

A wide-angle photograph of the River Eden flowing through a landscape. The river is in the foreground, with a grassy bank and some trees in the middle ground. The sky is blue with a few clouds.

RIVERFLY CENSUS RESULTS

A close-up photograph of the River Eden, showing the water flowing over rocks. The water is dark and rippling.

River Eden

www.salmon-trout.org
@SalmonTroutCons



Salmon & Trout
Conservation

KEEPING OUR WATERS WILD • EST 1903

The Riverfly Census was created to collect much needed high-resolution, scientifically robust data about the state of our rivers and the pressures facing them. We frequently talk about missing flylife and lack of fish compared to the 'good old days', but anecdotal evidence like this has little weight in environmental decision making.

“Without data you're just another person with an opinion”

W. Edwards Deming

River insects spend the majority of their lives in the water as nymphs, making them brilliant indicators of river health. Their continuous exposure to water makes examining them much more informative than spot chemical samples. Every invertebrate is unique, and each requires a specific set of conditions to thrive.

The Riverfly Census utilises the invertebrate assemblage: presence, absence and abundance of certain invertebrates, to indicate the types of stress our rivers are experiencing. The composition of the invertebrate community in the sample allows a biometric score to be calculated, which provides a surrogate, or direct scale, of physical chemical impact. Below are the biometrics used and the type of stress they indicate.

BIOMETRIC GLOSSARY

PSI

Proportion of Sediment-sensitive Invertebrates

A measure of stress caused by excess fine sediment on the invertebrate community

TRPI

Total Reactive Phosphorus Index

A relatively new metric developed to indicate pressure from phosphorus pollution

SPEAR

SPEcies At Risk

A measure to assess the impact of exposure to pesticides, herbicides and complex chemical toxicants on the invertebrate community

LIFE

Lotic-invertebrate Index for Flow Evaluation

A metric to assess the impact of flow related stress on invertebrate communities which live in flowing water

SI

Saprobic Index

A measure to indicate stress on the invertebrate community caused by organic pollution

CENSUS METHOD

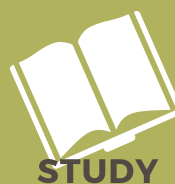
The Riverfly Census has spanned three years. It began in 2015, initially with 12 rivers across England. Multiple sample sites were carefully selected on each river.



Kick-sweep sampling was completed in spring and autumn to EA guidelines, at all sample sites. Sampling and species-level identification were carried out by professional external consultants, Aquascience Consultancy Ltd.



Species presence/absence data was inputted into Aquascience's biometric calculator to obtain scores against key stress types. The data was then evaluated in a whole catchment context to pinpoint likely suspects contributing to river deterioration.



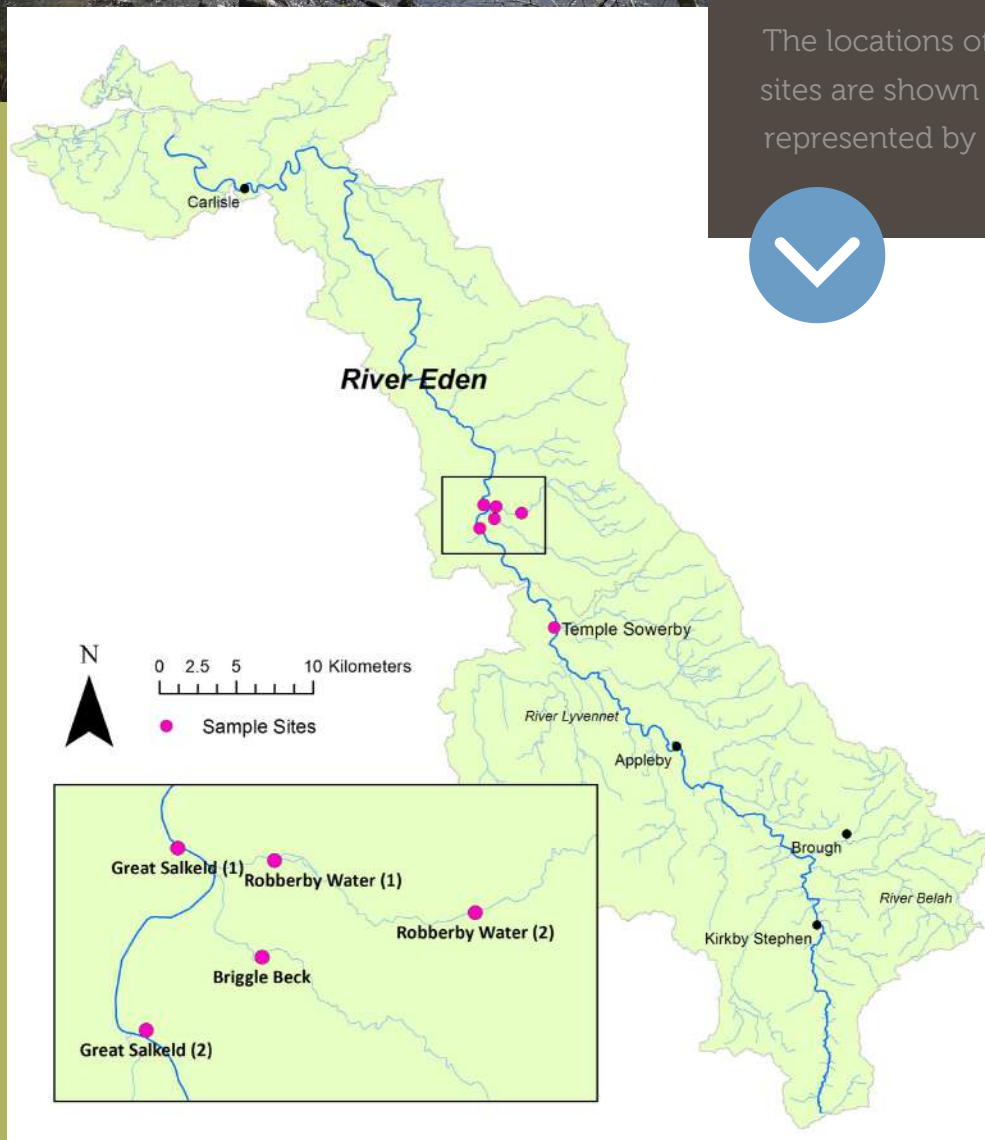
The data was compiled, and is being reported to stakeholders and policy makers, to improve management and conservation of our rivers.





Riverfly Census sampling on the Eden began in 2015 and continued for three years on six sites: Great Salkeld (1), Great Salkeld (2), Robberby Water (1), Robberby Water (2), Briggie Beck and Temple Sowerby.

The locations of our sample sites are shown on the map, represented by pink circles.



1

WHAT WE'VE FOUND

Great Salkeld (1)

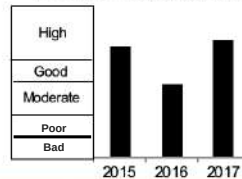
Due to unfavourable sampling conditions, this site was not sampled in autumn 2017.

A seasonal nutrient impact was indicated by the invertebrate community, with moderate TRPI scores occurring in autumn for the two years surveyed.

No moderate stress scores for sediment pressure were exhibited and no failures against the proposed WFD SPEAR standard (Beketov et al 2009) occurred during the survey.

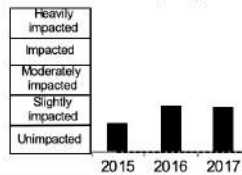
SPRING BIOMETRICS

Pesticide Rating (SPEAR)

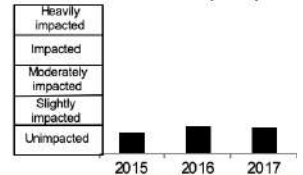


	2015	2016	2017
BMWP	159	144	184
ASPT	6.63	6.00	6.34
Annual mayfly sp. richness	6	5	-
Total Abundance	657	1168	852
EPT	20	17	25
CCI	8.86	9.04	-
LIFE	8.13	8.00	8.03
PSI	79.66	67.61	68.60
SPEAR	50.84	34.01	53.57
TRPI	85.71	81.25	82.61
Saprobic	1.74	1.96	1.73

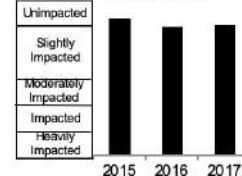
Siltation (PSI)



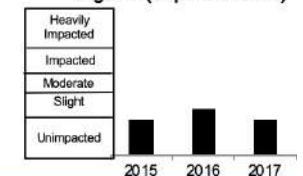
Nutrient 'P' (TRPI)



Flow (LIFE)

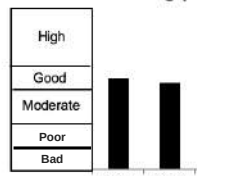


Organic (Saprobic value)



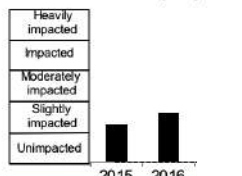
AUTUMN BIOMETRICS

Pesticide Rating (SPEAR)

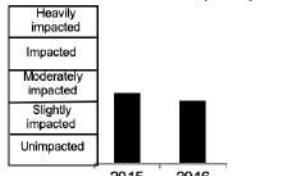


	2015	2016	2017
BMWP	122	144	-
ASPT	6.10	5.76	-
Annual mayfly sp. richness	6	5	-
Total Abundance	774	798	-
EPT	10	13	-
CCI	7.67	9.78	-
LIFE	8.10	7.75	-
PSI	75.00	67.74	-
SPEAR	39.30	37.64	-
TRPI	54.55	60.00	-
Saprobic	2.16	1.81	-

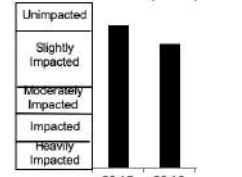
Siltation (PSI)



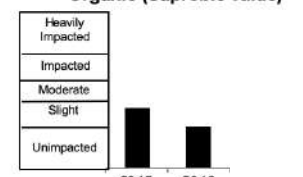
Nutrient 'P' (TRPI)



Flow (LIFE)



Organic (Saprobic value)



2

WHAT WE'VE FOUND

Great Salkeld (2)

Due to unfavourable sampling conditions, this site was not sampled in autumn 2017.

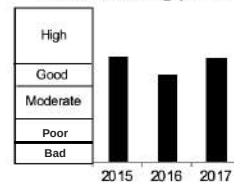
Nutrient stress was also indicated again in autumn, but this was less pronounced than the further downstream Great Salkeld site

No moderate stress scores from excess fine sediment was indicated at this site.

The SPEAR biometrics did not indicate any failure of the proposed WFD standard for chemicals.

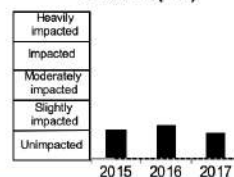
SPRING BIOMETRICS

Pesticide Rating (SPEAR)

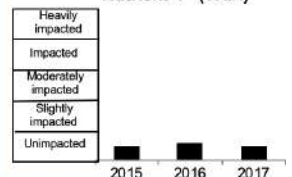


	2015	2016	2017
BMWP	140	148	139
ASPT	6.09	5.92	6.62
Annual mayfly sp. richness	6	8	-
Total Abundance	561	642	576
EPT	16	20	15
CCI	10.45	24.04	-
LIFE	8.32	8.09	8.55
PSI	80.00	77.61	81.82
SPEAR	47.55	39.32	46.83
TRPI	90.91	88.46	90.91
Saprobic	1.73	1.82	1.66

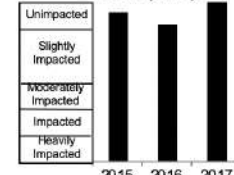
Siltation (PSI)



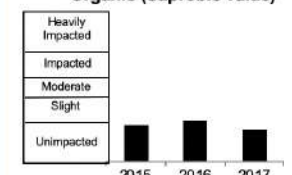
Nutrient 'P' (TRPI)



Flow (LIFE)

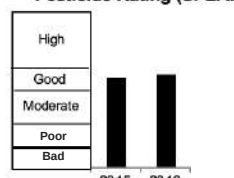


Organic (Saprobic value)



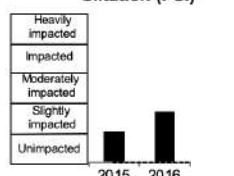
AUTUMN BIOMETRICS

Pesticide Rating (SPEAR)

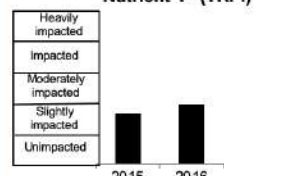


	2015	2016	2017
BMWP	130	157	-
ASPT	6.19	5.81	-
Annual mayfly sp. richness	6	8	-
Total Abundance	662	973	-
EPT	13	15	-
CCI	9.72	13.22	-
LIFE	8.17	7.75	-
PSI	79.63	65.75	-
SPEAR	40.40	41.97	-
TRPI	66.67	61.11	-
Saprobic	2.19	1.84	-

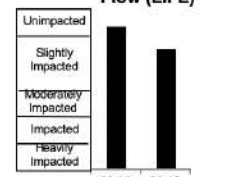
Siltation (PSI)



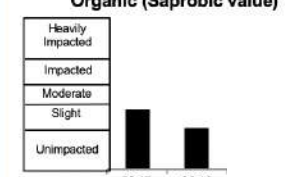
Nutrient 'P' (TRPI)



Flow (LIFE)



Organic (Saprobic value)



3

WHAT WE'VE FOUND

Robberby Water (1)

Overall, this site was indicated by the invertebrate community to be in healthy condition.

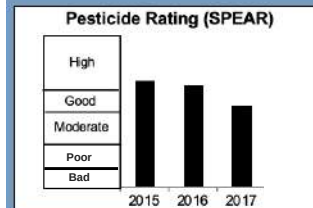
A borderline impacted nutrient stress signature was indicated in autumn 2015, but this was a singular occurrence.

Sediment stress was minimal with no concerning peaks.

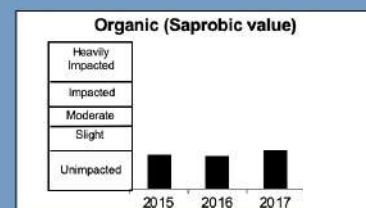
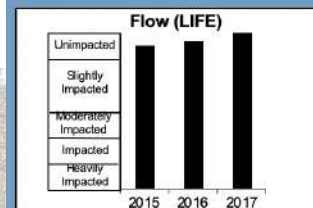
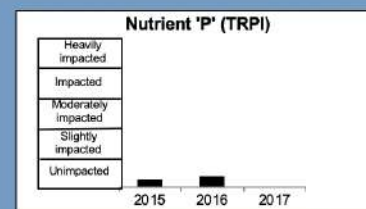
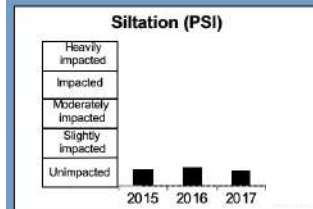
Chemical stress was not indicated, all SPEAR signatures passed the proposed WFD standard by Beketov et al. (2009).



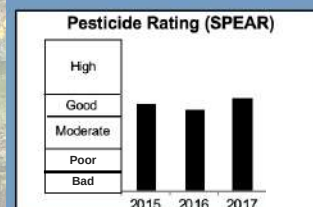
SPRING BIOMETRICS



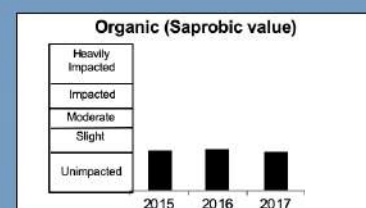
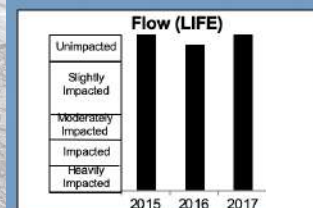
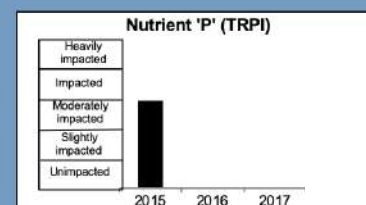
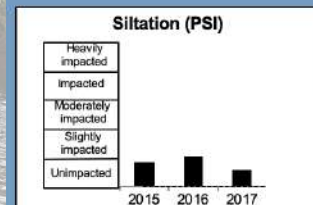
	2015	2016	2017
BMWP	160	177	94
ASPT	6.96	6.81	6.27
Annual mayfly sp. richness	7	7	6
Total Abundance	508	665	372
EPT	21	22	9
CCI	14.54	12.50	-
LIFE	8.25	8.35	8.64
PSI	88.14	87.50	89.29
SPEAR	48.97	47.26	37.76
TRPI	94.74	92.31	100.00
Saprobic	1.71	1.69	1.79



AUTUMN BIOMETRICS



	2015	2016	2017
BMWP	123	130	108
ASPT	6.47	6.50	6.00
Annual mayfly sp. richness	7	7	6
Total Abundance	620	814	328
EPT	12	13	12
CCI	5.47	8.42	9.71
LIFE	8.79	8.32	8.52
PSI	83.33	79.55	88.64
SPEAR	40.14	37.82	42.86
TRPI	41.67	100.00	100.00
Saprobic	1.82	1.87	1.81



4

WHAT WE'VE FOUND

Robberby Water (2)

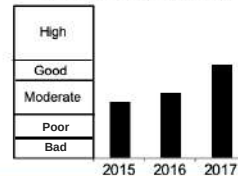
Nutrient stress was indicated by the invertebrate community, but only in autumn 2015.

Chemical stress was also present at this site. There were failures against the proposed WFD standard in spring 2015, spring 2016 and autumn 2016.



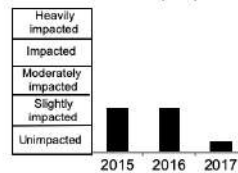
SPRING BIOMETRICS

Pesticide Rating (SPEAR)

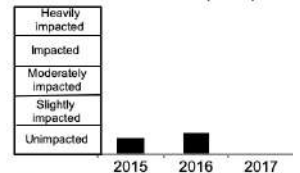


	2015	2016	2017
BMWP	115	110	104
ASPT	5.75	5.79	6.93
Annual Mayfly Sp. Richness	7	6	5
Total Abundance	663	918	438
EPT	11	10	16
CCI	4.33	7.35	-
LIFE	7.83	8.00	8.84
PSI	68.75	68.75	93.02
SPEAR	25.17	29.71	42.88
TRPI	90.00	86.36	100.00
Saprobic	1.90	1.97	1.84

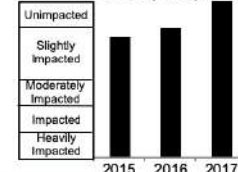
Siltation (PSI)



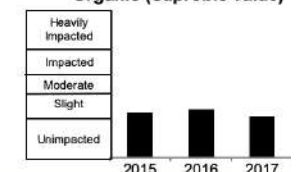
Nutrient 'P' (TRPI)



Flow (LIFE)

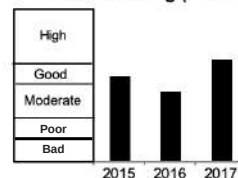


Organic (Saprobic value)



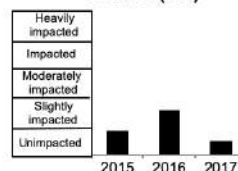
AUTUMN BIOMETRICS

Pesticide Rating (SPEAR)

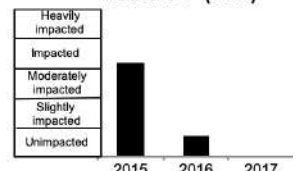


	2015	2016	2017
BMWP	122	136	92
ASPT	6.10	5.67	6.57
Annual Mayfly Sp. Richness	7	6	5
Total Abundance	692	1247	902
EPT	11	13	12
CCI	14.37	15.91	5.14
LIFE	8.55	8.12	8.88
PSI	82.98	68.75	90.24
SPEAR	38.92	31.79	46.79
TRPI	37.50	85.71	100.00
Saprobic	2.02	2.01	2.05

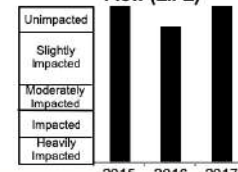
Siltation (PSI)



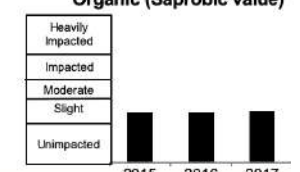
Nutrient 'P' (TRPI)



Flow (LIFE)



Organic (Saprobic value)



5

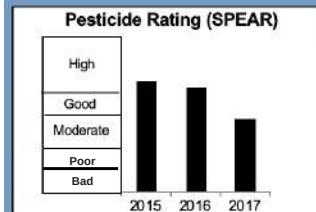
WHAT WE'VE FOUND

Briggle Beck

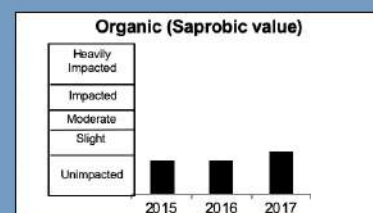
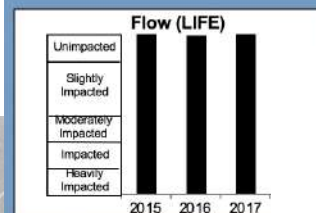
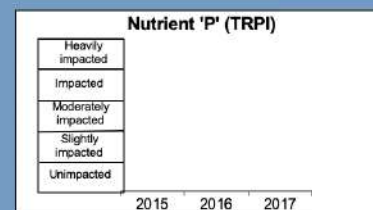
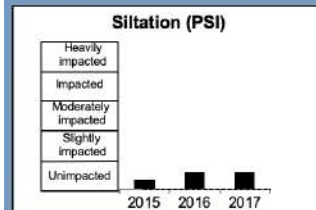
Briggle Beck was unimpacted by nutrient stress throughout the spring. However there was a concerning impacted peak in autumn 2015.

In spring there was only one borderline failure of the proposed WFD standard for chemicals. This occurred in 2017. In autumn failures were exhibited in 2015 and 2016.

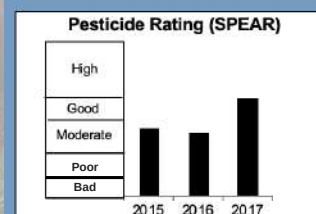
SPRING BIOMETRICS



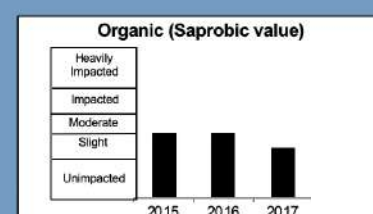
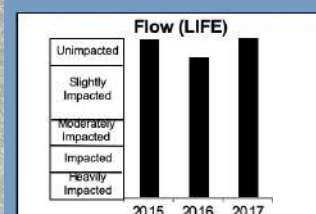
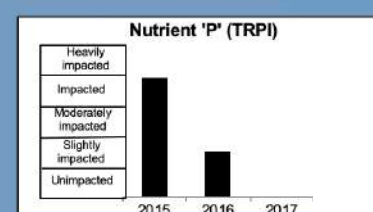
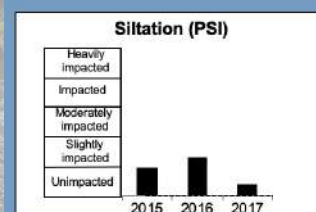
	2015	2016	2017
BMWP	102	136	77
ASPT	6.80	6.48	5.92
Annual Mayfly Sp. Richness	6	6	5
Total Abundance	644	972	766
EPT	14	17	10
CCI	4.59	7.50	-
LIFE	8.55	8.48	8.79
PSI	93.33	87.93	88.24
SPEAR	49.52	47.23	33.14
TRPI	100.00	100.00	100.00
Saprobic	1.67	1.68	1.87



AUTUMN BIOMETRICS



	2015	2016	2017
BMWP	114	119	96
ASPT	6.00	5.41	6.00
Annual Mayfly Sp. Richness	6	6	5
Total Abundance	1604	2275	482
EPT	12	12	11
CCI	9.17	8.89	5.08
LIFE	8.48	8.15	8.76
PSI	81.40	74.14	91.89
SPEAR	31.22	28.88	44.02
TRPI	21.42	70.00	100.00
Saprobic	2.31	2.30	2.00



6

WHAT WE'VE FOUND

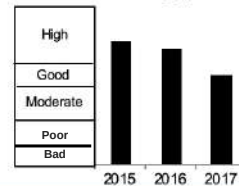
Temple Sowerby

Due to unfavourable sampling conditions, this site was not sampled in autumn 2017.

Overall, this site was indicated by the invertebrate community to be in healthy condition. No concerning stress was indicated by any of the biometrics throughout the survey period.

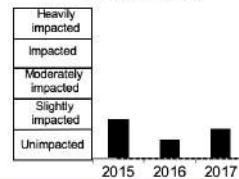
SPRING BIOMETRICS

Pesticide Rating (SPEAR)

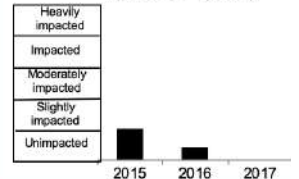


	2015	2016	2017
BMWP	176	141	162
ASPT	6.29	6.41	6.00
Annual Mayfly Sp. Richness	8	8	-
Total Abundance	1100	829	558
EPT	22	19	18
CCI	9.83	14.27	-
LIFE	8.36	8.55	8.09
PSI	74.07	87.50	80.30
SPEAR	54.62	51.33	39.63
TRPI	80.00	91.67	100.00
Saprobic	1.54	1.66	1.75

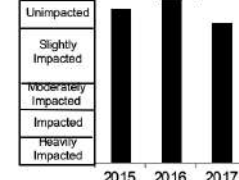
Siltation (PSI)



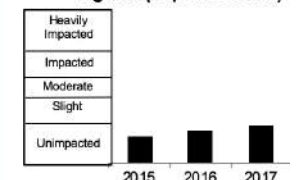
Nutrient 'P' (TRPI)



Flow (LIFE)

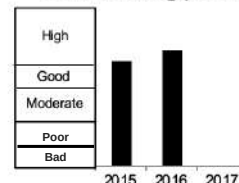


Organic (Saprobic value)



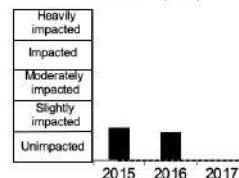
AUTUMN BIOMETRICS

Pesticide Rating (SPEAR)

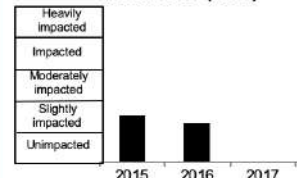


	2015	2016	2017
BMWP	157	159	-
ASPT	6.04	6.12	-
Annual Mayfly Sp. Richness	8	8	-
Total Abundance	1080	1393	-
EPT	15	20	-
CCI	12.88	13.19	-
LIFE	8.28	8.51	-
PSI	77.78	80.95	-
SPEAR	46.20	51.04	-
TRPI	70.00	75.00	-
Saprobic	1.77	1.71	-

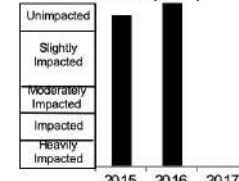
Siltation (PSI)



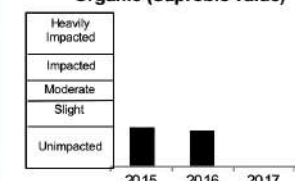
Nutrient 'P' (TRPI)



Flow (LIFE)



Organic (Saprobic value)



FINAL WORD

Many of our rivers lack historical reference points, making it difficult to know exactly what optimal conditions in our rivers should look like. It is only with a reliable 'benchmark' of health that we can properly quantify deterioration or recovery, and only with robust long term monitoring can we truly understand the changes occurring in our freshwater systems. Our Riverfly Census data has highlighted the subtle but lethal pressures facing UK rivers, but we need help to extend species level invertebrate analysis to many more. Our new project, SmartRivers, will enable volunteers to monitor the water quality in their rivers to a near-professional standard. SmartRivers compliments existing Riverfly Partnership monitoring but provides more information. The high-resolution nature of the data also means that S&TC is able to work with the Environment Agency and others to address the causes of poor water quality and drive forward positive change.

REFERENCES

Beketov MA, Foit K, Schäfer, RB. (2009). SPEAR indicates pesticide effects in streams—comparative use of species-and family-level biomonitoring data. *Environmental Pollution*: 157(6) pp. 1841-1848.

ACKNOWLEDGEMENTS & CONTACT



Work commissioned from Aquascience Consultancy Ltd. We thank them for their professionalism, rigour and assistance throughout the Riverfly Census.

Report composed by Lauren Mattingley. For Riverfly Census enquiries contact:
lauren@salmon-trout.org

Data copyright S&TC (2019). Please do not reproduce without permission.