Cheselbourne Stream, Cheselbourne, Dorset

Wild Trout Trust report following an Advisory Visit on 6 November 2019

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Introduction

This report is the output of a visit undertaken by Theo Pike of the Wild Trout Trust on approximately 2km of the Cheselbourne Stream in Cheselbourne, Dorset. A walkover of the site was requested by local residents and the Farming & Wildlife Advisory Group (FWAG). The visit was particularly focused on the urbanised areas of the Cheselbourne catchment, assessing habitat for wild brown trout *(Salmo trutta),* minor fish species, and biodiversity in general.

Comments in this report are based on observations on the day of the site visit and discussions with local residents. 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.

Figure 1: Map showing the location of the Cheselbourne stream in Cheselbourne

Catchment overview

The Cheselbourne Stream (also known simply as the Cheselbourne) in Dorset is the principal tributary of the Devils Brook, which in turn flows into the lower River Piddle. From here, the Piddle flows towards Poole Harbour.

The Cheselbourne does not appear to be classified separately from the Devils Brook for the purposes of the Water Framework Directive (WFD: the scheme currently used to assess the Ecological Status and Ecological Potential of our surface waterbodies in Britain), so data for the Devils Brook is included in the table below:

River	Cheselbourne Stream
Waterbody Name	Devil's Brook
Waterbody ID	GB108044010130
Management Catchment	Poole Harbour Rivers
River Basin District	South West
Current Ecological Quality	Bad (as at 2016)
U/S Grid Ref inspected	ST 75967 00174
D/S Grid Ref inspected	SY 76561 99049
Length of river inspected	2km approx

Table 1: WFD information for the Cheselbourne.

The Cheselbourne rises from chalk springs near Ansty, and flows south down a fairly steep-sided valley to meet the Devils Brook at Dewlish. The spring line village of Cheselbourne is established approximately halfway down the course of the stream. Local tradition suggests that the settlement was originally located on the ridge or hillside, south west of St Martin's Church, until the arrival of plague in the 14th century. The presence of 'plague pits' on the upper slopes of Church Field, possibly still marked by thick patches of nettles, means that this area has remained undeveloped, and the village is now spread out along the valley floor.

The etymology of the name Cheselbourne offers clues to its natural characteristics: 'chesel' apparently meaning 'gravelly' (cognate to 'Chesil beach') and 'bourne' referring to a winterbourne component of its chalkstream hydrology. Indeed, the stream now behaves very largely as a winterbourne, drying seasonally in most reaches when the level of water in the underlying chalk aquifer drops below a particular level. Local residents suggest that this winterbourne behaviour has been accentuated by abstraction from boreholes for agricultural and domestic water supply, causing the stream to dry more quickly in areas where it might previously have maintained a more enduring or even perennial flow. Possibly as a result of faulting in layers of chalk, exacerbated by abstraction, the stretch of stream between Cheselbourne and Dewlish appears particularly prone to early drying. EA geomorphologist John Phillips notes that the whole Devils Brook catchment is hydrologically complex, and notorious as a 'losing river' which tends to lose surface water back to groundwater as it flows downstream, rather than gaining water along its course in accordance with more usual river hydrology (John Phillips, pers. comm. to Nick Lawrence, November 2019).

Chalk streams like the Devils Brook and Cheselbourne are globally rare, with more than 80% of the world's total in the south and east of England. Fed from calcareous groundwater aquifers, the headwaters of these rivers are characterised by clear alkaline water, flowing year-round at a consistent temperature of about 10 deg C. This promotes characteristic plant communities, often dominated in mid-channel by water crowfoot and starwort, and along the margins by watercress and lesser water-parsnip.

In their natural state, chalkstreams have low banks, allowing water to spill easily into their floodplains: such lateral connectivity has traditionally been exploited by re-engineering into water meadows, which allowed early farmers to flood low-lying grassland to protect it from frost, and promote an 'early bite' for grazing livestock.

Due to their ephemeral flow, which is naturally governed by seasonal cycles of depletion and recharge, winterbourne reaches of chalk streams contain an even more specialised ecology of plants and animals which are adapted to periodic drying – for instance, the mayfly *Paraleptophlebia werneri*, which is typically found in winterbournes, due to its eggs' ability to survive periodic droughts, and the freshwater shrimp *Gammarus pulex* which may retreat deep into the permanently wet gravels of the stream's hyporheic zone (the region of porous sediment below the stream's surface flow, where groundwater and surface water interact). However, in stretches of river which are not naturally winterbournes, it is important to remember that anthropogenic drying as a result of human activities may cause problems or even local extinction for species which have not evolved to cope with such extremes of flow variation.

A further interesting feature of the Cheselbourne valley's hydrology is the presence of a natural subterranean channel, locally known as 'the underground river' which flows at around 25 metres (80 feet) below ground level, and is intercepted by at least one historic well (at approximately SY 76268 99824):

"When workmen were building an extension at Meyden Revel and capping off an old well, they found an underground river 80 feet down. This had a very strong flow on it - so strong that when they lowered a large log into it tied to a rope the flow was so strong they they couldn't pull it back up! There are two other wells at Meyden Revel: one towards the middle of the garden and one just outside the gate by Little Revel, which it is said access this river.

The underground river doesn't appear to be a diffuse water table due to the speed of flow. It isn't old engineering, at that depth there is nothing that we can think of, especially in a village that historically has only been very rural. It can't be heard or seen from above. Jackie Turner - house one upstream from Meyden Revel - says that the underground river runs through her property and can be followed by dowsing. She also has a well half in and half out of her house." (pers. comm. Sue Crabb, Jan 2020)

Other wells in the village include Hayes Cottage, which is monitored by the Environment Agency: local reports suggest that these rarely or never ran dry until abstraction increased in recent years.

Apart from slow percolation through soft chalk, water is generally thought to move through chalk aquifers along seams of flint: such a seam of flint may have been the origin of this underground river, with further erosion and dissolution of the chalk enlarging the channel over time. However, the specifics of water movement through most chalk aquifers is not well understood, and it would be fascinating to research Cheselbourne's 'underground river' further, perhaps with dye tracing, to work out where its water might eventually emerge at the surface.

At the other extreme, it is understood that the Cheselbourne catchment can also react very quickly to heavy rainfall, and most of the modern village occupies the valley floor, with locally steep gradients not commonly associated with chalkstream catchments. Increasing hard surfaces such as roads, private driveways and roofs will also promote runoff rather than infiltration of rain or melting snow, and numerous pinch points such as bridges and culverts make certain areas prone to flooding.

Particularly in light of climate change, with rainfall events likely to become increasingly intense and persistent, restoration plans for the Cheselbourne should prioritise 'making space for water' at all levels of aquifer charge and stream flow.

Under WFD, the Devils Brook catchment (including the Cheselbourne stream) is classified as 'not designated artificial or heavily modified'. This classification for the wider catchment understates the actual levels of historic modification which are evident on the Cheselbourne, particularly through the village, where many typical pressures of urbanisation were evident during the walkover survey. This means that having avoided classification as a 'Heavily Modified Water Body' (HMWB) under WFD, the Cheselbourne is subject to the target of 'Good Ecological Status' in spite of the clear urban pressures upon it: a more ambitious target than 'Good Ecological Potential' which is usual for urban HMWBs.

According to the EA's data, reasons for the Devil's Brook classification at 'Bad' Ecological Status include groundwater abstraction and land drainage structures (while fish passage and agricultural diffuse pollution issues are also evident on the ground). It is discouraging to note that the whole Devils Brook waterbody declined to 'Bad' status in 2016, having been classified as 'Good' in previous years, but this reclassification should be seen as a positive driver for improvement in the whole waterbody. A further policy driver for improving the ecological status of this catchment may be the current efforts to reduce excess nitrate levels in Poole Harbour.

Further details of the Devils Brook's WFD classifications can be found at:

https://environment.data.gov.uk/catchment-planning/WaterBody/GB108044010130

Other areas of the Devils Brook and Piddle catchments support healthy populations of fish, including trout, and it would be reasonable to suggest that a range of fish species might be able to thrive in the Cheselbourne if water quantity, water quality, fish passage and habitat issues were successfully addressed.

Thanks to their need for clean, well-oxygenated water, structurally-varied habitat and free movement between different types of habitat at different life stages, the UK's native wild brown trout makes an ideal indicator species for healthy rivers. These characteristics mean that a simple and effective assessment for river health can be based around the life cycle requirements of brown trout – and most of these factors will apply equally well to other kinds of river wildlife.

As a result, identifying and noting the presence or absence of habitat features that allow trout to complete their full life cycle is a very practical way to assess overall habitat quality (Fig.2). By identifying the gaps (i.e. where crucial habitat is lacking: Figs. 3-5), it is often possible to design actions to solve those habitat bottlenecks.

Even where there is little or no chance of wild trout colonising a stream, those requirements for structurally varied habitat, diverse vegetation and clean water are all good yardsticks for assessing its general health.

This means it is useful to examine a stream like the Cheselbourne for habitat bottlenecks that would prevent self-sustaining trout populations from existing.

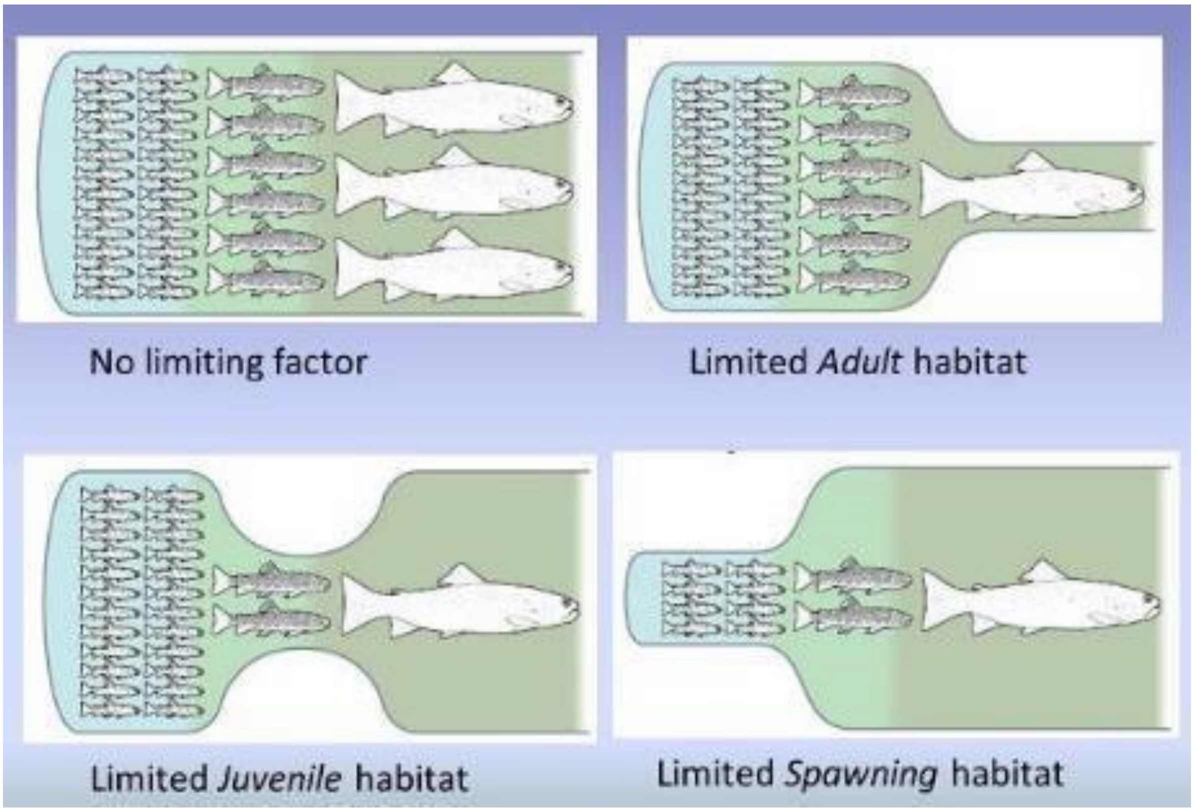

Figure 2: The impacts on trout populations lacking adequate habitat for key life cycle stages. Spawning trout require loose gravel with a good flow-through of oxygenated water. Juvenile trout need shallow water with plenty of diverse structure for protection against predators and wash-out during spates. Adult trout need deeper pools (usually > 30cm depth) with nearby structural cover such as undercut boulders, sunken trees/tree limbs and/or low overhanging cover (ideally trailing on, or at least within 30cm of, the water's surface). Excellent quality in one or two out of the three crucial habitats may still not be able to make up for a 'weak link' in the remaining critical habitat.

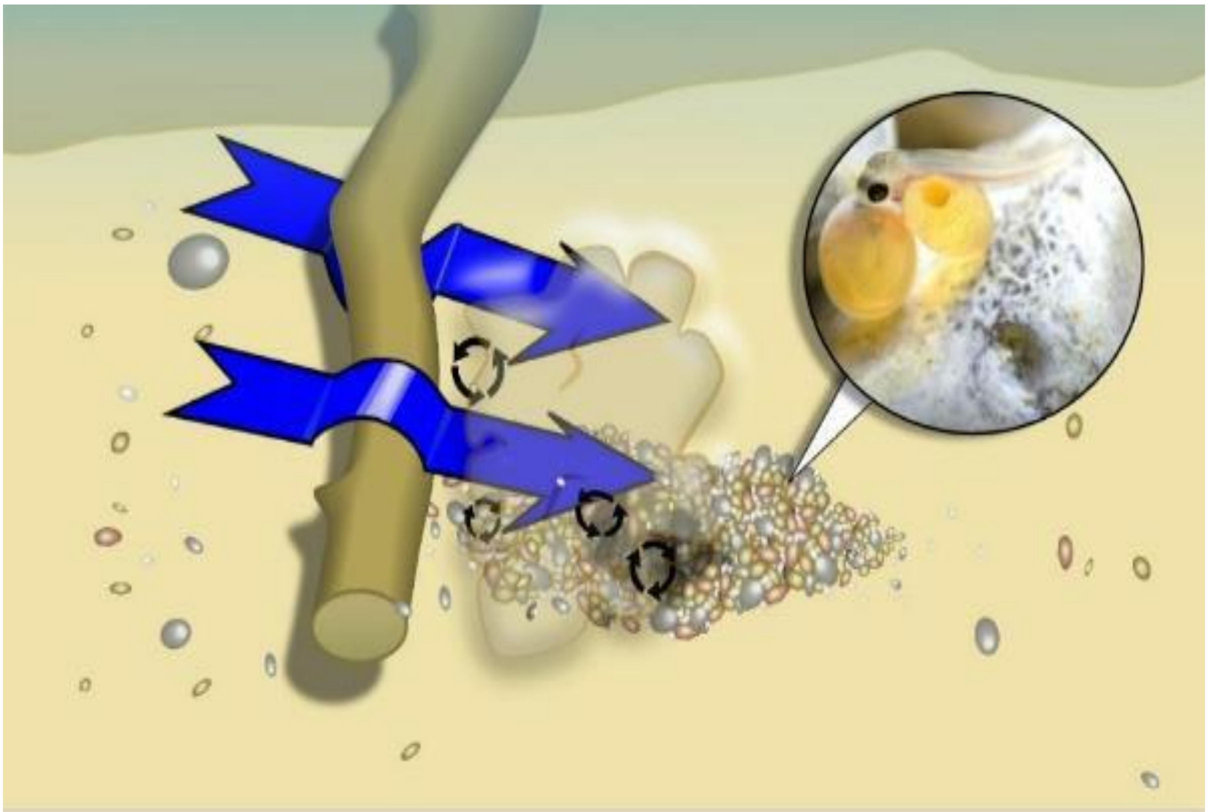

Figure 3: Features associated with successful trout spawning habitat include the presence of relatively silt-free gravels. Here, the action of a fallen tree limb is focusing the flows (both under and over the limb as indicated by the blue arrows) on a small area of river bed that results in silt being washed out from between gravel grains. A small mound of gravel is deposited just below the hollow scoured out by focused flows: this mound will be selected by trout to dig a 'redd' for spawning In the silt-free gaps between the grains of gravel it is possible for sufficient oxygen-rich water to flow over the developing eggs and newly-hatched 'alevins' to keep them alive as they hide within the gravel mound (inset) until emerging in spring.

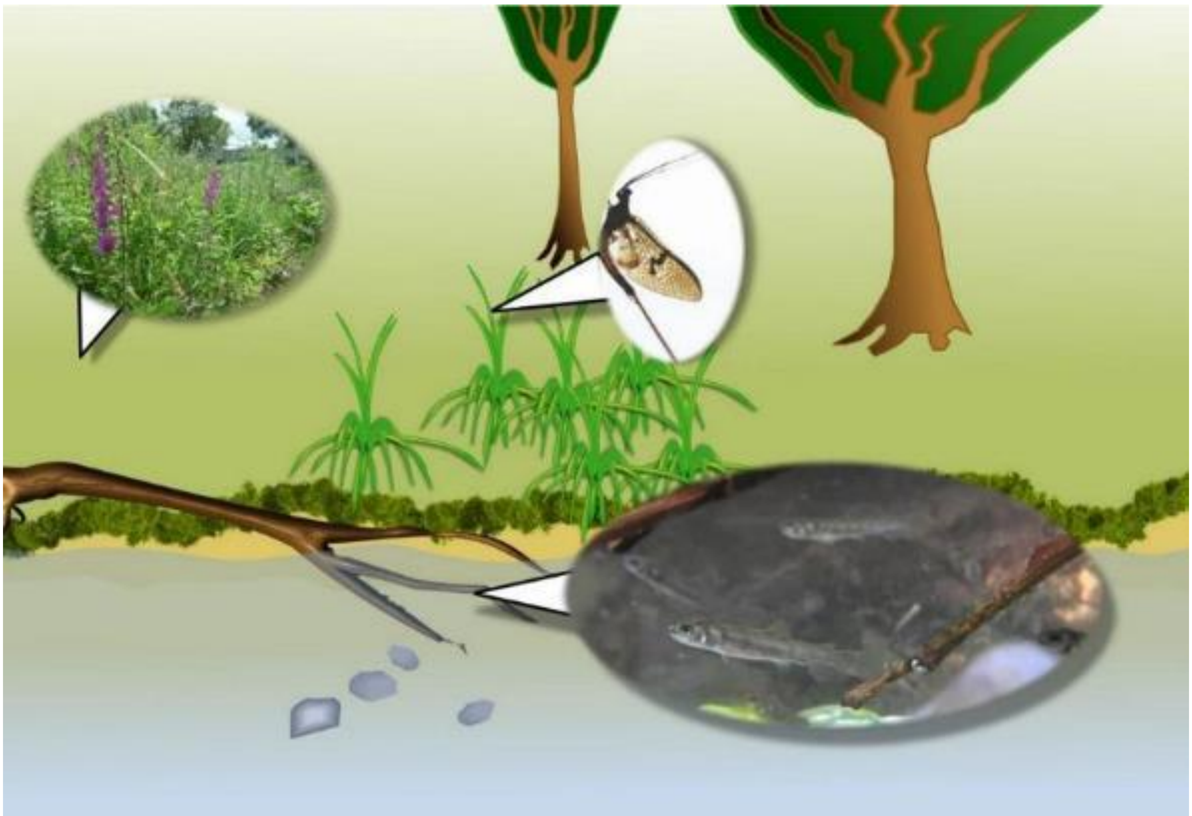

Figure 4: Larger cobbles and submerged ‘brashy’ cover and/or exposed fronds of tree roots provide vital cover from predation and spate flows to tiny juvenile fish in shallower water (<30cm deep). Trailing, overhanging vegetation also provides a similar function, and has many benefits for invertebrate populations (some of which will provide a ready food supply for the juvenile fish).

Figure 5: The availability of deeper water bolt holes (>30cm), low overhanging cover and/or larger submerged structures such as boulders, fallen trees, large root-wads etc. close to a good food supply (e.g. below a riffle in this case) are all strong components of adult trout habitat requirements.

To put all this into context, there are three types of habitat that are needed for wild trout to complete each one of the three key life cycle stages. These requirements create a demand for varied habitat, which is vital for supporting a wide variety of species.

With these broad descriptions of the elements of spawning, juvenile (nursery) and adult trout habitat in mind, measures to address the issues identified during the survey can more easily be described.

Overall, the Cheselbourne exhibits a relatively unusual mixture of urban modifications (hard banks, culverts, impoundments and fish passage issues) with rural water quality pressures (agricultural and road runoff). The next section of this report will explore these in more detail.

Habitat assessment

For the purposes of this report, the stretches of the Cheselbourne assessed will be described from the upstream to the downstream extent visited.

At the upstream limit of this visit, around ST 75967 00174, the Cheselbourne flows around the grounds of an old cottage. Partly due to lack of traditional garden maintenance, the stream has been allowed to go quite wild and natural in this area, with a diversity of plants such as sedge and watercress in the margins.

A similarly 'less-manicured' stretch of stream can also be found further downstream, alongside the village school's sports pitch, at approximately ST 76075 00025:

Figure 6: Complex habitat and biodiversity: this stretch of the Cheselbourne offers habitat for many different species

These areas could be seen as near-target conditions for other stretches of the Cheselbourne: rich in macrophytes which are 'reservoirs' for biodiversity, which offer excellent complex habitat for many species of aquatic invertebrates and even fish. The hydrological 'roughness' of the vegetation will also serve to 'slow the flow' very valuably in both high and low water conditions, contributing to flood attenuation for downstream areas on one hand, and maintaining summer water levels on the other.

It is essential to recognise that, however 'messy' such areas may appear at first glance, this 'messiness' provides many more habitat niches for different species, and is far more beneficial for birds, fish and insects, than hard banksides or tightly mown lawn turf extending right to the water's edge.

Supplementary planting of attractive and iconic native plants such as marsh marigold, purple loosestrife, water forget-me-not, water mint, flowering rush, meadowsweet, hemp agrimony and gypsywort, if these are not already present, could also add extra visual appeal for visitors throughout the year.

When winterbourne flows drop away completely, it is important not to remove native plants from the bed of the stream, as these will revive when flows return. Overall maintenance of the banks and channel of the stream should ideally be very light touch, perhaps restricted to occasional strimming to prevent vigorous plants like sedges from establishing dominance, and ensuring that most areas do not become over-shaded by fast-growing trees like willow.

Trees can provide important areas of cool-shade refuge, helping to mitigate the impact of direct sunlight on slow-moving water in a small stream, which would be beneficial for fish of all species. However, trees can also shade out important low-level vegetation in and around the channel, and it is generally accepted that dappled shade and sunlight, in an approximately 60:40 ratio, is ideal to promote cool water temperatures as well as a healthy diversity of riparian plants. In order to achieve this, a light touch regime of tree management, through coppicing and supplementary planting, could be initiated in order to establish and maintain structural diversity. If possible, it is generally beneficial to have low-level tree shading over deeper, slowly-flowing reaches, and sunlight penetrating faster-flowing riffle sections, where more aquatic plants are likely to grow, and more of the stream's aquatic invertebrates live.

At ST 76027 00103, where the stream emerges from a culvert under a crossroads in a residential area, and approaches Cheselbourne Village School, the stream bed is covered in a large volume of fine sediment, including a variety of small stone chippings which are distinctly different from the typical flint gravel of this area's chalk geology:

Figure 3: Uncharacteristic fine sediment on the bed of the stream at ST 76027 00103

Further investigation upstream suggests that this sediment is a mixture of road runoff down the hill from Drakes Lane, and limestone top dressing from residential driveways, all carried into the stream by a concrete channel from the crossroads to the downstream end of the culvert:

Figure 4: Pollution pathways into the Cheselbourne: fine sediment and possible evidence of leaking heating oil

Such large volumes of fine sediment are likely to be very damaging to a small stream like the Cheselbourne: smothering aquatic invertebrates and fish eggs, filling interstices between the stream's natural gravels, and contributing to streambed 'calcretion' as the fine sediments are concreted together by the action of calcium-rich water on silt, creating a uniform layer of tufa on the stream bed. By accumulating in the stream in close proximity to residential properties, the sediment may also increase flood risk.

For all of these reasons, this sediment pathway into the Cheselbourne should be addressed as a matter of some urgency. This could include encouraging local residents to take action against losing the top dressing from their driveways – this could include installing a 'lip' to retain the gravel, along the boundary line where the private driveway meets the public highway.

Also noticeable in this area (and visible in Figures 3 and 4 above) are pipes from nearby properties, which are clearly designed to overspill into the stream. Although no smell was evident at the time of the walkover, the black stain below the pipe in Figure 4 suggests the possibility of heating oil escaping from a cracked line and reaching the stream via surface water drainage. Further investigation would be advised.

A few metres further downstream, the Cheselbourne flows under the main road, and then under an access road to the Village Hall, in a sequence of double pipe culverts:

Figure 5: Double pipe culverts represent an obstacle to fish passage as well as a local flood risk. (However, the soft and natural bank, rich with pendulous sedge, is very beneficial to this stretch of stream)

Structures like this (which are also present at several other locations in the village) are likely to constitute an obstacle to fish passage, since fish may not willingly swim through long, dark tunnels. These culverts are also noted for increasing flood risk when the relatively small-diameter pipes become blocked with waterborne twigs, leaves and vegetation like watercress when these become dislodged and are carried downstream.

Even small water bodies like the Cheselbourne naturally convey quite considerable volumes of these kinds of 'coarse woody material', which promotes natural silt-scouring processes, and contributes nutrients for invertebrates like caddis and shrimp. On the other hand, with the increased risk of flooding, if pipe culverts like these become blocked, local residents are understandably less likely to tolerate the presence of beneficial woody material and vegetation in the stream. In an ideal world, with the likelihood of intense rainfall ever increasing as a result of climate change, it would be prudent to investigate replacing these pinch-point pipes with single-span culverts or bridges, or even breaking them out completely (for instance, where the stream flows under Robins Gardens at SY 76266 99675). In all of these cases, increasing conveyance and 'making space for water' is likely to dramatically reduce the risk of flooding.

As the stream flows through an area of rough meadow at ST 76099 00009, with a fairly steep slope rising from the LB, it is noticeable that silt is being deposited in the margins on both sides of the stream, and consolidated by the roots of emergent plants, while the gravels in the central channel (where the current runs faster) are scoured clean and silt free:

Figure 6: A healthy, natural stretch of stream, with lateral silt deposition being consolidated by a range of plant species, and a silt-free central channel

This is a beneficial natural process, whereby the stream is accommodating itself to available flows, and should be encouraged. Over time, the silty margins will consolidate: in the meantime, any attempt to remove the marginal plants should be avoided, as this will mobilise silt back into the central gravels, destabilise the new banks, and rob the stream of this vital habitat that connects aquatic and terrestrial habitats. Many aquatic insects, for example, live in the marginal vegetation as juveniles, and climb up it when they emerge into the air as adult flies.

It is understood that this area of floodplain and steeply sloping meadow, from the Village Hall downstream, has recently received planning permission for infill development with residential properties. If not managed sensitively, this presents a considerable risk to the Cheselbourne: additional proliferation of hard surfaces such as roofs, driveways and access roads will reduce infiltration of rainfall and increase flashy runoff into the valley floor, and inevitably into the stream. Every effort should be made to persuade the developers to incorporate sustainable drainage solutions (SuDS) into the design and construction of the new properties, including permeable paving, green roofs and swales or other soakaways. During and after construction, the stream banks should also be allowed to remain naturally ‘messy’ and unmanicured, leaving as wide an ecological corridor as possible along both banks. Care will also need to be taken during construction, to eliminate the possibility of silty runoff from the building site.

Downstream of this area, the stream runs into an area of private gardens, where some areas of bank host lush growths of hart’s tongue and other ferns. This soft, trailing marginal growth offers very beneficial low-level cover for fish and other aquatic species:

Figure 7: Soft, trailing vegetation offers beneficial low cover above a cleanly-scoured corner pool

In more formal areas of these gardens, the stream’s banks have been hardened with ornamental flint walls. The rough surfaces of the flints offer more varied and natural habitat structure than laminar concrete or 'concrete sandbag' construction, but softening with ferns and other suitable macrophytes (as above) would be beneficial.

At approximately SY 76272 99770, it was noticed that the stream's banks had been armoured with toe-boards of recycled railway sleepers:

Figure 8: Repurposed railway sleepers can be a significant source of long term chronic pollution as tar-based preservatives leach out into the stream

Railway sleepers have customarily been treated with preservative hydrocarbons such as creosote or tar. When sleepers are repurposed as toe-boards, the toxic hydrocarbons can leach out into the water for many years, with damaging effects on invertebrates. It would be highly advisable to remove these toe-boards as soon as possible, and use brush bundles to restore a soft margin of native plants (in conjunction with tree management to allow enough light for the plants to establish successfully).

At different points in these gardens, at approximately SY 76198 99900 and SY 76267 99783, the stream has been fragmented by ornamental weirs, perhaps in an attempt to retain water as a feature during periods of low flow:

Figures 9 and 10: Ornamental weirs act as a barrier to fish passage and interrupt the stream's natural processes

Such weirs create long stretches of very slowly-moving water, where sediment carried in suspension drops out of the water column uniformly across the stream bed, and habitat quality and diversity are severely degraded. Such conditions can sometimes provide sufficient deep water habitat for small numbers of adult trout and other species (until the deep water inevitably fills with sediment) but are generally unsuitable for gravel spawning fish, fry and juveniles.

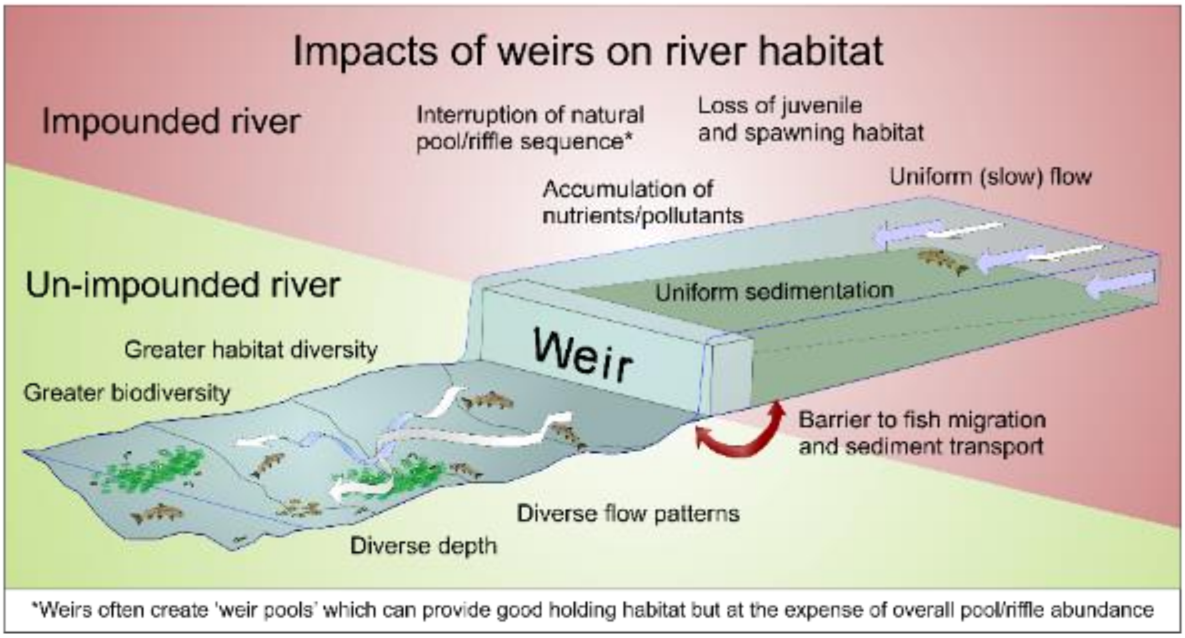

Figure 11: An illustration showing the impacts of weirs on habitat quality

Weirs are often significant barriers – or even complete obstacles – to fish passage, preventing many species from moving up and down rivers freely to fulfil the different stages of their life cycles. Weirs also interrupt the natural transport of river sediment. This can cause the river downstream to become depleted of coarse sediment, and increase rates of bed and bank erosion in an attempt to compensate for the interrupted supply of suitable gravel and cobbles.

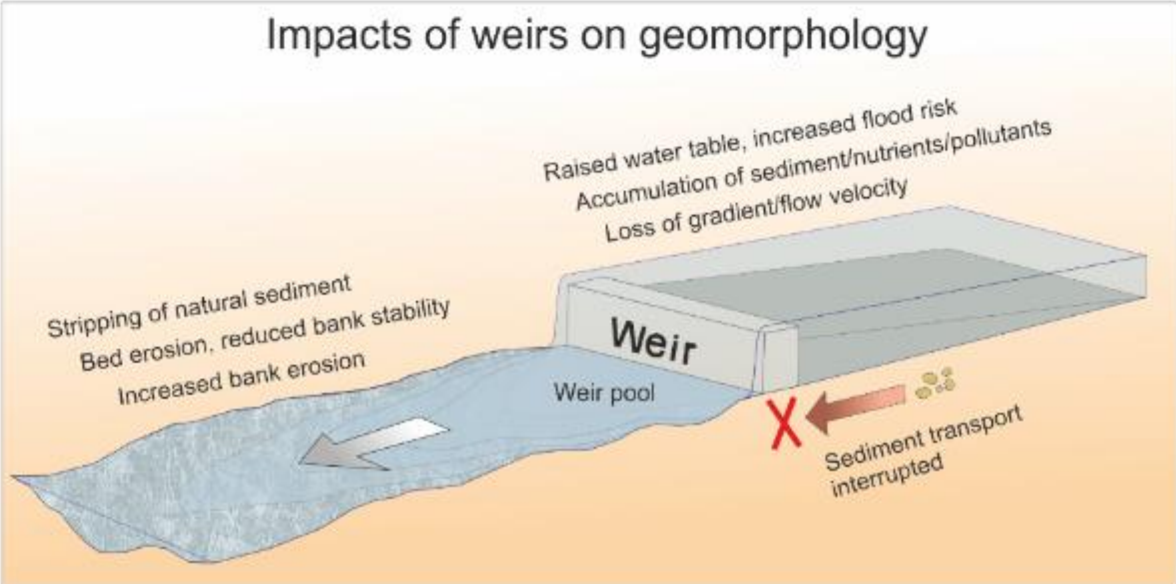

Figure 12: An illustration showing the impacts of weirs on river geomorphology

Proceeding downstream, the Cheselbourne passes under the main road once again, and enters another area of private gardens where its course has been straightened and its banks hardened with courses of 'concrete sandbags':

Figure 13: 'Concrete sandbag' flood walls provide very little visual interest or habitat diversity for insects, birds and fish

In general, stretches like this would benefit immensely from lowering and renaturalising the hard banks. However, in this particular area, where one of the artificial banks is supporting an access track, it may be more realistic to create a soft, green toe in the water at the foot of the sandbags to mask the bank, with plantings of iris, sedge and similar emergent plants.

In this area, it is likely that the high, hardened banks have also been necessitated by increased flood risk created by a hydrological throttle just downstream: a double pipe culvert, approximately 50 m long, under Robins Garden at SY 76264 99678:

Figure 14: The upstream end of the culvert under Robins Garden: undersized pipe culverts create flood risk for nearby properties, and could be broken out to make more space for water in this urbanised landscape

Figure 15: A view of the Robins Garden access and parking area constructed over the top of the culvert itself

According to local residents, the upstream end of this culvert is very prone to becoming blocked by coarse woody debris. As per the discussion above, strong consideration should be given to enlarging the under-capacity pipes to a single span box culvert - or preferably daylighting it completely to reduce flood risk by making space for water again in this urbanised landscape.

At the downstream end of the culvert, a strong sewage smell was noticeable, suggesting pollution from a misconnection into the culvert from a nearby property. Misconnections occur when sinks, lavatories or washing machines are mistakenly connected to surface water drainage systems, instead of the foul water sewer. Tracing the source of such chronic pollution can be a time-consuming task for water companies, but it can make a tangible difference to the chemical and biological health of a small stream like the Cheselbourne. To set this process in motion, any suspicion of pollution from a misconnection (or any other source) should be reported to the Environment Agency’s hotline on 0800 80 70 60.

Below Robins Garden, the stream breaks out of the culverts and takes an apparently natural course across Church Field at SY 76267 99620:

Figure 16: The Cheselbourne in Church Field: potentially an area for natural flood management interventions, as well as fencing to exclude livestock from the stream banks to prevent poaching and overgrazing. Similar NFM or remeandering work could also be considered in areas not visited in the course of this survey: for instance, just above the school, and between the Manor House and its withy beds.

Heavy growth of nettles along the banks indicates nutrient enrichment: this area might benefit from careful mowing and collection of cuttings, to reduce the nettles' dominance and encourage other wetland plant species.

Some thoughtful tree planting, to approach the 60:40 shade to light ratio discussed above, would be beneficial and help to maintain some areas of open water in high summer. It would also be worth investigating opportunities for natural flood management (NFM) in this locality, to increase infiltration and reduce flood risk to properties downstream - where a short stretch of the stream has been straightened and perched above its natural line of flow at the lowest point of the valley floor to make space for access tracks for houses and farm buildings. Indeed, it is likely that the original tracks in this area took deliberate advantage of the winterbourne's gravel bed as a naturally metalled surface:

Figure 17: Approaching the ford at SY 76452 99345, possibly along an earlier course of the stream (which now appears slightly perched above the valley floor)

At SY 76452 99345 (and at several other points in and around the village, including SY 76245 99866 and SY 76383 99410) the stream is crossed by a ford. Most such fords in this valley are accessed by steep lanes or tracks which run straight down the valley's sides, serving as sediment pathways channelling runoff (including road washings) directly into the Cheselbourne.

As a result of increasingly heavy farm machinery and associated transport, with tyres which not only carry soil out of fields but also erode the verges of narrow country lanes, the volume of silt pollution from this runoff is clearly very considerable.

Figure 18: A typical sediment pathway into the Cheselbourne, running straight downhill from the main valley road into a ford

In the case of the ford at SY 76452 99345 as shown in Figure 17, the runoff from the main road is also being piped directly into the stream from a gully pot uphill on the road at SY 76524 99392. This sediment pathway should be urgently intercepted: for example, by breaking out the pipe into an engineered wetland in the verge along the hedge line, or redirecting the flow into a soakaway in the adjacent field.

A further source of sediment is present at SY 76452 99345, in the form of runoff from an adjacent stable complex, as shown in Figure 19 below. With a mixture of manure and heavily poached mud entering the steam, this may be in breach of Defra’s Farming Rules for Water. The potential impacts of horse culture on streams and rivers (including runoff, bank poaching, soil compaction and over-grazing) are not as widely recognised as those from other farming activities: in this case, engaging with the landowner to discuss options such as permeable paving in a bunded area, plus proper separation of foul and rain water, could be very beneficial:

Figure 19: A source of agricultural pollution from a stable complex adjacent to the Cheselbourne stream

It is likely that much of the resulting sediment is captured by an online pond in the adjacent property: however, this is also causing the pond to silt up more rapidly, necessitating more frequent maintenance by the landowner:

Figure 20: An online pond which is currently acting as a trap for sediment inputs from upstream

No fish passage issues, apart from a temporary fine mesh fence, were noted at the lower end of the pond - although the remains of a sluice gate suggest that an impounding structure may once have been present.

Beyond this point, the Cheselbourne flows through the gardens of several separate properties. In general, its course appears to have been moved to the edge of each property at some past point in history: in some areas this was apparent from eroding vertical faces on the RB. Controlled erosion on the outside of bends is part of a natural stream's processes, liberating new gravels previously laid down in its floodplain, but more general erosion along a failing bankline is likely to deposit damaging amounts of silt into the stream.

Both banks were also heavily mown: such a monoculture of short, shallow-rooted grass can do very little to bind stream banks or support biodiversity. If making more space for the stream on the LB is not possible in this area, stabilising the RB by planting native shrubs such as hawthorn along the bank top, with associated planting of iris and other emergent plants along the bank toe, is suggested. Reed canary grass will also grow out from the toe of the bank in slightly deeper water than iris or sedge, but is less likely to invade mid channel areas than burr reed or club rush. This diversity of plants, with their varied root depths, will help to stabilise the stream banks:

Figure 21: Eroding vertical banks suggest that the Cheselbourne has been moved some distance from its natural course, perhaps across the middle of the garden

Where water courses like the Cheselbourne run through residential areas, a very common problem is disposal of lawn clippings and other garden waste on the banks of the stream. Lawn clippings are notorious for their high biological oxygen demand (BOD) when they decompose in water: in such a small stream, this could have a significant deoxygenating effect, threatening fish and invertebrates. As such, garden waste should always be allowed to compost well away from waterways of all kinds.

Overall, a more relaxed mowing and/or strimming regime is recommended throughout Cheselbourne village's gardens – allowing a fringe of native plants to develop along both banks, stabilising the soil, reducing erosion, and creating attractive wild areas. In practice, this would also have the benefit of reducing the burden of garden maintenance for riparian owners!

At the end of the gardens, the stream reaches a farmyard where it is heavily overshaded by a stand of Leylandii conifers. Such overshading renders the affected stretch of stream completely unproductive in ecological terms: ideally, these trees would be removed or very significantly reduced in height and extent.

Beyond the farm buildings, the stream continues to follow the boundary lines of the next field. At SY 76549 99103 (pictured below) two large water 'tanks' were observed, with an ancillary structure which may be an automated pump house, perhaps corresponding to an abstraction borehole whose details are available via this link:

http://scans.bgs.ac.uk/sobi_scans/boreholes/441019/images/10778151.html

Figure 22: A possible borehole site at SY 76549 99103: below this location, flow in the Cheselbourne had virtually disappeared at the time of this walkover

At the time of the visit, the base flow of the Cheselbourne appeared drastically reduced from this point downstream – suggesting either that the area's complex geology is 'sinking' the flow into subterranean channels and cracks in the chalk, or that the cone of depression from an abstraction borehole, such as the one noted above, is similarly taking the water from the surface.

By SY 76559 99042, the furthest downstream point of this walkover, the flow of the stream had virtually disappeared. However, a further sediment pathway into the stream bed was noted from a bridge and farm track off the main valley road:

Figure 23: A further sediment pathway from a farm bridge and track at SY 76559 99042

Recommendations

In order for the Cheselbourne Stream at Cheselbourne to achieve its full potential for biodiversity and good quality habitat, capable of supporting healthy, self-sustaining populations of fish including wild brown trout, the following actions are recommended:

1: Water quantity

As noted above, the catchment of the Cheselbourne and Devils Brook is hydrologically complex, and has clearly been heavily impacted by increasing borehole abstraction in recent years. It is also understood that 'losing' areas of the stream may have been created by landowners digging online ponds in an attempt to hold back more water in dry periods, but inadvertently creating sinks which lose water back into the depleted aquifer.

Generally speaking, in a healthy chalk stream system, free exchange of ground and surface water should take place through loose and uncompacted gravels on the stream bed – with surface flows increasing and decreasing according to water levels of the underlying aquifer. These loose and uncompacted gravels also provide essential habitat for aquatic insects and early life stages of many species of fish.

When streambed gravels become compacted and calcreted, this system is interrupted. For this reason, it is advisable to keep the surface layers of gravel loose and silt-free wherever possible – breaking up calcretion with garden forks and rakes, and recreating a naturally sinuous, self-cleaning line of flow in the channel which should scour itself clean of silt. This will also create a diversity of different habitats, even within very short lengths of channel.

Underpinning these actions, however, is the wider need to slow and reverse the ever-growing use of water in the water-stressed south of England, where chalk aquifers provide naturally purified and low-cost water for private abstractors and water companies alike. Engaging with local abstractors to reduce or relocate borehole abstraction points away from particularly vulnerable catchments like the Cheselbourne should be a long-term aspiration: for example, Wessex Water has already made significant investments in water transfer pipes in this area:

https://www.salisburyjournal.co.uk/news/15986988.work-on-pipeline-to-secure-city-water-supply-nearing-completion/

Thames Water has also recently constructed a pipeline to reduce abstraction from the Og and Kennet catchments:

https://wwtonline.co.uk/news/completed-pipeline-reduces-abstraction-on-river-kennet

In the meantime, a local 'wise water use' campaign could be very valuable in raising awareness and decreasing local domestic consumption. Local water supply companies are likely to support such community initiatives, including providing free water saving devices to give away at community events. In the Cheselbourne area, the relevant water supplier is Bristol Water (based on indicative postcode DT2 7NJ):

https://www.water.org.uk/advice-for-customers/find-your-supplier/

At the other end of the scale, Cheselbourne village could become more resilient to high flows by implementing natural flood management (NFM) initiatives, including remeandering the stream (or making it more possible for it to overtop its banks into the floodplain for flood storage and infiltration purposes) in selected areas above or even within the village, such as Church Field.

2: Water quality

The Cheselbourne is very vulnerable to agricultural runoff flowing into the river via steep lanes towards fords, and gully pots with pipes directed to the stream. In built up areas of the village, such as near ST 75997 00127, where no additional space exists for intercepting swales or soakaways, it might be possible to install specially-commissioned 'Downstream Defender' silt traps to intercept fine sediment inputs (although it should also be realised that the cost of such an intervention is likely to be significant, in the region of £10,000 plus installation).

In less built up locations, simple cross drains (or even slightly diagonal 'speed humps') could be installed across tracks and lanes to redirect runoff towards soakaways in fields or wooded areas, or into engineered wetlands or reed beds along existing ditch lines. In all of these cases, the objective would be to 'slow the flow' and channel it to other infiltration or sediment-depositing areas before it reaches the Cheselbourne.

Water quality in small streams can also be heavily impacted by misconnections and malfunctioning domestic sewage systems. All can be readily identified by unpleasant odours, and sometimes coloured discharges or even sanitary products in the water downstream. Small stream flows are often insufficient to mitigate such inputs by dilution, so it is very important for local people to be vigilant to such problems, and report all suspicions to the Environment Agency as soon as possible on 0800 80 70 60.

Figure 24: Downstream Defender hydrodynamic vortex chamber silt traps, originally designed for very high volumes of motorway runoff, being installed to intercept sediment in surface water drains near the River Wandle in south London (Photos: SERT)

3: Bank and stream bed management

Stretches of the Cheselbourne such as that near ST 76075 00025 (pictured in Figure 6) could be seen as near-target conditions for other stretches of the stream - with soft, natural, well-vegetated banks that offer excellent complex habitat for many species, and 'slow the flow' of water very valuably in a range of water conditions.

In areas where the banks of the stream have been hardened with 'concrete sandbags' and other forms of armouring, consideration should be given to breaking these out partially or completely, or at least softening them with a soft green toe of marginal planting, such as staggered stands of iris and watercress, to recreate a sinuous, meandering channel between the hard walls. Low level berms of gravel or loose flints could also be used to define this naturally self-scouring low flow channel: these are likely to consolidate with silt over time. The Wild Trout Trust has recently advised on similar restoration work on the East Meon, a small chalkstream in a village in Hampshire:

Figure 25: The River Meon in East Meon: an example of a small chalkstream before restoration, in an open culvert through a village similar to Cheselbourne

Figure 26: The River Meon in East Meon, during restoration by local residents, with guidance from the Wild Trout Trust

Figure 27: The River Meon in East Meon, with softened banks after restoration. Water voles have now been seen in this stretch – once a sterile stone and concrete drain!

Where the banks are softer, over-zealous mowing regimes should be relaxed where possible, allowing a fringe of native waterside plants to flourish – providing overhead cover for fish, and habitat for aquatic insects, as well as improved bank erosion controls. Natural assemblages of wild British waterside flowers are culturally iconic and very attractive: indeed iris, water crowfoot, water forget-me-not, water mint and purple loosestrife all feature in Millais's pre-Raphaelite painting 'Ophelia', which was painted from life on a small chalkstream near London:

Figure 28: Millais's 'Ophelia' was painted from life on the banks of the Hogsmill chalkstream, and is regarded by ecologists as a portrait of a perfect, diverse assemblage of native chalkstream species

In the event that the Cheselbourne's channel does become clogged with plant growth, especially when flows are low, limited vegetation clearance may be undertaken. This would best be done in the lowest flow conditions, prioritising removal of terrestrial plants like brambles, and designed to recreate a sinuous central channel to focus available flows and maximise ecological benefit when flows return. In any case, such works should be undertaken outside bird nesting season, i.e. not between February and August.

During the walkover, no water crowfoot was observed in the Cheselbourne: it is possible that it has been eradicated by over-drying of the channel, and consideration (subject to the caveat below) could be given to re-introducing it from elsewhere in the catchment.

Especially in small chalkstreams, ranunculus and watercress have a valuable and complementary role in maintaining flows. Ranunculus is most abundant in spring and early summer, before flowering and dying back, at which point watercress proliferates, holding up water levels until the first frosts, and flows are naturally boosted again by autumn rain and recharging aquifers. Even on a stream with winterbourne characteristics, it may well be worth attempting to recreate this highly evolved and beneficial dynamic.

However, this suggestion comes with the caveat that, once established, water crowfoot can raise water levels (and thus flood risk) quite considerably, and may require significant management through the summer months.

Although this walkover took place in late autumn, when invasive plant species are likely to be less apparent, it was very encouraging not to see any sign of the 'big three': Himalayan balsam, Japanese knotweed and giant hogweed. However, all three are spreading across the British Isles, and residents of Cheselbourne are strongly encouraged to be vigilant against their possible arrival, and take quick action to eradicate them in the local area if necessary.

For more information about these and other invasive non-native species in general, see Theo Pike's 'Pocket Guide to Balsam Bashing' (Merlin Unwin Books): www.merlinunwin.co.uk/balsambashing

4: Barriers: pipe culverts

Fish of many species need to be able to migrate between different areas of habitat to complete their life cycles successfully, and pipe culverts such as those in the village of Cheselbourne represent a significant barrier to this behaviour: the fast, laminar flow within the pipes is very difficult for fish to swim against, and they may not be inclined to swim up long, dark pipes.

Even more urgently for local residents, undersized pipe culverts can easily become blocked by debris swept downstream in higher flows, creating sudden flood risks for nearby properties.

For all of these reasons, it would be worth considering how to make more space for water in Cheselbourne: converting the village's culverts to clear-span box culverts where the stream passes under roads, or even breaking them out completely (or redirecting the stream to bypass them) in areas such as Robins Garden at SY 76264 99678. Alternatively, a compromise solution might involve removing the culvert pipes, renaturalising the stream bed with gravel, and bridging key areas for residents' access. Consideration could also be given to re-covering the channel area with industrial grating: this would allow residential traffic to pass overhead while still letting some light into the culvert for ecological benefit.

5: Barriers: weirs

As noted above, weirs prevent fish from migrating within streams and rivers, whilst also degrading habitat by impounding fine sediment in the slow water above the structure.

It would undoubtedly benefit the stream's natural function to reduce or remove the weirs at SY 76198 99900 and SY 76267 99783, regrading the bed of the stream through the head loss in each case, possibly with nature-like rock ramps. At the same time, hard sided channel walls above and below each structure could also be reduced or softened.

Figure 29: A nature-like rock ramp, constructed to replace a redundant weir on a small side channel of the River Wandle

6: Other possible projects

Mayfly in the Classroom

A healthy stream near a village school can provide a very valuable teaching resource for local children (as well as adults!). Mayfly in the Classroom is the Wild Trout Trust's flagship education programme, which aims to connect school children to their local river habitats by using the lifecycle of mayflies to teach them about the broader themes of biodiversity, ecology and the links between aquatic and terrestrial biodiversity.

The project involves setting up a series of small oxygenated 'tanks', using recycled plastic drinks bottles and inexpensive aerators. Mayfly or other aquatic invertebrate larvae are collected from a local stream or river, reared and studied by the kids until the insects hatch, and finally released back into the wild.

Mayfly in the Classroom is aimed at Years 4 – 6 (but has also been run in secondary school settings) and can be linked to specific Key Stages of the National Curriculum. Experience shows that it's a very effective way to engage children with their local river by tapping into their fascination with mini-beasts.

For more information and downloadable guidelines, please visit:

https://www.wildtrout.org/content/mayfly-classroom

Water vole reintroduction

Water voles are an iconic species whose populations have fallen dramatically across the British Isles, largely as a result of predation by non-native American mink. It is understood that the Cheselbourne catchment was invaded by mink when they were released from a nearby fur farm a number of years ago, but none have been seen recently.

A potentially hugely engaging community project could be designed around the aspiration to reintroduce water voles to the Cheselbourne stream. The first stages of this project would involve monitoring for mink, and trapping them if necessary, according to GWCT guidelines:

https://www.gwct.org.uk/advisory/guides/mink-raft-guidelines/

Further advice, including sources of water voles, may be obtained from Dorset Wildlife Trust.

Making it happen

The creation of any structures within most rivers or within 8m of the channel boundary (which may be the top of the flood-plain in some cases) normally require a formal Environmental Permit from the Environment Agency. This enables the EA to assess possible flood risk, and also 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 EA 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

A focused Trout in the Town Urban River Toolkit is available at:

https://www.wildtrout.org/content/trout-town

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.

Acknowledgement

The Wild Trout Trust would like to thank the Environment Agency for their continued support of the Advisory Visit service.

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