



Advisory Visit  
Little Ouse River, Thetford  
June 2018



Undertaken by Rob Mungovan

## Key findings

- Juvenile brown trout (parr) habitat is generally limited. The shallow channels running around the Coffee Mill present opportunities for parr habitat enhancement and could form the basis of a project with the Wild Trout Trust, through its Trout in the Town programme (see <http://www.wildtrout.org/content/trout-town>).
- Obstructions to fish passage exist at the Coffee Mill, the Thetford no.1 staunch and the Abbey Heath gauging station.
- Throughout the town and downstream along the riverside path, hard revetments shore up the banks. These hard structures severely limit habitat potential. Measures could be put in place to increase the fish holding capacity of these hard-bank reaches such as the placement of hazel faggot bundles topped with pre-planted coir rolls.
- Fallen trees should be retained within the river wherever possible. If they present a flood risk, or a hindrance to navigation, then they can be moved if necessary and securely pinned to the bank.
- There is great potential to use tree-hinging and tree-staking to provide a **management approach to the town's existing tall tree stock**. This would remove the risk of uncontrolled trees falling into the river and would allow a strategic approach to be taken regarding riparian trees.
- Tree management should seek to retain trailing branches at water level. Where trees need to be reduced in height on safety grounds, consideration should be had to utilising the material for habitat enhancement work.
- The natural, fully tree-lined reaches downstream of the town should be preserved.
- The invasive non-native plant, giant hogweed, was present on the Island and should be eradicated.

## 1.0 Introduction

This report is the output of a site visit undertaken by Rob Mungovan of the Wild Trout Trust to the River Lt Ouse on 6<sup>th</sup> June 2018. Comments in this report are based on observations on the day of the site visit.

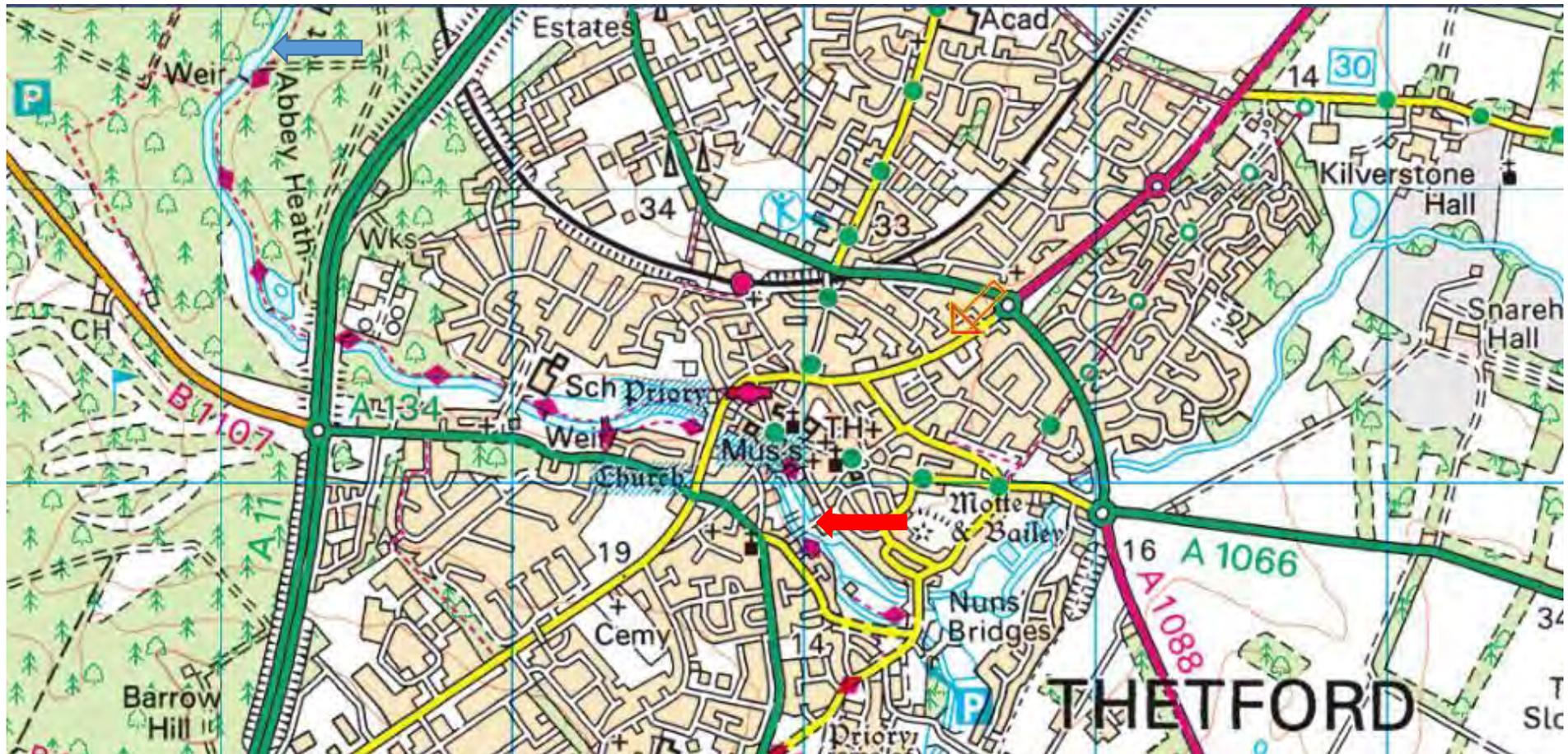
Normal convention is applied throughout the report with respect to bank identification, i.e. the banks are designated left hand bank (LB) or right hand bank (RB) whilst looking downstream.

The visit was undertaken at the request of Tina Cunnel, Clerk to Thetford Town Council. The Town Council does not own any of the river. Much of the banks are controlled by Breckland District Council (who are aware of this visit taking place).

## 2.0 Catchment Overview

Thetford is ~27km from the source of the Lt Ouse (near to Redgrave and Lopham Fen National Nature Reserve) and ~42 km from its confluence with the River Great Ouse at Brandon Creek. Flowing in a westerly direction, the Lt Ouse is joined by a number of small tributary streams, many of which are little more than field drains. The most notable tributaries are the Broomhill Stream, the Black Bourn and the River Thet. As the Lt Ouse enters the fenland landscape, it crosses over the Cut-Off Channel (a drainage channel into which the Lt Ouse can also discharge in high flow periods).

The Lt Ouse rises within the South Norfolk and High Suffolk Claylands but the reach visited is within the Brecks National Character Area. The underlying chalk geology has produced a low, gently undulating plateau, largely covered with sandy soils of glacial origin. The Brecks is located between more fertile clayland plateaus to the north, east and south, and drained peat and silt fens to the west. The Brecks is within the warmest and driest part of England. This aspect, combined with its free-draining soils, has greatly influenced the landscape character and led to the development of dry heath and grassland communities. Agricultural advances have enabled the dry, low-fertility soils to be farmed and the area is now a major producer of vegetables and cereals, with many fields requiring irrigation. To the immediate west of Thetford is Thetford Forest. The Forest is the largest lowland pine forest in Britain covering over 19,000 ha. The Scots pine was the initial choice for planting but this was superseded by Corsican pine. Douglas fir and larch were also planted along with hardwood species including oak and beech. The creation of the forest destroyed much of the typical Breckland environment of gorse and sandy ridges. However, the habitats within the Forest are now of national and European importance.



Map 1 - Location of the Lt Ouse at Thetford, Norfolk. Red arrow is upstream limit and blue arrow is downstream limit. Scale 1:50,000, 1 grid square = 1 km<sup>2</sup>, © Ordnance Survey.



Map 2 – Key locations and a close-up view of the Lt Ouse at Thetford.  
 Red arrow is upstream limit and blue arrow is downstream limit.  
 © Ordnance Survey.

	Little Ouse River
River	Little Ouse
Waterbody Name	Little Ouse River
Waterbody ID	<b>GB105033043400</b>
Management Catchment	Cam and Ely Ouse
River Basin District	Anglian
Current Ecological Quality	Overall classification of Moderate potential for the 2016 cycle
U/S Grid Ref inspected	TL 8704682858
D/S Grid Ref inspected	TL 8514484435
Length of river inspected	~3200m in total

Table 1 – data from <http://environment.data.gov.uk/catchment-planning/WaterBody/GB105033043400>

Tables 1 and 2 summarise the environmental data collected for Water Framework Directive (WFD) assessment of the Lt Ouse, which is designated as a Heavily Modified Waterbody. In the last (2016) assessment cycle, it **was classified 'moderate' ecological potential**. Parameters that make up this **overall classification include 'moderate' for fish (down from "good" in 2014), 'high' for invertebrates (up from "good" in 2014), and 'good' for chemical parameters**, with the poorest scoring parameters driving the overall classification.

High phosphate levels are known to be a pressure acting upon the river and Reasons for Not Achieving Good status (RNAG) are specified as sewage discharge (point source, continuous) and poor nutrient management (diffuse source). High nutrient loading combined with a modified channel form places pressure upon the river and may lead to low dissolved oxygen concentrations, which in turn may affect the distribution of fish, especially salmonids. **RNAG are also given as 'physical modification' resulting from recreation, flood protection and land drainage**. These factors hugely impact **upon the river's natural form and would require very significant investment to address** given the low-lying setting of the river at the edge of fenland. Furthermore, there is also an interest in maintaining the **river's amenity value for boating** in order to bring about economic regeneration for the

town. Thus removing impoundments and water control structures may not be achievable at the present time.

Classification Item		2013	2014	2015	2016
▼	<b>Overall Water Body</b>	Moderate	Moderate	Moderate	Moderate
▼	Ecological	Moderate	Moderate	Moderate	Moderate
▶	Supporting elements (Surface Water)	Moderate	Moderate	Moderate	Moderate
▼	Biological quality elements	Good	Good	Moderate	Moderate
	Fish	Good	Good	<u>Moderate</u>	Moderate
	Invertebrates	Good	High	High	High
▶	Hydromorphological Supporting Elements	Supports Good			
▶	Physico-chemical quality elements	Moderate	Moderate	Moderate	Moderate
▶	Specific pollutants	High	High	High	
▼	Chemical	Good	Good	Good	Good
▶	Priority substances	Good	Good	Does not require assessment	Does not require assessment
▶	Other Pollutants	Does not require assessment			
▶	Priority hazardous substances	Good	Good	Does not require assessment	Does not require assessment

Table 2 – data from <http://environment.data.gov.uk/catchment-planning/WaterBody/GB105033043400>

There are currently no angling clubs present on the reach visited. It is reported that occasional angling does take place throughout the town but it is unregulated. However, no problems associated with angling have been reported to Thetford Town Council nor Breckland District Council. There are no known records of the river having been stocked with trout at the site in question.

The predominant riparian land use within Thetford is public amenity with small parks, riverside paths and formal seating areas. A public footpath is present along the river for the entirety of the reach inspected.

Downstream of Thetford there are extensive areas of wetland/reed bed habitat which provide important floodplain habitats. There is also a large sewage treatment works which discharges to the river.

Set-back from the river the land use is a mix of forestry (particularly relevant being on the edge of Thetford Forest) and open grassland, wetlands and occasional private gardens.

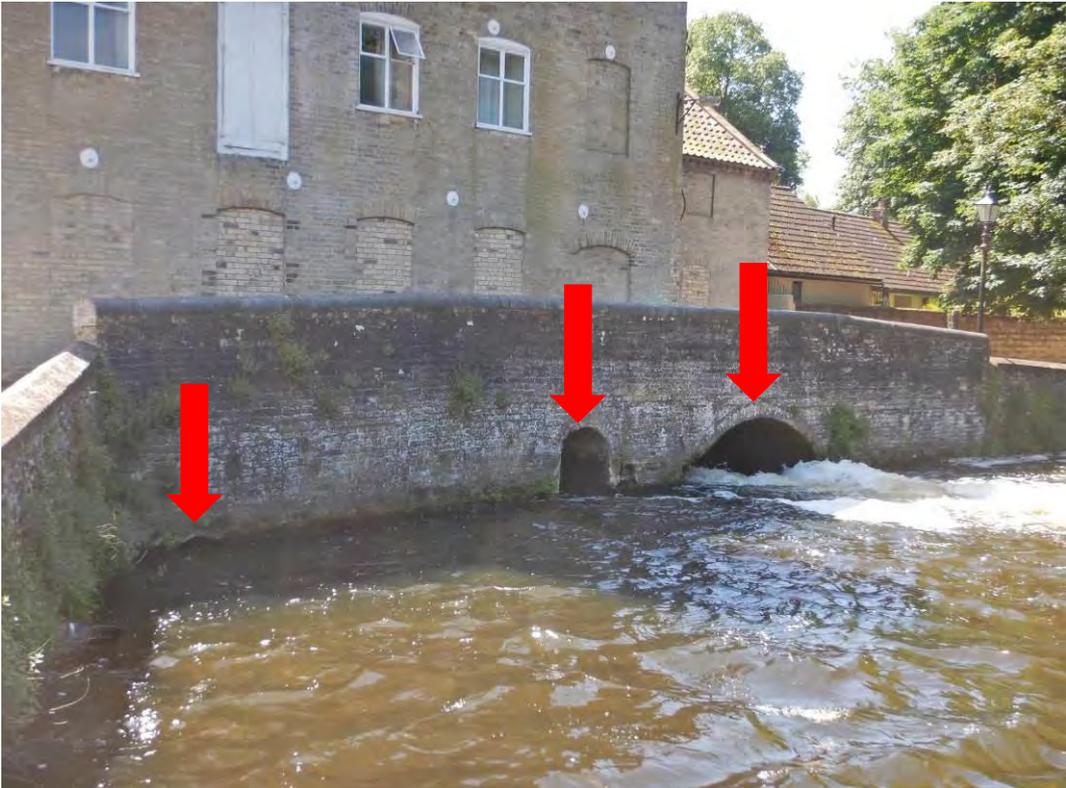
The river itself is not subject to any statutory nature conservation designation but the LB downstream of the A11 bridge is adjacent to Breckland Special Area of Conservation (SAC) and Thetford Golf Course and Marsh SSSI. Any proposal that has the potential to impact upon the nature conservation objectives of the designated sites would be subject to close scrutiny, with a presumption against any activity that causes an impact which cannot be adequately mitigated (such as lowering water levels

through impoundment removal which may lead to accelerated land drainage).

The river corridor provides habitat for a wide range of animals with kingfisher seen during the visit. Those that receive specific protection include otter, bats, and breeding birds. Otters are known to be widespread across East Anglian rivers and it was not surprising to find spraints within Thetford. Otters and their habitat receive full legal protection under the Wildlife and Countryside Act 1981 and the UK Habitats Regulations 1994, as do all bats. Breeding birds are only protected whilst on an active nest or in the process of nest building. These levels of protection have implications for a body such as the Town Council who may need to undertake vegetation clearance during times of the year that are sensitive for wildlife.

### 3.0 Habitat Assessment

The visit commenced in the town of Thetford immediately downstream of the Coffee Mill, and focussed on the two main channels that run around the town parks and open spaces. The Coffee Mill presents a significant barrier to the movement of all fish species. It is reported that a feasibility study for improvements to fish passage may be funded through the Water and Environment Grant (if successful). The front of the mill presents at least three pathways for flow and each of these should be investigated as potential routes for fish to traverse the mill.



Pic 1 – The Coffee Mill in Thetford town centre presents a barrier to the movement of fish. Three arches marked by red arrows represent potential flow pathways that should be investigated.

Downstream of the mill recent clearance work has resulted in the total removal of fallen trees from the river (pic 2). The remaining stumps have been treated with herbicide to prevent their re-growth (pic 3). Removal of fallen trees and their subsequent killing is highly detrimental to the river. Fallen trees, large branches and stems are collectively referred to as large woody material (LWM); the presence of which is extremely important within a river. It increases the available surface area onto which algae will grow and undertake photosynthesis thus initiating nutrient cycling. Algae then provides a source of food for invertebrates, thus increasing the total biomass that a river can support. LWM can also provide underwater cover, offering protection for fish against high flows, otters and fish-eating birds. LWM is also a key element in kick-starting geomorphic processes such as bed and bank scour, leading to the development of natural river features such as pool and riffle sequences (where gradient allows). Furthermore, the sorting of bed material can encourage marginal deposition of fine sediment or allowing it to be deposited upon the floodplain in out-of-channel flow.



Pic 2 - Tree removal (red arrow) has resulted in the removal of LWM from the river which would have otherwise provided valuable cover at water level.



Pic 3 – These sycamore trees have been cut-back and killed off as indicated by the cross-cutting to hold herbicide. Note an otter spraint present on the stump (inset picture).

The removal and killing of trees has left the bank prone to erosion. Fallen trees within a river can be managed to retain their habitat value by winching them to a secure bankside position and securing them with stakes and/or cable rope. Where riparian trees require thinning and their habitat potential as fallen LWM would otherwise be removed, a technique known as tree-hinging can be used. Tree-hinging is similar to hedge laying in that it retains a living hinge that secures the cut stem to the tree stump. The hinge continues to allow the tree to live so structural strength is retained. For additional security, the tree can be secured using cable rope. Laying the tree canopy down to water level (or below) provides excellent over-head cover, flow deflection and a spawning substrate for coarse fish species. These two approaches would be suitable for many of the trees within Thetford town where trees may otherwise be removed on safety grounds (pic 15).



Pic 4 – An example of tree hinging, a simple and effective technique for increasing cover in a river.

Rapid flow of water emerging from the Coffee Mill aerates the pool and maintains high flow velocities keeping the gravel free from silt. An extensive gravel bar at the tail of the pool (pic 6) provides valuable increased flow velocity and habitat diversity. This gravel bar is likely to present a locally important spawning area for many fish species (especially brown trout during the winter and chub and dace in the spring and early summer) and its presence and form should not be altered (such as by dredging). If sea trout run up the Lt Ouse and are prevented from moving further upstream by the mill then this type of feature would present a valuable spawning site.

This pool provides some good cover, but only along the LB that has branches trailing from it, and many of them were relatively small. It would be beneficial to provide further cover at the edges of this pool to protect adult fish during spawning periods. Nearby cover is important as spawning fish often become exhausted making them prone to predation. Cover also protects fish from wash-out during flood flows. Similarly, as young fish emerge they too need to find cover from strong flow in order to maintain a feeding station and to prevent them from being washed downstream.



Pic 5 – The river immediately downstream of the Coffee Mill, with turbulent flow keeping the pool cleansed of silt and the gravel well-sorted. Cover at water level is found on the LB but it is limited.



Pic 6 – The gravel bar (red arrow) at the end of the mill pool provides a valuable spawning site for a range of fish species including sea trout if they cannot pass the mill.

The parks and open spaces are typical of most urban parks with close-mown grass bordering the river. The bank was often formed from hard brick or stone revetments with no gradual transition to water level (pics 8 and 9).

However, at a number of points a valuable unkempt fringe of vegetation on an earth bank has been retained, especially beneath trees.



Pic 7 – A typical view of one of Thetford’s urban parks, the Island.



Pic 8 – The hard stone revetment provides no marginal habitat for the river. Extensive lengths of walling prevent plants that would otherwise support invertebrates and small animals from finding a niche.



Pic 9 – The contrast in habitat quality between a tree-lined bank and a hard revetment is very apparent at this location. The stone walled right bank has been colonised by a very limited number of plants. In contrast, the opposite bank has marginal vegetation which trails to the water, and trees provide bank stability and cover.

Trailing branches are particularly important as overhead cover for a wide range of fish (especially trout), creating micro-pocket water and increasing the available number of lies within a river. The branches also provide habitat for invertebrates which may fall into the channel where they become food for fish. Branches that extend into the water may also provide a means for some aquatic invertebrates to emerge or return beneath the water in order to lay their eggs.

Downstream of the Coffee Mill the river forms an important amenity feature through the town. There is a riverside café which was well attended on the day of the visit. In front of the café there is a dense stand of tall common reed (pic 10) that could provide nesting opportunities for birds such as sedge warblers. In contrast to the reed fringe there is a hard wooden revetment forming a boat dock with accordingly poor marginal habitat, but the inlet of the dock provides a backwater habitat and was being used by fish fry as a refuge from the main river flow. The stand of bittersweet in the foreground has grown over a retained stump and demonstrates how retained LWM can act as support for plants which in turn provide excellent cover at water level.



Pic 10 – The river bank in front of the café provides an interesting set of contrasting habitats.

During the visit the only non-native invasive species observed was one stand of giant hogweed. Giant hogweed presents a serious threat to any waterway due to its ability to rapidly colonise habitats through mass seed production. The plant can then out-compete other species due to its tall growth allowing it to form dense monocultures. In addition to being a threat to native biodiversity through direct competition, the plant poses a serious threat to human health. Hogweed contains a photoactive sap that, following contact with skin, reacts when exposed to sunlight, causing potentially serious chemical burns. There is often a lag time between exposure to the sap and its photoactivity period so anyone that comes into contact with the plant may not realise until it is too late. All giant hogweed plants should be controlled through appropriately certified personnel, using herbicide if necessary. No flower heads should be allowed to set seed.



Pic 11 – A small number of giant hogweed plants were found growing on the right bank of the Island at TL 87017 82864. All hogweed plants should be eradicated as a matter of health and safety.

Moving southwest past the Coffee Mill, two side-channels were encountered. Both of these channels have good habitat for wild brown trout being comparatively shallow and fast flowing with well vegetated margins and trailing branches. There were aquatic plants growing from the riverbed which included unbranched bur reed and lesser water parsnip, with occasional water crowfoot and willow moss.

Wild brown trout require diverse habitat, food, spawning and nursery areas as well as good water quality. Vital aspects of habitat diversity are created through active geomorphic processes which are a product of gradient and stream power, causing erosion and subsequent deposition. Features such as fallen trees may locally increase areas of scour and deposition, resulting in the formation of pools and riffles (shallow, gravel-rich runs with broken surface water) which are extremely important as spawning areas. Trout (as well as chub, dace and minnows) will spawn upon well-sorted gravels (particularly in the range 15mm to 40mm) that are relatively stable within a river. Pool and riffle sequences provide valuable habitat diversity for juvenile trout (within the shallow riffles) which keeps them from competing with (or from being eaten by) adult trout (who tend to favour the cover of deeper water). Adult trout were observed in the channels running around the Coffee Mill.

Whilst adult trout can use deep water with relatively strong flows, juvenile trout require areas away from adults. They will often find such habitat in shallow riffles or densely vegetated margins. The Lt Ouse does not support a typical pool and riffle sequence, with shallow runs being quite limited in their occurrence. Whilst adult fish may be able to find spawning areas amongst the clean gravel bed it is considered that juvenile habitat is currently acting as a bottleneck to the river containing greater numbers of wild brown trout.



Pic 12 - The view looking downstream from the 1<sup>st</sup> bridge after the Coffee Mill. A shoal (10+) of large dace were seen. Note the relatively clean bed and its clean stony substrate which will harbour many invertebrates.



Pic 13 – The view looking off the 2<sup>nd</sup> bridge after the Coffee Mill. Note the shallow depth and stony bed, potentially good trout parr habitat. The trailing vegetation provides marginal cover in addition to that provided by the bridges. The habitat could be further enhanced.



Pic 14 - Good cover for fish and birds is provided by extensive willow branches trailing to the water. A brown trout was observed at this location (inset).

The densely tree-lined nature of the two side-channels means that shade is an issue that needs balancing. Whilst shade is important for keeping rivers cool, too much shade will suppress the growth of

aquatic and marginal plants. This can lead to a reduction in plant diversity and a subsequent decline in invertebrate numbers. Furthermore, fine sediment input may increase as banks are left bare of vegetation and become prone to erosion if tree roots are not able to bind fine sediments.

It appeared that the effect of shade was starting to impact upon in-channel plant growth. Selective tree work to let light onto parts of the channels would be advantageous. The techniques of coppicing and/or pollarding might be appropriate. However, tree-hinging would be of greater benefit to the river. This approach would allow a reduction in the shade cast whilst still utilising the fallen (but still fixed) timber to create habitat features such as flow deflectors and LWM at water level as cover. There were many tall trees, and some standing dead trees, which could be utilised for in-river habitat enhancement work.



Pic 15 – Tall alder trees are casting shade on the river and reduce both marginal and aquatic vegetation growth.



Pic 16 – A limited number of standing dead trees were observed. Presumably these trees will have to be taken down given their location in a public park. These trees provide a ready source of LWM for undertaking habitat enhancement work.

The tree-lined reaches provide further habitat through underwater root systems, particularly from the alder trees. Underwater roots provide excellent cover for both adult and juvenile fish, as well as an extensive surface area for invertebrates to colonise. Tree roots should always be retained.



Pic 17 - Alder tree roots (red arrow) provide excellent underwater habitat in stark contrast to the hard revetment opposite.

Extensive fine sediment is being deposited in the slack water around the confluence of the two side-channels. The use of LWM in the form of brushwood mattresses could help to speed up this deposition and help to consolidate it. Stable silt bars then provide an opportunity for colonisation by vegetation and provide further marginal habitat for invertebrates.



Pic 18 – An example of a low level brushwood mattresses created on the River Misbourne following tree thinning work. Brushwood mattresses can be used to protect banks from erosion, to create in-channel sinuosity and to entrain silt and sand.



Pic 19 – Deposition of fine sediment in margins shows that the river has the ability to sort and transport its load. If this sediment remains stable it will become vegetated.

Downstream of Thetford town centre the river flowed in one channel. The channel is relatively narrow and constrained by hard revetments. This reach offers little habitat potential and, given the requirement for boating traffic

into the centre of the town, the option of providing habitat in the narrow channel is not easily achievable. If/when the existing walls require significant repair, or replacement, a holistic scheme could be put forward which retains the required strength of the walls whilst providing planting opportunities at water level.



Pic 20 – Where boat traffic is important, there is very minimal opportunity to provide habitat gain unless significant re-engineering of the retaining walls is required.



Pic 21 – Approx. 25m downstream of pic 20 the RB of the river is lined with trailing vegetation at water level which provides some off-set to the stark environment of concrete and sheet steel piling provided to the LB.

The reach of river from Thetford to the **Environment Agency's (EA)** Abbey Heath gauging station had extensive tree coverage yet the river, being ~15m wide in places, was not over-shaded. The broad width of the river appears to be able to accommodate navigation, flood conveyance and biodiversity.



Pic 22 – Riverside trees have been allowed to trail down to water level providing important cover. Trailing vegetation should be retained as far as possible where it does not conflict with navigation.



Pic 23 – Where the sunlight reaches the banks marginal vegetation has become established. In this case, lesser pond sedge is providing a contrasting habitat to that of trailing branches.



Pic 24 – The view to the London Road bridge showing extensive trailing branches providing good cover for both fish and birds.



Pic 25 – There is an attractive diversity of aquatic plants including unbranched bur reed, lesser water parsnip, and water crowfoot.

Where willow roots were growing out of the hard revetments there were 100s of small fry taking cover (pic 26). The provision of similar additional structure (such as hazel faggots or pinned tree stems) could vastly increase the holding capacity of the river for juvenile fish.



Pic 26 – Tree roots provide cover for 100s of small fry (red circles).



Pic 27 - The RB is extensively tree-lined, providing an important habitat in contrast to the hard revetment of the footpath.

From the London Road bridge the river is heavily tree-lined on both banks. This is likely to be a favoured area by many adult species of fish due to the food input of falling invertebrates from the trees, extensive cover and water depth. Retention of this tree-lined reach should be an objective for local river conservation.



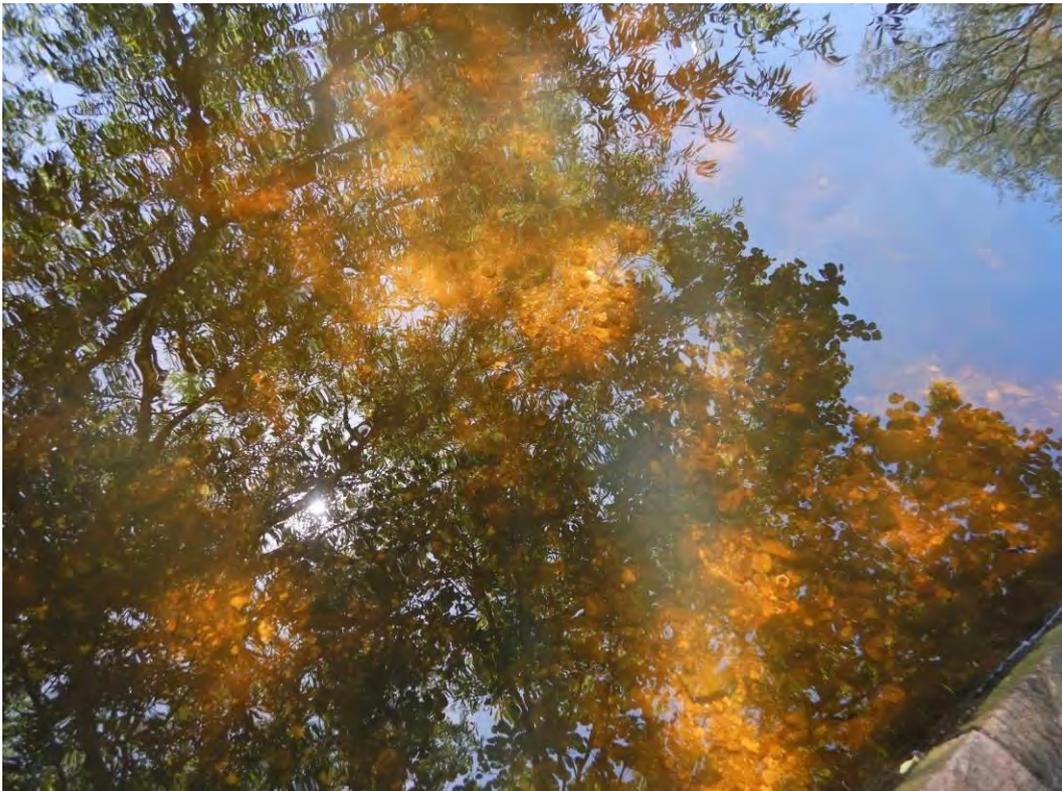
Pic 28 – Downstream of the London Road bridge the river is densely lined with trees which provide excellent cover for adult brown trout.



Pic 29 – Wetland habitats were observed on the floodplain near to the Thetford Priory.



Pic 30 - A sedge bed has developed on the LB suggesting the deposition of fine sediments allowing subsequent colonisation.



Pic 31 – The majority of the bed throughout the reach visited consisted of clean gravel.

It is presumed that the Thetford no.1 staunch's purpose is to retain an upstream water level to aid navigation. If navigation was not required it might be possible to remove this structure, reducing upstream flood risk and allowing the river to develop a more natural form.

The staunch consists of two lifting gates to control upstream water levels. The right gate is raised slightly above the bed level, resulting in flow beneath it. Whereas the left gate is dropped (assumed to bed level) so that flow cascades over it. When a gate is lifted fish may be able to swim beneath it (subject to flow velocity) but when both gates are dropped the water then has to cascade over them. This presents a barrier of ~0.4m which is impassable to most fish species (except large trout). There is also an eel pass and possible fish ladder (see inset) but it requires maintenance to remove debris that has accumulated upon it.

Downstream of the staunch the river bank appears to have been modified for boat launching, with a consequential degradation of marginal habitat. This area could be reshaped and planted to create a reed bed in the shallow margins if boat access is no longer a priority. It should be noted that there were a number of large underwater posts that present a hazard to boaters and swimmers (pic 34).

Where the riverbed shallows, the flow rate increases resulting in attractive stands of water crowfoot (pics 35 and 38). Water crowfoot is important for retaining a head of water, increasing in-channel cover, providing shade, and spawning substrate for many coarse fish species. The plant is typical of clean swift-flowing rivers. Extensive reed bed habitats were seen on the RB floodplain where woodland is not established.



Pic 32 - A staunch on the river still controls upstream levels back to Thetford.



Pic 33 - The downstream view of the staunch showing the eel pass (inset).



Pic 34 – The banks have been strengthened to facilitate boat traffic with a consequential degradation of biodiversity. Red circles show underwater posts which presents a hazard to boats and swimmers.



Pic 35 – Dense stands of water crowfoot further enhance the river’s biodiversity value.



Pic 36 - The river takes on a more natural feel again without a riverside path on top of the bank.



Pic 37– This culvert (TL 8584083335) releases storm flow to the river. It is a source of plastic rubbish to the river and had traces of oil residue emerging from it.



Pic 38 – Further dense stands of water crowfoot were found downstream. It was very pleasing to see it in such abundance in a lowland river at the edge of fenland.

Downstream of Thetford there was only one notable garden that extended down to the river. Whilst the mowing of the riverbank is not desirable due to the removal of marginal cover, the impact is negligible given the extent

of this habitat throughout the reach. Fortunately trailing branches have been retained.



Pic 39 – Garden habitat is present but its extent was negligible. Water crowfoot grows where the canopy is broken and allows light to the river.



Pic 40 – Reed beds provide a valuable floodplain habitat towards the sewage treatment works is approached.

Moving away from the built-up areas a number of fallen trees were encountered. Fallen trees in the river provide excellent habitat for fish and

invertebrates by creating flow and habitat diversity. In fact, such features are often proposed as specific habitat enhancements on wide lowland rivers and their natural occurrence should be welcomed.



Pic 41 – Fallen trees provide important habitat and should be retained.

On the day of the visit, the discharge from the sewage treatment works appeared acceptable with no foul smells or high sediment loading. The occurrence of foaming is most probably related to detergents used in domestic washing. It should be remembered that the sewage discharge is given as reason for the river not achieving good status under the WFD classification and is clearly a known issue to the EA.



Pic 42 – The outfall from the Thetford sewage treatment works.



**Pic 43 – The A11 crossing has resulted in degradation of river habitat beneath due to shading and the hard edges provided by the walkway.**

Downstream of the A11 the river takes on a natural feel again with many trees trailing branches to water level and stands of emergent and aquatic plants growing from the river bed.

The RB floodplain has been excavated (presumably for gravel extraction) leaving behind lakes that provide a complementary habitat to the river. The lakes are used for coarse fishing and are otter fenced to protect the resident fish stocks.

Some parts of the river again take on a more natural feel as the canopy encloses the river. This is important for summer cooling, aquatic weed control or simply as a contrasting habitat. The occurrence of trailing branches to water level is desirable. Whilst it would not be good to have long reaches like this (as the shading effect could then be counter-productive by preventing plant growth) occasional sections like this are fine.

One of the reported concerns at leaving fallen trees was the occurrence of litter (pic 44). Unfortunately, as long as litter enters the river this is unavoidable. It is fortunate that Thetford River Group undertake litter picks as they will be going some way to controlling this problem. The benefits provided in terms of habitat gain by fallen trees should not be dismissed simply due to the presence of litter.



Pic 44 – One of the concerns at leaving fallen trees is that they collect litter (red arrows). However, that it is a human action . Whilst litter is unsightly and potentially hazardous to wildlife, the Lt Ouse does not have a significant litter problem, especially when compared to many reaches of urban river elsewhere.



Pic 45 - A natural looking part of the river with no obvious human intrusion. These reaches contrast strongly with the treeless hard edges through Thetford.



Pic 46 – Otter fencing protects a fishery within a lake. However, the gates don't extend fully to the ground so otters will still be able to access the lakes.



Pic 47 - The tree canopy gave total coverage at a few points downstream of the fishing lakes. Large branches trailing in the water represent excellent cover for many species of fish, especially adult brown trout.

The approach to the Abbey Heath gauging station was clear of fallen trees and trailing branches resulting in an impoverished habitat. However, these smooth flow conditions (laminar flow) are necessary for accurate monitoring. The open nature of the river has allowed the growth of extensive beds of reed sweet grass which provide important marginal habitat.

One willow tree was observed almost immediately above the gauging station with some trailing branches (presumably which came down this winter). Amongst the cover provided by the willow were nesting swans (red arrow). Note that the plant growing abundantly within the river (pic 49) is a broad leaved pond weed (a Potamogeton species not water crowfoot), likely in response to the impounded nature of the section and resulting fine sediment deposition.



Pic 48 - Above the EA's gauging station the river widens with extensive margins of reed sweet grass.



Pic 49 – A swan's nest (red arrow) was observed above the EA's flow gauging station.



Pic 50 - The upstream view of the EA's Abbey Heath gauging station.



Pic 51 – Immediately above the gauging station the plant community was surprisingly diverse, with lesser water parsnip, broad-leaved pondweed, unbranched bur reed and water dropwort.

At the gauging station the water is held back by a weir to allow the measurement of flow. The smooth face presented by the crump weir makes it impossible for coarse fish species to swim up it, and it would be extremely challenging for salmonids to ascend (except once drowned out). It is reported that a feasibility study looking into improving fish passage at the site may be funded through the Water and Environment Grant (if successful).

A drainage ditch runs alongside the river and stops at the gauging station. If the ditch were connected to the river and brought around the gauging station it could be possible to create a by-pass channel. The channel would have to be carefully designed and carry a known volume of water in order not to affect the operation of the gauging station. This approach was used **on the River Cam at Byron's Pool, Grantchester.**

Alternatively, an ambitious target could be to replace the current gauging station's weir with less intrusive gauging technology. This would remove the need to maintain an upstream impoundment and would allow a natural channel to establish.



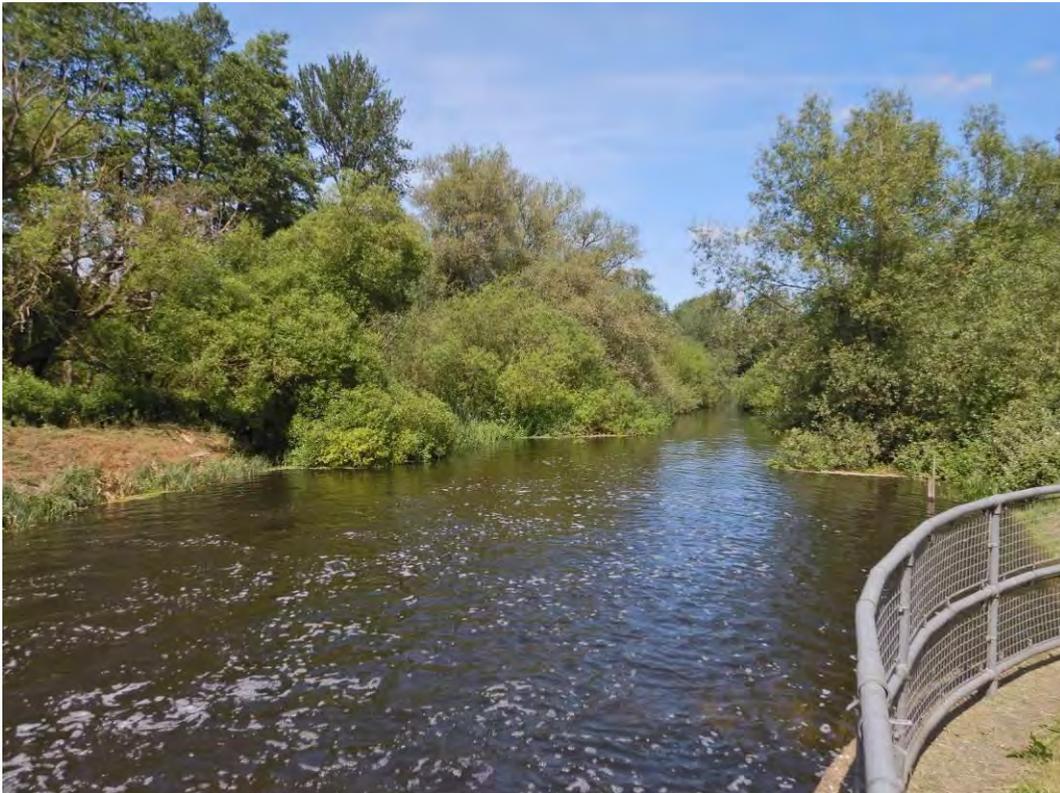
Pic 52 – The downstream view of the gauging station.



Pic 53 – There is an eel pass in the form of brush baffles that should allow eels to ascend the structure. However, it looks as if it requires some maintenance due to missing covers.



Pic 54 – A possible route for a by-pass channel around the gauging station. Any new channel would have to carry a known volume of water at all times so as not to affect the performance of the gauging station.



Pic 55 – The view downstream from the gauging station. The turbulent and aerated water may become a focus for fish if the river suffers from low oxygen concentrations in hot summers. Ironically, low oxygen concentrations are compounded by water that is impounded by structures like gauging stations and other weirs.



Pic 56 – Downstream of the gauging station the river became natural in its appearance again with ecologically important beds of water crowfoot and dense tree cover with plenty of trailing branches.

#### 4.0 Recommendations

The tree stock through Thetford town should be assessed and a strategic approach developed to its management. The approach should identify which trees must be retained for their landscape and habitat importance, which will need to be managed for future safety needs, and those trees which can be used for habitat enhancement for the river. Tree management should also have regard to tree planting to ensure that a future stock of riparian trees is established. Trees particularly valuable for planting adjacent to rivers include willow species, common alder, native black poplar and hazel.

There are three structures, the EA gauging station, the staunch and the Coffee Mill, which present barriers to the passage of fish and restrict habitat development. Fish passage, both upstream and downstream, is extremely important for natural and sustainable fish populations. Removal of these structures or fish passage over, or around, should be investigated in order allow all species to migrate naturally.

The side-channels that run around the Coffee Mill have shallower depths than the main channel. The shallow depths present an opportunity for safe in-channel working. It would be possible to conceive a habitat enhancement scheme to increase the juvenile trout holding potential of the river (which would have benefit to other species). This could act as a catalyst to the Thetford River Group getting involved in practical habitat conservation

work. The WTT would be able to support the Council if they wished to discuss the approach further.

Many fallen trees were present in the channel downstream of Thetford and present important habitat features. Regard should be given to stabilising those that can be retained. Such trees can be winched to the sides and staked into position using cable rope if necessary. Removing these natural structures would result in significant habitat degradation.

Retaining walls and hard revetments greatly **reduce the river's biodiversity** value through Thetford. Whilst it is clear that hard edges need to be retained where boat traffic is present, there may be locations where boats no longer require access. The replacement of hard edge structures, or their mitigation through the placement of some form of additional marginal habitat structure, should be considered in order to increase the juvenile fish holding capacity within Thetford.

The river downstream of Thetford is very attractive and provides an interesting contrast to the urban setting of the town. One of the attractions of the reach was its naturalness, with fallen trees and a closed canopy in places. Provided other river users, such as boaters and canoeists, are not effected these features should be retained in full as they provide a visually interesting contrast and retain important habitats.

The operation of the staunch should be such that the gates are lifted as much, and frequently, as is possible in order to facilitate fish movement and sediment transfer.

## 5.0 Making it Happen

**It is a legal requirement that (most) works to 'Main River' sites like the Lt Ouse** require written EA consent prior to their implementation, either in-channel or within 8 metres of the bank.

The Wild Trout Trust can provide further assistance in the following ways:

- Assisting with the preparation and submission of an Environmental Permit to the EA (formerly referred to as Land Drainage or Flood Defence consents).
- Running a training /demonstration day to demonstrate the techniques described in this proposal.

**We have produced a 70 minute DVD called 'Rivers: Working for Wild Trout'** which graphically illustrates the challenges of managing river habitat for wild trout, with examples of good and poor habitat and practical demonstrations of habitat improvement. Additional sections of film cover

key topics in greater depth, such as woody material, enhancing fish stocks and managing invasive species.

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

The WTT website library has a wide range of materials in video and PDF format on habitat management and improvement: [www.wildtrout.org/content/library](http://www.wildtrout.org/content/library)

## 6.0 Acknowledgement

The WTT would like to thank the Environment Agency for supporting the advisory and practical visit programme in England, through a partnership funded using rod licence income.

## 7.0 Disclaimer

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