



RIVERFLY CENSUS CONCLUSIONS

River Dove



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Salmon & Trout
Conservation

KEEPING OUR WATERS WILD • EST 1903

REPORT OUTLINE

OUR KEY POINTS

The 'take home' messages and recommendations from our survey on the River Dove

WHAT WE'VE DONE

A summary of the Riverfly Census process and objectives

WHAT WE'VE FOUND

A site-by-site presentation of the S&TC Riverfly Census results on the Dove

OUR THOUGHTS

We use our findings to discuss potential key issues on the river



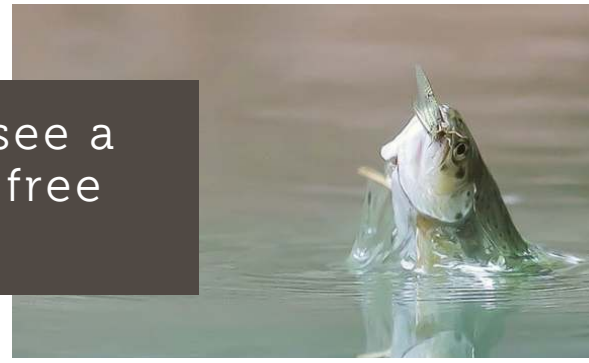
ACKNOWLEDGEMENTS & CONTACT



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

At Salmon & Trout Conservation, we see a world where wild fish have pollution-free places to live, with plenty to eat.



OUR KEY POINTS

The Salmon & Trout Conservation (S&TC) Riverfly Census on the Dove has indicated that the river is relatively healthy with a few intermittent stresses. The River Dove is a nationally important example of a nutrient poor limestone river. Approximately 10.5km of the River Dove is designated as a SSSI, it is also designated as part of the Peak District Dales Special Area of Conservation (SAC). Our main recommendations for the Dove are below:

-  Further expert investigation would be beneficial to detect any 'fingerprints' of ecological impact associated with invasive species, namely the demon shrimp and signal crayfish.
-  There has been no spatial or temporal surveying of the river above Hartington since 2009, apart from our samples at Hollinsclough. Retrospective SPEAR analysis of invertebrate data from 2009 indicated chemical issues in the upper river. Extending our survey by adding more monitoring sites in the upper reaches of the river would be valuable to know if chemical impacts are still an issue.
-  Access to the the river by livestock is common in the upper Dove catchment. It would be interesting to fence off a significant section of river bank from animals and conduct species-level biological monitoring before and after to see if this stops/reduces the intermittent nutrient signatures.

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, 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.



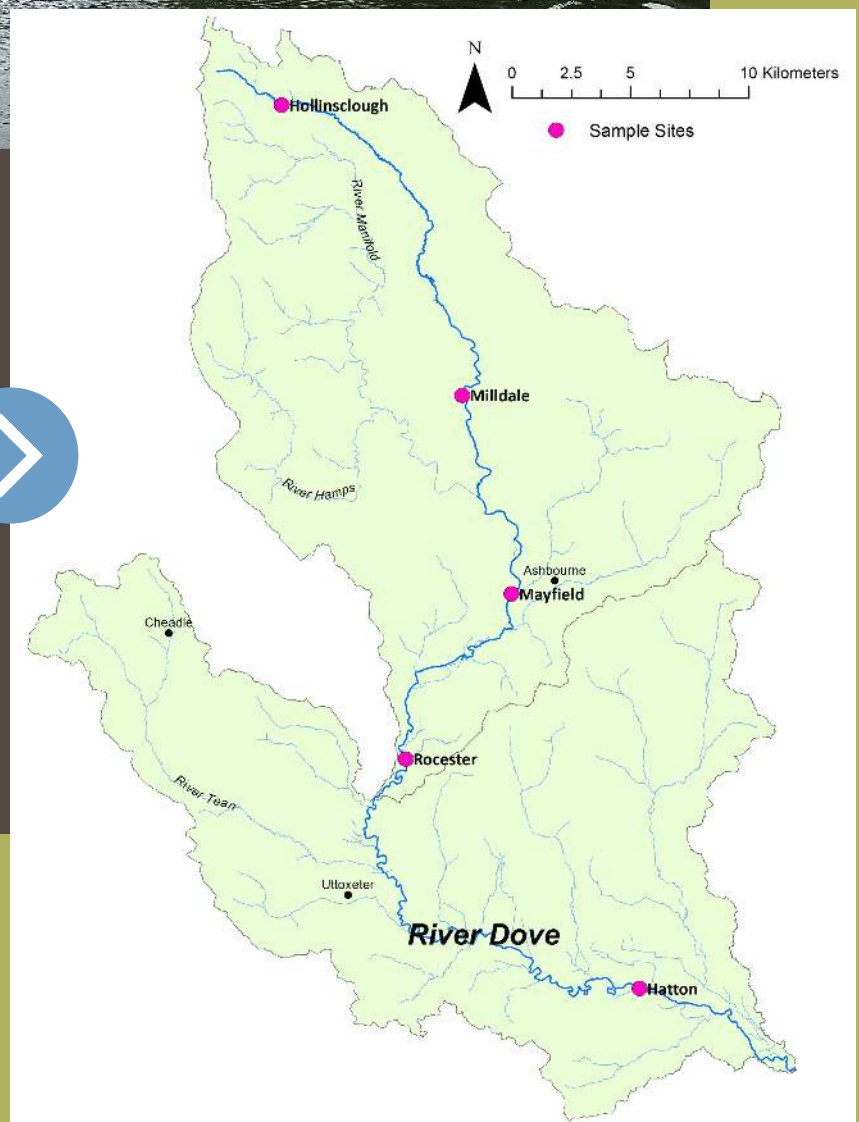
WHAT WE'VE FOUND

Results



Riverfly Census sampling on the Dove began in 2015 and continued for three years on five sites: Hollinsclough, Milldale, Mayfield, Rocester and Hatton

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



1

WHAT WE'VE FOUND Hollinsclough

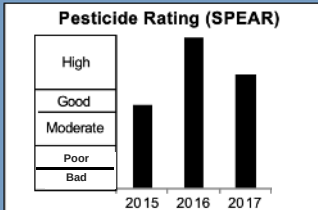
RESULTS

The invertebrate community at Hollinsclough did not exhibit any flow stress. Stress from excess fine sediment was also minimal throughout the survey period.

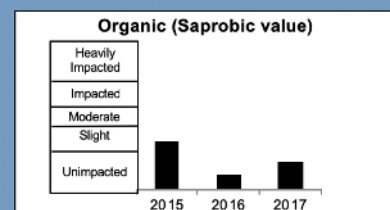
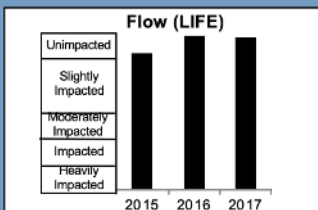
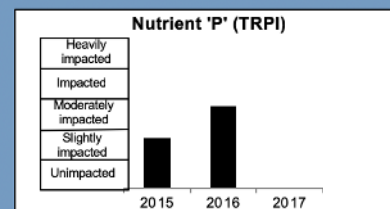
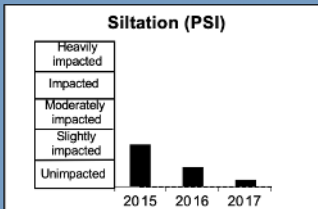
Nutrient stress was present but only in spring 2015 and spring 2016. All SPEAR values were above the proposed WFD threshold (Beketov et al. 2009), so chemical stress was not an issue at this site.



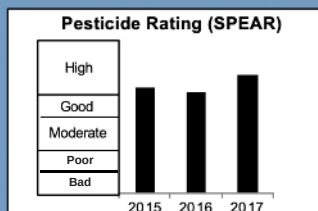
SPRING BIOMETRICS



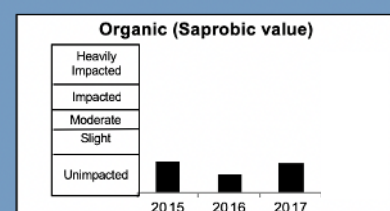
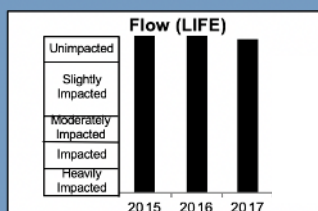
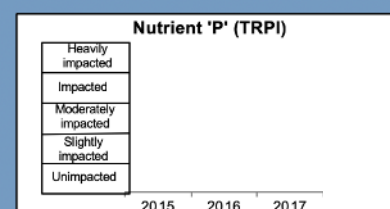
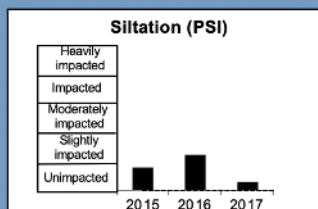
	2015	2016	2017
BMWP	125	101	90
ASPT	6.25	6.73	6.92
Annual Mayfly Sp. Richness	7	5	5
Total Abundance	819	425	147
EPT	15	18	8
CCI	17.18	18.90	15.40
LIFE	8.12	8.45	8.42
PSI	71.70	86.36	94.74
SPEAR	38.06	68.23	51.47
TRPI	66.67	45.45	100.00
Saprobic	1.99	1.33	1.57



AUTUMN BIOMETRICS



	2015	2016	2017
BMWP	102	139	98
ASPT	6.38	6.62	7.00
Annual Mayfly Sp. Richness	7	5	5
Total Abundance	278	453	167
EPT	11	14	13
CCI	10.83	10.88	13.00
LIFE	8.65	8.59	8.44
PSI	84.62	75.51	94.12
SPEAR	47.80	45.68	53.54
TRPI	100.00	100.00	100.00
Saprobic	1.65	1.38	1.61



2

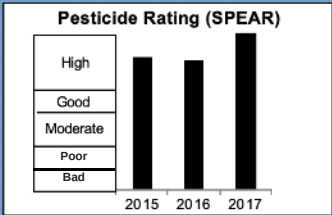
WHAT WE'VE FOUND Milldale

The biometrics at Milldale indicated it to be quite a clean site. Flow stress was not exhibited by the invertebrate community. Stress from excess fine sediment and nutrients was also minimal.

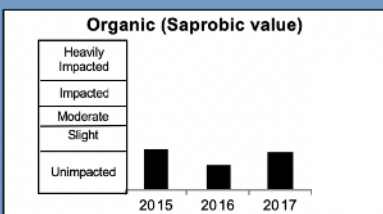
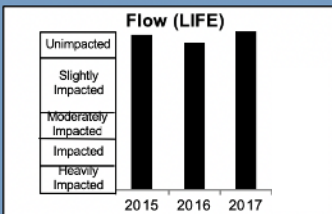
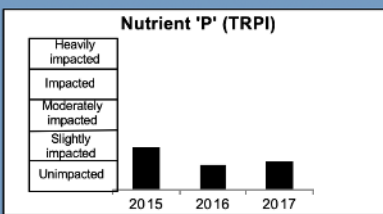
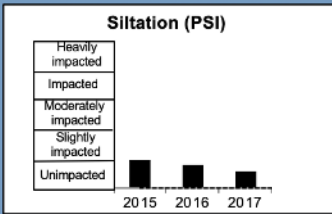
Chemical stress was slightly more pronounced in autumn but all SPEAR values were above the proposed WFD threshold.



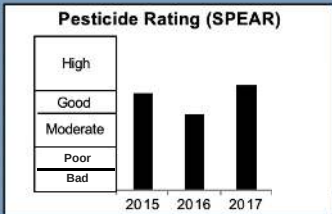
SPRING BIOMETRICS



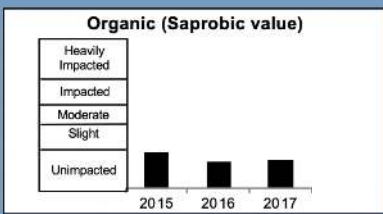
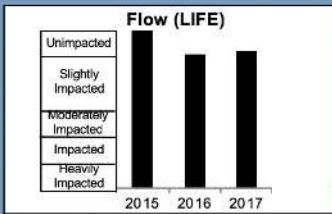
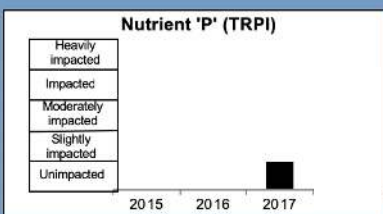
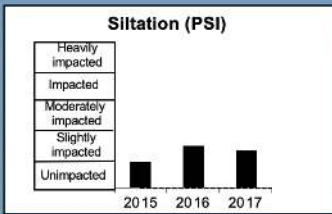
	2015	2016	2017
BMWP	150	169	129
ASPT	7.50	6.76	7.17
Annual Mayfly Sp. Richness	9	9	6
Total Abundance	566	242	286
EPT	18	21	17
CCI	4.50	14.29	19.83
LIFE	8.43	8.30	8.57
PSI	80.95	84.31	88.89
SPEAR	59.31	58.16	100.00
TRPI	71.89	83.33	81.25
Saprobic	1.84	1.53	1.78



AUTUMN BIOMETRICS



	2015	2016	2017
BMWP	129	117	156
ASPT	6.79	5.85	6.50
Annual Mayfly Sp. Richness	9	9	6
Total Abundance	536	525	235
EPT	15	11	18
CCI	14.33	7.50	18.96
LIFE	8.56	8.05	8.11
PSI	82.35	71.11	74.47
SPEAR	43.42	34.60	47.05
TRPI	100.00	100.00	81.82
Saprobic	1.73	1.55	1.59



3

WHAT WE'VE FOUND

Mayfield

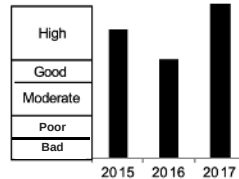
Stress from excess fine sediment was more pronounced at Mayfield than the previous two sites, but still not concerning. Both seasons in 2017 exhibited a greater impact from sediment than the previous two years.

Nutrient stress was minimal, but the community did indicate slightly more stress in 2017.

Chemical stress was more pronounced in autumn. However, all values were above the proposed WFD threshold.

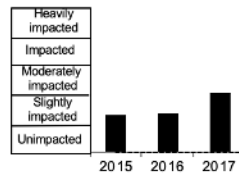
SPRING BIOMETRICS

Pesticide Rating (SPEAR)

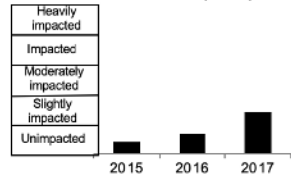


	2015	2016	2017
BMWP	186	173	166
ASPT	7.15	6.18	6.15
Annual Mayfly Sp. Richness	9	7	7
Total Abundance	1091	349	920
EPT	25	19	16
CCI	14.00	12.60	14.70
LIFE	8.13	8.06	7.86
PSI	75.00	72.88	59.02
SPEAR	59.01	45.09	100.00
TRPI	91.67	86.96	71.43
Saprobic	1.80	1.76	1.91

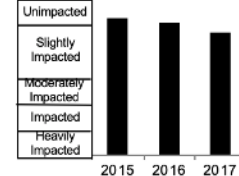
Siltation (PSI)



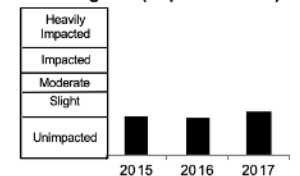
Nutrient 'P' (TRPI)



Flow (LIFE)

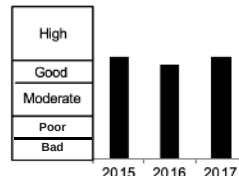


Organic (Saprobic value)



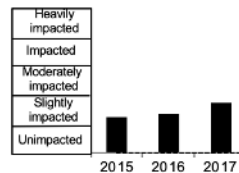
AUTUMN BIOMETRICS

Pesticide Rating (SPEAR)

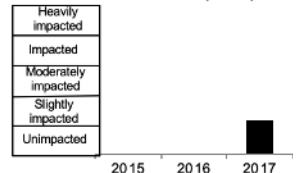


	2015	2016	2017
BMWP	147	138	161
ASPT	6.13	6.00	5.75
Annual Mayfly Sp. Richness	9	7	7
Total Abundance	750	575	794
EPT	17	14	17
CCI	12.83	12.89	14.88
LIFE	8.24	8.29	8.29
PSI	75.41	73.08	65.28
SPEAR	46.91	42.69	46.25
TRPI	100.00	100.00	76.92
Saprobic	1.65	1.86	1.53

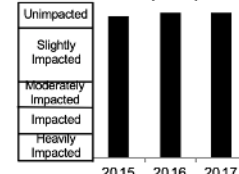
Siltation (PSI)



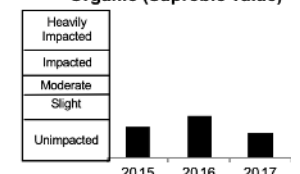
Nutrient 'P' (TRPI)



Flow (LIFE)



Organic (Saprobic value)



4

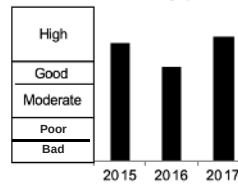
WHAT WE'VE FOUND
Rocester

Stress from nutrients and excess fine sediment was minimal in spring. There was slightly more of an impact from sediment on the invertebrate community in autumn, particularly in 2017.

Chemical stress was slightly more pronounced in autumn but all SPEAR values were above the proposed WFD threshold.

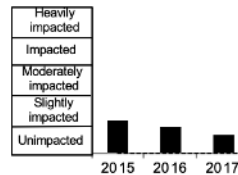
SPRING BIOMETRICS

Pesticide Rating (SPEAR)

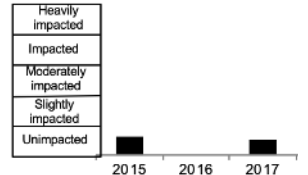


	2015	2016	2017
BMWP	180	113	154
ASPT	7.20	6.28	7.00
Annual Mayfly Sp. Richness	8	7	9
Total Abundance	843	288	1098
EPT	20	13	17
CCI	10.43	7.06	15.00
LIFE	8.48	8.35	8.36
PSI	78.26	82.50	87.76
SPEAR	53.36	42.04	55.99
TRPI	88.00	100.00	89.47
Saprobic	1.76	1.81	2.07

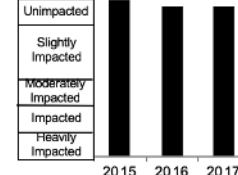
Siltation (PSI)



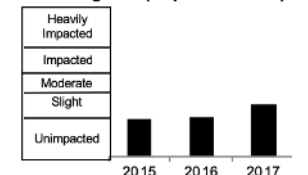
Nutrient 'P' (TRPI)



Flow (LIFE)

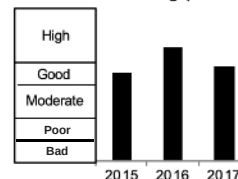


Organic (Saprobic value)



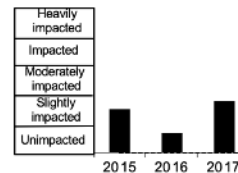
AUTUMN BIOMETRICS

Pesticide Rating (SPEAR)

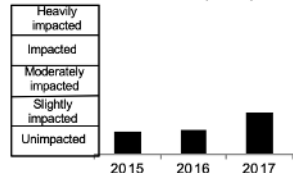


	2015	2016	2017
BMWP	158	132	148
ASPT	6.87	6.95	5.92
Annual Mayfly Sp. Richness	8	7	9
Total Abundance	906	827	673
EPT	13	14	14
CCI	16.10	9.44	18.00
LIFE	8.08	8.68	8.22
PSI	69.81	86.54	65.08
SPEAR	39.82	51.30	42.95
TRPI	84.62	83.33	71.43
Saprobic	2.03	1.93	1.82

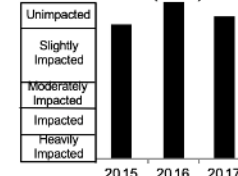
Siltation (PSI)



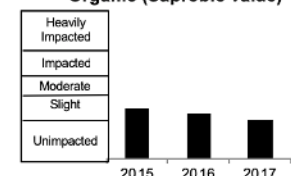
Nutrient 'P' (TRPI)



Flow (LIFE)



Organic (Saprobic value)



5

WHAT WE'VE FOUND

Hatton

Due to unfavourable sampling conditions, Hatton could not be sampled in spring 2015 and spring 2016.

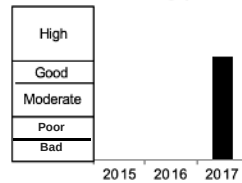
The invertebrate community indicated moderate stress from nutrients in our single spring sample. Moderate stress was also exhibited in autumn 2015 and autumn 2016.

Stress from excess fine sediment was borderline moderate in autumn 2016 and autumn 2017.

Every site in autumn failed the proposed WFD standard for chemicals.

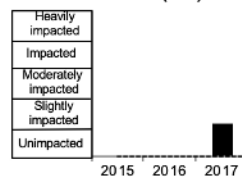
SPRING BIOMETRICS

Pesticide Rating (SPEAR)

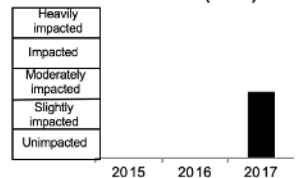


	2015	2016	2017
BMWP	-	-	138
ASPT	-	-	6.57
Annual Mayfly Sp. Richness	-	-	6
Total Abundance	-	-	1414
EPT	-	-	14
CCI	-	-	15.67
LIFE	-	-	8.16
PSI	-	-	77.78
SPEAR	-	-	46.68
TRPI	-	-	56.47
Saprobic	-	-	2.32

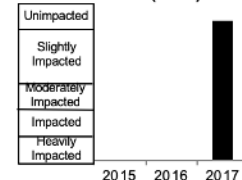
Siltation (PSI)



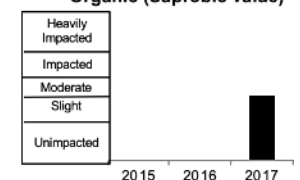
Nutrient 'P' (TRPI)



Flow (LIFE)

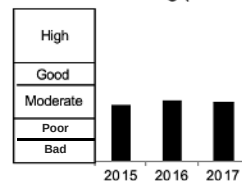


Organic (Saprobic value)



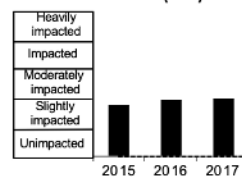
AUTUMN BIOMETRICS

Pesticide Rating (SPEAR)

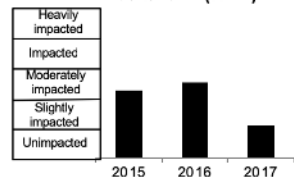


	2015	2016	2017
BMWP	125	133	133
ASPT	5.95	5.32	5.32
Annual Mayfly Sp. Richness	-	-	6
Total Abundance	839	688	926
EPT	9	9	9
CCI	15.40	8.10	8.41
LIFE	7.64	7.65	7.85
PSI	64.29	61.82	60.00
SPEAR	25.92	27.85	27.15
TRPI	54.55	50.00	77.78
Saprobic	2.02	2.10	2.17

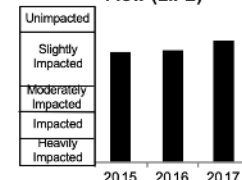
Siltation (PSI)



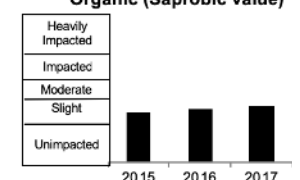
Nutrient 'P' (TRPI)



Flow (LIFE)



Organic (Saprobic value)



Several invasive species have entered the River Dove in recent years, including the signal crayfish (*Pacifastacus leniusculus*) and the demon shrimp (*Dikerogammarus haemobaphes*). Demon shrimp were found in our samples at Mayfield, Rocester and Hatton. We only found signal crayfish at Rocester, but other investigations have identified presence of this species further upstream (Fig. 1) These species are capable of exerting change in ecological condition to the river, so it is essential their impact is monitored. Evidence of signal crayfish and demon shrimp impacting the ecological condition of the nearby River Derwent and River Churnet has been identified from some long-term study reports.

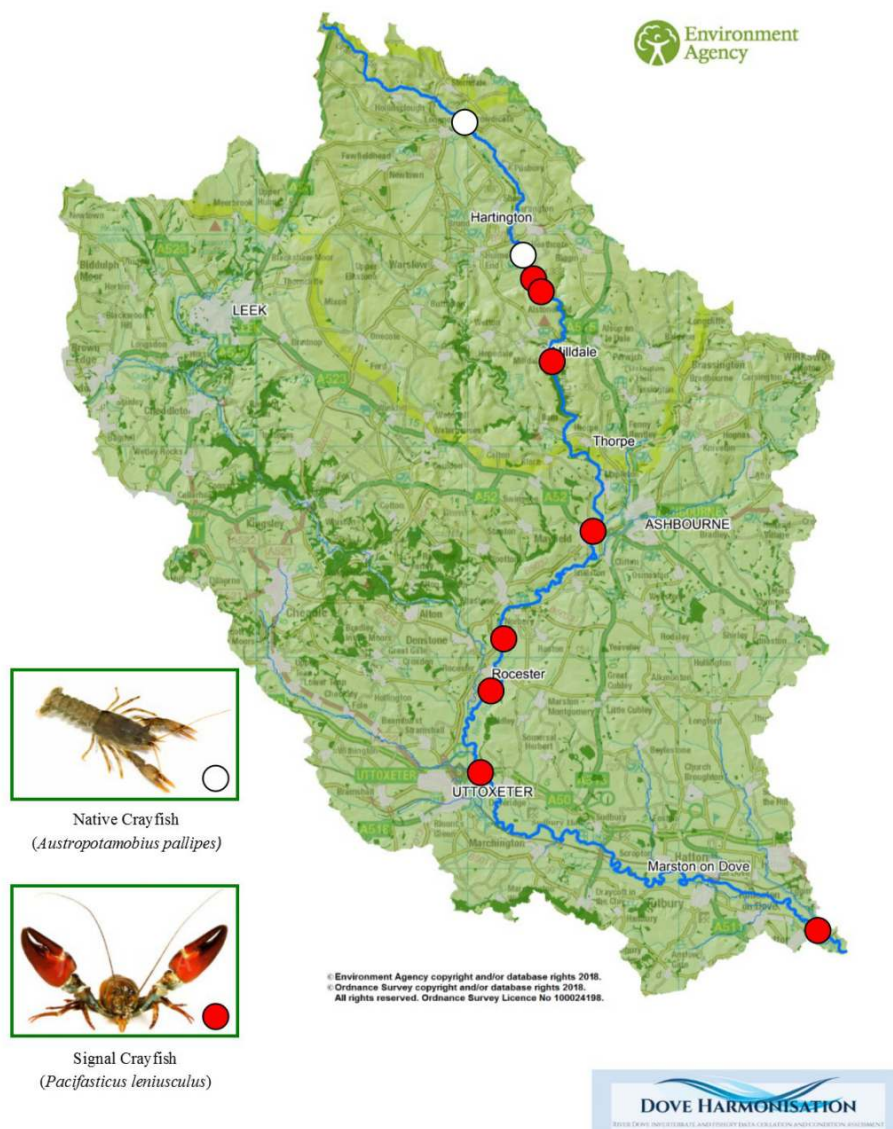


Fig. 1 - Distribution of native (*Austropotamobius pallipes*) and Signal Crayfish (*Pacifastacus leniusculus*) in the River Dove 2017 (Aquascience Consultancy Ltd, 2018).

Land use in the upper Dove catchment is predominantly grassland, mainly for dairy cattle, which is quite intensive in places. In the lower area of the catchment, around our Hatton sample site, land use shifts to industrial. Chemical signatures are Good or High at all our sites except Hatton, potentially suggesting chemical inputs from the change in land use. Previous investigations in the upper river (upstream of Hartington, including our Hollinsclough site) in 2009 did indicate detectable chemical signatures from brooks just upstream of Glutton Bridge and the main river around Hollinsclough (Fig. 2)(Aquascience Consultancy Ltd, 2018). Much of the upper river is easily accessible by livestock, so chemicals may be entering the river directly from animals. However, without further investigation the exact origin cannot be determined.

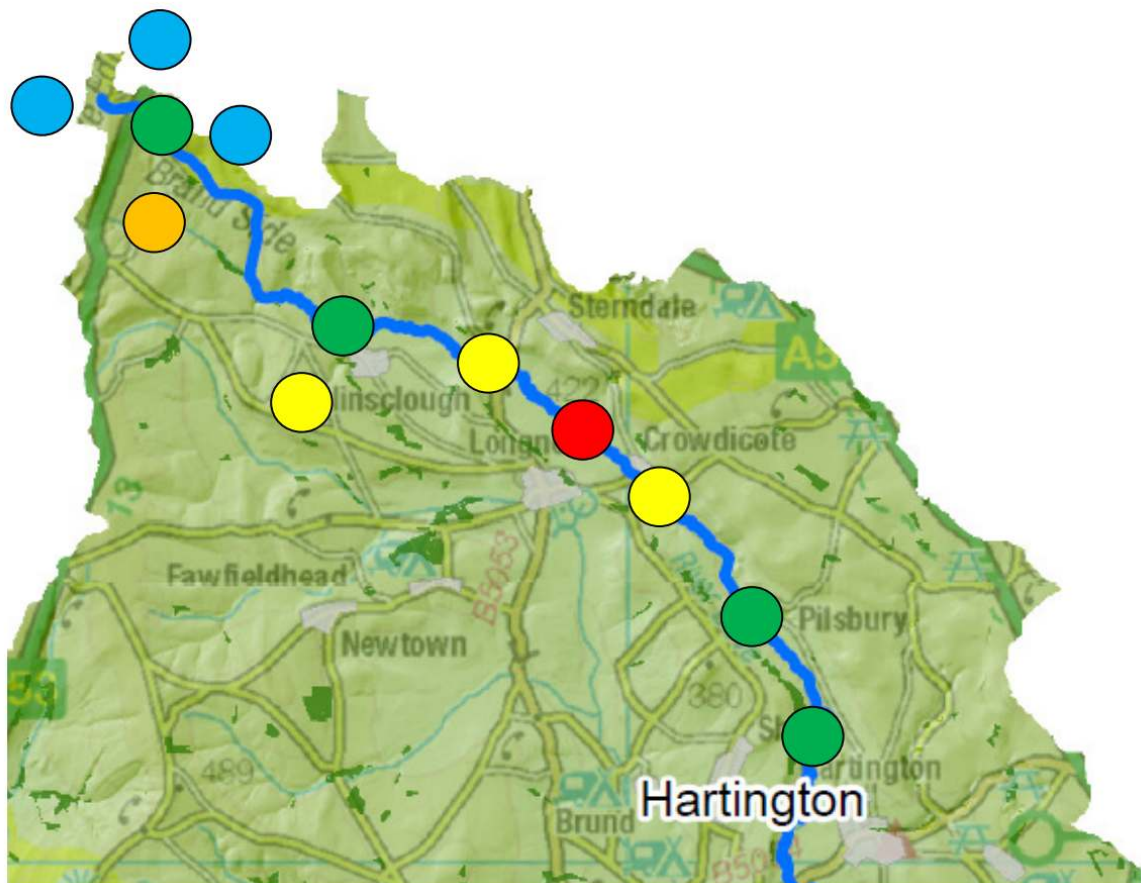


Fig. 2 - Traffic light scoring of SPEAR chemical signatures in the upper Dove. (Aquascience Consultancy Ltd, 2018).

Our sites intermittently indicated signs of nutrient stress, apart from Hatton where there was a consistent fingerprint for phosphate enrichment over the last 3 years. The intermittent nutrient biosignatures in the upper river are likely to be a result of localised nutrient incursions, potentially from cattle encroachment. Further investigation into this at Hatton would be beneficial

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.

We hope the Riverfly Census has gone some way towards helping to address these missing 'reference points' by providing the first species-level baseline for many of the rivers surveyed. But this is just the first step! We welcome working with local groups to better understand the possible pressures and moving towards a more sustainable future for our waterways.

REFERENCES

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