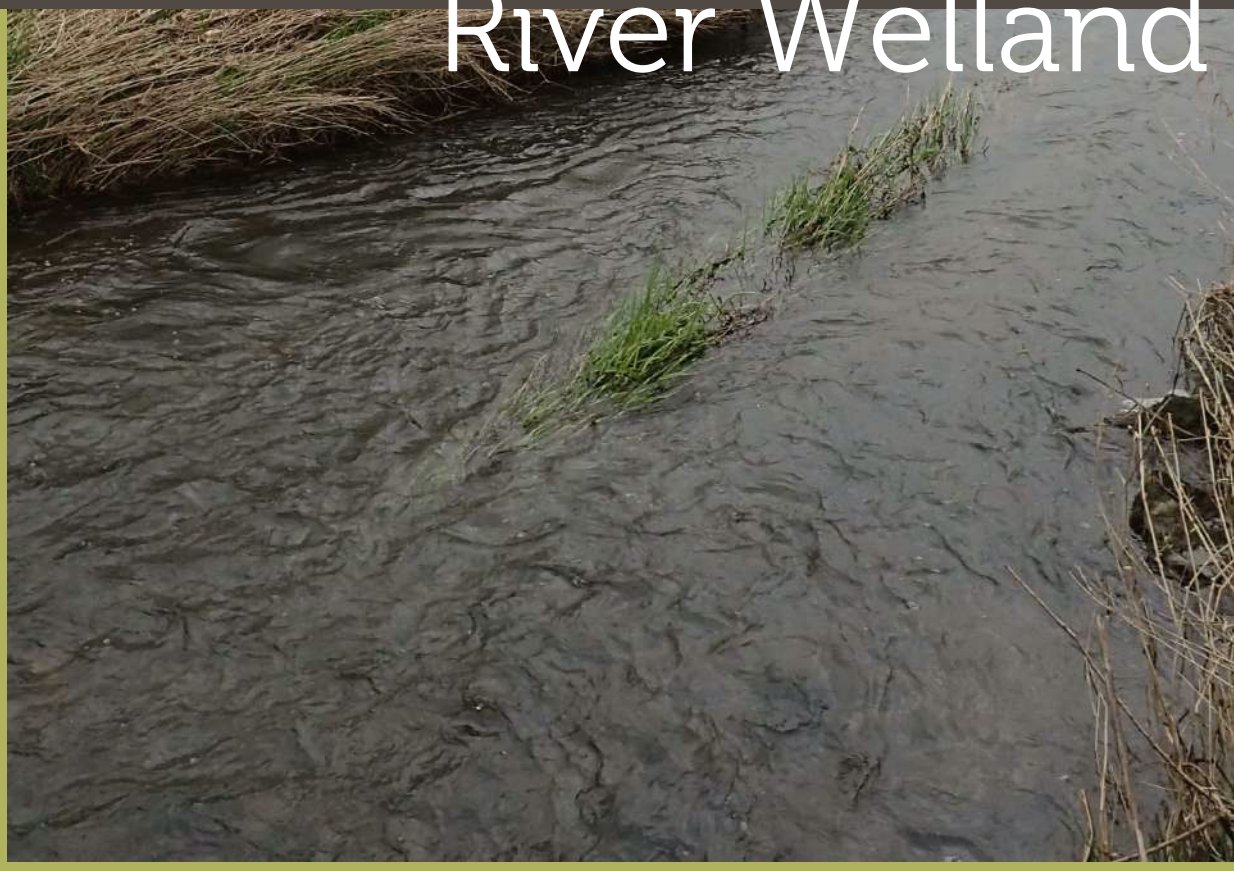
RIVERFLY CENSUS RESULTS

River Welland



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WHAT WE'VE DONE

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

SCOPE

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

SAMPLE

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.

STUDY

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.

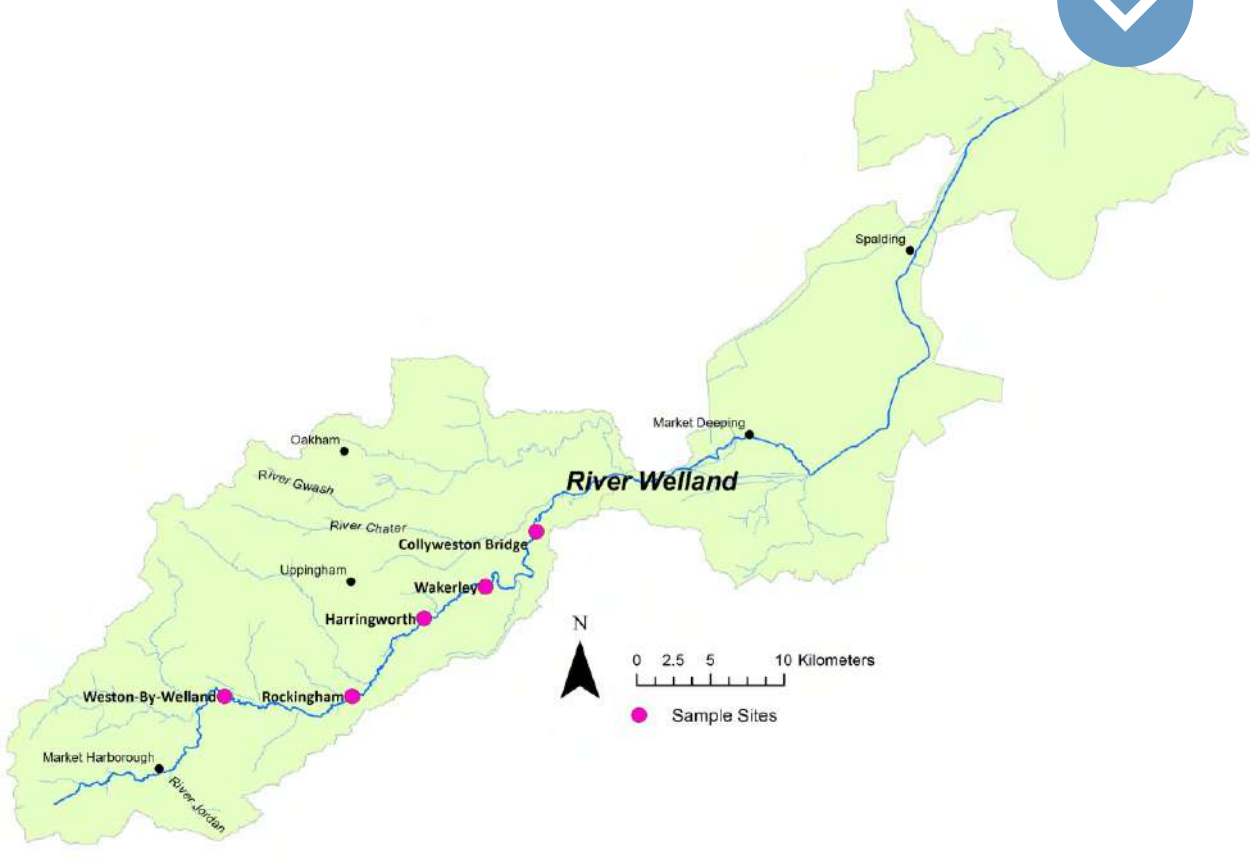
MAKE A STAND

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

Results

Riverfly Census sampling on the Welland began in 2015 and continued for three years on five sites: Weston-By-Welland, Rockingham, Harringworth, Wakerley and Collyweston Bridge

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



1 WHAT WE'VE FOUND
Weston-By-Welland

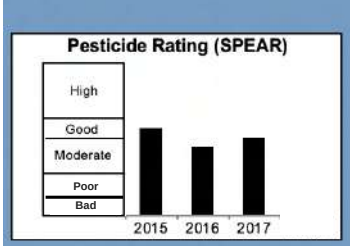
Concerning stress from excess fine sediment was consistently exhibited by the invertebrate community at Weston-By-Welland in both seasons. At no point during the survey did the PSI score indicate a less than moderate impact from sediment stress.

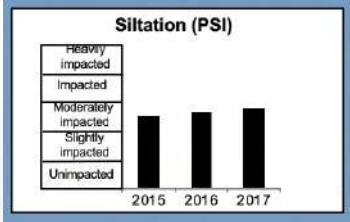
Moderate nutrient stress was also indicated in all years, but this was seasonal and occurred only in autumn.

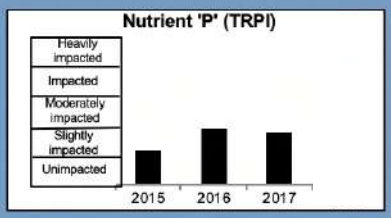
Failures against the proposed WFD SPEAR standard (Beketov et al 2009) occurred in 2016 for both seasons.

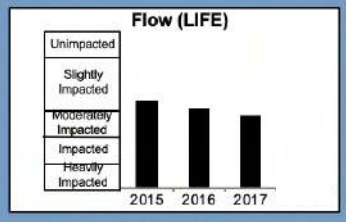
SPRING BIOMETRICS

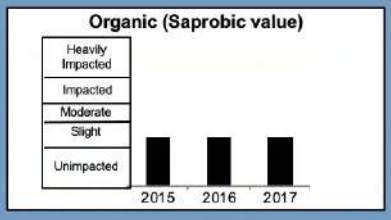
	2015	2016	2017
BMWP	132	129	143
ASPT	5.50	5.86	5.72
Annual mayfly sp. richness	6	6	5
Total Abundance	965	390	357
EPT	13	12	13
CCI	4.00	6.14	6.54
LIFE	7.17	7.04	6.89
PSI	50.00	47.73	46.00
SPEAR	40.06	31.56	35.24
TRPI	76.19	61.54	64.29
Saprobic	1.99	2.00	1.99





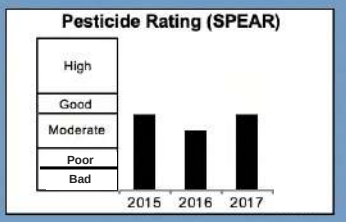


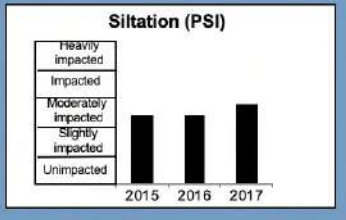


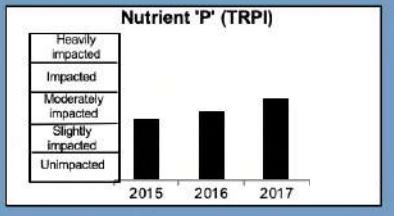


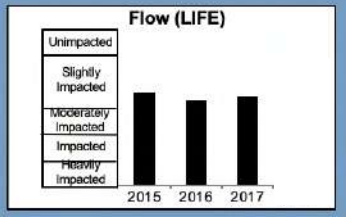
AUTUMN BIOMETRICS

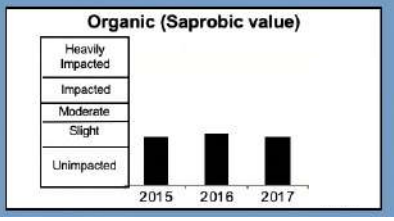
	2015	2016	2017
BMWP	154	157	104
ASPT	5.92	5.61	5.20
Annual mayfly sp. richness	6	6	5
Total Abundance	477	2091	111
EPT	12	15	9
CCI	10.08	11.34	7.94
LIFE	7.27	7.14	7.19
PSI	52.73	52.78	45.45
SPEAR	34.87	27.10	34.61
TRPI	58.33	53.33	44.44
Saprobic	1.99	2.04	2.00











2 WHAT WE'VE FOUND
Rockingham

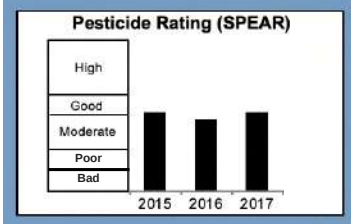
At Rockingham, stress from excess phosphorus became more pronounced towards the end of the survey, with moderate TRPI scores in autumn 2016 and both seasons in 2017.

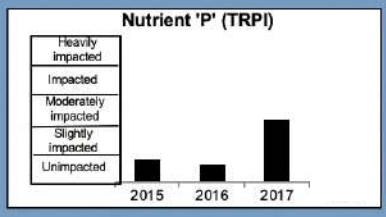
Stress from excess fine sediment was considerable in 2016, with moderate impact PSI scores in both spring and autumn.

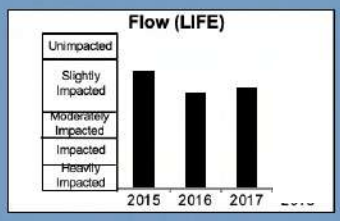
Chemical stress was present, with failure of the proposed WFD SPEAR standard in autumn 2015, spring 2016 and autumn 2016.

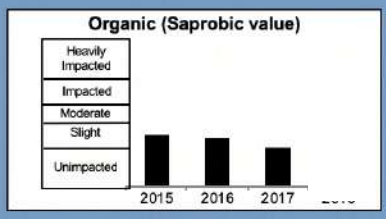
SPRING BIOMETRICS

	2015	2016	2017
BMWP	119	138	137
ASPT	6.29	6.00	5.96
Annual mayfly sp. richness	5	5	5
Total Abundance	848	607	406
EPT	13	15	16
CCI	4.29	7.96	-
LIFE	7.76	7.33	7.46
PSI	64.15	52.63	60.32
SPEAR	36.22	32.60	35.90
TRPI	84.00	87.50	57.14
Saprobic	2.04	1.98	1.79



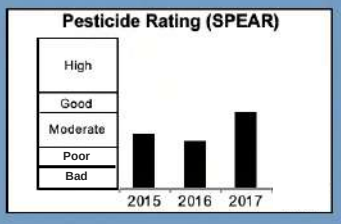


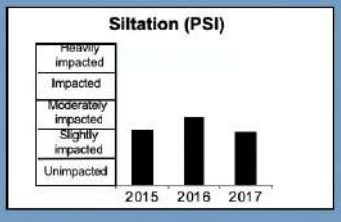


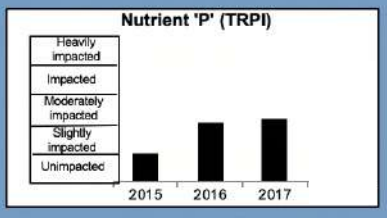


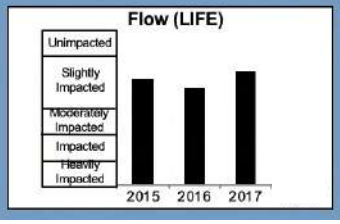
AUTUMN BIOMETRICS

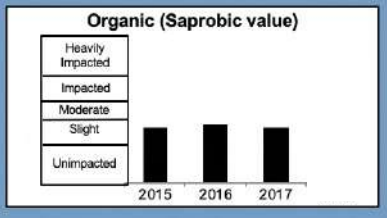
	2015	2016	2017
BMWP	108	155	168
ASPT	5.68	5.74	5.79
Annual mayfly sp. richness	5	5	5
Total Abundance	916	5192	2617
EPT	8	13	14
CCI	7.50	13.10	12.12
LIFE	7.55	7.40	7.69
PSI	62.50	53.49	63.77
SPEAR	25.75	22.13	35.19
TRPI	80.00	60.00	57.14
Saprobic	2.13	2.21	2.15











3 WHAT WE'VE FOUND
Harringworth

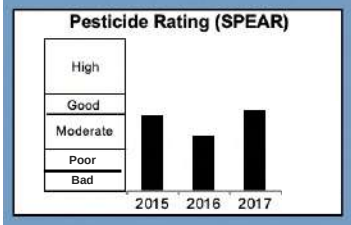
The invertebrate community at Harringworth only indicated moderate stress from nutrient enrichment at one point during the survey (autumn 2016).

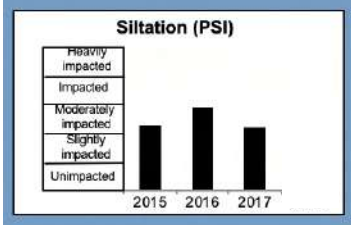
Sediment stress was persistent at this site across the three years; all of our sample events yielded a moderate impact PSI score.

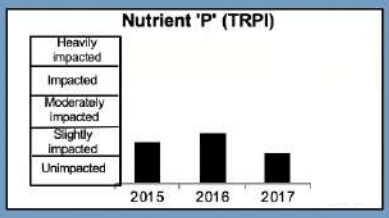
Chemical stress was indicated with consistent failure of the proposed WFD SPEAR standard throughout autumn, also failure in spring 2016.

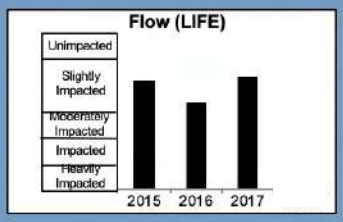
SPRING BIOMETRICS

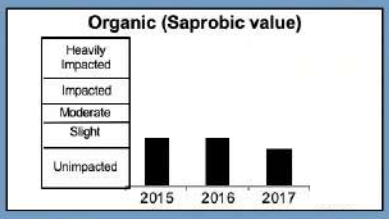
	2015	2016	2017
BMWP	179	145	107
ASPT	5.91	5.37	5.63
Annual mayfly sp. richness	5	5	6
Total Abundance	1079	815	268
EPT	18	11	13
CCI	4.36	6.79	-
LIFE	7.61	7.18	7.68
PSI	55.71	43.48	57.45
SPEAR	34.44	25.00	37.20
TRPI	71.43	65.38	78.95
Saprobic	2.00	1.99	1.74





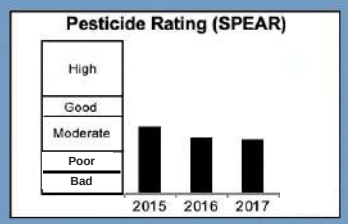


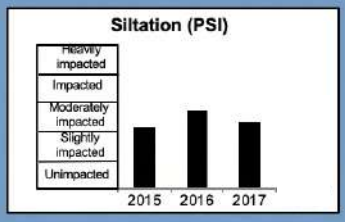


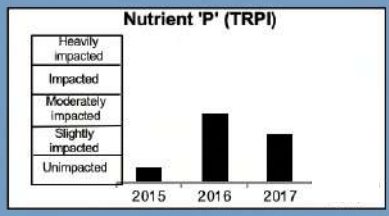


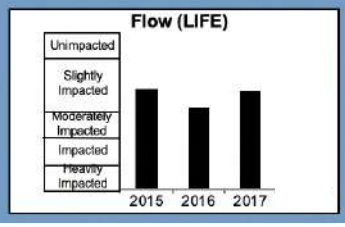
AUTUMN BIOMETRICS

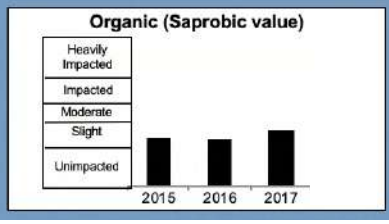
	2015	2016	2017
BMWP	135	167	141
ASPT	5.87	5.57	5.64
Annual mayfly sp. richness	5	5	6
Total Abundance	550	1477	1174
EPT	12	17	12
CCI	11.08	10.68	8.20
LIFE	7.41	7.07	7.39
PSI	58.49	46.39	54.39
SPEAR	30.51	25.61	24.45
TRPI	88.89	53.33	66.67
Saprobic	1.97	1.96	2.13











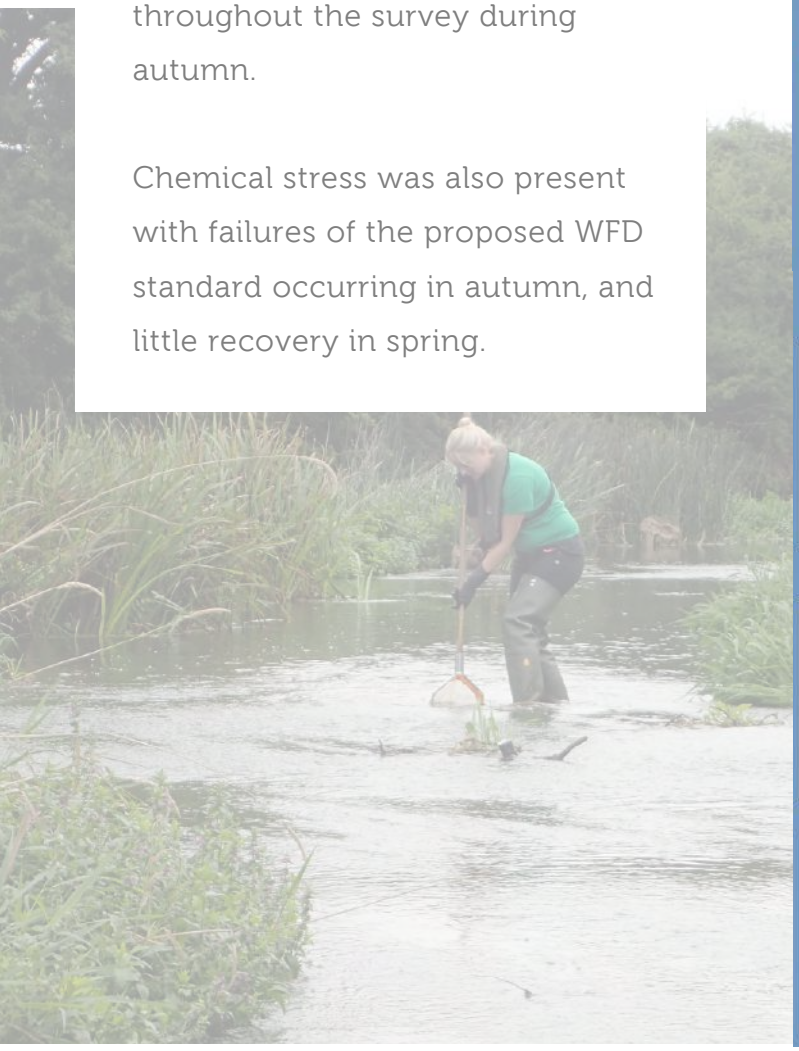
4 WHAT WE'VE FOUND
Wakerley

Moderate stress from altered flow was indicated by the invertebrate community at Wakerley in spring 2017.

Stress from excess fine sediment was persistent at Wakerley throughout the survey, but was particularly concerning in 2017, with impacted PSI scores in both seasons.

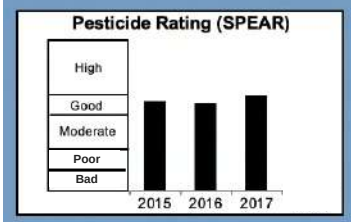
A seasonal impact from excess phosphorus was indicated, with moderate impact TRPI scores throughout the survey during autumn.

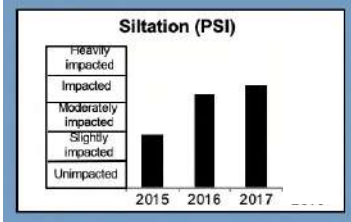
Chemical stress was also present with failures of the proposed WFD standard occurring in autumn, and little recovery in spring.

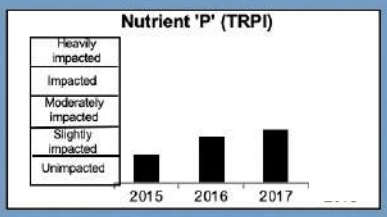


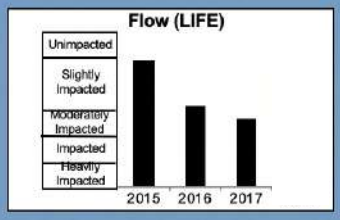
SPRING BIOMETRICS

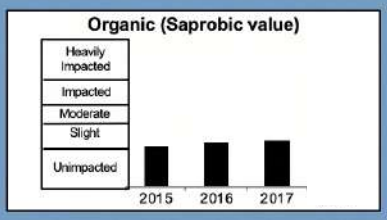
	2015	2016	2017
BMWP	127	151	130
ASPT	5.77	5.81	5.42
Annual mayfly sp. richness	4	8	4
Total Abundance	415	543	189
EPT	13	13	13
CCI	4.50	21.78	-
LIFE	7.96	7.06	6.80
PSI	62.79	35.71	29.17
SPEAR	41.62	40.75	44.04
TRPI	80.00	68.18	63.64
Saprobic	1.85	1.90	1.95





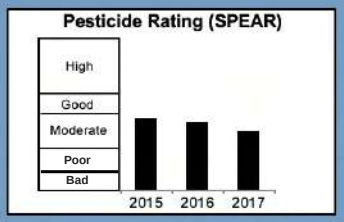


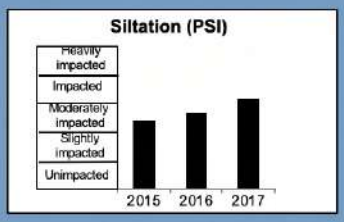


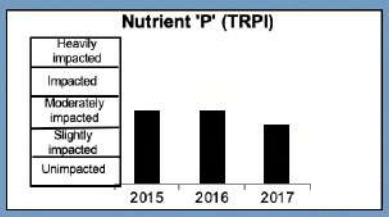


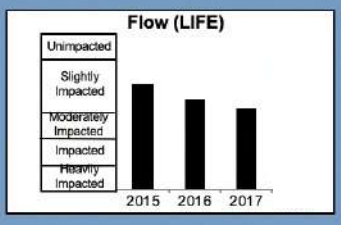
AUTUMN BIOMETRICS

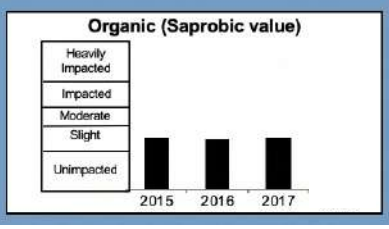
	2015	2016	2017
BMWP	138	186	123
ASPT	6.00	5.81	5.59
Annual mayfly sp. richness	4	8	4
Total Abundance	739	1417	499
EPT	9	18	9
CCI	12.38	12.03	12.67
LIFE	7.54	7.23	7.08
PSI	52.63	47.87	37.50
SPEAR	33.13	31.09	27.22
TRPI	50.00	50.00	60.00
Saprobic	2.04	2.01	2.07











5 WHAT WE'VE FOUND
Collyweston Bridge

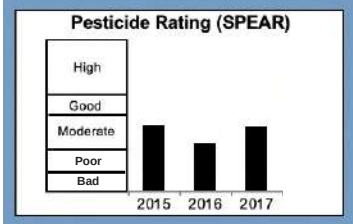
Out of all the sites surveyed, the invertebrate community indicated the greatest pressure from excess fine sediment at Collyweston Bridge. Impacted PSI scores were exhibited in spring 2016 and autumn 2017. A moderate impact from flow stress also occurred in spring 2016.

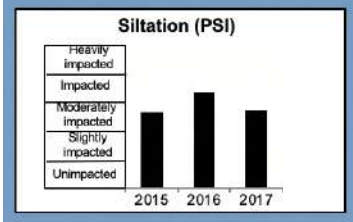
Nutrient stress was only moderate for one year during spring (2017), but moderate stress or worse was consistently exhibited in autumn.

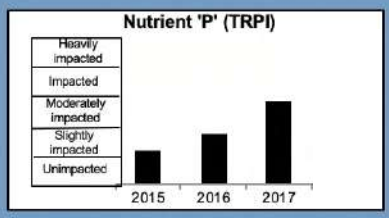
The proposed WFD standard for SPEAR was only met in autumn 2015 indicating persistent chemical stress on the invertebrate community at this site.

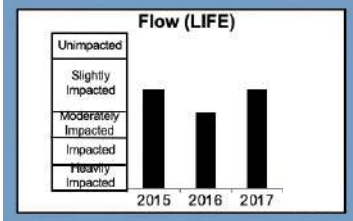
SPRING BIOMETRICS

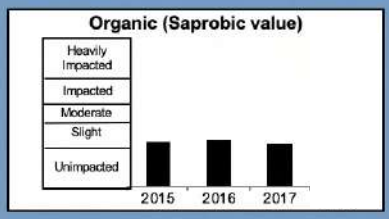
	2015	2016	2017
BMWP	144	135	145
ASPT	5.54	5.40	5.37
Annual mayfly sp. richness	4	5	6
Total Abundance	339	771	997
EPT	11	10	13
CCI	4.62	7.04	7.50
LIFE	7.43	6.97	7.43
PSI	48.08	33.87	46.15
SPEAR	30.27	22.01	29.58
TRPI	76.47	65.00	42.86
Saprobic	1.89	1.95	1.87





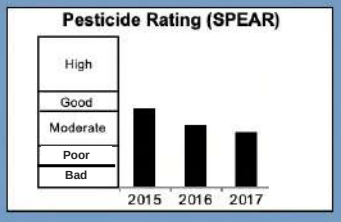


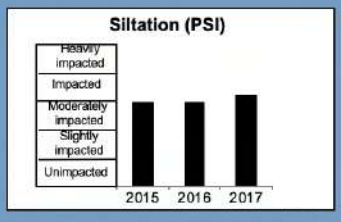


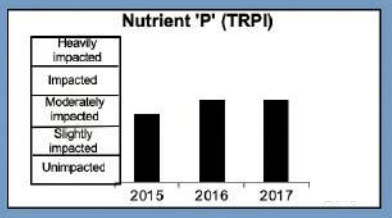


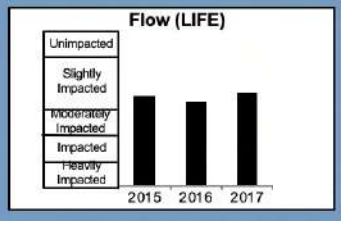
AUTUMN BIOMETRICS

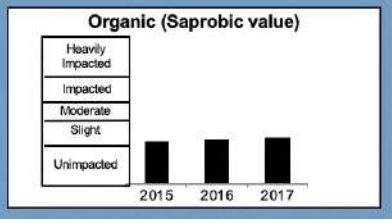
	2015	2016	2017
BMWP	143	168	115
ASPT	5.72	5.79	5.00
Annual mayfly sp. richness	4	5	6
Total Abundance	564	1422	528
EPT	9	14	8
CCI	12.50	11.47	10.68
LIFE	7.23	7.14	7.30
PSI	42.31	41.94	36.54
SPEAR	36.58	29.17	25.38
TRPI	53.33	42.86	42.86
Saprobic	1.87	1.90	1.94











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.

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