CCB 2022-24

CHALK STREAMS AND WETLAND MEADOWS RIVER RESTROATION PROJECTS

CASE STUDY: HAMBLE BROOK

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CHILTERNS CONSERVATION BOARD

CHILTERNS CHALK STREAMS PROJECT

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HAMBLE VALLEY LOCATION

Nestled in the South Chilterns, between Henley on Thames and Marlow, the Hamble Valley is a very picturesque and largely undeveloped part of the Chilterns.

Although there has been a history of occupation and modification in the valley over many centuries, the establishment of the Greenlands Covernant in the 1940s, has meant change has been very limited over the last 80 years.

The restoration project was focussed on a rural section of the river corridor between Pheasants Hill and Skirmett, that was once covered by a single landowner, but is now divided between three.

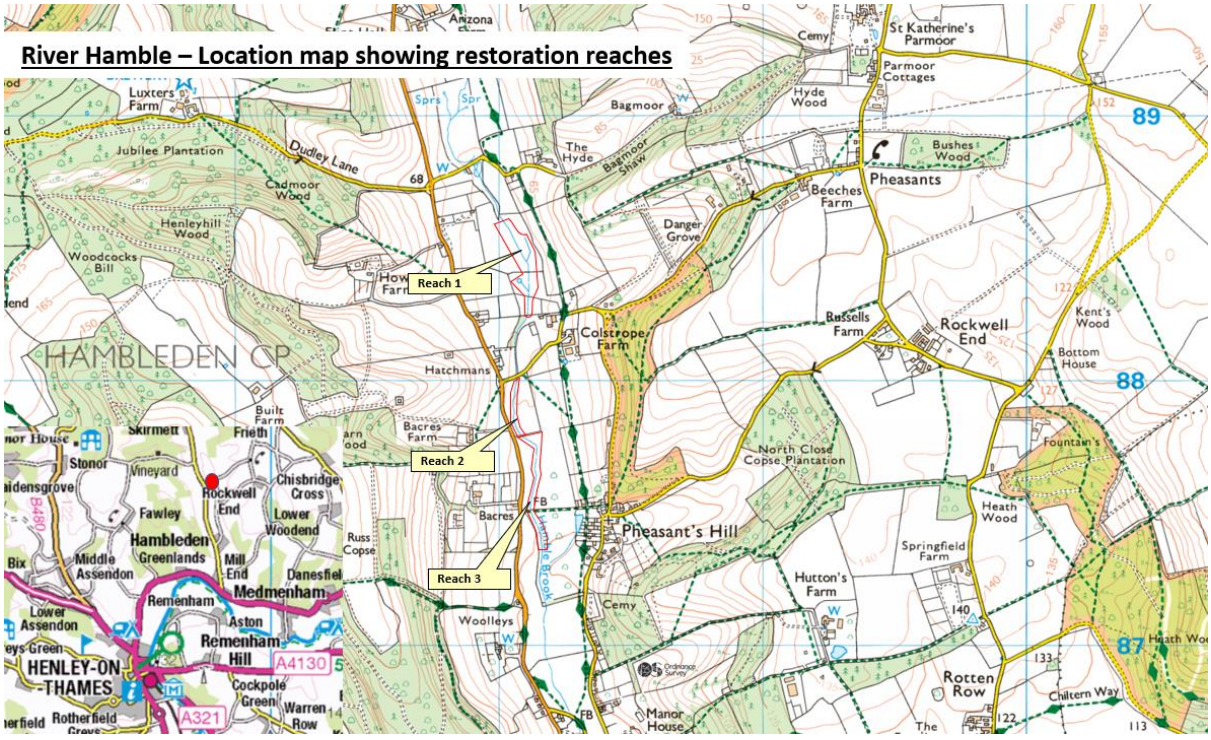


Figure 1: Location of Hamble Brook restoration reaches

INTRODUCTION

The Hamble Brook has been extensively modified over many centuries, through activities such as agricultural cultivation, ornamental landscaping, flood alleviation and even possibly milling, deleteriously impacting its natural function and ecology.

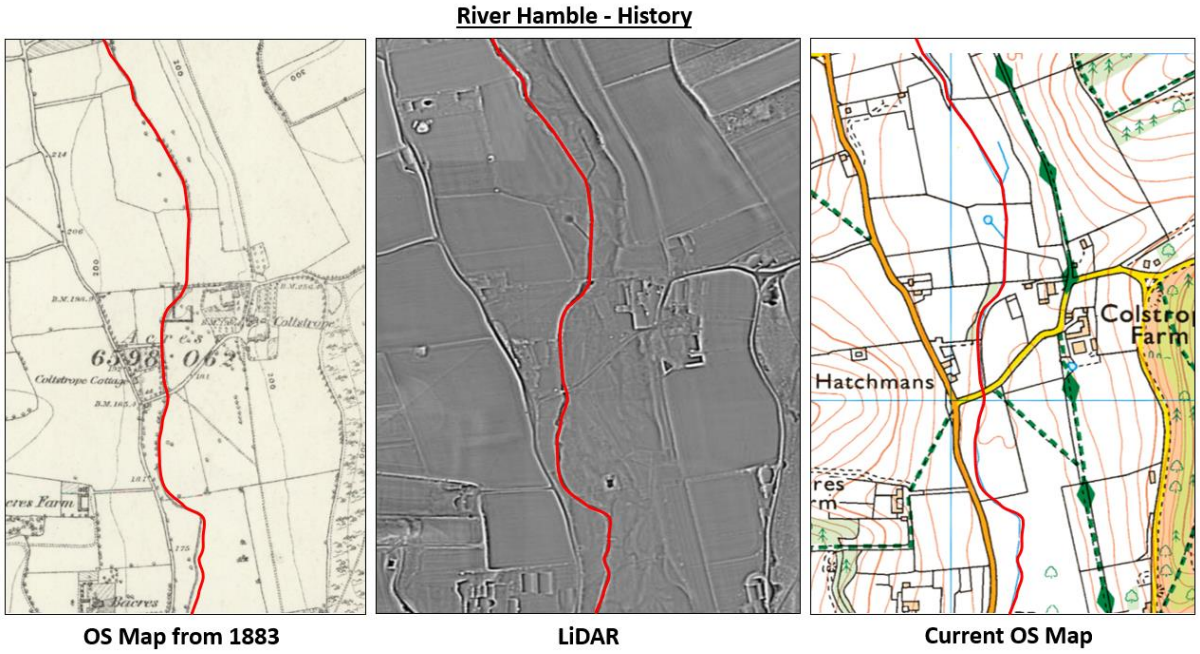


Figure 2: Current and historic channel location

Pushed to the side of the valley the channel lies in the lowest part of the valley today, but this is likely due to dredging and other removal of material creating an artificial course. Visible evidence on the ground, level surveys and LiDAR data all point to the natural channel location being elsewhere in the valley.

The Environment Agency have classified the brook as failing to achieve 'Good Ecological Status' and is currently assessed as 'Poor', citing fish population, invertebrates, macrophytes and phytobenthos.

The project originated from conversations with one landowner who had recently taken possession of 450m of the Hamble Brook as part of the sell-off of a historic farm, and was seeking advice as to how best to manage the channel and surrounding landscape. Driven by the landowner's own objectives and ecological passion, this presented a rare opportunity to influence a change in management style and priorities that could provide a long-term benefit to the ecology of a long-neglected winterbourne.

In January 2021 Allen Beechey of the Chilterns Chalk Steam Project provided an Advisory Report to the landowner which outlined management strategies that would provide benefit to the ecology of the channel and riparian zone, and proposed physical channel changes that could be implemented were the opportunity to arise. This was well-received and some of the proposals, e.g. suggested fencing strategies, were immediately adopted, but wholesale changes to the channel were not thought practical at the time due to funding constraints.

In April 2021 the proposed channel changes were included in an ultimately successful bid to the Heritage Lottery's Green Recovery Challenge Fund, which provided funding to scope, design and eventually deliver the first 450m of channel improvements. But by the time we were ready to go out to tender, we had two additional landowners and the project scope had increased to 1100m.

THE PLAN

The site was divided into three Reaches. These included two former swimming sites, one offline pond, one online pond and associated 100m of connecting channel, and an adjacent spring with another 100m of connecting channel.

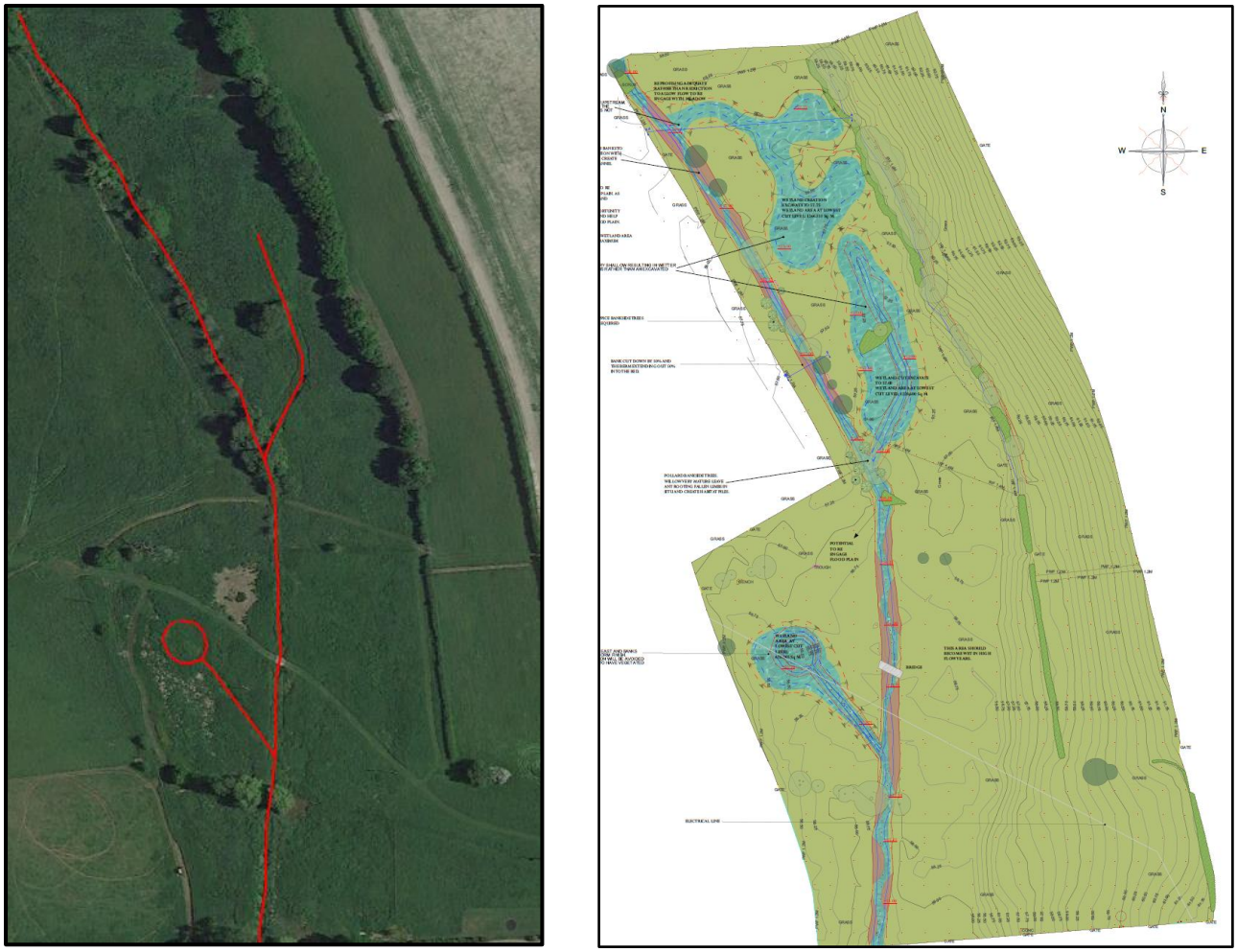


Figure 3: Comparison between existing & proposed landscapes showing the positive benefits brought by the project

The plan was to re-naturalise all these areas by increasing the hydromorphological variation and improve the connectivity with the adjacent landscape through:

- Using cut & fill techniques to reintroduce sinuosity to the channel,
- Create a narrow first-stage channel in the river bed that encourages sediment mobilisation during low flow times and includes pools and riffles,
- Create shallow sloping berms that encourage the growth of marginal vegetation,
- Introduce two backwaters within the existing swimming sites,
- Soften the gradient of the bank and where practicable, remove previously dredged material from the bank tops,
- Sculpt the two ponds to create a variety of water depths and slope gradients,
- Replace one bridge to improve fish passage and reduce flow impoundment,
- Lower the bank top at strategic sites to promote the flow of water from the channel into the adjacent landscape during high flow periods,

- Improve the balance of light and shade through a combination of bankside tree & scrub management and the planting of native saplings.

Due to the scale of the project and the requirement for the movement of significant quantities of material, this project was to be implemented using a contractor. A tender process was commenced and three contractors were invited to provide a response. The appointed contractor, R.J.Bull, demonstrated the best understanding of the sensitivity of the landscape and the capability to deliver a successful project within the timeframe.

We worked closely with R.J.Bull throughout the design, development and implementation phases and established an open-book conversation between them, ourselves and the landowners. This was of benefit to all parties and helped ensure that the best value for money was delivered by the project.

Several face-to-face discussions were had to shape the project and landowners opinions, and objectives were taken into account and questions answered throughout the design and delivery phases. This directly shaped the design and implementation, and also enabled concerns to be raised e.g. about lasting landscape damage due to the works, which were answered through the use of limited, lightweight machinery and techniques that minimise movement.

Prior to submission of the FRAP to the Environment Agency we invited the Biodiversity Officer and Fisheries Officer from the Partnership and Strategic Overview team to a site walkover with the contractor to seek their opinions of the project. The team were impressed with the strength of the original design and also how willing the contractor was in taking on board their comments, and ultimately this helped win their support for the project and their assistance in shepherding it through the necessary approval channels.

The Bespoke Permit request was granted on the 9th March 2023 and work commenced the next week.

Prior to restoration, Riverfly and MoRPh surveys of the site were completed, as well as some dry-bed ecological sampling.

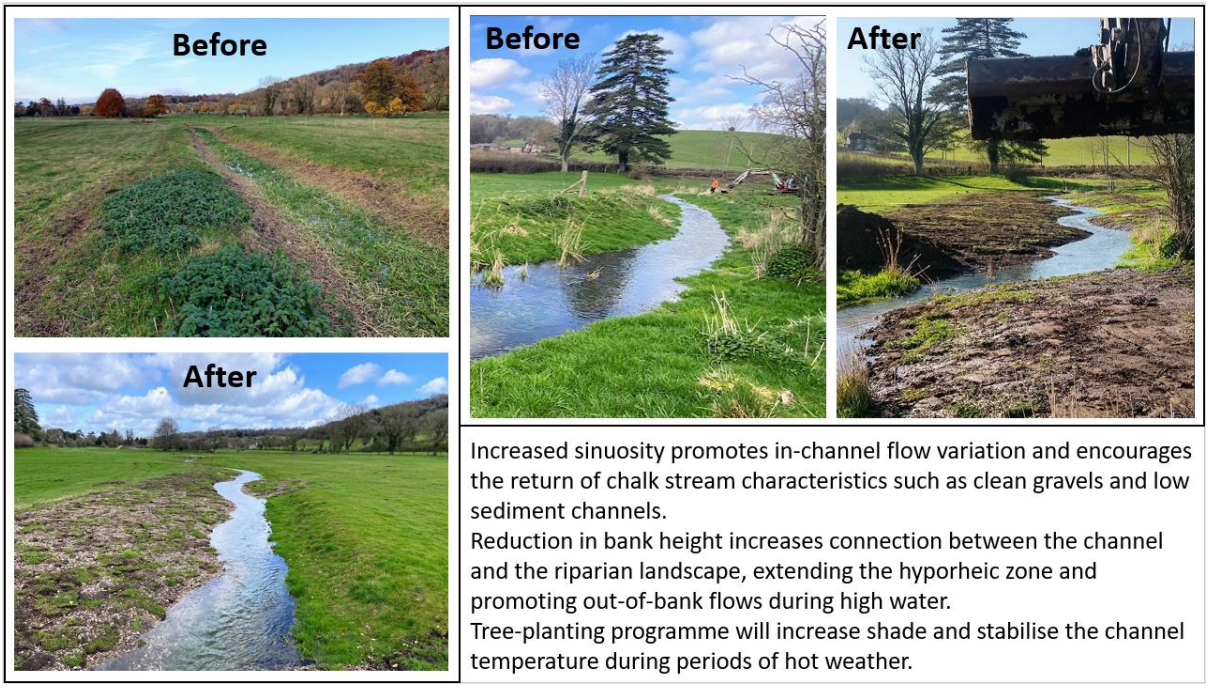


Figure 4: Hamble Brook channel restoration comparison

OUTPUTS AND OUTCOMES

HEADLINES

- *This is the **largest channel restoration** ever undertaken by the Chilterns Chalk Stream Project as measured by total length, cost, complexity and proportion of river improved (16%).*
- *It is believed to be the **largest winterbourne restoration** ever undertaken by the Environment Agency in the UK (from: Tim Sykes).*
- *Project was enabled by GRCF funding, but **leveraged additional £3 for every £1** of GRCF money spent.*
- *Project is an excellent demonstration of **partnership working** between CCSP, private landowners, Environment Agency, National Trust and the environmental contractor (R.J.Bull).*

Over an 18-month period since first proposing the ideas to the landowners, the following has been accomplished:

- Re-naturalisation of 1100m of winterbourne chalk stream
- Re-sculpting and re-shaping of one offline pond
- Re-sculpting and re-shaping of one online pond
- Re-naturalisation of additional 200m of connecting channels
- Removal of two former weirs
- Creation of two backwater sites
- Improved riparian connectivity along 400m of channel
- Creation of 2500m2 new wetland
- Planting of 60 native species
- Establishment of seven MoRPh survey sites
- Links with Nottingham Trent for dry-bed sampling

CORE PROJECT OBJECTIVES

The following sections outline the original objectives of the project and how they were met.

***Objective**: Restoration of 610m of Hamble Brook incl. removal of existing fencing and reinstatement of new fence line 8m back from riverbank along 300m of the Brook.*

Channel improvement has been completed in accordance with the list above, resulting in restoration of 16% of the entire length of the Brook, which is the largest project of its type ever attempted according to the Environment Agency.

Fencing along the right bank of Reach 1 is 8m back from the channel and all other fencing proximal to the channel has been removed.

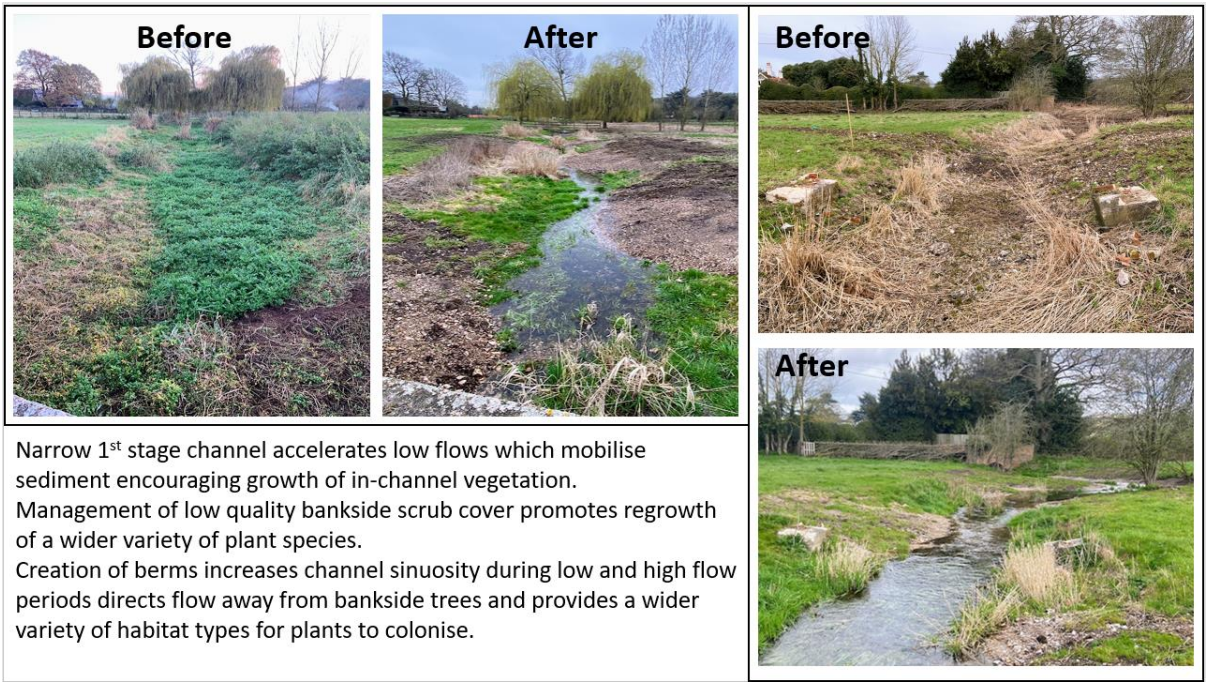


Figure 5: Hamble Brook channel restoration comparison

Objective: *Creation of a Hamble River restoration options plan.*

Guidance on channel and riparian land maintenance has been provided to the landowners, including advice on grazing. Restoration options include identification of future wetland areas and channel realignment opportunities, which could incorporate at least another 1100m of channel.

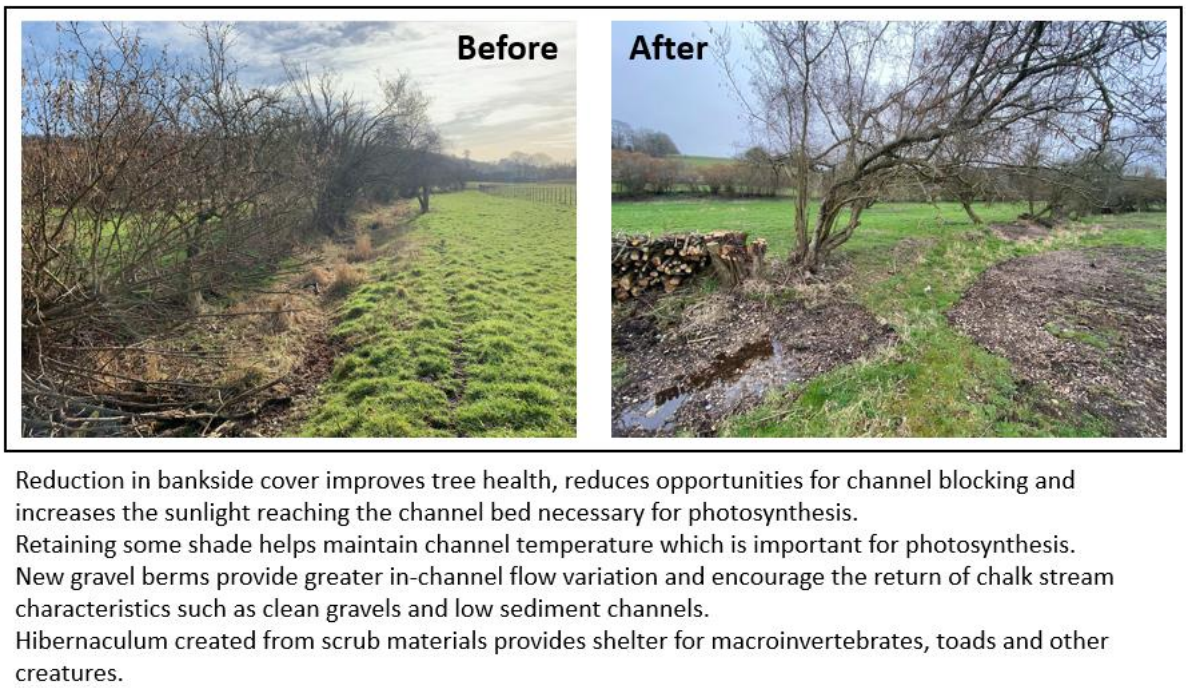


Figure 6: Hamble Brook channel restoration comparison

Objective: *Possible restoration of offline pond, enhancement of spring site to create habitat for wetland species.*

Improvement works to ponds, spring and associated channel has been completed to include softer bank gradients and a more natural form and variety of depths, to support different plant and animal species.

Figure 7: Hamble Brook pond restoration comparison

LIMITATIONS & CONSTRAINTS

PROJECT FUNDING

To deliver the project properly along the full 1100m of channel, whilst considering the sensitivity of the landscape, it was necessary to secure additional match funding beyond the initial £57.8k provided by the Green Recovery Challenge Fund. Through a combination of building and maintaining good relationships with stakeholders, and careful negotiation we managed to secure an additional £50k from an Environment Agency grant and the landowners have agreed to contribute £46.6k.

Funding summary (to date)

• Heritage Lottery – Green Recovery Challenge Fund	£ 58k
• Environment Agency – Chalk Fund	£ 50k
• Landowner contributions	£ 27k
• Defra – FiPL (tree-planting grant)	£ 9k
• Defra – FiPL (wet-land grant)	£ 13k
• Chiltern Chalk Stream Project	£ 1k
• In-kind contributions from CCSP (Project Man.)	£ 20k
Total	**£180k**

This equates to the largest value river project that the Chilterns Chalk Stream Project have ever completed and the one with the largest private contribution.

WINTERBOURNE CHANNEL

With periods of low and zero flow, all the planning and some of the improvement works have had to be completed without water in the channel. This presented challenges for all parts of the process, including design, pre-restoration surveys and channel sculpting, which we have worked together to overcome. Some of the mitigations include:

- Extending the levels survey to try and best establish the true path for the channel flow,
- Use of historic film and photography,
- Support from Queen Mary University of London (QMUL) for modifications to the MoRPh survey technique,
- Assistance from Nottingham Trent University (NTU) in dry-bed sampling.

LOCAL CONCERN

The local community are heavily invested in the Hamble Brook and due to previous poor communication, are nervous about changes to it.

To help explain the project, we first spoke to the parish council and then set up a public meeting, which was advertised in the local online newsletter. The meeting was attending by 48 people from neighbouring villages, including two of the supporting landowners, and lasted for 2 hours. Feedback was excellent and included comments about our positivity and enthusiasm as well as *"some people who were apprehensive beforehand were won round".*

After the meeting, two further landowners expressed interest in working with us on future restoration projects on their sections of the Hamble Brook.

HISTORY AND HERITAGE

The Hamble valley contains evidence interventions by early humans, as well archaeological remains including Roman and pre-Roman. To help ensure that we were not going to disturb anything of importance, during the planning process we examined LiDAR data that was commissioned as part of the Beacons of the Past project, to identify and avoid areas of potential archaeological interest.

During project implementation, a local archaeologist maintained a watching brief on the soil and gravel movement in case anything of interest was uncovered.

CASE STUDY/FEEDBACK

USING PLANT MACHINERY IN A SENSITIVE LANDSCAPE

Two of the landowners expressed concern that given the amount of rainfall in March 2023, they weren't sure that the work should go ahead due to the potential rutting and compaction damage to the soil from the extensive material movements.

We were able to provide reassurance using the credentials of the contractor R.J.Bull, which demonstrated extensive experience of working in this type of landscape, as well as the type of machinery that was being used including low tyre pressures and broad weight distribution, and operator experience that maximise the rotational movement of the excavator at the same time as minimising lateral movement. Although we agreed to review, the landowners gave permission for the project to commence as planned.

After the first few days the feedback was very positive including *"we are very pleased with the care of the work… how little disturbance results"* and *"an incredibly neat job".* On the last day of the project another landowner seeing the site for the first time stated "*if you'd told me it was going to look this good I would never have believed you*", and was talking very positively about future establishment of his wetland. This not only vindicates our choice of R.J.Bull, but also shows how it is possible to work with machinery in a sensitive landscape.

We would definitely support continuing to work with R.J.Bull on future phases of this project and would welcome tender responses for other chalk stream restoration projects when the opportunities arise.

FINISHING OFF

Three activities were deferred to later in 2023, whilst still being funded within the existing project budget

- Replacement of the farm bridge in Reach 3: Deferred to September when water levels in the channel and adjacent ground would likely have subsided and therefore minimise the risk of accidental pollution to the channel. Second deferral to 2024 to accommodate landowner's sheep farming requirements.
- Re-seeding: Deferred to Autumn 2023 to allow time for natural recovery to occur – Completed
- Tree planting of sixty native saplings: Deferred to the autumn when survival rates would be greatly increased due to improved access to water and reduced seasonal heat – Completed

In June 2023 a grant application from Farming in Protected Landscapes (FiPL) was secured that enables the installation of the first wetland area, at the top of Reach 1 which both adds to the landscape mosaic in that part of the valley, but will also act as a demonstration site for the remaining approved and other planned wetland developments.

REACH 1 WETLAND

Works to deliver the two wetland areas in Reach 1 (see Fig. 3 above) were carried out in November 2023 using a single long arm excavator and Hydrema 912 compact dump truck. The design focussed on the naturally lower, wetter areas as indicated by a ground survey completed previously as well as the vegetation types. the top-soil & vegetation layer was removed and set aside before digging out a flat bottomed bed with gentle slopes and rounded edges. Removed material was sculpted into a shallow slope running parallel to the eastern field boundary which has the effect of softening the existing bank face, before the set aside top-soil and

vegetation layer was returned to provide a seed-bank for recovery as well as restoring a more natural appearance to the ground cover.

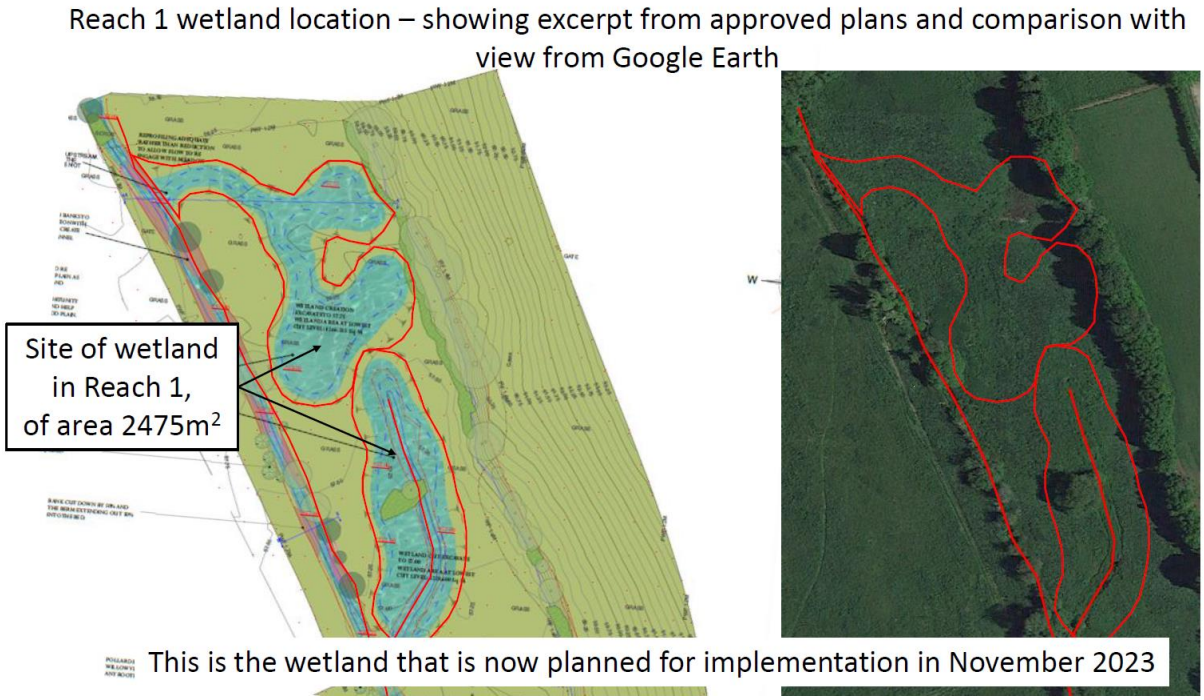


Figure 8 - Reach 1 wetlands location and boundary shape

The northern wetland was excavated to a depth of 57.75m AOD once the top-soil layer had been returned, corresponding to the channel depth at the likely off-take. An area of lowered bank helps to dictate where a breach may occur during high flows, the top of which sits 250mm above the channel bed level at this point. This off-take is set to be upstream to avoid unnecessary detraction of the channel's main flow.

The southern wetland was excavated to a depth of 57.00m AOD once the top-soil layer had been returned. A new natural looking stream channel was reinstated approximately following the line of the present channel, and linked with the existing confluence under the willows. The isolated willow stand was protected, but will become a drier island refuge during wet periods.

Figure 9 - Reach 1 wetland (left) during construction and (right) with top soil replaced - November '23

Being a winterbourne valley with a large annual fluctuation in ground water levels, the wetland areas will not be wet all the time, but being closer to the water table they will be wetter earlier and for longer. And the design is such that they can also be fed, or topped-up by a spring channel as well as, during high flows, the main river.

Figure 10 - The new wetland area filling as the ground water rises - December '23

During the winter of 2023-2024 the ground water was exceptionally high; recorded on 23rd November as being 2.7m higher than the same date in the previous year. This filled the wetland areas entirely and created flow paths that approximated paleochannel flows through the same area.

Figure 11 - Video still showing water flowing through wetland area in high ground water during January '24. Note: Main channel is NOT visible in this image. © Maria Spink

TREE PLANTING

Sixty native saplings, all of UK provenance, have been planted in the lower part of Reach 2 and along Reach 3:

- 10 Alder
- 10 Field Maple
- 10 Hawthorn
- 8 Goat Willow
- 8 Crack Willow
- 8 White Willow

- 6 Black Poplar

Being a winterbourne, this stream is subject to periods of very low flows and pooling, and is therefore even more susceptible to elevated temperatures during hot weather. The resultant algal growth can prove lethal to macroinvertebrates and other wildlife. The trees help create areas of close channel shading over a 400m length of channel over which none exists at the moment: to help regulate water temperatures, chalk streams should have an approximate sun/shade ratio of 1:1 and this helps improve the balance.

We are providing additional tree, ground and water habitats for insects, plants, birds and small mammals, extending the current habitat mosaic and re-establishing lateral connections to upstream and downstream shaded areas. Planting native species already present in the valley will increase the genetic variety and reduce the susceptibility to disease.

By planting larger trees, of 8 to 12cm trunk girth, we will gain some immediate benefit in channel shade which will only increase as the trees mature.

Figure 12 – Some of the recently planted native saplings that will provide shade, habitat and temperature control

Each tree is supported by two posts connected by a cross-member support and the trunk surrounded by an expandable mesh fence that will protect against grazing damage from sheep and deer up to a height of 1.8m. The landowners have the option of installing more robust anti-grazing protection.

LEGACY

CITIZEN SCIENTISTS

In recent years, the Hamble Brook has only had one active Riverfly site, regularly sampled by a single dedicated volunteer. At the public meeting on 7th March, we explained how citizen science could be used to improve the temporal and spatial understanding of the Hamble Brook ecology and hydromorphology. Following this meeting, at least twelve people expressed an interest in becoming citizen scientists. Training days for Riverfly and MoRPh survey techniques are planned, and it is hoped that we can extend the surveying to cover birds, dry-bed sampling and species identification from aerial (drone) photography.

- MODULAR RIVER SURVEYS (MORPH)

The MoRPh citizen science technique has been employed on the Hamble since February 2023, giving us a pre-restoration baseline from which change can be measured, as well as increasing active community engagement in the health of the channel and wider river corridor.

There are seven sites within the restoration project site, one upstream & downstream to act as a reference sites, and now four further locations which are providing data for future works.

Figure 12 - Excerpt from a Citizen Science poster presented at the Scientific Advantages in River Restoration conference, September 2023

Case study 1: Hamble Brook

Rising northeast of Henley-on-Thames (Figure 1), the Hamble Brook (Figure 2) is a naturally ephemeral chalk stream. This restoration project encompassed 1.2 km of the brook with 9 MoRPh sites in total.

Pre-project MoRPh surveys were conducted a week prior to the restoration in February 2023 during patchy winterbourne flows. Post-project surveys were then conducted in May and June 2023 during full stream flow.

Figure 2
The Hamble Brook before (March 2023) and immediately following (April 2023) the restoration work was completed.

Preliminary data (Figure 2) using the MoRPh scoring indices[5] identify immediate increases in physical habitats, with a slight reduction in siltation. Comparisons of vegetation and flow data are not shown due to differing times of year where the data are not directly comparable.

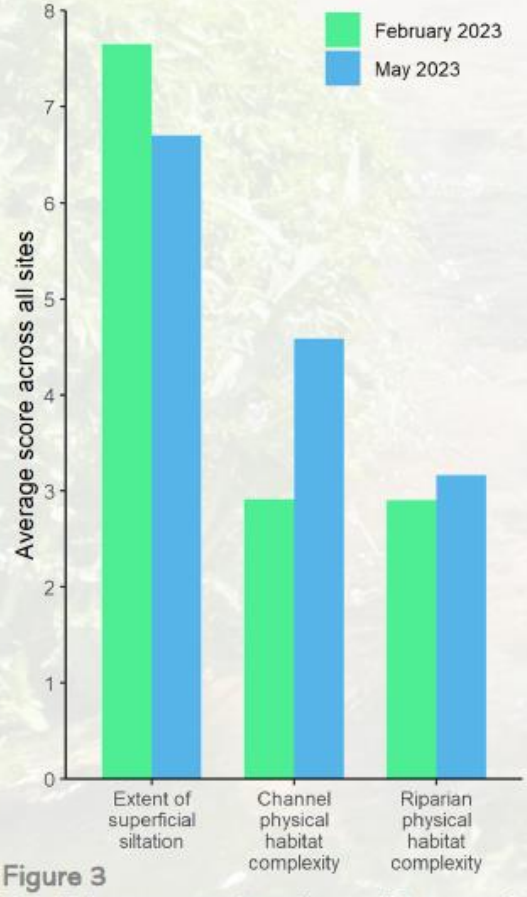


Figure 3
Pre (February 2023) and post (May 2023) project MoRPh indices scores[5], averaged across survey sites including two controls up and downstream.

- RIVER FLY MONITORING

There has been an active River Fly monitoring site on the Hamble Brook for several years, which provides a good level of baseline data as well as allowing identification of trends over time, including the arrival of new species.

It is hoped that a second site can be established in the upper section before too long.

PARALEPTOPHLEBIA WERNERI

On the 20th June 2023, as part of a citizen-science led riverfly monitoring activity, samples of mayfly species were collected for identification by Craig Macadam of the Ephemeroptera Recording Scheme. These were identified as the Scarce Purple Dun (*Paraleptophlebia Werneri*), a temporary stream specialist classed as Nationally Scarce, which is the first confirmed identification within Buckinghamshire and the Chilterns AONB.

The record has been added to the iRecord database, but the exact location has been kept secret.

SUSTAINABLE LAND MANAGEMENT

The landowners with whom we are engaging are new to the area and, without having farming as their primary focus, bring with them a desire to manage the land to benefit the local wildlife and ecology. By enabling the landowners to make this transition, supporting them through it via the relationship we have developed, the advice we give and the long term management plan, we are demonstrating that it can be done and showing the positive impact it can have on the land, the wildlife and the river.

The changes made by this project help restore character to the channel that hasn't been seen in 140 years and creates a precedent for management of the landscape throughout the Hamble valley.

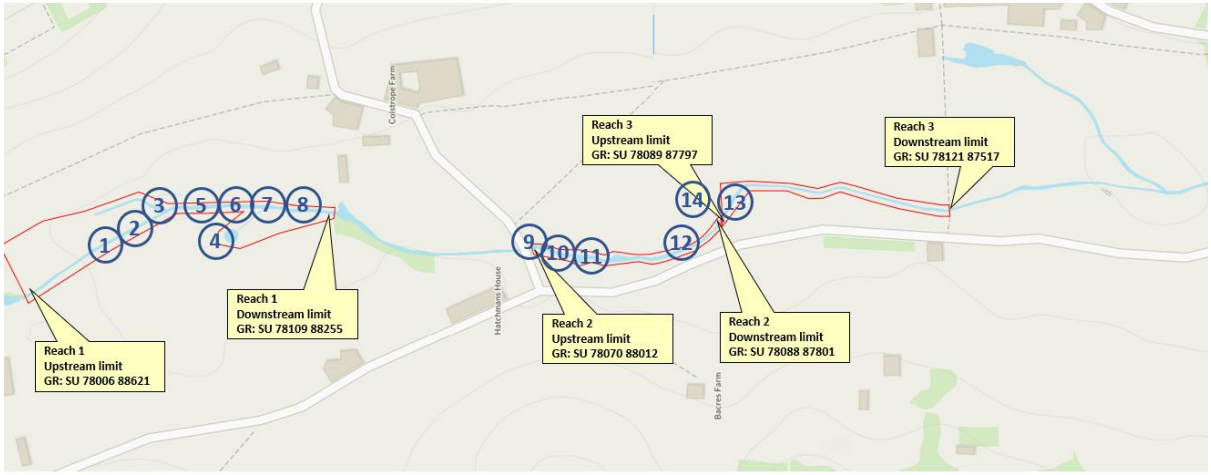
FUTURE RESTORATION PROJECTS

From the start we have considered this project as a steppingstone for future restoration projects on the same channel. Our research, surveys and planning have extended beyond the existing restoration reach. Our communication with the Environment Agency and National Trust has always been about this being one phase of the project, and we were very keen to secure landowner contributions to establish a sustainable, match-funding financial model. This approach has already worked as we were able to use additional EA grant funding (not available until November 2022) to extend the current project, and we have had very positive initial

engagements with three additional landowners which could lead to a further 2000m of channel improvements.

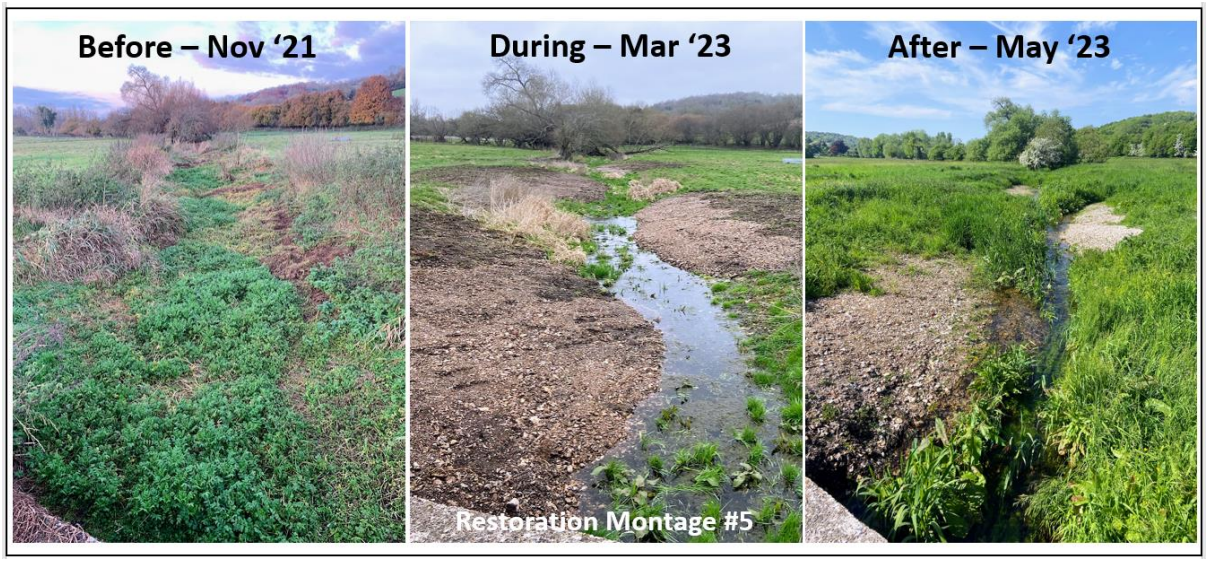
APPENDIX A - PHOTO MONTAGE EVIDENCE

River Hamble – local area map showing restoration montage locations




Before
After
Restoration Montage #3


Before
After
Restoration Montage #4


Before – Nov ‘21
During – Mar ‘23
After – May ‘23
Restoration Montage #5


Before – Nov ‘21
During – Mar ‘23
After – May ‘23
Restoration Montage #6


Before
After
Restoration Montage #7


Before
Restoration Montage #8


After


Before
Restoration Montage #9


After


Before
Restoration Montage #10


After


Before
Restoration Montage #11


After


Before
Restoration Montage #12


After


Before
Restoration Montage #13


After


Before
After
Restoration Montage #14