The State of the River Chess

What we know about the environmental status of the River Chess and its catchment

Working in partnership

Thames Water

The River Chess Association

Chilterns Chalk Streams Project

CHILTERNS CONSERVATION BOARD

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Buckinghamshire Council

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Queen Mary University of London

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Foreword

> The Chess Valley is part of the Chilterns Area of Outstanding Natural Beauty (AONB) and is a jewel in this already sparkling crown. The valley has a growing reputation as a destination for the public and educational institutions who are keen to experience the breath-taking scenery and study the varied geography and wildlife.

The River Chess is under pressure for a number of reasons. Flows have become less reliable in recent decades due to increasing groundwater abstraction and more variable and extreme rainfall. Also, water quality has been impacted by runoff and, notably, sewage effluent. Many of these key issues are already being addressed and through the 'smarter water catchments' initiative and this report, we're focussing on identifying how we can create a more resilient environment for future generations to enjoy.

Working with a group of partners, a team of highly motivated and talented individuals has come together to implement and improve the state of the River Chess catchment; something that will be achieved with the help of our stakeholders and local people.

Paul Jennings
The River Chess Association

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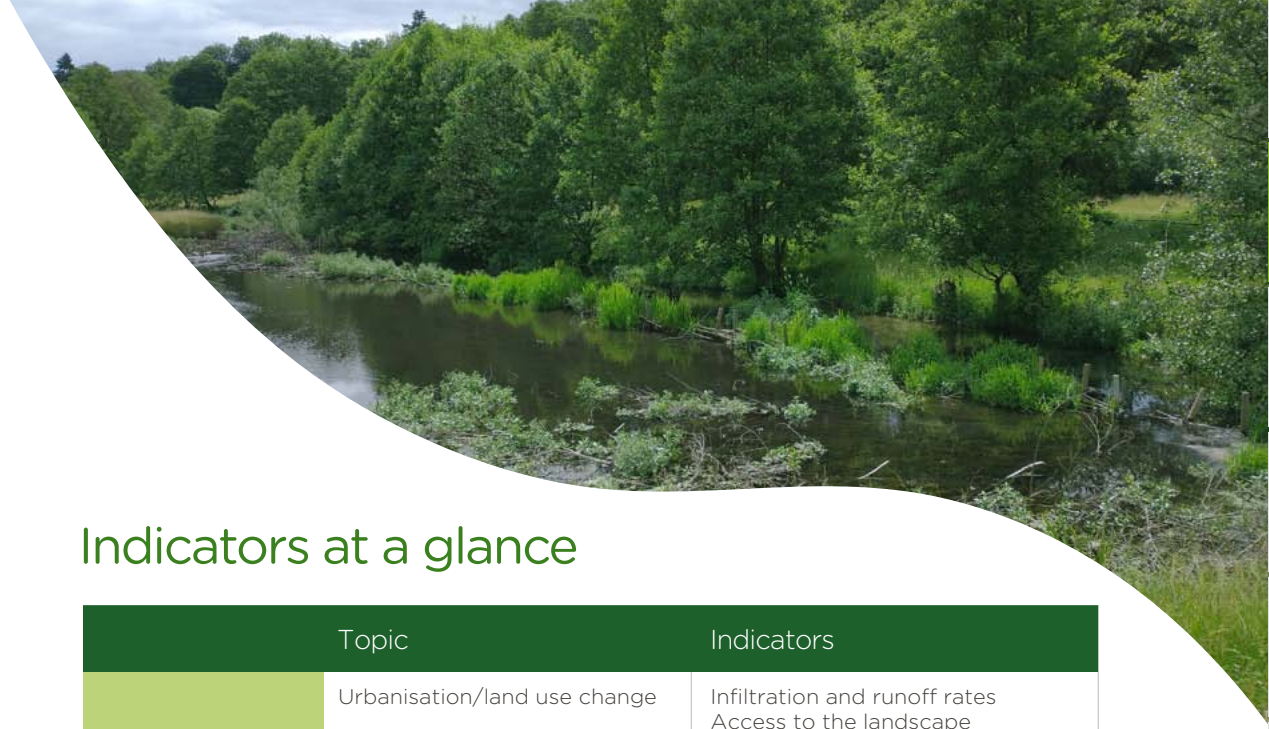
We wholeheartedly welcome your help and views. You can get in contact with us by emailing our dedicated team at **chesspartnership@chilternsaonb.org**

Executive summary



Our report corresponds with the first year of the 'smarter water catchments' initiative and gives a summary of our improved understanding of the catchment and opportunities for the future. We've put together a baseline of key information across a number of indicators so we can observe trends and see what actions we need to take together, from this point on.

Chalk streams under pressure

The River Chess and surrounding catchment contains valuable habitats and species that are under pressure from over-abstraction for drinking water; urbanisation and agricultural activities, which can lead to water quality problems; and river modifications, which can alter flows and trap silt. These combined pressures lead to a river with poor ecological health and a reduced biodiversity.

It's critical that we protect and enhance the health of this precious chalk stream. We must take a systems-based approach, looking at whole landscapes and improving where we live – for people and wildlife, for today and into the future.

We can all help, whether it's in a big or small way. Whether it's adjusting how we use water, supporting and encouraging positive action, volunteering, or undertaking practical work to protect the river. Collective action can help protect and enhance the catchment that we value.

Indicators at a glance

	Topic	Indicators
State of the environment and landscape	Urbanisation/land use change	Infiltration and runoff rates Access to the landscape How areas are utilised
	Contaminants	Sewage Nutrients Emerging chemicals of concern Plastics Sediment Noise and light
	Climate change	Changing rainfall Changing air & water temperatures
State of nature	Biodiversity/Species	Abundance Diversity
	Landscape connectivity	Condition Extent
	Habitats	Condition Extent
State of play and ecosystem services	Wellbeing	Exercise Mental wellbeing
	A landscape to live and work in	Food provision Healthy soils Carbon storage Flow regulation Clean air

Report context

Why have we done this report?

The purpose of this report is to provide a summary of the current understanding of the River Chess catchment. The report provides the context for further work, developing a baseline from which improvements can be made. The report is not comprehensive but provides a starting point, which can be built upon and highlights some of the work that has been done to date.

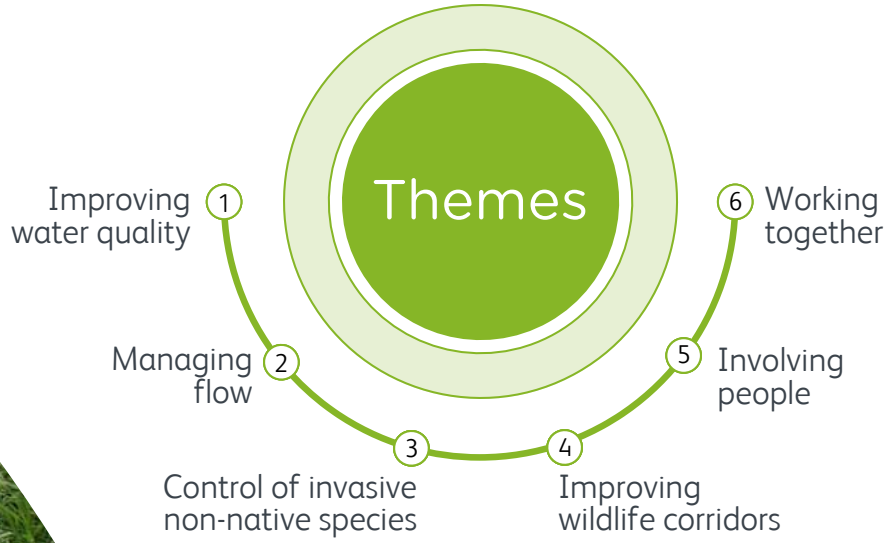
The catchment includes both the river, and all the land around it, from which the River Chess is formed. This includes semi-natural, agricultural, and urban areas. The habitats and processes within the catchment are interlinked and shouldn't be considered in isolation, this project reflects that interplay.

Some context around the project

This report has been produced as part of the 'smarter water catchments' initiative which is being piloted within the River Chess catchment. The project is looking to taking a systems-based view of the environment, collectively addressing multiple challenges and co-delivering solutions that make the most of opportunities on an even bigger scale. The work is being led by stakeholders to make sure it reflects local needs and considers local knowledge.

Our 10-year catchment plan was published in March 2021, detailing actions under our key themes. This report has been written and published on completion of our first year, with the purpose of tailoring our next steps and continuing to promote the stakeholder-led approach, reaching out to wider communities.

River Chess strategy



Background

Value of the River Chess catchment

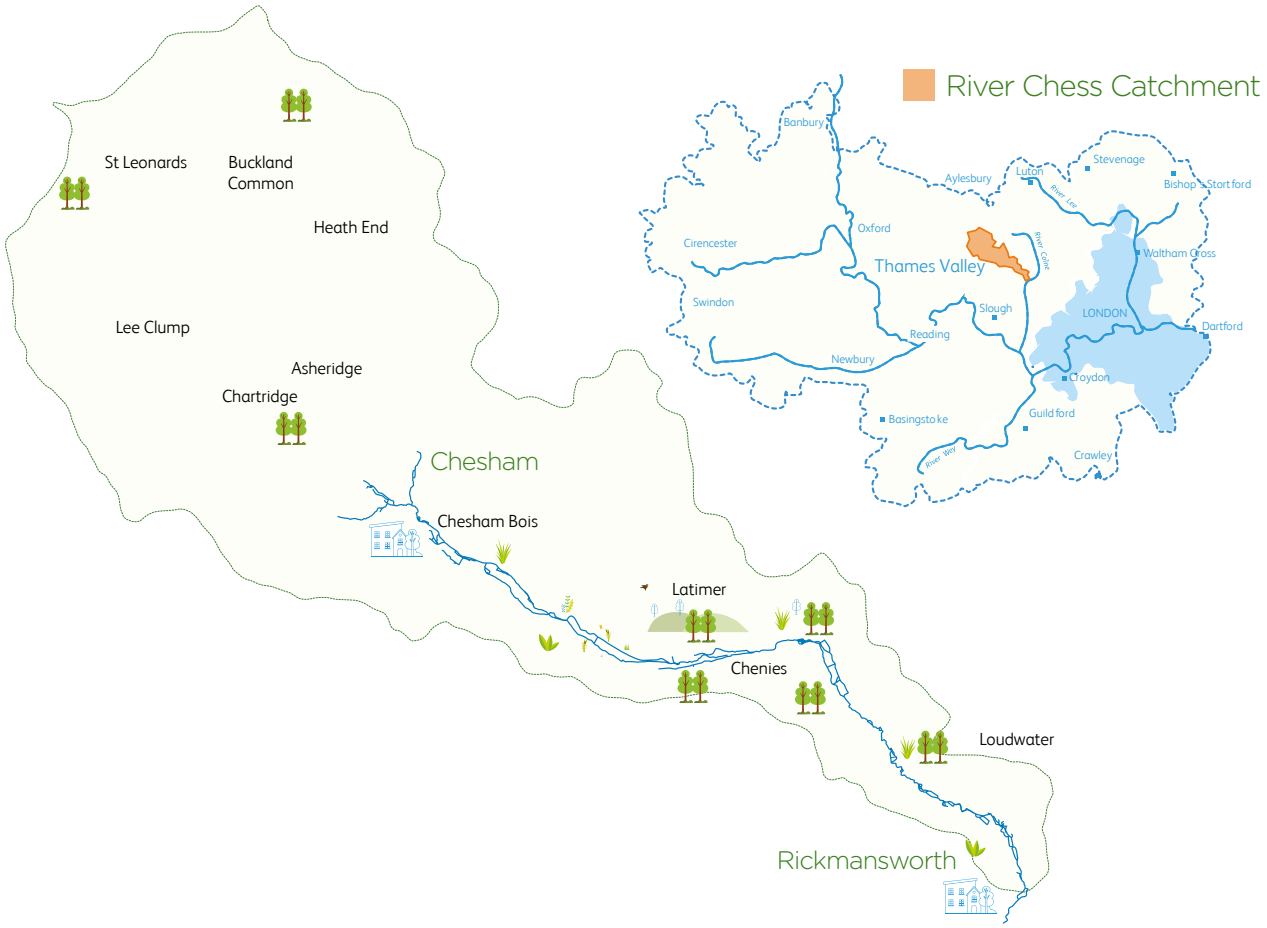
Overview

The River Chess catchment is extremely important in a wide range of contexts; from local to global. It's home to many people and an abundance of wildlife. It's also a vital green and blue space for visitors from inside and outside the catchment.

Habitats in the landscape are globally scarce, such as the chalk stream, lowland meadows and chalk grassland; therefore, some of the species supported by these habitats are rare and under threat. The habitats also provide wider reaching benefits such as helping landscapes adapt to climate change, reducing carbon and providing a more resilient landscape for people and wildlife.

Geographical and biological context

The River Chess is a precious chalk stream that makes up one of the rivers within the Colne catchment. It rises from a number of sources around Chesham, such as at Pednormead End, and flows for 11 miles through the Chilterns Area of Outstanding Natural Beauty, to meet the River Colne in Rickmansworth. The River Chess is one of only 283 chalk streams that have been identified in England. Emphasising this scarcity, England supports the majority of the chalk streams in the world. The River Chess is renowned for its lush margins, clean gravel bed and crystal-clear, oxygenated waters. Plants like the white-flowered water crowfoot grow abundantly in its fast flow, and fish such as brown trout lay their eggs in the riverbed. The river, in turn, is also strongly influenced by habitats within the catchment.



What does the River Chess Catchment provide us?

Systems within the River Chess catchment provide a wide range of benefits including, food, water, biodiversity, ecosystem services and recreation. Examples of ecosystem services include flood amelioration, clean air and water.

We're all dependent on the world we live in – having healthy and resilient landscapes helps us all to thrive, supporting future generations of people and wildlife.

Recreation

The catchment provides a varied landscape for outdoor activities such as hiking, fishing, horse riding and cycling.

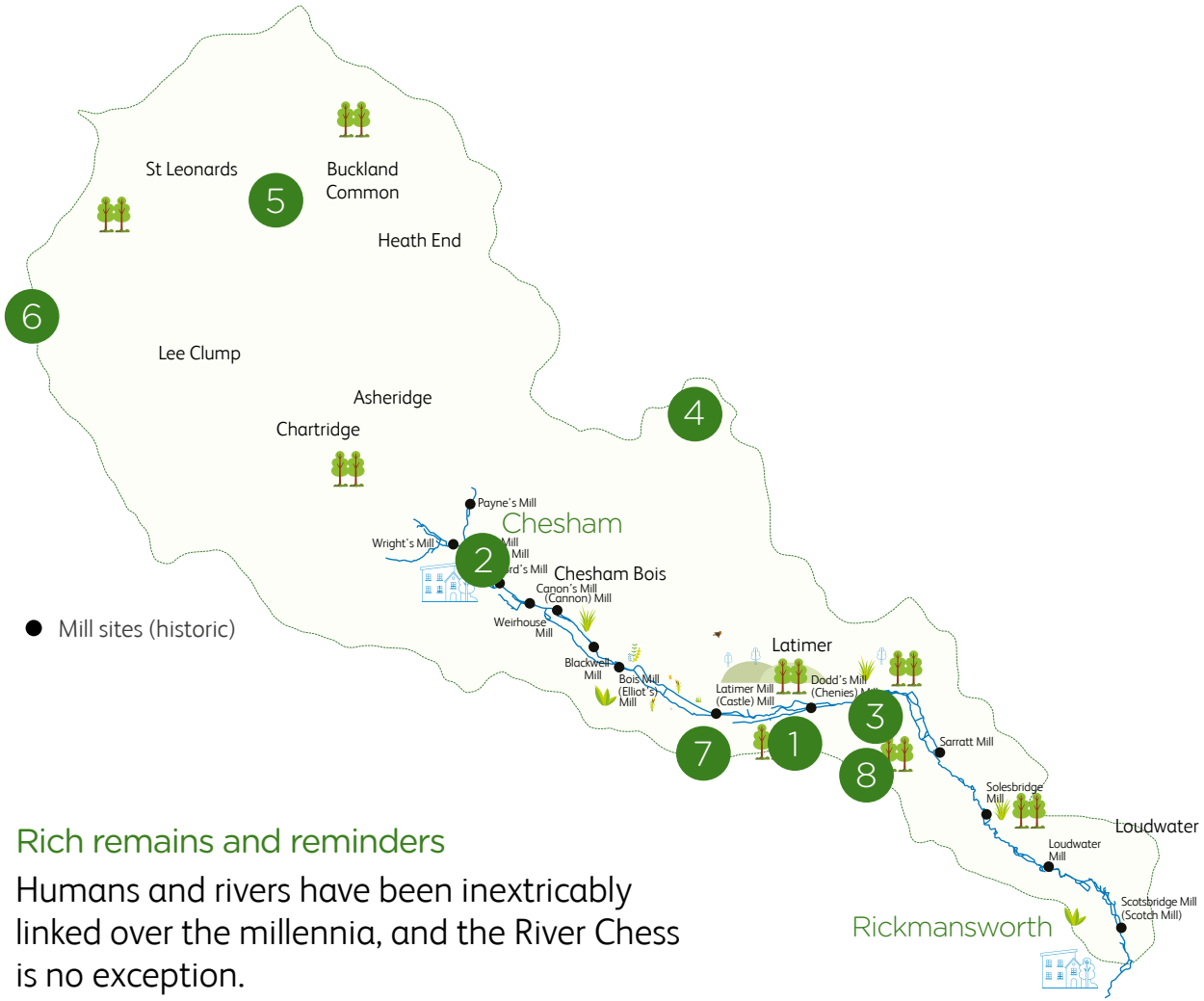
Water

The river and aquifer has historically provided an important source of drinking water, and historically the water has supported watercress farms and milling industries.

Biodiversity

Habitats within the catchment are highly biodiverse and support many rare species within limited geographical distribution.

Cultural heritage



Rich remains and reminders

Humans and rivers have been inextricably linked over the millennia, and the River Chess is no exception.

The River Chess catchment is richly strewn with the remains and reminders of past generations and their connection to the river. From the earliest post-glacial presence of hunter-gatherers in the Mesolithic (1), drawn to the reliable clean waters and abundant springs, to the first farmers of the Neolithic (2) who more than 5,500 years ago began to plant the rich soils of the valley bottom, the Chess has influenced human settlement in the region. By the later prehistoric period, the entire catchment was well populated (3), and significant monuments in the form of hillforts (4,5) and the enigmatic 'Grim's Ditch' (6) were constructed. During the Roman administration of the area, well established farmsteads, villas (7), and roads (8) served a thriving region of grain and iron production.

Historical features

1 Mesolithic flint working

Flint scatters suggesting locations where hunter gatherers were making tools and weapons.

2 Neolithic flint working

Near the Vale Brook, flint working has been found dating to when people were beginning to settle.

3 Iron Age farmstead

Located near to Chenies Bottom. The farmstead was still occupied in the Roman period.

4 Whelpley Hill Hill-fort

One of two hillforts in the catchment and is probably a site where objects were manufactured for trade.

5 Cholesbury Camp Hillfort

A large, enclosed hillfort, which was used intermittently for iron production from the Middle Iron Age into the Roman period.

6 Grim's Ditch

One of a series of linear earthworks. This section may have been a territorial boundary marker.

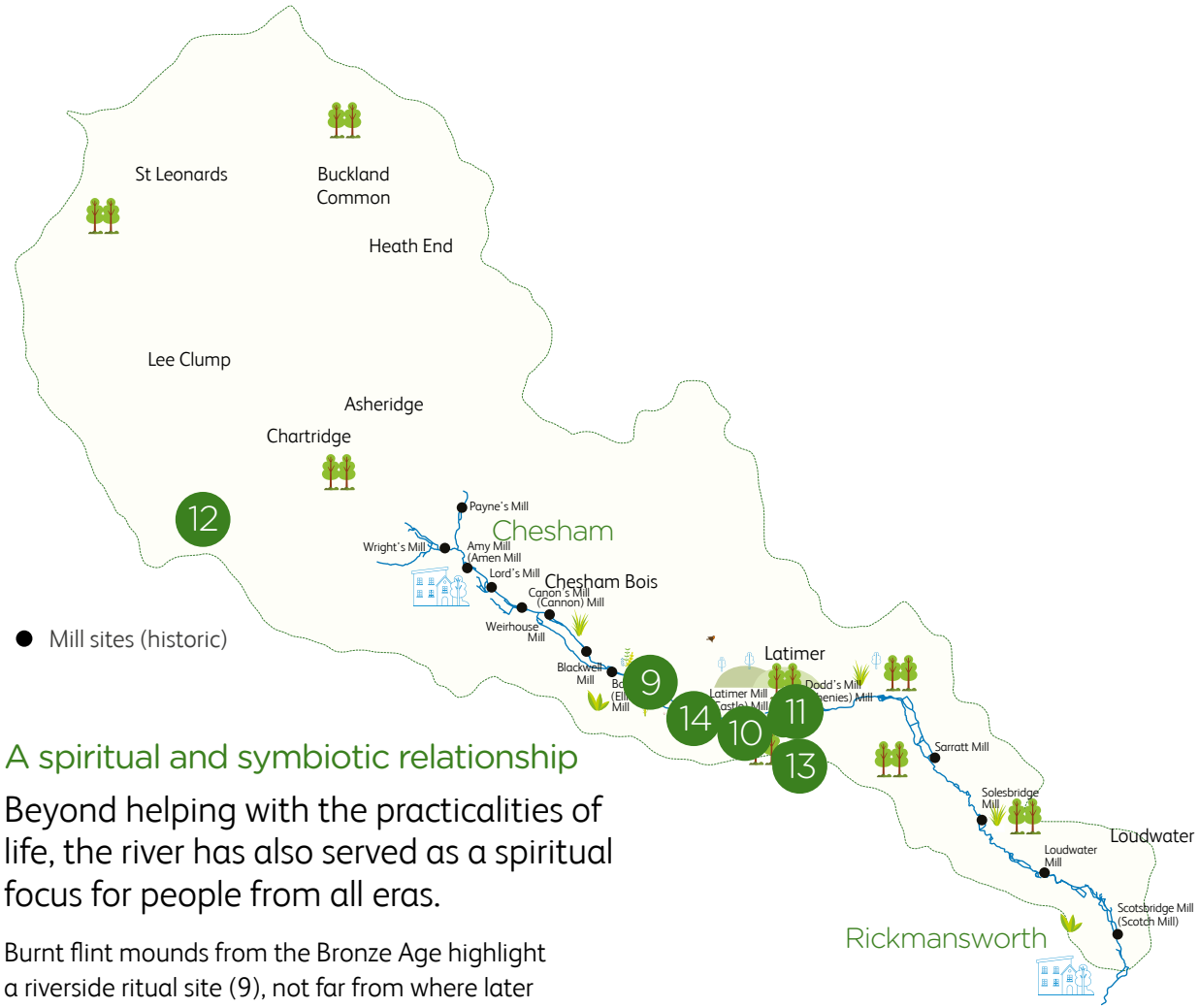
7 Roman villa

A villa with mosaic floors and underfloor heating was excavated under the current site of Restore Hope at Latimer.

8 Roman road

Evidence of a Roman road leading from the River Thames, crossing the Chess near Chenies, and continuing to St Albans (the Roman city of Verulamium).

Cultural heritage



A spiritual and symbiotic relationship

Beyond helping with the practicalities of life, the river has also served as a spiritual focus for people from all eras.

Burnt flint mounds from the Bronze Age highlight a riverside ritual site (9), not far from where later inhabitants would construct St Mary's Church at the now deserted Flaunden village (10). Holy Cross Church, Sarratt, which overlooks the Chess Valley was founded as an 'anchorite' chapel; i.e a chapel where monks, in this case from St.Alban's Abbey, could reflect in isolation. Not just spiritual power, but physical power was invoked from the River Chess over the course of the last millennium as mills were constructed to process grain into flour and rag into paper.

By this time, an archaeological feature in its own right, the chalk stream had been shaped and reshaped for purposes such as the flooding of managed water meadows and watercress beds, now visible only through LiDAR imagery (11).

The wealth produced from these industries led to the presence of large stately manors(12), enjoyed by some of our key historical figures (13,14).

As some settlements like Chesham grew to urban proportions, and other methods of power became available, the river lost a lot of its central role. Once the very reason for people to settle, it became shut away and neglected. But the relationship between humans and the river is still a long and interconnected one, and we're putting ambitious measures in place for it to be a mutually caring one.

Historical features

9 Bronze Age finds

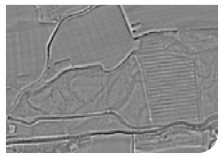
Concentrations of finds dating to the Bronze Age suggest burnt mounds, used to create a type of sauna, perhaps similar to sweat lodges.

10 St Mary Magdalene Church

The church was built in the early 13th century, but flooding forced the entire village of Flaunden to move six centuries later.

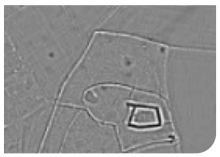
11 Water meadows

Meadows like these were irrigated to produce plentiful hay crops and rich grassland for pasture. Channels were dug and managed so the fields could be flooded to maximise production.



12 Redding Wick

This is one of several moated manors in the region, with extensive earthworks dating from the 13th century.

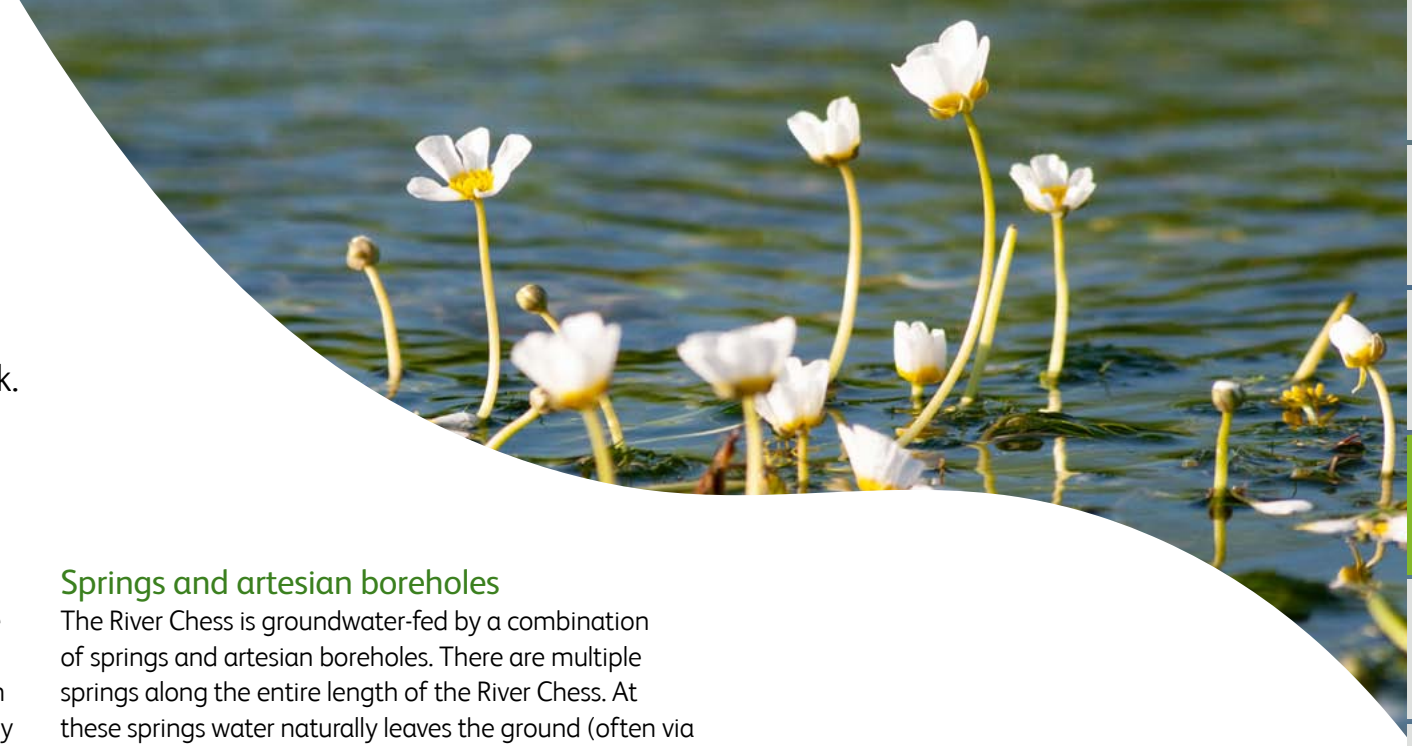


13 Chenies Manor

Originally constructed in the 13th century, with many changes over the Medieval period. The manor hosted visiting royalty, including Henry VIII and Elizabeth I.

14 Latimer Park House

Home of the first Barons and a prominent feature of the valley, possibly influenced by Lancelot 'Capablity' Brown, and used by the military during WWII.



Hydrogeological setting

Chalk aquifers

The geology in the River Chess catchment is dominated by White Chalk. The Chalk is found in most of southern England, and it extends to East Anglia, Lincolnshire and the Yorkshire coasts.

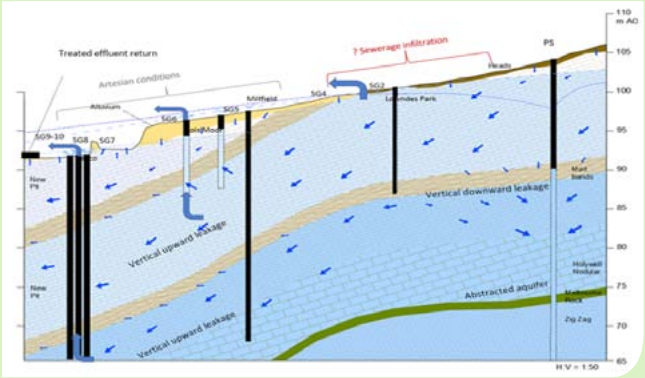
The Chalk is the most important aquifer in England made of the remains of micro-fossils deposited at the bottom of an ocean between 65 - 100 million years ago. Groundwater in the Chalk aquifer moves through fractures and rock openings; groundwater flow velocity can be very high (hundreds of metres per day).

In the Chess catchment water has been abstracted from the underground aquifer for public water supply. Aquifers have sufficient permeability and can be exploited economically from wells or springs. Typically, an aquifer has an unsaturated zone of dry rock and then below the water table, has a saturated zone, where groundwater collects. It can be imagined as a sponge, partially in water where the bottom half is saturated (i.e. all pores are filled with water) and top half is unsaturated (little to no pores are filled with water).

The Chalk aquifer in the Chess catchment has multilayer properties. An extensive monitoring network concentrated in the Upper catchment, with 12 spot measurements for river flow (monthly basis) and 18 observation boreholes with loggers for groundwater levels (hourly basis) measures this complex hydrogeological setting and helps us understand the catchment.

Springs and artesian boreholes

The River Chess is groundwater-fed by a combination of springs and artesian boreholes. There are multiple springs along the entire length of the River Chess. At these springs water naturally leaves the ground (often via a fracture in the Chalk) and joins the river. Such springs were often used in the past as the sites of watercress beds. In addition, the Chess aquifer has artesian boreholes which discharge into the River Chess between Lords Mill and the Decco site; this provides artificial flow to the River Chess and the Little Chess.



Schematic of the hydrogeological setting in the aquifer near Chesham town

Flowing artesian borehole at Bois Moor

The catchment hydrogeological settings are complex and a portion of the abstractions influence on river baseflow is indirect.

Introduction to pressures and impacts

A range of pressures

The River Chess catchment faces a range of pressures which are often replicated nationally, although some impacts are unique to chalk stream river systems, and chalk habitats.

Understanding influences within the catchment provides a background to help inform the future decision-making process for improvements within the catchment.

Impacts of these pressures include:

- **Climate change**- Changing temperatures and patterns of rainfall, and increased extreme weather events, result in stressed habitats and species
- **Land use**- Changing land use and urbanisation, as well as changes in land management practices, impact public access and loss of habitat for species
- **River modifications**- Physical modifications to the river including straightening, deepening, man-made banks, barriers such as weirs and mill structures
- **Pollution**- Sediment in rivers, contaminants, noise, light, plastics and air pollution
- **Loss of habitat connectivity**- Habitat fragmentation, habitats in poorer condition, loss of habitat extents, loss in carrying capacity of habitats
- **Groundwater abstraction**- Reducing flow of rivers, increasing the risk of channels drying out, changing processes within the river (lower energy environments)
- **Biodiversity loss** (as a result of pressures in the catchment)- Changes in species distribution, health, and population sizes. Reduction in species diversity, and a loss of resilience to further change
- **Invasive species**- Competition with native species, habitat damage, disease and predation

Managing flows

Restoring the River Chess

Affinity Water and Thames Water are committed to helping restore the health of the River Chess, working in partnership to shape the strategy and action plans for the next nine years and beyond. In the past few years, Affinity Water voluntarily stopped groundwater abstractions from the upper catchment and helped customers to reduce their water demand.

Reducing groundwater abstraction

The reduction in groundwater abstraction in the River Chess catchment took place in January 2018 and August 2020. It's now estimated that the total reduction in abstraction to be approximately 4 mega litres per day (Ml/d), from 10 to 6 Ml/d. Thames Water is also planning to turn off its public water supply in the catchment by the end of 2025.

Since 2020/21, an increase in ground water levels has been observed. It should be noted that the monitoring period in 2021 was particularly wet and the observed surface flow increase was induced by higher than average recharge. Observations need to be repeated in drier conditions in the next few years to confirm the impact on baseflow in the River Chess.

The increases were concentrated along the valley and the maximum recovery was approximately one metre.

When looking at surface water flows, Affinity Water has seen a potential increase in baseflow caused by voluntary groundwater abstraction reductions at Chesham in the Vale Brook at the Townsend Road monitoring point. An increase of just under 1Ml/d was observed, however this was during a peak in flow (flood conditions) only.

The monitoring will stay in place and continue for the next three years. More evidence like this will help build a robust picture of the flow patterns.

Restoring the watercourse

The current river morphological conditions severely affect the ecological habitats. Thames Water and Affinity Water, alongside the wider partnership, are planning future river restoration works aiming to mitigate the negative effects of barriers, weirs and artificially-shaped channels.

Demand management

The water we all use in our homes comes from our local environment, so how much we use has an impact on local chalk streams.

What are the challenges?

The Environment Agency has recommended that the South-East, South and Midlands should be classified as areas of serious water stress. In the Chess catchment, over 94% of water supplied by Affinity Water is for domestic users and the per capita consumption is one of the highest in the Affinity Water supply area. It averaged 176.16 litres per day (l/p/d) in 2020/21 compared to the supply average of 169.3 l/p/d; an increase of 14.3 l/p/d (9.2%) on the prior year, mainly due to more people staying at home because of COVID-19, as well as the hot weather from May to August 2020.

What can we do?

In April 2021, Affinity Water's 'Save Our Streams' campaign helped customers understand the link between local rivers, streams, and their own water use. Over 180,000 customers engaged in the campaign, representing over 10% of the properties in the area. In the Chess catchment alone, 5% of customers responded to the first and second survey that helped us understand their water use awareness. The measured impact of this campaign to date is a saving of 5 million litres of water a day.

Our next steps

We're working on ways to give more feedback to our customers, more quickly. This might be through existing channels (e.g., www.saveourstreams.co.uk) or through new ones, such as an app. This will improve our understanding of customer behaviour.

In addition to this, smart meters will help us do more customer segmentation and bespoke messaging, increasing the uptake of our next behavioural change initiatives.

Water quality

ChessWatch: a water observatory for the River Chess

In 2019, we installed four real-time sensors (also known as sondes) into the River Chess to measure different aspects of water quality. These measurements include water temperature, dissolved oxygen levels, electrical conductivity, pH and turbidity.

Assessing water quality

Data from these sensors allowed us to assess water quality before deciding on appropriate actions to include in our 'smarter water catchments' plan. The monitoring strategy was co-designed with the River Chess Association, Chilterns Chalk Streams Project and Queen Mary University of London. Citizen Scientists help clean and maintain the sondes and have created a water quality dashboard to help visualise the data in our River Chess Storymap.

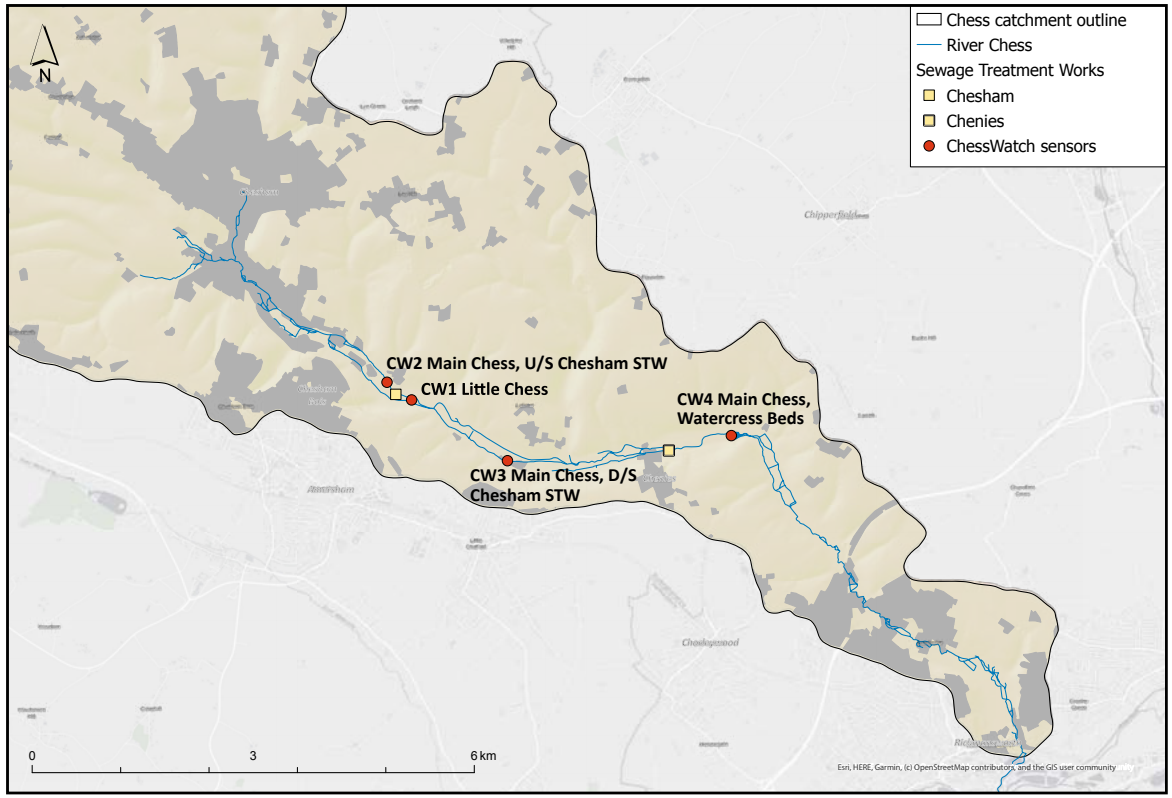
This data complements the monthly water quality monitoring by the Environment Agency, and helps us understand the effects of events, such as rainfall, on water quality in the Chess.

Addressing the challenge

We'll continue to monitor water quality in this way throughout the programme to measure any changes that might come from mitigation actions such as reducing urban runoff and increasing treatment capacity at Chesham sewage treatment works.

The data from the sensors can be viewed in our River Chess Storymap at **chess-observatory.qmul.ac.uk**

ChessWatch sensor sites



Data source: River Chess Smarter Water Catchment work

Example of a ChessWatch sonde

Storm tank overflow and dissolved oxygen levels in the River Chess

Our ChessWatch sensors have been measuring dissolved oxygen levels in the water both upstream and downstream of Chesham sewage treatment works (STW). Under the Water Framework Directive classification, the River Chess meets 'high' standards for dissolved oxygen content, which means that oxygen levels in the river water are generally very good and support healthy fish and invertebrate life.

Storm tank discharge at Chesham STW

Since the ChessWatch monitoring started in Summer 2019, changes in rainfall patterns have meant rising groundwater from low to high levels, with river levels and flows also increasing. This is also shown by data from the Environment Agency's water level recorder in Chesham. Whilst the increase in flows supports good river health, high intensity rainfall and high groundwater levels have put pressure on wastewater treatment in the catchment.

In 2020 and 2021, the storm tanks at Chesham discharged untreated effluent into the River Chess because of the intense rain and groundwater infiltration into the sewer network.

Storm tank discharge from Chesham STW

Addressing the challenges

Putting untreated sewage into our rivers is unacceptable, which is why Thames Water have a 2020-2025 programme in place to invest in sewage infrastructure and minimise this happening.

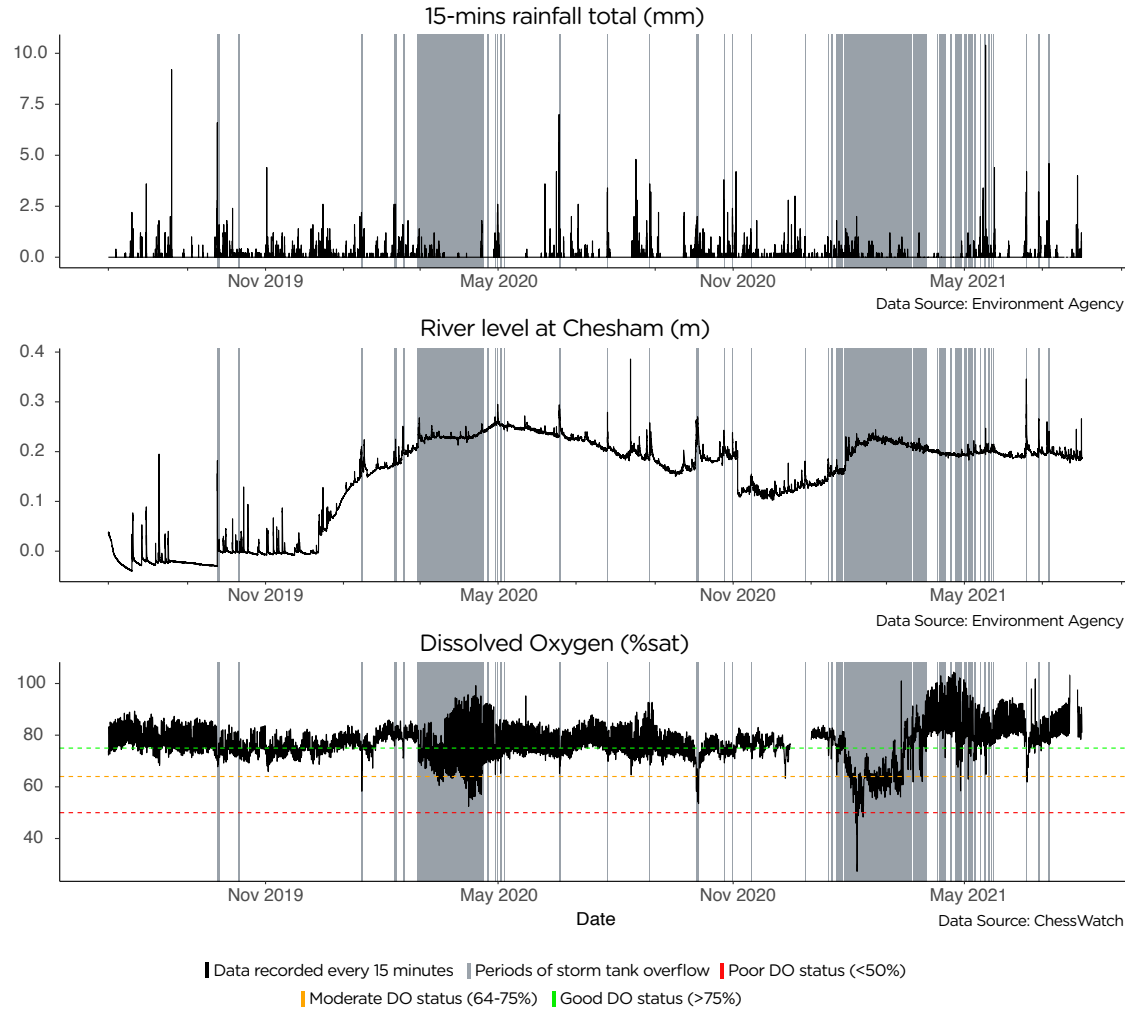
Improving infrastructure around Chesham

All sewerage systems will experience some groundwater infiltration and an allowance in design is made for this. However, in Chesham, the impact of infiltration during periods of high groundwater can be considerable, leading to much greater flows arriving at the sewage treatment works, typically during the winter. We've found that over 25% of the 4.6km of sewer surveyed suffers from infiltration, often in the form of cracks or holes, and sometimes even misconnected down pipes plumbed directly into the network.

The company has been addressing these challenges in two ways. Firstly, by increasing the capacity of the sewage works by nearly 40%, due to be completed at the end of 2023, and secondly by investing in cleaning, repairing and relining the sewer network and affected manholes.

Rainfall, water level at Chesham stageboard and dissolved oxygen in the River Chess 2km downstream of Chesham STW (2019-2021)

The grey-coloured panels on the graphs indicate the periods during which storm tanks at Chesham STW discharged untreated sewage to the Chess (for a total of 83.8 days in 2020 and 2021 combined). The final graph shows the effect on dissolved oxygen levels in a 2km stretch of the river downstream of the STW. The green, orange and red dashed lines indicate good, moderate and poor dissolved oxygen status respectively.



Total reactive phosphorus in the River Chess

Phosphorus is a critical nutrient for plants in the river, but too much of it can lead to a condition known as cultural eutrophication. This happens when nutrient enrichment changes the biodiversity of the river system, reducing the variety of plant species and encouraging the growth of algae.

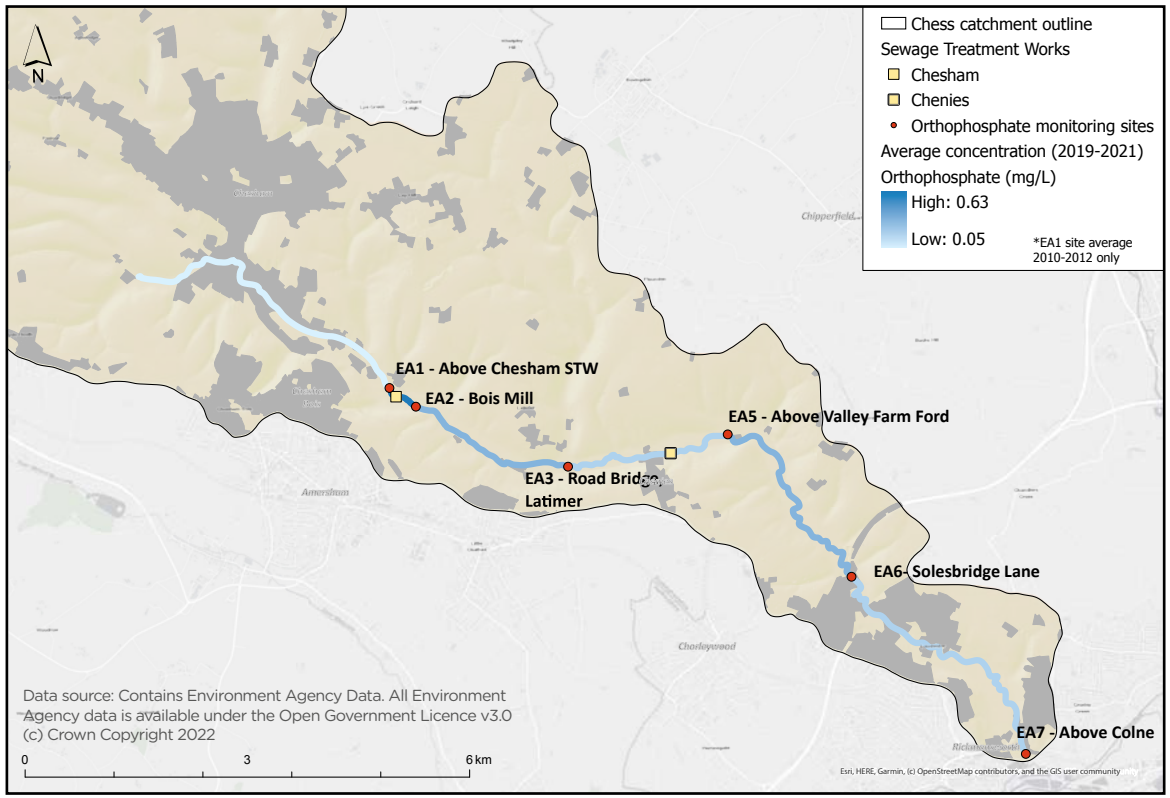
Sources of total reactive phosphorus

The River Chess is classified as having 'poor' phosphorus status under the Water Framework Directive. This means that the phosphorus concentrations in the river may be having a harmful effect on the river ecosystem. The Environment Agency estimate that 96 % of the total reactive phosphorus (the proportion of phosphorus that is available to biota) currently originates from treated effluent entering the river from Chesham STW.

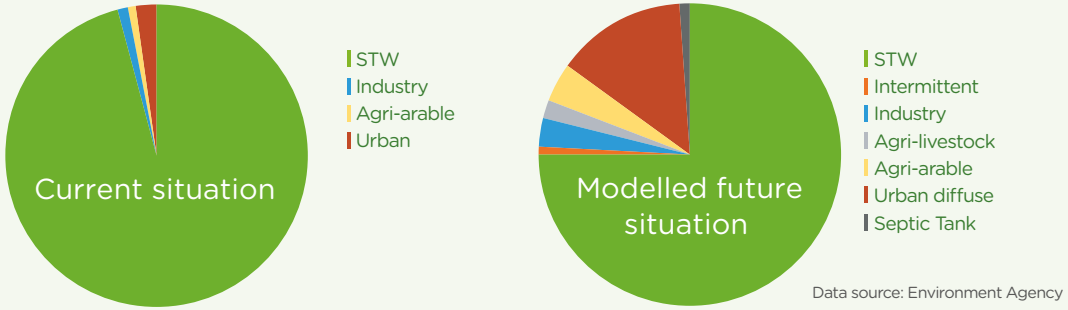
Addressing the challenge

To help improve the phosphorus status of the River Chess at Chesham, the maximum phosphorus concentration permitted in treated effluent will reduce from 2 to 0.25 mg P/L. Thames Water will be introducing additional treatment processes by the end of 2024; this is predicted to change the watercourse status to 'moderate' phosphorous condition.

Spatial distribution of ortho-phosphate concentration in the River Chess



Percentage contribution of different sources of Reactive Phosphorus to the River Chess as calculated by the Environment Agency (a) current situation; (b) modelled contribution of different sources of P following 2024 permit change to Chesham STW



Data source: Environment Agency

Fine sediment in the River Chess

The gravel bed of chalk streams, such as the River Chess, is an essential habitat for important invertebrates, fish and plants (including Ranunculus or water-crowfoot). On the other hand, fine sediment (particles less than 2mm) can have a negative effect on this habitat.

Impact and sources of fine sediment

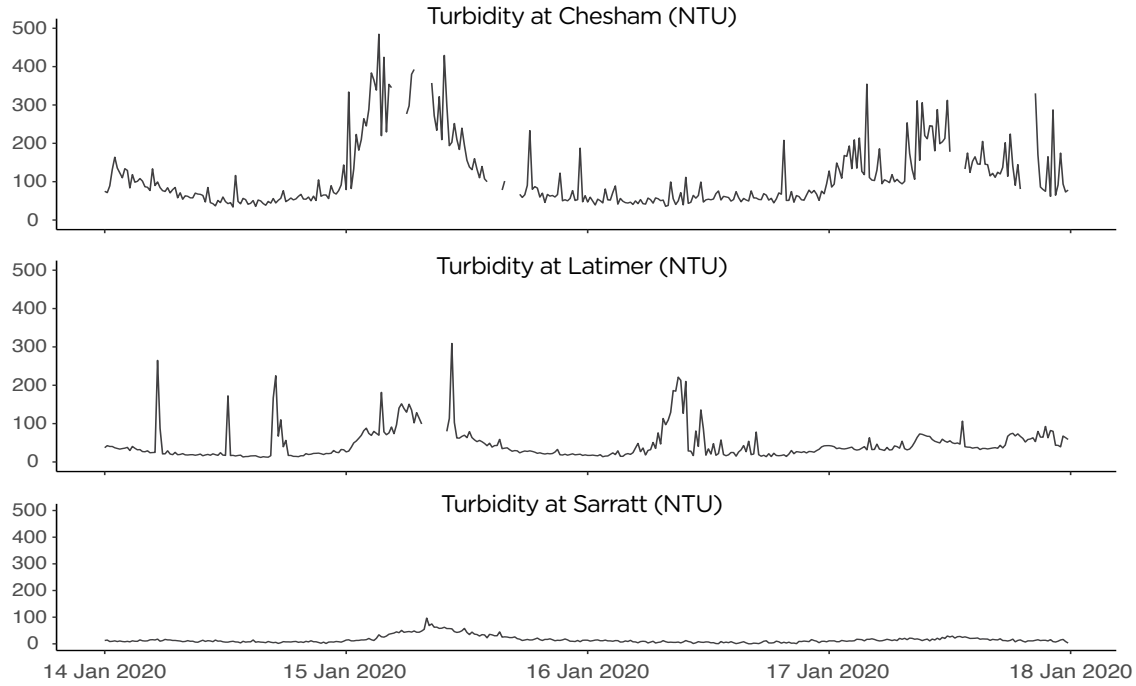
Fish, such as trout and grayling, lay their eggs in the gravel. These eggs need good oxygen levels to develop and hatch. When fine sediment enters a river, it settles on the riverbed and fills the spaces between the gravel, preventing movement of water through the riverbed. This 'cloak' of sediment can prevent the growth of plants and affect fish and invertebrate populations.

Fine sediment gets into the River Chess from different sources such as road runoff and agricultural activity. The extent of this issue is not yet fully understood, but some entry locations have been identified, such as the Vale Brook in Chesham. Our measurements to date suggest that more sediment is entering the river in the upstream sections around Chesham than in the middle reaches of the river.

Addressing the challenge

Over the next few years, we're planning to find out more about the sources and magnitude of fine sediment entering the River Chess, and to take action to minimise this.

Turbidity in the River Chess (14 - 17 January 2020)



Data source: ChessWatch

Road runoff into the River Chess

Fine sediment flowing from Vale Brook in Chesham

Wildlife

Habitat overview

The catchment covers nearly ten thousand hectares and includes a mixture of semi-natural habitats, agricultural and urban areas.

Urban and agricultural activities have strongly influenced the characteristics of the catchment and have helped shape the landscape to what it is today. These actions include grazing animals, felling trees and recreational use of the river. Where they've gone on for a long-time, species have taken advantage of the habitat niches present.

Geology

The distinct characteristics of the catchment have also been strongly influenced by the underlying chalk geology and historic geological processes. Rare habitats and species are found here that can't thrive outside of chalk landscapes. The specific geology has led to the formation of the River Chess as a chalk stream. Chalk streams are a rare habitat and, as 85 % of the world's chalk streams are present in England, we've a huge responsibility to protect and enhance this scarce habitat.

Chalk streams

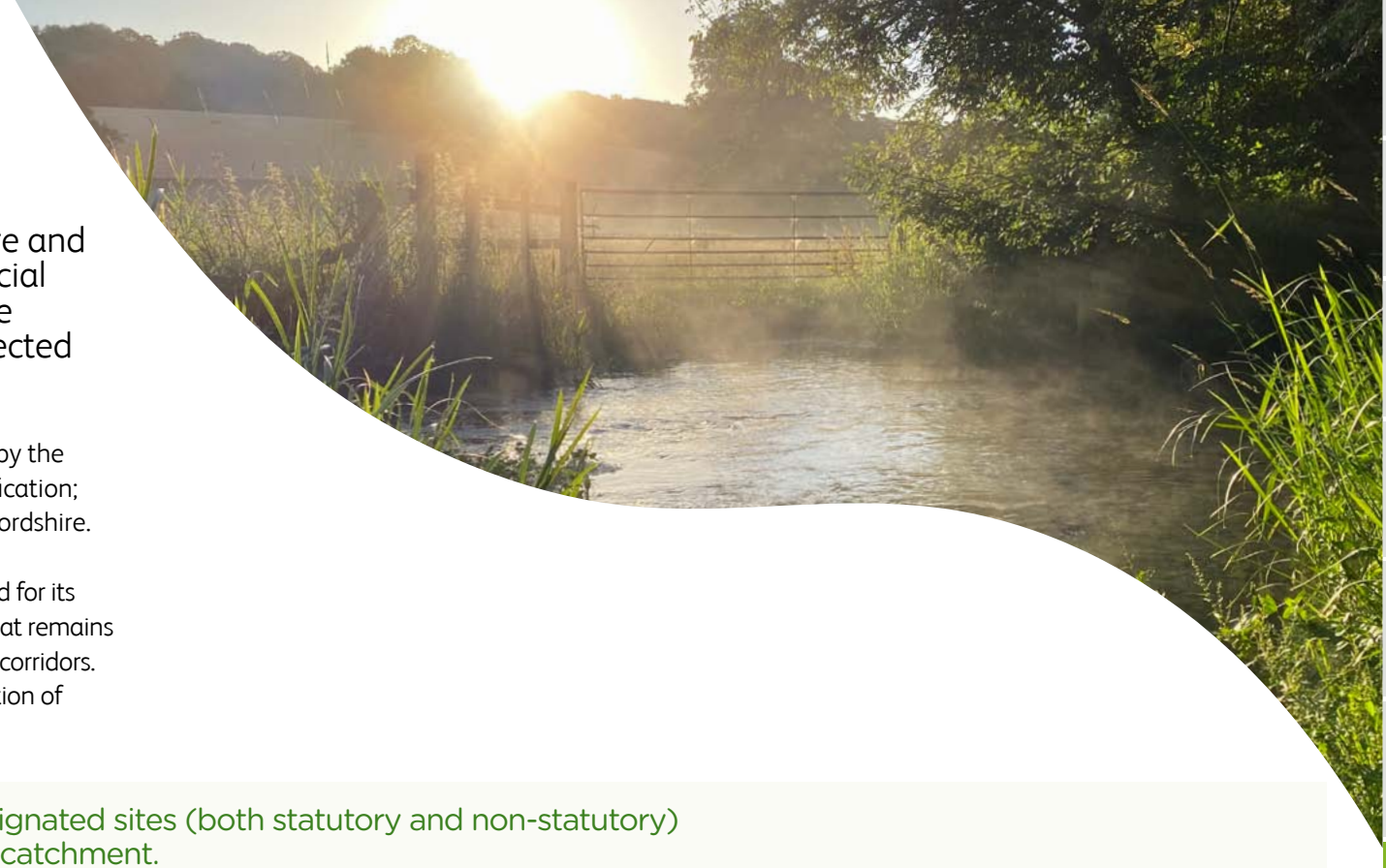
The flow of chalk rivers and streams is fed from aquifers. An aquifer is formed when water gets into permeable rock and creates a store of water. The rock filters the water making it clean, pure and a stable temperature. Together with the geomorphology, this means that the river can support rare and specialist species. These range from very small insects such as a type of mayfly, to fish like the brown trout (Salmo trutta), from certain aquatic plants to well-loved animals like water voles (Arvicola amphibious).

Statutory and non-statutory protected sites

These protected sites include Sarratt Bottom Site of Special Scientific Interest (SSSI), and Frogmore Meadows SSSI and Local Nature Reserve (LNR) sites, Chorleywood House Estate and Captain's Wood. Local wildlife sites are distributed across the catchment, including sections of the river.

Landscape approaches

Organisations have considered opportunities in the catchment for habitat restoration and creation. These include biodiversity areas and areas which target conservation and restoration. One of which is the Chilterns Area of Outstanding Natural Beauty (AONB) designation.



How is the landscape protected?

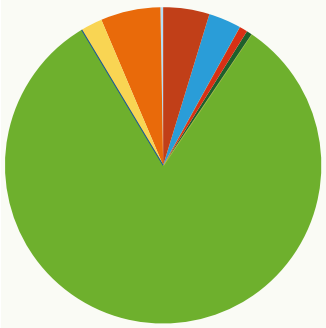
The catchment covers Buckinghamshire and Hertfordshire and has two Sites of Special Scientific Interest and two Local Nature Reserves, as well as non-statutory protected sites and a range of priority habitats.

A large proportion of the catchment is also covered by the Chilterns Area of Outstanding Natural Beauty classification; covering the counties of Buckinghamshire and Hertfordshire.

Only a small proportion of the catchment is designated for its wildlife interest, underlining the value of the habitat that remains and the need to protect, expand and enhance wildlife corridors. There's also a case for considering additional designation of areas within the catchment such as the River Chess.

Land use cover, an examination of designated sites (both statutory and non-statutory) and priority habitat extents within the catchment.

Habitat types (ha)



- 7254.48 Cultivated/disturbed land - amenity grassland
- 916.79 Broadleaved woodland - semi-natural
- 536.02 Hardstanding
- 428.08 Coniferous woodland - plantation
- 280.87 Scrub - dense/continuous
- 210.27 Buildings
- 93.80 Poor semi-improved grassland
- 42.40 Running water
- 14.31 Other habitat
- 6.36 Not Classified
- 1.13 Scree - basic
- 0.82 Marsh/marshy grassland
- 0.01 Hard cliff

Priority habitats (ha)

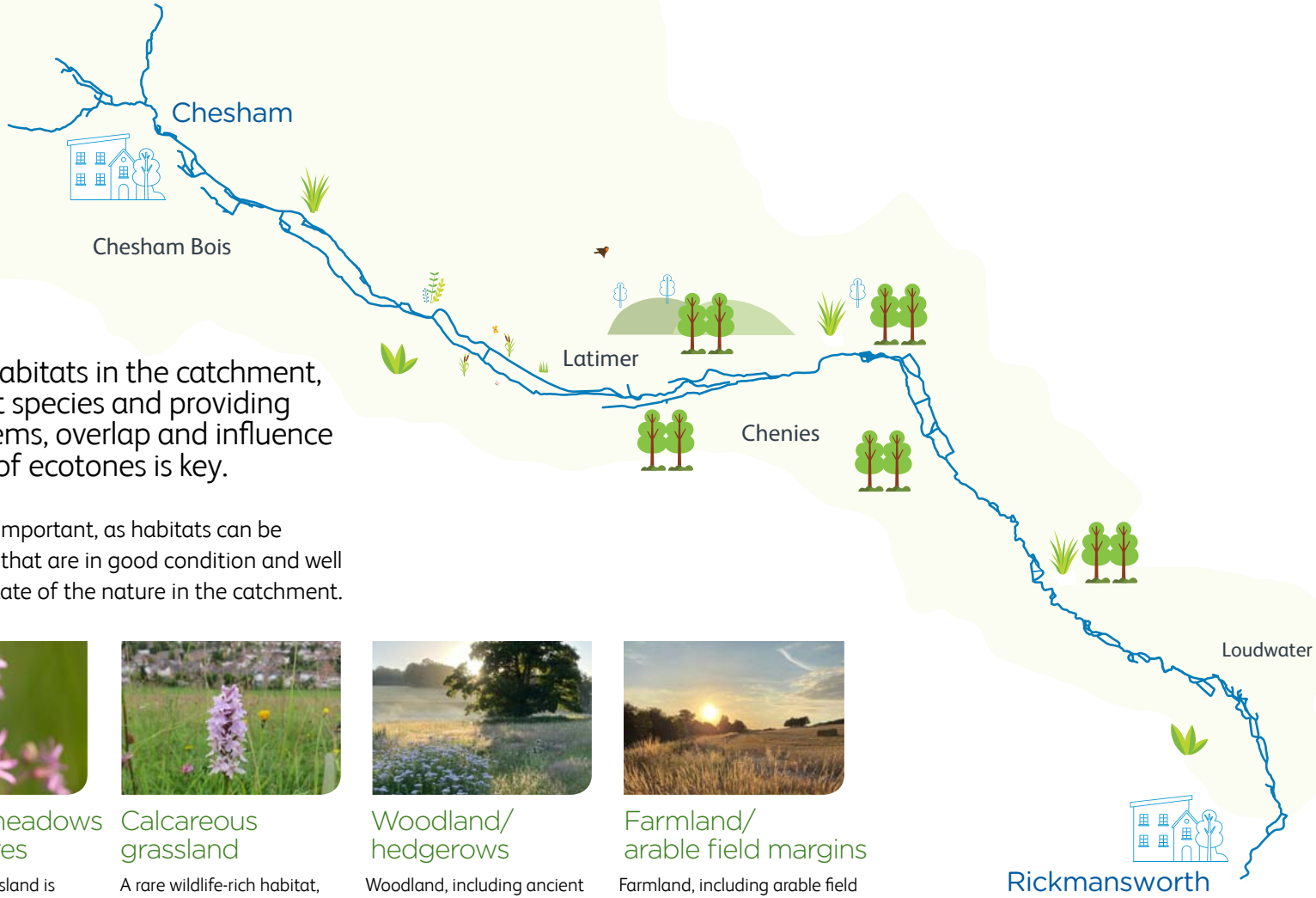
- 8593.01 Non-priority habitat extent
- 1044.25 Deciduous Woodland
- 55.67 Good Quality Improved Grassland
- 48.03 No main habitat but additional habitats present
- 18.94 Traditional Orchards
- 15.99 Lowland calcareous grassland
- 7.87 Lowland Meadows
- 1.53 Lowland Fens
- 0.06 Lowland Heath

Designated habitats (ha)

- 9330.28 Areas not known to be covered by wildlife designation (excludes AONB)
- 363.4 LWR – (only calculated for Buckinghamshire currently)
- 83.64 LNR
- 8.03 SSSI
- 0 SAC
- 0 NNR

Overview of semi-natural habitats

Condition	Abundance	Range/diversity	Connectivity
Habitats in good condition are more resilient and diverse, supporting a wider range of species.	Species abundance, as well as distribution, is important, helping ensure balanced ecosystems.	Highly biodiverse habitats and species with good species range, helps support robust ecosystems.	Connectivity allows species to move, colonise new areas and form healthy populations.



There's a range of different habitats in the catchment, each giving value for different species and providing services for us. These ecosystems, overlap and influence each other and the interplay of ecotones is key.

The condition of these habitats is also important, as habitats can be present but degraded. Having habitats that are in good condition and well connected is vitally important for the state of the nature in the catchment.

Chalk streams

Highly biodiverse, ground water fed supporting many rare and specialist species. This habitat has a very limited distribution globally.

Lowland meadows and pastures

Unimproved grassland is a very rare and declining habitat which can support a diverse range of plant and invertebrate species.

Calcareous grassland

A rare wildlife-rich habitat, usually developed over centuries of grazing on nutrient-poor soils found on steep slopes.

Woodland/ hedgerows

Woodland, including ancient woodland, is present in the catchment. A historic hedgerow system forms an important landscape characteristic of the catchment.

Farmland/ arable field margins

Farmland, including arable field margins, provides a wide range of wildlife habitats important for a range of species including farmland birds and arable plant species, many of which are in decline.

Measures to improve the catchment

Condition

Improving the condition of existing habitats is important. This can help habitats we already have to be more biodiverse. Implementation of targeted management plans and natural regeneration can help achieve this.

Abundance

Not only has distribution of species changed but relative abundance is also important. The less of a species that's present, the more it's at risk from being lost. We need to provide species recovery plans, habitat regeneration and improved connectivity.

Range/diversity

Increase the distribution of species and habitats, and the diversity of species to help species survive in the longer term. This can be achieved by restoring natural processes, active management, and habitat creation.

Connectivity

If habitats are isolated, species can't spread, there's no genetic diversity and whole populations can be lost. Connectivity can be improved by improving exiting habitats, creating new habitats, removing barriers, and creating safe routes.

There are many things we can do to help a decline in wildlife, changes in distribution, and to build resilience.

Our options include, restoring the River Chess, creating robust habitat buffers, creating and allowing wetland habitats to regenerate, proving connectivity in the catchment and improving habitats in the urban environment. Solutions can be big and small, and everyone has the chance to make a difference. These options should be used in combination with each other and their impacts monitored at both a local and landscape scale.

Creating buffers along the river

Allowing marginal vegetation to establish, preventing soil entering the river and providing habitat for species such as the water vole. This can be achieved through activities such as fencing, allowing natural regeneration, and changing how land is used.

Restoring the river

Removing features that reduce connectivity and negatively affect the natural state of the river, for example weirs, culverts and concrete banks. Protecting eroded damaged banks, restoring natural processes and degraded sections where it's over widened or deepened.

Creating associated wetland habitats

Including ponds, reedbeds, wet meadows. Relinking the river with the floodplain and increasing the diversity of its habitats. Restoring natural processes which can increase biodiversity, abundance and provide services to people.

Linking habitats within the catchment

Proving connectivity, for example, by connecting woodland through the restoration of hedgerows and widening of hedgerows and scrub. Connectivity of other habitats should also be undertaken.

Increasing diversity of habitats in urban spaces

Reducing mowing, planting bee-friendly grassland and removing hard standing, including permeable surfaces. Increasing the number of green roofs, installing bird boxes, such as swift boxes, linking gardens (e.g., for hedgehogs) creating rain gardens and making ponds.

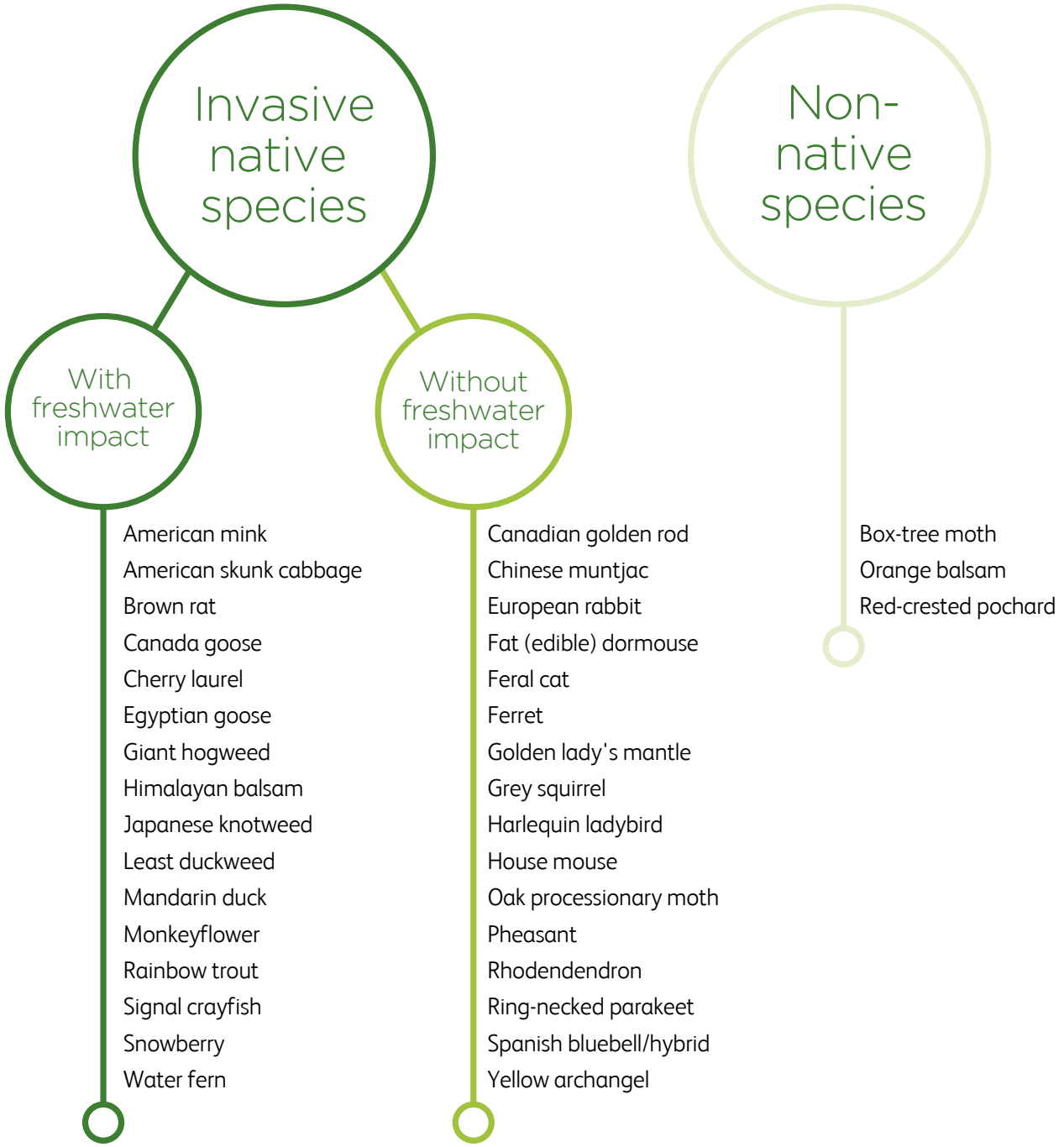
Invasive non-native species

Overview

Invasive non-native species (INNS) are those which have been introduced to areas outside their natural range by humans and pose a threat to native organisms or environments.

Britain is home to over 3,000 non-native species, with 155 of these considered to be invasive in terrestrial or freshwater habitats. Data from Buckinghamshire & Milton Keynes, and Hertfordshire Record Centres, reveals 19 non-native species have been recorded in the Chess catchment in the last 10 years. This figure is likely to be a substantial underestimate of the true total. In fact, the Chilterns Chalk Streams Project (CCSP) is aware of at least 16 additional species that are present in the catchment.

Of the total of 35 known species, all but three are considered to be invasive in nature. Some species like the European rabbit (Oryctolagus cuniculus), brown rat (Rattus norvegicus) and edible dormouse (Glis glis) have been present in the catchment for hundreds of years but many species like the American signal crayfish (Pacifastacus leniusculus) and Oak processionary moth (Thaumetopoea pityocampa) are more recent colonisers.



INNS impacting the River Chess

Of the 32 invasive non-native species that are known to be present in the catchment, a total of 18 are having a direct or indirect impact on freshwater ecosystems within it.

Invasive plants

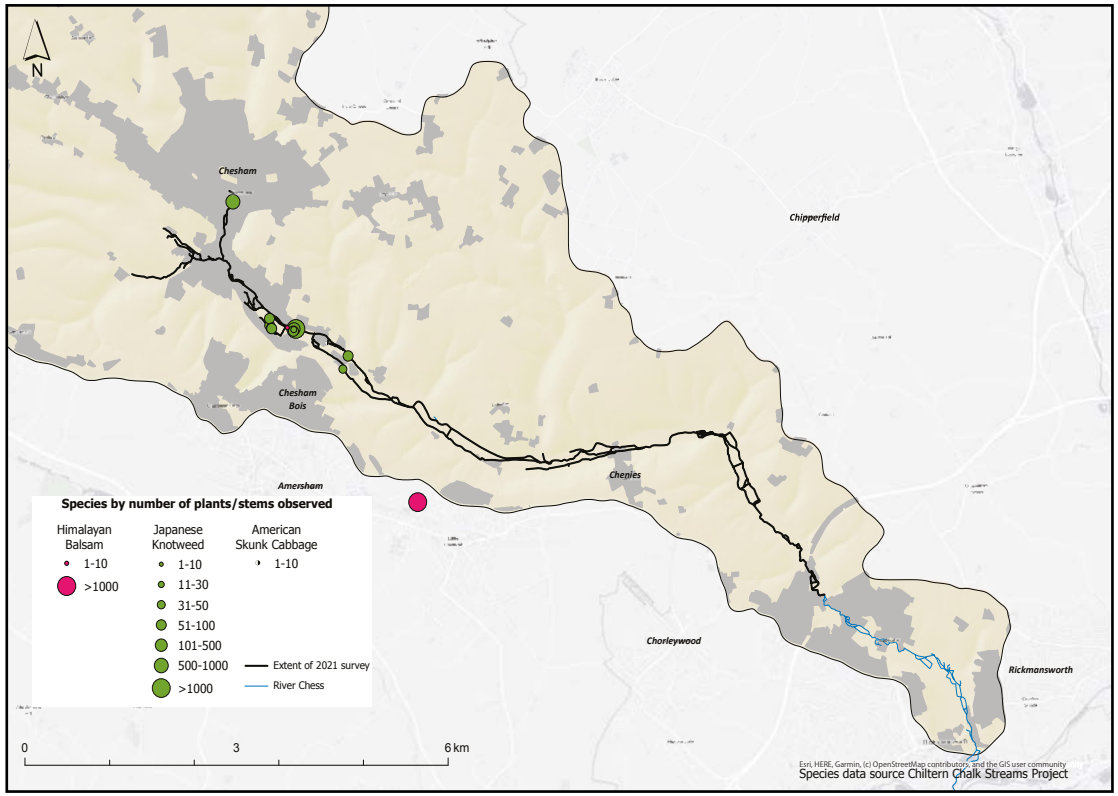
In 2007, the Chilterns Chalk Streams Project (CCSP) carried out an INNS survey along the Chess. This revealed significant infestations of Japanese knotweed, Himalayan balsam and orange balsam along the river. Several previously unrecorded species such as American skunk cabbage and giant knotweed were also found. Of these, orange balsam was most widely distributed. Although, not officially classified as an invasive species, orange balsam was recorded due to landowner concerns about its increased presence on the river in recent years. Following analysis of the results and the potential impact of each species on the river, the CCSP initially prioritised control efforts on Himalayan balsam and Japanese knotweed in the Chesham area before working downstream. The Project worked with partners of Impress the Chess (a local community river group in Chesham) to raise public awareness of INNS and to control infestations.

A repeat of the INNS plant survey in 2021 by the CCSP and River Chess Association volunteers revealed significant progress has been made in controlling both species. Infestations of Japanese and giant knotweed at five sites (totalling over 450m2) have been treated by landowners, and the plants eradicated at four sites. In addition, the survey showed that the combined efforts of volunteers from the Chesham Environment Group, River Chess Association and the CCSP have also got rid of Himalayan balsam from the catchment.

Invasive invertebrate species

American signal crayfish (Pacifastacus leniusculus) were introduced into the upper Chess in the late 1980s. They quickly spread throughout the river, wiping out the native white-clawed crayfish. Signal crayfish are having a significant impact on native species, mainly as predators of bottom-dwelling invertebrates and fish eggs. Their burrowing behaviour is also damaging habitat through erosion of river banks. Measures to control numbers are currently limited to trapping and to habitat restoration.

INNS survey of the River Chess 2021



Japanese knotweed

Volunteers clearing Himalayan Balsam

Mink and the River Chess Water Vole Recovery Scheme

Water vole population

The water vole is Britain's fastest declining mammal. The main reasons behind this decline are thought to be loss of habitat and predation by North American mink (Mustela vison), an invasive non-native species introduced to the UK in the early 20th century to be farmed for their fur.

The River Chess supports one of the two remaining populations of water vole in Buckinghamshire and the last remaining population in the Chilterns. In 2001, the CCSP working with local organisations, landowners and volunteers, carried out a survey which found a healthy population of water voles along the entire river.

Mink population

Following a series of mink sightings, a repeat survey was carried out in 2003 by the CCSP and the Berks, Bucks and Oxfordshire Wildlife Trust (BBOWT). The survey revealed that the water vole population had declined by 97%. A comparison of the two surveys showed that habitat loss could not account for the sudden population decline. After careful consideration, the CCSP, BBOWT, the Environment Agency and landowners agreed to work in partnership to implement a water vole recovery scheme on the river. The scheme, which continues to operate today, includes an integrated programme of mink control, habitat enhancement and biennial quantitative surveys of the water vole population.

The installation of mammal tracking rafts have ensured that mink have been promptly caught and dispatched when detected. As a result, the water population has returned from the brink of extinction with numbers now in excess of 300 animals.

The results of the water vole surveys show clearly how mink control combined with habitat enhancement can rapidly bring about a recovery in water vole numbers. The success over the last 19 years has been largely a result of the long-term commitment and support of landowners and local volunteers.

Addressing the challenges

To ensure mink don't become re-established on the Chess, a constant effort from landowners, volunteers and partner organisations is required for the long-term. The 2021 survey revealed several significant gaps between mammal tracking rafts. To fill these gaps, the CCSP has secured funding to install five new remote monitoring rafts in 2022. These rafts can notify raft checkers via SMS message of any capture, allowing greater efficiency in monitoring. In addition, to get a complete picture of the water vole population, the River Chess Association and Herts & Middlesex Wildlife Trust will survey the Chess from Loudwater to the confluence with the River Colne and new mammal monitoring rafts will be deployed at suitable locations.

Baby water vole

Mammal tracking raft with trap

Remote monitoring trap

Emerging threats

With so many INNS becoming established in England and new species being recorded each year, the threat of further INNS populating the Chess catchment is high. Particularly concerning is the potential colonisation of demon shrimp (Dikerogammarus villosus). Introduced from the Ponto Caspian region, demon shrimp are spreading rapidly up the River Colne and have now become established in the lower River Gade.

In the wider catchment there are a number of species that could spread into the catchment and impact on habitats and native species. One of these is the Asian hornet (Vespa velutina), which continues to be found regularly across the South of England. A highly effective predator of insects, the Asian hornet can cause significant losses to bee colonies, and other native species.

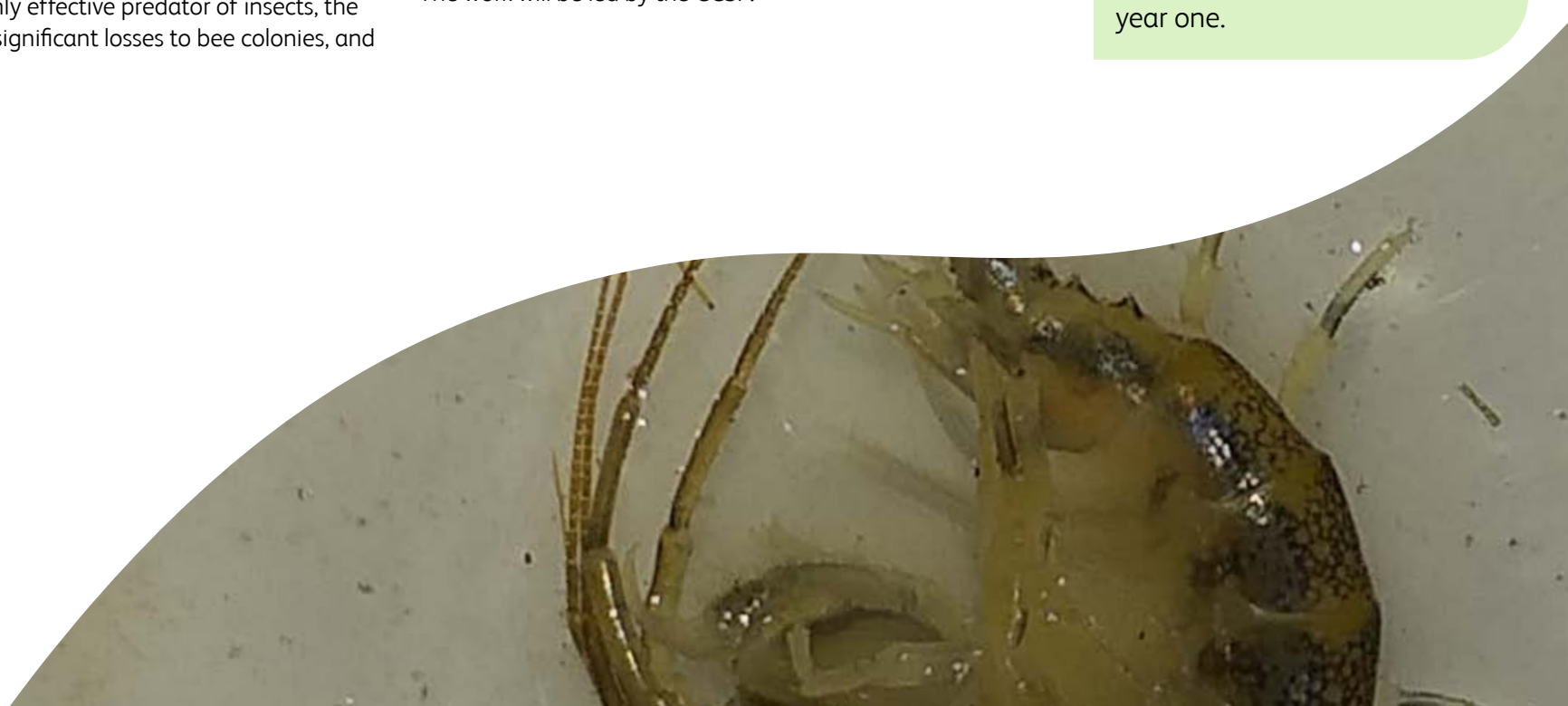
Next steps

While progress on the control of some priority INNS has been significant, there's still a lot of work to do. The discovery of one Himalayan balsam plant next to the river near the Moor Recreation ground in Chesham suggests that an infestation may still be present in the area. As well as this discovery, another infestation has been reported on the outskirts of Little Chalfont. The risk of this spreading into the catchment means that it will have to be tackled. It's hoped that volunteers will help with this important work.

A focus of efforts in year two of the Chess SWC will be to deliver a pilot that focuses on bringing infestations of Japanese knotweed under control. The pilot will include a public awareness campaign, the creation of a volunteer team that is trained in knotweed control techniques and a support package for landowners to help them control it on their land. The work will be led by the CCSP.

Addressing the gaps

While the distribution of INNS along the Chess and its immediate corridor is well known, there are still significant gaps in our knowledge about the wider catchment. Part of the work in year two will be to fill in these gaps in knowledge by carrying out further surveys. The results of these will then be used to refine the INNS management strategy that was developed in year one.



Spotlight on organisations involved along the river

Organisations and groups

The 'smarter water catchments' initiative brings together local authorities, public and private institutions, third sector and special interest groups – to harmonise plans and develop common goals. At the same time, the project engages local people including farmers, landowners and businesses, as we work together towards common goals.

What have we done to date?

Up until now, we've concentrated on establishing some structures and launching a widespread public consultation exercise to understand who is interested and what they might bring to the plan. We're also keen to learn from what has already been achieved with existing projects such as the Ground Water Resilience and Community Engagement (GRACE) Project. The next stage will be to turn the results of the engagement survey into a plan, detailing who, when and how we'll link-up with people, organisations and local authorities.

Understanding what farmers and landowners want and need is vital. Early conversations show that farmers want to be involved, that they believe they have the expertise and knowledge to make a difference and many are passionately committed to sustainable agriculture and developing the 'natural capital' of their land. But they also ask for realism. Farming is a complex and financially risky business and to ask them to allow a corner of their field to grow wild has huge financial costs attached. This is recognised by the government in its new Environmental Land Management Scheme (ELMs), and we'll be looking to see how we can support them, as the new scheme rolls out.

Next steps

Looking forward, we'll be creating business, and farmers, circles and understanding the challenges they face. Secondly, we'll be setting-up a range of small-scale local projects, that will support the main goals and involve as many local people as possible.

Grant Scheme

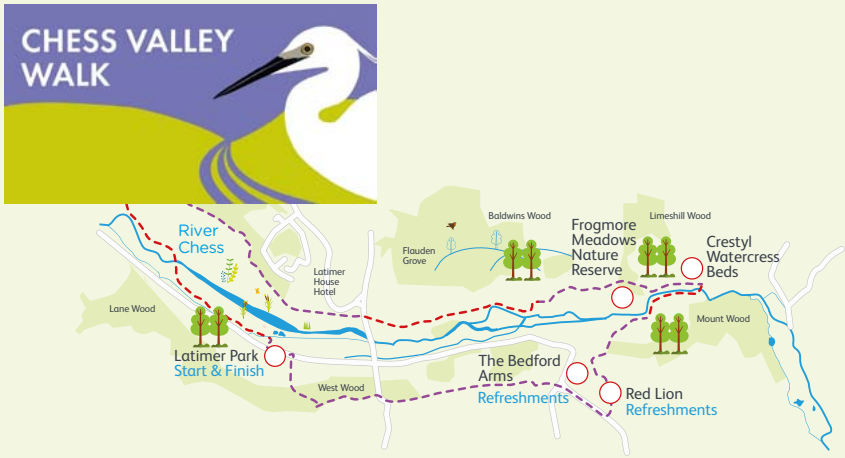
The local projects will have a grant scheme that's small-scale, up to £5,000, with minimal bureaucracy and a fast turnaround time for decisions. At local council level, this amount can develop something worthwhile and engaging. We hope that up to £50,000 will be available from March 2022 onwards and £100,000 in 2023/24.

We believe that these grants, together with a different approach and thinking, will truly begin to make a difference. A difference that will be seen and appreciated by all in the Chess catchment.

Case study examples of partnership work

All partners are working together to deliver the objectives of the 'smarter water catchments' plan for the River Chess, with a number of schemes making this a reality.

Chess Valley Walk regeneration



The Chiltern Society and Chilterns Conservation Board secured over £100,000 funding from the government's Green Recovery Challenge Fund towards projects on the River Chess during 2022. Here's how the money is being used:

The Projects Rivers Officer leading on:

- Water Vole Habitat restoration
- Access enhancements on the Moor Recreation Ground, in Chesham.

The new Engagements Officer is working with volunteers and contractors on:

- The start of the Chess Valley Walk regeneration
- Expanding education outreach with local schools with Trout in the Classroom

Volunteer and Citizen Science opportunities on the River Chess

A citizen science programme to help assess the current state of the River Chess. The citizen science work is focussing on answering and developing knowledge, and implementing practical management techniques to improve habitats on the river. The work includes:

- River habitats
- Sediment inputs to the river
- Practical river restoration
- Monitor insect numbers and diversity
- Measure water quality
- Measure river flows
- Control invasive species

If you'd like to find out more about these opportunities, or would like to get involved, please email us at **chessCS@chilternsaonb.org**

Looking forward

Delivery of our ‘smarter water catchments’ plan is in its early stages but has the potential to bring tangible benefits to the whole catchment – improving what’s there while making it a more resilient landscape as pressures change.

Thinking big in a connected and coherent approach is the best way to achieve this, done collectively. There are opportunities to get involved at all levels of this project helping to shape, direct, and implement what’s done; in support of a robust catchment thriving for people and wildlife. A catchment where the boundaries of the two aren’t considered in isolation but where it’s understood that the health of one directly influences the health and happiness of the other.

Please help us make this a reality. Whether it’s doing something big or small, through individual actions or supporting the delivery of projects on the ground.

Thank you

Ways you can help!

- Volunteer at events within the catchment - habitat work, invasive non-native species clearance, river restoration
- Support local action groups
- Become a citizen scientist
- Raise the profile of the importance of what we have
- Record species and submit biological records
- Make gardens and communal greenspaces suitable for wildlife
- Reduce your water use (including watering gardens)
- Habitat creation and enhancement
- Implement habitat management plans
- Talk to our Farming Officer about options with your landholdings

Acknowledgements

Thames Water would like to thank all of the organisations and individuals representing the partnership who have contributed their valuable technical inputs, insights and time during the process, through various forums and engagement platforms, to enable the joint development of our plan and subsequently this report. We greatly appreciate the commitment and enthusiasm expressed to achieve this vision and look forward to working together to deliver the next year of the plan.

The information provided to develop this report is correct as of 31 March 2022 and has the formal support of key stakeholders.

Contributors

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Chesham Town Council
Chilterns Conservation Board
Chilterns Chalk Streams Project
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Thames Water
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Ver Valley Society

Photography

Front cover and pages 3, 4, 5, 6, 8, 9, 10, 13, 17, 18, 19, 20, 22, 23 and 28 photos taken by Allen Beechey, Chilterns Conservation Board

Pages 2, 8 and 16 photos taken by The River Chess Association

Pages 7, 12 and 16 photos taken by Chilterns Conservation Board

Page 11 photo taken by Affinity Water

Pages 13, 20, 25, 26, 27 photos taken by Thames Water

Pages 19 and 20 photos taken by Chesham Town Council

Page 23 photo taken by Ver Valley Society

Page 24 photo taken by Rod Cutler

Work with us

We wholeheartedly welcome your views on this report. Please share them by email with our dedicated team at chesspartnership@chilternsaonb.org

Working in partnership

Thames Water

The River Chess Association

Chilterns Chalk Streams Project

CHILTERNS CONSERVATION BOARD

Chiltern Society
We care for the Chilterns

Buckinghamshire Council

Environment Agency

AffinityWater

Herts & Middlesex Wildlife Trust

Queen Mary University of London