Restore Hope Latimer (Little Chess) - Comparison report

Part A – Modular River Survey

Smarter Water Catchment Programme

July 2024

Working in partnership

Thames Water · The River Chess Association · Chilterns Chalk Streams Project · Chilterns · Chiltern Society · Environment Agency · Affinity Water · Herts & Middlesex Wildlife Trust · Queen Mary University of London

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1 Introduction

This report contains a comparison of the baseline and post restoration Modular River Survey (MoRPh) data captured by citizen scientists engaged on the Little Chess at Restore Hope Latimer (Little Chess), located immediately upstream of Latimer in the Chilterns Area of Outstanding Natural Beauty (Figure 1.1). This report focusses on the Little Chess which runs south east alongside Latimer park.

MoRPh is a bankside surveying technique developed by Queen Mary University of London that enables non-specialists to gather scientific data on the physical, ecological and hydrological condition of water bodies and adjacent land. Short lengths or 'subreaches' of the river are surveyed and the results are used to calculate 14 indices represent physical habitat mosaics and human pressures. The surveys allow independent monitoring and evaluation of our river restoration projects. We can therefore be held to account if project goals are no longer being met, and can investigate and intervene if necessary, to ensure the long term-success of restoration work.

A programme of recruitment and training was started in early 2022, kindly funded by a grant from the Chess Smarter Water Catchments Programme. As of January 2024, our volunteers have undertaken 158 MoRPh surveys throughout the Chess catchment. This demonstrates a huge commitment from volunteers who have not only provided their time but have also co-ordinated to make sure surveys are completed, and demonstrated a great level of rigour to ensure the data gathered and uploaded is of the best quality possible.

In this report, we summarise the findings of the baseline MoRPh surveys at Restore Hope Latimer (Little Chess) and compare them with the new MoRPh (post-project) surveys. We also make comparisons with our other restoration projects on the Chess catchment and utilise the online MoRPh database[1] which contains all the data collected by citizen scientists since the Modular River Survey began in 2016, filtering the surveys undertaken on chalk streams[2]. This is used to help us measure the potential effect the restoration works are having on the river and allows us to see how the site compares with other chalk streams across the UK.

Between 2017 – 2021 flow deflectors were put in as restoration measures through the site through a collaboration of the River Chess Association Restore Hope Latimer and Chilterns Chalk Streams Project. Flow deflectors were installed by partially cutting trees to form hinges that allow them to be laid into the river channel whilst remaining alive, firmly secured and able to grow. These in-channel features were added to narrow the channel and improve flow diversity alongside creating new marginal habitat. The deflectors create low velocity areas to provide habitats for juvenile fish and encourage sediment accumulation behind them.

The MoRPh surveys undertaken in 2022 were conducted three to six months after new fencing was installed and no significant changes to the channel are likely to have occurred in the short time that had past. Therefore, the 2022 surveys summarised in this report are classed as 'baseline' surveys. The 2023 MoRPh surveys undertaken 16 months after the fencing was constructed are classed as 'post-project'. In this report, we summarise the fencing intervention activities undertaken at the Restore Hope Latimer (Little Chess) site and link these to the baseline conditions gathered from the baseline MoRPh surveys.

It is worth noting that the analysis within this report is based on the average values from the baseline citizen science MoRPh surveys. Therefore, we have not discussed the possible differences in the results due to surveys undertaken in multiple seasons. As the baseline surveys were undertaken in July and

[1] MoRPh Citizen Science Map, https://modularriversurvey.org/map/, accessed 12/02/24
[2]Sites from the MoRPh database were filtered based on whether they were undertaken within 50m of a chalk stream (utilising: DEFRA Priority Habitat Chalk rivers and Streams, https://naturalengland-defra.opendata.arcgis.com/datasets/1bb8e710c8254e8fa33e95c7bc13229e, accessed 12/02/24)

October 2022, there is likely to be seasonal differences in vegetation growth when comparing the baseline data with the post-development data collected in July 2023.

Figure 1.1 General view of the Little Chess at Restore Hope Latimer (Little Chess) during the baseline surveys, taken from Subreach 7.

2 What did we learn from the baseline MoRPh surveys?

The initial surveys were undertaken on 9 subreaches[3] of the Little Chess (Figure 2.1) at Restore Hope Latimer (Little Chess) in July and October 2022. The River Chess has been affected by centuries of historical modification, including canalisation and drainage for flood defence, farming and fishing pursuits, urban development and for industries such as milling. In the late 18th century, the River Chess was separated into two channels, creating the Little Chess and the main River Chess. The Little Chess channel is artificial and as a result is straighter and wider than it would naturally be. The land use at the site is predominantly agriculture, and the floodplain is used for sheep and cattle grazing. Extensive grazing by livestock on the floodplain has led to poaching of the channel banks. As a result, there has been increased erosion of the channel banks which has caused fine sediment to enter the river. (Figure 1.1).

[3] Subreaches are sections or 'reaches' of the river that have been divided up to undertake the survey following the standard MoRPh methodology

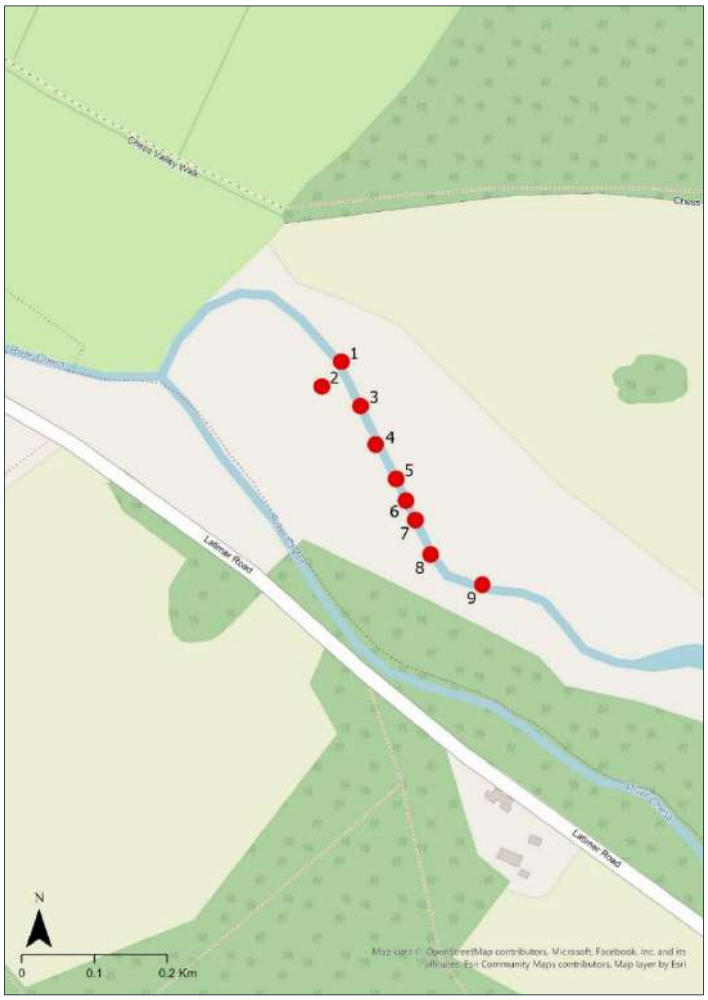


Figure 2.1 Map of the Restore Hope Latimer (Little Chess) site, showing the locations of the MoRPh subreaches (red circles).

The baseline MoRPh data (Figure 2.5 and Figure 2.6) show the average number of flow types (Index 1) were relatively low (1.5-2.5), about the same as the UK chalk stream average, but well below what the river would naturally contain (pre-modification) (Figure 2.2). The highest energy flow types recorded were mainly rippled and unbroken standing wave.

Figure 2.2: Photos of flow types during the baseline surveys taken at Subreach 4 (left) and Subreach 7 (right).

Bed material in the channel was predominantly gravel, with some sand. The amount of finer material in the channel and siltation on the channel bed (Index 7) was relatively low, as expected from chalk streams where a high proportion of flow is groundwater fed[4].

Average channel physical habitat complexity (Index 8) and the number of aquatic vegetation morphotypes[5] (Index 9) were both slightly above the UK chalk streams average. The numbers of aquatic vegetation morphotypes[5] varied along the channel within the site. This is likely reflecting the variability of channel shading by the riparian vegetation which fluctuates between overgrown and limited along the channel (Figure 2.3).

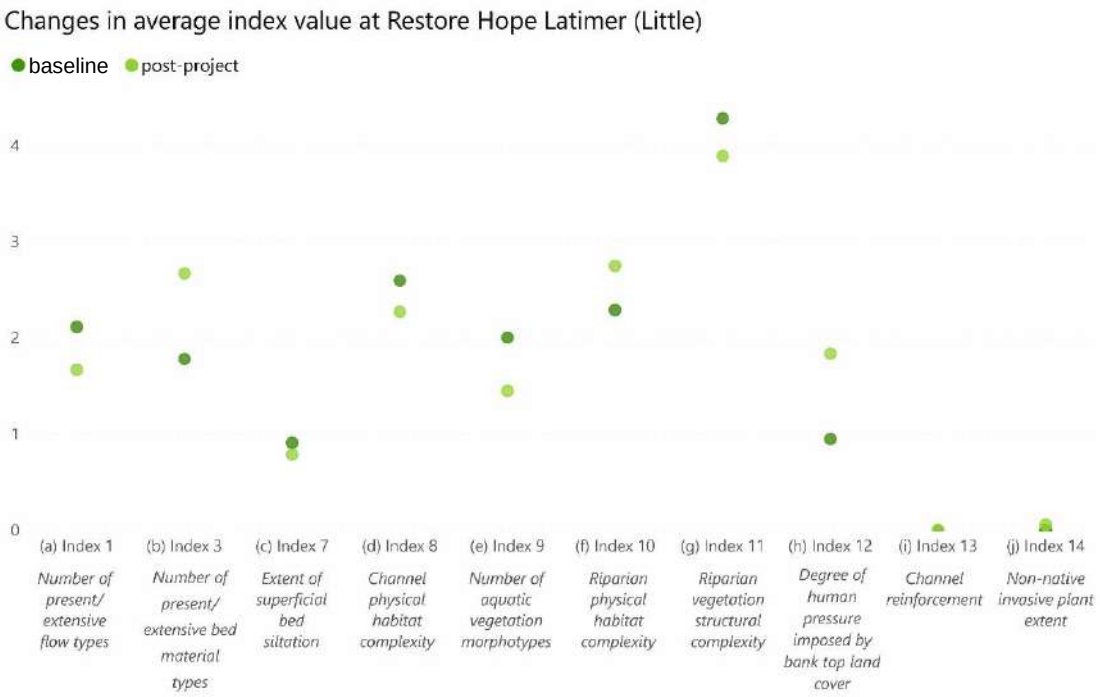
Figure 2.3: Evidence of the variability of the riparian vegetation and number of aquatic vegetation morphotypes. Limited riparian cover and higher amount of vegetation morphotypes shown at Subreach 8 (left) and less aquatic vegetation morphotypes shown at Subreach 2 (right).

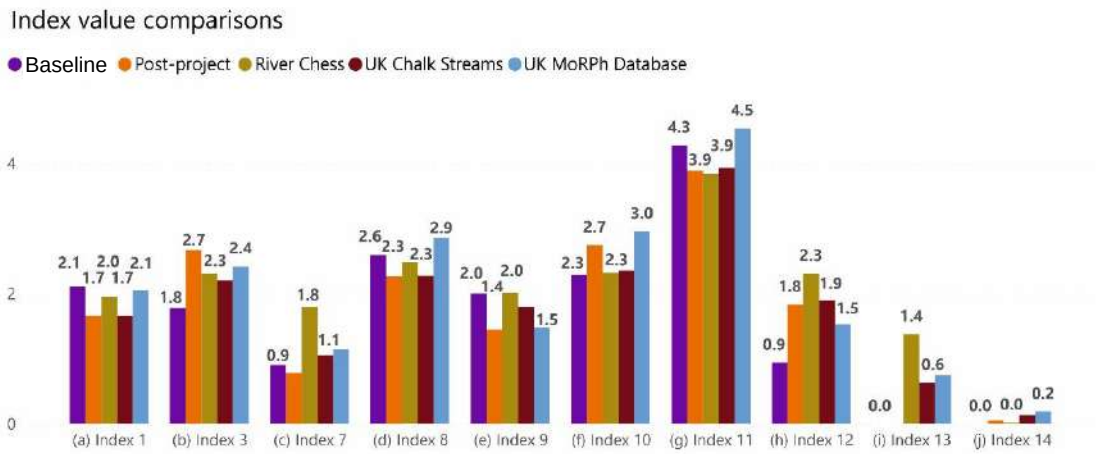
The average baseline riparian vegetation structural complexity (Index 11) was relatively good, but the average riparian physical habitat complexity (Index 10) was about average compared to other UK chalk streams (Figure 2.4 and Figure 2.5).

[4] Beth Mondon et al., 'The Sedimentology of Gravel Beds in Groundwater-Dominated Chalk Streams: Implications for Sediment Modelling and Management', River Research and Applications, 2024).
[5] Organisms that share particular physical characteristics (size, height etc.)

Figure 2.4: Photos of the riparian cover during the baseline surveys. Taken at Subreach 9 (left) and Subreach 3 (right).

Human pressure on the bank top (Index 12) was identified on the site at all subreaches except one however, the amount of pressure recorded was low at the majority of sites. No channel reinforcement (Index 13) or non-native invasive species (Index 14) were recorded within the site.





Dataset	Index 1	Index 3	Index 7	Index 8	Index 9	Index 10	Index 11	Index 12	Index 13	Index 14
UK MoRPh Database	2.05	2.42	2.86	1.14	1.48	2.95	4.54	1.53	0.75	0.19
UK Chalk Streams	1.67	2.21	2.27	1.05	1.80	2.35	3.93	1.90	0.63	0.14
River Chess	1.96	2.31	2.48	1.80	2.02	2.32	3.84	2.31	1.38	0.00
Post-project Restore Hope Latimer (Little)	1.67	2.67	2.27	0.78	1.44	2.75	3.89	1.83	0.00	0.05
Baseline : Restore Hope Latimer (Little)	2.11	1.78	2.59	0.91	2.00	2.29	4.28	0.94	0.00	0.00
Total	**1.89**	**2.28**	**2.49**	**1.14**	**1.75**	**2.53**	**4.10**	**1.70**	**0.55**	**0.08**

Figure 2.5 Summary of the baseline (purple) and post-project (orange) averages of the MoRPh indexes[6]. Also shown are index value comparisons for all MoRPh surveys on the Restore Hope Latimer Little Chess (brown), UK average chalk stream values (Red), and average values for all rivers within the Citizen Science MoRPh database (blue).

[6] *Indexes 2,4,5,6, are excluded from these plots as they are not numbers between 0 and 10.*

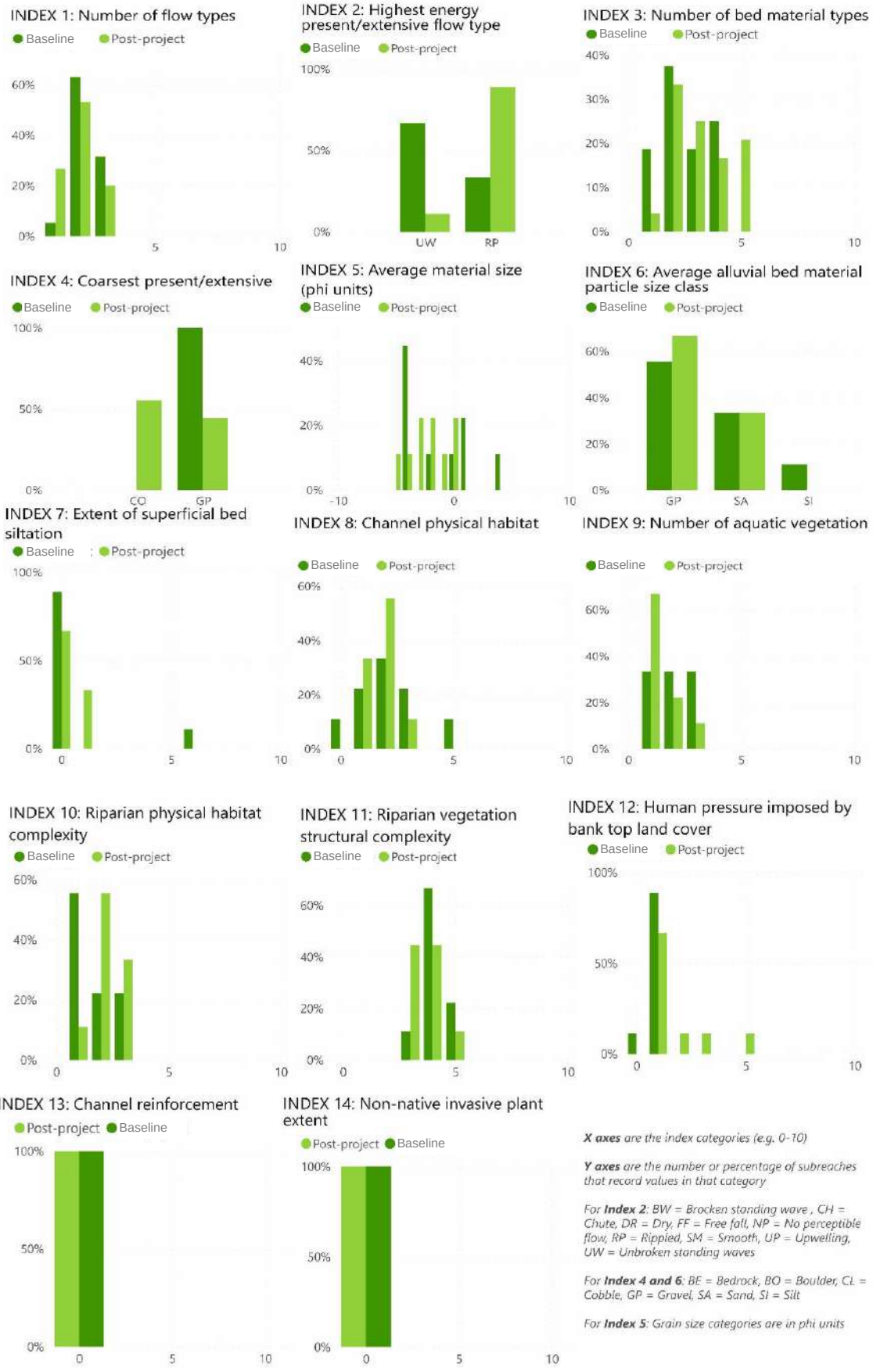


Figure 2.6 Frequency distributions of MoRPh Index values 1-11 comparing the baseline and post-project data.

3 What intervention activities have been undertaken at the site?

As outlined above, the Little Chess at the Restore Hope Latimer (Little Chess) site has been artificially created, historically modified and influenced by agricultural land use.

At the Restore Hope Latimer (Little Chess) site, new fencing was installed along the channel in March 2022. The main aims was to:

- Improve the riparian habitat by restricting livestock access to enable vegetation growth.
- Improve the bed substrate by reducing sediment runoff transported from the banks into the river.

As the channel at the site is accessible by livestock, there was evidence of poaching of the channel banks. This has led to bank erosion and increased sediment runoff into the river, deteriorating the water quality and river bed substrate. We installed new fencing along both sides of the channel within the site and beyond to restrict livestock access. This allows the river banks to repair their condition and encourage riparian vegetation to grow, reducing bank erosion and excess sediment inputs to the river.

It is hoped the improvements will create a more diverse riparian habitat and a more natural in-channel habitat to attract and support native wildlife. Due to the works, we would expect to see future improvements in many of the indices as the system adjusts. In future post-restoration MoRPh surveys this could include decreases in the extent of bed siltation, improvements in the physical habitat and riparian vegetation complexity and increases in the numbers of flow types and aquatic vegetation. We hope these improvements will occur as a result of restricting livestock access.

4 What has changed since the fencing has been installed?

Post-project' MoRPh surveys were undertaken in 2023 (16 months following restoration) and comparisons of the MoRPh indexes are summarised in Figure 2.5. A breakdown of the different indices is also shown in Figure 2.6.

The results show improvements in the average diversity of bed material (Index 3), which is now higher than the UK chalk stream average. The average extent of superficial bed siltation (Index 7) has shown a slight increase. Whilst this may seem negative, this likely reflects an increase in sediment trapped in newly created backwater areas between flow structures and is part of the river naturally adjusting to the new hydraulic conditions.

Subreach 6 (baseline)

Subreach 6 (post project)

Subreach 7 (baseline)

Subreach 7 (post project)

Figure 4.1: Left photos show baseline conditions and right photos show post-recovery conditions demonstrating the changes in bed material.

A detailed breakdown of changes in bed material (Index 3) is shown in Figure *4.2*. The changes are most distinct at subreaches six, seven, eight and nine where the number of bed material types have increased. The aim of the fencing was to limit livestock accessibility to the channel banks and as a result reducing the impact of poaching and reduce excess sediment input to the channel. We can see that there are potentially higher numbers of bed material types being recorded due to a reduction in silt covering the channel bed. However, the increases in numbers of bed material types may have also been

influenced by the survey access and vegetation growth (linked to the season of the survey) dictating the proximity of the surveyor to the channel and therefore ability to see the bed material.

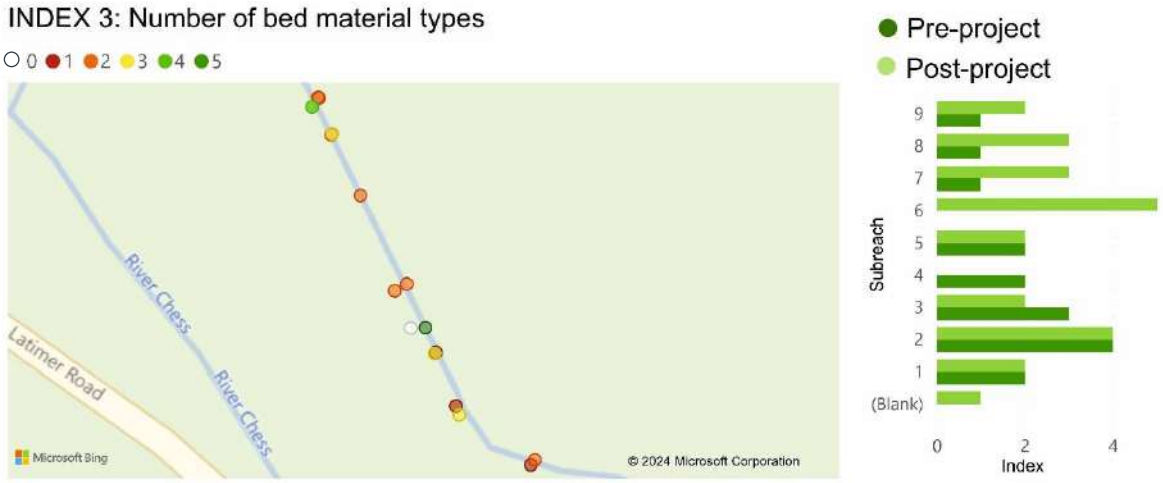


Figure 4.2: Index 3 at each subreach.

There have also been modest improvements to the average riparian habitat complexity (Index 10), which is now slightly above the UK chalk stream average.

A detailed breakdown of changes to riparian physical habitat complexity (Index 10) is shown in Figure 4.4. Increases in the riparian habitat complexity (Index 10) are most distinct at subreaches five, six, seven, eight (Figure 4.3), and nine. This is potentially a reflection of the new fencing that the bank conditions are starting to recover from the impact of livestock grazing and poaching. However, similar to the improvements recorded in bed material type, many factors can influence the results including access to the channel bank which can vary between each survey due to vegetation growth.

Subreach 8 (baseline) 2022

Subreach 8 (post project) 2023

Figure 4.3: Photos of the riparian conditions during the baseline (left) and post-recovery (right) surveys.

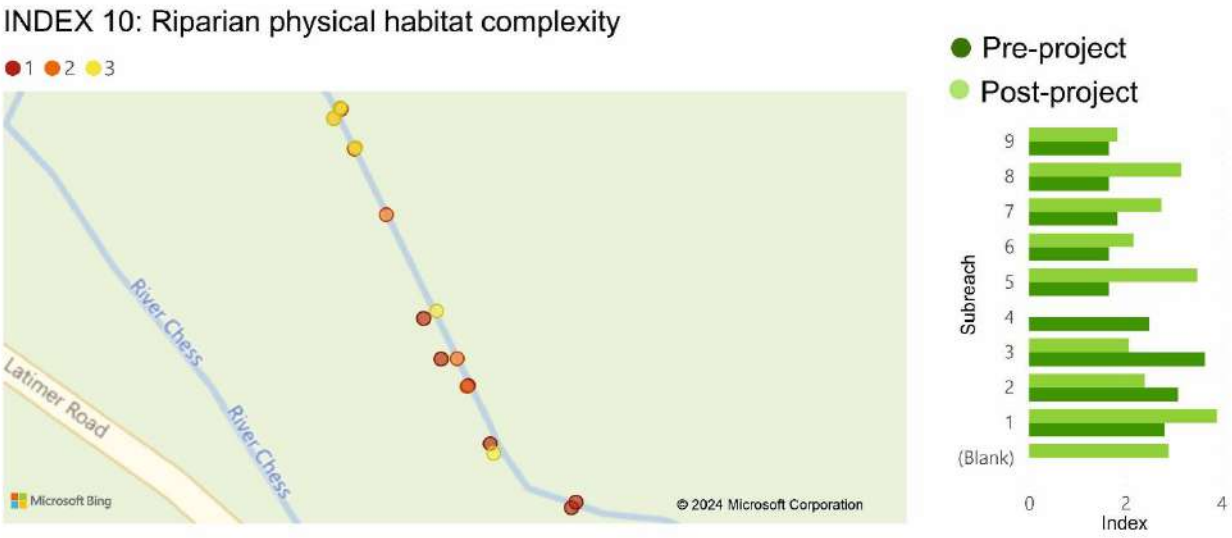


Figure 4.4: Index 10 at each subreach.

The results show slight reductions in the average number of flow types, the channel physical habitat complexity, the number of aquatic vegetation morphotypes[5] and the riparian vegetation structural complexity. There has also been an increase in the subreaches where human pressures were identified; however, this is expected due to the new fencing that has been installed.

Overall, there are currently no major improvements in the channel or riparian habitat following the installation of the new fencing. However, post-restoration surveys were only undertaken 16 months after the works were undertaken and that probably is not enough time for the banks to recover. In future post-restoration MoRPh surveys we would expect to see improvements in many of the indices as the system adjusts this will include:

- Decreases in the extent of bed siltation due to a reduction in sediment input from the channel banks. We hope this will be the outcome of restricting livestock access to the channel through the new fencing.
- Decreases in the extent of bed siltation due to the flow deflectors installed between 2017 – 2021. As vegetation colonises the silt deposited behind the deflectors this may develop into vegetated side bars and berms.
- Improvements in the riparian physical habitat and vegetation complexity. We are hopeful that by restricting livestock access to the channel banks, more diverse riparian vegetation will have time to establish such as scrub and trees. This will eventually create a more diverse and complex habitat of the bank face and tops that will be captured in MoRPh surveys.
- Higher numbers of aquatic morphotypes[5] due to a reduction in bank poaching enabling aquatic vegetation to settle and grow, adding to previous in-channel enhancements from the flow deflectors.

5 Conclusions

MoRPh surveys of both baseline and post restoration activities have enabled us to monitor the impact of river restoration at the Restore Hope Latimer (Little Chess) site. From this, we can make the following conclusions:

- During the baseline surveys the site had MoRPh indexes that were mostly about average or slightly below average for chalk streams in the UK.
- In the sixteen months since the fencing was installed, the average diversity of the bed material and riparian physical habitat complexity have improved, and the scores are now above the UK chalk stream average.
- These improvements are related to the flow deflectors installed between 2017 - 2021 and the restriction of livestock grazing which has allowed the channel bed morphology to improve and new riparian habitat to establish.
- The majority of indicators are currently relatively unchanged. However, river adjustment takes time and we expect to see future increases in these measures as the river adjusts and the ecosystem matures.

MoRPh citizen science surveys are a great technique for non-specialists to gather scientific evidence on the conditions of waterbodies. They are also a valuable way for the community to feel more engaged with their local river. We hope that these surveys have enabled volunteers to explore unfamiliar parts of the Chess catchment and appreciate it in a new way and are excited to see the results of future surveys.

MANY THANKS FOR ALL THE EFFORT WITH SURVEYING AND WE HOPE YOU'VE ENJOYED OUR REPORT. WE WOULD LOVE TO HEAR ANY FEEDBACK AT CHESSCS@CHILTERNS.ORG.UK

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