Galmington Stream, Taunton

An Advisory Visit Report by the Wild Trout Trust

Contents

Introduction

This report is the output of an advisory visit carried out on the Galmington Stream tributary of the River Tone in Taunton, Somerset - national grid reference (NGR) ST206233 to ST221246. The visit was requested by Miriam Woolnaugh of Somerset Wildlife Trust, and was focussed on assessing the quality of the stream habitat and identifying possible habitat enhancement opportunities. Comments in this report are based on observations on the day of the site visit and discussions with Dr Katie Sumner and Francis Farr-Cox of the Environment Agency.

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

The section of Galmington brook visited has only recently been designated as *Main River* by the Environment Agency and has not been assigned a Water Framework Directive (WFD) status.

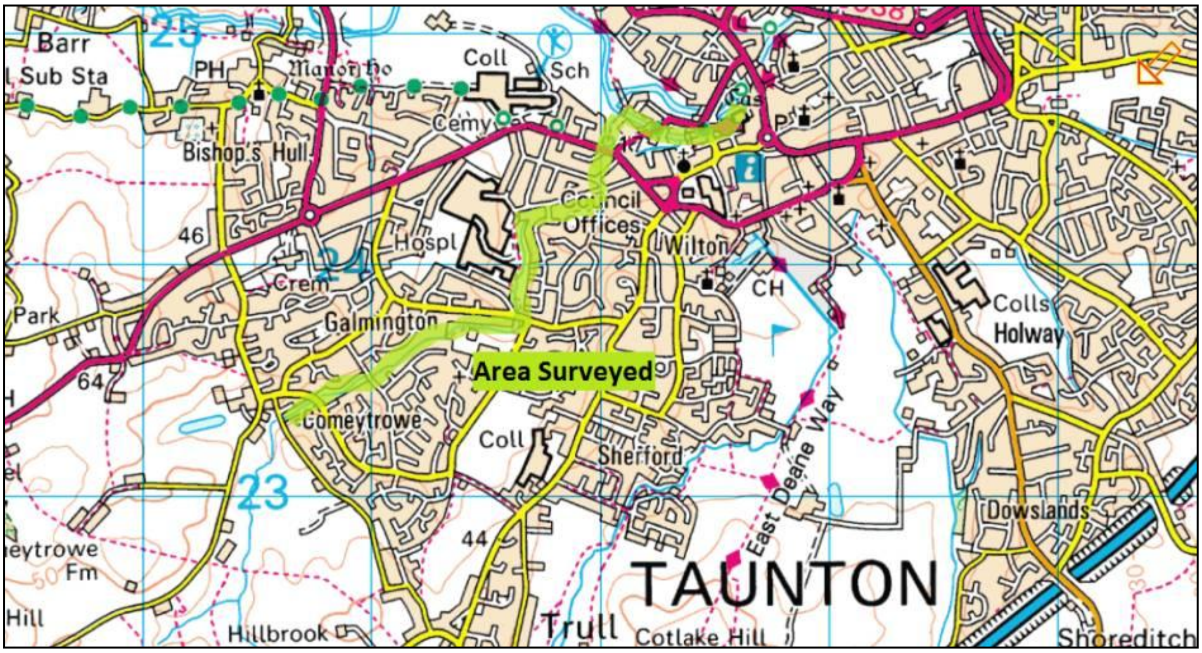

Figure 1: Map showing the section of Galmington Stream visited

Catchment and Fishery overview

Galmington Stream flows over a superficial diamicton-colluvium geology i.e. a wide range of non-sorted sand and stone sediment suspended in a mud matrix that has collected in the stream valley. The underlying mudstone formation of the area is largely impermeable, which contributes to the ~~reactiveness of the stream and the~~ relatively short lag-time between periods of rainfall and spate flows.

The bed of the stream consists of sandy sediment and a wide size range of cobbles and gravels. Throughout much of the stream, brick rubble and other urban debris also litter the bed and further diversify the size and shape of bed material.

The stream has a relatively steep gradient and subsequently active geomorphology. It cuts a meandering path where erosional and depositional processes have been allowed to occur naturally. However, as the stream flows through more urbanised areas of Taunton, the stream banks are more-heavily engineered and the channel follows a more controlled path.

Recent development within the floodplain of the Tone have been mitigated by creating compensatory online floodplain storage on the upper Galmington Stream and controlling peak flows through the more urbanised reaches downstream.

Habitat Assessment

The walk-over assessment commenced on the outskirts of Taunton at Comeytrowe Road. Here the Galmington Stream flows through the South Taunton Streams Local Nature Reserve (LNR). Through the reserve, the stream flows through a wide river corridor. The upper banks are vegetated with a mixture of grass species and populated by willows *(Salix spp.)* alder *(Alnus glutinosa)*, and hazel *(Corylus spp.)*. The lower banks support marginal plants such as hemlock water dropwort *(Oenanthe crocata)*, great willow herb *(Epilobium hirsutum)* and sedges *(Carex spp.)* that compete for space against terrestrial nettles *(Urtica dioica)* and ivy *(Hedera helix)*.

On the outside bank of meanders in the stream, natural erosion has led to undercutting of the banks, causing rotational slumps. As a result, grassy sections of upper bank have slid into the river and been transported a short distance before being deposited on the inside bends of meanders downstream. This has in places created small, grassy shelves at the toe of the bank. In other places, depositional processes have created small, muddy gravel shoals that have become colonised by beds of fools watercress *(Apium nodiflorum)*.

Figure 2: Fools cress growing in-channel

The active geomorphology and wide river corridor allows the river to cut a naturally meandering path through the valley and helps the stream to self-regulate appropriate dimensions for the volume of water flowing through the system. The meandering nature of the stream and active transport of bed material has also created a natural pool-riffle sequence. Deep pools provide holding habitat for adult flow-loving fish species whilst gravel riffles provide potential spawning habitat and refuge for juveniles and small fish such as bullhead *(Cottus gobio)*.

Figure 3: A balance of erosion and deposition maintain channel width

Figure 4: Pool and riffle habitat

The root systems of bankside trees play an important role in forming meanders and have helped to protect steeper sections of bank from lateral erosional forces and promoting locally-increased depth via vertical scour. The bankside trees also shade the channel, keeping the stream cool and protecting its inhabitants from overheating in summer months.

Figure 5: Shade from riparian trees

Whilst shade is a vital component of the stream ecosystem, too much shade can limit macrophyte growth and reduce productivity. Recent research published by the Environment Agency recommends a roughly 50:50 ratio of shade to direct sunlight in order to protect species such as brown trout *(Salmo trutta)* from the potential impacts of climate change whilst also maintaining productivity and biodiversity.

Throughout much of the stream corridor, the canopies of trees on either bank have grown across the narrow channel to form an almost unbroken tunnel of shade. This *tunnelling* is inhibiting the growth of aquatic and marginal plants and has resulted in bare soil banks in many locations. Banks deprived of vegetation are prone to increased rates of erosion.

Figure 6: Too much shade can lead to bare soil and increased rates of erosion

At ST207234, a concrete throttle structure controls peak flows downstream and acts to temporarily store floodwater within the stream corridor. This flood management technique requires riparian land upstream to remain undeveloped. The LNR designation has also helped ensure that the stream and its banks are protected for the benefit of wildlife.

Figure 7: A throttle structure holds excess flood water upstream

As the stream flows alongside residential properties, some residents have attempted their own make-shift erosion repairs. These mostly consist of vertical structures that not only fail to abate the erosion but may actually be accelerating the process by further reducing opportunities for marginal plants to establish and increasing scour by focussing flows. Consequently, the exposed soil is washed away at the toe and behind the structure, and the banks continue to slip into the river.

Figure 8: a DIY revetment may actually be accelerating erosion

Along the back of properties on Galmington Drive, erosional processes that have helped shape the natural channel form upstream are halted by concrete and stone revetments on the LB. Fortunately, large stones/blocks have rolled into the channel and deflected flows to scour a pool-riffle sequence along the bed.

Figure 9: Rubble from dilapidated hard-engineered bank revetments helping to scour a pool and riffle

This scouring process, combined with the cover and flow variation provided roots of riparian trees intruding into the channel, has retained a relatively high-level of habitat diversity along the engineered reach. In several locations, brambles creep over the concrete to hang down into the stream providing marginal cover where the concrete revetments inhibit the establishment of marginal plants.

However, some sections of hard engineering have straightened the channel to such an extent that the habitat has become homogenous. Here the stream would benefit from the introduction of some simple in-stream structure (i.e. woody debris, tree kickers or flow deflectors) to help diversify habitat conditions.

Figure 10: Straightened, engineered banks result in homogenous habitat conditions and poor biodiversity

Near Bishop Henderson's Primary School, a large tree branch was observed wedged across the channel and collecting smaller pieces of woody debris to form a 'debris dam'. The river appears to have scoured a pool under the dam and the dam does not appear to be impounding flows. The volume of trapped woody material suggests that the stream receives a significant steady supply of woody debris from the bankside trees upstream. Woody debris is a vital component of the river ecosystem. It is an important food source for invertebrates and helps to increase flow diversity, which in turn improves the geomorphology for the stream, leading to increased habitat diversity.

Figure 11: A 'debris dam' highlights the volume of woody debris entering the stream

On the upstream side of the debris dam, a mass of white foam had accumulated. Foam on the water can occur entirely naturally as organic compounds from decaying debris break the surface tension allowing bubbles to form. However, accumulations of foam could also be indicative of elevated phosphate concentrations, possibly from sewerage effluent.

A number of small outfalls drain into the stream. In urban environments, misconnections between foul sewers and surface water sewers can often cause contaminated water to drain directly into urban streams. There is at present very little available water quality information for Galmington Stream.

Nearby, a small drainage ditch runs through Comeytrowe Neighbourhood Park. Emergent and marginal plants including meadowsweet *(Filipendula ulmaria)*, branched bur-reed *(Sparganium erectum),* and water mint *(Mentha aquatica)* are present in abundance where the banks are exposed to direct sunlight. This highlights the potential for marginal plants to establish where bank gradient and light conditions are suitable.

Figure 12: Meadowseet *(Filipendula ulmaria)* growing in open sunlight

Near Musgrove Park Hospital, a water main runs below the stream bed. The exposed surface of the main was not a barrier to fish passage on the day of the visit but could be an obstruction during exceptionally low-flow conditions.

Figure 13: Water main running through the riverbed

Downstream of the hospital, the stream banks appear to be walled. Much of the stream is heavily over-shaded but where sunlight is able to penetrate, some marginal plants are growing in depositional areas.

Figure 14: Tall and steep banks

Figure 15: Growth in the margins where sunlight penetrates through to the bed

The stream runs between private residential properties and is inaccessible until it re-emerges alongside Parkfield Drive, at the junction of Parkfield Road. Here the stream is impounded by a pipeline set into a concrete weir. Upstream of the structure the habitat is degraded and the bed has become smothered with sediment as flows are backed-up and solids drop out of suspension. A dense bed of bur-reed *(Sparganium sp.)* has established and the stream resembles a still-water habitat, as opposed to a fast-flowing stream. The weir is a complete barrier to fish passage, preventing fish in the River Tone downstream from accessing the Galmington Stream upstream of this location.

Figure 16: A ~~complete~~ barrier to fish passage fragments the stream habitat

Downstream of the weir the channel is heavily engineered and canalised. A secondary high-flow channel takes excess flood water along a temporary channel parallel to Castle Street. This channel was not observed during the visit but is reported to be frequented by otters.

Just upstream of the A38 stream crossing, a patch of Japanese knotweed *(Fallopia japonica)* has sprouted from the stone wall on the LB. This was the only alien invasive species observed on the Galmington Stream on the day of the visit. Options should be explored to remove it in order to prevent it spreading.

Figure 17: Japanese knotweed will need to be controlled

Downstream of the A38, the stream flows into an old mill leat known as the Mill Stream. The leat runs parallel to the River Tone, joining upstream above French Weir and downstream near The Museum of Somerset.

At the upstream confluence, flow enters the leat via a hatch control structure known locally as the 'barrier wall'. Adjacent to the barrier wall a small weir structure discharges into the Tone. This structure allows the Mill Stream to discharge into the Tone from either end, effectively allowing the Mill Stream to flow in both directions to quickly drain the Galmington and Sherford catchments during high flows.

French Weir is impassable for fish. A stepped fish pass structure has been constructed on the left hand side of the weir but was not operational. The fish pass functions when boards are dropped into position to raise water level in a series of steps. None of the boards were in position on the day of the visit.

Figure 18: French Weir is impassable to fish

Figure 19: Fish pass not in operation

At the downstream confluence, a series of small weirs are major barriers to fish passage in most flow conditions, but may be passable during high flows. Fish passage into the Mill Stream from the Tone could be improved by the removal or alteration of the weirs.

Figure 20: One in a series of weirs at the downstream confluence of the Mill Stream and Tone

Figure 21: A series of small weirs can be a serious energy drain for fish

A couple of small trout were observed in the leat and at the lower reach of Galmington Stream (below the pipeline weir) suggesting that trout are able to access the leat under certain flow conditions. However, the cumulative effect of even the most passable of structures can seriously deplete the number of fish that successfully migrate upstream.

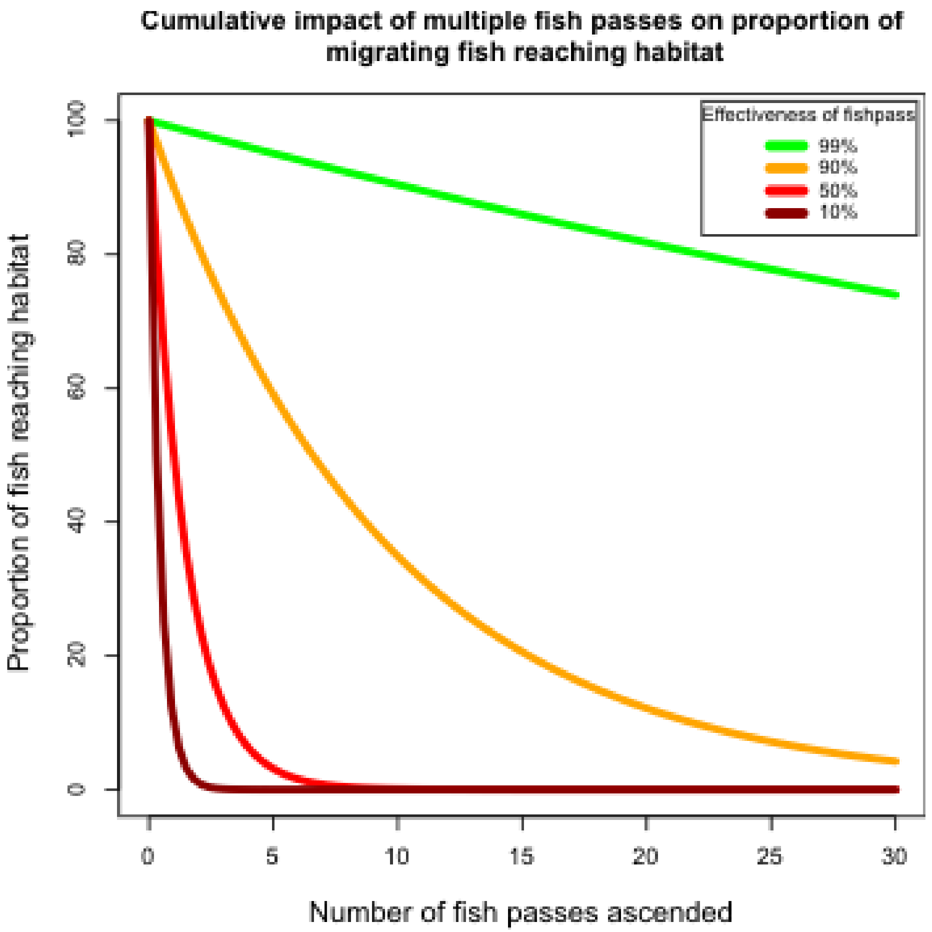

Figure 22: Graph showing the cumulative effect of multiple obstacles to fish passage on upstream migration (courtesy of Dr E Shaw, Catchment Science Centre, University of Sheffield).

Fish passage is a major bottleneck preventing the Galmington Stream from achieving its full potential as a habitat for wild brown trout and other flow-loving fish species.

Conclusion

Galmington Stream has great potential as a habitat capable of supporting flow-loving fish species. In the upper reaches, the relatively steep gradient and unmanaged river corridor ensure that natural morphological processes maintain a physically diverse habitat. An abundance of woody debris throughout the system further diversifies flow patterns and also provides food for invertebrates and shelter for fish. The productivity of the ecosystem could be boosted by allowing slightly more direct sunlight onto the stream to encourage a broad range of marginal and aquatic plants to establish throughout the stream and banks.

At present, barriers to fish passage prevent fish from the Tone from fully utilising the Galmington Stream. In particular, the upper reaches of the stream where natural gravel riffles present valuable opportunities for spawning.

Fish passage and habitat improvements would benefit the whole stream ecosystem and could help support threatened species such as otters and kingfishers.

Recommendations

In order for the Galmington Stream to reach its full potential as a healthy and biodiverse habitat, the following actions are recommended:

1. Investigations should be carried out to ascertain current water quality in Galmington Stream. Simple kick-sampling invertebrate surveys following the Biological monitoring working party (BMWP) scoring system should give a good indication of overall water quality.
   http://www.fba.org.uk/recorders/publications_resources/sampling-protocols/contentParagraph/01/document/CourseInvertSamplingProtocol.pdf

   http://www.cies.staffs.ac.uk/bmwptabl.htm

BMWP score	Category	Interpretation
0-10	Very poor	Heavily polluted
11-40	Poor	Polluted or impacted
41-70	Moderate	Moderately impacted
71-100	Good	Clean but slightly impacted
>100	Very good	Unpolluted, unimpacted

   In order to reduce the effects of human error (i.e. differences in sample size, sampling effort and efficiency), the Average Score Per Taxon (ASPT) should also be taken into consideration. This is obtained by dividing the BMWP score by the total number of taxa (families) in the sample.

Average Score Per Taxa	Category
Over 5.4	Very good
4.81 – 5.4	Good
4.21 – 4.8	Fair
3.61 – 4.2	Poor
3.6 or less	Very poor

Riverfly Partnership training may be beneficial to aid with identification and understanding of stream invertebrates, their life-cycles, position in the food web and sensitivities to water quality

http://www.riverflies.org/

2. The major barrier to fish passage near the junction of Parkfield Drive and Parkfield Road needs to be addressed. Options to re-route the pipeline and remove the weir, or to at least ease fish passage over the obstruction should be explored with the Environment Agency. The free passage of fish is a key requirement of the Water Framework Directive (WFD).

3. The downstream confluence of the Mill Stream and the River Tone should also be improved for fish passage as this appears to be the main access to the Mill Stream for fish populations in the River Tone. The ideal solution would involve the complete removal of the weirs. If however, this option proves impractical (for flood defence purposes etc.); it may be possible to remove approximately ¼ of each weir at alternating ends, using the remnants of the weirs as mid-points for rocky point-bar berms that would improve channel structure between the weirs (Figure 23).

At the very least, the option of cutting deep notches into the weirs should be explored in order to improve fish passage without affecting the flow regime of the Mill Stream (Figure 24). Notches should be cut as low as possible so as to avoid the requirement for a jump and with an appropriate width to maintain a suitable depth of water and flow velocity for fish passage.

Figure 23: An illustration of the existing weirs with 1/4 removed and the remainder used as mid-points for berms (white areas) to re-shape the channel

Figure 24: An illustration of simple notches that could be cut into the weirs (blue arrows indicate a smooth-flowing column of water).

4. Fish passage over French Weir may have an impact on fish passage into the Mill Stream if fish can drop down through the hatches at the 'barrier wall'. The current operational status of the French Weir fish pass should be investigated with the Environment Agency.

5. Through the over-shaded sections of the stream, selective tree works should be undertaken to create a dappled mosaic of light conditions with an approximate 50:50 ratio of shade to direct sunlight.

Tunnelling tree branches should be cut back in a few spot locations to create occasional south-facing skylights and selected riparian trees should be coppiced or pollarded to create occasional areas of sunlit bank. Sunlight should be focussed over shallow riffles and shallow-gradient banks in order to encourage aquatic and marginal plant growth.

Creating and maintaining optimum light conditions over a small stream can be a challenge. It is important not to be overzealous with tree works and to resist the temptation to pollard bankside trees to a uniform height. A rotational programme of tree management should be established whereby an uneven age and size structure is maintained throughout the river corridor in order to maintain variation in light conditions throughout the day.

A 5 year rotational programme of tree works is recommended with the aim of maintaining a diverse range of light conditions over the water.

6. Some of the heavily-engineered sections of the stream would benefit from the introduction of some fixed LWD to introduce some physical diversity into the homogenous habitat. Thick branches from the proposed tree works could be pinned to the bed to promote localised scour and create a more sinuous channel form.

Figure 25: An example of LWD root wads positioned in-channel to diversify flow patterns

7. The Japanese knotweed should be treated in order to prevent it spreading. JK is sensitive to a range of herbicides and the most effective time to apply herbicides is in late summer. The best method of treatment is stem injection by an NPTC qualified person. Permission will be required from the Environment Agency to use herbicides near the stream.

Making it Happen

There is the possibility that the WTT could help to start a project via a Practical Visit (PV). PV's typically comprise a 1-3 day visit where approved WTT 'Wet-Work' experts will complete a demonstration plot on the site to be restored

This will enable project leaders and teams 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 PV leader.

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 WTT would like to thank the Environment Agency for supporting the advisory and practical visit programmes.

Disclaimer

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