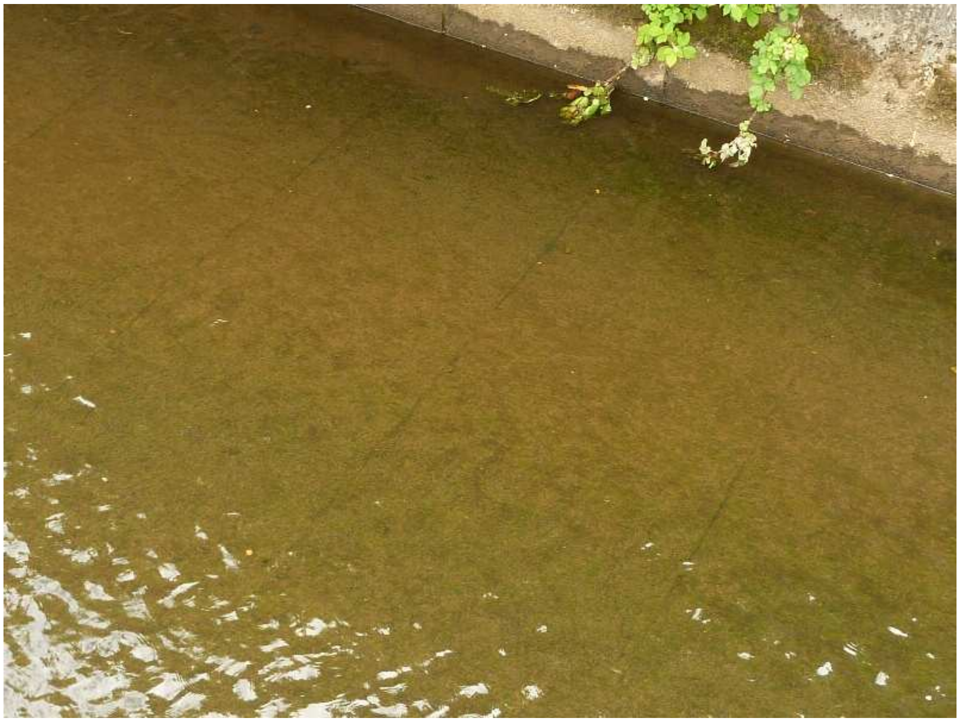


Figure 16: Uniformly very shallow - even after significant rainfall. Very poor habitat and a significant barrier to fish that could otherwise benefit from the good quality habitat upstream

Figure 17: Marginal berms planted and mown for aesthetic improvements to the river corridor between NM85978 29797 and NM85956 29906

Some small adjustments and additions to these works would provide highly significant wildlife benefits as well as continuing to provide excellent aesthetic benefits. Suggestions towards achieving these, and other aims highlighted previously, are given in the following section.

3.0 Recommendations

It is a legal requirement that all the works to the river require written consent from SEPA prior to undertaking any works. In addition, the permission of all relevant stakeholders (including, but not limited to, riparian landowners) will also be an absolute requirement.

3.1 Summary of environmental improvement objectives

As a first step, the following priority objectives have been identified:

1. Achieve control over invasive plant species Japanese knotweed and Himalayan Balsam via stem injection and manual removal respectively
2. Identify and eradicate sources of oversupply of fine sediment – coupled with geomorphology survey to identify potential to improve fine-sediment redistribution.
3. Augment potential spawning gravels with woody debris installations to promote localised silt-free spawning sites
4. Retain existing excellent wild habitat in secluded reaches
5. Install marginal cover and structure in concrete channel sections that currently support fish using a combination of bolted wood and imported rock
6. Create a "low flow" channel in the over-shallow concrete ramp section and augment with installed marginal structure that will retain additional marginal substrate (consider imported rock placements and/or upstream-pointing wooden baffles)
7. Incorporate additional planting scheme/reduced mowing regime of introduced berms as well as incorporation of installed woody flow deflectors to maximise wildlife and aesthetic value.

3.2 Summary of community engagement objectives

In parallel with the above series of habitat and biodiversity-focussed works, a programme should be instigated to:

8. Incorporate sustainable access to the concreted river corridor sections

9. Increase community engagement with the burn, its value and issues

With particular reference to points 8 and 9, consideration should be given to a walkway scheme along the heavily modified portion of the burn. The inclusion of signage that explains the rationale and function of specific interventions is a vital component of this engagement. A catalogue of before, during and after photographs is a highly valuable component of such signage. Schemes that have used a comparable approach to increasing the community value of their urban watercourses include the Five Weirs Walk in Sheffield (http://www.fiveweirs.co.uk/ and Fig. 18, left) and the millennium walkway in New Mills (http://www.newmillsheritage.com/walkway.htm and Fig. 18, right).

In concert with creating sustainable access, there will be great value in establishing a programme of community-based working parties and general custodianship that local people can contribute to on a voluntary basis. Sponsorship by local businesses, particularly those who are riparian owners along the course of the burn, is an excellent way to increase community cohesion and economic development. The existing works completed in the channel are evidence that there is good potential for local community support for future ventures. The likely longer timescale required to secure the funding and permissions for such an access scheme should not be allowed to prevent the initiation of habitat improvement works. It will be important for these to be in place ready for the completion of any improved access scheme.

Figure 18: Cobweb bridge above the waters of the River Don (left) to provide pedestrian crossing beneath a railway line – N.B. achieving a similar effect in Oban may be constrained by the likely heights of flood waters that may make such "under-bridge" walkways non-viable. Millenium walkway (right) providing pedestrian access to an otherwise totally isolated gorge in New Mills, Derbyshire.

3.3 Specific guidance on environmental improvement objectives by objective number

Objective 1: Invasive plant control

In accordance with guidance offered in the urban rivers restoration guidelines (cited in section 2 of this report) it is recommended that stem injection of Japanese knotweed is carried out by appropriately certified and insured individuals. Himalayan balsam can be tackled by a combination of hand pulling (by volunteers) and strimming below the first stem node (by appropriately qualified personnel). N.B. strimming should NOT be used to control Japanese knotweed – as plants can propagate from fragments as small as the last joint of a thumb. Hand pulling and strimming of balsam must be carried out when plant growth is vigorous, but prior to setting seed. Both Japanese knotweed and Himalayan balsam eradication efforts must be carried out from an upstream to downstream direction to prevent unnecessary efforts to control recolonisation from upstream sources. Spraying of herbicide for either balsam or knotweed (c.f. injection) would not be recommended in the case of the Black Lynn Burn due to its impact on non-target species and because control is feasible by alternative means. Depending on the speed of recovery from the native seedbank, it may be desirable to assist the development of native flora by either seeding with a locally-appropriate mix of species. In situations that the regeneration by both natural and hand-seeded means is poor, it may be advantageous (although more costly) to kick start the process using mature plants.

Objective 2

Making contact with the appropriate SEPA personnel that can assist in tracking down the predominant sources of any potential fine sediment over-supply is crucial to removing the spawning success bottleneck. Their involvement will also be instrumental in helping those responsible to meet the requirements of “no deterioration” for ecological potential under the Water Framework Directive (as well as existing legislation governing the accidental pollution of watercourses). As stressed previously, this must be undertaken alongside an assessment of channel geomorphology and potential improvements to sediment transport and deposition processes.

Objective 3

A small number of simple, pegged woody debris structures will generate valuable gravel size "sorting" (or grading) that, in concert with reduced sediment supply, help to maximise egg survival. For example, a simple "upstream V" structure (Fig. 19A) in the reach pictured in Figure 8 at NM86010 29341 would generate "gravel-cleaning" scouring flows in the centre of the channel. Similarly, individual upstream logs (Fig. 19B) would enhance existing marginal deposits of gravel.

A  B 

Figure 19: Upstream "V" scouring clean gravels in the middle of the channel (A). Spawning redd just off the point of an installed single upstream flow deflector (B). Both River Wandle, Carshalton

Objective 4

The importance of proactively protecting what is already high quality habitat should not be underestimated. It could be quite easy to place a greater value on the more obvious interventions suggested within this report. This would be highly detrimental to the prospects for wild trout and other river corridor wildlife – especially if it resulted in over-zealous management efforts to "tidy" the highlighted juvenile and adult cover.

Objective 5

For overwide, straightened concrete sections that already hold some adult fish, it would be ideal to use a combination of suitable imported stone (potentially augmented with timber structures bolted to the concrete) to produce a staggered series of alternating side-berms. In this way a meandering planform of the river flow could be created within the river channel. It is important to make the bank-side edges of such berms the highest point – with the lowest points occurring in the river channel. If this guideline is not observed, the water tends to cut behind such installed berms during spate flows and erode the banks (along with any high-value material aggregated during low flows). The berms should also be planted up with suitable wetland plant species seed (consider also installing mature sedge grasses). An example of berm creation within an engineered/straightened channel is given over (Fig. 20). Note the size of stone selected and also the gentle, vertically sloping nature of the berms towards the centre of the channel.

It may also be possible and desirable to introduce spawning substrate (gravels in the 20 – 40-mm diameter size range). The additional use of large boulders and pinned logs, would be valuable in grading and retaining such spawning gravels during the natural processes of remobilisation and deposition during spate flows. The logs, in particular, could be fixed in an upstream pointing direction and used to delimit the downstream edges of constructed berms. This arrangement will tend to naturally accumulate any bed materials transported down the channel and re-introduce this natural process back into the artificial channel. This work should also be combined with installing suitably-sized “brashy” tree tops (Fig. 21) that would act to enhance the variation in flow and depth, but also provide vital cover for juvenile and adult fish from the threat of predation. An example schematic of a possible arrangement of these techniques is also given to illustrate a generic layout (Fig. 22).

Figure 20: Meandering planform, aquatic plant establishment and introduced gravels/cobble substrate within retaining walls of an engineered channel.

Figure 21: Tree top brashy cover example

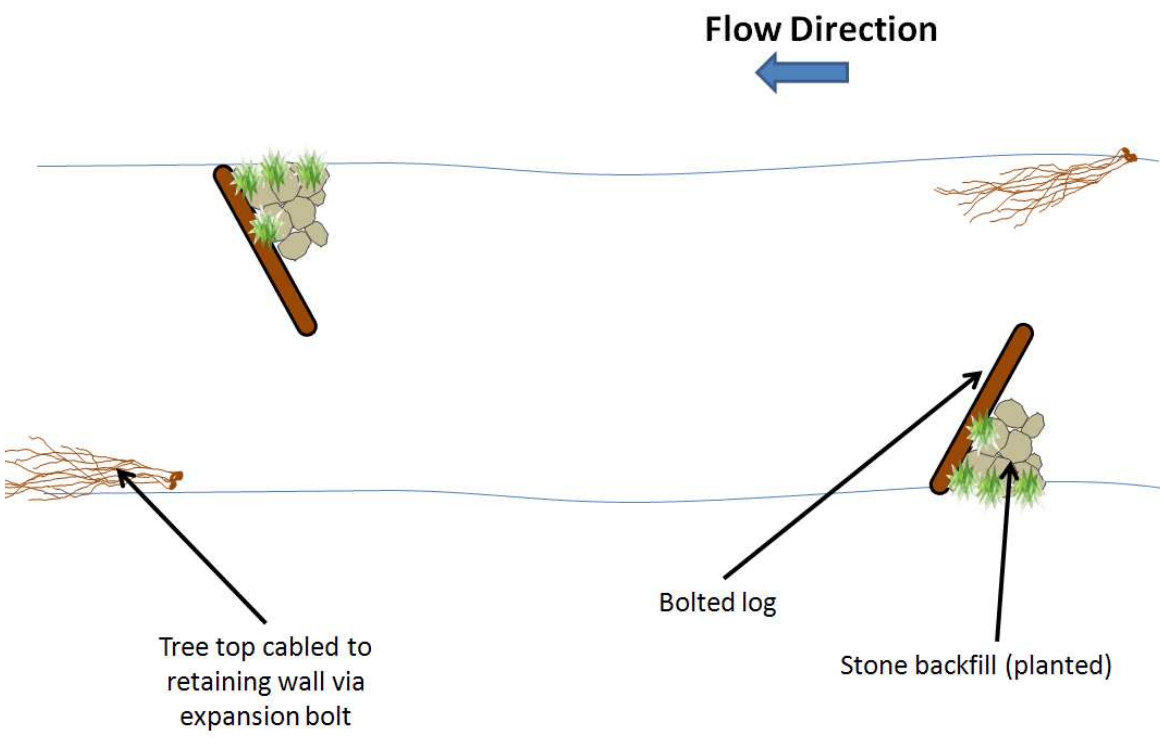


Figure 22: Schematic (plan view) of potential arrangement of suggested installations

Objective 6

Creation of a low flow channel could be achieved - N.B. FOLLOWING THOROUGH SERVICES CHECK - by simply breaking up the concrete bed (e.g. via pneumatic drill) to the desired depth, width and planform. An example design given on the Forecaster website (http://forecaster.deltares.nl/index.php?title=Main_Page) is shown below (Fig. 23).

Figure 23: Sinuous low flow channel created in overwide concrete watercourse.

The additional inclusion of imported stone and planting schemes would augment this improvement – both aesthetically and in terms of the habitat value.

Objective 7

A little less mowing, some appropriate wild vegetation planting and the addition of logs in a similar arrangement to those shown in Figure 22 would add huge habitat value to the works already completed in stream. In addition, the “toe” of the existing berms (the part where the riverbed joins the vertical face of the bank) could be stabilised against erosive flows using dense brash bundle installation (retained with fencing wire attached to steel pins or expansion bolts according to nature of the stream bed). Alternatively (spate flows allowing) a sloping gravel reject toe could be used to the same ends. A mixture of both techniques would provide a nice range of habitat and should be considered.

4.0 Making it Happen

Due to the urban development surrounding the Black Lynn Burn considered in this report, there is a critical requirement to obtain all the required written permissions. The first requirement will be a consent from SEPA to acknowledge that there are no untoward flood risk implications associated with the proposed works.

Of equal importance will be the establishment of ownership (and subsequent obtaining of permissions) to make the required alterations to the stream bed as well as the low weir at the top of the inspected reach.

The WTT funding and communications officer (Denise Ashton; dashton@wildtrout.org) can offer assistance in strategies to raise any funds that may be required to undertake recommended works. Depending upon availability, it may be possible to complete some of these works as part of a "Practical Visit" (PV) training event. Please bear in mind that demand for PVs is high and the availability of funding and staff will determine the WTT's capacity to run these events.

5.0 Acknowledgement

The WTT gratefully acknowledges the funding support provided by the Fishmongers' Company that enabled this visit and report to be completed.

6.0 Disclaimer

This report is produced for guidance only and should not be used as a substitute for full professional advice. 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.