



CITIZEN SCIENCE EVENING – RIVER ECOSYSTEMS

5TH OCTOBER 2026

River Chess Smarter Water Catchment

Chilterns National Landscape

CHILTERNS CHALK STREAMS PROJECT

How good is my river?

Steve Brooks,

Riverfly Partnership & Natural History Museum



River Ash, Watersplace Farm, Ware, Hertfordshire

Riverfly Monitoring Initiative

- National cit sci scheme since 2003
- Monthly river trips
- Kick sample in the river
- Identify aquatic invertebrates - ecological indicators of river health
- Report trigger breaches of pollution incidents
- Track restoration sites



Stonefly nymph, *Plecoptera*

Flat bodied mayfly nymph, *Heptageniidae*



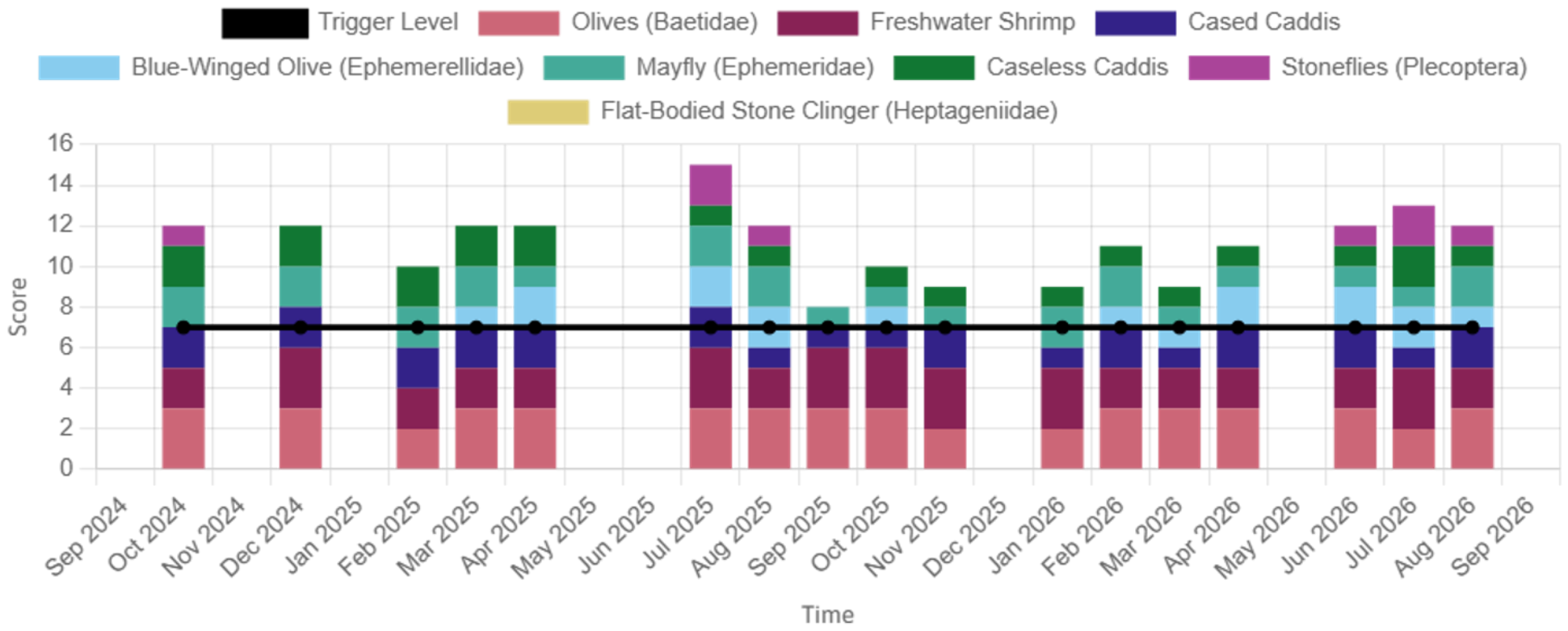


Burrowing mayfly nymph, *Ephemeridae*

Cased caddis fly larvae, *Trichoptera*



Riverfly scores at Watersplace Farm, River Ash, Hertfordshire



But is the river reaching is full potential? Are these scores as good as we can expect?

Riverfly scores in context

- What would my riverfly scores be like if my river was in good condition?
- The River Invertebrate Classification Tool (RICT) is a mathematical model developed by scientists at the Freshwater Biological Association and the four UK environmental agencies to predict this.
- Based on dataset of macroinvertebrates from 200 top quality UK rivers
- Produces predicted (modelled target) RMI, Urban and Extended Riverfly scores for entire river network in England Wales at 50m resolution
- Available for every RMI sampling site on Cartographer

How does RICT work?

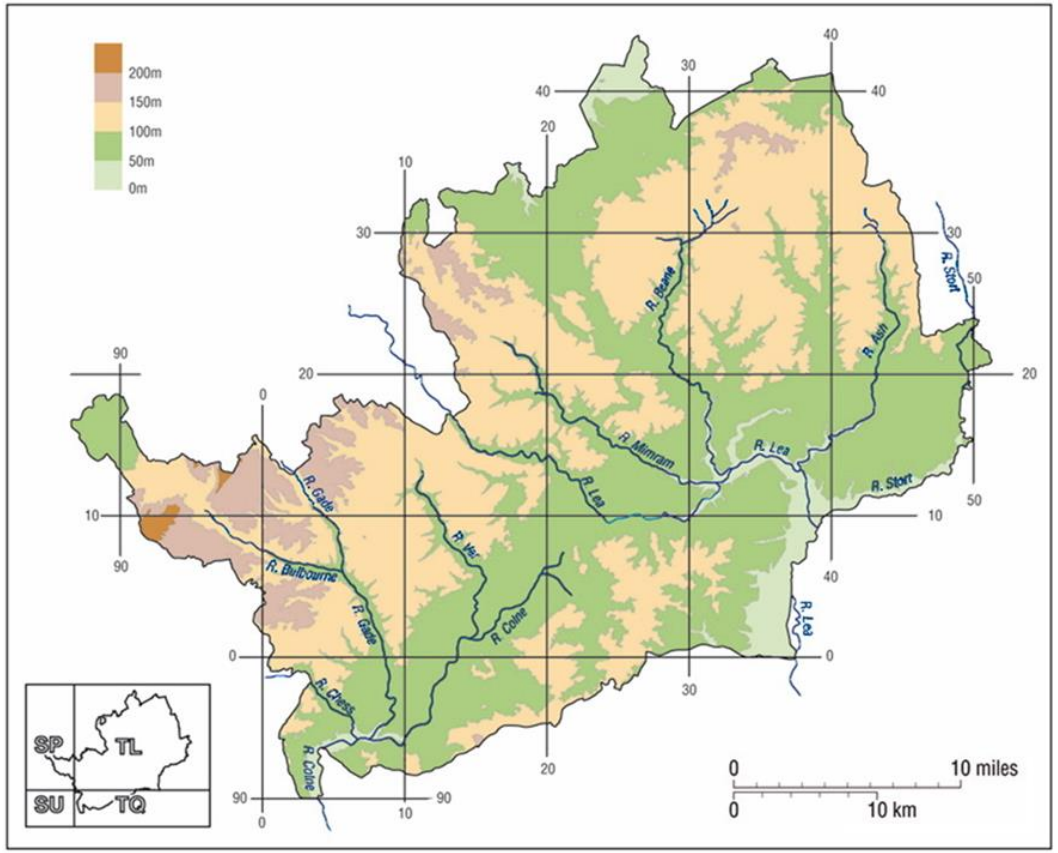
Twelve physical variables best predict the macroinvertebrates that are most likely to occur in a good quality river.

- alkalinity
- substrate composition
- longitude and latitude
- altitude
- distance from the river’s source
- width and depth of the channel
- discharge
- slope
- mean air temperature and mean air temperature range

How does RICT work in practice?

An example from the River Ash, Hertfordshire

- River Ash relatively short (26 km) and shallow gradient
- Predicted or modelled target RMI scores 10-13 throughout length
- Lower scores in autumn, higher scores in spring and summer



	River Ash sampling sites	Observed RMI (average)	Modelled target score
Upstream	Maltings Lane	5	11.2
	Hadham Mill	9	10.8
Downstream	Watersplace Farm	11	11

Why differences between predicted and observed scores?

- Sensitive farming and river restoration through Easneye Estate

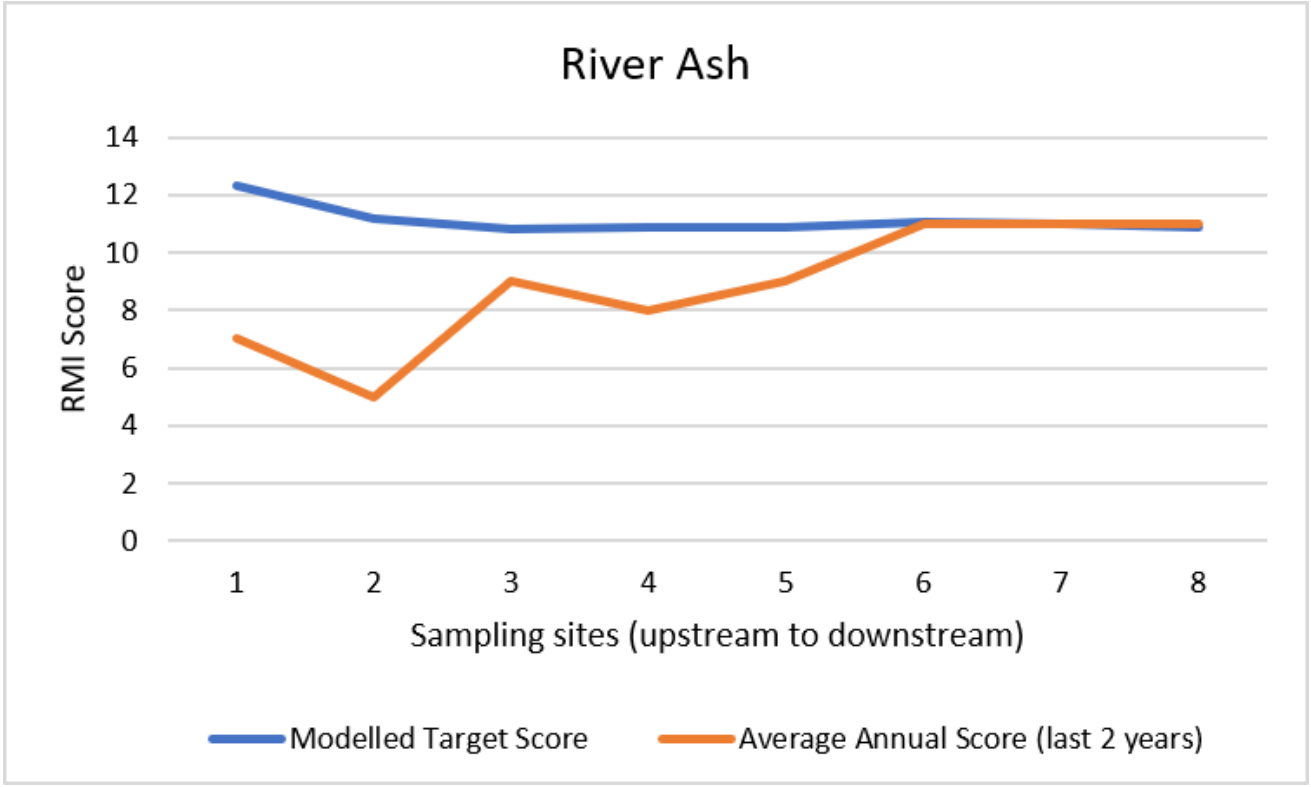


- Low flows and siltation in upper reaches due to water abstraction



How are the modelled target scores useful?

- Provides context for RMI scores
- Which parts of river in better-than-expected condition and which are worse
- Which drivers may be responsible for these results
- Predicted RMI scores provide targets, and a measure of success, for river restorations
- Predicted scores also available for Urban Riverfly and Extended Riverfly



WFD and modelled trigger levels

Ecological status



WFD class boundary	RMI score obs/pred (%)
Bad/Poor	28.6
Poor/Moderate	50.3
Moderate/Good	75.2
Good/High	97.6

← Modelled trigger level

Downstream

River Ash	Observed/Predicted (%)	WFD class	Current trigger level (o/p)
Watersplace Farm	101	High	7 (63.6) too high
Hadham Mill	83.3	Good	8 (74.1) too high
Maltings Lane	44.6	Moderate	3 (26.8) too low

Upstream

Extended Riverfly

- Extension of original RMI using 33 invertebrate groups, including the basic 8 groups.
- Includes most of the major groups of invertebrates you are likely to find.
- Gives more nuanced idea of what is going on in the river.
- Produces two scores:

Water Quality Score (WQS) – biodiversity and impacts of organic pollution

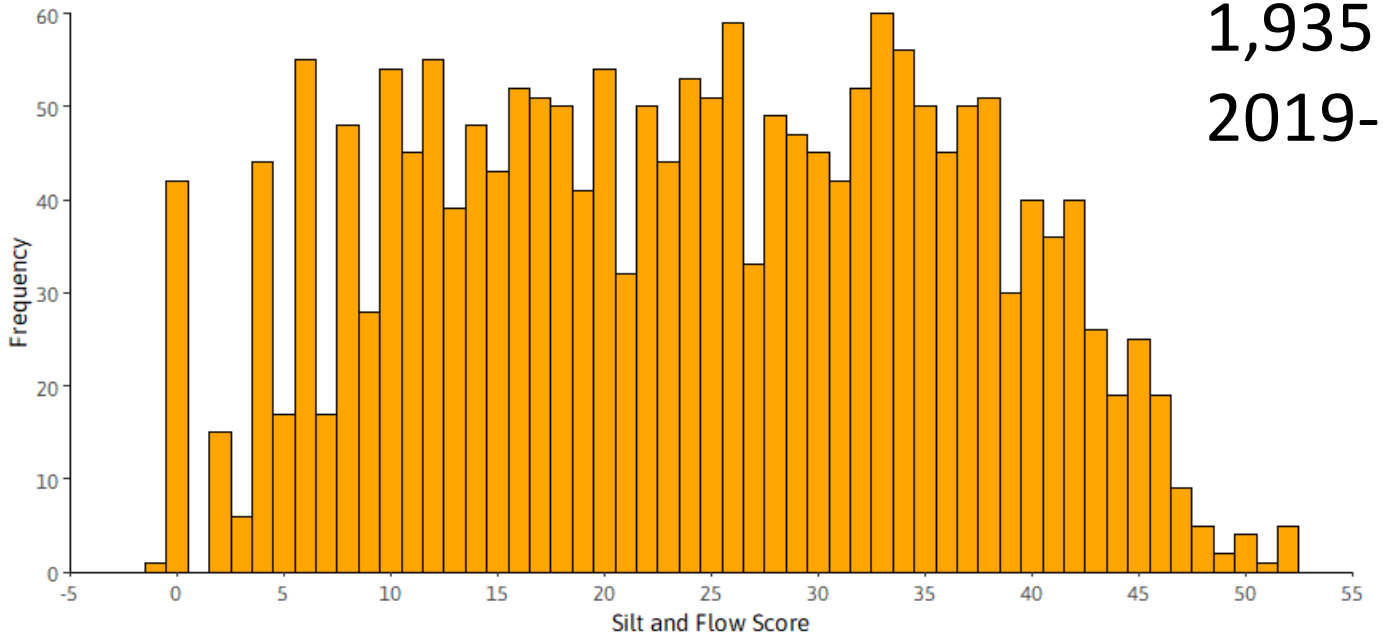
Silt and Flow Score (SFS) – impacts of low flows and siltation



Extended Riverfly

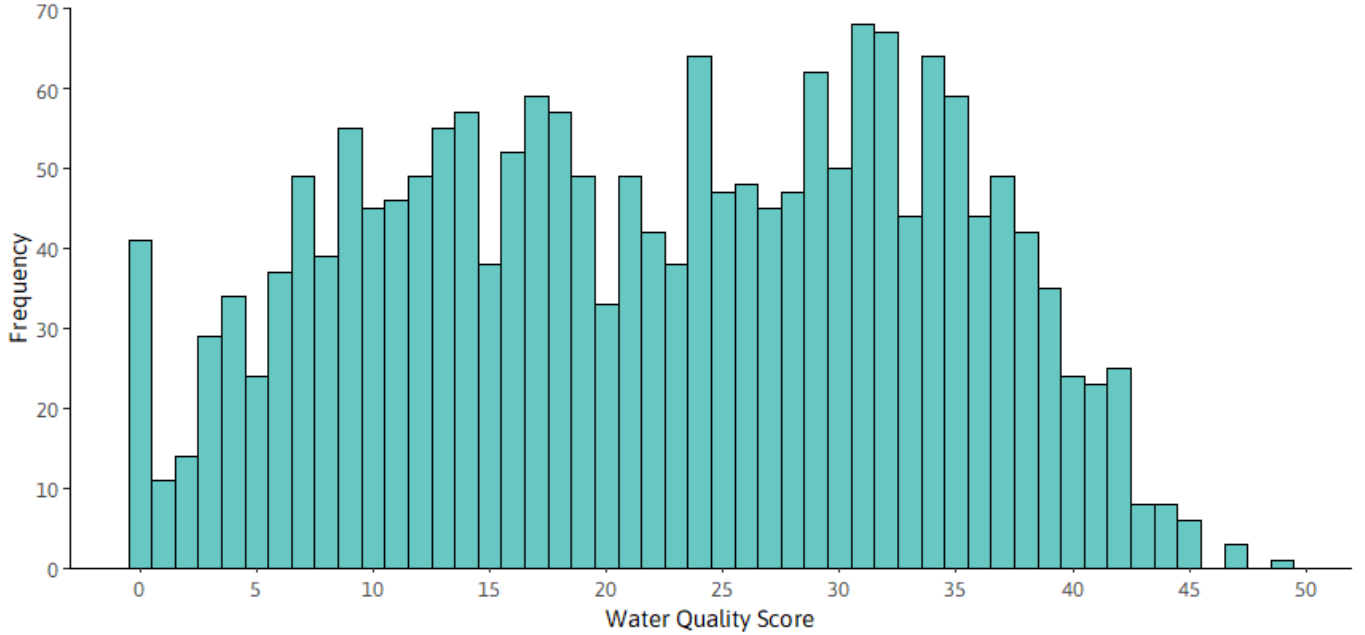
1,935 records
2019-2025

Number of Silt & Flow scores





Number of Water Quality Scores



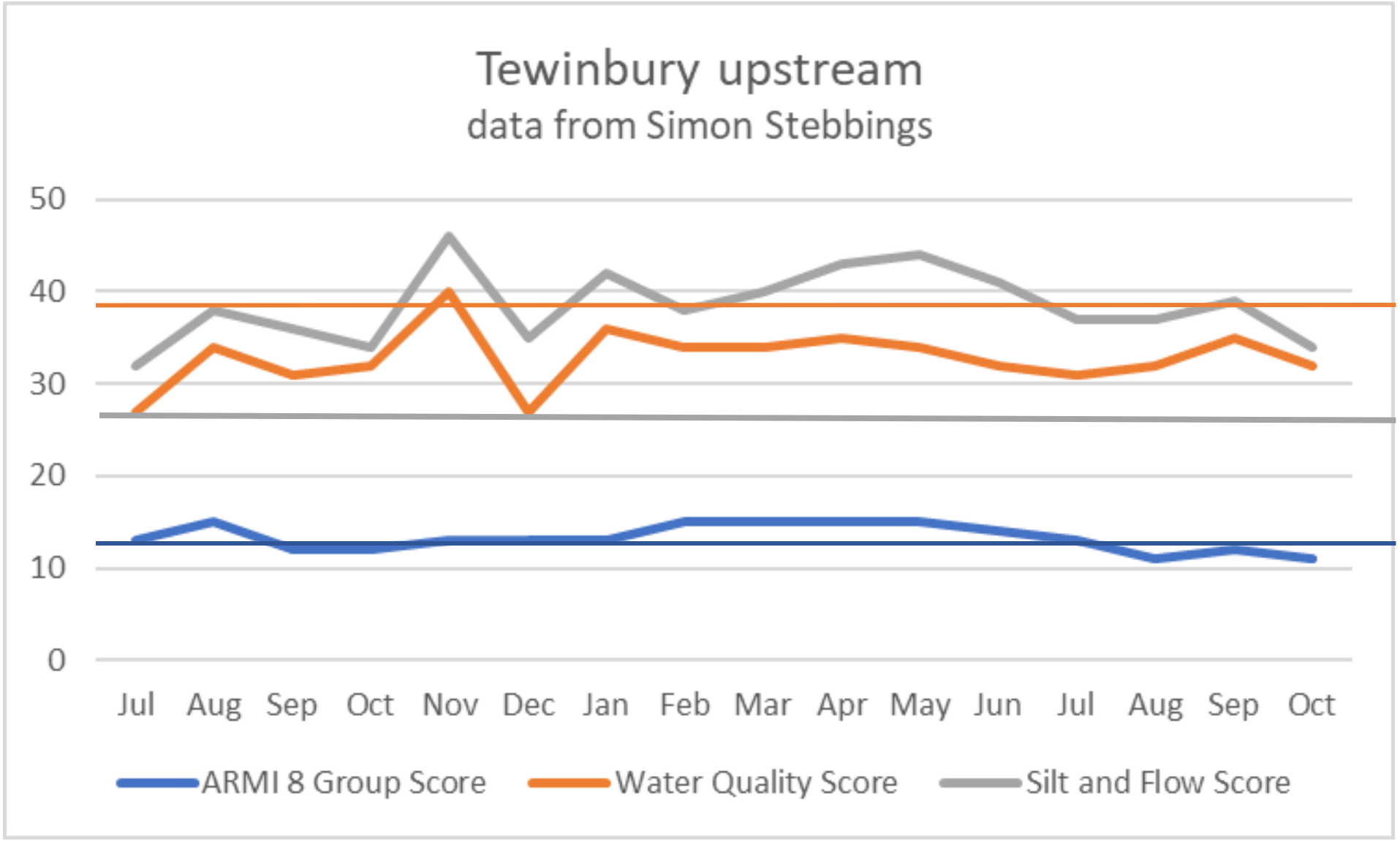
Extended Riverfly

Based on 33 taxa,
produces two metrics:
Silt and Flow Score (SFS)
Water Quality Score (WQS)

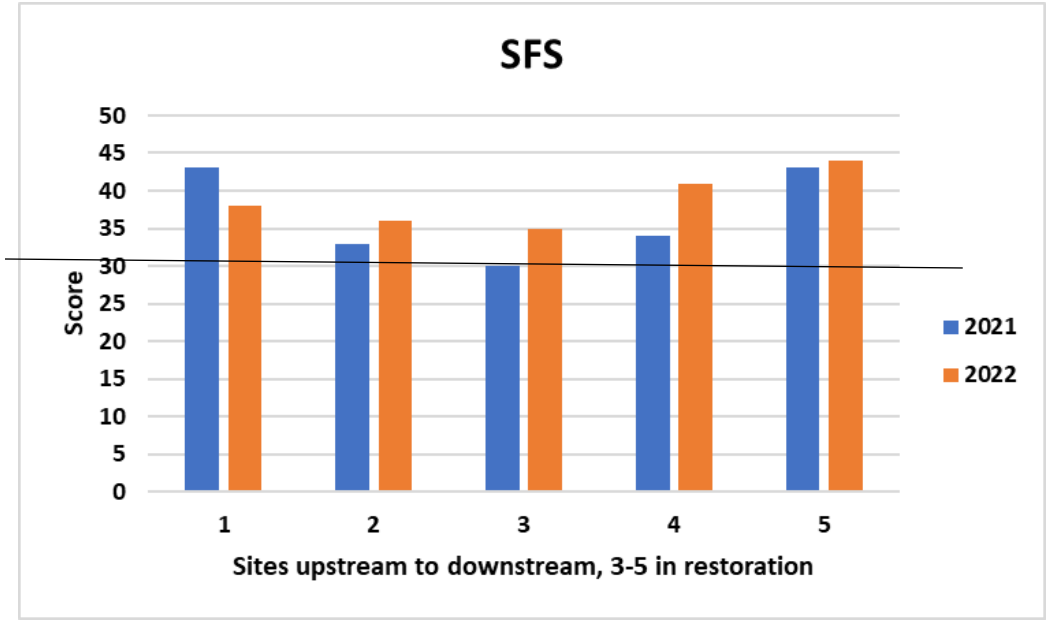
River Ash	Predicted SFS	Obs SFS
Watersplace Farm	27	46
	Predicted WQS	Obs WQS
	38	41

Extended Riverfly. River Mimram, Hertfordshire

ExR scores emphasise trends missed by RMI, SFS better than average for this type of river



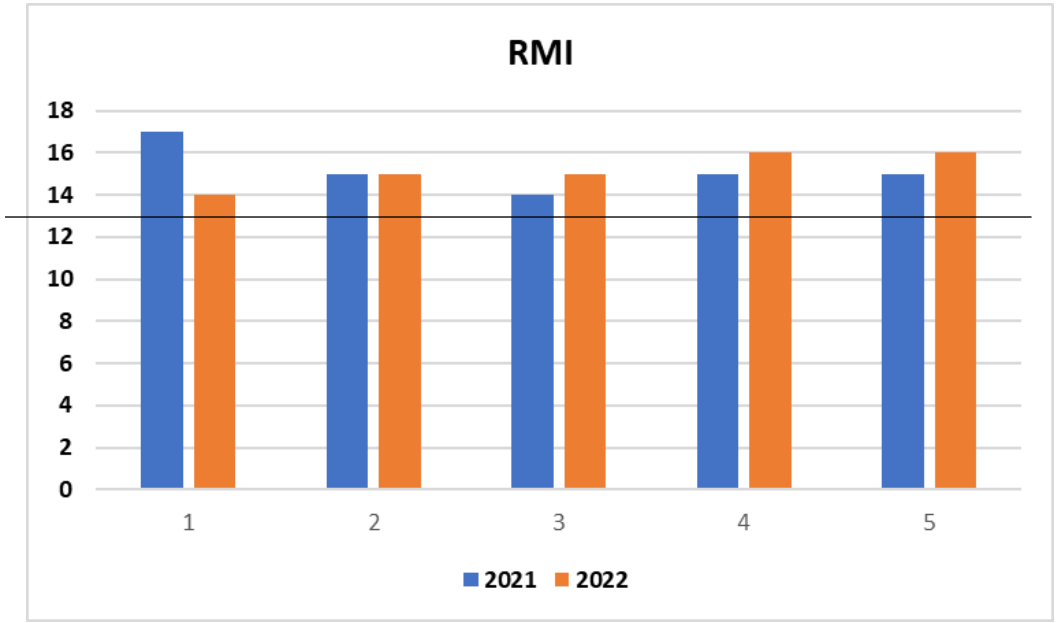
River Mimram restoration at Panshanger



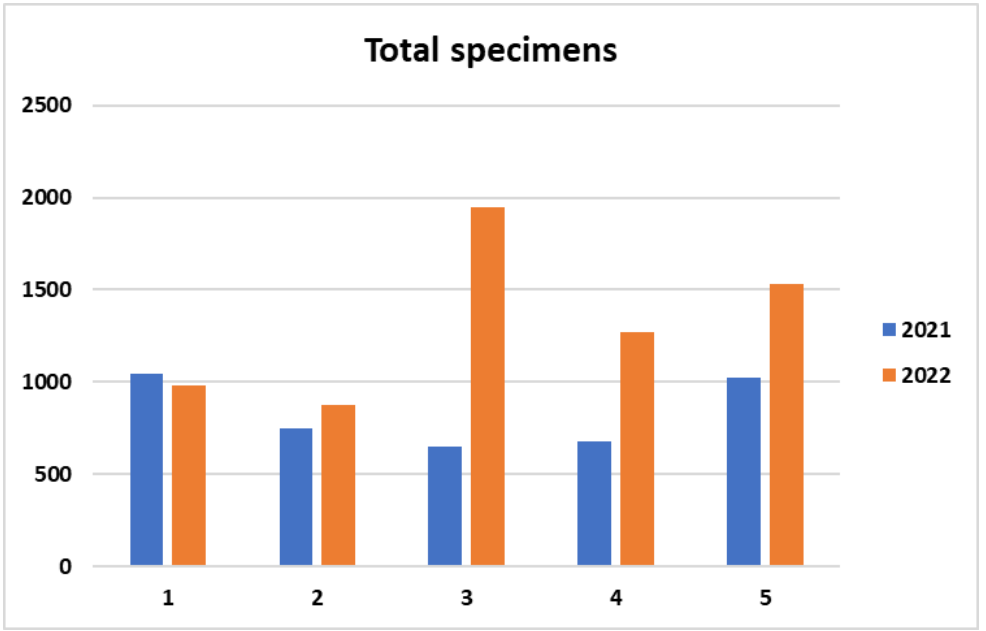
Predicted 30



Predicted 40



Predicted 13





Post-restoration response



	2025	2026
RMI score	11	18
Water Quality Score	25	34
Silt and Flow Score	29	42

River Beane, Woodhall, Herts
Target RMI score 13.2

Low WQS and SFS in first year reflects lag in colonization of new gravels. High RMI score shows water unpolluted

RMI score	11
Water Quality Score	24
Silt and Flow Score	29

River Ash, Widford, Herts
Target RMI score 10.9

Questions?



NATURAL HISTORY MUSEUM

Inverts and Indices: What is citizen science telling us about River Chess ecology?

CHILTERNS CHALK STREAMS PROJECT

Iona McMillan, 05.10.2026



Chilterns National Landscape

Contents

- Riverfly
- SmartRivers
- MoRPh



NOTE: Many other great citizen science ecology surveys including the redd count and water vole surveys presented recently!

CHILTERNS CHALK STREAMS PROJECT

Chess Riverfly

- 17 active sites
- ~25 active Riverfly monitors
- Monitoring first began in 2009
- Collaboration CCSP and River Chess Association – Chess Riverfly coordinated by Kathryn Graves, currently handing over to Mark Gardiner





THANK YOU!!



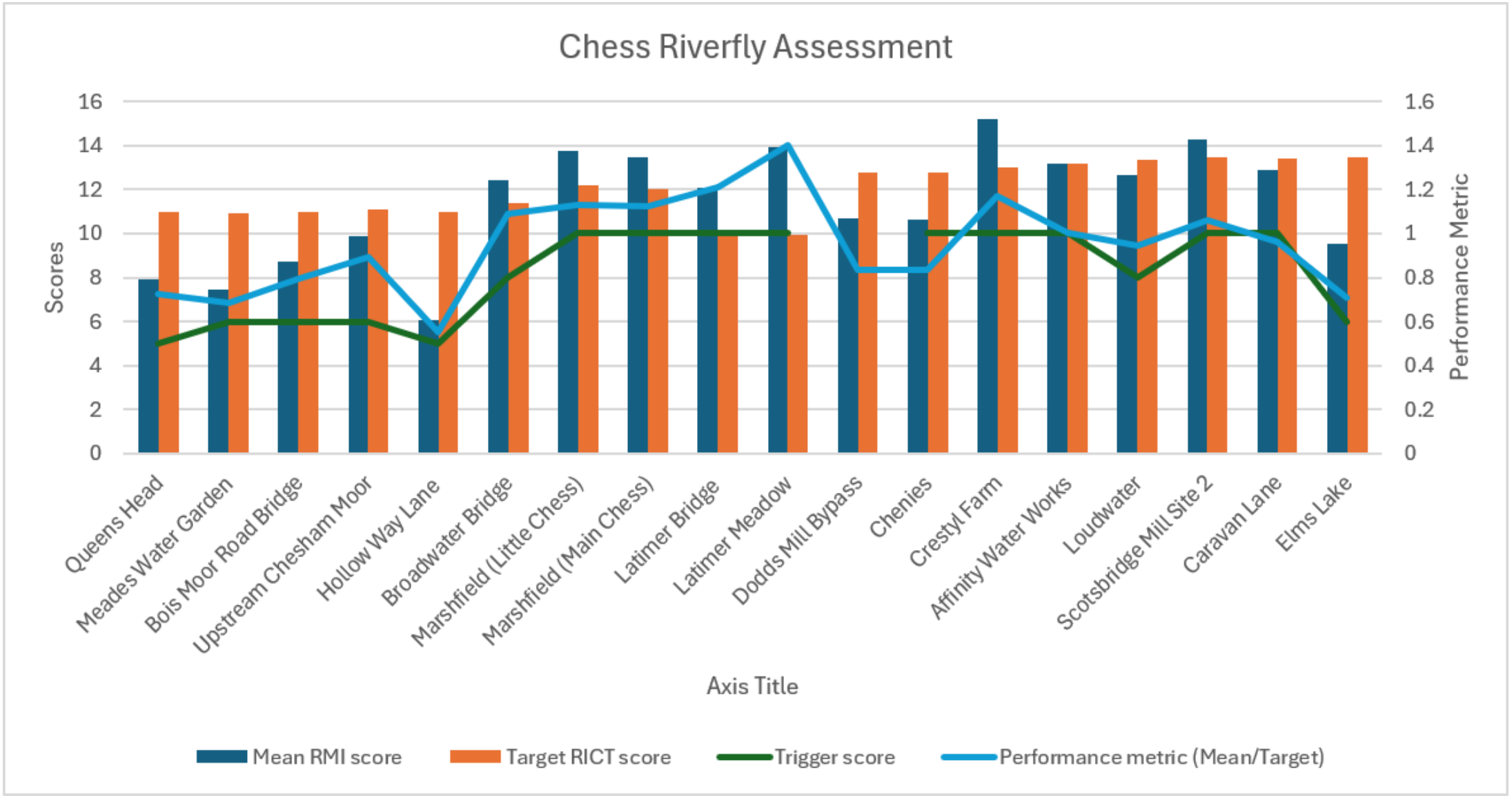




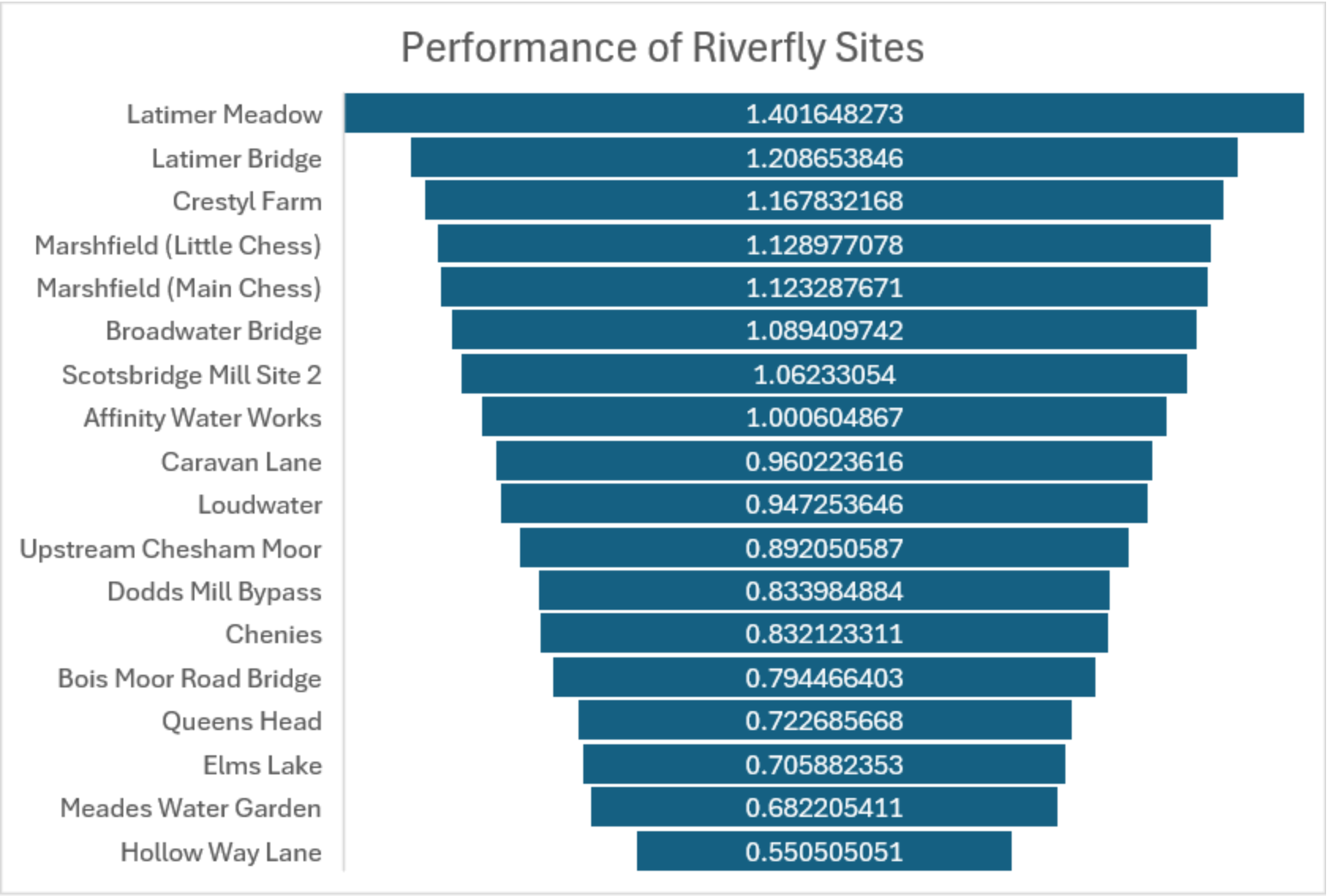
CHILTERNS CHALK STREAMS PROJECT

Chilterns National Landscape

RICT Analysis of the Chess



Ranking of Riverfly sites by performance



1 = mean score matches the target score
>1 = mean score exceeds target score
<1 = mean score below target score

Most Chess sites have a Riverfly community better than predicted – a healthy aquatic invertebrate community!

Lower performing sites:

Bois Moor Road Bridge 0.794 - channel has been restored and scores increasing

Queens Head and Queens Head - winterbourne sites with frequent drying which reduces abundance

Elms Lake 0.706 - poor performing site, with urban stress – decreasing scores

Holloway Lane – no data since 2023. Known poor condition, Thames Water conducted some restoration eg reduced shading

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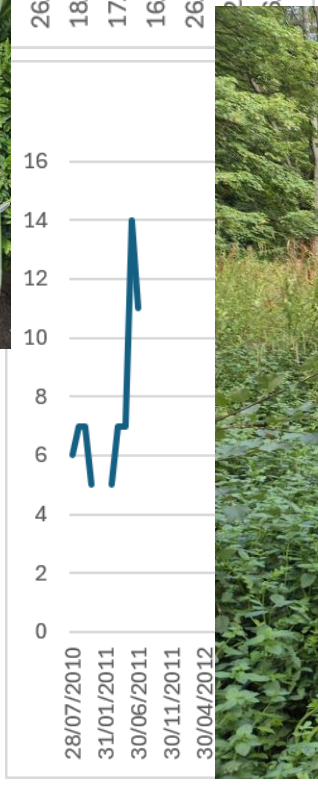
Meades Water Garden and Queens Head

Winterbourne headwaters - ecological response and recovery to intermittent flows



The low
obscu
increas
diversity after dry periods

In times of peak flows both sites reach scores of 10-14





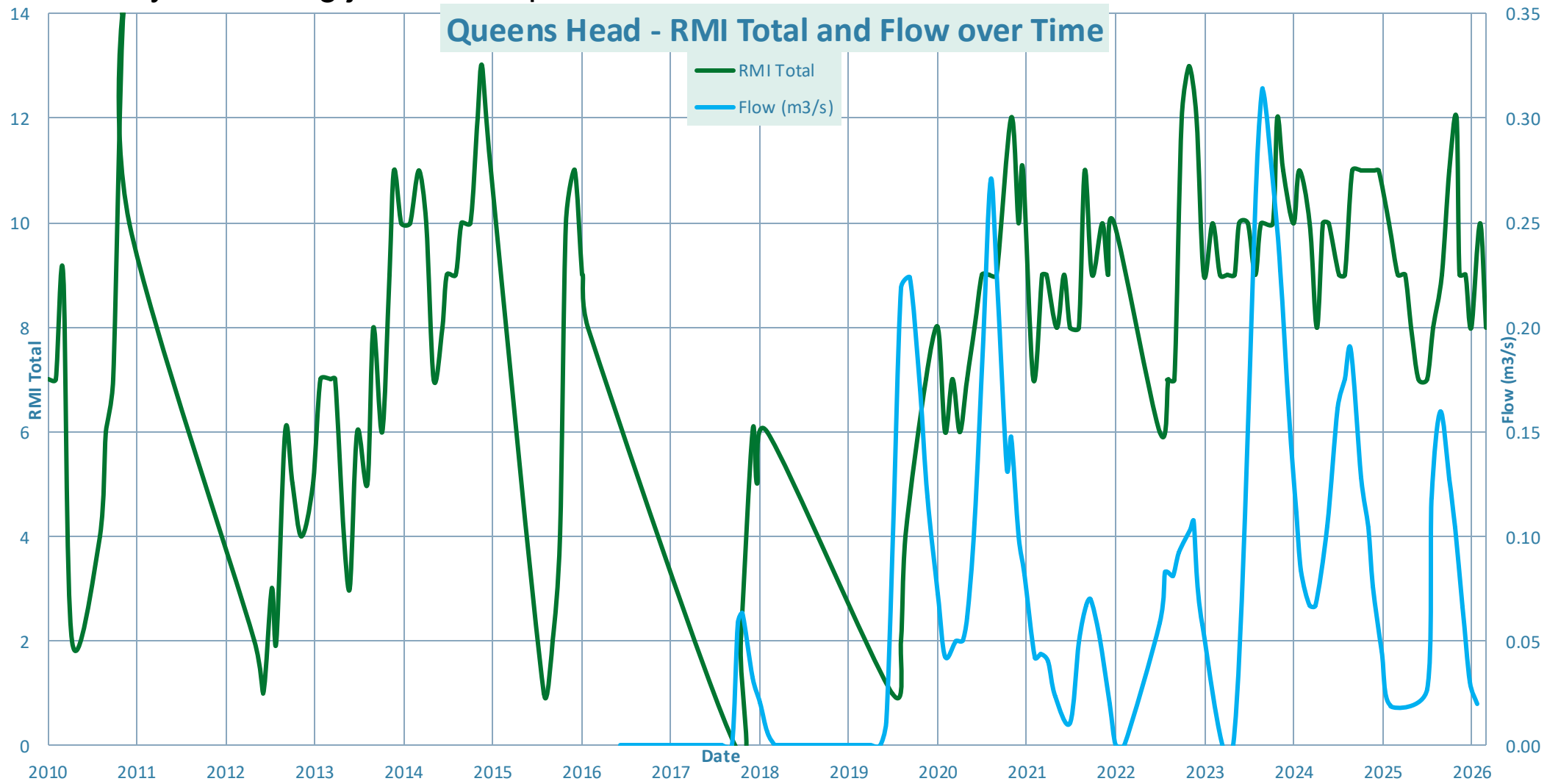


The importance of multi-parameter monitoring

Peak Riverfly scores lag just behind peaks in flow



Thank you to our flow monitoring team!



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Winterbourne monitoring

Winterbourne specialists such as winterbourne stonefly – found by Andrew Clark in April 2024 at the Queens Head Riverfly site – a first record for Chilterns and Bucks

Future plans: Extended Riverfly for more insight into these special communities



Winterbourne stonefly – Chess, 24th April

Keep an eye out for anything unusual when completing your riverfly samples and send me photos of anything different!

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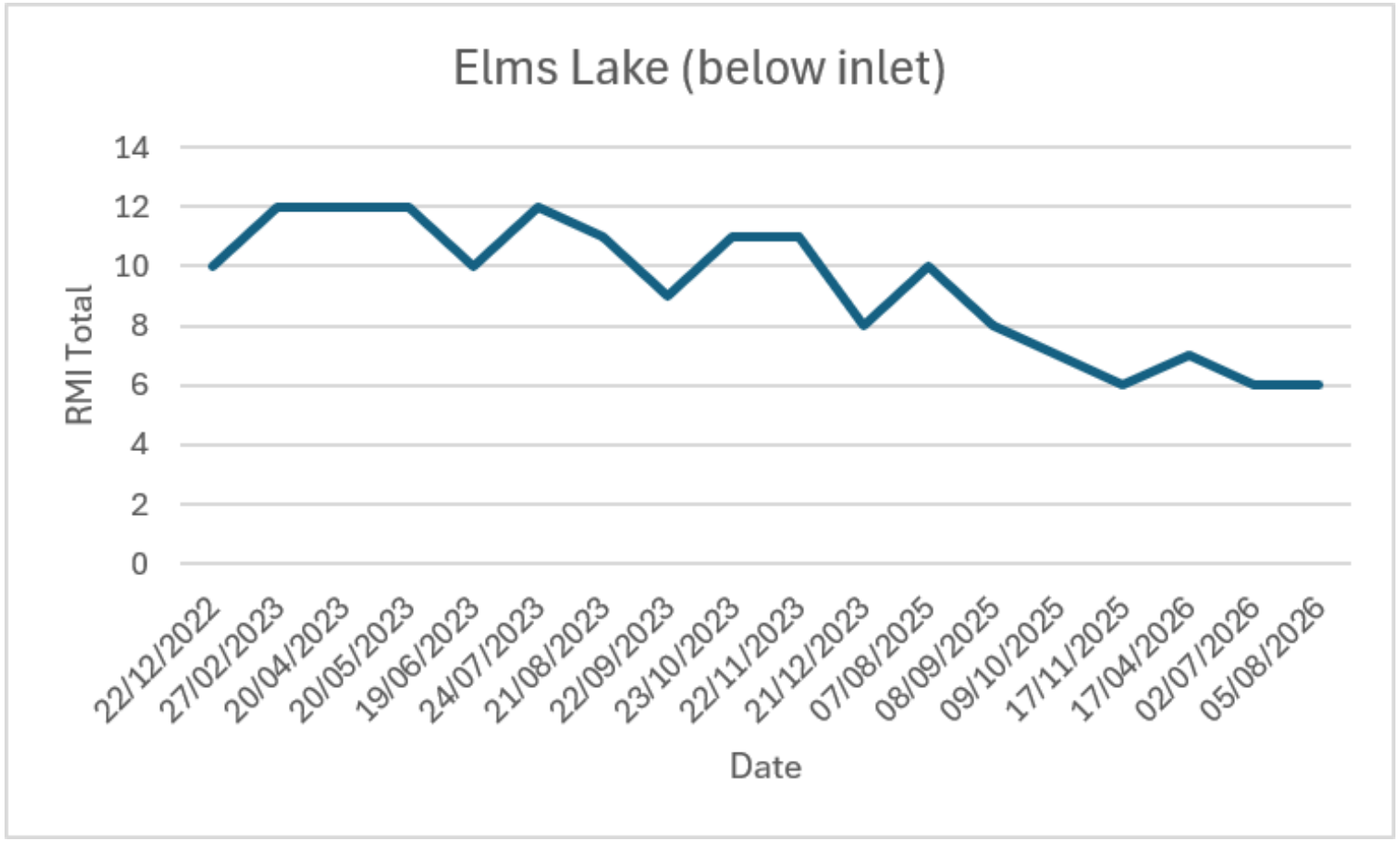
Elms Lake – a real decline



Scores have halved in four years, suggesting serious decline in habitat or water quality

More investigation of causes is needed

Will inform priority locations in next catchment management plan



CHILTERNS CHALK STREAMS PROJECT

Chesham Moor restoration case study

Ambitious restoration project completed in Spring 2025

-Removed 80 tons of concrete

-Restored natural meandering stream

-Restored riparian vegetation corridor

-Constructed gravel beach for schools stream dipping access

-Replaced footbridge



2024

2025

Funding by CCSP, Heritage Lottery, DEFRA's Access Fund, Chesham Town Council's Mayoral Fund, and Affinity Water Ltd.

Thank you to Chesham Environmental Group for ongoing maintenance.

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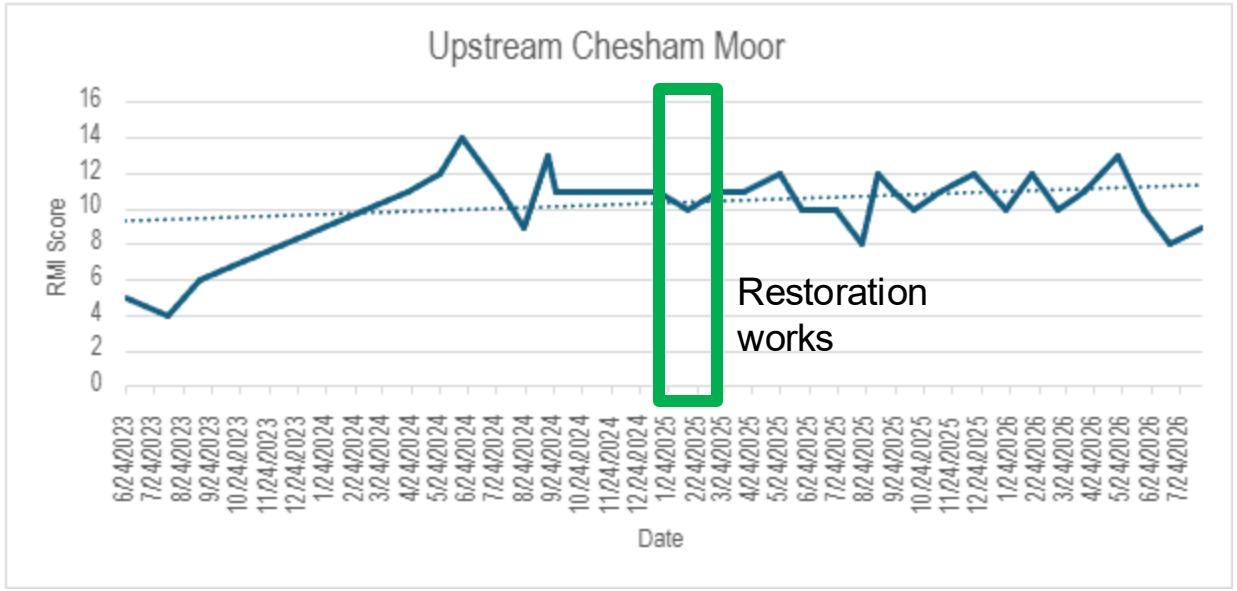
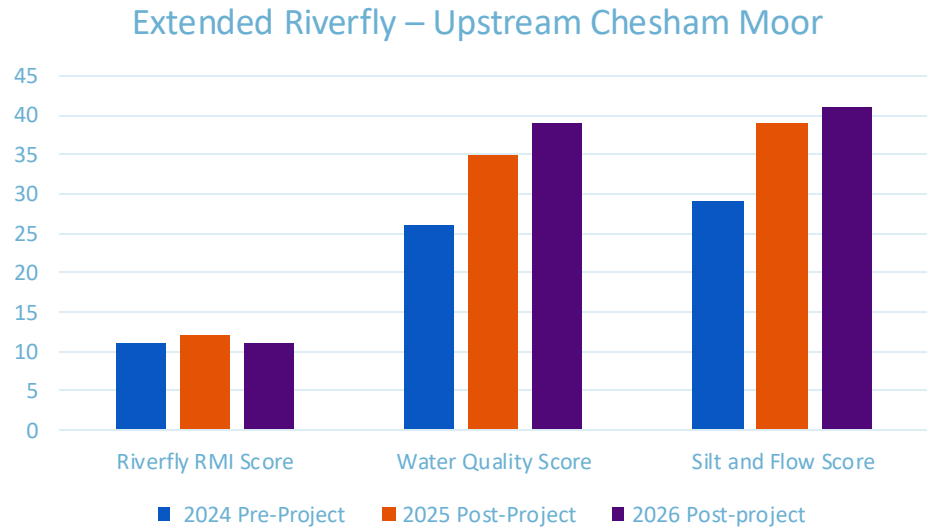
Chilterns National Landscape

Riverfly – Chesham Moor

Consistent improving trend since restoration in 2024, especially apparent in Extended Riverfly







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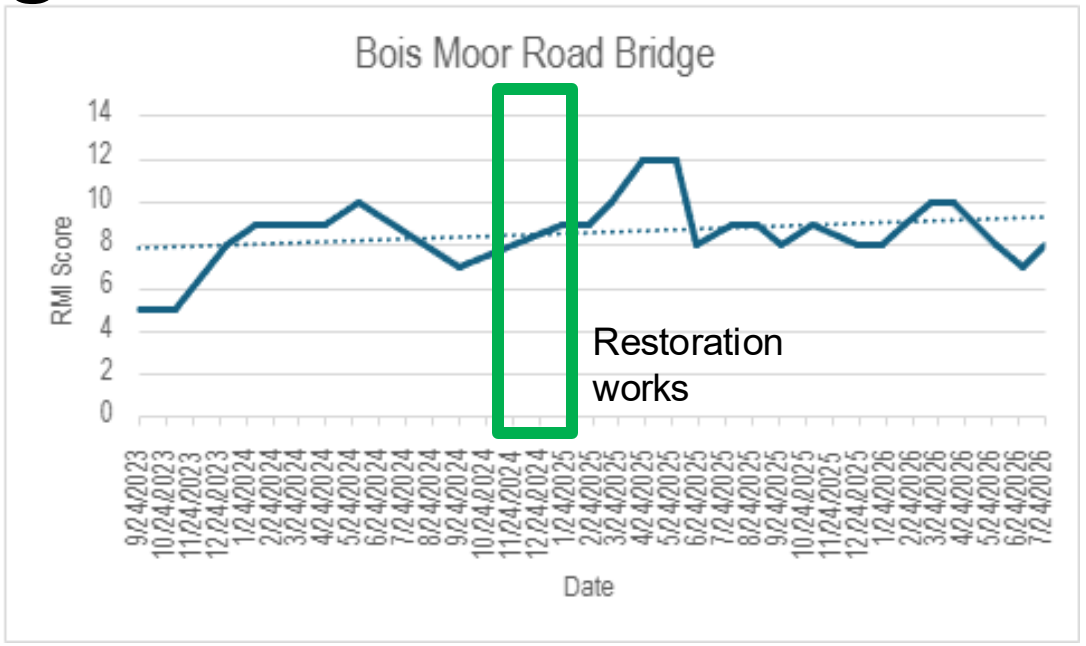
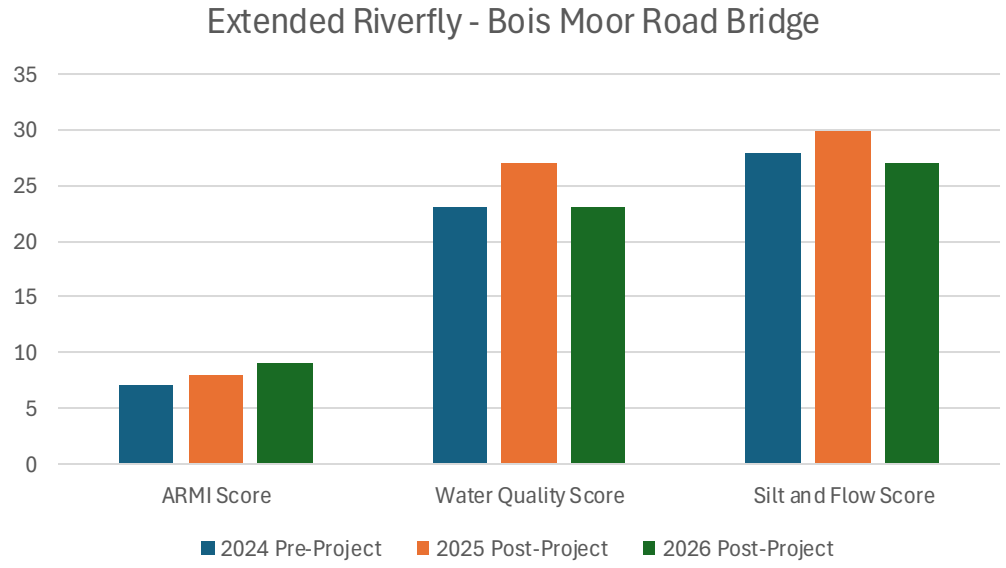
Chilterns National Landscape

Riverfly – Bois Moor Road Bridge









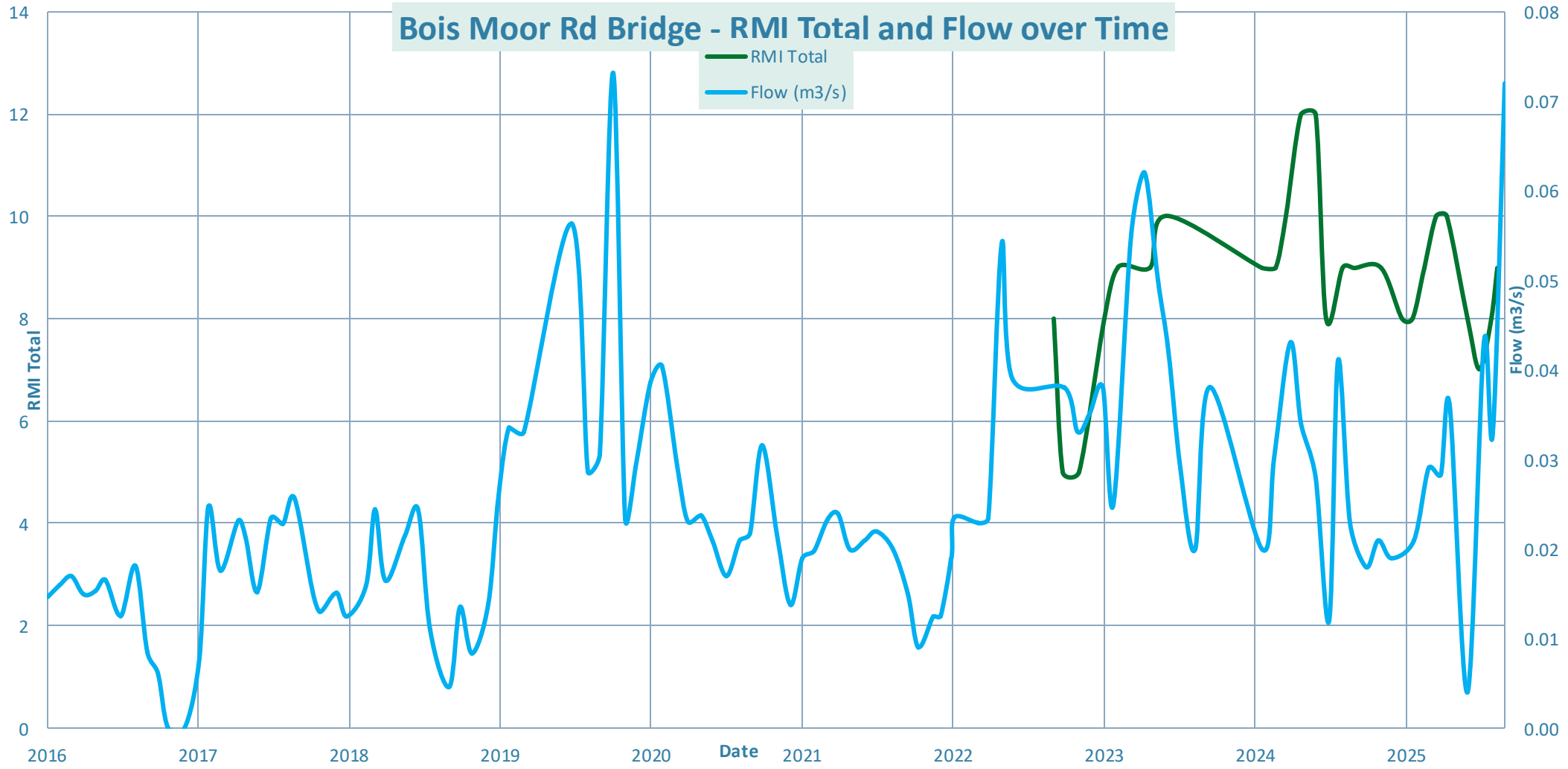
Bois Moor Road Bridge

As a headwater site, flow variation displays a strong correlation with Riverfly score

Link between high temperatures and lower flows this summer and dip in observed Extended Riverfly scores



Thank you to our flow monitoring team!



CHILTERNS CHALK STREAMS PROJECT

SmartRivers

National survey run by WildFish

Kick sampling for aquatic invertebrates

Laboratory analysis for species level ID

Calculation of stress indices

6 sites on the Chess monitored Spring and Autumn



Ordnance Survey Data © Crown copyright and database right 2025







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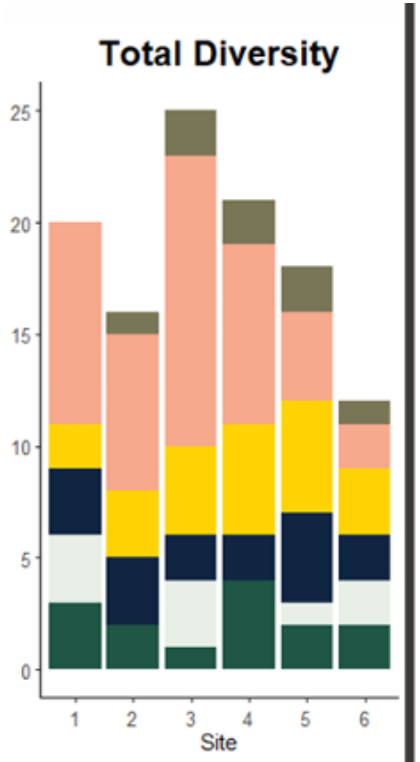
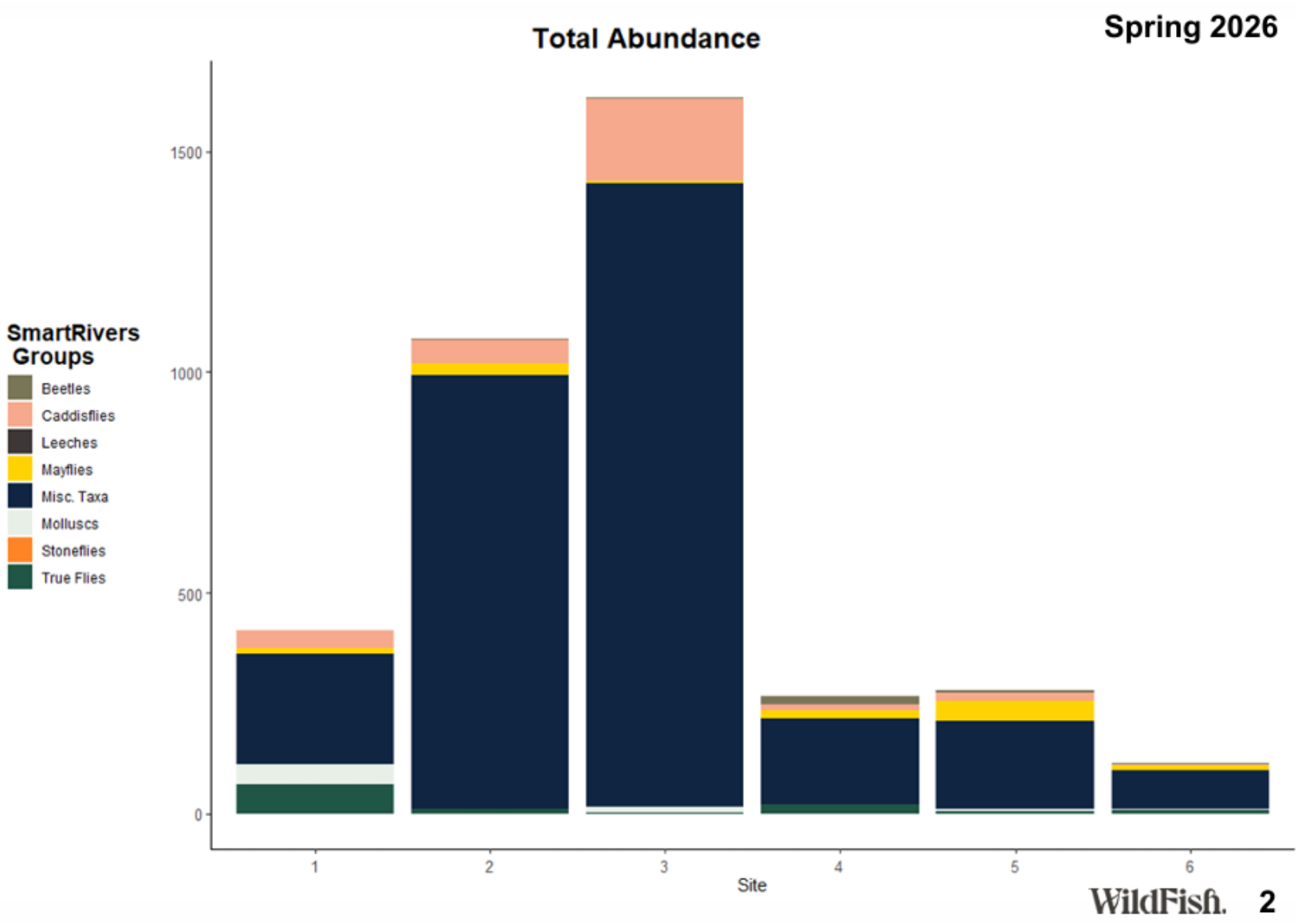
Diversity and abundance



Total Community

Site	Diversity	Abundance
1	20 (5)	414
2	16 (3)	1075
3	25 (5)	1622
4	21 (3)	265
5	18 (1)	278
6	12 (0)	114



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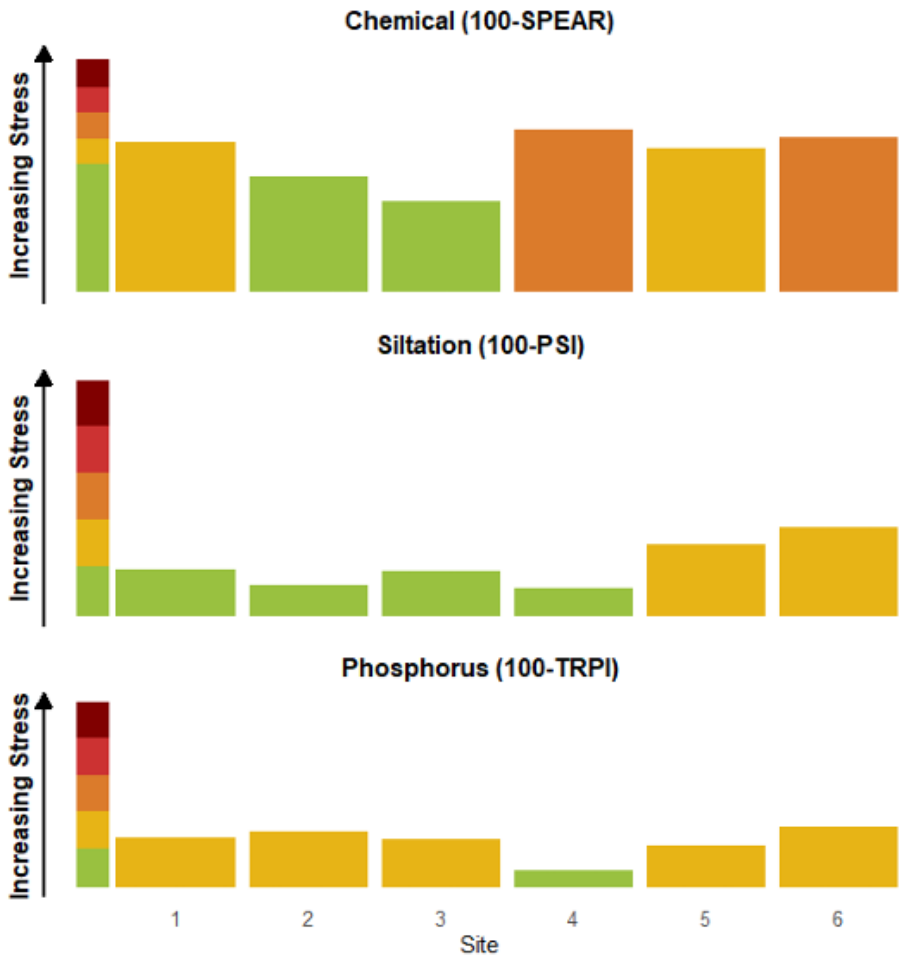
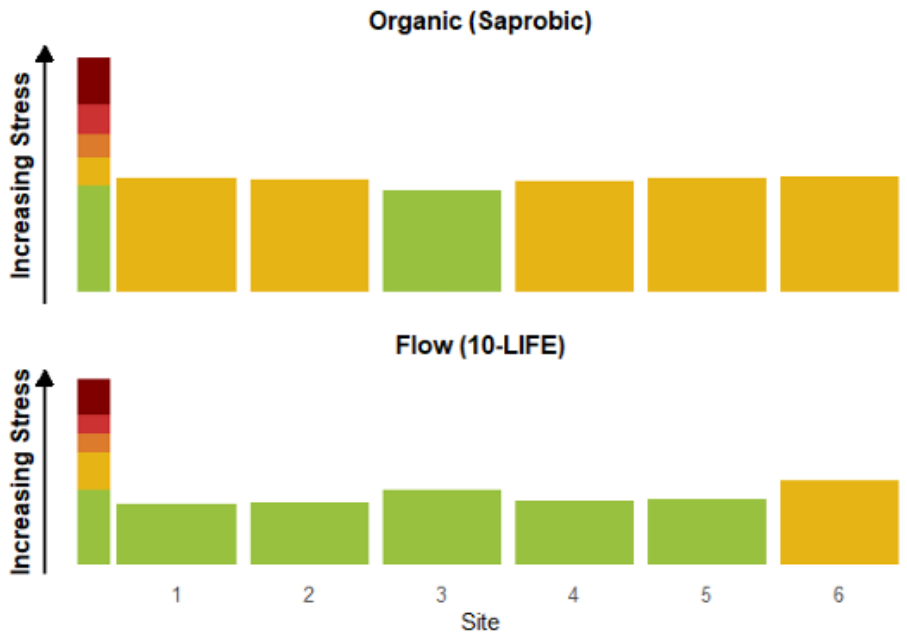
Ecological indicators of water quality

CHILTERNS CHALK STREAMS PROJECT

Spring 2026

Water Quality Scores



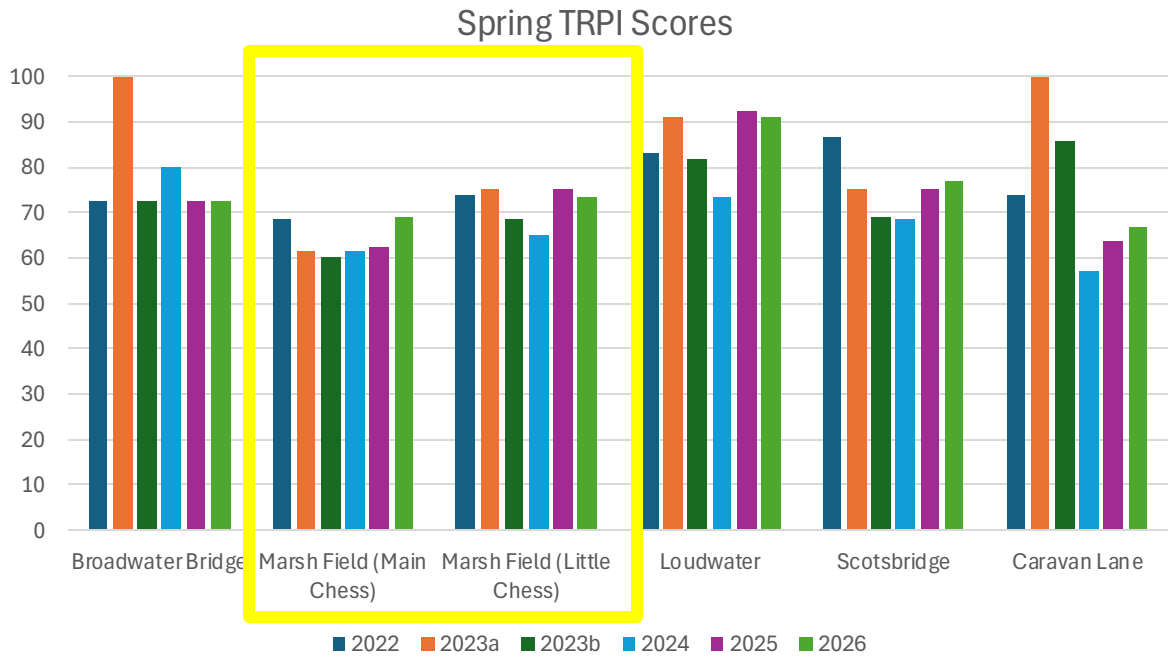


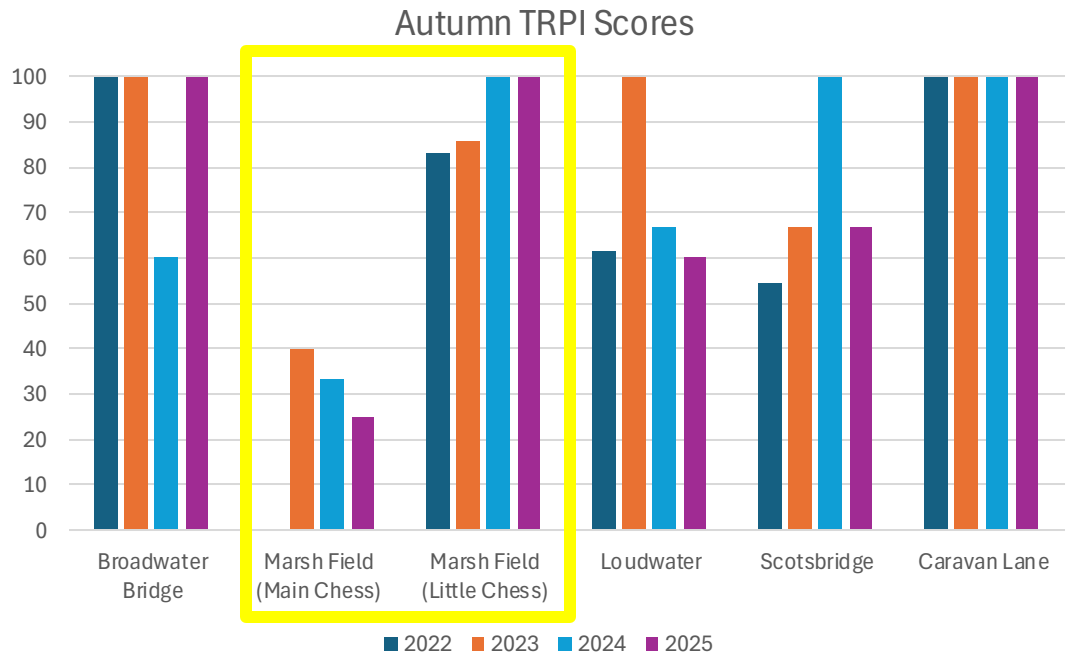
Water Quality Scores By Site

Water Quality Metric	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
SPEAR	35.78	50.60	61.51	30.70	38.93	33.95
Saprobic	1.95	1.92	1.74	1.89	1.95	1.97
PSI	80.56	86.67	80.85	88.24	70.00	62.50
LIFE	8.39	8.33	8.00	8.28	8.25	7.73
TRPI	72.73	69.23	73.33	90.91	76.92	66.67
BMWP	80.00	89.00	105.00	90.00	97.00	76.00
WHPT	85.60	83.70	105.30	91.90	88.90	69.30
WHPT NTAXA	15.00	13.00	17.00	15.00	15.00	12.00
WHPT ASPT	5.71	6.44	6.19	6.13	5.93	5.78
CCI	10.00	3.33	8.67	5.54	6.46	4.12

SmartRivers – Phosphorus impact

- 2024 was a particularly bad year for phosphorus impact on ecology – high rainfall = sewage outfalls and run-off
- We have been investigating impact of the phosphorus stripping installed at Chesham Sewage Treatment Works in December 2024
- Lagged ecological recovery

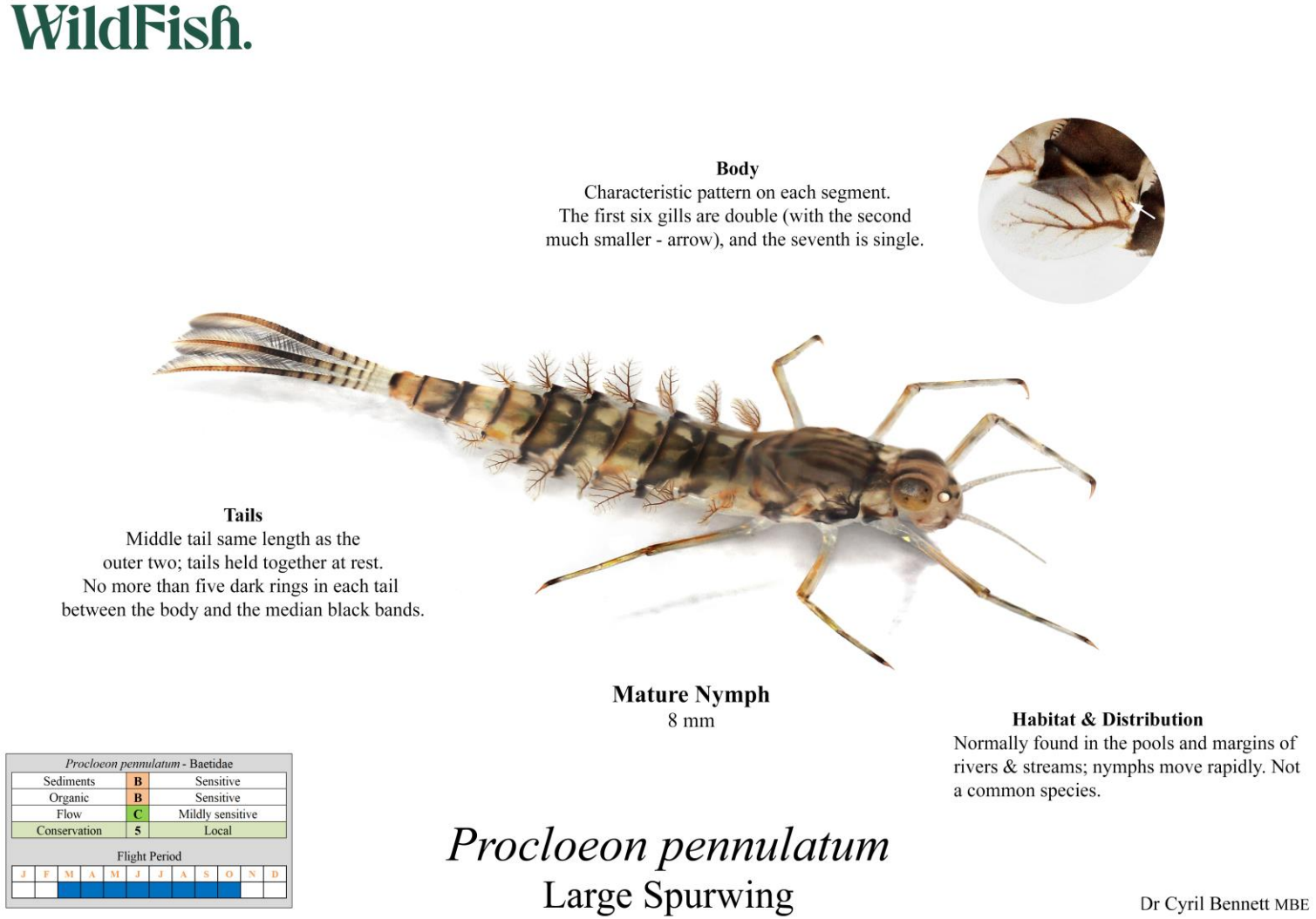




Under-recorded and rarities

May 2026- An under-recorded species of Black Fly (*Simulium ornatum* group), found at sites 1 and 4, with 789 records in the UK

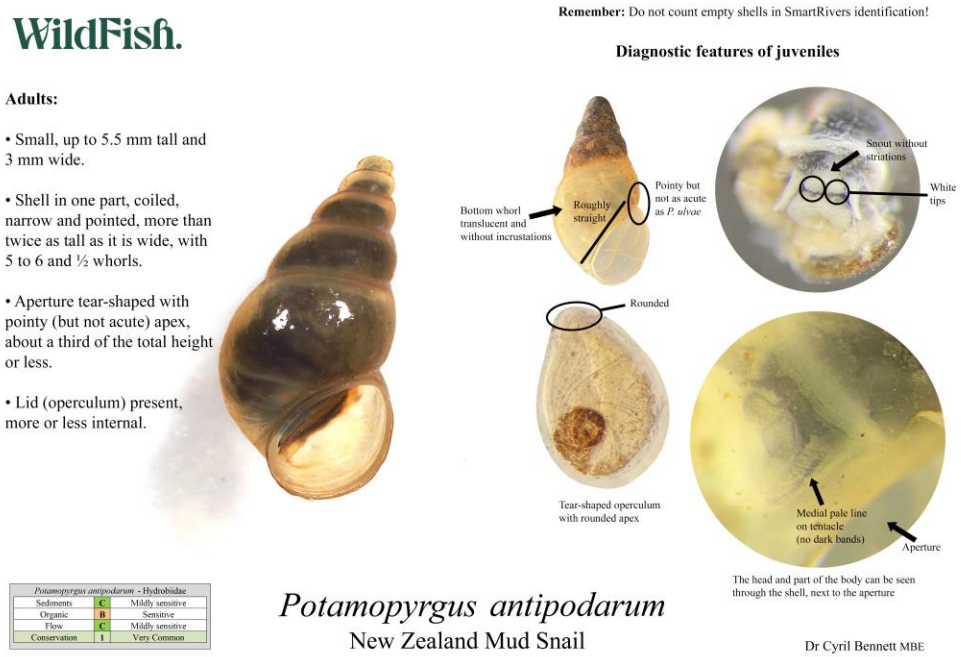
Oct 25 – An under-recorded species of Mayfly *Procloeon pennulatum* was found at site 3 (702 records in the UK). Some under-recorded species of flies were also found: *Tonnoiriella sp.* (site 3, 76 records), *Dixa nebulosa* (sites 1 and 3, 299 records)



Identifying cryptic invasives

The New Zealand Mud Snail *Potamopyrgus antipodarum* was recorded at site 1 in Spring 2026 and sites 2, 4, 5 and 6 in Autumn 2025





The North American flatworm *Girardia tigrina* was recorded at site 5 in Spring 2026

MoRPh - Modular River Physical Survey

National cit sci scheme run by Cartographer, developed by QMUL with the Chess an early trial

Bankside visual survey conducted in pairs/groups

Records river habitat diversity and quality

CCSP has established MoRPh groups on 6 rivers to monitor restorations



MoRPh River Survey (ver 15)

Sheet 3 - BANK FACE AND CHANNEL MARGIN MEASUREMENTS

RECORD WHAT YOU SEE NOT WHAT YOU KNOW

MEASUREMENT CATEGORY	MEASUREMENT TYPE		CODE	LB	RB	ABUNDANCE LB	ABUNDANCE RB	NOTES
3.1 BANK FACE - PROFILE				LB	RB	LB	RB	
Bank face - Profile	Natural / artificial bank profile	DOMINANT TYPE *(V, Vo, Vu, Vt, St, Gt, Cm, Rs, Ts, Em, Sm, Pc)*	*Bank profile type*			A / T / P / E	A / T / P / E	**SUB-DOMINANT TYPE** ONLY RECORD if it occupies > 20% of the bank length
		SUB-DOMINANT TYPE (see **(i)**)	*Bank profile type*			A / P / E	A / P / E	
3.2 BANK FACE - MATERIALS				LB	RB			**WHICH PART OF THE BANK IS REINFORCED?** A = absent T = mainly the top B = mainly the bottom W = Whole bank face
Bank face - Natural materials	Bank face sediment *(AR, BE, BO, CO, GP, SA, SI, CL, OR, PE, EA, NV)*		*Sediment size (top 2/3)*			LB	RB	
			Sediment size (bottom 1/3)					
Bank face - Reinforcement	Which part of the bank is reinforced? **(NOTE SPECIFIC CODES IN BOX (ii))**					A / T / B / W	A / T / B / W	
	How extensive is the reinforcement horizontally along the module?					A / T / P / E	A / T / P / E	
	Bank reinforce-ment	DOMINANT TYPE *(CC, CB, BR, SP, WP, BW, RR, GA, WS, RE, BC, WO)*	*Reinforcement type*					**SUB-DOMINANT TYPE** ONLY RECORD if it occupies > 20% reinforced area
		SUB-DOMINANT TYPE (see **(iii)**)	*Reinforcement type*					
3.3 BANK FACE / CHANNEL MARGIN - FEATURES				LB	RB	LB	RB	
Natural physical features	Bare / unvegetated side bar (< 50% vegetation cover)		*Sediment size*			A / T / P / E	A / T / P / E	**ABUNDANCE CODES** A/T/P/E abundance codes on sheet 3 refer to **proportion of bank length** occupied by feature, APART FROM '*Terrestrial vegetation on bank face*' and '*Non-native invasive plant species*' in section 3.4, which refer to **proportion of bank face area**: A = 0%, T = < 5%,
	Vegetated side bar (>50% vegetation cover)		*Sediment size*			A / T / P / E	A / T / P / E	
	Berm (if unsure whether berm/bench record as berm)					A / T / P / E	A / T / P / E	
	Bench (if unsure whether berm/bench record as berm)					A / T / P / E	A / T / P / E	
	Stable cliff (> 0.5 m)					A / T / P / E	A / T / P / E	
	Eroding cliff (> 0.5m)					A / T / P / E	A / T / P / E	
	Toe					A / T / P / E	A / T / P / E	
	Nest holes or animal burrows					A / T / P / E	A / T / P / E	
	Marginal backwater					A / T / P / E	A / T / P / E	
	Tributary/distributary junction: RECORD AS COUNT							
Artificial physical features	Pipes / outfalls (if appear potentially functional): RECORD AS COUNT							**Maj** (Major) = >20% channel width; **Int** (Intermediate) = 10-20% width; **Min** (Minor) = <10% width
	Jetty					Maj / Int / Min	Maj / Int / Min	
	Deflector					Maj / Int / Min	Maj / Int / Min	
	Other: INSERT FEATURE NAME					Maj / Int / Min	Maj / Int / Min	

Chess MORPH Group

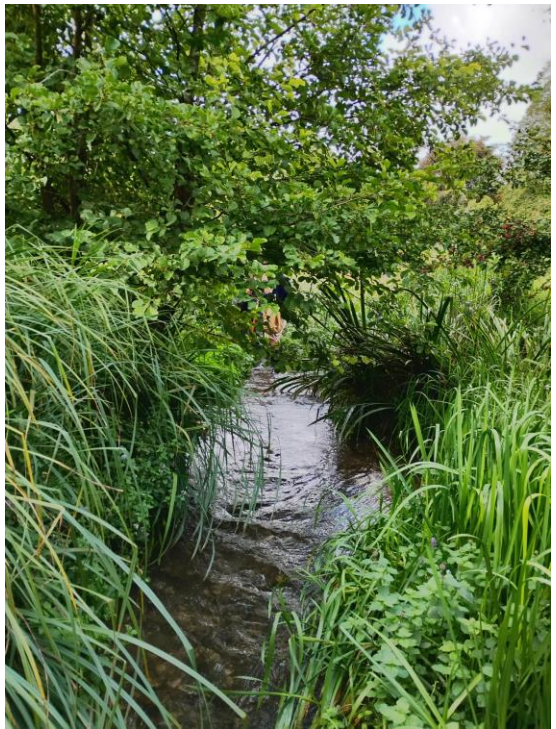
~15 active volunteers
10 projects monitored
Coordinated by Anthony Howe







THANK YOU ALL!!!

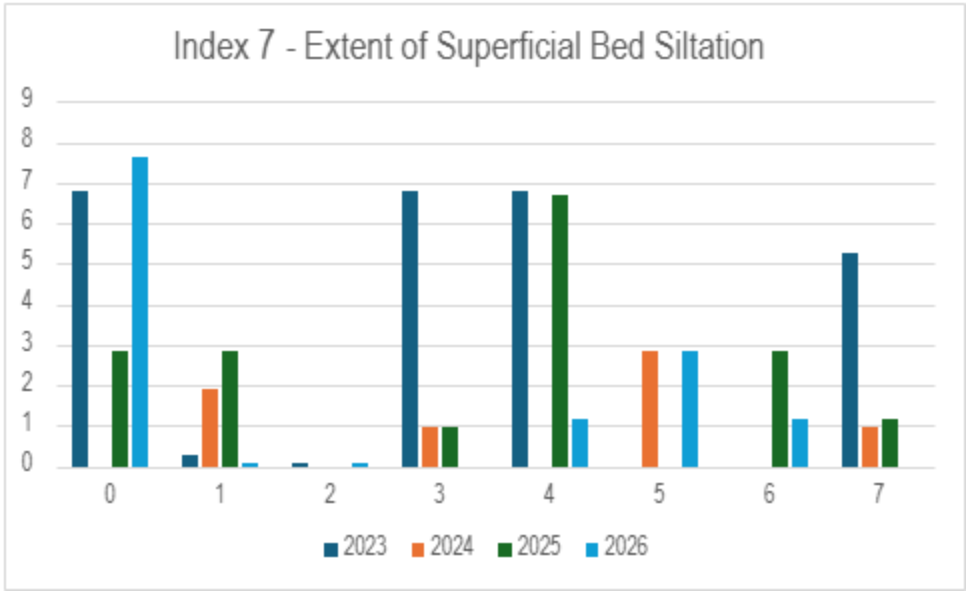




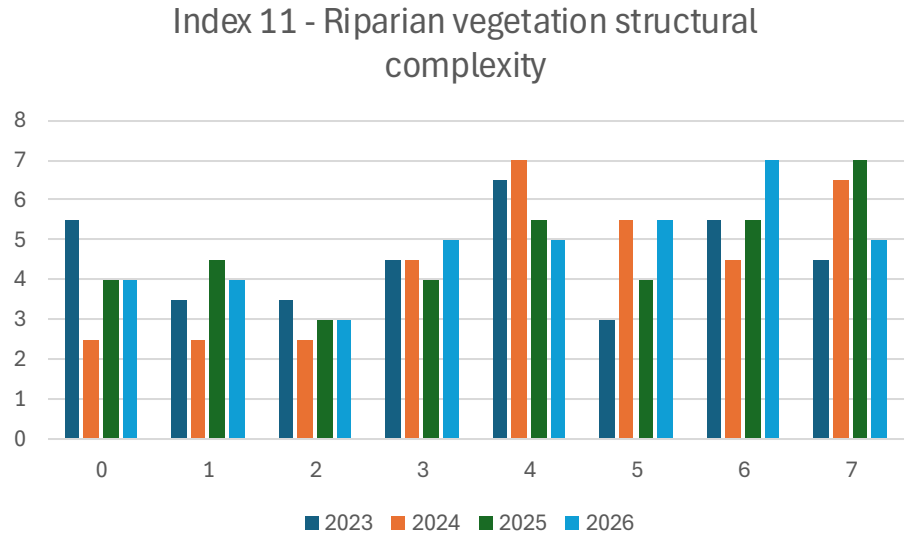
CHILTERNS CHALK STREAMS PROJECT

MoRPh Case study – Blackwell Hall riparian fencing

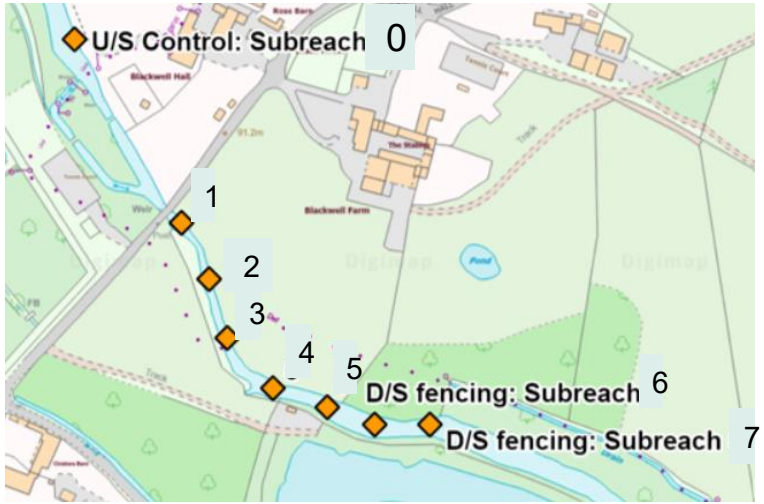
Decrease in siltation index from a mean average of 2.75 pre-project in 2023, to 0.76 in 2026



Increase in average mean score of riparian vegetation structural complexity from 4.42 in 2023 to 4.93 in 2026



But there is variation between modules … signs of plateau in vegetation diversity in middle modules and increase in silt



CHILTERNS CHALK STREAMS PROJECT

Site 5

2023 2024 2025 2026

Mid-point







Upstream






Downstream







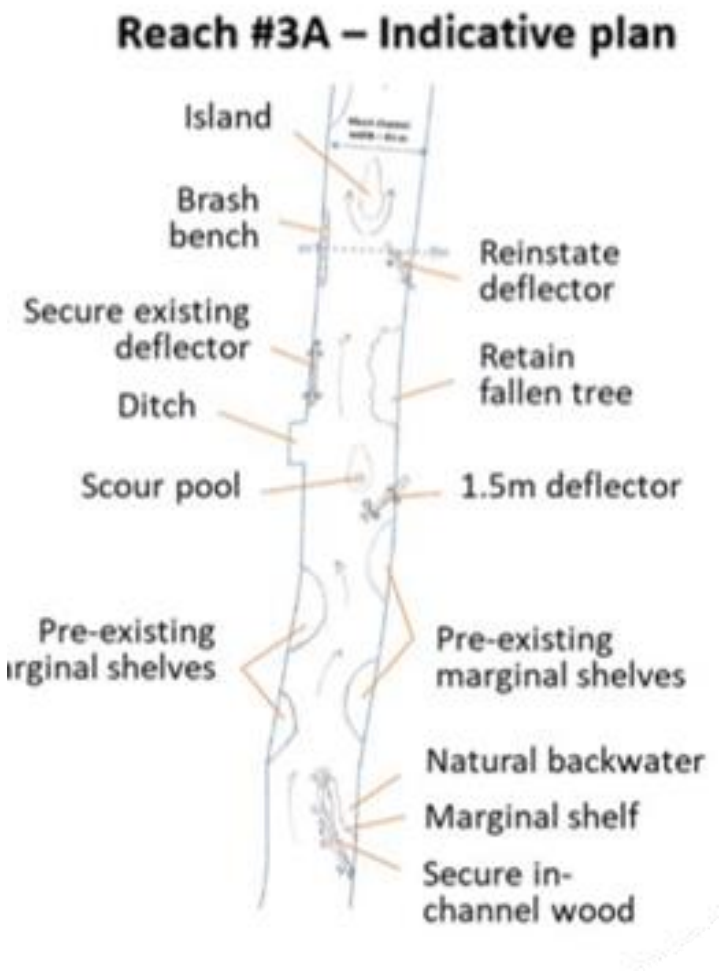
MoRPh informing dynamic restoration

We have seen significant improvements since the riparian fencing – reduced poaching, reduced siltation, increased vegetation diversity, improved flow

But in response to rapid vegetation growth, we have now worked with the farmer to implement occasional grazing to prevent succession



MoRPh case study -Restore Hope Latimer Restoration



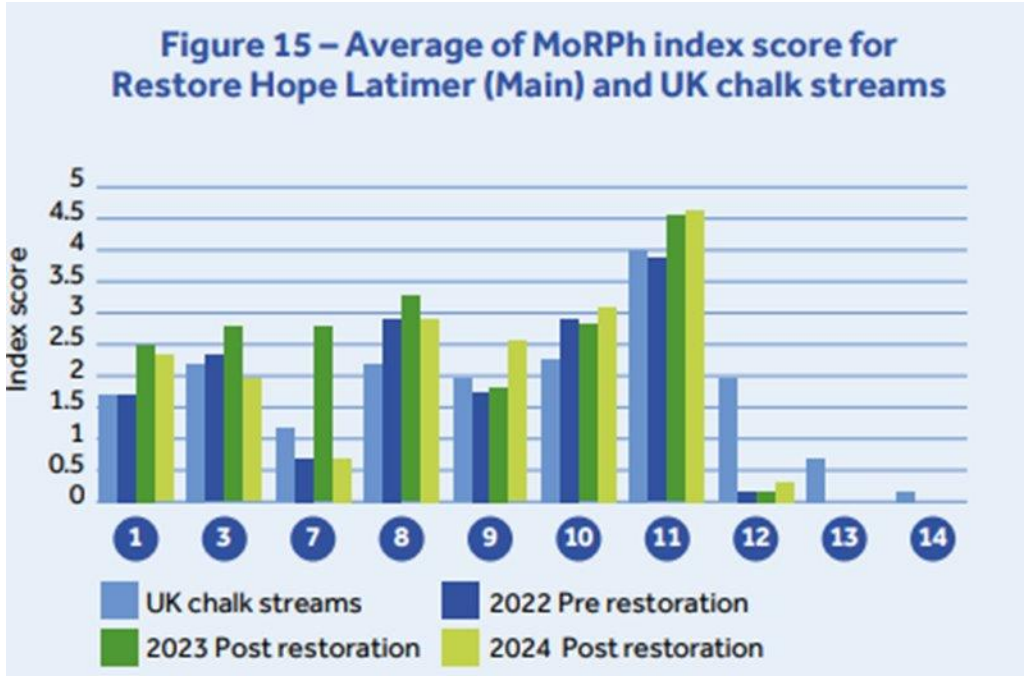
Restoration on main channel at Restore Hope completed in 2023

Volunteers from Chilterns Society and corporate volunteers helped construct berms and deflectors

Aim to improve flow and habitat diversity

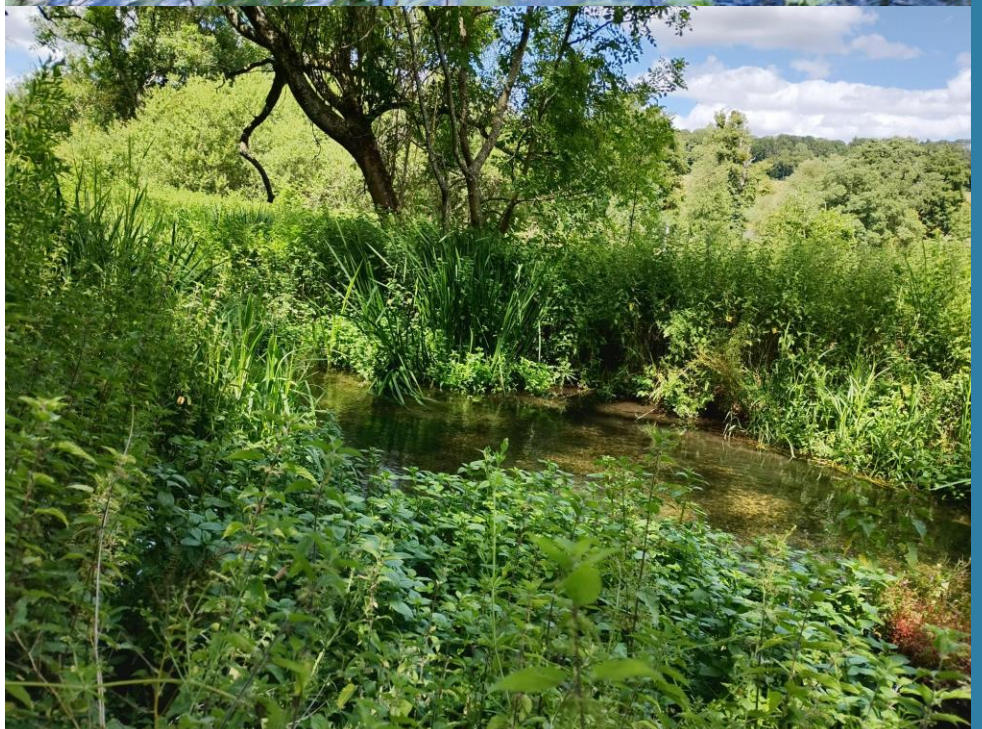


Restore Hope Latimer MoRPh results



1. Number of flow types
3. Number of bed material types
7. Extent of bed siltation
8. Channel physical habitat complexity
9. Number of aquatic vegetation morphotypes
10. Riparian physical habitat complexity
11. Riparian vegetation complexity
12. Degree of human pressure imposed by land cover on the bank tops
13. Channel reinforcement
14. Extent of non-native invasive plants





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Chilterns National Landscape

Restoration in progress!

Restoration currently underway on Flaunden Brook and Chess between Latimer and Chenies
Involves deculverting, rewiggling, channel creation, and deflectors

Pre-project surveys show current poor state of Flaunden Brook -
Low Channel physical habitat complexity score (0.417)
Low Riparian Physical Habitat Complexity Score (1.667)
Low number of flow types (1)



CHILTERNS CHALK STREAMS PROJECT

Chilterns National Landscape

THANK YOU ALL FOR YOUR AMAZING WORK!

Citizen science:

- Makes an invaluable contribution to our understanding of ecology in the River Chess
- Informs river restoration and projects to improve water quality

What next?

- Continuing to build our knowledge
- Working with partners to best use our data
- What are your ideas?



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