



NORFOLK RIVERS TRUST



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Restoring, protecting and enhancing the water environments of Norfolk for the benefit of people and wildlife



Our VISION

Our vision is to ensure that the quality of water provides the best habitat to benefit people and wildlife by delivering:

- Aquatic habitat creation;**
- Conservation and restoration;**
- Education and engagement; and**
- Land management and farm advice.**

Our APPROACH



As an independent and trusted charity, our team of experienced ecologists and advisors take a river Catchment-Based Approach (CaBA) to develop practical, cost-effective and integrated long-term solutions.

Working across Norfolk, and extending out into the Cam and Ely Ouse Catchment (CamEO), the scale of the challenge necessitates partnership working with a wide range of organisations. These include farmers and landowners, water companies, government bodies and other charities, as well as the general public.

Our funders include government bodies (local and national), private corporations, charities and independent donors.



FRONT COVER WATER VOLE IMAGE: JACK PERKS

A background to NORFOLK

In Norfolk, we are incredibly fortunate to be home to many internationally rare chalk-fed rivers (there are just over 220 across the world). These

exceptional ecosystems provide a habitat haven for a large variety of fauna and flora to thrive including the otter, starwort, brown trout and the

iconic white-clawed crayfish. Delicate underground chalk aquifers and springs supply clear, mineral-rich water to these precious watercourses.

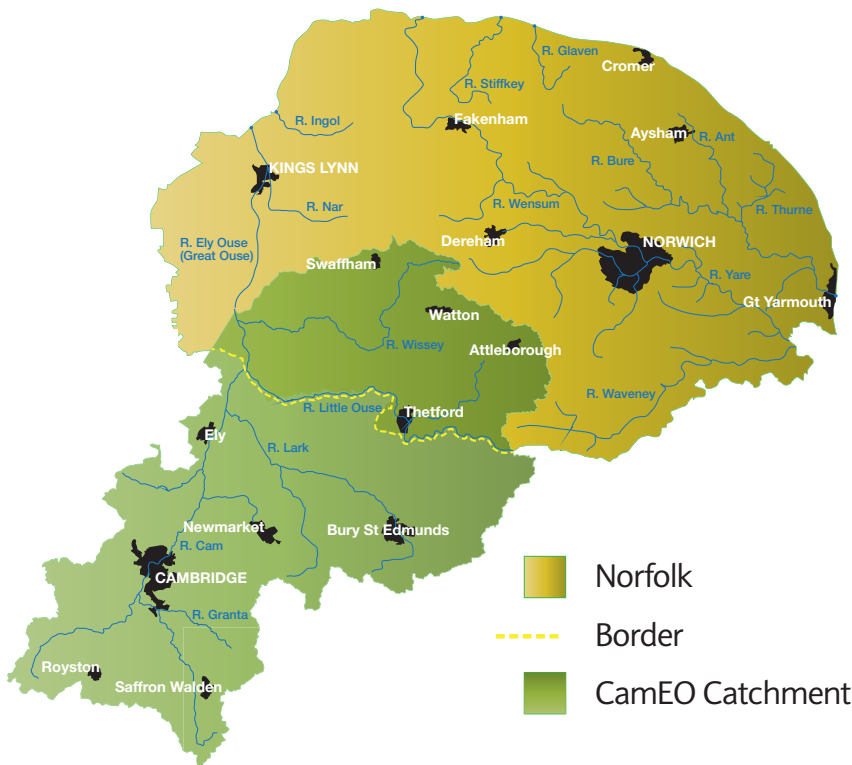


IMAGE: JACK PERKS



IMAGE: DARREN WILLIAMS



IMAGE: JACK PERKS





Key ISSUES

*facing our
freshwater
environments*



WATER QUALITY

Norfolk is an important county for food production, particularly wheat, barley and sugar beet. These crops are often farmed intensively, which is a cause for concern when managed ineffectively. Agrichemicals can percolate through the ground and contaminate groundwater reserves. In addition, pollutants (nutrients, pesticides, manure and sediment) are carried off farmland during various diffuse processes, where they eventually enter watercourses. These pollutants can degrade the quality of water and

promote eutrophication; waterbodies can become over-enriched with nutrients, encouraging excessive algal growth. Furthermore, sediment loading can result in turbid waters and the smothering of spawning areas.

Roads and urban infrastructure provide another source of pollution. For example, Water Recycling Centre (WRC) discharges can contain ammonia and phosphate (although water is treated to legal standards, the levels of treatment are not always adequate to protect river health).



WATER QUANTITY

The impacts of climate breakdown, coupled with an increasing population and growing demand for water, presents a challenge for the county. The aquatic environment is being increasingly threatened by the over-abstraction of water; too much water is removed from these environments for public supply, industry and irrigation, from a region that is already one of the driest in the UK. This can result in lower flows and reduced water levels, which, in turn, may limit ecological health. For example, fish can become stranded in small pockets of water when the rest of the river is dried up.



PHYSICAL MODIFICATIONS

Over the centuries, most Norfolk rivers were modified to make way for agriculture and industry; rivers were straightened, drained, dredged and embanked. This land use change has led to a decline in the quality and resilience of aquatic habitats. For instance, rivers are silted, disconnected from their floodplains, and lack morphological features for wildlife. Furthermore, barriers to fish and changes to riparian habitats have also had negative impacts.

Our WORK



AQUATIC HABITAT CREATION

We create aquatic environments to provide innovative, integrated and natural solutions to man-made problems.

LAND MANAGEMENT & FARM ADVICE

We work closely with farmers to develop flexible and targeted management interventions that benefit soil and water, as well as farm business resilience. For example, independent farm advisory visits are carried out to identify pollution sources. Bespoke mitigation measures, such as sediment traps that capture valuable topsoil and nutrients, are then employed to tackle the problem.

CONSERVATION & RESTORATION

By restoring the aquatic environment to a natural state, we work to enhance the value of these aquatic ecosystems and reinstate their self-regulating functions. In a river restoration context, this involves improving the habitat, both in-river and along the riparian margins. For instance, narrowing and meandering widened and straightened river channels, creating morphological features such as gravel riffles, revegetating river margins and reconnecting floodplains.

EDUCATION & ENGAGEMENT

An important area of our work is to educate and engage with people of all ages and backgrounds; it is key that we celebrate and promote our natural world if we are to foster good water stewards in the future and inspire individual action.





Case STUDY: *Aquatic habitat creation*



INGOL WETLAND CREATION; NATURE'S OWN WATER TREATMENT

Funded by Anglian Water, a new wetland has been constructed to provide a natural, low-cost and sustainable water treatment method. The Environment Agency (EA) sets standards for the quality of the final effluent discharged from Water Recycling Centres (WRCs). At Ingoldisthorpe WRC, which discharges into the chalk-fed River Ingol, more ammonia and phosphate needed to be removed. Norfolk Rivers Trust (NRT) conducted a feasibility study to investigate what would be required to achieve the necessary improvements in water quality. Following this, the pioneering and innovative wetland-creation project was given the go-ahead on land next to the treatment works.

➔ **One-hectare in size**, the site consists of four interlinked shallow cells, the first of which receives the newly-directed treatment outflow. The cells were filled with 25,000 native wetland plants,

such as veronica, watercress and iris. These plants filter the remaining ammonia and phosphate from the water as it drains through each cell, before the 'cleaned' water is released from the fourth cell and into the River Ingol.

➔ **A new meandering section of the Ingol was created** to allow space for the wetland. The stretch contains new features, including a narrower channel with a faster flow, riffles, and shallow and deeper sections. The result is a classic chalk-fed stream with clearwater and gravel beds.

➔ **1400 native trees**, including oak, holly, hawthorn, field maple and hazel hornbeam, have been planted to keep the river cool.

➔ **The site demonstrates** how wetland habitats can both improve water management and deliver a valuable habitat haven for a diverse variety of wildlife.

➔ **The success of this ground-breaking system** provides a case study example of a project that could be replicated at other prospective sites.

Joff Edevane, Environmental Regulation Manager at Anglian Water Services, said: "The wetland treatment system at Ingoldisthorpe has provided a cost-effective solution in terms of carbon and cash delivered through a collaborative approach, which is how our regulators would like to see us deliver investment in the future. Traditional approaches typically deliver a targeted water quality benefit for a specific substance; a wetland delivers improvements for a number of substances, plus benefits for local biodiversity and the nation's natural capital stock."

A COLLABORATIVE FEAT

The project was funded by Anglian Water, delivered in partnership by Norfolk Rivers Trust and the Environment Agency, and constructed by William Morfoot Ltd. This project highlights what can be achieved when working together.

Case **STUDY:** *Conservation & restoration*



A NEW CHANNEL FOR THE GLAVEN AT BAYFIELD

The River Glaven's natural course had been moved some 120 years ago to bypass the lake at Bayfield Estate, preventing silt deposition and an associated loss in the lake's water quality; it was diverted and enclosed for 1km by a long brick tunnel. The aim of this project was to bring the river to the surface again by creating a new sinous river channel at the Estate in Norfolk, thereby restoring the Glaven to its full potential. In 2014, following considerable planning and after obtaining necessary permissions and licences, work began.

➔ **The new meandering course**, which bypasses the lake and is part of the Glaven, will provide a rich and complex

habitat for fauna and flora – particularly those which are associated with rare chalk streams, such as starwort and white-clawed crayfish.

➔ **At 1.2km in length**, the new channel is one of the longest man-made stretches of river in the UK. The channel's design is based on the untouched remnants of natural chalk streams and contains over 30 gravel riffles – suitable for spawning trout and invertebrates – as well as many deep pools.

➔ **The channel was sharpened** and a series of berms (ledges) were formed to promote rush growth.

➔ **Two controlled cattle crossing points** were created using a bed of chalk material.

One was placed in the upper reach and the other was installed in the lower reach for summer grazing – preventing the poaching of banks (erosion).

➔ **The 'hidden' stretch** (enclosed in the brick culvert) was returned to the meadow surface, where it can once again spill on to its floodplain on the west side, naturally 'slowing the flow' and reducing flood risk.

This project was part of the overall 'Nine Chalk Rivers' project. A huge thanks to the Wild Trout Trust, River Glaven Conservation Group, Professor Richard Hey and the Environment Agency.

Case **STUDY**: *Education & engagement*



IMAGE: JACK PERKS

GLAVEN EEL PROJECT

NRT delivered a two-year Heritage Lottery Fund (HLF) project, working with eels on the River Glaven in north Norfolk. The overall aim was to reconnect current generations with the eel and its folklore, as well as to improve this critically endangered species' habitat. Since 2013, there has been a legal requirement that states that 60% of elvers caught should be made available for restocking and educational purposes. Consequently, in 2015 and 2016, we received a number of elvers from the River Severn.

- ➔ **The elvers were distributed** around local schools for the summer.
- ➔ **As well as caring for**

these elvers in the classroom, the children were involved in the elvers' release process.

➔ **Half-day workshops** were conducted on the river bank, where children learned about eel conservation, lifecycles, water quality and river restoration through a series of educational games and activities.

➔ **Eel trails were set up** for the local community and tourists; leaflets were produced to guide users to points of eel interest within the Glaven valley and eel-inspired art was placed in different locations.

➔ **Habitat restoration work took place** to reconnect backwaters and ponds and install fish passes, thereby increasing the eels'

passage through the Glaven river system. At Thornage Common, non-native and unhealthy trees were used as woody debris, creating deep pools and refuge areas for eels and invertebrates (eels feed on these).

This project was in partnership with various organisations including: Norfolk Coast Partnership, University College London, The River Glaven Conservation Group, Centre for Environment, Fisheries and Aquaculture Science (CEFAS), Eastern Inshore Fisheries and Conservation Authority (EIFCA), the Environment Agency, Norfolk Wildlife Trust, Holt Hall and the National Trust.



Case STUDY:

Land management & farm advice



Before works



After works



After works

PROTECTING THE RIVER WENSUM USING SEDIMENT TRAPS

Run-off had been occurring from damaged road verges, eroded field entrances and agricultural topsoil from a sugar beet pad, at the Salle Estate in Norfolk. The farmer had been aware of these run-off issues and had already carried out important steps to trap the sediment and associated phosphorus and nitrogen on the farmland. Having heard about our farm work, the farm manager agreed for one of NRT's farm advisors to come and visit the site.

➔ **An assessment of the site** (using surface flow mapping,

a walkover and farmer knowledge) was conducted to identify locations which posed the greatest risk, such as high sediment supply, high soil moisture content, proximity to river channels and apparent connectivity to the rest of the catchment (via roads or tramlines).

➔ **A farm report was produced** and it was decided that three silt traps would be installed alongside the road on land belonging to the Salle Estate. The traps were constructed in autumn 2016 and they work by capturing and

slowing down polluted run-off, which enables the sediment and suspended solids to settle out before the water discharges to the Blackwater Drain. This eventually feeds the River Wensum, a designated Site of Special Scientific Interest (SSSI) and a Special Area of Conservation (SAC).

This project was part of the 'Water Sensitive Farming' initiative, funded by the Coca-Cola and WWF Freshwater Partnership.

Norfolk Rivers **ECOLOGY** Ltd



Norfolk Rivers Ecology is an ecological consultancy offering expert aquatic-based restoration and conservation services across Norfolk. Seeking the best ecological outcomes for our clients, the environment and the wider water ecosphere, our team of fully qualified, licenced and highly experienced ecologists deliver:

Surveys and monitoring

- ➔ Otter, water vole and white-clawed crayfish surveys
- ➔ Freshwater, saline and estuarine fish species surveys, including electrofishing

Habitat assessments

- ➔ River corridor and in-river walkovers
- ➔ Impact assessments – Phase 1 and phase 2 habitat surveys
- ➔ Aquatic re-wilding
- ➔ Wetland feasibility studies

Planning

- ➔ Mitigation for water quality issues and development
- ➔ Mapping using

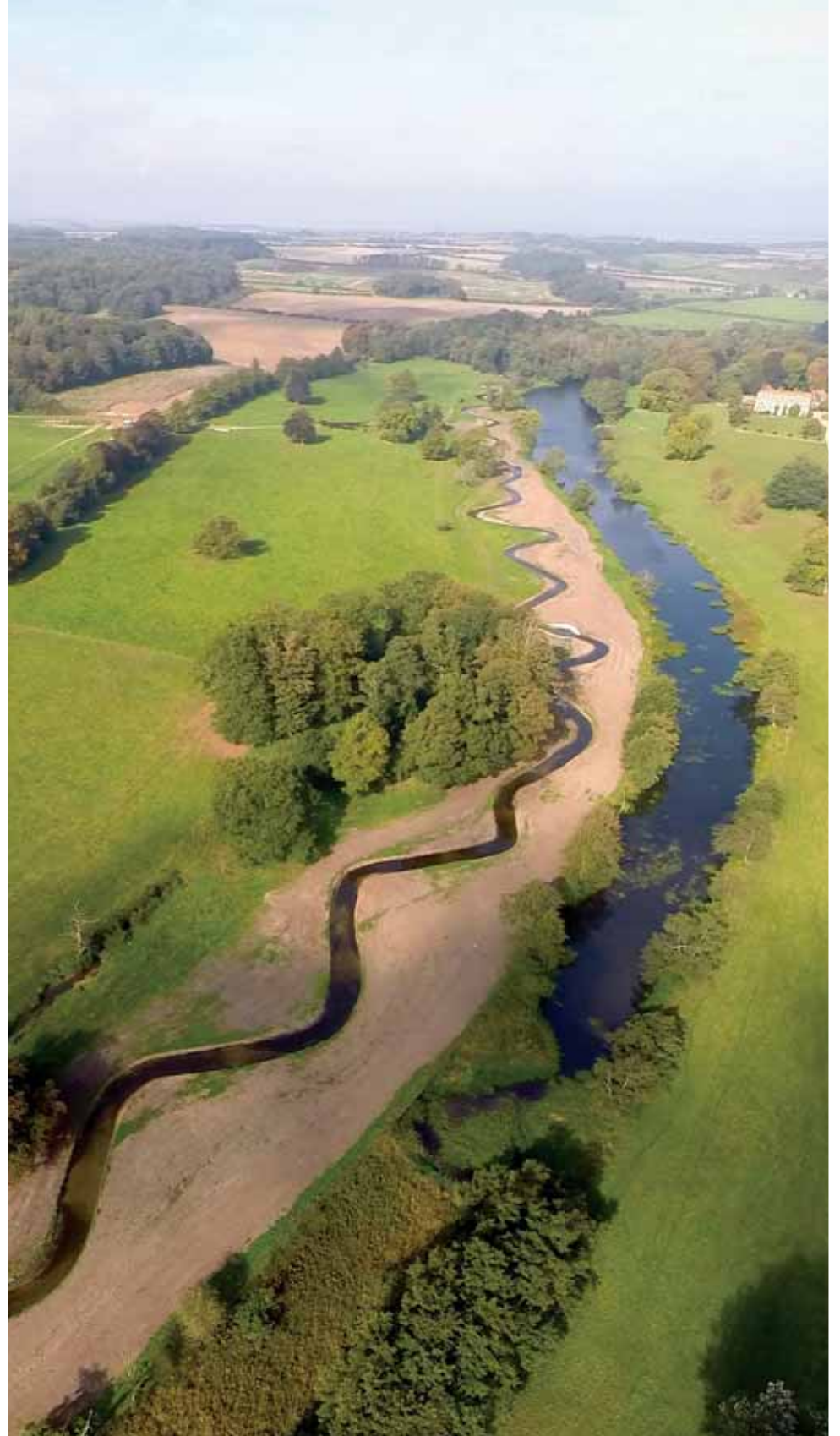
Geographical Information Systems (GIS)

Delivery

- ➔ River, ditch and pond restoration and enhancement
- ➔ River channel and wetland creation including Integrated Constructed Wetlands (ICWs)
- ➔ **Project management:**
 - Surveys
 - Planning and design
 - Consents and licencing
 - Contractors
 - Site management and liaison
 - Delivery and implementation
 - Post-project monitoring and evaluation





Norfolk Rivers Ecology is a wholly-owned subsidiary of Norfolk Rivers Trust. All profits received are passed straight to the charity to support NRT's core work: to restore, protect and enhance the water environments of Norfolk.

Please contact us to find out more information and talk through your requirements.



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