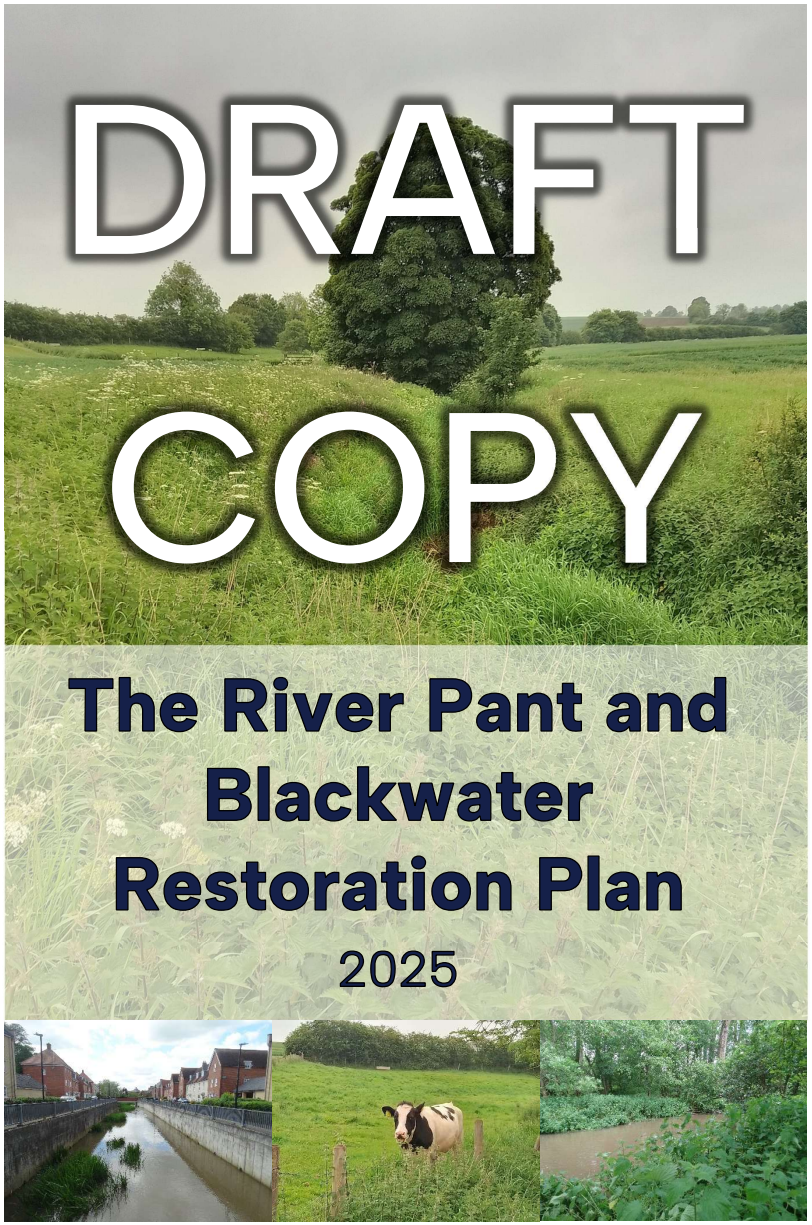


Acknowledgements

Prepared by the Essex and Suffolk Rivers Trust in collaboration with Essex Suffolk Water, The Environment Agency and North Essex Farm Cluster

Prepared using funding by Essex and Suffolk Water

Fluvial audit survey conducted by JBA consulting under contract to the Essex and Suffolk Rivers Trust

The recommendations made in this report are suggestions only and are subject to further review, permissions and funding

THIS IS A DRAFT COPY AND SUBJECT TO FURTHER REVIEW AND ADDITIONS

An Essex Rivers Hub Plan delivered in partnership

Contents

A female scarce chaser (Libellula fulva) seen by the River Pant

Forward

Forward to be supplied after public draft review.

Introduction

The river

The waters of the river Pant (referred to throughout this plan simply as 'the Pant') start their journey slightly upstream from the hamlet of Wimbish, not far from Saffron Walden. The Pant is a river dominated by agriculture, all the way from its source through towns and villages including Radwinter, Great and Little Sampford, Little and Great Bardfield, Shalford and Bocking.

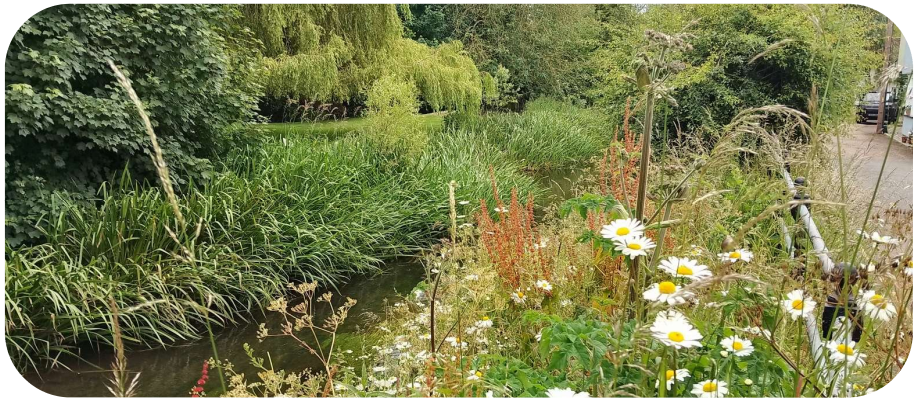
At Bocking, under the bridge on Church Lane, the Pant becomes the River Blackwater (referred to as 'the Blackwater'), a much larger river that passes through a more urbanised, but still largely rural, catchment. From Bocking, it passes Braintree, Stisted, Coggeshall, Feering, Kelvedon, Rivenhall End, Witham and Langford, joining the River Chelmer at Beeleigh. At Kelvedon, the Blackwater has a confluence with Domsey Brook and at Witham the River Brain.

Water from the Pant and Blackwater eventually flows into the Blackwater Estuary. Covering 44km^2 (17 square miles), it is Essex's largest estuary. The area is a vitally important wildlife site, being recognised as a Ramsar site, SPA, NNR and SSSI.

The total length of the main river from source to the confluence with the Chelmer is around 74km (45 miles) with a catchment area of around 247km^2 (95 square miles). This area includes 24 parish councils. The largest town on the Blackwater, with a population of over 55,000 is Braintree. Other sizable settlements on the river's course being Witham with a population of 25,000, Kelvedon with a population of less than 5,000 and Coggeshall with a population of less than 4,000. Notably, all of these population centres are on the Blackwater, the Pant having no settlements with a population higher than 1,400 residents. Although not included within the scope of this plan, Maldon is a sizable town of around 15,000 residents, found downstream of the area covered by this plan at the point where the Blackwater enters its estuary. Work performed upstream on both the Pant and Blackwater and the Chelmer and its tributaries will have an effect on the town.

Land use

The area is dominated by arable agriculture, with grassland and some orchards in its lower reaches. Reflective of this highly rural nature, the catchment is home to a large farm cluster, the North Essex Farm Cluster (NEFC). This cluster has assisted with the production of this plan and many of the future projects resulting from it will involve their members, as well as independent landowners, land managers and farmers.
The catchment of the freshwater Pant and Blackwater contains three SSSIs. These are all woodland and all fall at the far edge of the catchment, well away from the river. They are West Wood (Little Sampford), Bovingdon Hall Woods and Bletcher and Broadfield Woods.



The Blackwater at Kelvedon

A series of key definitions have been provided in Appendix 7 to explain some terminology used.

Creation of this plan

This plan has been developed in response to the current concerns of the communities within Pant and Blackwater catchments. In 2023, Essex County Council and the members of the Essex Rivers Hub identified the Blackwater as a priority catchment for the county for both restoration efforts and building resilience to climate change. The catchment of the blackwater is within the Essex Climate Focus Area and is a part of the seriously water stressed area of East Anglia[1], within the operational area of Essex and Suffolk Water.

In this catchment, Essex and Suffolk Water (ESW), part of the Northumbrian Water Group (NWG) are the water supplier, providing water to residents and businesses. Anglian Water provide drainage and sewerage operations for the region.

This plan has been funded by ESW. Delivery partners in the development of this plan are:

- **The Essex and Suffolk Rivers Trust (ESRT)**: Founded in early 2014, the ESRT is dedicated to the protection and enhancement of freshwater and estuarine systems in Essex and Suffolk. They provide advice, project management and support to river enhancement projects in the two counties. The ESRT is one of over 60 members of the Rivers Trusts movement. The ESRT are the hosts of the Essex Rivers Hub, the CaBA catchment partnership for this area and co-ordinated the production of this plan.

- **Essex Suffolk Water (ESW):** As well as being the funders of this project, ESW are a key delivery partner. Throughout the next five years of the 8th Asset Management Period (AMP8, 2025-2030), ESW have allocated funding in line with their environmental ambition for the improvement of rivers across Essex.

- **The Environment Agency (EA):** A non-departmental public body, sponsored by Defra. Formed in 1996, they have responsibilities relating to the protection and enhancement of the environment of England. The EA monitor and regulate all work on main river courses so their involvement and approval of this plan has been invaluable.

  They also operate the Ely-Ouse transfer scheme. This is a large pipeline that carries water from the Great Ouse in Cambridgeshire to the River Stour on the border of Essex and Suffolk. Some of this water is then pumped further on to the Pant, augmenting the water supply of the Pant and Blackwater. This pipeline has been operational since 1971.

- **The North Essex Farm Cluster (NEFC):** Founded in 2022, the relatively new cluster has rapidly grown to include over 70 farms encompassing around 20,500 ha of land. Although this does not represent all the land owners in the area, this does cover a significant portion of riparian landowners along both the Pant and Blackwater. As such, the NEFC have been able to represent the views and challenges of these landowners during the production of this plan and will be able to assist in the delivery of many future projects.

The condition of the river

The two waterbodies of this river are heavily modified and influenced by human activity. Through the data gathering process of this plan, a number of issues around the physical and chemical condition of the river, as well as the presence of invasive species at multiple sites was identified.

This is discussed in more detail in the 'Catchment Environmental Issues' section of this plan.

Data gathering

The Water Framework Directive

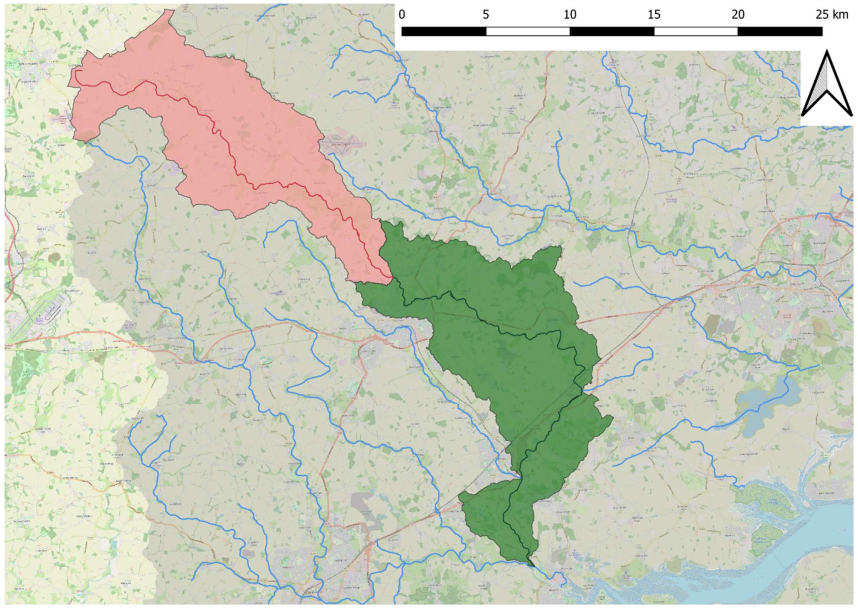
Discussed in more detail on the following page, the issues highlighted by the water directive framework have been used to produce this plan. Conversely, the overall vision of this plan is to improve the current status of the river under the water directive framework's measures.

Fluvial audit

A fluvial audit is an intensive survey of the morphology (and hydrology of a river system. To gather information on the condition of the river system, a fluvial audit was undertaken in the summer of 2024 by contractors JBA. This methodology uses both on the ground recordings and observations along as much of the length of the river upstream of the Chelmer confluence as possible and a desk based study, reviewing all available data.

This study covers the non-tidal, non-canalised section of the river. This is the entirety of the two waterbodies, 'Pant' and 'Blackwater (Combined Essex)' as defined under the Water Framework Directive (WFD). This is a total of around 74km of river. The canalised Chelmer and Blackwater navigation and river Chelmer after the Blackwater confluence measure around 4km each and are of very different character to the fluvial river system.

Data from the fluvial audit have been used to develop recommendations within this report, in line with current EA monitoring. The report produced from the fluvial audit formed the backbone for the recommendations within this plan, in line with current EA monitoring discussed below.



The area covered by this plan, within the context of surrounding main rivers (shown in blue). The area of the Essex Combined Management Catchment is shown in grey. The Pant is show in red and the blackwater in green, with their respective catchments highlighted in the same colours

Stakeholder workshops

As a part of the consultation process for this plan, two workshops were organised by the ESRT. The first, held in May of 2024, outlined the process of the fluvial audit and gathered relevant information from attendees to feed into the plan. The second workshop, held in November 2024divulged the results of the fluvial audit and gathered additional information about the catchment, including the potential commitments of those present.

As a part of the public consultation on this plan, a webinar and open consultation form were used to gather public feedback during April of 2025.

More information about both the fluvial audit and workshops can be found in appendix 2.

Attendees of the November workshop listen to the opening speech by Helen Dangerfield, director of the ESRT

The upper reaches of the Pant (left) and the lower reaches of the Blackwater (right)

The Water Framework Directive

The Water Framework Directive (WFD) is a European Union directive dating from 2000. It is the primary legal and monitoring framework for freshwater, transitional waters, coastal surface waters and groundwater within the EU. Despite leaving the EU, the United Kingdom continues to use the WFD, roughly in line with EU member states though with some minor modifications. In the UK the body responsible for monitoring rivers for the WFD is the Environment Agency (EA).

The environmental aims of the regulations of the WFD are to:

- Prevent further deterioration of and to improve and enhance aquatic systems including wetlands
- Promote sustainable water usage
- Reduce pollution for priority substances and have the use of hazardous priority substances phased out
- Prevent the deterioration or pollution of groundwater
- Continue to mitigate against flooding and drought

The framework not only sets out targets and regulations for waters, but also divides waterbodies into manageable areas, including the defined area of the Pant and Blackwater river catchments. The largest region of these is the River Basin District. In England, there are 10 of these and the Pant and Blackwater fall within the Anglian District. River Basin Districts have their own plans and targets which are outlined later in this plan.

The waterbodies that fall within the scope of the directive are assessed and given a one word status for their ecological health. Until 2022 chemical health of rivers was also assessed. Although many chemical/nutrient factors are still taken into account in the ecological assessment, the chemical health of rivers is no longer assessed for priority substances (i.e. chemical compounds that are not naturally occurring). In 2022, every river in England was found to have failed under the criteria of the time and, as these chemicals cannot be removed from the watercourses, reassessments are no longer made and all rivers automatically fail their chemical status assessment.

WFD – Ecological Status

High – near natural conditions – no restriction on the beneficial uses of the water body – no impacts on amenity, wildlife, or fisheries
Good – slight change from natural conditions because of human activity – no restriction on the beneficial uses of the water body – no impact on amenity or fisheries – protects all but the most sensitive wildlife
Moderate – moderate change from natural conditions because of human activity – some restriction on the beneficial uses of the water body – no impact on amenity – some impact on wildlife and fisheries
Poor – major change from natural conditions because of human activity – some restrictions on the beneficial uses of the water body – some impact on amenity – moderate impact on wildlife and fisheries
Bad – severe change from natural conditions because of human activity – significant restriction on the beneficial uses of the water body – major impact on amenity – major impact on wildlife and fisheries with many species not present

The Blackwater near Kelvedon

The status of rivers overall and for categories that are assessed is ranked in five tiers; bad, poor, moderate, good and high, with the aim of the WFD being that all water bodies are at good or high ecological status. In England, as well as all water bodies failing chemically only 15% are at good or high ecological status. In Essex only 8% are of good status, 0% are high. In 2025, the ecological status of the Pant and Blackwater waterbodies are both moderate (below the 'good' target), with a target to achieve overall good status by 2063, though many aspects of river health have sooner targets.

Both rivers are classified hydrologically as 'heavily modified' meaning their course and overall morphology has been radically altered from their natural state, in the case of this river primarily due to historic navigation.
As well as an overall status, a breakdown of 'classification items', these being a combination of monitoring elements of a similar type, is also provided. A summary of classification items can be found in table 1 and details of classification elements can be found in table 1 of appendix 1.

Table 1: The status of each classification item of WFD monitoring during cycle 3 (2022) for the Pant and Blackwater. Note that 'high' is synonymous with 'high status' (i.e. high quality) and not a high level of pollutant

Classification Item	Pant Status (Cycle 3, 2022)	Blackwater Status (Cycle 3, 2022)
Biological quality elements	Poor	Moderate
Physico-chemical quality elements	Moderate	Moderate
Supporting elements	Moderate (or less)	Moderate (or less)
Specific pollutants	High	High
Chemical	Fail	Fail

Reasons for not achieving good status (RNAGs) under WFD

As a part of the WFD, the EA outline the reasons that a waterbody is not achieving a good status. These are discussed in detail in Appendix 1 and were a large part of the determination for the objectives and targets later in this plan.

The Pant upstream of Braintree

Catchment Environmental Issues

The detailed fluvial audit was able to identify many local features of the river, both positive and negative and provide evidence for the interventions (solutions) discussed later in the plan. These findings are complex enough that to include all of their detail in this document would be needlessly complex. However, the results of these findings, i.e. the opportunities they have identified are shown later in this plan.

There are, however, some general findings that apply to much of the river which are detailed here.

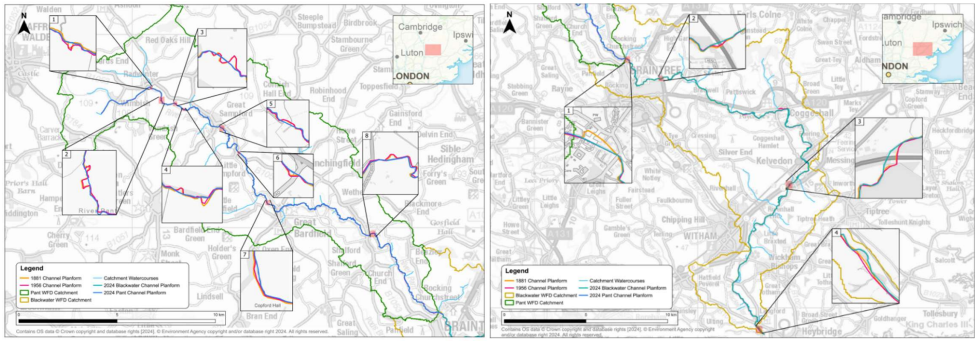
Channel modification

The Pant and Blackwater are over wide, over straight and over deep. This is primarily a product of historic changes to the river system for human use, for transport, drainage and for the use of watermills. In some cases, the original channel, known as a paleochannel, is still visible within the landscape as a ditch or damp area and can be identified through LIDAR imagery and confirmed on historic mapping. Straightening, deepening and widening of a channel is useful for navigation as this allows boats to travel a shorter distance with less chance of grounding. However, the change to the river channel dramatically alters the hydrology of the system.

Making a channel straighter not only decreases the length of the channel but also increases the gradient of the channel. All of these physical changes combine to mean that the channel holds less water which moves much faster (carries more energy) than it would were it sinuous, causing bank damage and not retaining water in areas where the river should. In other areas, the river has been artificially widened and deepened. This causes the opposite effect, the river slows and deposits silt. Gradually, the river cuts a new, narrower channel in this silt, but this wide, slow and silty channel provides a poor habitat for freshwater organisms and does not move sediment and nutrients through the system correctly.

Sediment, if allowed to build up, can cause impoundment of sections of the river. Sediment from fields bring nutrients with it, which, combined with increased turbidity from the sediment itself, negatively affects sensitive freshwater organisms.

Fine sediment is the primary bed substrate in the Pant and Blackwater with very few gravel sections. Gravel is a vital habitat for invertebrates and for fish to spawn in. The whole river system is highly homogeneous, that is to say, there is very little variation in the structure of the habitat available along the whole length of the river. For proper functioning, rivers need to have a multitude of micro habitats that allow a multitude of species to flourish.



The location of realignments on the Pant (left) and Blackwater (right). The blue line shows the current course of the river, orange the course on an 1881 map and pink the course on a 1956 map.

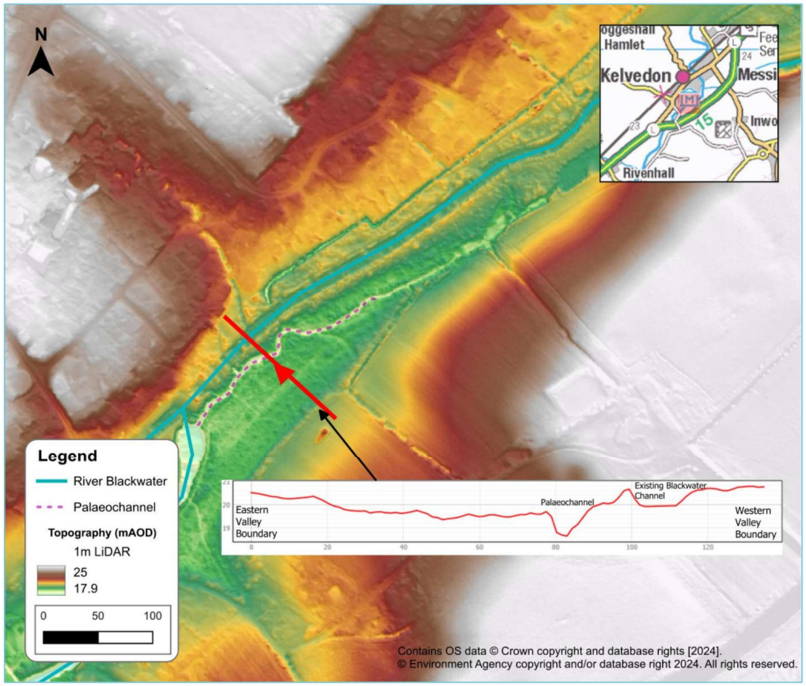
Efforts to redress the damaged caused through the physical modification of the river are of great importance for allowing the recovery of biodiversity in the area, as well as for reducing the risk of flooding to populated areas.

Floodplain connectivity, embankments and historic dredging

Historically, dredging has occurred on the river. The dredged material from this has been used to build up embankments on the side of the river.

Dredging has led to these reaches becoming over wide and over deep, exacerbating the issue of sedimentation rather than improving the situation.

The build-up of embankments has caused the river channel to become highly disconnected from its floodplain. In some sections, particularly near the headwaters of the Pant, embankments are preventing proper flow of water from the land into the river channel as well as preventing flood water from overflowing onto agricultural land correctly during times of high flow, leading to higher volumes of water downstream and an increased risk of flooding.



A notable example of the issues of dredging, realignment and embankments on the Blackwater at Kelvedon. Here, LIDAR elevations show that the embankment around the Pant is considerably higher than the surrounding land, meaning that the river is not running at the bottom of its valley where the old course of the river was (paleochannel). The large width of the channel is also notable here in the cross section. Similar issues have been noted along the length of the river at sites including Great Sampford, Little Sampford, Bocking, Pattiswick, Rivenhall End, Witham and Langford.

In some places, due to historic realignments, the river is not even flowing at the bottom of its valley. This is leading to issues of water being unable to enter the river system at all and simply sitting on land lower than the channel itself.

Riverbank erosion and sediment load

During the fluvial audit investigation, many areas of riverbank showed damage including poaching. In some places, grazing of livestock has occurred right to the edge of the river which has left the bank susceptible to further erosion which is loading sediment into the channel and impeding flows.

Erosion of banks is also exacerbated by the presence of Himalayan balsam.

Weirs and other barriers

A total of 16 Weir structures are known on the river. These significantly alter the flow state of the river including the build-up of silt upstream of them. They also restrict or prevent the movement of freshwater organisms (most notably fish) passed them.

The Essex Fish Migration Roadmap, collated by the Essex Wildlife Trust lists the whole river as an 'A-Road' i.e. that this is a path of great importance to freshwater species and lists a number of structures on both rivers.

High and low flows

East Anglia is the area of the UK that suffers most severely from high rainfall in the winter and drought in the summer. With the changing climate of the Earth, this will only exacerbate over the coming years. This seasonality is already putting enormous pressure on the Pant, Blackwater and surrounding rivers. In winter, high flows are causing flooding, notably around the lower Pant from Great Bardfield to Braintree and on the mid Blackwater around Coggeshall, Fearing and Kelvedon, though many other areas are prone to flooding too. In summer, low flows have been an issue in the area for decades, leading to the construction of the Ely Ouse transfer scheme to transfer water from the Great Ouse to the River Stour and on to the Pant, completed during the 1970s. There is an ever increasing demand for water from domestic and agricultural sources. In many parts of East Anglia, demand already outstrips supply in the summer. This leaves the river with little summer water to allow nutrients to be washed away and for organisms to live in. The character of the summer and winter rivers are very different and the river channel must be able to cope with different flow conditions

A road sign close to the ford on Codham Mill Lane

The late spring of 2024 was very wet and much of the fluvial audit was conducted under high flow conditions, highlighting some of the issues of the river at these times.

Water quality

Although the fluvial audit did not test for water quality this is a known issue and testing under the WFD has provided enough evidence that this should be considered a priority issue for the river. The nutrient of most concern is phosphate. Phosphate is naturally occurring in all rivers. It is an ion of phosphorus and required for the growth of plants. Excessive levels of phosphate in rivers can lead to eutrophication, the rapid growth of plants and algae which can block light for other plants and, after their death, are broken down by bacteria which use up a lot of oxygen, reducing oxygen for the river system. Phosphate enters the river system through diffuse sources, primarily run off from fields and from point source pollution, primarily sewage outfalls. This is affecting the whole river with the EA recording high levels of phosphate as upstream as Radwinter. Like all rivers, other pollutants from a range of sources are also a major concern to aquatic life.

Riparian margins

The fluvial audit's results suggest that many sections of the river, particularly the Pant, have a well-developed riparian (bankside) margin, i.e. there is a good amount of space between agricultural land (or urban areas) and the river and this is filled with plants of varying sizes from small annual flowers to large trees.

However, there are other areas where there is degraded or little to no margin. In these areas, repair of the margin by setting aside small strips of land to be planted with trees and shrubs can help shade the water, keeping it cool in summer, and reduce sediment and nutrient loads into the river.

INNS

The only INNS (Invasive, Non-Native Species) found during the fluvial audit was Himalayan Balsam, though there are reports of mink (*Neogale vison)* and floating pennywort (*Hydrocotyle ranuculoides)* via other projects (including INNS Mapper and Waterlife Recovery East's mink programme) and the WFD has highlighted the issue of non-native crayfish (highlighted too by attendees of our workshop events). Himalayan balsam (*Impatiens glandulifera*) was seen in large quantities and future plans are being considered to tackle this issue on the river system. Native white-clawed crayfish (*Austropotamobius pallipes*) population collapse has been highlighted under the WFD and is largely due to the presence of non-native crayfish species competition and disease introduction. Non-native crayfish are now at the point where some species have spread widely across the South of England and the Midlands and are realistically unable to be eradicated in our river systems.

Recovery

There is, however, evidence the river is recovering to a more natural state. In some cases, sediment and vegetation has restored a more natural flow profile. A very obvious example of this is at the point the Pant becomes the Blackwater. The river channel runs through a wide concreated section which has filled with sediment and plant life, gradually building up a more natural, sinuous and free flowing river channel.

Action to improve the functioning of the river, improve its ecological state and to preserve and protect sites of heritage, business and homes, is vital to ensure the future status of the Pant and Blackwater for people and wildlife. This work has already begun and has resulted in a river with a generally good riparian margin.

These findings of the fluvial audit are in line with those of the WFD but give a more detailed picture of the hydrological functioning of the whole river system.

Surveyors overlook the point where the Pant becomes the Blackwater at Bocking, Braintree. At this site, the overwide river has deposited silt which has allowed vegetation to build up, creating a more sinuous, natural channel within the larger concrete channel. The site now attracts wildlife including nesting swans

Vision, Goals and Targets

Our vision is:

"The River Pant and Blackwater will be a thriving ecosystem, adapting to change and inspiring future generations."

This plan's vision is to strategically support the ecological and hydrological restoration of the river Pant and Blackwater, specifically targeting issues highlighted by the fluvial audit study completed by JBA Consulting on behalf of the ESRT, in 2024, and the monitoring data collated by the EA for the Water Framework Directive (WFD). We will also consider river resilience to future climatic change.

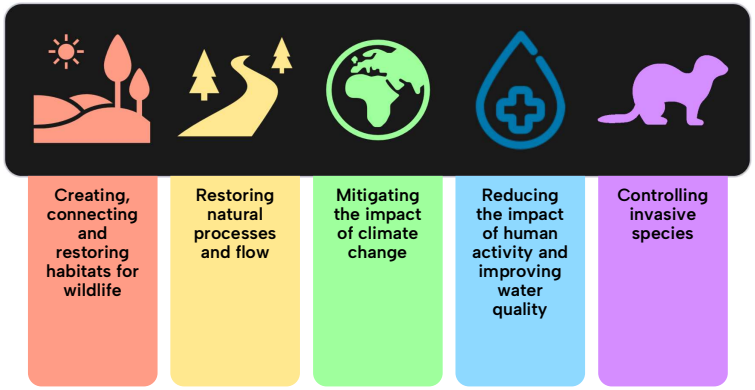
With local groups, individual stakeholders, charities and public bodies all working jointly from this plan, a more cohesive, larger scale ambition can be achieved. This will include members within and outside of the Essex Rivers Hub.

Ecological and river management improvements must be made within the context of other strategies, land schemes and targets, both regional and national.

Projects should work towards increasing engagement, education and empowerment of local community. This is a vital step to ensuring a secure ecological future for the river. Ensuring the river is usable, beautiful and accessible for communities and visitors to enjoy.

This plan will promote multi-benefit ecosystem services through the development of nature-based solution to help address flood alleviation, a naturally functioning river, and ecological functionality.

Improving the river's use for recreation is key to ensuring ownership and partnership delivery of the plan. For example, many angling clubs use the river. An improvement to fish passage combined with an increase in fish habitat can lead to increased fish stocks, thus improving the rivers angling opportunities.
The river is the focus of this plan, but rivers are not isolated in their environment. Efforts to reduce water usage across the catchment will be vital to ensure the supply of water throughout the upcoming century. The continued efforts of organisations such as the North Essex Farm Cluster and Catchment Sensitive Farming (CSF) are also required to improve the impact of the wider landscape of farming on the Pant and Blackwater.



Goals

Five general goals have been set by this plan, based on goals identified by stakeholders during workshops in 2024 as well as WFD targets, both of which are explained in more detail in their relevant sections below.

1. Creating, connecting and restoring habitats for wildlife

The first goal is to improve the natural environment of the Pant and Blackwater in both the riparian zone and in-channel. At present, there is a fair riparian structure along much of the Pant and Blackwater, but the fluvial audit identified opportunities for greater improvements, highlighting the sections that are in least favourable condition. For instance, where in-channel structure is highly homogeneous leaving poor habitat structure and river connectivity to support thriving ecosystems.

2. Restoring natural processes and flow

The EA classify the Pant and Blackwater as 'heavily modified waterbodies' which is defined as a '*body of surface water which as a result of physical alterations by human activity is substantially changed in character…*'[2]. It is clear from the data gathered in support of this plan that the river is not functioning naturally and, while natural processes are gradually reasserting themselves, interventions are needed to improve the hydrological functioning of the river and its disconnection to its floodplain, to reduce the impacts of historical physical modification and dredging.

As well as this, the Blackwater (and to a lesser extent the Pant) is home to a number of historic mills and other water level management structures, such as weirs. These can impede the passage of fish, other organisms and sediment and need to be mitigated. Preferably this should be performed while retaining the local heritage of the landscape, focusing on helping river recovery.

3. Mitigating the impact of climate change

The effects of climate change are already being felt in the region. East Anglia is already showing signs of water stress with very low flows in the summer, as well as severe winter flooding.

The plan will go some way towards mitigating climatic impacts on this river, but further explorations of nature-based solutions through natural flood management and the connection of habitat aligned to the Lawtonian principles[3] of 'bigger, better and more joined up' will help reduce and even reverse the loss of biodiversity and biomass in the catchment and provide numerous anthropogenic benefits.

4. Reducing the impact of human activity and improving water quality

Human activity has shaped the Pant and Blackwater for hundreds of years. As well as physical alterations, farming practices and an increasing population have put pressure on the chemical and hydrological health of the river. Changes in practice, abstraction and pollution control are required to improve the water quality of the river for both biodiversity and human wellbeing.

5. Controlling invasive species

Invasive, non-native species (INNS) can have a highly detrimental effect on native species through competition and disease. Under the Wildlife and Countryside Act (1981), it is an offence to permit escape, release or plant non-native species into the wild. This document outlines a plan for the catchment for the species that are of most concern.

Targets

Within the 5 goals outlined, a series of measured targets have been identified. These are outlined in the table below.

Further details on suggested interventions are in the 'Environmental Improvement Interventions' section of this plan.

Goal	Targets	Issues the Goal will address
Creating, connecting and restoring habitats for wildlife	Restore 10km of in-channel river habitat Create 30 ha of floodplain wetland habitat Improve fish stocks throughout the catchment Increase woodland connectivity within the riparian corridor Support pond recovery and creation	• Channel modifications • Floodplain connectivity • Riverbank erosion and sediment load • Riparian margins • Water quality
Restoring natural processes and flow	Removal, modification or bypassing of fine river barriers preventing fish movement Reconnect 10 km of river floodplain Re-naturalised 5km of river	• Channel modifications • Floodplain connectivity • Water quality • Weirs and other barriers • Embankments and historic dredging
Mitigating the impact of climate change	Deliver five projects using nature-based flood risk solution to reduce flood risk within the catchment Planting of 25000 trees in the riparian zone	• Climate resilience • High and low flows • Riparian margins
Reducing the impact of human activity and improving water quality	Development a tiered approach for Citizen science monitoring within the catchment to monitoring Water quality and habitats. Reduce impacts of abstraction, run-off and waste water treatment through partnership working Introduction or maintenance of riparian buffer strips along 50% of the river. Implementation of best farming practices to reduce nutrients and sediments entering the river systems. Supporting and enforcing Farming Rules for Water Improve community perceptions of the river	• Historic dredging • Riverbank erosion and sediment load • Riparian margins • Water quality
Controlling invasive species	Produce a co-ordinated plan for the control of invasive species to build upon actions already happening To support Waterlife Recovery East to reduce the numbers of mink in Essex Control or eradication of invasive plants such as Himalayan balsam, Japanese knotweed, giant hogweed and floating pennywort in the catchment	• Invasive, non-native species (INNS)

Environmental Improvement Interventions

This section of the plan outlines the types of intervention that are recommended in the following section. These are a general explanation of what each intervention is, but every project is unique. The scale of the intervention as well as the exact design will need to be tailored to the exact specifications of a given site.

Interventions are also not mutually exclusive. Many are complimentary such as reconnecting floodplain features and adding ponds/scrapes, both being about allowing the river to connect to the surrounding land.

The interventions discussed are also not a completely exhaustive list and novel approaches to riverine enhancement would also be welcome in this catchment.

Many people equate river health, water quality and the ability of a river to handle high flows with dredging or desilting. For many decades, this was common practice on many of the UK's rivers. While still common practice on canals and some rivers, there are a number of reasons why this is no longer the case for most rivers.

Dredging does not solve the issues of silt depositing in rivers. It is not a long term solution and requires constant, expensive, time consuming and resource heavy effort while causing ecological and structural damage to the immediate area and emissions from machinery. The interventions suggested in this plan are more long term solutions that act passively to restore the river to a more natural state.

For more information on dredging from the EA, please visit this webpage: https://environmentagency.blog.gov.uk/2021/12/23/floods-and-dredging/

Re-connection of floodplain features or re-meandering

This is, of all the interventions discussed in this plan, is the largest in range, scope and impact.

Re-meandering generally involves the mechanical digging of a more naturally formed channel along sections of the river that have been straightened. This improves the river's flow and creates many new features for freshwater species to live in.

The channel need not simply follow a more winding path but can split into multiple channels, forming wetland features.

There have recently been some examples of river channels being completely filled in and the water being allowed to flow across a landscape in whatever path topology dictates. This is quite extreme but allows the river to restore itself to a near completely natural state.

These interventions have the benefit of creating a lot of new habitat and reducing the flood risk downstream by holding back water in wetland features, creating more river channel for water to flow through and slowing the flow of that water.

Embankment set back or removal

As explained above, embankments can actually increase the risk of flooding if used incorrectly, forcing water that is in the channel to remain in the channel to potentially flood more populated areas downstream, instead of holding it on agricultural land that can cope with being wet. They also cut the river off from its landscape, meaning it is harder for water to enter the river, creating water-logged areas in undesirable locations behind the bank that cannot properly drain.

By setting back an embankment by just a few meters (or removing sections or even the whole embankment) the river is able to better connect hydrologically with its surroundings and can produce a more natural array of features such as bars and runs that encourage biodiversity and reduce flooding downstream.

Scrape and pond creation

Scrapes are shallow, semi-permanent wet features along the edge of rivers, often connected to rivers via shallow channels that only fill during heavy rainfall. They are usually quite wide, often several hundred square

meters, but are generally under half a meter (20 inches) deep. They promote a wide range of specialist plants (and the animal species associated with them) adapted to both wet and dry conditions. The land they occupy can generally still be used for livestock grazing.

Ponds have a less distinct definition. They are generally areas of permanent water (though some ponds do dry out in the summer), may or may not have a channel connecting them to the river, are generally deeper than scrapes and vary in size from a few square meters to a few hundred square meters. Ponds often encourage species that require a more permanent water source such as frogs, newts and dragonflies as well as many pond specific plants.

Both ponds and scrapes increase biodiversity along the river corridor and are brilliant at storing of water during heavy rainfall events and can be used to attenuate sediment and nutrients.

Riparian zone improvements

There are many improvements that can be made to the riparian zone (the area of bank along the river).

Planting of trees and other vegetation has a number of benefits for the river and catchment. These include:

- Increasing biodiversity
- Acting as a source of food and shelter for existing animals
- Stabilising the river bank
- Capturing carbon, providing shade to the river (in turn reducing water temperatures and increasing the amount of oxygen that the water can dissolve)
- Holding back water after rainfall
- Reducing the sediment and nutrient load into the river.

All of these benefits dramatically add to the resilience of the river to the effects of climate change.

Maintenance of fence structures to prevent livestock from getting close to the river and damaging the bank is a very quick and simple method of reducing poaching and therefore sediment and nutrient load on the river. Damaged segments of bank can be repaired using natural materials, primarily wooden (often willow) fascines (faggots). These bank barriers naturalise over time and can even sprout into new trees.

Addition of in channel woody material

This can refer to a range of interventions, but primarily to some form of flow deflector. A flow deflector is a (usually small) structure that sticks out into a river channel. These can be easily and cheaply constructed using wooden stakes, infilled with spare woody material.

With careful construction, these small barriers can change the flow of the river to create natural features such as bars where plant life can flourish and gravel beds, perfect spawning grounds for fish.

In smaller tributaries, logs and leaky dams can be added to reduce flow during period of high rainfall and therefore slow the addition of water to the main river channel.

Woody material can also provide habitat in of itself for river organisms feed off.

Weir or sluice removal or modification

This intervention can range from slight modifications to total removal of artificial structures.

The foremost reason for this intervention is to enable the easier passage of fish and other aquatic organisms throughout the length of the river. Artificial barriers preventing fish passage is a major issue for this region. The Essex Wildlife Trust, in partnership with the Essex Rivers Hub have produced the Essex Fish Migration Roadmap, mapping over 400 structures in Essex of which the Pant and Blackwater is home to 16 weirs.

Removal or modification of barriers restores the natural flow of the river and allows features such as gravel runs and bar features to reestablish. This reduces build-up of sediment in the main channel and creates resilience to high and low flow conditions.

Modifications can be extremely minor, such as a slight change to the design of a sluice gate to change when it can be opened, to much more major modifications such as the addition of a fish passage. These are carefully assessed on a site by site bases to ensure that any changes to not cause additional flooding risks or negatively impact the river's flow.

As well as the ecological advantages, this intervention can save money and effort in the long term as artificial structures require long term maintenance to avoid failure.

Those barriers furthest downstream should be tackled with greater priority to enable more of the river to be accessible from the sea.

Natural bypass creation

In some cases, where there are artificial structures or some other feature in the river and appropriate surrounding land is available, a second channel can be created that bypasses the structure altogether.

These allow fish and other organisms to bypass the structure, as well as allowing a second channel for the transportation of sediment and additional water during high flows. The additional length of channel provides new habitat for freshwater organisms.

Citizen Science

Citizen science projects enable non-professionals to complete scientific research and surveys. They are a valuable method of gaining both large quantities of data and engaging local people. These projects have are effective in plugging the gaps in EA monitoring and can identify sources of pollution which can then be targeted. It is vital that volunteers on the ground feel connected as a community and that their efforts yield results. The Essex Rivers Hub is running one such project, the Essex RiverWatch.

Water Company Commitments

Essex and Suffolk Water and Anglian Water have both made large commitments over the new Asset Management Period (AMP8) and beyond to deliver schemes that provide natural flood management and/or water quality improvements, through both the WINEP scheme and other funding sources. You can find out more about these in appendices 3 and 4

Changes to Farming Practices

Current farming practices can put pressure on river systems but there are many small changes that can be made to reduce nutrient and sediment loading, many of which can even generate money for farmers and diversity their income stream such as SFI options. For further information about where to find advice tailored to your farm and learn more about funding see appendices 3 and 4

North Essex Farm Cluster: Pant Valley Pilot Project

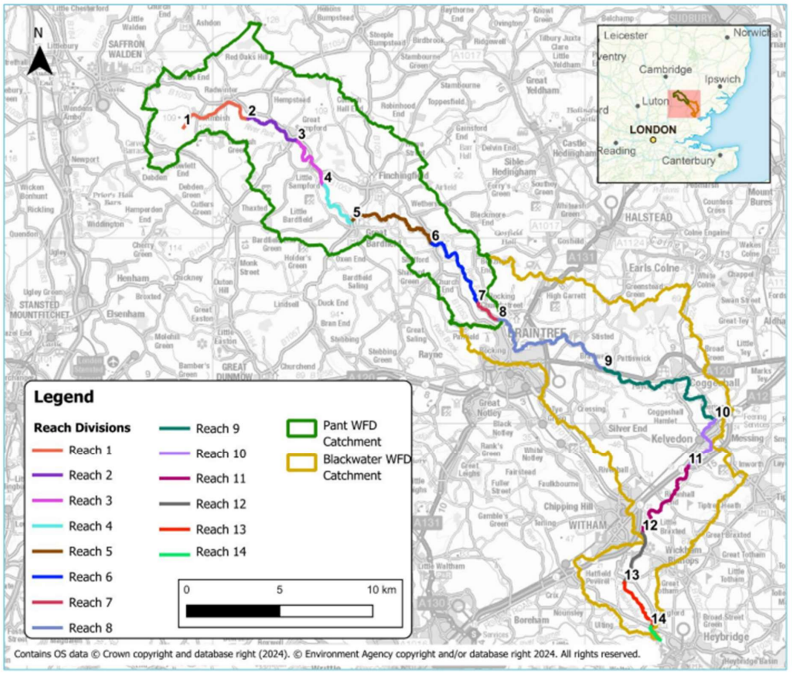
A collective effort by the North Essex Farm Cluster has resulted in the NEFC Pant Valley Pilot Project (referred to from here on as the NEFC PVPP). This is a series of interventions along the length of the Pant from Wethersfield to Bocking. This project focuses on interventions on arable land that can have a positive effect on the river system. This project is mentioned throughout the following section. For more information, please contact the NEFC. You can also watch a short video about the project on YouTube.

- NEFC Website
- Project Video

Guide to river reaches

Opportunity and Recommendation Mapping

The Pant and Blackwater have been



The 14 reaches of the Pant and Blackwater

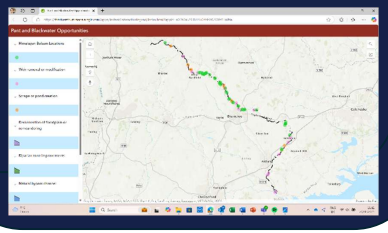
split into 14 reaches to more easily understand the changes along the river's length and highlight potential physical interventions and projects that have been identified for that reach through our fluvial audit process.

In the table on the following page is information about where the reaches are so that users of this plan can easily look up the reaches of interest to them.

Each heading below has more information on current and potential improvement works on that river reach.

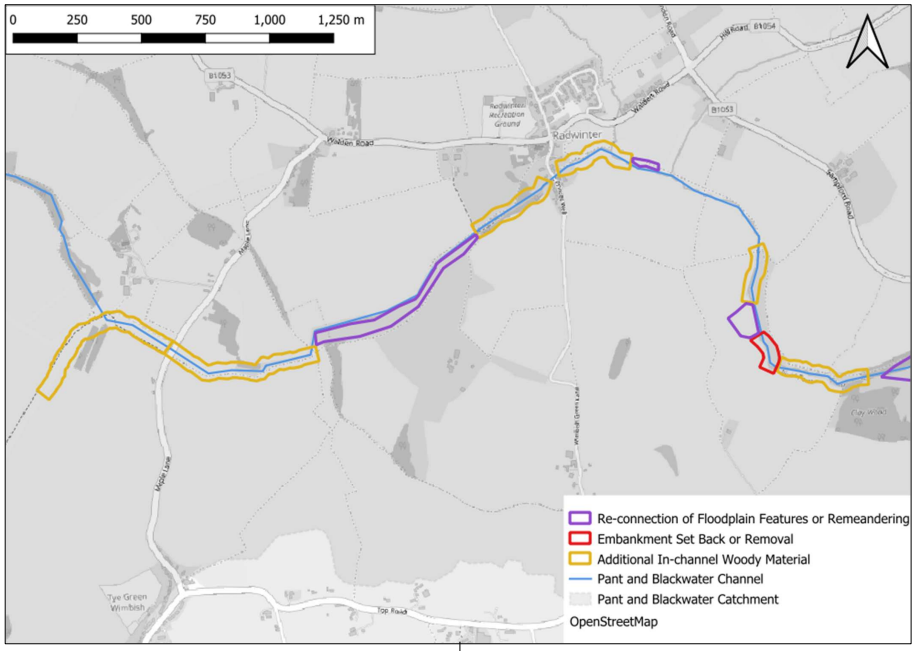
Alongside this document, a mapping application is available to view the data around the challenges the Pant and Blackwater faces.

A link to the application can be found by clicking here



Reach Number	Reach Name	Length (km)	Start Point NGR	Reason for Division
1	Wimbish to Radwinter	5.21	TL 58440 35912	Start of surveyed length
2	Radwinter to Great Sampford	4.02	TL 61907 36373	Valley widens, fewer in channel features, embanked section, lots of in channel vegetation
3	Great Sampford to Little Sampford	4.35	TL 64588 35128	Ely Ouse outfall location
4	Little Sampford to Great Bardfield	3.59	TL 65988 32805	Channel widens, more bank poaching and poorer riparian zone
5	Great Bardfield to Shalford	7.27	TL 67540 30939	Great Barfield Mill landmark, increased Himalayan balsam, deeper channel
6	Shalford to Panfield	5.74	TL 71774 29675	Wethersfield Mill landmark, improved riparian zone, floodplain features
7	Panfield to Bocking (Braintree)	1.68	TL 74268 26470	Differently managed section
8	Bocking (Braintree) to Bradwell	9.89	TL 75368 25574	Urbanised area
9	Bradwell to Feering	10.18	TL 81062 22966	Rural area, more gravel based bed, willow planting
10	Kelvedon	3.96	TL 86979 20207	Urbanised area
11	A12 to Witham	6.01	TL 85560 17653	Rural area, A12 landmark
12	Witham and Wickham Bishops	3.24	TL 83082 14083	Whetmead local nature reserve, River Brain tributary, urbanised area
13	Wickham Bishops to Langford	3.61	TL 82113 11412	Rural area, embankments, more sinuous, not included in fluvial audit
14	Langford to Beeleigh (Chelmer Confluence)	0.98	TL 83546 09067 Ending at: TL 83977 08392	Section past Langford is canalised

Reach 1: Wimbish to Radwinter



Short-term	• Installation of leaky dams and other NFM techniques in multiple locations • Riparian planting • Use of woody in-channel material to increase meandering and habitat • Himalayan balsam investigation
Medium-term	• Wetland creation in the downstream segments
Long-term	• Re-meandering project to make major changes to the channel across the reach

The most upstream portion of the Pant is highly incised (deep) and straightened. The area has a larger amount of woodland than many downstream reaches and has a generally favourable riparian ecosystem.

Of note, is the reach, for roughly 1km leading up to Radwinter, which is particularly straight and homogenous with almost no in-channel features. This is the sort of river morphology that is highly unfavourable in headwaters. This is an area that would benefit from re-meandering and greater interaction with the floodplain, which would slow the flow of water towards Radwinter, which is prone to flooding near the river.

The significance of this site was identified early in the process of producing this plan and discussion have begun about improving the site even before the fluvial audit fieldwork was completed. Some tree planting has already been undertaken in the upstream sections.

A series of local landowners and a number of regional NGO's are jointly working to consider large scale intervention.

This project will cover over a kilometre of river immediately upstream of Radwinter, with potential for further extension beyond the village into reach 2. The current plan is for re-meandering and reforming of much of this segment, as well as the creation of attenuation ponds and leaky dams to slow the flow of water from tributaries into the Pant in this reach.

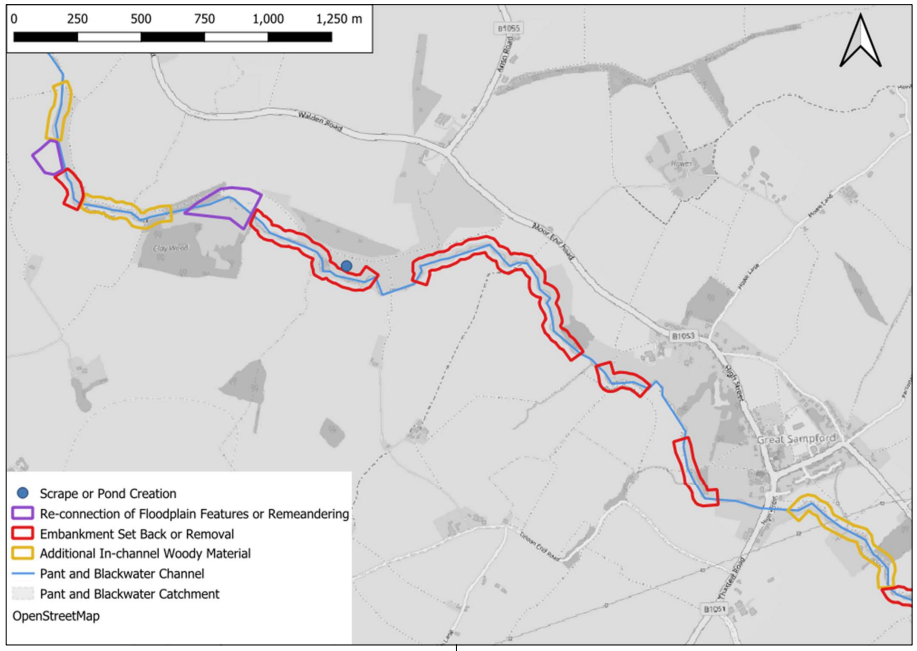
In March 2025, a workshop was held by the EA about the improvements that could be made to the segment of river below Radwinter. Though no project has yet been firmly established, landowners were very open to a range of interventions including the use of leaky dams or wetland creation.

In the short term, some smaller in-channel interventions, NFM measures and further planting could be undertaken, particularly in the area upstream of Radwinter, though the whole reach has relatively well developed riparian margins.

During the fluvial audit, a single record of Himalayan balsam was made in this reach at grid reference TL 61478 36768, the only record upstream of the Finchingfield brook. Following discussions with the landowner it is likely that more plants exist in the surrounding area. Further assessment of this is recommended to ensure Himalayan balsam does not spread in the upper Pant.

The Pant in the area where re-meandering is to take place

Reach 2: Radwinter to Great Sampford



Short-term	• Leaky dams and other smaller NFM measures in the upper portion of this reach. • River channel could be improved using woody material
Medium-term	• Creation of intermittent wetland features, scrapes and ponds close to Goose Woods. • Reconnection of the flood plain
Long-term	• River realignment from Clay Wood to Great Sampford

The most upstream portion of the second reach continues the project described in Reach 1 until the reconnection of floodplain features around Clay Woods. The landowners of this area are keen on restorative works but retaining good working access to the land is a vital element of any project and must be a consideration. Some NFM measures could be implemented here such as use of leaky dams to slow the flow.

Reach 2 continues as far as Great Sampford.

The dominant issue in this area is very high embankments, likely formed as a part of dredging operations as well as heavy realignment of the channel. The whole length of Reach 2 has a thick sediment layer on the riverbed and in-channel plants are slowing the flow, further exacerbating the issue of sedimentation.

Embankment along this reach of the Pant. The embankment is around 1-2m high compared to the floodplain. The Pant is not visible here due to the embankment and incised channelling, but in places the channel is around 4m deep or more.

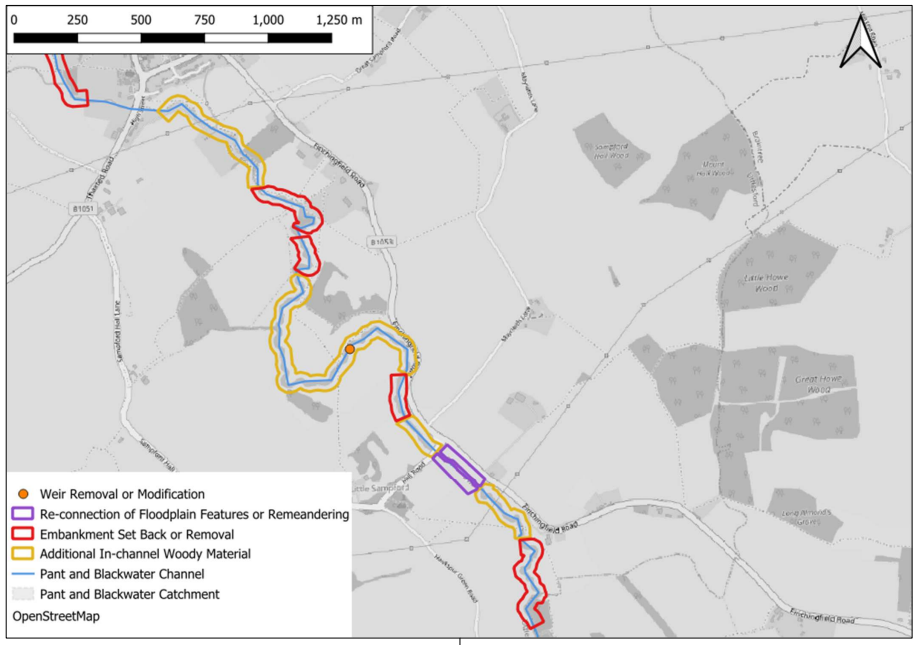
Realignment of these banks could restore a more natural river channel morphology and potentially assist in alleviating the flooding pressure at Great Sampford. This would be a long term vision for the area.

The river could be sensitively cleared of weeds to recreate a following channel either through channel two-staging using woody material, the additional of flow deflectors to promote in channel sinuosity or careful dredging / vegetation clearance.

There is the potential in the up-stream portion of this reach to create small breaches in the embankment to increase floodwater connectivity to low-lying land, which could become a flood storage area, wetland, scrape or ephemeral pond.

This could be further enhanced with the creation of ponds, temporal wetlands and scrapes in the area between the Pant and Goose Woods.

Reach 3: Great Sampford to Little Sampford



Short-term	• Woody material to be used to protect embankments from poaching/erosion along the whole reach • Fencing/riparian buffer zone improvements to prevent further bank damage
Medium-term	• Potential floodplain reconnection on meadow at Little Sampford
Long-term	• Setback or removal of embanked areas in this reach • Removal/modification of the weir near Little Sampford

Downstream from Great Sampford the extent of river embankment reduces. However, smaller segment of embanking do existing and would benefit from removal and breaching. The river channel remains quite incised in many places.

Of more immediate, short term concern along this section of river is that the high riverbanks are unconsolidated and eroding in small sections, caused by high flows and livestock poaching of the banks. There have been several bank collapses caused by the incised channel. Potential work to repair the riverbanks using woody materials / bio-engineered revetment, combined with riparian fencing and an improved riparian buffer zone of scrub and/or tree planting could help in stabilising the banks.

This work could either be carried out by individual farms, each repairing their own segment of riverbank or as a collaborative project.

Many areas also have high banks that could benefit from setback or other modifications, such as near Millfield Cottage

It is also in Reach 3 that the Ely-Ouse transfer scheme, operated in the summer months by the Environment Agency, discharges water from the River Stour into the Pant to top up low flows and transfer water to Abberton Reservoir. Ongoing investigations are going to be required into the scheme in the context of:

- Climatic change
- Population growth
- Chemical changes

The effectiveness of the transfer scheme is continually monitored by the regulators and this must continue in perpetuity. Concerns have been raised by many stakeholders about the alkalinity of the water from this scheme. Alongside monitoring by the water companies and EA, citizen science can be used to allow concerned individuals to collate pH data, comparing summer and winter flows.

Past the bridge at Little Sampford is a wide area of open grassland that, with cooperation from the landowners, could be a suitable location for river re-alignment and wetland creation.

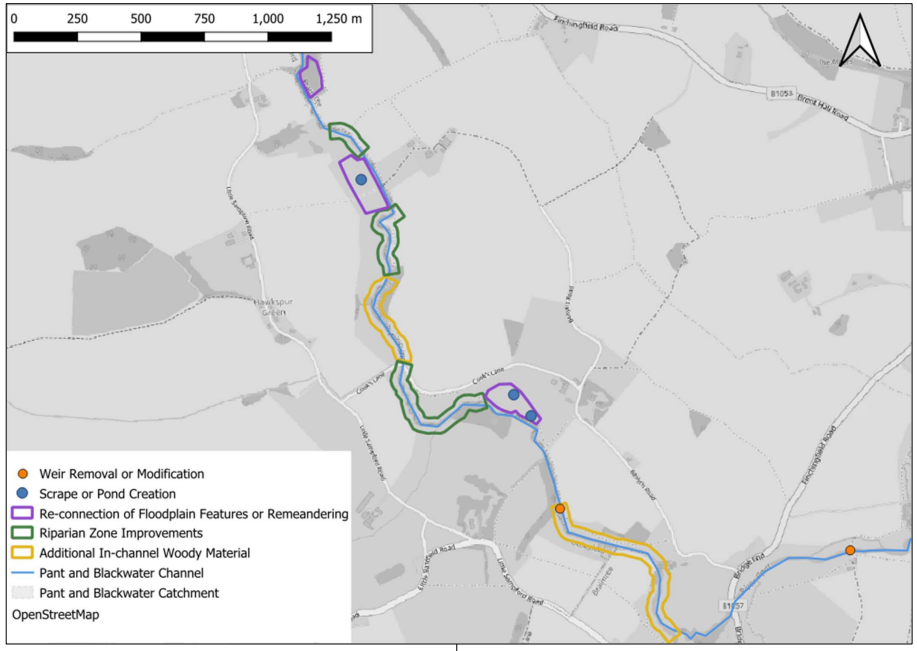
The area of grassland meadow that could have meanders or other wetland features added

Wetland features here would also benefit the area in capturing sediment from the banks upstream as well as acting as a filtering method for nutrients from the Ely-Ouse transfer scheme.

There is a weir in this reach, the furthest upstream on the Pant. It has a relatively small head and should be passable to larger fish. It is of low priority and should be considered a long-term future project.

The weir in this reach under heavy flow conditions

Reach 4: Little Sampford to Great Bardfield



Short-term	• Woody in-channel material and riparian improvements • Improvement of riparian buffer strips throughout the reach • Use of in-channel woody material to improve river features downstream of Copford Hall
Medium-term	• Reconnection of ghost ponds and paleochannels near Salmon's Farm and Beslyns Road
Long-term	• Removal or modification of the gauging weir at Copford Hall

Like Reach 3, Reach 4 is dominated by eroding banks. In many places, this is being caused by poor marginal zones and a lack of riparian planting, combined with poaching from livestock. However, this improves significantly when flowing through areas of woodland.

The short term priority for this reach is consolidate these banks through:

- Riparian planting where possible
- Fencing off of livestock to prevent poaching
- Use of woody material to protect exposed banks where possible
- Use of woody flow deflectors to redirect the energy of the river's flow away from some bank areas.

There are multiple points along both Reach 3 and Reach 4 that would benefit from these simple tasks.

There is some evidence to suggest that both paleo-channels (historic river routes) and possibly ghost ponds (ponds that have been lost in time) exist in this section, including at Copford Hall.

Excavation and reconnection of these features, as well as the creation of additional ponds and scrapes in two distinct areas of the reach (near Salmon's Farm and Beslyns Road) could dramatically increase the ability of this section of the river to hold greater quantities of flood water during high flows.

At Copford Hall, there is a gauging weir. The weir is large and evidence from the fluvial audit study suggests it is impounding the river upstream. This is leading to sediment building up upstream of the structure and the river channel becoming choked with aquatic plants.

A long term aspiration for modification would be to remove the structure and naturalised the river channel. However, to do this an alternative less impacting method of gauging river flow would be required.

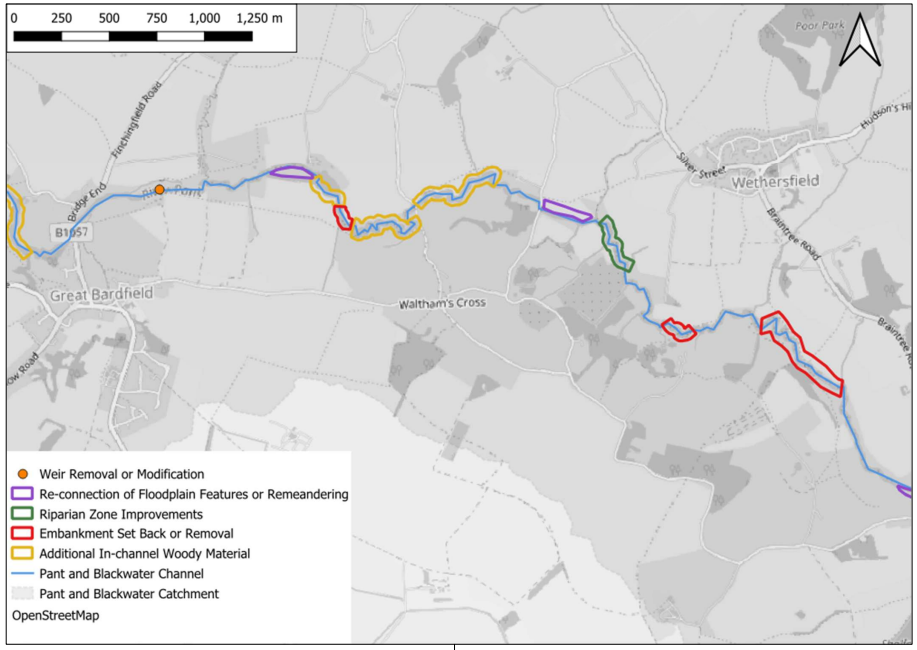
Further investigation is required to see if this structure prevents fish migration upstream.

Below Copford Hall weir, the river has created stable berm features and much of the bed is clean gravel. Although, this is indicative of good condition within the channel, it could be further enhanced through the introduction of woody material. This could be a relatively simple and low cost intervention to consider for a short term intervention.

An example of where the bank has collapsed on this reach. Riparian planting and woody material interventions could be used to prevent further collapse and return the river channel to a more natural form

One of the wet areas on the left bank of the Pant upstream of Copford Hall weir that could be excavated for further water storage

Reach 5: Bridge End to Great Bardfield



Short-term	• Investigation of Himalayan balsam on Finchingfield Brook • Minor in-channel modifications through woody material installation
Medium-term	• Modification of Great Bardfield Mill • Start point for co-ordinated Himalayan balsam removal • Floodplain reconnection around Waltham's Cross
Long-term	• Embankment realignment downstream of Wethersfield • Continued rewilding as a part of Ground Control's Wildfell project

Reach 5 begins at Great Bardfield where the river is slowed and impounded by the sluice at derelict Great Bardfield Mill. This is causing silt to deposit above the sluice and bed erosion below, which is also showing signs of banks erosion. Modification of this structure would be a good medium term aspiration for this reach. However, this is a grade II listed structure and any modifications would need to take into account the heritage of the site.

The river takes on a more natural character through this section, around Waltham's cross but improvements could be made to the channel here to help reduce erosion and promote a more natural channel form.

It is notable that this is the reach in which Himalayan balsam become prevalent in abundance. Particularly below the confluence with Finchingfield Brook, suggesting this sub-catchment could be the notable source for the river. A catchment-scale plan to control Himalayan balsam should be a consideration and medium term action.

An area past Wethersfield showing a high bank that is disconnecting the Pant from its floodplain and, in the foreground, Himalayan balsam. Photo by JBA Consulting

Downstream of the Finchingfield Brook confluence are further opportunities for small-scale floodplain reconnections, enhancement of the channel with woody material and setting back of the banks.
at Wethersfield, there is an opportunity for improving the riparian margins and further tree and scrub planting at a site owned by Ground Control.

Ground Control, an environmental consultancy and project delivery company, own much of the land surrounding the north of Wethersfield, including a short section of the left bank of the Pant. The 120 ha site, known as Wildfell, is being transformed from arable land into an area of biodiversity net gain. More information about Wildfell can be found on their website.
https://www.ground-control.co.uk/biodiversity/project-wildfell/

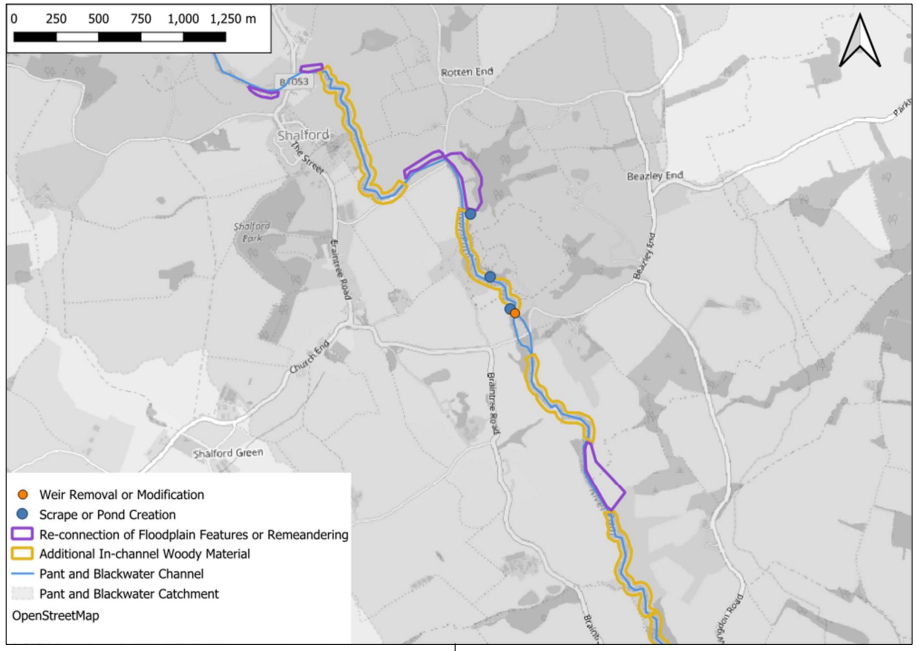
The derelict mill race at Great Bardfield, photo by JBA Consulting

Beyond Wethersfield is an area where high sided banks could be lowered, removed or set back. This represents a long term ambition for this reach.

The North Essex Farm Cluster's Pant Valley Pilot Project (NEFC PVPP) have identified a small tributary on the left bank near Wethersfield for project intervention. They will add 6 leaky dams and create 2 new attenuation ponds. The stream crosses the land of 6 farms and is an example of co-operative action.

Nearby is ex-RAF Wethersfield. Run-off from the old runways is discharged into the Pant. Although beyond the scope of this plan, it is hoped that all future planning relating to this site encompass environmental mitigation, such as Sustainable Urban Drainage (SUDs) to reduce the environmental impacts of any development on the Pant and its tributaries.

Reach 6: Shalford to Panfield



Short-term	• The NEFC Pant Valley Pilot Project encompassing leaky dams, pond creation and scrapes and hedging • Co-ordinated Himalayan balsam pulling along the reach • Use of leaky dams or other measures to manage road run off from Gosfield Road
Medium-term	• Additional in-channel woody flow deflectors added around Shalford and downstream of Codham
Long-term	• Modification of Codham Mill for eased fish passage

Reach 6 is the main area of work for the NEFC PVPP. Current planned work being:

- Upstream of Shalford, a cluster of new ponds are to be created.
- On the opposite bank a new attenuation pond and new hedges are being installed.
- Near to Water Hall Lane, a new scrape is being installed.
- Near to Codham Mill, a new attenuation pond is to be connected and reconnection of the paleochannel will be completed.
- Further downstream – 3 new ponds are to be added and new hedgerow planting.
- At Codham, a new attenuation pond is to be created.
- New leaky dams to be installed on a small tributary.
- A re-connection of floodplain and ponds are to be created along with a silvopastoral scheme.

Localised flooding has been noted from the run-off from Gosfield Road and through the nearby dairy farm. A further opportunities for the intersection and capture of this water could assist further in NFM improvements.

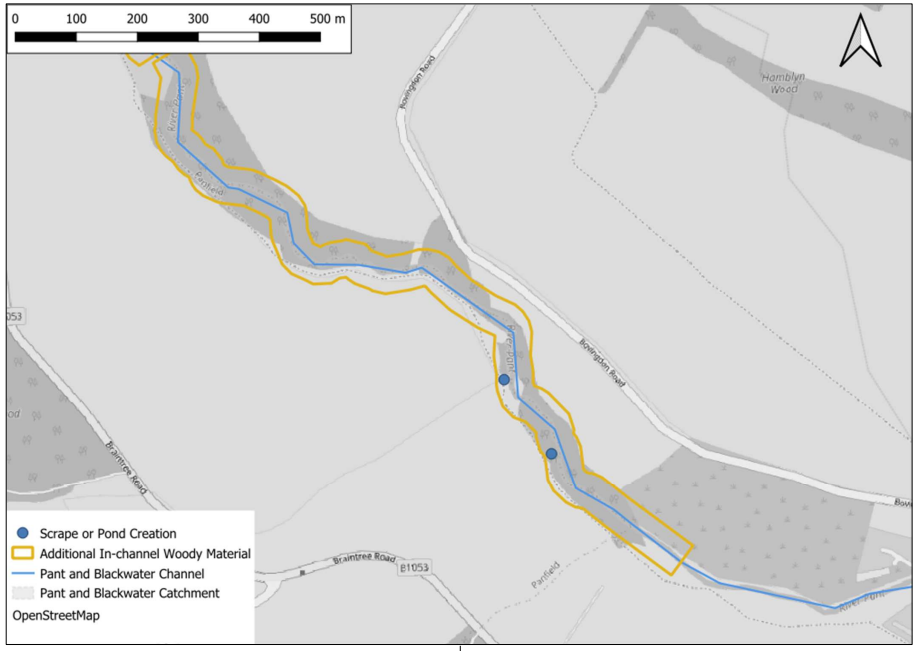
Previous work has been completed at Ironbridge Farm, just upstream of Copford by the Essex Wildlife Trust in 2014. Work here connected the local wildlife site of Ironbridge Farm to the Pant via a pipe to wet up the area and produce wet woodland and fen meadow. This has helped with water storage and water quality on this section of river and the new NEFC project will further enhance the area.

This secures the short term future of the area. However, Codham Mill in the centre of this reach could be considered for alteration. This would likely prove difficult though as the building has been converted into a multiple occupation residence. There is a mill bypass channel that has potential weir easement for fish passage, but given the current occupation status of the building and that it is likely fish can pass this structure this is not a priority for weir removal. Like all structures though, further review is always required but this represents one of the last weir structures likely to be considered as a priority for river.

Part of the paleochannel upstream of Codham. The channel's course is visible from the differing vegetation structure

Codham Mill, the Pant flows under where this image was taken and to the left of the picture

Reach 7: Panfield to Bocking (Braintree)



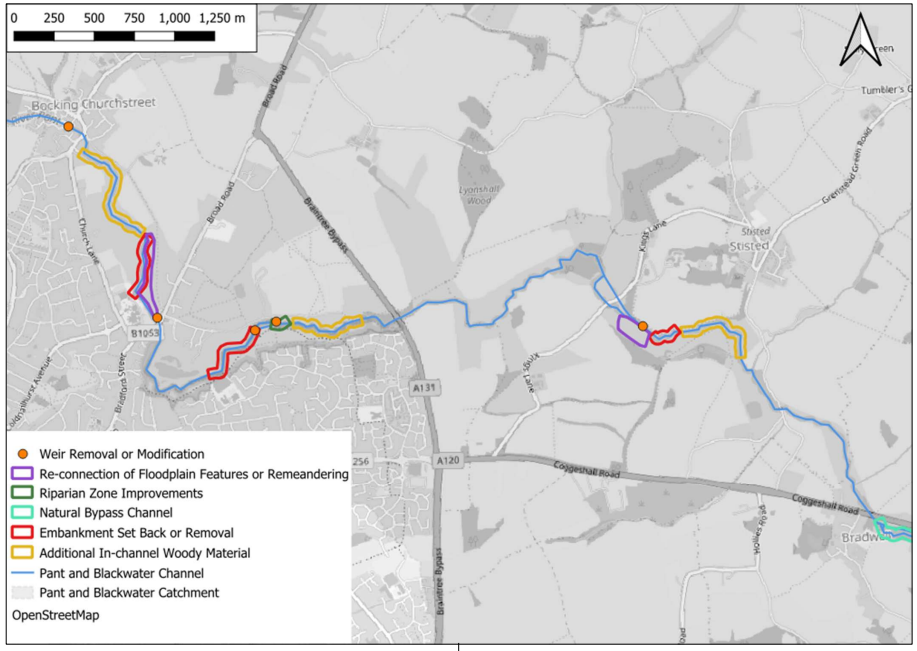
Short-term	• The NEFC Pant Valley Pilot Project, additional tree planting and ponds • Co-ordinated Himalayan balsam pulling along the reach
Medium-term	• Additional scrapes and in-channel woody material added to create new river features
Long-term	• Assess the reach for any further habitat potential to promote species specific targets (e.g. water vole habitat or fish spawning)

Reach 7 is very short and managed somewhat differently to other areas. The river has a wide riparian margin where plants have been allowed to grow freely. This is excellent riparian habitat for many species, however this area does also contain a high abundance of Himalayan balsam. Some sections of the is also used for growing cricket bat willow.

This area is in relatively good ecological health but could be enhanced further by the use of scraps or ponds to help capture heavy flows and some additional in channel woody material or minor modifications as in this reach the river is beginning to deposit material to narrow its channel and encouraging this in the right places will allow for a very natural channel in this area.

This is the lowest area of the NEFC PVPP and farms in this reach are carrying out tree planting and are developing some new ponds away from the river channel.

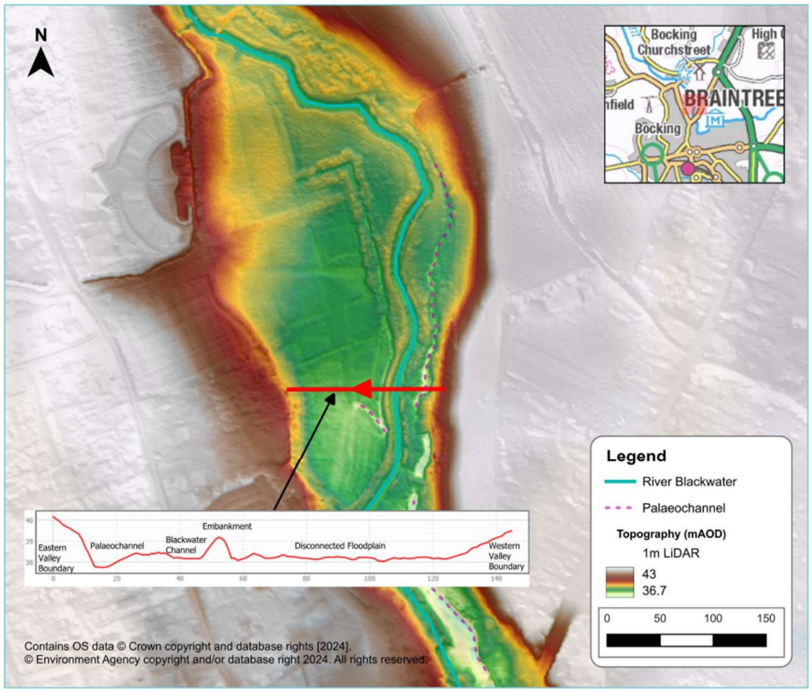
Reach 8: Bocking (Braintree) to Bradwell



Short-term	• Improvements/bank repairs to section around Straits Mill • In-channel woody material and berms could be added at Stisted • Evaluation of the weir at Straits Mill for fish passage • Co-ordinated Himalayan balsam pulling along the reach
Medium-term	• Modification of Bocking weir • Embankment modifications at Stisted
Long-term	• Modification of Cane's Mill weir • Modification or removal of Stisted weir and Bocking Churchstreet weir

Reach 8 begins as the Pant changes its name to the Blackwater at Bocking Churchstreet. This area was once a textile factory and the site of this is now a housing development. The river channel is very wide, runs within concrete banks and is hydrologically disconnected from its floodplain excluding from artificial outfalls. It would be impossible to alter the structure of these banks without remodelling the entire area, which although possible in the future, subject to any far future development, is likely to be aspirational and a long-term goal rather than being achievable in the near future.

The Blackwater passes over a weir beneath the footbridge at TL 75711 25545 which is impounding the section in the concrete channel, limiting the river's ability to naturalise. Modification of this for improved fish passage is a medium term ambition.



LIDAR mapping of the Blackwater downstream of Bocking. The paleo channel and disconnected floodplain can be seen in the cross section bottom left. Mapping by JBA Consulting

The river then passes back into countryside. The area patches of natural gravel exposed on the bed, but is still largely silted. In-channel woody material could be of used to improve in-channel features and habitat and could be either delivered separately as on isolated project or combined as a part of a larger weir modification project.

The Blackwater then passes through an area where the valley widens, however, high banks have disconnected the river from its floodplain. A paleochannel in this area could be reopened to restore river course and provide natural river habitats.

This could be considered as a viable project for medium term ambitions. The project could also have flood risk benefits to for Braintree.

Cane's (also called Bocking) Mill, privately owned and restored to good (though not working) condition

A further weir ends this section at Cane's Mill (sometimes called Bocking Mill). This is a medium-sized weir system and very difficult for fish to pass.

Should a project be considered for this site then full and appropriate flood risk assessment and modelling is likely to be required.

Beyond this is a great example of an area that has been conserved extensively in the past, Bocking Blackwater LNR. The reserve is around 13ha in size and maintained by Braintree District Council. The reserve is open to the public and is a widely enjoyed resource for recreation. There is a Weir here. Data from the Essex Fish Migration Roadmap suggests that only eels can pass the structure, however a full evaluation should be considered.

The land is owned by Braintree District Council and Billericay and District Angling Club, who have both worked on projects here in the past.

Nearby Straits Mill is a site owned by the Billericay and District Angling Club and features several fishing ponds that were enhanced in 2016. Almost a decade has now passed since, and the site and surrounding riverbank could be considered for further riparian improvements, particularly as the popularity of the site has led to bank poaching from humans and dogs. This is a smaller scale, short term project to be considered by the B&DAC and partners. Angling platforms could also help reduce the wear and tear on the riparian margin in this area.

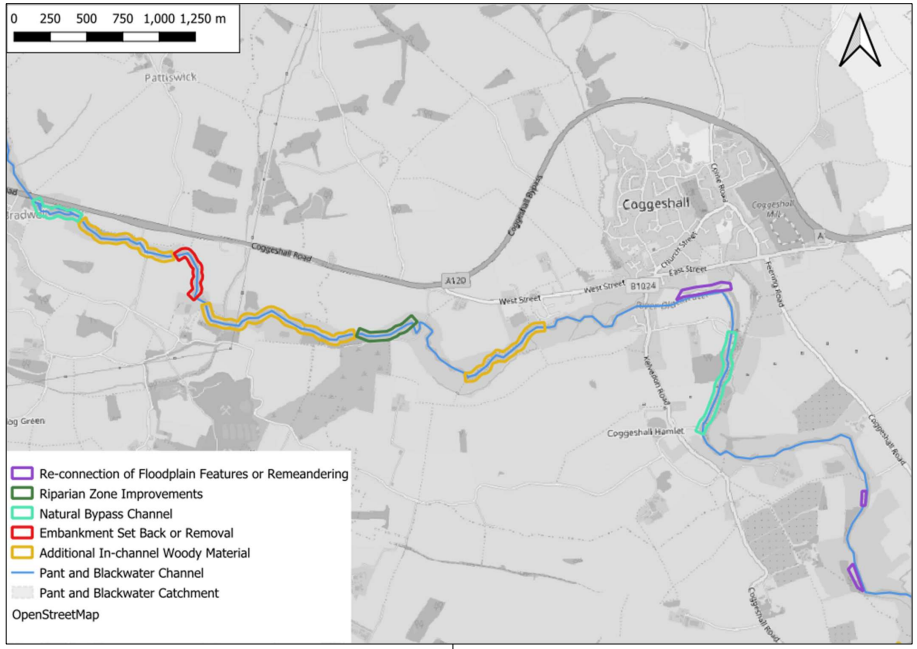
The Blackwater downstream of this point is generally in acceptable condition until Stisted, where there is a highly modified channel for Stisted Mill, now a grade II listed private residence. The weir here is used as a gauging weir by the EA and as such would be very difficult to create any form of modification.

At Stisted there is an opportunity to improve the embanked channel with woody material or the creation of berms and other in-channel features. A distant long term aspiration would be to have naturalised banks rather than sheer concrete edges.

The Blackwater at Bocking, view looking upstream towards the Pant. Despite high flows, it is possible to see where silt deposits have created a sinuous river channel

The floodplain around Braintree

Reach 9: Bradwell to Feering



Short-term	• In channel woody material could increase river features upstream of Coggeshall • The EA are continuing to complete work around Paintwall Mill • Focus area for removal of Himalayan balsam
Medium-term	• NFM measures on tributary at Bradwell • Modifications to the bank and straightened section downstream of this site
Long-term	• Further work on this reach will be influenced by the CF&KFAS • Bypass of Bradwell weir to improve sediment flow

Reach 9 is the area around Coggeshall. A notable future capital scheme in the area is the Coggeshall, Feering and Kelvedon Flood Alleviation Scheme (CF&KFAS), proposed by the Environment Agency. This scheme aims to alleviate flooding on the three towns by use of a dam at Coggeshall.

It is hoped that the cumulative work of projects from this plan would reduce the need for such a large, hard engineering solution to flooding in the area. More information about the scheme can be found on the EA's website: https://consult.environment-agency.gov.uk/east-anglia-c-e/coggeshall-flood-alleviation-information-page/

A small tributary in Bradwell is contributing to silt into the Blackwater main river channel. The original source of the sediment will need further investigation, but NFM measures such as leaky dams or attenuation ponds could help reduce sediment load into the Blackwater.

There is also an impounded section here caused by the weir of the old mill that could see modification or bypassing to ease flow from this tributary, allowing better sediment transfer and improve fish passage.

There is the potential to create modification to the small tributary to reduce the impacts of sediment. Flow deflectors could help to concentrate flow and create areas of scour and deposition.

The embanked areas and river could be adapted alongside these in-channel modifications to produce a more natural river channel profile.

The section of river leading into Coggeshall has been historically straightened and would benefit from in-channel woody material or minor modifications, subject to Coggeshall, Feering and Kelvedon Flood Alleviation Scheme. Any works in this section must not exacerbate flood risk.

The listed footbridge 'Nunn's Bridge' can be found here, close to Coggeshall Football Club's pitch and any work in the area must take this historic feature in to account.

Floodplain reconnection could be possible around Coggeshall, but flood risk would need to be a major consideration. Wetland features, if installed correctly, could reduce the risk of homes flooding in this area, but must be constructed carefully.

The landowners, in partnership with the EA, are creating approximately 12 hectares of wetland features around Paintwall Mill. Additional work may be required in support of the scheme once fully complete. Further bypassing of the very sluggish channel around this site may be considered in the future, but current work must be completed first.

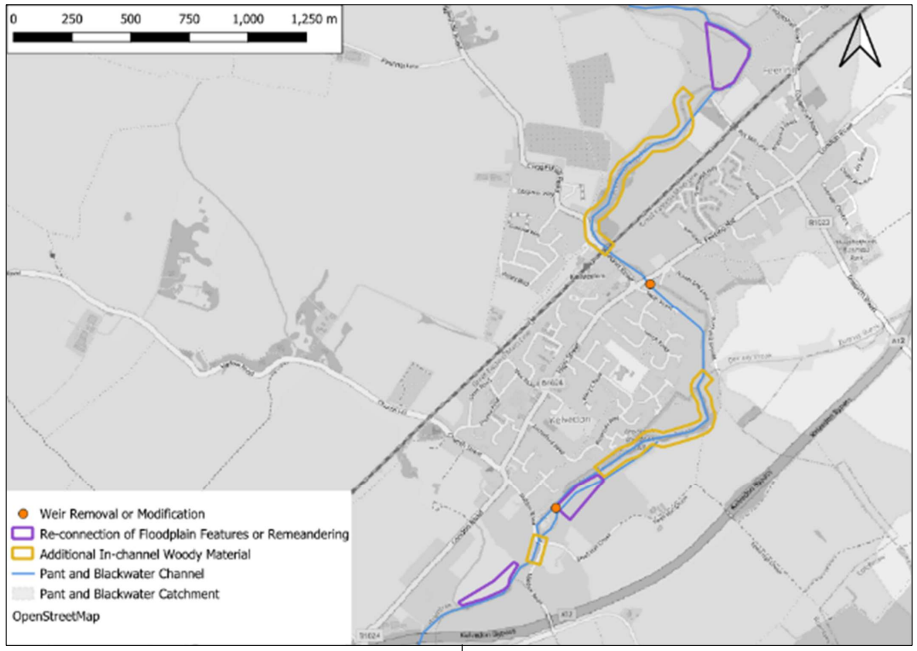
It is notable that Paintwall Mill leet has sheet piled banks. If possible, bioengineering options should be considered if the piling needs replacing.

This area has a high abundance of Himalayan balsam present, much of which is accessible by public rights of way (though landowner permissions are still required to work on these areas). This is therefore an idea reach for additional balsam clearance, as additional effort is likely to be needed in the area.

Beyond Paintwall Mill, the river is in a relatively good condition with small patches of silt, combined with a gravel and sand bed. This area the land is a part of Feeringbury Manor

The Blackwater flows under Nunn's Bridge, photo by JBA Consulting

Reach 10: Kelvedon



Short-term	• In channel flow deflectors and gravel introduction to create fish habitat and spawn grounds around Kelvedon • Co-ordinated Himalayan balsam pulling along the reach
Medium-term	• Floodplain reconnections to further the previous in channel improvements, notably at Feering Cricket Club and Brockwell Meadows LNR • Removal or modification of weir structure near B1024 • Modification of Easterford Mill
Long-term	• Investigation of and further modification to Grey's Mill

The lower Blackwater is heavily dominated by mills and weir structures. At Kelvedon there are two mills, Easterford Mill and Grey's Mill as well as a weir structure under the B1024.

Grey's mill, downstream of the town, is now a series of private flats. Although, in beautiful surroundings, the mill is causing impoundment and is a barrier to fish passage. It has, however, been fitted with an Eel pass. Further investigations for multi-species fish passage should be considered.

Easterford Mill has been assessed and has potential modifications suggested. However, further work is needed to ensure that modifications do not cause any flow split issues and that all parties in the privately owned mill and surrounding properties are comfortable with any proposals.

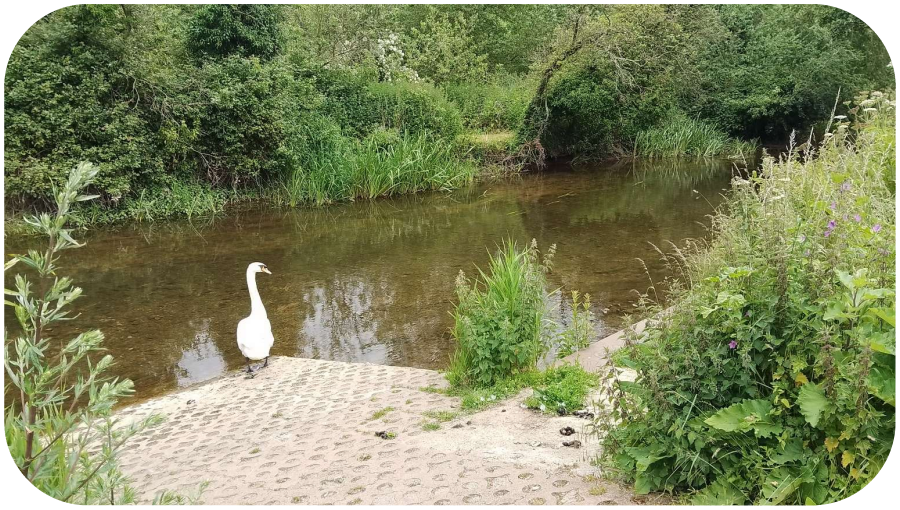
Close to the B1024 is another weir which is in a poor state of repair and distribute water around Easterford Mill. This weir is starting to fail. This structure is being considered for fish passage to aid fish passage at Easterford Mill.

Grey's Mill and leet, downstream of Kelvedon

A large portion of the Blackwater in this reach is owned by Kelvedon & District Angling Association (KDAA). The KDAA have shown interest in flow deflectors along many of the areas marked for in-channel material in this reach. This would greatly improve the river habitat and flow diversity and could potentially develop suitable gravel to promote fish spawning for a number of endemic species. Suitable gravel riffles could be added to promote fish species spawning.

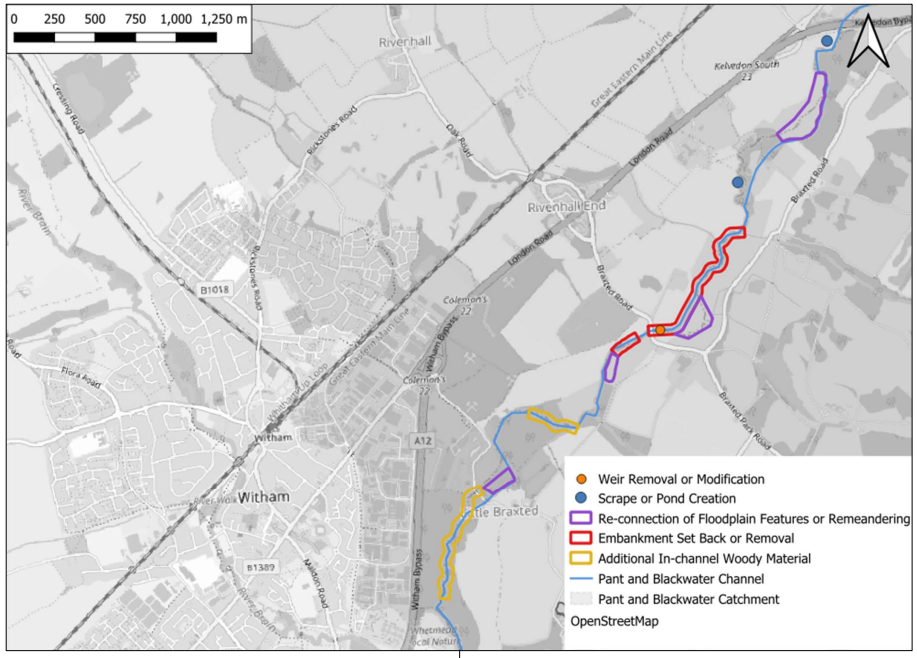
Additionally, further woody material could be added around Brockwell Meadows LNR, to similarly enhance this section of river.

Floodplain reconnection and adding riparian interest could also be a potential option in small number of areas in this reach, which could include rewetting the woodland near Grey's Mill, and floodplain reconnection at a site near to Kelvedon and Feering Cricket Club.



The Blackwater at Kelvedon, upstream of Easterford Mill. The river here is in very good condition, despite being straightened, and perched, however fish in this section struggle to pass Easterford Mill

Reach 11: A12 to Witham



Short-term	• Removal (or modification) of barriers at Little Braxted and associated in-channel woody material added downstream • Co-ordinated Himalayan balsam pulling along the reach
Medium-term	• Addition of scrapes or ponds to be considered either as a part of A12 widening or as improvements after roadworks • Possible bank realignments around Colman's Reservoir and Appleford Farm gauging weir with floodplain reconnection
Long-term	• Modification or removal of Appleford Farm Weir

The riparian zone along Reach 11 is of very high quality, however, the river channel suffers from many of the same issues found upstream.

This is the most downstream reach of the Blackwater where there is good scope for the creation of scrapes, wetlands or ponds. These could be part of an NFM scheme for Witham to help manage flood risk. This may provide a medium term opportunity, but must take into account potential infrastructure changes, such as A12 modifications.

For more information on the proposed changes to the A12, follow this link: https://nationalhighways.co.uk/our-roads/east/a12-chelmsford-to-a120-widening-scheme/

Appleford Farm gauging weir, photo by JBA Consulting

At Appleford Farm there is a gauging weir operated by the EA. Gauging weirs are very difficult to modify and the weir is easily passed by fish and overly impounding. As such, this is among the lowest priority weirs for modification on the Pant and Blackwater.

Surrounding this weir, historic dredging has created embankments. It could be possible for some setting back of the embankment, but full consideration is needed for this as the surrounding land is arable and includes Colman's Reservoir and fishery. The reservoir acts as silt traps for a small tributary that discharges into the river.

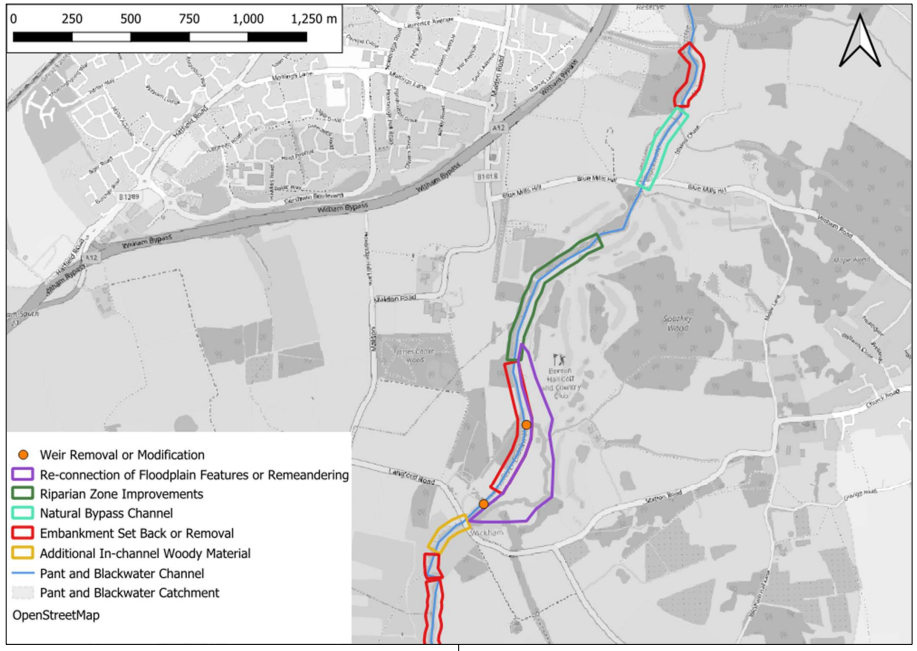
There is an increase opportunity for floodplain reconnection on the left bank of the Blackwater, upstream of the gauging weir.

At Little Braxted, the Blackwater is impounded and highly silted. This is being caused by barriers (not included on the map) in the river which are completely impassable to all fish (as listed by the Essex Fish Migration Roadmap).

Removal or modification of the barriers at Little Braxted would free passage along the river for fish and help restore natural river processes from Kelvedon to the River Brain and should be considered.

Downstream of this point, flow deflectors could be used to narrow the channel and produce a more natural flow. This could be a short term option if the landowners supports this potential enhancement of the main channel.

Reach 12: Witham and Wickham Bishops



Short-term	• Minor in-channel woody-material works downstream of the B1018 • Co-ordinated Himalayan balsam pulling along the reach
Medium-term	• Bypass options at Blue Mills • Riparian improvements at Benton Hall Golf • Investigation into additional sediment entering Blackwater from the River Brain • Modifications to embankment around Whetmead to increase the floodplain connectivity
Long-term	• Combination of interventions to improve the area at Benton Hall Golf Club, bank realignment, floodplain reconnection and weir removal or modifications •Modification of Wier at Wickham Mill

The River Brain joins the Blackwater at the start of this reach. It was noted that there is an increase in sediment in the Blackwater at this point. Assessment of the Brain is recommended to understand the source of this additional sediment and where this can be mitigated. Witham Town council have begun monitoring of the Brain via the ESRT's Essex RiverWatch programme.

The two rivers meet in an area that was once wider floodplain, where water could flow across plain regularly, increasing flood water storage. The presence of embankments around this area prevent the water attenuation, which reduces flood storage capacity. In the medium term, considerations could be made to set these embankments back and allow a more natural floodplain to absorb water during high flows in the area downstream of Whetmead LNR, provided this does not increase flood risk to properties. This could include the creation of new wetland features to increase biodiversity and help to improve water quality.

South of this is the historic Blue Mills. An initial assessment of fish passage has been completed for this site. The assessment found that the structure is impassable to all but the largest fish (and even then passage is unlikely). At the time, the recommendation was the removal of the weir but this was rejected by the owners over concerns regarding the water levels above the weir. Alternative modification options have been drafted and the site could be adapted for a nature-based fish bypass channel, if permission are agreed.

After the road bridge, the river flows past a wooded section where the river has been assessed a being in good condition, before passing to Benton Hall Golf Club.

Impounding from the weir at Wickham Mill has left the channel in a low energy state leading to a very silted channel.

However, there is good evidence of the old channel, with part of the paleochannel still being wet, now acting as a ponded area. The channel that was created to service the mills has now become the main channel. The riparian zone is managed for amenity rather than nature.

There are opportunities to improve the river, with landowner permission. The could be quite a significant large scale restoration, but the golf club's needs must be considered in any plans. Interventions could improve river connectivity and fish passage past Wickham Mill. There would also be an opportunity to improve floodplain connection and riparian habitat.

This represents a long term project that would need considerable planning such that the needs of the river, residents and golf club can all be met while remaining sensitive to the heritage of the area, such as the preservation of the historic Wickham Bishops Viaduct scheduled monument and Benton Hall.

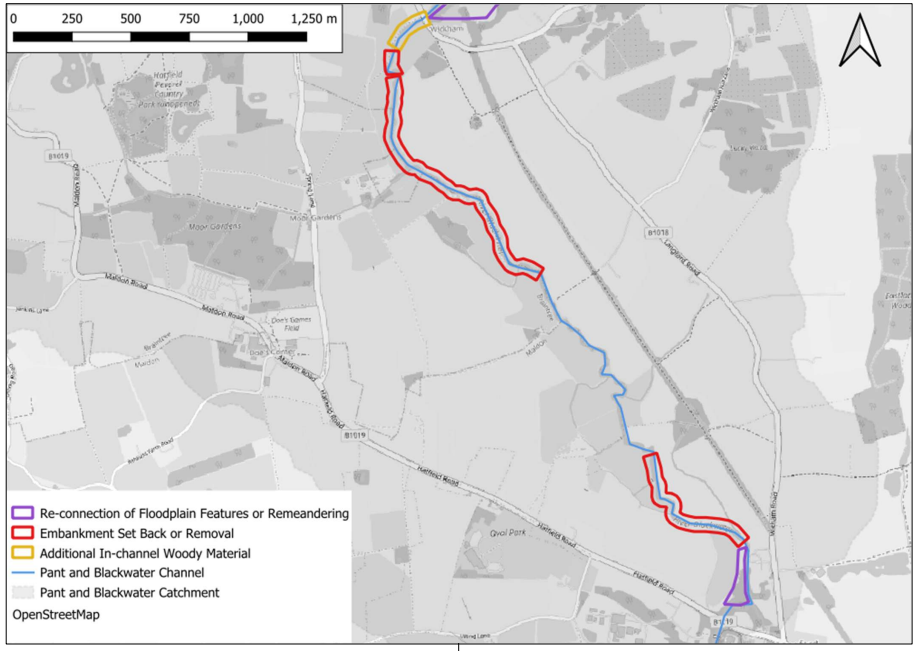
Smaller scale options could also be considered which would involve reopening and restoration of the original channel, bypassing the mill structures and the inclusion if woody material lower in the reach.

Feasibility studies and full engagement with Benton Hall Golf Course and other stakeholders would be needed for any programme of river improvement to progress further than an aspiration.

Part of the original course of the river within Benton Hall Golf Club, photo by JBA Consulting

The road bridge downstream of Blue Mills, photo by JBA Consulting

Reach 13: Wickham Bishops to Langford



Short-term	• Further engagement and information gathering is required in this reach • Identification of Himalayan balsam in this reach and co-ordination of removal
Medium-term	• Potential for some small scale floodplain connections upstream of the Museum of Power
Long-term	• Potential for bank realignments but further investigations are required

Reach 13 is the only reach that could not be accessed during the fluvial audit process due restricted permission. All the results and recommendations are based solely on the desk-based study. Further engagement in this area as well as additional survey work is recommended as the current planning for this area cannot be as detailed as for other reaches.

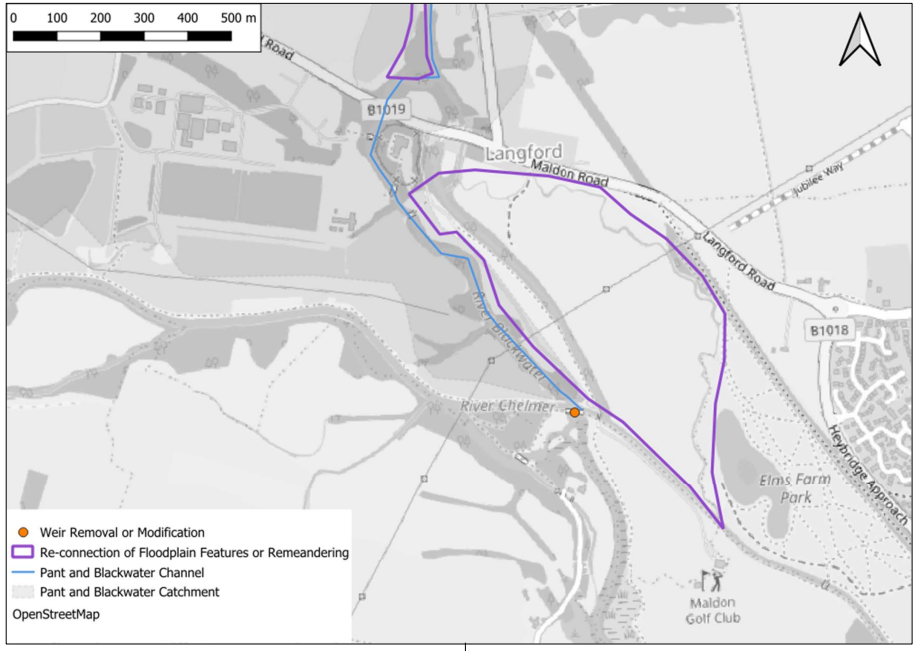
The primary intervention recommended based on LIDAR information is the removal or setting back of banks, however it is very difficult to ascertain the feasibility of this at present. This should be considered for the medium to long-term future.

The Museum of Power is at the lowest point of this reach, housed in the pumping station at Langford. This once supplied Maldon. Here, the channel splits in two and at this point, there is the potential to reinstate some small floodplain features. This would require the agreement of the Museum of Power and other adjacent land owners. The area of land owned by the Museum has been enhanced to increase biodiversity for visitors, with assistance from the Essex Wildlife Trust, and is home to at least 70 bird species.

As this reach has not been fully investigated, the status of INNS is not fully known to the authors of this plan. Further investigation of the current spread of Himalayan balsam and co-ordination with landowners and local interest groups can then be established.

The gates of the Museum of Power, a museum housing a large static steam engine and other machinery associated with pumping water. The museum could be a key partner in this reach

Reach 14: Langford to Beeleigh



Short-term	• Confirm identification and presence of floating pennywort and its extent • Apply control measure to prevent its spread and to try to eradicate its presence from this reach
Medium-term	• Modification of Beeleigh weir to allow fish passage
Long-term	• Potential for reconnection of old marshland area

The final, very short, reach of the Blackwater covers the area around Langford and Beeleigh. This is a very straight and canalised section that has a generally clean gravel bed. The entire reach is managed by a single landowner. The opportunities in this area are limited to modification of Beeleigh weir and the potential for reconnection of the floodplain around Langford, which was historically marshland.

Any work to reconnect the floodplain must take into account the river's brackish characteristics, and so careful planning would be required to prevent saline intrusion into the fluvial Blackwater.

The weir modifications would be a major undertaking due to the complexity of the site, which is fully canalised and is navigable by boat beyond this point.

This structure is the first on the fluvial river and is currently very difficult for fish to pass. This structure creates a barrier for migratory fish species to move between the estuary and freshwater environment.

A short section of this reach was identified as having floating pennywort (*Hydrocotyle ranuculoides*) in 2024 (refer to Appendix 7). The location of the floating pennywort was upstream of the confluence of the Blackwater and Chelmer at Beeleigh. The river is split into two channels through this section and the floating pennywort has been identified in the eastern channel, known as the Langford cut (NGR: TL840084).

To prevent further spread, this plan recommends resurveying as soon as possible to confirm the presence of floating pennywort and if present then undertaking control measures to prevent its further spread. Monitoring will be required in the future to ensure that the floating pennywort is controlled.

Beeleigh weir, photo by JBA Consulting

The reported location of floating pennywort on the Langford Cut, sightings shown as yellow dots. The main channel of the Blackwater can be seen in the middle of the map flowing north to south and the Chelmer can be seen flowing from east to west. Map produced by the ESRT using data from INNS Mapper

Summary of Interventions

Reach	Short-Term	Medium-Term	Long-Term
1	• Installation of leaky dams and other NFM techniques in multiple locations • Riparian planting • Use of woody in-channel material to increase meandering and habitat • Himalayan balsam investigation	• Wetland creation in the downstream segments	• Use of woody in-channel material to increase meandering in most up-stream portion
2	• Leaky dams and other smaller NFM measures in the upper portion of this reach. • River channel could be improved using woody material	• Creation of intermittent wetland features, scrapes and ponds close to Goose Woods. • Reconnection of the flood plain	• River realignment from Clay Wood to Great Sampford
3	• Woody material to be used to protect embankments from poaching/erosion along the whole reach • Fencing/riparian improvements to prevent further bank damage	• Potential floodplain reconnection on meadow at Little Sampford	• Setback or removal of embanked areas in this reach • Removal/modification of the weir near Little Sampford
4	• Woody in-channel material and riparian improvements • Improvement of riparian buffer strips throughout the reach • Use of in-channel woody material to improve river features downstream of Copford Hall	• Reconnection of ghost ponds and paleochannels near Salmon's Farm and Beslyns Road	• Removal or modification of the gauging weir at Copford Hall
5	• Investigation of Himalayan balsam on Finchingfield Brook • Minor in-channel modifications through woody material installation	• Modification of Great Bardfield Mill • Start point for co-ordinated Himalayan balsam removal • Floodplain reconnection around Waltham's Cross	• Embankment realignment downstream of Wethersfield • Continued rewilding as a part of Ground Control's Wildfell project
6	• The NEFC Pant Valley Pilot Project encompassing leaky dams, pond creation and scrapes and hedging • Co-ordinated Himalayan balsam pulling along the reach • Use of leaky dams or other measures to manage road run off from Gosfield Road	• Additional in-channel woody flow deflectors added around Shalford and downstream of Codham	• Modification of Codham Mill for eased fish passage
7	• The NEFC Pant Valley Pilot Project, additional tree planting and ponds • Co-ordinated Himalayan balsam pulling along the reach	• Additional scrapes and in-channel woody material added to create new river features	• Assess the reach for any further habitat potential to promote species specific targets (e.g. water vole habitat or fish spawning)
8	• Improvements/bank repairs to section around Straits Mill • In-channel woody material and berms could be added at Stisted • Evaluation of the weir at Straits Mill for fish passage • Co-ordinated Himalayan balsam pulling along the reach	• Modification of Bocking weir • Embankment modifications at Stisted	• Modification of Cane's Mill weir • Modification or removal of Stisted weir and Bocking Churchstreet weir
9	• In channel woody material could increase river features upstream of Coggeshall • The EA are continuing to complete work around Paintwall Mill • Focus area for removal of Himalayan balsam	• NFM measures on tributary at Bradwell • Modifications to the bank and straightened section downstream of this site	• Further work on this reach will be influenced by the CF&KFAS • Bypass of Bradwell weir to improve sediment flow
10	• In channel flow deflectors and gravel introduction to create fish habitat and spawn grounds around Kelvedon • Co-ordinated Himalayan balsam pulling along the reach	• Floodplain reconnections to further the previous in channel improvements, notably at Feering Cricket Club and Brockwell Meadows LNR • Removal or modification of weir structure near B1024 • Modification of Easterford Mill	• Investigation of and further modification to Grey's Mill
11	• Removal (or modification) of barriers at Little Braxted and associated in-channel woody material added downstream • Co-ordinated Himalayan balsam pulling along the reach	• Addition of scrapes or ponds to be considered either as a part of A12 widening or as improvements after roadworks • Possible bank realignments around Colman's Reservoir and Appleford Farm gauging weir with floodplain reconnection	• Modification or removal of Appleford Farm Weir
12	• Minor in-channel woody-material works downstream of the B1018 • Co-ordinated Himalayan balsam pulling along the reach	• Bypass options at Blue Mills • Riparian improvements at Benton Hall Golf • Investigation into additional sediment entering Blackwater from the River Brain • Modifications to embankment around Whetmead to increase the floodplain connectivity	• Combination of interventions to improve the area at Benton Hall Golf Club, bank realignment, floodplain reconnection and weir removal or modifications •Modification of Wier at Wickham Mill
13	• Further engagement and information gathering is required in this reach • Identification of Himalayan balsam in this reach and co-ordination of removal	• Potential for some small-scale floodplain connections upstream of the Museum of Power	• Potential for bank realignments but further investigations are required
14	• Confirm identification and presence of floating pennywort and its extent • Apply control measure to prevent its spread and to try to eradicate its presence from this reach	• Modification of Beeleigh weir to allow fish passage	• Potential for reconnection of old marshland area

Appendix 1: Detailed Breakdown of the WFD

Table A1-1: The status of each element of WFD monitoring during cycle 3 (2022) for the Pant and Blackwater

Classification Item	Element	Pant Status (Cycle 3, 2022)	Blackwater Status (Cycle 3, 2022)
Biological quality elements	**Overall**	**Poor**	**Moderate**
	Fish	High	High
	Invertebrates	Poor	High
	Macrophytes and phytobenthos combined	–	Moderate
	Macrophytes	Moderate	Moderate
	Phytobenthos	–	Moderate
Physico-chemical quality elements	**Overall**	Moderate	Moderate
	Acid neutralising capacity	High	High
	Ammonia	High	High
	Biological oxygen demand (BOD)	High	High
	Dissolved oxygen	Poor	High
	Phosphate	Bad	Poor
	Temperature	High	High
	pH	High	High
Supporting elements	Mitigation measures assessment	Moderate (or less)	Moderate (or less)
Specific pollutants	**Overall**	High	High
	Arsenic	High	High
	Chlorothalonil	High	High
	Copper	High	High
	Iron	High	High
	Manganese	High	High
	Pendimethalin	High	High
	Triclosan	High	High
	Zinc	High	High
Chemical	–	Fail	Fail

Reasons for not Achieving Good Status (RNAGs) in detail

The EA outline the reasons why specific elements have not achieved a good (or high) status with specific discussion of the activity (the action or source of the issue), category (the sector responsible for the action through action or inaction) and which of the above classification elements is affected. These are all elements in table A1-1 that are not highlighted as high. Chemical status is ignored and, from 2022, not monitored due to the presence of 'forever chemicals' that are not possible to remove but known to be present in all UK watercourses.

Addressing these RNAGs is the primary concern of this plan and, as such, the goals, targets and solutions outlined in this document are designed to target them and improve the overall condition of the whole river system.

RNAGs – Pant

P1 Physical modification including land drainage associated with agriculture and rural land management and other activities associated with the water industry, impacting upon Invertebrates and Mitigation Measures Assessment.

P2 Point source pollution from sewage discharge (continuous) associated with the water industry impacting upon Phosphate and Dissolved Oxygen.

P3 Point source pollution from private sewage treatment associated with agriculture and rural land management impacting upon Invertebrates.

P4 Point source pollution from trade/industry discharge impacting upon Phosphate.

P5 Diffuse source pollution from poor soil management associated with agriculture and rural land management impacting upon Phosphate and Invertebrates.

P6 Invasive non-native species (North American signal crayfish) impacting upon Invertebrates.

P7 Unknown Significant Water Management Issue impacting upon Perfluorooctane sulphonate (PFOS).

RNAGs – Blackwater

B1 Physical modification impacting upon Mitigation Measures Assessment.

B2 Physical modification linked to flood protection (structures) impacting upon Macrophytes and Phytobenthos Combined.

B3 Point source pollution from sewage discharge (continuous) associated with the water industry impacting upon Phosphate.

B4 Diffuse source pollution from transport drainage associated with urban and transport infrastructure impacting upon Phosphate.

B5 Diffuse source pollution from poor livestock management associated with agriculture and rural land management impacting upon Macrophytes and Phytobenthos Combined.

B6 Diffuse source pollution from poor nutrient management associated with agriculture and rural land management impacting upon Macrophytes and Phytobenthos Combined and Phosphate.

B7 Unknown Significant Water Management Issue impacting upon Perfluorooctane sulphonate (PFOS).

B8 Unknown Significant Water Management Issue impacting upon Benzo(g-h-i)perylene.

B9 Point source pollution from Sewage discharge (continuous) associated with the water industry impacting upon Macrophytes and Phytobenthos Combined.

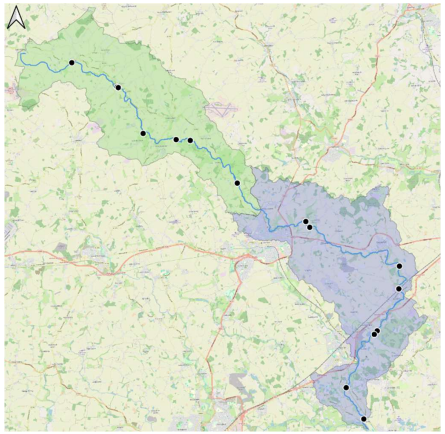
Of these, RNAGs P7, B7 and B8 are very difficult to resolve due to a lack of understanding of their causes and the enormous challenge associated with the removal of chemicals like PFOS and Benzo(g-h-i)perylene. Therefore, this plan will aim to improve the condition of the river with a focus on those RNAGs that have the potential to be corrected.

Environment Agency Monitoring

In the UK, the role of carrying out monitoring for the WFD and ensuring the targets of the WFD are met falls to the Environment Agency (EA). Like all government funded institutions, the EA have been subject to large cuts over the past 15 years. As such, the frequency of monitoring, and the number of locations monitoring takes place at have dropped over this time period, as demonstrated in graph 1.

The work of the EA in monitoring and supporting projects to improve the WFD status of the Pant and Blackwater remains invaluable. However, efforts to support monitoring from other sources help to provide more evidence of the rivers condition. The fluvial audit report that was produced as a part of this plan is an in depth snapshot of the state of the river, but only in once moment and time and it is not feasible to repeat such a study regularly.

Monitoring by other organisations, including through the use of citizen science is an important augment to the work of the EA. In 2024 the ERH launched the Essex RiverWatch citizen science programme where members of the public monitor basic physical parameters of local rivers as well as the water quality monitoring determinants of TDS, temperature, phosphate, nitrate, ammonia and turbidity.



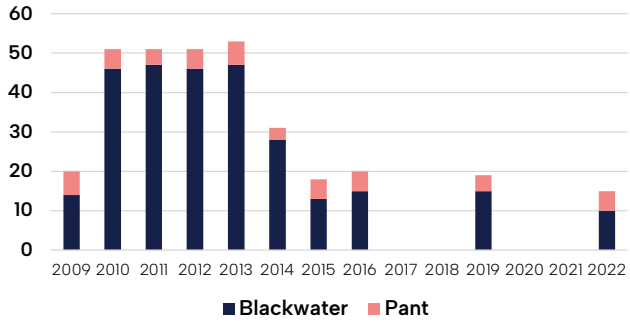
The location of EA monitoring locations during the 2022 WFD evaluation. Note that not all variables are measured at all sites. Map produced by the ESRT using EA data

There are also 3 operational gauging stations on the river, these are:

- On the Pant at Copford Hall (37016) NGR: TL668313
- On the Blackwater at Stisted (37017) NGR: TL792242
- On the Blackwater at Appleford Bridge (37010) NGR: TL844158

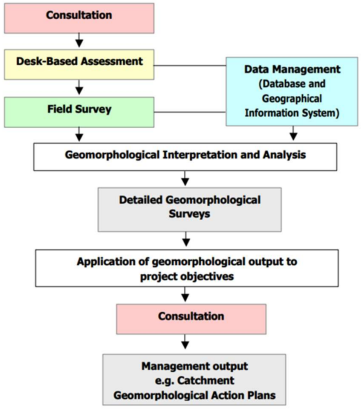
Data was also taken at Langford (37004) from the 1930s to 1960s but is now defunct.

Graph A1-1: Number of recording locations during each year of monitoring for the WFD



Appendix 2: Data Gathering Details

Fluvial Audit



The conceptual framework of a fluvial audit taken from the EA's 2005 methodology document

The fluvial audit method, originally set out in a 1995 paper by Sear *et al*.[4] and later refined in 2005 by the EA[5] is an intensive study of the geomorphology and hydrological processes of a river system. In order to gather data to inform this plan, the fluvial audit process was deemed the most appropriate methodology. The contractors for this fluvial audit were JBA Consulting.

The method involves a desk based portion, studying available data including similar past reports, historic flow records and LIDAR data to gain a picture of the fluvial functioning of the river system.

This is then followed up by a survey of the whole length of the river system. In the case of this plan, permissions to access land by either email or postal letter were sought from all landowners with a good response. Much of the Pant and some of the Blackwater is also accessible via public rights of way. Excluding in the lowest reaches of the Blackwater, most of the river was able to be surveyed during April and May 2024.

Surveyors from JBA Consulting and the ESRT make observations on the river Pant

Along the length of the river at a reach scale, the features of sediment input, channel modifications and structure and vegetation type and structure (as well as invasive species observed) were noted. All these data were combined (along with the results of the workshops discussed below and existing data sources) into a report. The data contained in the report informed the production of this plan, the ultimate output of the fluvial audit process.

Although the fluvial audit and the multiple sources of data it has drawn from form the backbone of this report, additional data sources have also been considered including findings gathered by citizen science and where appropriate these have been mentioned.

Stakeholder Workshops

As well as the in-field and desk based study, a pair of workshops have been held to gather local knowledge and opinion from a range of stakeholders as well as inform local people about the progress of the project.

Two stakeholder workshops were held as a part of this plan in May and November 2024. Both had around 30 attendees including landowners, farmers, local councillors, charity representatives, local business and angling clubs.

May Workshop

The first workshop aimed to:

- Introduce the Pant and Blackwater restoration project and its aims and objectives
- Share how the North Essex Farm Cluster could assist with restoration work
- Share JBA's study approach
- Have an open discussion about the catchment to acquire local knowledge
- Have an open discussion around potential restoration opportunities

Attendees were asked to complete 2 activities assessing local knowledge and perception of the river respectively.

Attendees' perceptions of the river at present were mixed. There was acknowledgement of

Representatives from the ESRT and JBA Consulting discuss the fluvial audit during the May workshop

the complexity of the river system, concerns around flooding and drainage and a general sense of the importance of wildlife and sadness towards the decline of wildlife populations such as local fish stocks.

The attendees perceptions of a healthy river are highly aligned with the goals of this plan and included that the river should have the following features:
- A gravel bed
- A meandering course
- Deeper and shallower areas of flow
- Clear water (at low flows)
- Trees
- Rushes
- A riparian margin
- Wetland habitat

There was also discussion that connectivity of the rivers reaches, good flow and the maintenance of a 'good' depth year round were signs of a healthy river.

Many changes to the system were noted. These include the straightening of sections that were also noted during JBA's study and the presence of historic mills. Other changes of note include:
- The restoration of a former landfill site into Whetmead LNR
- That water rarely breaches the banks of the lower blackwater (suggestive of disconnection to the floodplain)
- Changes to species and habitat including loss of frogs and mussels between Wimbish and Radwinter, additional otters and kingfishers throughout the river system and less fish with increased crayfish throughout, echoing the results of the WFD
- Erosion was mentioned by many, notably on the lower Pant
- In the same area as above, silt build up was noted
- Near the headwaters of the Pant where silt has increased, attendees suggested a likely cause of Gross Forest Cover Loss (GFCL).
- An increase of flooding was noted in many areas
- Low flows in summer were also a concern
- Housing developments at Finchingfield and Coggeshall were noted, as well as other infrastructure changes around Witham and Langford

Of the recreational uses of the river, walking and fishing were the most noted.

Current practices undertaken on the river that was noted included:
- Abstraction, with concerns raised that this is impacting low flows at Langford
- Dredging was mentioned multiple times but attendees were generally understanding that this is not a long term solution
- Riparian buffer strips are being well managed and maintained in many areas
- Concerns were raised about the Coggeshall, Feering and Kelvedon Flood Alleviation Scheme and its impact on water quality

Some of the suggested improvements that could be made to the Pant and Blackwater included:
- Wetland creation
- Lake/scrape creation
- Weir removal/ improvement
- Channel restoration including bed and bank improvement works
- Removal of excess vegetation including Himalayan Balsam
- Soil quality restoration

Attendees stressed the importance of partnership working on all projects as well as public education and engagement. The importance of not taking farming land out of production was stressed.

November Workshop

The second workshop aimed to:

- Present the findings of the fluvial audit
- Present target areas for restoration and identify potential locations for implementation
- Gain feedback from the local community
- Identify stakeholders willing to take part in the restoration project
- Present the next steps of the project and provide a timeline for the completion of the Pant and Blackwater restoration plan

The attendees identified the goals that were of greatest importance to them which heavily influenced the final goals of this project. These goals were:
- Improved river health and water quality
- Habitat creation for wildlife
- Reduced impact from climate change
- Good connectivity between the river and its floodplain
- Reduced flood risk

Attendees also completed a series of proforma of potential projects in their local area which helped in producing this plan. 100% of attendees were interested in continuing to be actively involved with future work, suggestive of a highly engaged and motivated community around this river.

April 2025 Feedback

A public feedback period was held during April and May of 2025. After this, additions and edits relating to the feedback provided have been made.

The authors of this report would like to thank all the attendees of these workshops and those who provided feedback for their invaluable contributions to this plan.

Attendees of the November stakeholder workshop watch a presentation by JBA Consulting on the Fluvial Audit's results

Appendix 3: Funding and Payment Opportunities

This appendix has been dedicated to informing parties interested in starting projects of sources of funding that are available at the time of this plan's publishing or will be available soon after, as well as payments to landowners once work is complete. This plan is designed to be used for many years and for those reading this document some-time after the initial publishing these opportunities may have expired, but can hopefully still find some ideas to identify current funding. Appendix 4 suggests a number of organisations that can be contacted to assist with information on the latest funding schemes. Particularly useful contacts are the North Essex Farm Cluster and Farming & Wildlife Advisory Group. This may involve the creation of a brand new project or ongoing projects that are looking for additional participants.

Methods of funding and payment include (but are not limited to):

Sustainable Farming Incentive (SFI)

At least 9 actions were available for farm payments through the current iteration of the SFI scheme and additional options may be applicable depending on the type of project.

https://www.gov.uk/government/collections/sustainable-farming-incentive-guidance

In March 2025, the UK government ended its 2024 SFI commitments. At the time of writing this plan, the future of SFIs are uncertain. A new, reformed system is expected in the future, though exactly what form this will take and when is unknown.

Countryside Stewardship (CS)

Countryside stewardship higher tier is due to open in the summer of 2025. There are around 20 actions relevant to this plan as well as over 20 capital items that could be relevant.

https://www.gov.uk/government/collections/countryside-stewardship-get-funding-to-protect-and-improve-the-land-you-manage

Biodiversity Net Gain (BNG)

A biodiversity net gain agreement (BNG) is a contract wherein a rural landowner sets a unit of land aside for the creation of additional biodiversity and is then paid for the management of this site. Generally, contracts last for 30 years. As this is a long term commitment, taking land out of production and with potential legal ramifications, this is a large investment and must be considered very carefully before an agreement is entered into. The latest information regarding BNG can be found through Defra:

https://www.gov.uk/government/collections/biodiversity-net-gain

Environmental Land Management (ELM)

ELM is an extension to the countryside stewardship scheme and offers some additional payments with more options for the improvements that can be made. ELM is run through Defra and more information can be found on their website:

https://www.gov.uk/government/publications/environmental-land-management-update-how-government-will-pay-for-land-based-environment-and-climate-goods-and-services/environmental-land-management-elm-update-how-government-will-pay-for-land-based-environment-and-climate-goods-and-services#waterbodies

England Woodland Creation Offer (EWCO)

This is a scheme by the forestry commission that funds support for the creation of woodland areas. For projects in which many trees are planted, this could be a useful source of income. More information can be found through the forestry commission:

https://www.gov.uk/guidance/england-woodland-creation-offer

Note too that many organisations including Natural England, the Woodland Trust and the Environment Agency are available to supply trees, in many cases for free.

Private Sector Support

Private sector donations and sponsorship are a more rare method of funding projects but can be possible if good relationships are established and clear benefits can be demonstrated.

NEFC RAF Wethersfield Proposal

A proposal is currently under negotiation between the NEFC, local government and partners to develop the Weathersfield in a sustainable way that not only provides ecological good, but economic too. The aim would be that profits from the mixed used site would be able to be fed back into the local community, enabling funding for numerous projects in the area, particularly for river restoration. The project is still in it's early stages, but if successful, could prove to be an ambitious method of funding public good across the catchment.

Environment Agency

The environment agency can offer multiple forms of support to projects, including, in some cases, financial assistance. This is generally only during partnership working with partners that have established relationships to the EA.

Water Environment Improvement Fund (WEIF)

This is an Environment Agency funding pot to improve the riparian environment of the UK through habitat restoration and tree planting. Many projects stemming from this plan could utilise these funds to improve riparian habitat.

Local Levy NFM funding

A local levy is a small charge added to council charges to pay for improvement works and comes out of local taxations. For projects focusing on natural flood management, these can unlock funding in the mid tens of thousands of pounds.

Grant Funding

The landscape of grant funding changes regularly with new funding pots becoming available regularly. Searching the internet and asking the advice of organisations in appendix 4 is the best way of finding the latest information. However, some organisations regularly have funding available including:

- Water companies
- Esmée Fairbairn Foundation
- Nineveh Trust
- National Lottery
- Postcode Lottery
- Essex Community Foundation

St Andrew's church, Shalford, stands between the Pant, a small tributary of the Pant and an Anglian Water waste water reclamation site

Appendix 4: Relevant Organisations

In this appendix, organisations that can help with the organisation, funding and delivery of the interventions recommended by this report are listed, categorised by their function. If you are the owner, tenant or relevant authority responsible for land that has been suggested for an intervention and would be interested in what can be done on your land, the ESRT should be the first organisation to contact. Other enquiries may require one of the other organisations listed. Organisations that are focused on funding alone have not been included, nor small grassroots organisations that could be able to assist with offering volunteers.

Advisory Groups

Many organisations are available to help offer advice to landowners, some of whom can also assess the feasibility of a given project. Not every project will need to involve an advisory group, particularly those not on farmland.

Catchment Sensitive Farming

Catchment Sensitive Farming
Working together for a healthy environment

CSF is an advisory group lead by Natural England in partnership with the EA, Defra and the Forestry Commission. They offer advice to farmer and land managers on a range of ecological topics, including sustainable use of water, how to handle and reduce pesticides and fertilisers and natural flood management. CSF are a valuable contact anyone in the farming industry to help reduce their environmental impact and run a more efficient farm.
https://www.farmingadviceservice.org.uk/csf

Farming & Wildlife Advisory Group (Eastern Division)

Farming & Wildlife Advisory Group
FWAG East

FWAG East offer a range of advisory services from their team who are experts in ecology and farming practices. Established in the 1960s, they are one of the most trusted and experienced land use advisory charities. Not only can they help with the planning of projects but they are also expert in unlocking the capital potential of work through government subsidies.
https://www.fwageast.org.uk/

North Essex Farm Cluster

North Essex Farm Cluster

Founded in 2022, this relatively new farm cluster is a collective of farmers and landowners around the Pant, Blackwater and bordering area. It is run by its members, organises talks and events and offers advice and collaborative working between both different farmers and other groups in this appendix. They can be a useful go-between between landowners and charities or the EA and offer advice about other organisations to contact to further project ideas.
https://www.northessexfarmcluster.co.uk/

Environmental Charities

County scale charities that regularly organize projects of the types listed in this plan are given here. This list is by no means exhaustive and other charities such as the RSPB or Woodland Trust could make beneficial partners for certain projects.

Essex and Suffolk Rivers Trust

Essex and Suffolk Rivers Trust

Founded in 2014, the ESRT is a charity dedicated to the protection and enhancement of rivers in Essex and Suffolk. They are a member of the Rivers Trusts movement along with over 60 other trusts. They work on a large number of improvement projects across both counties. Primarily, the ESRT work to coordinate land owners, expertise, funding and contractors to enable riverine projects to take place. They are the point of contact for this plan and should ideally be contacted initially with by interested parties and can advise on partners who may be suited to assisting with enquiries and future work.
www.essexsuffolkriverstrust.org

Essex Wildlife Trust

Essex Wildlife Trust

One of nearly 50 wildlife trusts in the UK, the EWT was founded in 1959 with the goal of protecting the wildlife of the county. They operate dozens of nature reserves as well as over 10 visitor centres around the county. The EWT (alongside the Wildlife Recovery Trust) are also managing the mink eradication programme in Essex. Though they manage no sites in the area of this plan, they are an excellent partner for those looking to improve their land for nature.
https://www.essexwt.org.uk/

Groundwork (East)

GROUNDWORK EAST

Groundwork are an environmental charity focused on community projects that have been a charity since 1985. They are an excellent choice of partner for community based works in more populated areas or where a council is the initiator of a project.
https://www.groundwork.org.uk/east/

Statutory Bodies

At the time of writing this plan the results of the UK Government's English Devolution White Paper of December 2024 are not yet known, but council structure is likely to radically change across England. However, for the immediate future, ECC and district councils remain useful contacts. The over 20 parish council's within the project area have not been listed as these are more likely to be project initiators rather than organisers. Other statutory bodies to consider include the forestry commission, Internal Drainage Boards and The Water Services Regulation Authority.

District Councils

There are 3 district councils with the project area who are useful points of contact for contacting other organisations and organising projects. These are:

- Uttlesford: https://www.uttlesford.gov.uk/
- Braintree: https://www.braintree.gov.uk/
- Maldon: https://www.maldon.gov.uk/site/

Environment Agency

Environment Agency

The EA are a non-departmental public body, sponsored by Defra, formed in 1996. The EA oversee the environment of the UK and, as such, will form part of all but the very smallest

projects as they oversee the permits and permissions of environmental interventions.
https://www.gov.uk/government/organisations/environment-agency

Essex County Council

As the lead local flood authority, Essex County Council are often involved in projects that have the potential to alter the behaviour of a river with regards to flooding. ECC also released their strategy for water in 2024 and have the potential to become a partner in some projects resulting from this plan.
https://flood.essex.gov.uk/

Natural England

NE are responsible for the protection and restoration of the natural areas of the UK. They manage some of the UK's most wild areas, known as National Landscapes (formally Areas of Outstanding Natural Beauty) and many nature reserves and rights of way. They have access to many internal funding pots and are an excellent project partner for restoration projects able to offer advice and management. However, they are of less relevance in more urban areas.
https://www.gov.uk/government/organisations/natural-england

Water Companies

Water companies spend hundreds of thousands of pounds annually on environmental improvements and have many programmes of funding available. In the case of large projects, direct funding could be a possibility with the water company brought into a steering committee for the project. Both water companies also offer an advisory service to landowners and can assist in funding projects (see appendix 3).

Anglian Water

Anglian Water provide sewerage collection and water treatment around the Blackwater catchment and across East Anglia.
https://www.anglianwater.co.uk/developing/

Essex & Suffolk Water

ESW are a part of the Northumbrian Water Group and provide drinking water in the Blackwater catchment. As co-creators of this plan, ESW would be eager to hear about opportunities arising from this plan and have a number of funding opportunities, including Blue Spaces for access to water and Branch Out for control of invasive species.
https://www.eswater.co.uk/services/developers/

Essex Rivers Hub

The Essex Rivers Hub is the catchment partnership, operating under the CaBA principle for the Combined Essex Management Catchment. It is administrated by the Essex and Suffolk Rivers Trust. The ERH is the meeting place for many of the above organisations to discuss progress towards improving the rivers of Essex and South Suffolk. While not an organisation in its own right, there is a lot of useful information available through the ERH website and contacting the ERH is a good step in finding relevant organisations to help with projects and more information generally.
https://www.essexrivershub.org.uk/

Appendix 5: Relevant Higher Level Planning

Multiple levels of existing law, plans, strategies and frameworks already cover this catchment (and beyond), from the international level to regional plans. While not every plan can be included in detail, especially those at a local level, relevant frameworks, strategies and target documents have been included here, with details of relevant elements of those plans.

National

25 Year Environment Plan (25YEP) (2018)

Originally published in 2018, but updated for 2023, the UK Government policy paper '25 Year Environment Plan' outlines the strategy and targets of the nation's environmental policy. Of its 10 goals, this plan will assist in tackling:

2. Clean and plentiful water
3. Thriving plants and wildlife
4. A reduced risk of harm from environmental hazards such as flooding and drought
6. Enhanced beauty, heritage and engagement with the natural environment
7. Mitigating and adapting to climate change

Some notable targets from this plan relevant to the scope of this plan are:

- ¾ of our waters (such as rivers and streams) should be close to their natural state as soon as practicable.
- Creating or restoring 500,000 hectares of wildlife-rich habitat outside the protected site network, focusing on priority habitats as part of a wider set of land management changes providing extensive benefits.
- Making sure that there are high quality, accessible, natural spaces close to where people live and work, particularly in urban areas, and encouraging more people to spend time in them to benefit their health and wellbeing.
- Focusing on increasing action to improve the environment from all sectors of society.
- Making sure that all policies, programmes and investment decisions take into account the possible extent of climate change this century.

Water Industry National Environment Programme (WINEP) (2021)

WINEP is a national framework that uses the information of the 25YEP, river basin management plans (see below) and other water related plans and strategies to set out the design, development and delivery of improvements to the aquatic environments of the UK. It was jointly developed by the EA, Defra and Ofwat.

The plan is also based on WISER, the water industry strategic environmental requirements. This outlines a number of legal obligations to the water industry for environmental improvements. Of particular note is the statutory requirement to provide:

Catchment actions to prevent deterioration in water quality and to reduce the need for additional treatment.

Plan For Water (2023)

Produced by Defra, this document contains a number of recommendations in line with this plan including the increase of the number of wetlands in the UK, the re-meandering of rivers and removal/bypass of barriers to fish. As well as this, this document is an example of the type of collaborative working the Plan for Water champions.

Regional

Anglian River Basin District River Basin Management Plan (2022)

Regional River Basin plans are required under the Water Framework Directive. The region that the Pant and Blackwater fall under is

Anglian, the area from the Thames estuary to Lincolnshire, including one nautical mile of coastal water around this area. Each plan is updated every six years and the Anglian plan was last updated in December of 2022 and will next be updated before December 2027. It sets environmental objectives for groundwater, surface, estuarine and coastal waters as well as devising programmes to meet the objectives.

The general objectives of all Basin management plans are:

- Preventing deterioration of the status of surface waters and groundwater
- Achieving objectives and standards for protected areas
- Aiming to achieve good status for all water bodies
- Reversing any significant and sustained upward trends in pollutant concentrations in groundwater
- Cessation of discharges, emissions and losses of priority hazardous substances into surface waters
- Progressively reducing the pollution of groundwater and preventing or limiting the entry of pollutants

Furthermore, the plan outlines the current condition of the rivers and estuarine systems of the Anglian Region, as well as environmental objectives in 11 areas. These are under the topics of:

1. Climate emergency
2. Biodiversity crisis
3. Physical modifications
4. Pollution from agriculture and rural areas
5. Pollution from water industry waste water
6. Invasive non-native species
7. Pollution from towns, cities and transport
8. Changes to water levels and flows
9. Chemicals in the water environment
10. Pollution from abandoned mines
11. Plastics pollution

Within this plan, topics 1, 2, 3, 4, 5, 6, 8 and 9 are addressed.

Water Strategy for Essex (2024)

Produced in 2024, the water strategy for Essex combines the visions of existing plans with Essex County Councils goals and strategies. This plan contributes to the items referenced as:

- EIP1
- EIP4
- EIP7
- PFW1
- PFW2

Essex River Hub Vision (2024)

As the co-ordinators of the Essex Rivers Hub, the ESRT is committed to ensuring the fulfilment of the aims of the ERH's strategy through ourselves and other members. The 3 primary aims of the ERH are:

1. Make significant progress towards achieving a good ecological status under the WFD
2. Raise awareness and enhance engagement with the water environment
3. Increase resilience to climate change

Each of these aims has 2 or 3 objectives associated with them. Of these the primary objectives relevant to and supported by this plan are:

1b – Improve connectivity in fluvial and coastal environments and recognise the journey from source to sea. Using the Essex Fish Migration Roadmap, we will improve 30km worth of migration routes or modify 3 barriers to fish migration by 2030.
1c – Work with appropriate partners
3a – We will deliver Nature-based Solutions. We will install 3 in-channel improvements for Natural Flood Management and restore or enhance 100ha of wetland, Eelgrass or saltmarsh by 2030.
3b – We will acknowledge that the nature of the work undertaken by the ERH will change in response to climatic changes and will have documentation, such as the one being consulted on here, be subject to review and change.

Essex Climate Focus Area (2024)

The Essex Climate focus area (CFA) encompasses the operational catchments of the Colne and Blackwater, covering around 1/3 of the total land area of Essex. This area has been designated as a part of the recommendations that came from the Essex Climate Action Commission's Net Zero planning. Within the area, a more intensive effort is to be made to meet net zero targets swiftly. The primary goal set by the commission is to:

'Achieve net zero carbon emissions through carbon reduction and carbon sequestration methods'.

The plan stresses the importance of collaborative working and engaging with landowners, particularly through farm clusters and will help combat flooding and will help contribute to the tree coverage targets set out by this plan.

Local Nature Recover Strategy (LNRS) (2025)

The LNRS is a series of 48 regional strategies (most covering 1 county) commissioned by Defra in 2022 for publishing in 2025. These strategies map out key locations and identify target habitats and species for prioritised action.

At the time of writing this plan, none of the 48 LNRSs have been published. Once they are published, local planners and landowners wishing to implement actions to improve the river Pant and Blackwater must consider both this plan and the LNRS to identify sites of highest value.

Links to the strategies of this section

- 25 Year Environment Plan
- NE Climate Change Risk Assessment and Adaptation Plan
- WINEP
- Plan for Water
- Anglian River Basin Management Plan
- Water Strategy for Essex
- Essex River Hub Vision
- Essex Climate Focused Area
- Local Nature Recovery Strategy

Surveying the River Pant in heavy rain, photo by JBA Consulting

Appendix 6: INNS Catchment Plan

Invasive, non-native species (INNS) control is important for protecting the biodiversity of riverine habitats for the future. These alien species reduce biodiversity through competition, predation or spreading of disease. Some, such as giant hogweed (*Heracleum mantegazzianum*) are harmful to human health, others have naturalised and are beyond control, such as the American signal crayfish (*Pacifastacus leniusculus*) in Essex.

On the Pant and Blackwater, there are three species of primary concern, the, mink (*Neogale vison*), floating pennywort (*Hydrocotyle ranunculoides*), and Himalayan balsam (*Impatiens glandulifera*).

During the fluvial audit process in the summer of 2024 no invasive plant species were identified besides Himalayan balsam. There is, however, one record of giant hogweed in Little Bardfield a few tens of meters from the Pant.

Floating pennywort has been observed at the Chelmer Confluence, both identified through the citizen science app INNS Mapper. For information on floating pennywort see reach 14.

The loss of native white-clawed crayfish is listed as an RNAG under the WFD. However, research conducted by the ESRT in 2022 testing for environmental DNA (eDNA) suggested that the white-clawed crayfish may now be extinct in Essex, or in such low numbers as to be undetectable. This is a story being mirrored across the country, and beyond the scope of a plan of this scale. However, individual fisheries within the catchment may wish to consider crayfish stock within their lakes.

For those species not covered below, vigilance and identification skills are key. Recording through citizen science schemes such as iRecord, INNS Mapper and the Essex RiverWatch will allow invasive species to be identified and removed effectively. An increased awareness of INNS for riparian owners and uses is also vital. A leaflet campaign and additional public posters and information boards could also be used to disseminate information locally, as well as a continued presence of conservation charities at public events, such as county fates, to raise awareness.

An American Mink (Neogale vision) entering a trap on the river Colne. Image provided by the Essex Wildlife Trust

Mink

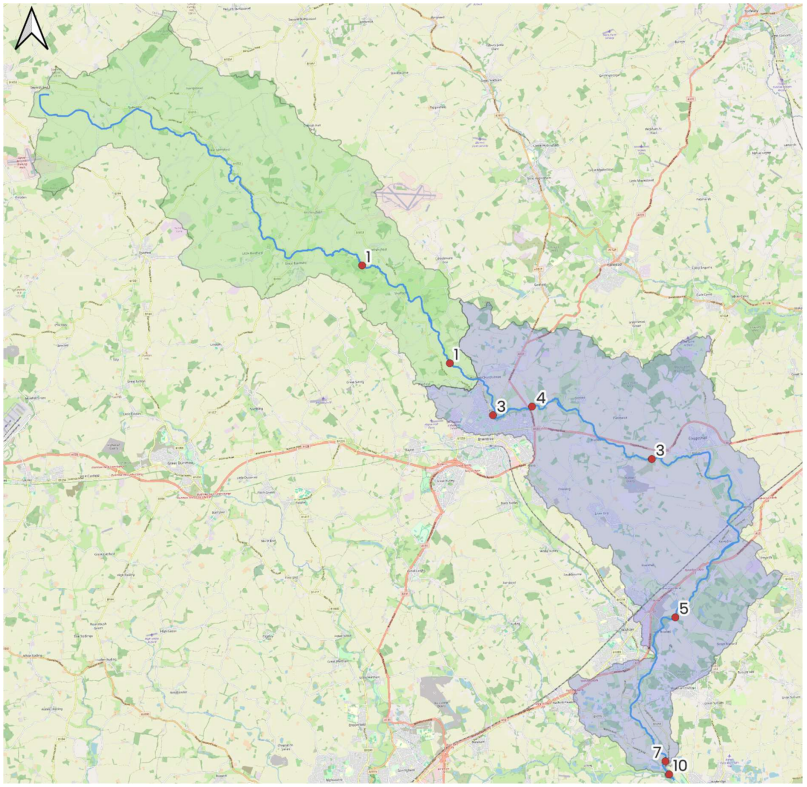
The American mink (*Neogale vison*), commonly referred to as simply mink is an invasive species of mammal first brought to the UK in the 1920s for the fur trade and released during the 1950s and 60s.

American mink should not be confused for the now critically endangered European mink (*Mustela lutreola*) which is only found in small areas of Europe, nor for the native Eurasian otter (*Lutra lutra*) which is a similar looking mammal occupying the same niche.

American mink have led to losses of native birds predating both adult animals and their eggs as well as fish and other organisms locally, e.g. water vole (*Arvicola amphibius*).

Since 2019, a large scale, targeted effort has been made to eradicate mink. Starting in the north of East Anglia, the aim is to remove mink from the entirety of the UK. In Essex, the programme is led by the Waterlife Recovery Trust and the Essex Wildlife Trust.

In 2024 it is thought that mink have been completely eradicated from Norfolk and Suffolk, with no mink caught north of the Blackwater during that year. The Pant and Blackwater will form a key element of eradicating them from the whole of East Anglia. If you have a stretch of river you have access to, please consider contacting the Waterlife Recovery Trust for a trap.



Location of mink traps on the Pant and Blackwater with the number of mink caught in each during 2024. Map produced by the ESRT using data provided by the Essex Wildlife Trust and Wildlife Recovery Trust

Traps are laid for mink on floating rafts. When triggered, these are checked and any captured mink can then be culled. Any non-mink captures such as an otter can be released with no harm caused.

In 2024, 2 mink were captured on the Pant and 32 on the Blackwater for a total of 34 captures on the river.

Additional rafts are needed to ensure good coverage of the river, especially in the upper Pant which has no rafts currently.

Otherwise current efforts are proving effective and no further change is needed to the present eradication methodology.

Himalayan balsam

Himalayan balsam (*Impatiens glandulifera*), is a plant native to the slopes of Himalayan mountains in India and Pakistan. In 1839 it was introduced to gardens in Britain due to its appealing summer blooms in July and August. It is a large and highly competitive plant and prevents the growth of native bankside vegetation. During winter, it dies off and, due to having a very shallow root structure, leaves banks weakened which leads to increased erosion and silt deposition, a major issue on this river. As well as this, when the plants die back in autumn they can easily fall into the river where they are gradually broken down

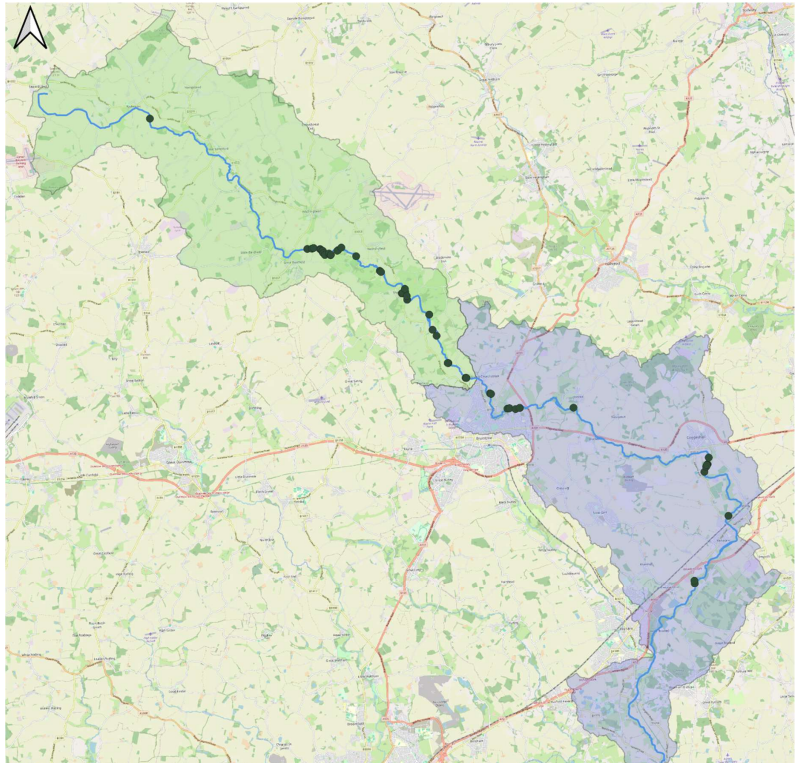
by various organisms, increasing biological oxygen demand and killing oxygen sensitive species.

The seed pods of Himalayan balsam can explode, spreading seeds into the river where the plant proliferates downstream.

On the Blackwater and Pant, Himalayan Balsam is very common, in some places being the dominant riparian plant. Excluding a single small collection of plants close to the top of the Pant near Radwinter, these are only found downstream of the confluence with Finchingfield brook.

Removal of Himalayan balsam is simple but time consuming, as the most effective method of removal is simply to pull the plants out of the ground by hand. Less effective but much better than no action is 'bashing', breaking the plants near the base to prevent growth. Bashing is much more time efficient for large groves of plants.

Himalayan balsam is the largest annual in the UK, often growing beyond 2m in height (6'7"). It can also easily spread into large clusters that cover many dozens of square meters. Hand removal is therefore time consuming and requires many volunteer and staff days on the part of charities and local action groups.



Locations of Himalayan balsam (dark green dots) identified during fluvial audit survey in summer 2024, though it is likely there is a greater spread than was observed. Map produced by the ESRT

Himalayan balsam seen on both banks of the Blackwater near Coggeshall. Insert: a close up of a plant at Shalford on the Pant

A trial at Braintree is now being considered by the ESRT using rust fungus (*Puccinia komarovii* var. *glanduliferae*) to kill off Himalayan balsam.

Co-ordinated action is now required to reduce and remove balsam from the catchment. Removal must begin at Finchingfield and work downstream. Co-ordinating this action through partnership working such as the ERH and NEFC is vital to ensure effective coverage of the river.

As such, the **5 stage plan for controlling Himalayan balsam is**:

1. Raising local awareness of Himalayan balsam (and other INNS) through events and other communications
2. Use data from surveys, including this fluvial audit and citizen science records, to identify areas with balsam
3. Local and regional groups to co-ordinate pulling, cutting and beating plants along the whole river, working upstream to downstream
4. Consider novel approaches where appropriate, such as trialling rust fungus control measures
5. Ensure repetition of the above 4 steps annually with good reporting of where balsam persists to evaluate effectiveness of control efforts

Staff from the ESRT pulling Himalayan Balsam in Suffolk during 2024, showing the typical size of a fully gown plant. The plant shown here is likely around 225cm (7' 4") tall

Appendix 7: Key Definitions

Benzo(g-h-i)perylene	A naturally occurring chemical that is also a byproduct of combustion of oil based products including petroleum and tar. It can also be found in tobacco smoke. This chemical can easily dissolve in water and is a known carcinogen.
Berm	A sandy or gravel based bank or ridge in a river channel
Biological Oxygen Demand (BOD)	The amount of dissolved oxygen (DO) being used by aerobic bacteria. It is difficult to determine without time consuming laboratory testing.
Catchment	The area of land where any ground water will eventually flow into a given river or other waterbody. The edge of this, where water would flow into another waterbody, is called the watershed.
Catchment Based Approach (CaBA)	An initiative, based on the principle of civil society-let partnerships being established between local authorities, NGOs, water companies, businesses and other parties to manage and improve the UK's rivers for people, water management and wildlife collaboratively.
Catchment Partnership	These are groups formed under the **CaBA** approach that include relevant parties. The Pant and Blackwater falls under the **Essex Rivers Hub catchment partnership** which covers all of the **Essex Combined management catchment**.
COP (Including COP 26)	The United Nations Climate Change Conference. The highest level of conference on the topic of climate change attended by leaders and dignitaries of the United Nations. COP 26 was held in Glasgow in 2021, it was delayed by 1 year due to the COVID-19 pandemic.
DESNZ aka The Department of Energy Security and Net Zero	A ministerial department of the central (Westminster) government of the United Kingdom formed in 2023. It is responsible for energy supply, reducing energy pricing inflation, ensuring the UK is on track for its net zero targets, increasing the delivery of green energy infrastructure and improving the housing energy efficiency. DESNZ has 6 ministerial positions.
Defra aka The Department for the Environment, Food and Rural Affairs	A ministerial department of the central (Westminster) government of the UK formed in 2001. It is responsible for protecting the environment, production and standards of food, agriculture, rural communities and fisheries. Defra also represents the UK on these matters during global talks. It is not responsible for energy or matters relating to climate change, this is under the remit of **DESNZ**. Defra has 6 ministerial positions.
Environment Agency (EA)	A **non-departmental public body**, sponsored by **Defra**. Formed in 1996, they have responsibility relating to the protection and enhancement of the environment of England. It has a similar but more general remit to **Natural England**. Representatives of the EA sat on the steering group for this restoration plan.
Essex and Suffolk Rivers Trust (ESRT)	Founded in 2014, the ESRT is a charity dedicated to the protection and enhancement of rivers in Essex and Suffolk. They are a member of the Rivers Trusts movement and work on a large number of improvement projects across both counties. They are the primary organisers and authors for this restoration plan.
Essex and Suffolk Water (ESW)	A water supply company that is a branch of the Northumbrian water group (NWG), formed in 1992. They supply water to the south of Essex and Suffolk coast. They were the primary funder for this restoration plan.
Essex Combined [Management Catchment]	The **management catchment** the Pant and Blackwater fall under. This covers 5 **operational catchments** in Essex and Suffolk, including Blackwater, the operational catchment which includes the Pant and Blackwater. These are all rivers in Essex (and their tributaries, some of which are in Suffolk) that flow directly east into the north sea, not via the Wash or Thames. Essex combined is managed by the **ERH catchment partnership**.
Essex Rivers Hub (ERH)	The **catchment partnership** that manages projects in the **Essex combined management catchment**.
Essex Wildlife Trust (EWT)	The wildlife trust that covers the county of Essex formed in 1959. They protect wildlife through conservation of landscapes and species. In 2024 they had over 38,000 members and close to 2000 volunteers.
Fluvial Audit	An intensive form of geomorphological survey for a river. For more detail see the data gathering section of the main report.
'Forever Chemicals'	See **PFAS**
Invasive, Non-Native Species (INNS)	An animal or plant that is non-native i.e. not from the UK and invasive, i.e. establishes well and out-competes native plants. Section 14 of the Wildlife and Countryside Act 1981 (and the updates to this) lists these species, sometimes referred to as 'Schedule 9' species due to the part of the act they are listed. It is a criminal offence to plant, cause to grow, import, breed, sell, transport or in other way spread these plant species, including allowing them to naturally reproduce. The main INNS of concern in this plan is Himalayan balsam.
LIDAR	Laser Imaging, Detection And Ranging. A method of measuring topography (the height of the surface of the Earth) using satellites or aircraft to fire lasers at the surface of the Earth and measure the amount of time it takes for the reflection of that laser to return to the source.
Local Nature Reserve (LNR)	A statutory designation of nature reserves in Britain where a local authority was the designating body and the land owner. They are locally important, but not significant on a national scale. They can incorporate nature reserves, nature education facilities, geological points of interest and/or national parks. England has well over 1000 LNRs. Unlike **SSSIs**, LNRs do not have any standards or legal need for management and can be left in any condition though they are generally protected from development.
Macrophyte	A macroscopic plant i.e. a plant large enough to be visible to the naked eye.
Management Catchment (MC)	An **Environment Agency** designation of a cluster of **operational catchments.** This is the middle level of clustering of water bodies. The management catchment for the Pant and Blackwater is **Essex Combined** which contains 5 **operational catchments**, one of which, Blackwater, contains the river. There are 14 management catchments within the Anglian **river basin district**.
Natural England (NE)	A **non-departmental public body**, sponsored by **Defra**. Formed in 2006, they have responsibility relating to the protection and enhancement of the natural environment of England. It has a similar but more specialised remit to that of the **Environment Agency**. While the EA deals with the environment of the whole of England including agricultural and urbanised areas, Natural England only deals with 'natural' landscapes not primarily for human use as well as heritage sites. They also designate English national parks and manage national landscapes, previously AONBs.
National Nature Reserve (NNR)	These are designated by **Natural England (NE)** that are deemed to have national importance by the government of the United Kingdom. Nature reserves designated by local authorities are referred to as **local nature reserves (LNR).** There are over 200 NNRs in England. Many sites are managed by NE, but some are managed, on behalf of the nation, by NGOs such as the RSPB or National Trust.
Non-Departmental Public Body (NDPB)	A public sector organisation that helps execute the mandate of the government, without being a departmental body. They are not headed by ministers, unlike ministerial departments. Examples include the **EA** and **NE**.
Water Services Regulation Authority (Ofwat)	Formed in 1989, this is the body that regulated the privatised water and sewerage industries of England and Wales. They set the price limits for services of water companies and all financial regulatory matters, but do not regulate the environmental impact of water companies, the **EA** monitor this.
Operational Catchment (OC)	An **Environment Agency WFD** designation of a cluster of **water bodies.** This is the smallest amalgamation of water bodies, bellow management catchments. The Pant and Blackwater belong to the Blackwater operational catchment, along with Domsey Brook, Virley Brook and the River Brain. All of these rivers flow into the Blackwater Estuary. The Blackwater operational catchment is one of 5 operational catchments that make up the **Essex Combined management catchment**.
PFAS (Per- or polyfluoroalkyl substances)	A group of around 7 million synthetic organic chemical compounds, including PFOS and PFOA, found in a huge range of products from cosmetics to clothing to packaging. They are commonly referred to as 'forever chemicals' due to being very stable and persisting in the environment for many years. They accumulate in many organisms including humans and have been linked to numerous health conditions.
PFOS	See **PFAS.**
Poaching	In this context, poaching is damage to the **riparian** zone and riverbank caused by the trampling of livestock.
(Ortho)Phosphate	Phosphate, sometimes called orthophosphate, is an ion (charged particle) with the chemical formula $[PO_4]^{3-}$. It is vital for organisms including its use in tooth enamel, bones and use by plants. It occurs naturally in mineral deposits, but is also found in chemical fertilisers and effluent. An

	excess of phosphate leads to eutrophication, the uncontrolled growth of plants in aquatic systems leading to an eventual loss of light and oxygen killing animal organisms.
Phytobenthos	Autotrophic (in this case analogous to photosynthesising) organisms found in the benthic (bottom of the water column) environment, attached to the bed of a waterbody. They include cyanobacteria, algae and **macrophytes**.
Ramsar Site	A wetland designated as having global importance under the terms of the UNESCO Ramsar convention, signed in the 1970s in Ramsar, Iran. There are around 2500 Ramsar sites globally.
Riparian	Relating to the edge of a river, the riverbank and land immediately either side of a river.
River Basin District	An **Environment Agency** designation of a cluster of **management catchments**. The Pant and Blackwater are within the Anglian river basin district, one of ten river basin districts that cover all of England as well as some of Scotland and Wales.
River Basin Management Plan	These are plans that are a part of actioning the **WDF** that each cover one r**iver basin district** (in the case of this plan, Anglian). Each plan outlines the challenges and actions for achieving good ecological status of all rivers within their district.
River Catchment	See **Catchment**.
Special Protected Area (SPA)	Along with special areas of conservation (SAC) these are the areas of protection designated by the European Union Natura 2000 network. They are sites designated to protect listed bird species and their habitats that are rare and at risk within Europe, particularly for migratory birds.
Site of Special Scientific Interest (SSSI)	These are areas with Britain that have been protected due to their uniqueness and interest to science and conservation. Many are sites that have been designated with another level of protection such as a **Ramsar site** or **SAC**, but others only have SSSI protection and can sometimes be very small. They can be designated due to interesting biology, geology or both.
Total Dissolved Solids (TDS)	The measure of the dissolved particulate matter in water that is less than 2µm (micrometer or micron) in diameter. For context, a human hair is around 20-200µm wide and a bacteria is typically around 1-5µm in length.
Turbidity	The measure of the cloudiness of a fluid.
Water Body (or Waterbody)	A significant accumulation of water on the Earth's surface. This can be anything from a pond to an ocean including flowing water such as rivers. Generally, in this document, it refers to rivers.
Water Framework Directive (WFD)	A European Union directive from 2000, implemented in 2003 that protects Europe's rivers and classifies all rivers in Europe on a 5 point scale, bad, poor, moderate, good or high for ecological and chemical health. At present in the UK, all rivers fail chemically and in England, 85% of all rivers are less than the good status target set by the EU. In the UK, the WFD is managed by the **Environment Agency**, based on legislation from 2017 to replace the EU statute with a UK statute. Alongside the existing and slightly modified methods, each **River Basin District** has to produce a **River Basin District Management Plan**.

References

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Mapping

All maps are produced by JBA Consulting unless otherwise specified. Those produced by the Essex and Suffolk Rivers Trust utilise data provided by JBA Consulting unless otherwise specified. Maps in the opportunities section are produced by the ESRT using JBA data.

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