RIVERFLY CENSUS CONCLUSIONS

River Lark

Salmon & Trout Conservation

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REPORT OUTLINE

OUR KEY POINTS

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

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 Lark

OUR THOUGHTS

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

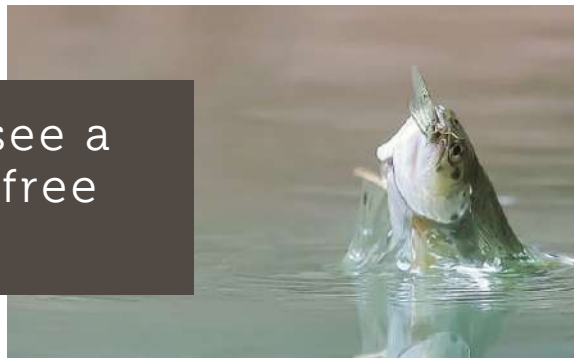
ACKNOWLEDGEMENTS & CONTACT

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

Many thanks to Ian Hawkins for his passion and knowledge of the Lark, without it we would not have been able to generate this important evidence.

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 Lark has revealed that water quality is not where it should be. The invertebrate communities are indicating substantial pressure from nutrients, with additional stress from excess fine sediments and organic loading. To improve water quality in the River Lark and protect its wildlife here are our recommendations:

- The Lark is being subjected to pressures associated with increased urban development. An effective water quality monitoring regime needs to be in place to keep track of ecological impact in the river as this growth occurs. Thorough assessment of the headwaters, their ecological importance and implications for the rest of the river also needs to take place, prior to the housing and road developments proposed in this area.

- Many of the sewage works discharging into the Lark are rural and require upgrading to reduce their impact on water quality. It would be beneficial to carry on species-level monitoring to evaluate the effectiveness of any improvement works from a biological perspective.

- In-river restoration efforts alone have not been sufficient to fix the Lark's water quality issues. To address the problems, management priorities should be on tackling the main issues at source, which are over-abstraction and pollution from point discharges.

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 launched in 2015, with 12 rivers across England. More rivers were added to the Census after 2015, increasing our coverage to 20 rivers. 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.

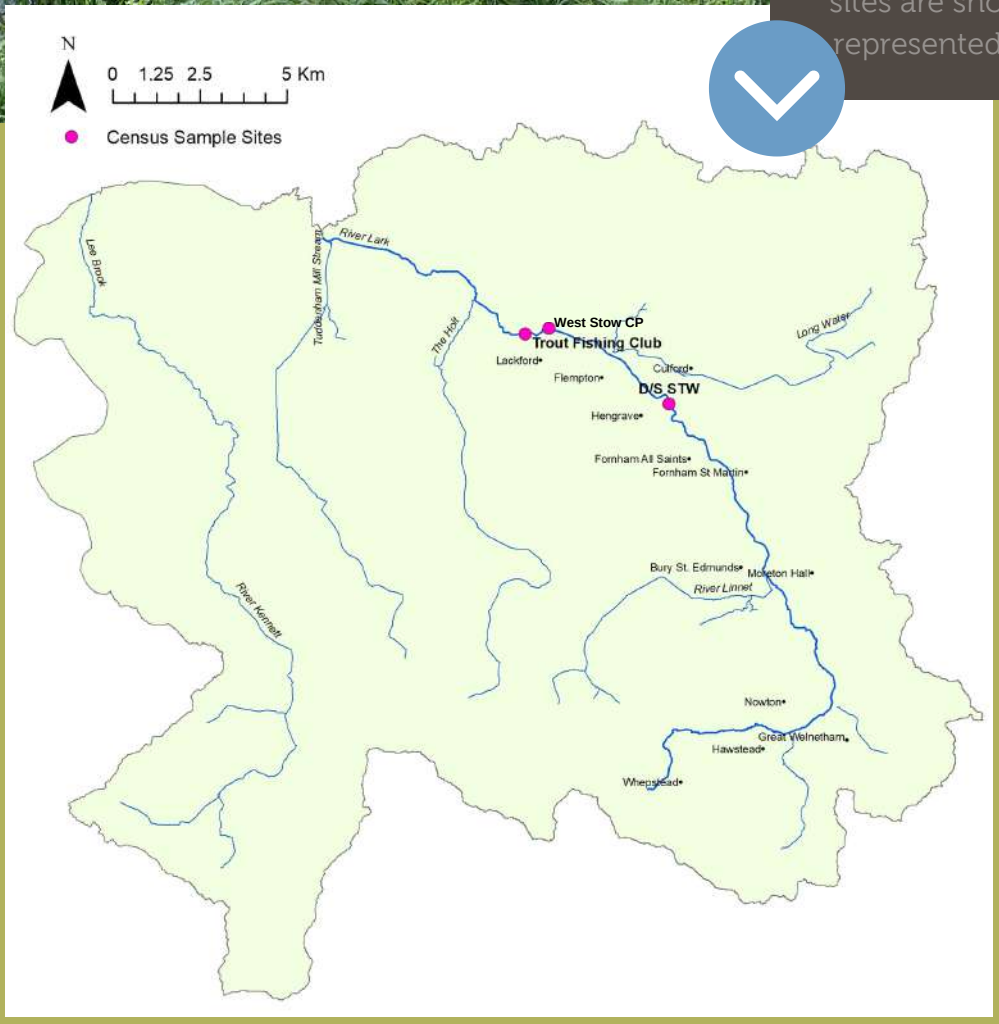
MAKE A STAND

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 Lark began in 2016 for two sites (Trout Fishing Club Reach and West Stow Country Park). These were sampled for three years, A third site downstream of the sewage treatment works (D/S Fornham STW) was added in 2017 and sampled for two years.

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



1 WHAT WE'VE FOUND
D/S Fornham STW

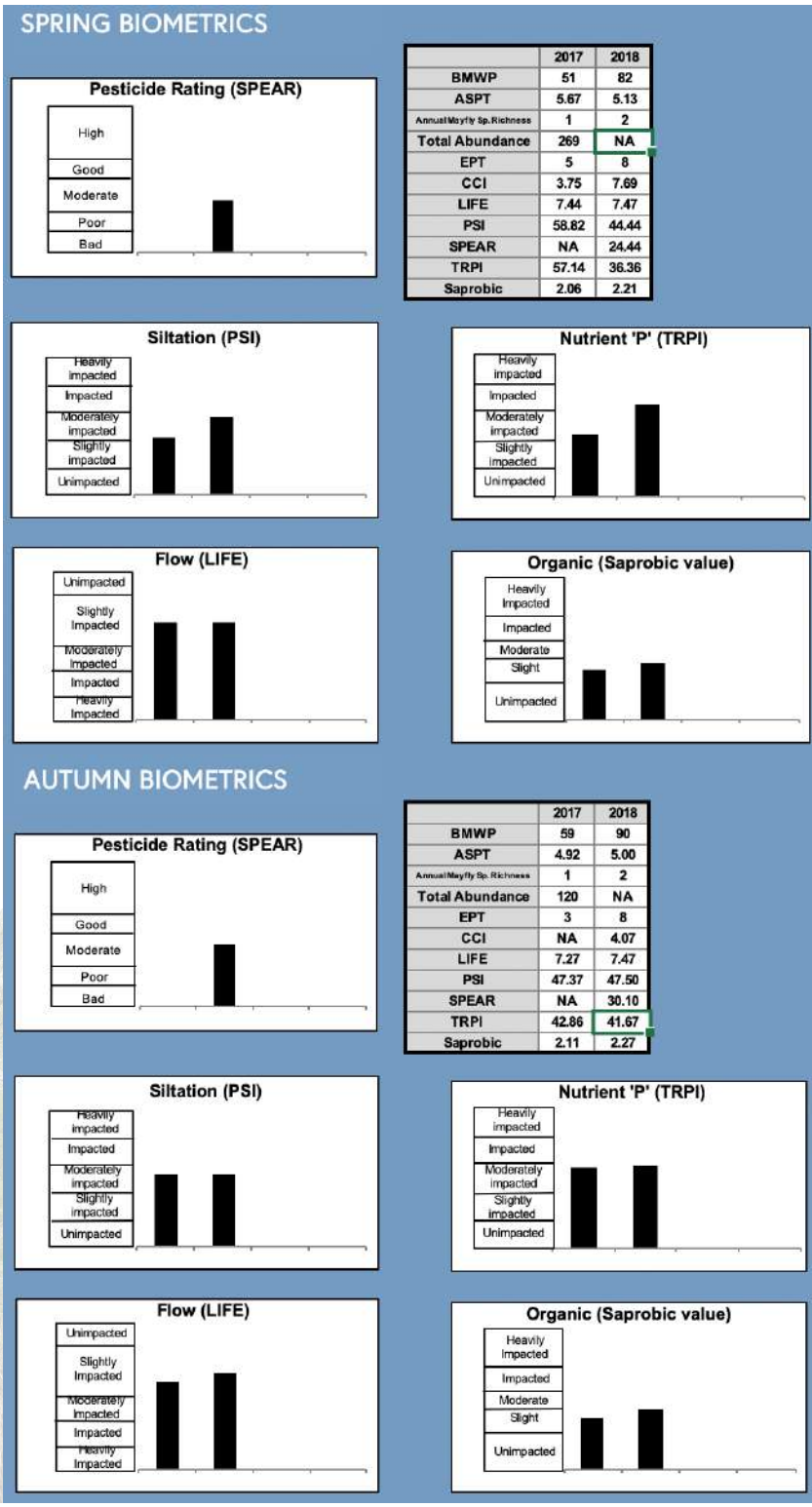
Our furthest upstream site was near Hengrave, downstream of Fornham sewage treatment works. Unlike the downstream sites, this site was only sampled for two years (2017 and 2018). Moderate sediment stress was exhibited in both years, although it was slightly less pronounced in spring 2017.

Nutrient stress was also moderate throughout the two years. However, greater stress on the community was indicated in spring 2018 where an impacted score occurred.

Slightly raised organic enrichment stress signatures occurred in 2018 for both spring and autumn.

For the year SPEAR was calculated, chemical stress was indicated in both seasons and the proposed WFD standard by Beketov et al. (2009) was failed.

Slight flow stress was indicated at this site with LIFE scores lower than the two downstream sites.



	2017	2018
BMWP	51	82
ASPT	5.67	5.13
Annual Mayfly Sp. Richness	1	2
Total Abundance	269	NA
EPT	5	8
CCI	3.75	7.69
LIFE	7.44	7.47
PSI	58.82	44.44
SPEAR	NA	24.44
TRPI	57.14	36.36
Saprobic	2.06	2.21

	2017	2018
BMWP	59	90
ASPT	4.92	5.00
Annual Mayfly Sp. Richness	1	2
Total Abundance	120	NA
EPT	3	8
CCI	NA	4.07
LIFE	7.27	7.47
PSI	47.37	47.50
SPEAR	NA	30.10
TRPI	42.86	41.67
Saprobic	2.11	2.27

2 WHAT WE'VE FOUND
West Stow Country Park

Considerable nutrient stress was exhibited in 2017 and 2018 during both seasons at West Stow. This stress was less pronounced in 2016, but was still borderline moderate in autumn.

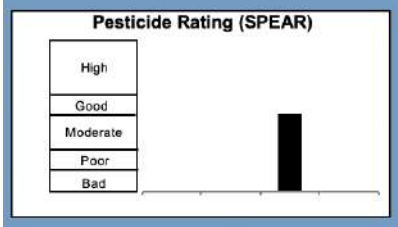
Moderate sediment stress was exhibited by the invertebrate community in spring 2017, spring 2018 and autumn 2016.

Slightly raised organic enrichment stress signatures occurred in 2016 for both spring and autumn.

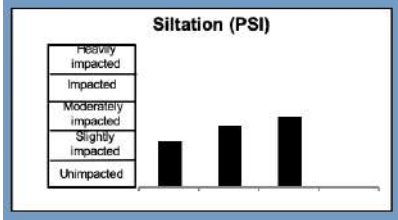
West Stow failed the proposed WFD standard for chemicals in autumn 2018.

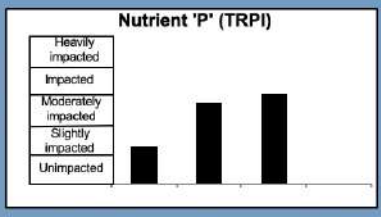
Minimal flow stress was indicated.

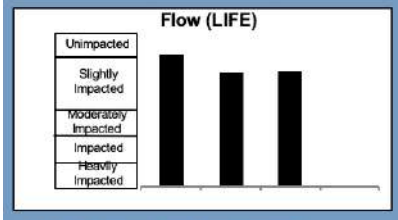
SPRING BIOMETRICS

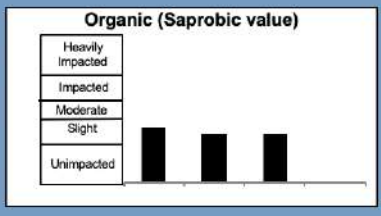


	2016	2017	2018
BMWP	103	84	116
ASPT	5.80	6.46	5.52
Annual Mayfly Sp. Richness	5	5	4
Total Abundance	NA	1319	NA
EPT	14	8	12
CCI	9.72	8.89	8.53
LIFE	8.05	7.69	7.75
PSI	68.18	57.69	52.08
SPEAR	NA	NA	35.43
TRPI	75.00	45.45	40.00
Saprobic	2.14	1.99	1.97

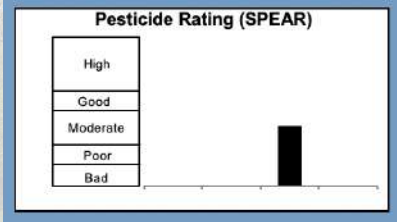




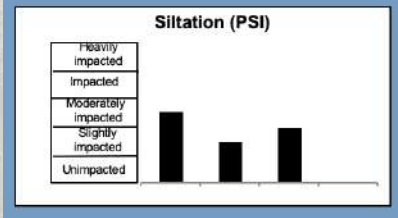


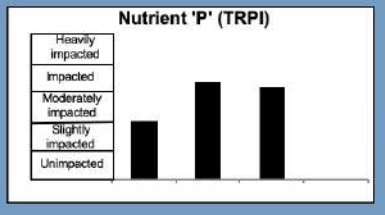


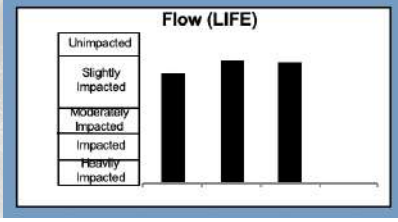
AUTUMN BIOMETRICS

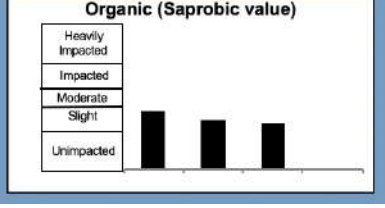


	2016	2017	2018
BMWP	81	84	92
ASPT	5.06	6.00	5.41
Annual Mayfly Sp. Richness	5	5	4
Total Abundance	878	498	NA
EPT	6	8	10
CCI	4.50	NA	9.21
LIFE	7.67	7.93	7.89
PSI	50.00	71.43	61.36
SPEAR	NA	NA	27.73
TRPI	60.00	33.33	37.50
Saprobic	2.22	2.04	1.96









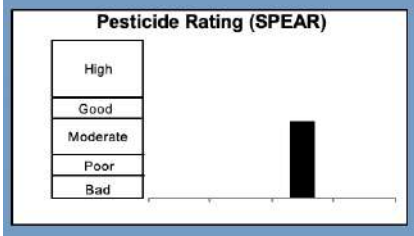
3 WHAT WE'VE FOUND
Trout Fishing Club Reach

The invertebrate community at the fishing club reach exhibited marked nutrient stress in 2018 for both seasons. Nutrient stress was also notable at spring 2017, where a moderate impact score occurred.

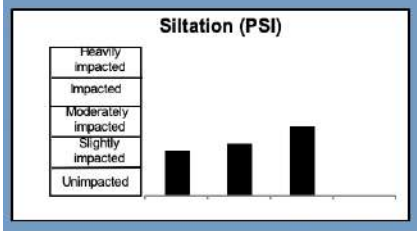
Stress from excess fine sediments was less pronounced at this site compared to the other two we sampled. However, moderate stress signatures were still exhibited in autumn 2016 and spring 2018.

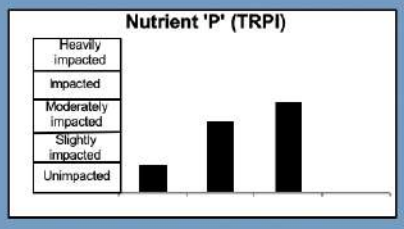
Chemical stress was evident in autumn 2018, where the proposed WFD standard for SPEAR was failed.

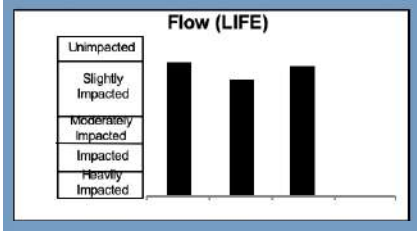
SPRING BIOMETRICS

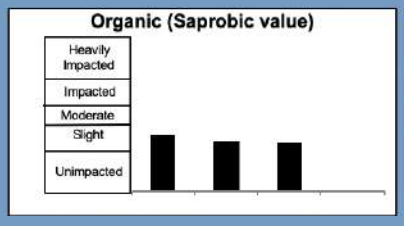


	2016	2017	2018
BMWP	107	90	98
ASPT	5.90	6.00	5.76
Annual Mayfly Sp. Richness	6	4	4
Total Abundance	NA	695	NA
EPT	13	8	9
CCI	10.28	9.50	4.93
LIFE	8.00	7.67	7.93
PSI	70.73	65.52	54.84
SPEAR	NA	NA	34.02
TRPI	83.33	53.85	41.67
Saprobic	2.09	2.00	1.94

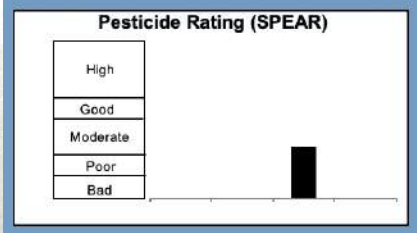




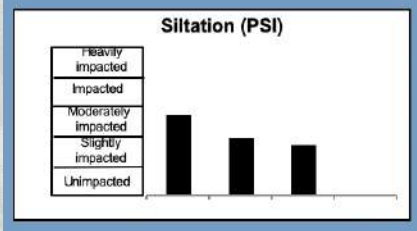


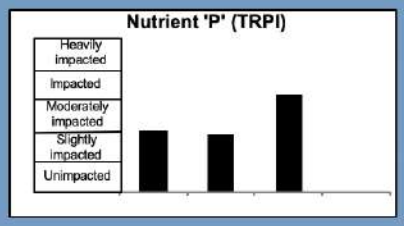


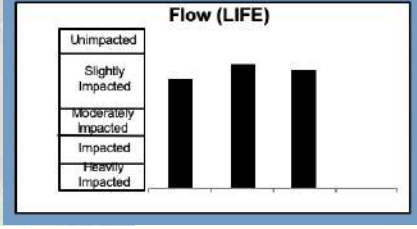
AUTUMN BIOMETRICS

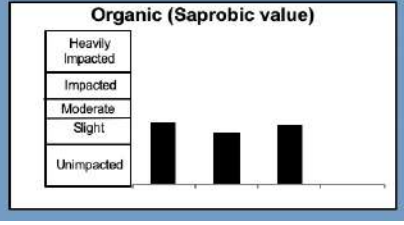


	2016	2017	2018
BMWP	110	86	86
ASPT	5.24	6.14	5.06
Annual Mayfly Sp. Richness	6	4	4
Total Abundance	1143	497	NA
EPT	9	8	8
CCI	7.50	NA	5.00
LIFE	7.53	7.80	7.72
PSI	46.51	61.29	66.67
SPEAR	NA	NA	23.02
TRPI	60.00	62.50	37.50
Saprobic	2.21	2.03	2.17









Discussion

Nutrient stress was exhibited by the invertebrate communities at all of our sample sites. However, the pressure appeared to be greatest at the site downstream of Fornham sewage treatment works. As well as the biometrics, the improvement in water quality at the further downstream sites is also indicated in the riverbed photographs (Fig. 1).

Increases in population are projected to be significant in the Lark catchment. Between 2012 and 2031, the Bury St Edmunds population is predicted to grow by around 13,776 people, a population increase of approximately a third (Office for National Statistics, Census 2011)(St Edmundsbury Borough Council, 2014). Such growth will increase the dependence on sewage works, and will lead to greater volumes of phosphorus, sediment and chemicals being discharged into the river. The invertebrate communities are indicating that the current state of water quality is far from healthy, therefore preventing further deterioration as a result of this extra loading is critical. No further deterioration is also a requirement under the Water Framework Directive.

Fig. 1 - Riverbed photos (left to right) D/S Fornham sewage treatment works, West Stow country park and trout fishing club, autumn 2017

Additionally, plans for a new road and housing on both sides of the river Lark in currently unspoiled, natural headwaters have been proposed (Amec Foster Wheeler Environment & Infrastructure UK Ltd, 2015). As habitat with significant ecological importance to the Lark's invertebrate life and fisheries, it is essential that Environmental Impact Assessments for the works take into account the water environment, rather than just the terrestrial habitat surrounding the river.

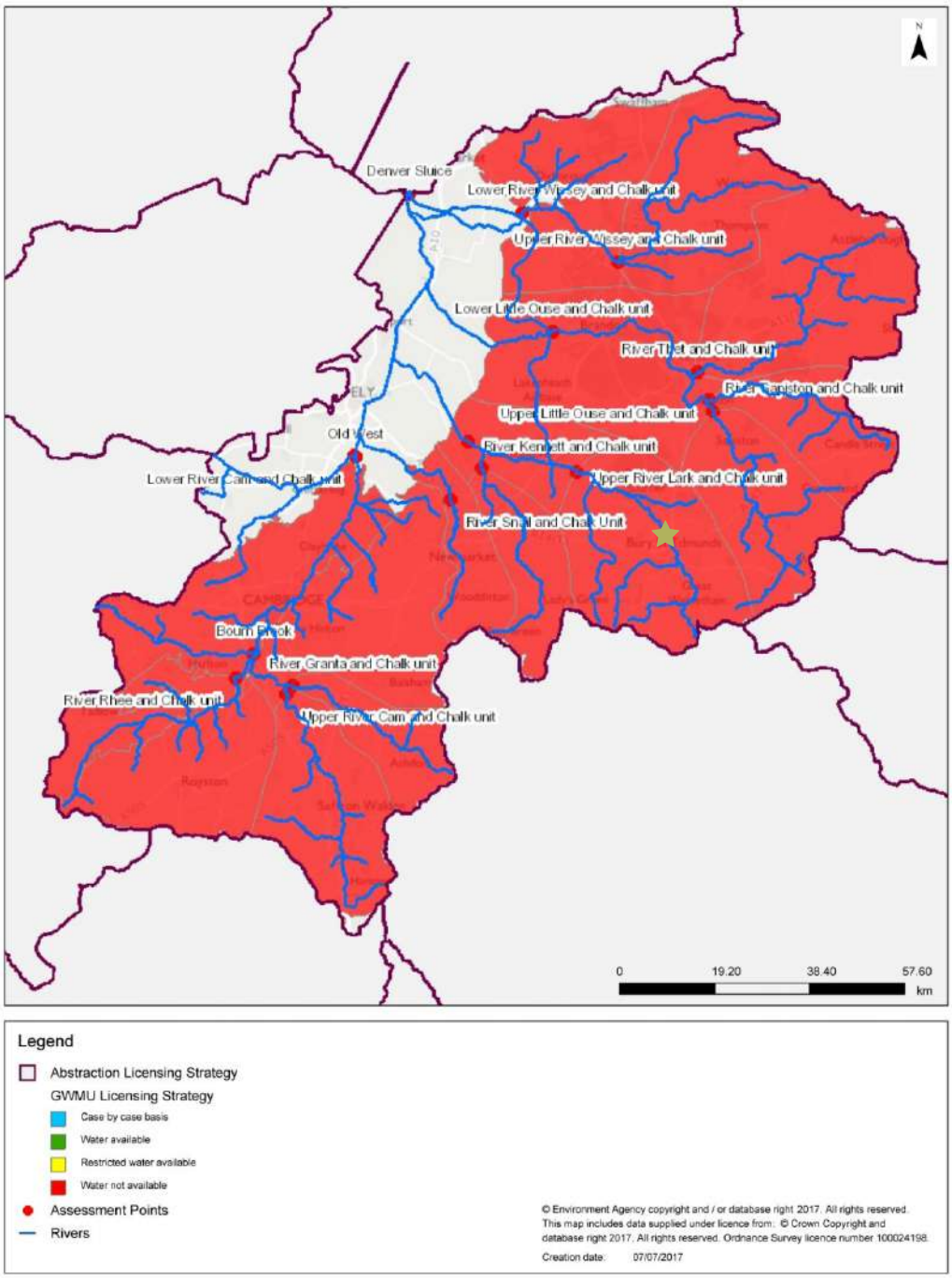


Fig. 2 - Cam & Ely Ouse CAMS Groundwater Resource Colours Map. Lark indicated by green star. Environment Agency, 2017

Nutrient, sediment, chemical and organic stress can also be exacerbated by lack of available water to dilute loading inputs. The Environment Agency's abstraction strategy for the Cam and Ely Ouse catchment (the Lark is a sub-catchment within this) shows that for groundwater, more water has been abstracted based on recent amounts than the amount available. Essentially, the river is at full capacity (Fig. 2). New housing will increase water demand further, and result in greater pressure on the Lark's current abstraction points.

Some stress from organic pollution was indicated by the biometrics. A large sewage fungus event was reported in late July/August 2017 between West Stow Country Park and the Trout Club reach. West Stow sewage works is located upstream of where the fungus event was documented, so the organic input may potentially have been a result of this discharge. In the year after the fungus event, improvement works began and are due for completion in March 2020 (Martin Bowes, Anglian Water). As these improvements started in September 2018, the biological response is not covered in our survey. It would be beneficial to carry on species-level monitoring to see if the invertebrate community responds positively to the upgrade of this rural sewage works.

A variety of restoration projects have taken place on the Lark, including removal of weir boards and installation of large woody debris and gravel. However, it has been reported that the installed gravels are now covered in algae and silt. A blue-winged olive translocation project was also undertaken on the Lark, in an attempt to restore populations of this upwing species. Nine-million eggs were incubated and released into the Lark in 2017. Despite evidence that these eggs successfully hatched, reports suggest that they did not translate into a reproducing adult population. These examples indicate that in-river restoration efforts alone are not sufficient to fix the Lark's water quality issues.

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.

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