Scotsbridge Mill - Baseline report

Part A – Modular River Survey

Smarter Water Catchment Programme

July 2024

Working in partnership

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

Contents

List of figures

1 Introduction

This report contains a description of the baseline Modular River Survey (MoRPh) data captured by citizen scientists engaged on the River Chess at the Scotsbridge Mill site located approximately 1km north east of the town centre of Rickmansworth (Figure 1.1). This report will focus on the River Chess at the Scotsbridge Mill site which flows south along Scotsbridge Playing Fields. The site is immediately upstream of a culverted (piped) section of the River Chess under the A412.

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 that 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 ensure surveys are completed, and demonstrated a great level of rigour to ensure the data gathered and uploaded is of the best quality possible.

Figure 1.1 General view of the main River Chess during the baseline (pre-restoration) MoRPh surveys at Scotsbridge Mill, taken from Subreach 4 (March 2023).

In this report, we summarise the findings of the pre-restoration (baseline) MoRPh surveys at Scotsbridge Mill. We make comparisons with the online MoRPh database[1] which contains all the data collected by citizen scientists since the Modular River Survey began in 2016, and have filtered out the surveys undertaken on chalk streams[2]. This is used to help us measure the current condition of the river in

[1] MoRPh Citizen Science Map, https://modularriversurvey.org/map/, accessed 13/02/24
[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 13/02/24)

comparison to the wider River Chess catchment and other chalk streams across the UK. We have summarised the baseline conditions of the Scotsbridge Mill site because future river restoration works are planned for the River Chess catchment. To set river restoration objectives, it is necessary to understand the site, as the baseline conditions will help us decide which restoration activities are most suitable.

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

2 What did we learn from the baseline MoRPH surveys?

Baseline surveys were undertaken on nine subreaches[3] of the River Chess (Figure 2.1) at Scotsbridge Mill in January, June and November 2023. 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.

Figure 2.1 Map of the River Chess at the Scotsbridge Mill site, showing the locations of the MoRPH subreaches (red circles).

The Scotsbridge Mill site includes a section of the main River Chess and an artificial channel bypass. The mill was constructed in the late 16th century and closed in the late 19th century before it was converted to a restaurant in the late 1980s. As of 2024, the historical mill site is a restaurant, and the main River Chess is highly constrained by the mill infrastructure. The main channel has been historically straightened and flows in an artificial channel through the restaurant. The artificial bypass channel is culverted at the upstream end where it splits from the main River Chess. It is then culverted again where it rejoins the main River Chess. The bypass channel and the main channel join downstream of the mill and are then culverted under the A412. The riparian vegetation cover is variable through the site, and heavily

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

overgrown in some sections (Figure 2.3). Through the site, the channel is constrained by the commercial and recreational land use which includes green space and leisure (restaurant and car parks).

2.1 Overall site

The pre-project MoRPh data (Figure 2.5 and Figure 2.6) shows the number of flow types (Index 1) were on average similar to the UK chalk stream average, but well below what the river would naturally contain (pre-modification). The number of flow types and energy of the flows had a small distribution, reflecting a lack of flow diversity through the site (Figure 2.2). The average numbers of aquatic vegetation macrophytes[4] (Index 9) was also low (0-2), below the UK chalk stream average.

Figure 2.2 Photos of the flow conditions and in-channel conditions of the River Chess at the Scotsbridge Mill site. The photos show there was a lack of flow diversity, energy and very few numbers of aquatic vegetation morophotypes. The left photo shows gravel material covering the channel bed. Taken at Subreach 1 (left, June 2023) and Subreach 8 (channel bypass) (right, June 2023).

The coarsest bed material size (Index 4) covering the river bed at the majority of subreaches was gravel material. The extent of bed siltation on average was very low, as would be expected from chalk streams where a high proportion of flow is groundwater fed[5] (Figure 2.2).

Channel physical habitat complexity (Index 8) and riparian physical habitat complexity (Index 10) were both on average slightly higher than the average for UK chalk streams and the River Chess catchment. However, the data illustrates the limited diversity of channel physical habitat (Index 8) and riparian physical habitat (Index 10) (Figure 2.3) within the site. Similarly, there was on average, a small amount of aquatic vegetation morphotypes[4] (Index 9), indicating limited diversity.

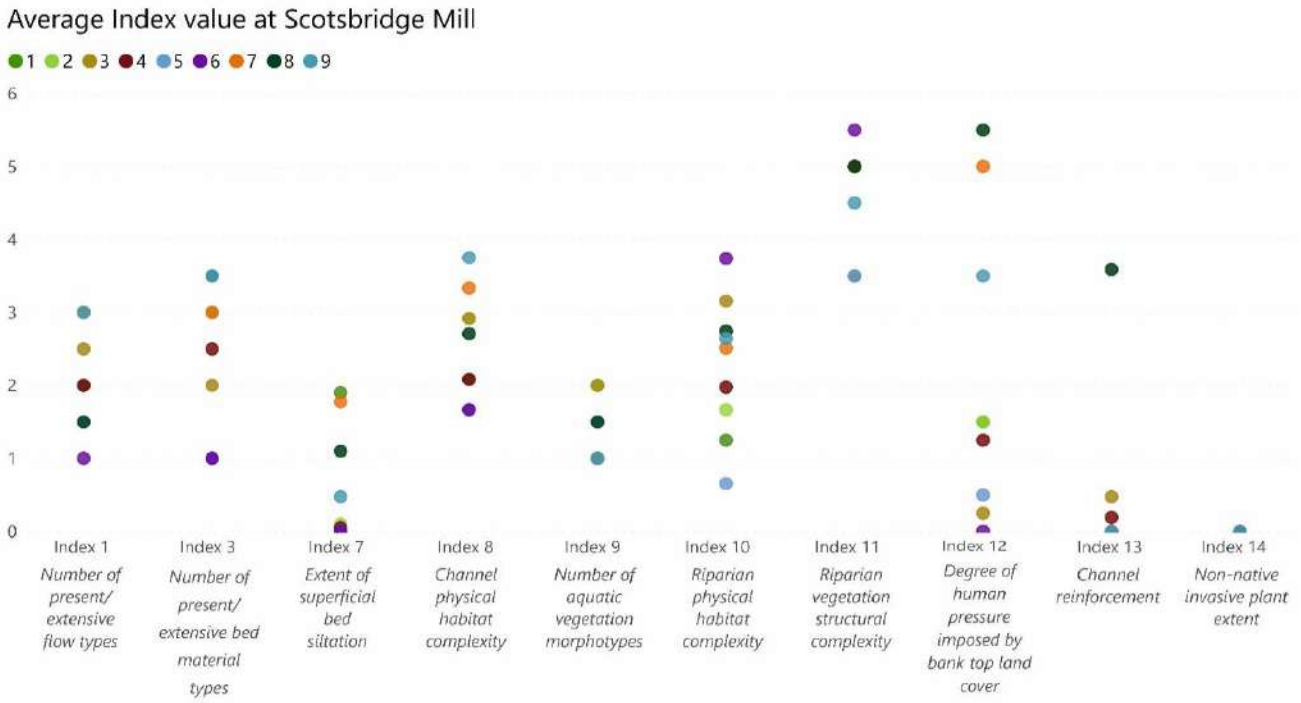
The average riparian vegetation structural complexity (Index 11) was good and higher than the UK chalk stream and River Chess catchment average.

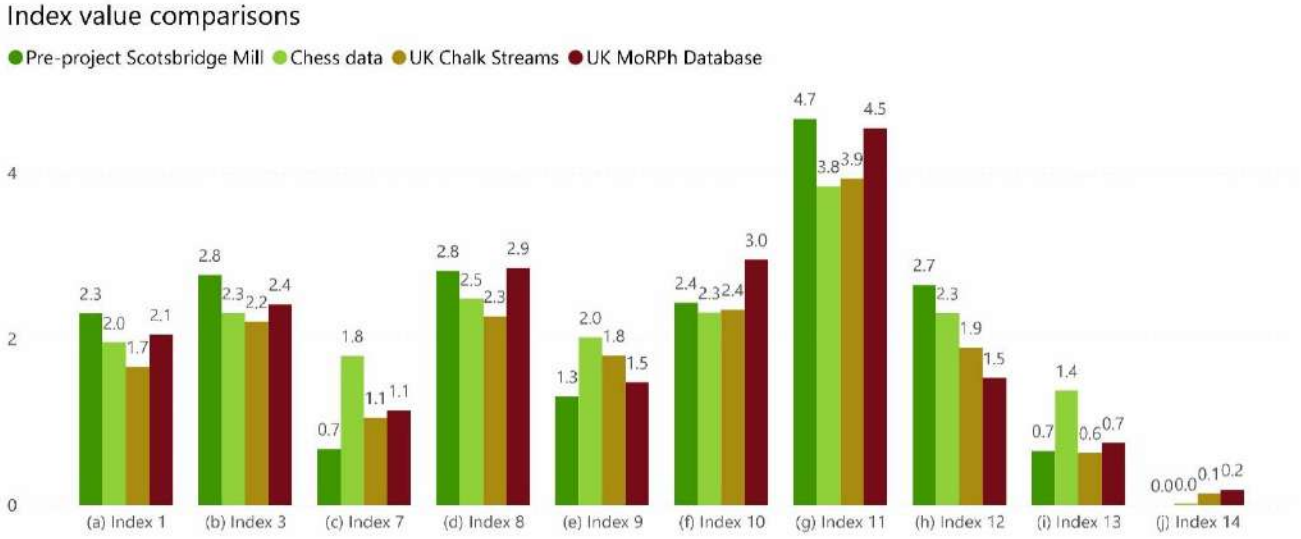
[4] Organisms that share particular physical characteristics (size, height etc.)
[5] Beth Mondon et al., 'The Sedimentology of Gravel Beds in Groundwater-Dominated Chalk Streams: Implications for Sediment Modelling and Management', River Research and Applications, 2024).

Figure 2.3: Photos of the riparian vegetation of the River Chess at the Scotsbridge Mill site. The photos show moderate conditions and the lack of riparian vegetation diversity and complexity. Taken at Subreach 8 (channel bypass) (left, June 2023) and Subreach 5 (right, June 2023).

Human pressures on the bank top were recorded at the majority of the subreaches, and channel reinforcement was identified at a small amount of the subreaches. Human pressures on the site are linked to the artificially straight nature of the channel, the historic industrial land use and the present commercial land use (Figure 2.4). No non-native invasive plant species were recorded at any of the subreaches.

Figure 2.4 Photos of the bank top showing the human pressures on the land use. Taken at Subreach 7 (left, January 2023) and Subreach 9 (right, June 2023).





Dataset	Index 1	Index 3	Index 7	Index 8	Index 9	Index 10	Index 11	Index 12	Index 13	Index 14
Chess data	1.96	2.31	1.80	2.48	2.02	2.32	3.84	2.31	1.38	0.00
UK MoRPh Database	2.05	2.42	1.14	2.86	1.48	2.95	4.54	1.53	0.75	0.19
Pre-project Scotsbridge Mill	2.31	2.77	0.68	2.82	1.31	2.44	4.65	2.65	0.65	0.00
UK Chalk Streams	1.67	2.21	1.05	2.27	1.80	2.35	3.93	1.90	0.63	0.14
Total	**2.00**	**2.43**	**1.17**	**2.61**	**1.65**	**2.52**	**4.24**	**2.10**	**0.85**	**0.08**

Figure 2.5 Summary of the pre-restoration (baseline) averages of the MoRPh indexes[6] per subreach. Also shown are index value comparisons for all MoRPh surveys on the River Chess (green), UK average chalk stream values (orange), and average values for all rivers within the Citizen Science MoRPh database (dark red).

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

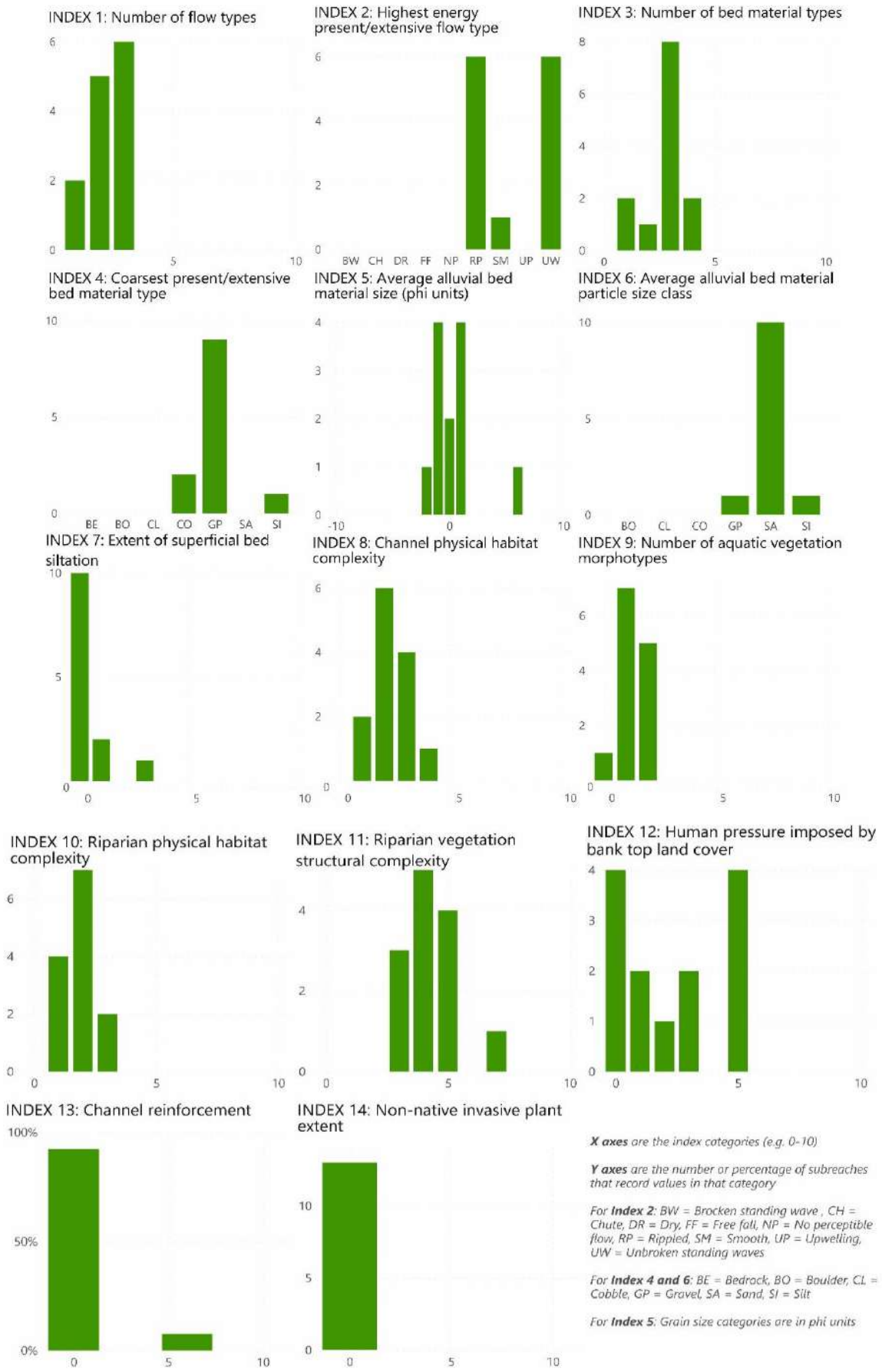


Figure 2.6 *Frequency distributions of MoRPh Index values 1-14 for pre-restoration (baseline) surveys of the Scotsbridge Mill site.*

2.2 Bed material

A detailed breakdown of bed material along the channel within the site is shown in Figure 2.7. Index 3 indicates the number of bed material types identified by the trained citizen science surveyor. The greater the number of bed material types, the higher the score, and the more diverse the channel bed sediment is within the reach. Within the site, the numbers of bed material types were consistently three at all subreaches apart from five and six which had only one. This can be related to the poor conditions of the channel morphology at subreach six which is located at the channel bypass (Figure 2.8).

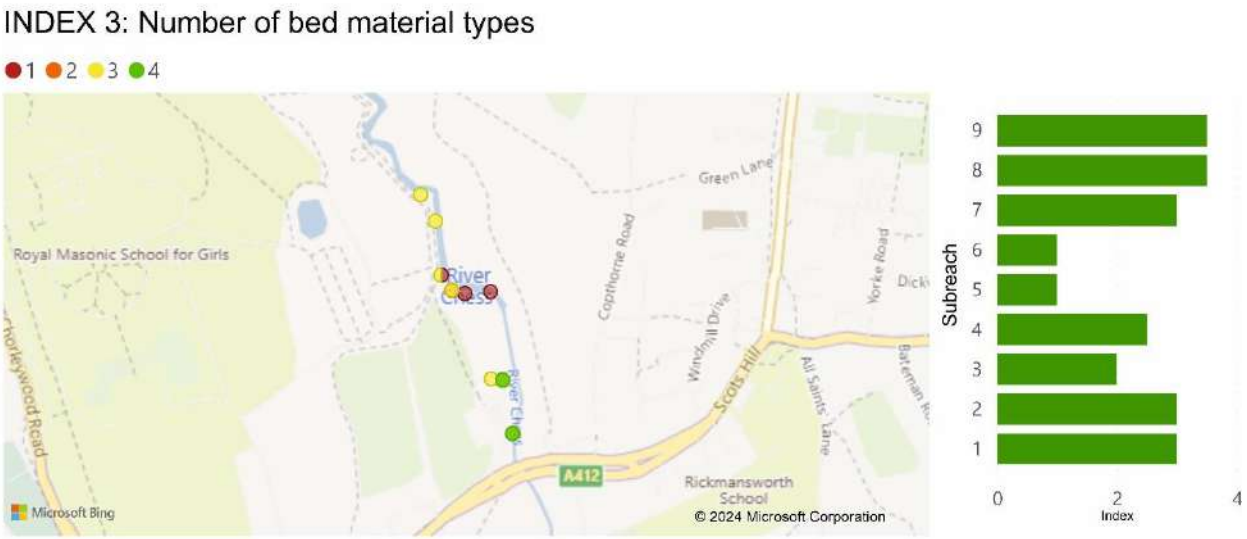


Figure 2.7 Index 3 at each subreach.

Figure 2.8 Photos of subreach 6 (left) and subreach 9 (right) illustrating the difference between a subreach showing one type of bed material and three types of bed material.

2.3 Channel and riparian physical habitat complexity

A detailed breakdown of physical habitat complexity within the site for the channel and the riparian margins shown in Figure 2.9. Within the site, the complexity of physical habitat varies along the river for both the channel and riparian margins. Subreach three has the highest in-channel and riparian physical habitat complexity.

Figure 2.9: Index 8 and Index 10 at each subreach.

3 Conclusions

MoRPh surveys of the River Chess at the Scotsbridge Mill site have enabled us to understand the pre-restoration (baseline) conditions. From this, we can make the following conclusions:

- The Scotsbridge Mill site had relatively poor average flow diversity, that was due to the highly modified channel conditions. At the site, the river bed was mostly composed of gravel, and overall, there was little evidence of silt being deposited.
- The average channel and riparian physical habitat complexity and vegetation were both good in comparison to the UK chalk streams. However, they had relatively low diversity and few numbers of aquatic vegetation morphotypes[4].
- Overall, MoRPh indices are average or higher than average for chalk streams in the UK. However, the site has been subject to extensive historic human modifications associated with the historic mill including culverting and creation of an artificial channel bypass. The present commercial industry (car park, restaurant, historic mill infrastructure) and lack of riparian vegetation maintenance means there are areas in the site where the in-channel and riparian diversity could be improved.

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 River Chess 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

River Chess
Smarter Water
Catchment