



Cam Brook and Midford Brook Riverfly Monitoring Summary Report

October 2024



Version history

Revision	Date	Description	Author(s)	Reviewer(s)	Approval
0.0	September 2024	Draft	JG	SH	SH
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Executive summary

Bristol Avon Rivers Trust secured funding from the Nineveh Charitable Trust and the Danielle Trust to carry out SmartRivers macro-invertebrate monitoring on the Cam Brook in Spring and Autumn 2024. SmartRivers is a scheme spearheaded by WildFish. It is a water quality monitoring project using macro-invertebrate sampling to collect species level data that can be analysed to learn more about the pollutants that stress our rivers. BART collected macro-invertebrate samples at five sites on the Cam Brook in Spring and Autumn 2024. This report covers the findings of the macro-invertebrate surveys.

BART is the Bristol Avon Riverfly hub for the Riverfly Monitoring Initiative (RMI). The Riverfly Monitoring Initiative uses citizen science to get people out and about on their local river, enjoying the natural environment and sampling for riverflies. The scheme is supported by the Riverfly Partnership and more info can be found on their website here: <http://www.riverflies.org/rp-riverfly-monitoring-initiative>.

BART volunteers have two active sites on the Cam Brook – at Midford (registered in 2023) and at Dunkerton (registered in 2022) and one site on the Midford Brook – at Cattle Crossing (registered in 2015). This report covers the findings of the Cam Brook and Midford Brook RMI surveys.

Figure 1 below shows the locations of the SmartRivers and RMI sites on the Cam and Midford brooks.



Figure 1 – Map of SmartRivers and RMI sites on the Cam and Midford brooks

Findings

Cam 2024 SmartRivers Overview Table

Site no.	Site Name	NGR	BMWP		Pesticides (SPEAR)		Nutrient "P" (TRPI)		Organic (Saprobic value)		Siltation (PSI)		Flow (LIFE)	
			Spr	Aut	Spr	Aut	Spr	Aut	Spr	Aut	Spr	Aut	Spr	Aut
1	Cam at Cameley Lane	ST 60259 57457	119	116	UI	SI	UI	UI	SI (1.86)	SI (1.96)	UI	SI	UI	SI
2	Cam at DS Paulton STW	ST 65683 57625	87	70	MI	I	MI	SI	MI (2.46)**	MI (2.34)**	MI	I	SI	MI
3	Cam at Stoneage Lane	ST 69641 58515	59	89	SI	SI	-	SI	UI (1.35)	UI (1.79)	SI	SI	UI	SI
4	Cam at Bath Hill, Combe Hay	ST 72841 59622	99	95	SI	I	UI	SI	UI (1.63)	SI (1.97)	UI	I	UI	SI
5	Cam at Midford	ST 75818 60543	76*	145	MI*	SI	UI*	SI	UI*(1.66)	UI (1.77)	SI*	SI	SI*	SI

Table 1 – Cam SmartRivers Overview

*High flows at Site 1 – Midford during Spring sampling resulted in poor quality data

** Experts at WildFish state that SmartRivers saprobic scores above 2 should be flagged as problematic

Acronym	Rating
HI	Heavily Impacted
I	Impacted
MI	Moderately Impacted
SI	Slightly Impacted
UI	Unimpacted

Table 2 – Pressure Ratings Key

Macro-invertebrate assemblages

The macro-invertebrate surveys found a variety of taxa at the five sites including cased caddisflies, caseless caddisflies, stoneflies, mayflies, beetles, fly larvae, freshwater shrimps and worms. The diversity of macro-invertebrates found varied considerably between sites. The Autumn sample at the most downstream site – at Midford, where BART have undertaken river restoration works in the past, had the highest scores for all the biotic indices – BMWP, ASPT, WHPT and Number of Scoring Taxa (NST). Spring results for the Midford site were much lower but high flows at the Midford site during Spring sampling resulted in poor quality data and results should be treated with caution. The sites at Stoneage Lane (near Camerton) and DS Paulton STW had the lowest scores for most of the biotic indices.

BMWP is a procedure for measuring water quality using species of macro-invertebrates as biological indicators in which the method is based on the principle that different aquatic invertebrates have different tolerances to pollutants. The high BMWP score in Autumn 2024 at the Midford site indicated that the water quality here can support a good diversity of macro-invertebrate taxa. The habitat availability at this site is also excellent, following BART's river restoration works, with riffle, run and pool habitats present as well as instream water crowfoot (*ranunculus sp*) and a variety of different substrate types.

Biotic indices at Cameley Lane were also high and indicated that the water quality at the top of the brook can support a good diversity of macro-invertebrates. The low BMWP scores and other biotic indices at Stoneage Lane, near Camerton (Spring) and DS Paulton STW (Autumn) indicate that the water quality in these locations cannot support a good diversity of macro-invertebrates.

The SmartRivers database pressure analysis undertaken by WildFish looked at the macro-invertebrate communities found in each of the surveys and calculated which pressures were impacting most on each of the sites. The Cameley Lane and Stoneage Lane sites scored unimpacted or slightly impacted for all of the pressures – suggesting that these pressures are not significantly restricting the macro-invertebrates at these sites. The stoneage lane site is potentially more impacted by habitat availability – this site was located in a very straight stretch of the brook with 100% cover of overlying silt. River restoration works to improve the habitat in this location is recommended.

The Midford site Spring results should be discounted due to the high flows impacting reliability. The Autumn sample scored unimpacted or slightly impacted for all the pressures, again supporting the comment that conditions are good at this site.

The Cam at Bath Hill, Combe Hay scored slightly impacted or unimpacted for all pressures apart from the Autumn scores for siltation and pesticides which both scored impacted. This suggests that there are seasonal pressures on this section of watercourse, possibly as a result of run off from the agricultural land uses upstream. Walkover surveys undertaken by BART in 2021 identified large, sloped, bare arable fields with small buffer zones immediately upstream of Bath Hill. Following rain fall events these fields are likely to result in significant diffuse run off entering the brook.

The DS Paulton STW site scored moderately impacted or impacted for all pressures apart from flow (slightly impacted in Spring) and nutrients (slightly impacted in Autumn). This suggests that the macro-invertebrates at the DS Paulton STW site are restricted due to all the pressures recorded. The very high saprobic scores – 2.46 and 2.34 at this site suggests considerable water quality issues are present here. Experts at WildFish state that SmartRivers saprobic scores above 2 should be flagged as problematic. Following this investigation BART will feedback this information to Wessex Water. High levels of overlying silt were recorded at the time of sampling at the DS Paulton STW site – 100% of the site had a thick covering of silt. Excessive sediment caused by anthropogenic factors is detrimental to the water quality and ecology of a watercourse, including fish and invertebrates. Impacts on macro-invertebrates include the clogging of gills and the destruction of suitable habitats. River restoration works to improve the habitat in this location, pinch the channel, increase flow diversity and reduce overlying silt is recommended.

Riverfly Monitoring Initiative Findings

Riverfly Monitoring Initiative (RMI) Overview Table

Site Name	Grid Reference	Average RMI Riverfly Score	Trigger Level Breaches
Midford Brook at Old Cattle Crossing	ST 76126 60836	13.5	0
Cam at Dunkerton	ST 70750 59400	10.4	2
Cam at Midford	ST 75818 60543	11.3	0

Table 3 – RMI Overview Table

Riverfly total scores at the Cam at Dunkerton site ranged between 6 and 13. The vast majority of samples scored between 9 and 12 with no clear trend over time (the site was monitored regularly between July 2022 and present day). Two samples fell below the trigger level of 7 (6 scored in August 2022 and a 5 scored in November 2022). These low samples could have been the result of the drought conditions of Summer 2022, known to have had an impact on macro-invertebrate abundances throughout the catchment. These results were reported to the Environment Agency to inform their drought investigations.

All of the eight RMI groups have been recorded at the Dunkerton site. Shrimps and Olives were the most abundant in the samples. Flat bodied mayflies were the least abundant – recorded in four of the samples.

The RMI data suggests conditions at the site are able to support a good diversity of Riverfly groups. The low scores in 2022 suggests that the ecology at the site is vulnerable to low flow conditions.

Riverfly total scores at the Cam at Midford site ranged between 10 and 12 (the site was monitored ten times between July 2023 and present day).

All of the eight RMI groups have been recorded at seven out of the ten samples taken at the Midford site. Flat bodied mayflies are missing from three of the samples. The gaps in data in Winter of 23/24 are likely to be the result of high flow conditions in the catchment at this time. The RMI data suggests conditions at the site are able to support a good diversity of Riverfly groups.

Riverfly total scores at the Midford Brook site at Old Cattle Crossing ranged between 9 and 18 with the highest scores generally recorded in the summer and the lowest scores in the winter. The vast majority of samples scored between 12 and 15 with no clear trend over time (the site was monitored regularly between 2015 and 2022). No samples fell below the trigger level of 7.

All of the eight RMI groups have been recorded at the Midford Brook site with Cased Caddisflies being the most abundant of the eight RMI groups. Stoneflies were the least abundant of the RMI groups. The RMI data suggests conditions at the site are able to support a good diversity of Riverfly groups.

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1. Introduction

1.1 Riverfly Monitoring Overview

Bristol Avon Rivers Trust secured funding from the Nineveh Charitable Trust and the Danielle Trust to carry out SmartRivers macro-invertebrate monitoring on the Cam Brook in Spring and Autumn 2024. SmartRivers is a scheme spearheaded by WildFish. It is a water quality monitoring project using macro-invertebrate sampling to collect species level data that can be analysed to learn more about the pollutants that stress our rivers.

The purpose of the SmartRivers monitoring was to establish a baseline data set of the macro-invertebrate communities present in the brook and to identify the main pressures impacting on the different sections of the watercourse. There is also the potential to monitor any changes to these macro-invertebrate communities over time should further funding become available. BART collected macro-invertebrate samples at five sites on the Cam Brook in Spring and Autumn 2024. This report covers the findings of the macro-invertebrate surveys.

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BART volunteers have two active sites on the Cam Brook – at Midford (registered in 2023) and at Dunkerton (registered in 2022) and one site on the Midford Brook – at Cattle Crossing (registered in 2015). This report covers the findings of the Cam Brook and Midford Brook RMI surveys.

1.2 Smart Rivers Macro-invertebrate Site Locations

The five sites were chosen at key locations on the Cam brook where BART were particularly interested in the macro-invertebrate assemblages to help understand the pressures on that stretch of river.

The location of each of the Cam brook sampling sites is included in Table 4 alongside the flow types recorded at each site. A representative photo of each macro-invertebrate site is included as Appendix 1. A map of the sampling locations is included as Figure 2.

Site number	Site Name	NGR	Flow Types
1	Cam at Cameley Lane	ST 60259 57457	Riffle, Run, Pool
2	Cam at DS Paulton STW	ST 65683 57625	Run
3	Cam at Stoneage Lane	ST 69641 58515	Riffle, Run, Pool
4	Cam at Bath Hill, Combe Hay	ST 72841 59622	Riffle, Run
5	At Midford	ST 75818 60543	Riffle, Run, Pool

Table 4 SmartRivers Site Locations

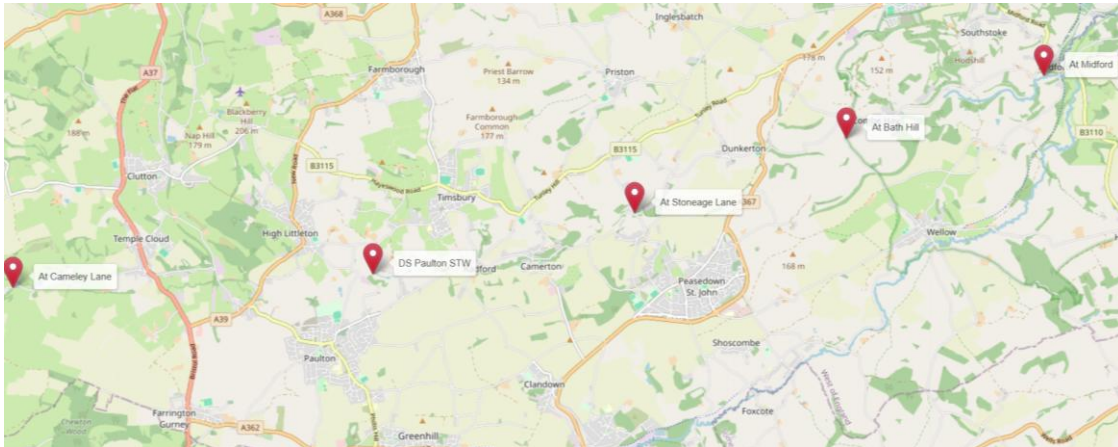


Figure 2 Map of SmartRivers Site Locations on the Cam brook

1.3 Riverfly Monitoring Initiative (RMI) Site Locations

BART volunteers have two sites on the Cam Brook – at Midford and at Dunkerton and one site on the Midford Brook - at Old Cattle Crossing. A map of the RMI sampling locations is included as Figure 3, the scale on this map is different to the map of SmartRivers locations to allow more detail of the river.

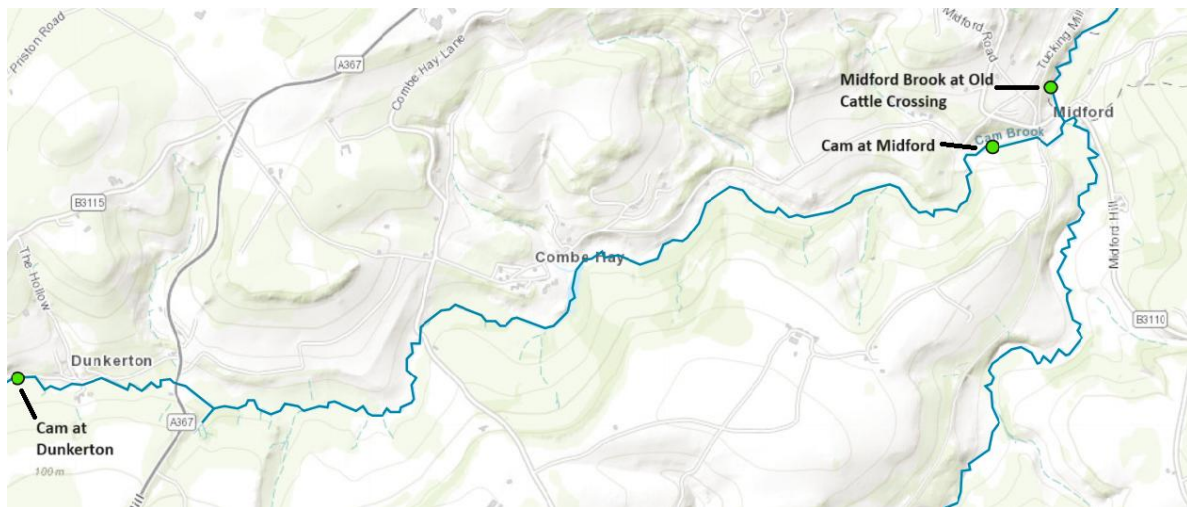


Figure 3 Map of RMI Site Locations on the Cam brook and Midford brook

2. Methodologies

2.1 SmartRivers Macro-invertebrate Sampling and Analysis Methodology

One macro-invertebrate kick sample was taken by BART's Aquatic Ecologist Jessy Grant at each of the SmartRivers survey locations during Spring 2024 and Autumn 2024. The standard method used at each of the macro-invertebrate sites involved a three-minute kick sample of each habitat in proportion to its occurrence, collecting the macro-invertebrates in a standard, long-handled pond net with a mesh size of 1mm. This was followed by a one-minute hand search of stones and other moveable objects. The sampling method conformed to: BS EN ISO 10870:2012 Water quality - Guidelines for the selection of sampling methods and devices for benthic macroinvertebrates in fresh waters (BSI 2012).

All samples were placed in labelled buckets and taken back to the BART laboratory for further analysis. On return to the laboratory each sample was stored in the fridge. Before analysis, fine silt was washed from the sample by rinsing it with tap water through a 500 μ m sieve. Larger aperture sieves were then used to split the sample into fractions to enable efficient sorting. Small amounts of the sample were then placed in white trays for analysis, until the entire sample had been processed. Macro-invertebrates were identified as far as taxonomically possible using standard procedures. Results were entered onto the WildFish SmartRivers Cartographer database for data analysis.

2.2 RMI Sampling and Analysis Methodology

The RMI monitoring methodology copies the standard sampling methodology outlined in section 2.1 above. The monitoring is carried out by a volunteer trained in RMI sampling. The same monitor samples the same site as regularly as possible – aiming for once a month.

Analysis is undertaken bankside following the method outlined in the RMI training. The sample is sorted in a white tray and macro-invertebrates from eight key groups are picked out and counted. The eight RMI groups are: stoneflies, flat bodied mayflies, burrowing mayflies, blue winged olive mayflies, olive mayflies, cased caddisflies, caseless caddisflies and shrimps.

Counts are entered by the volunteer onto the Riverfly Partnership's Cartographer database for each of the eight groups. Scores are automatically calculated for each site using the following categories:

1-9 = 1

10 - 99 = 2

100 – 999 = 3

1000+ = 4

An overall score for the sample is calculated by combining the scores for all the groups. This score is compared to a trigger level, set by the Environment Agency. Scores that fall below the trigger could be a sign that there is a pollution incident occurring and follow up is required.

3. Results

3.1 SmartRivers Results

3.1.1 Biotic Indices

Tables 5 and 6 below show the observed Biological Monitoring Working Party (BMWP), Average Score per Taxon (ASPT), Number of Scoring Taxa and WHPT biotic scores calculated for all the surveys. Further information about the biotic indices is included as Appendix 3.

Site No.	Site Name	BMWP		WHPT	
		Spr 24	Aut 24	Spr 24	Aut 24
1	Cam at Cameley Lane	119	116	146	132.5
2	Cam at DS Paulton STW	87	70	89	65.2
3	Cam at Stoneage Lane	59	89	63	93.5
4	Cam at Bath Hill, Combe Hay	99	95	108	101.9
5	At Midford *	76	145	92	149.6

Table 5: Observed biological indices scores from the Cam Brook SmartRivers sites

*High flows at Site 1 – Midford during Spring sampling resulted in poor quality data and results should be treated with caution

Site No.	Site Name	Number of Scoring Taxa		ASPT	
		Spr 24	Aut 24	Spr 24	Aut 24
1	Cam at Cameley Lane	19	23	6.26	5.04
2	Cam at DS Paulton STW	16	15	5.44	4.67
3	Cam at Stoneage Lane	11	16	5.36	5.56
4	Cam at Bath Hill, Combe Hay	16	17	6.19	5.59
5	At Midford	14	24	5.43	6.04

Table 6: Observed biological indices scores from the Cam brook SmartRivers sites.

The key for the BMWP indicative water quality categories used in Table 5 is included as Table 7 below.

BMWP Score Range	Water Quality Category	Interpretation
0 -10	Very Poor	Heavily Polluted
11 - 40	Poor	Polluted or impacted
41 - 70	Moderate	Moderately impacted
71 - 100	Good	Clean but slightly impacted
100 +	Very Good	Unpolluted / unimpacted

Table 7: BMWP score range, water quality category and interpretation. Source: www.researchgate.net

3.1.2 Pressure Ratings Results

Tables 8 and 9 below show the pressure ratings calculated for all samples, accessible on the WildFish Cartographer Site.

It should be noted that low diversity can affect the calculation of the more sensitive SmartRivers metrics - TRPI (phosphorus) and PSI (sediment). This could account for the no rating for Nutrient “P” at the Stoneage Lane site – this site had the lowest diversity of macro-invertebrates of all five sites.

Site No.	Site Name	Pesticides (SPEAR)		Nutrient “P” (TRPI)		Organic (Saprobic value)	
		Spr 24	Aut 24	Spr 24	Aut 24	Spr 24	Aut 24
1	At Midford *	MI	SI	UI	SI	UI (1.66)	UI (1.77)
2	Cam at Bath Hill, Combe Hay	SI	I	UI	SI	UI (1.63)	SI (1.97)
3	Cam at Stoneage Lane	SI	SI	-	SI	UI (1.35)	UI (1.79)
4	Cam at DS Paulton STW	MI	I	MI	SI	MI (2.46)	MI (2.34)
5	Cam at Cameley Lane	UI	SI	UI	UI	SI (1.86)	SI (1.96)

Table 8: Pressure ratings for the Cam brook SmartRivers sites.

*High flows at Site 1 – Midford during Spring sampling resulted in poor quality data and results should be treated with caution

Site No.	Site Name	Siltation (PSI)		Flow (LIFE)	
		Spr 24	Aut 24	Spr 24	Aut 24
1	At Midford	SI	SI	SI	SI
2	Cam at Bath Hill, Combe Hay	UI	I	UI	SI
3	Cam at Stoneage Lane	SI	SI	UI	SI
4	Cam at DS Paulton STW	MI	I	SI	MI
5	Cam at Cameley Lane	UI	SI	UI	SI

Table 9: Pressure ratings for the Cam brook SmartRivers sites.

The key for the pressure ratings categories used in the pressure ratings tables is included as Table 10 below.

Pressure Rating Acronym	Pressure Rating
HI	Heavily Impacted
I	Impacted
MI	Moderately Impacted
SI	Slightly Impacted
UI	Unimpacted

Table 10: Pressure ratings key

3.2 Riverfly Monitoring Initiative Results

Figures 4 to 6 below show the RMI total riverfly scores over time for each of the RMI sites on the Cam and Midford Brooks. The graphs are taken from BART’s Riverhub (<https://riverhub.co.uk/>). It should be noted that the trigger level set by the Environment Agency for each site is 7.

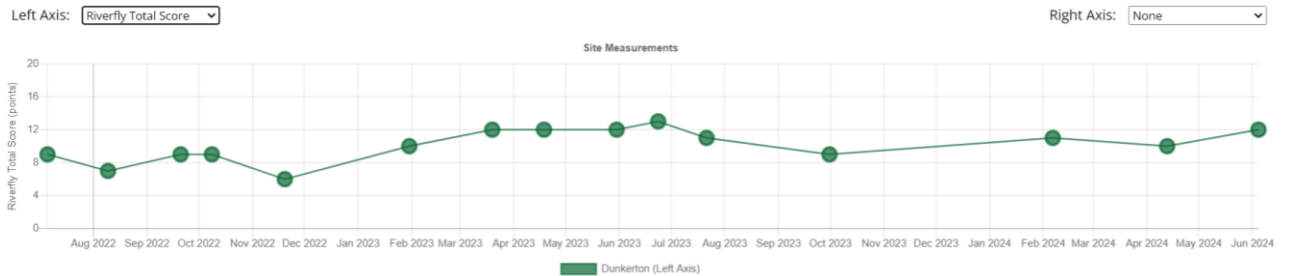


Figure 4 Cam at Dunkerton

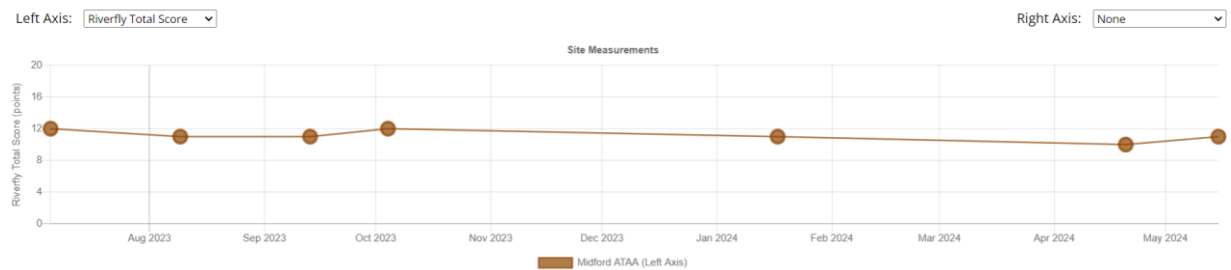


Figure 5 Cam at Midford



Figure 6 Midford Brook at Old Cattle Crossing

The graphs 7 to 9 below show the RMI total riverfly scores over time for each of the RMI sites on the Cam and Midford Brooks. The graphs are taken from the Riverfly Partnership’s Data Platform: [Riverfly Data](#)

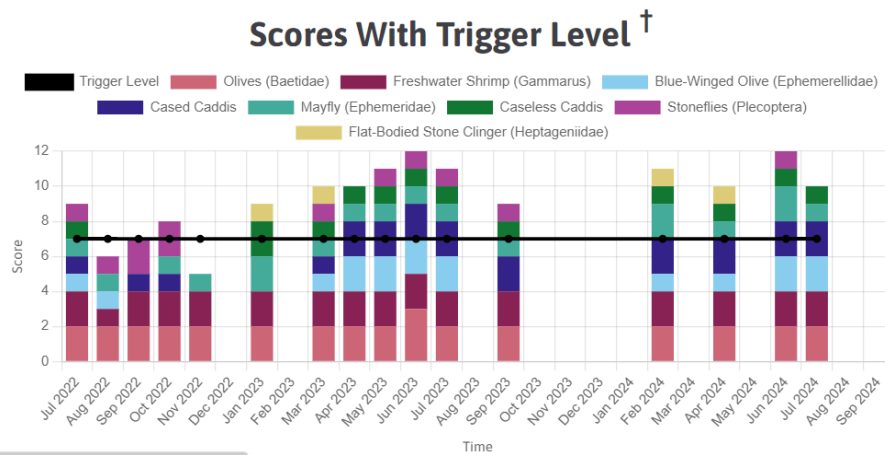


Figure 7 Cam at Dunkerton scores and taxon distribution

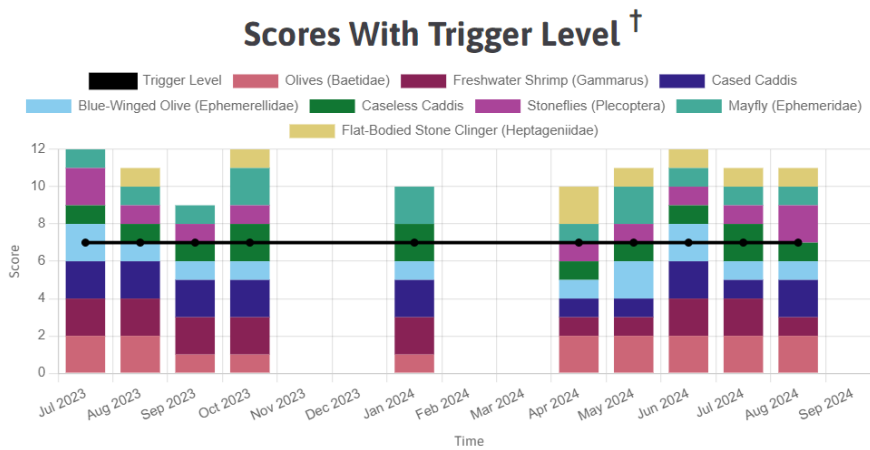


Figure 8 Cam at Midford scores and taxon distribution

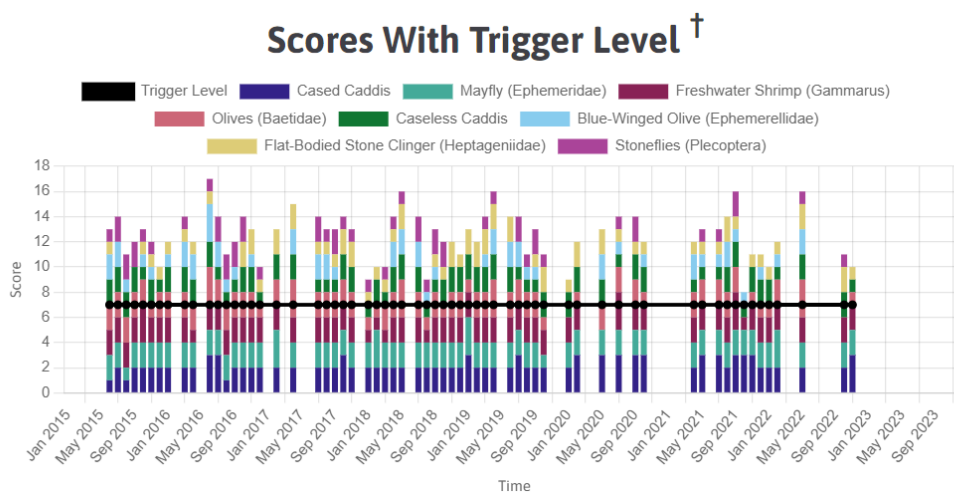


Figure 9 Midford Brook at Old Cattle Crossing scores and taxon distribution

4. Discussion

4.1 SmartRivers

The macro-invertebrate surveys found a variety of taxa at the five sites including cased caddisflies, caseless caddisflies, stoneflies, mayflies, beetles, fly larvae, freshwater shrimps and worms. The diversity of macro-invertebrates found varied considerably between sites. The Autumn sample at the most downstream site – at Midford, where BART have undertaken river restoration works in the past, had the highest scores for all the biotic indices – BMWP, ASPT, WHPT and Number of Scoring Taxa (NST). Spring results for the Midford site were much lower but high flows at the Midford site during Spring sampling resulted in poor quality data and results should be treated with caution. The sites at Stoneage Lane (near Camerton) and DS Paulton STW had the lowest scores for most of the biotic indices.

BMWP is a procedure for measuring water quality using species of macro-invertebrates as biological indicators in which the method is based on the principle that different aquatic invertebrates have different tolerances to pollutants. The high BMWP score in Autumn 2024 at the Midford site indicated that the water quality here can support a good diversity of macro-invertebrate taxa. The habitat availability at this site is also excellent, following BART's river restoration works, with riffle, run and pool habitats present as well as instream water crowfoot (*ranunculus sp*) and a variety of different substrate types.

Biotic indices at Cameley Lane were also high and indicated that the water quality at the top of the brook can support a good diversity of macro-invertebrates. The low BMWP scores and other biotic indices at Stoneage Lane, near Camerton (Spring) and DS Paulton STW (Autumn) indicate that the water quality in these locations cannot support a good diversity of macro-invertebrates.

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The Cam at Bath Hill, Combe Hay scored slightly impacted or unimpacted for all pressures apart from the Autumn scores for siltation and pesticides which both scored impacted. This suggests that there are seasonal pressures on this section of watercourse, possibly as a result of run off from the agricultural land uses upstream. Walkover surveys undertaken by BART in 2021 identified large, sloped, bare arable fields with small buffer zones immediately upstream of Bath Hill. Following rain fall events these fields are likely to result in significant diffuse run off entering the brook.

The DS Paulton STW site scored moderately impacted or impacted for all pressures apart from flow (slightly impacted in Spring) and nutrients (slightly impacted in Autumn). This suggests that the macro-invertebrates at the DS Paulton STW site are restricted due to all the pressures recorded. The very high saprobic scores – 2.46 and 2.34 at this site suggests considerable water quality issues are present here.

Experts at WildFish state that SmartRivers saprobic scores above 2 should be flagged as problematic. Following this investigation BART will feedback this information to Wessex Water. High levels of overlaying silt were recorded at the time of sampling at the DS Paulton STW site – 100% of the site had a thick covering of silt. Excessive sediment caused by anthropogenic factors is detrimental to the water quality and ecology of a watercourse, including fish and invertebrates. Impacts on macro-invertebrates include the clogging of gills and the destruction of suitable habitats. River restoration works to improve the habitat in this location, pinch the channel, increase flow diversity and reduce overlaying silt is recommended.

4.2 Riverfly Monitoring Initiative

Riverfly total scores at the Cam at Dunkerton site ranged between 6 and 13. The vast majority of samples scored between 9 and 12 with no clear trend over time (the site was monitored regularly between July 2022 and present day). Two samples fell below the trigger level of 7 (6 scored in August 2022 and a 5 scored in November 2022). These low samples could have been the result of the drought conditions of Summer 2022, known to have had an impact on macro-invertebrate abundances throughout the catchment. . These results were reported to the Environment Agency to inform their drought investigations.

All of the eight RMI groups have been recorded at the Dunkerton site. Shrimps and Olives were the most abundant in the samples. Flat bodied mayflies were the least abundant – recorded in four of the samples – as shown in figure 7.

The RMI data suggests conditions at the site are able to support a good diversity of Riverfly groups. The low scores in 2022 suggests that the ecology at the site is vulnerable to low flow conditions.

Riverfly total scores at the Cam at Midford site ranged between 10 and 12 (the site was monitored ten times between July 2023 and present day).

All of the eight RMI groups have been recorded at seven out of the ten samples taken at the Midford site. Flat bodied mayflies are missing from three of the samples. The gaps in data in Winter of 23/24 are likely to be the result of high flow conditions in the catchment at this time. The RMI data suggests conditions at the site are able to support a good diversity of Riverfly groups.

Riverfly total scores at the Midford Brook site at Old Cattle Crossing ranged between 9 and 18 with the highest scores generally recorded in the summer and the lowest scores in the winter. The vast majority of samples scored between 12 and 15 with no clear trend over time (the site was monitored regularly between 2015 and 2022). No samples fell below the trigger level of 7.

All of the eight RMI groups have been recorded at the Midford Brook site with Cased Caddisflies being the most abundant of the eight RMI groups. Stoneflies were the least abundant of the RMI groups. The RMI data suggests conditions at the site are able to support a good diversity of Riverfly groups.

5. References

BS EN ISO 10870:2012 Water quality - Guidelines for the selection of sampling methods and devices for benthic macroinvertebrates in fresh waters

Researchgate.net (2021) https://www.researchgate.net/figure/BMWP-Classes-Scores-Categories-and-Interpretation-of-the-Result_tbl1_326649205

RiverHub Data Platform 2024: <https://riverhub.co.uk/>

Riverfly Partnership Data Platform 2024: [Riverfly Data](#)

6. Appendices

Appendix 1 – SmartRivers Site photos (Spring 2024)



Site 1: Cam at Midford



Site 2: Cam at Bath Hill, Combe Hay



Site 3: Cam at Stoneage Lane



Site 4: Cam at DS Paulton STW



Site 5: Cam at Cameley Lane