



Ripple effect: A Waterway Resilience Initiative

Funded by **SSRP**, *Sussex Sustainability Research Programme*



Project
**Ripple
Effect**

Ripple Effect Report
March – September 2024



**FRIENDS OF THE
RIVER MEDWAY**

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Project
**Ripple
Effect**

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This report has been written and produced by Ellen Rotheray, with help from Caitlin Mook, Sue Blanch, and the Ripple Effect citizen scientists

Summary

- Ripple Effect monitored the Upper River Medway and Grom from March until September 2024.
- Ammonia, phosphate, and conductivity levels exceeded healthy thresholds at multiple sites. Our findings suggest that some locations experience fluctuating levels of these parameters, likely due to sewage outfall or runoff.
- Riverfly score data from monthly kick surveys indicate that several sites support animal groups that are positive indicators of water health. Some sites with lower scores corresponded with higher indicators of pollution.
- Our eDNA analysis detected over 500 aquatic and terrestrial species, between 30 and 157 per site.
- To better understand these results and complete our baseline dataset, we need to complete a full year of data collection and include physical habitat variables.



Flat-bodied stone clinger

Introduction

Globally, freshwater wildlife is affected by habitat degradation, invasive species, and pollution (including sewage, runoff, chemicals, and waste). These stressors are associated with major wildlife population declines and species loss. No stretch of river in England is in good overall health; 23% have poor or bad overall status, and 85% are below good ecological standards¹.

Monitoring plays a fundamental role in identifying the stressors driving freshwater wildlife declines, and documenting ecosystem recovery after restoration efforts.

This project aimed to:

1. Combine existing, complementary citizen science methods for monitoring river health
2. Utilise combined citizen science methods to monitor the Upper River Medway and Grom to inform, protect, and motivate positive action



Damselfly



Stonefly



¹ The Rivers Trust. (2024). State of Our Rivers. Available here: <https://theriverstrust.org/key-issues/state-of-our-rivers>

Method

We identified 15 sites for monitoring along three, 10km stretches of the Upper River Medway and Grom (see map, page 10). We asked citizen scientists to survey:

- Ammonia, Phosphate, Conductivity* and Temperature every two weeks, Mondays between 10am and 2pm, to determine range and capture incidents
- 8 groups of animals following Riverfly² Kick survey methods, once per month, as a measure of water quality
- eDNA* once in May (analysed by ADAS³), to compare across sites, and use as a biodiversity baseline

NB. An additional site Hartfield ‘HF6’ was added due to HF4 & HF5 tributaries drying up in summer and the main river at these sites being unsafe to sample after May. GB2 was also sampled before (GB2a) and after (GB2b) a sewage outfall at this site.

*See pages 13 & 14 for a glossary of terms



²The Riverflies Partnership, Available here: www.riverflies.org

³ADAS, Available at <https://adas.co.uk/>

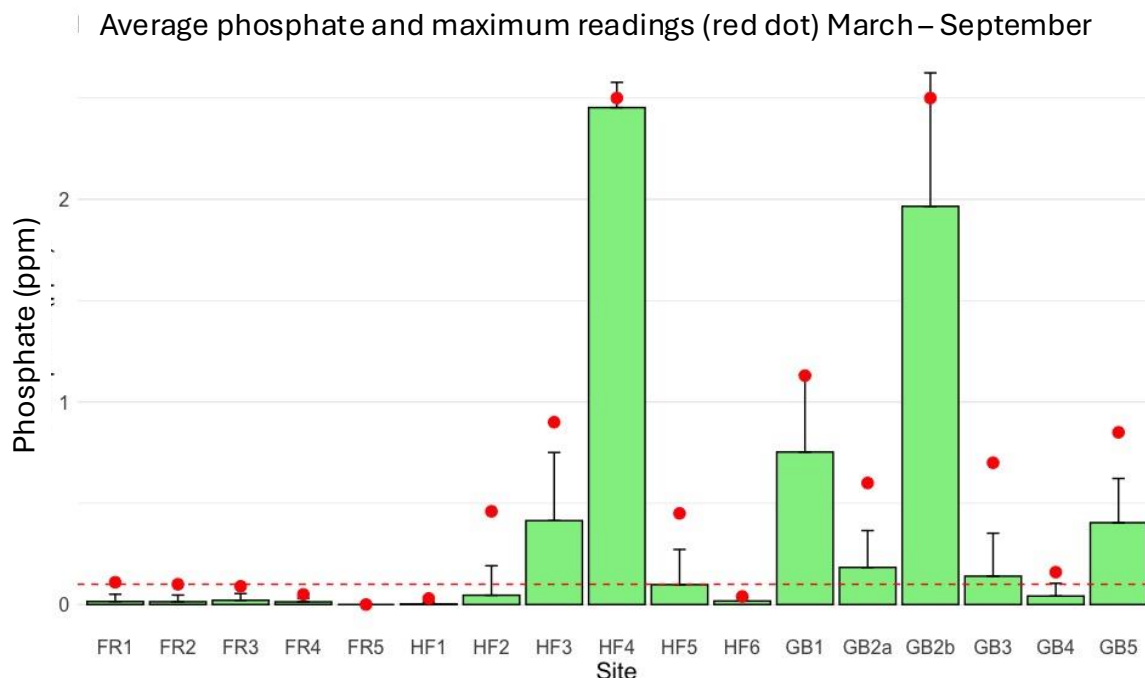
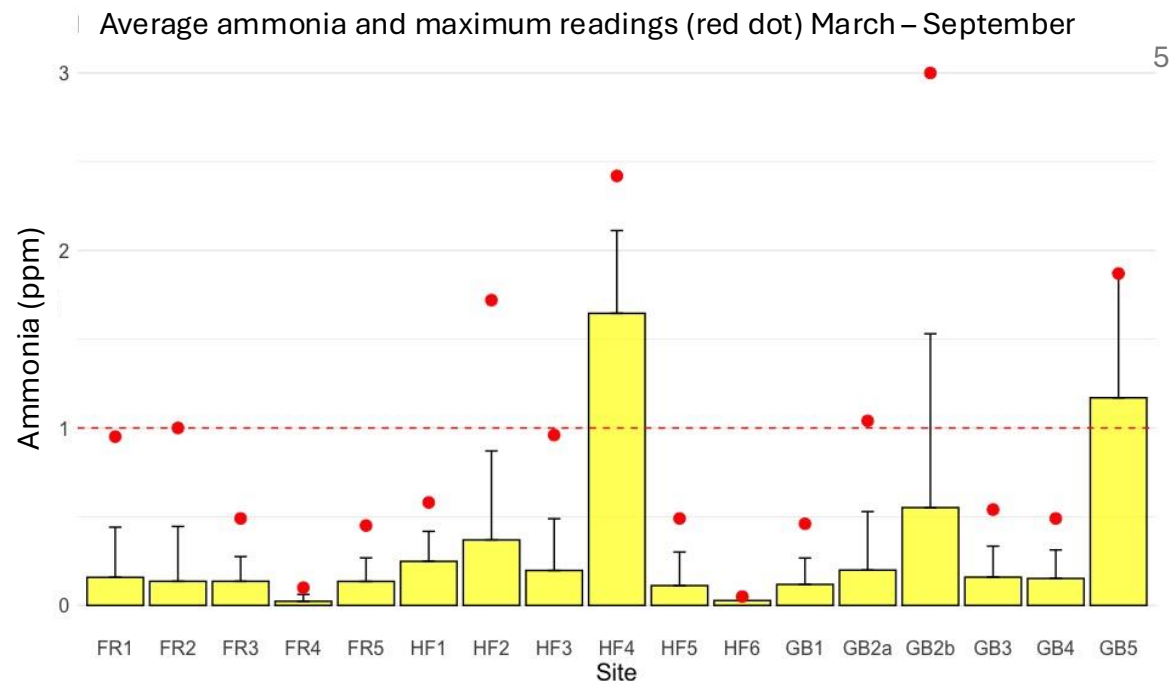
Results – water parameters

Ammonia

This figure illustrates the average ammonia level (yellow bars) at each site, showing that Hartfield Forest Way (HF4), Groombridge After Outfall (GB2b) and Garden Centre (GB5) are exposed to higher-than-average, and above healthy levels of ammonia (red dashed line at 1 ppm). The highest maximum ammonia recording was 3 ppm at GB2b. The longer error bar at GB2b indicates that there was more variation in ammonia levels at this site - the sewage outfall is the assumed source.

Phosphate

This figure illustrates the average phosphate levels (green bars) at each site. Higher than healthy levels of phosphate (red dashed line at 0.1 ppm) were detected on average (March until September) at 7 of 17 sites sampled. Again, the greatest level of variation (length of error bar) was recorded at GB2b, likely due to the outfall at this site.



Results – water parameters

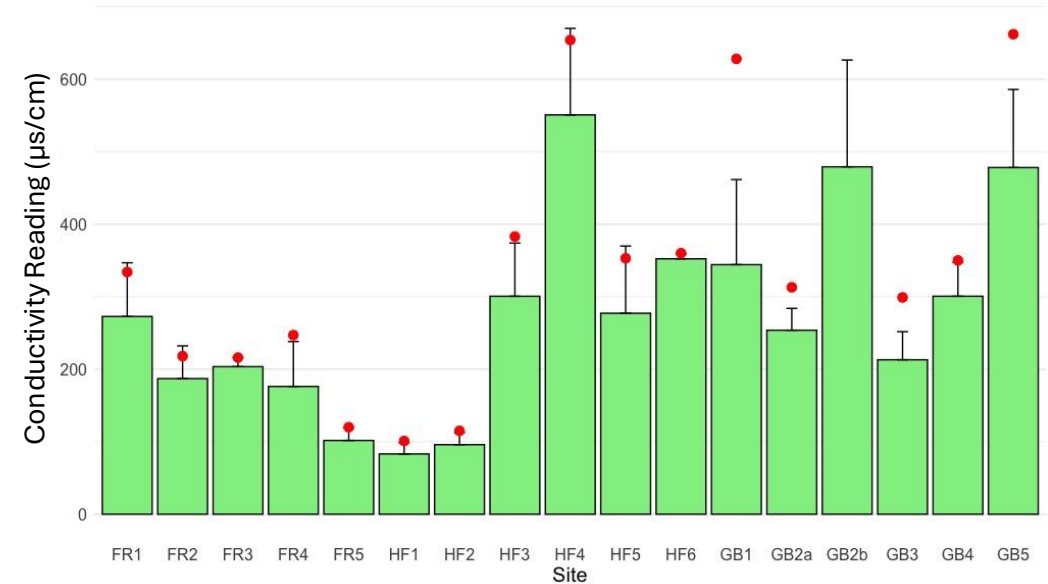
Average conductivity

Average conductivity (green bars) was highest at Hartfield Forest Way HF4, recorded at over 500 $\mu\text{S}/\text{cm}$; a level which may indicate unsuitable conditions for certain species. It was also detected at this level at Groombridge Forest Way (GB1), After Outfall (GB2b), and Tunbridge Wells Garden centre (GB5).

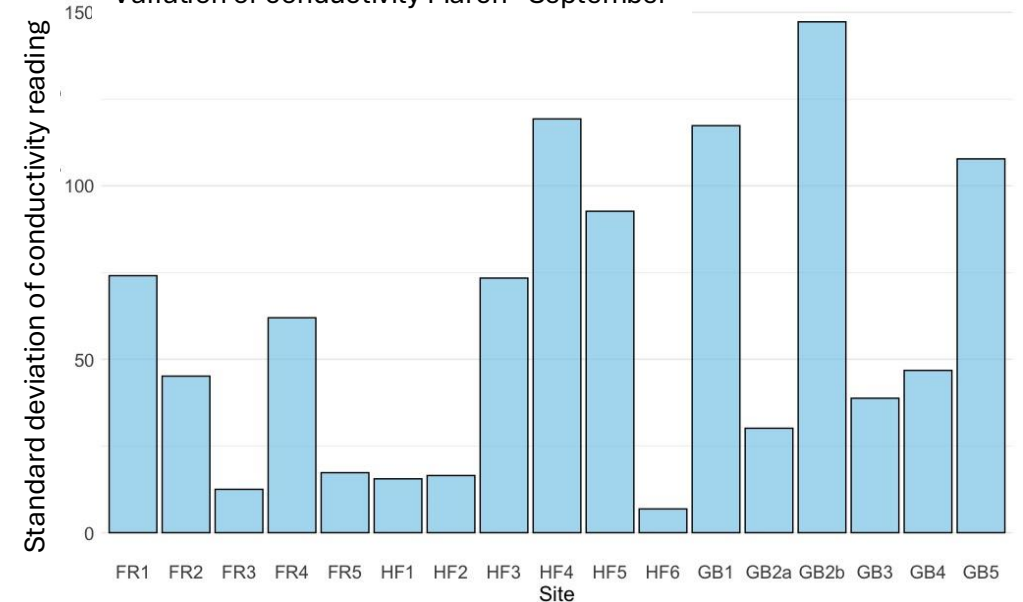
Conductivity variation

The variation in conductivity (light blue bars) at Hartfield Forest Way (HF4), Groombridge Forest Way (GB1), After Outfall (GB2b) and Garden centre (GB5), suggests these sites are likely exposed to outfall or runoff causing spikes. For detailed parameter trends over time at individual sites see pages 11 to 13.

Average conductivity and maximum readings (red dot) March - September



Variation of conductivity March - September



NB. Hartfield Forest Way (HF4) is a tributary and dried up early in the summer

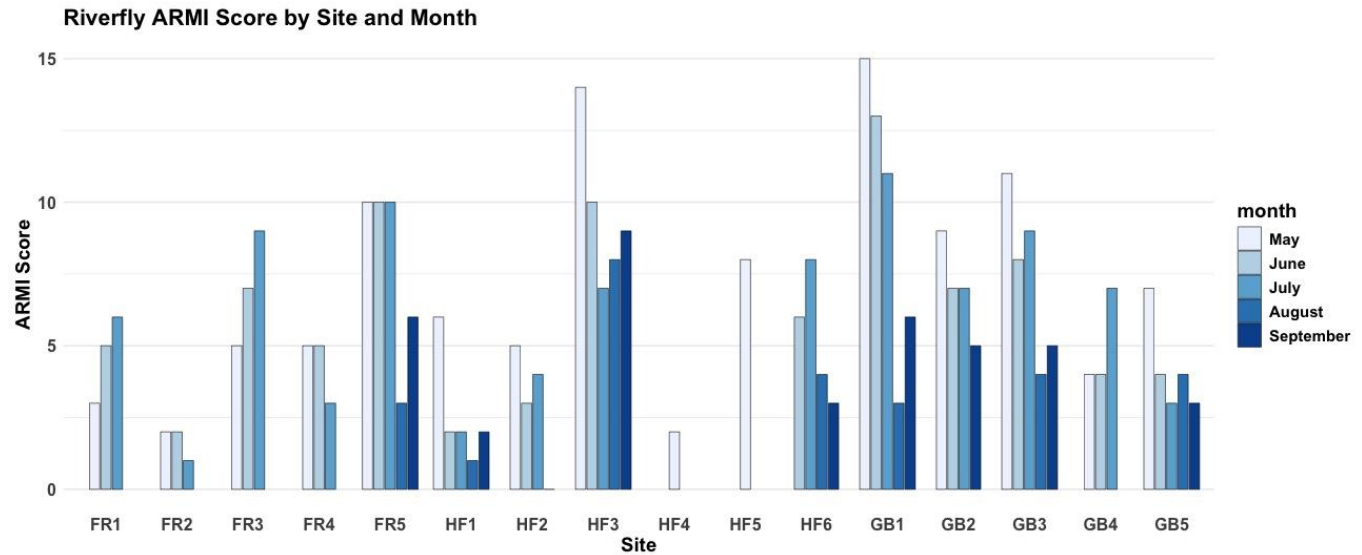
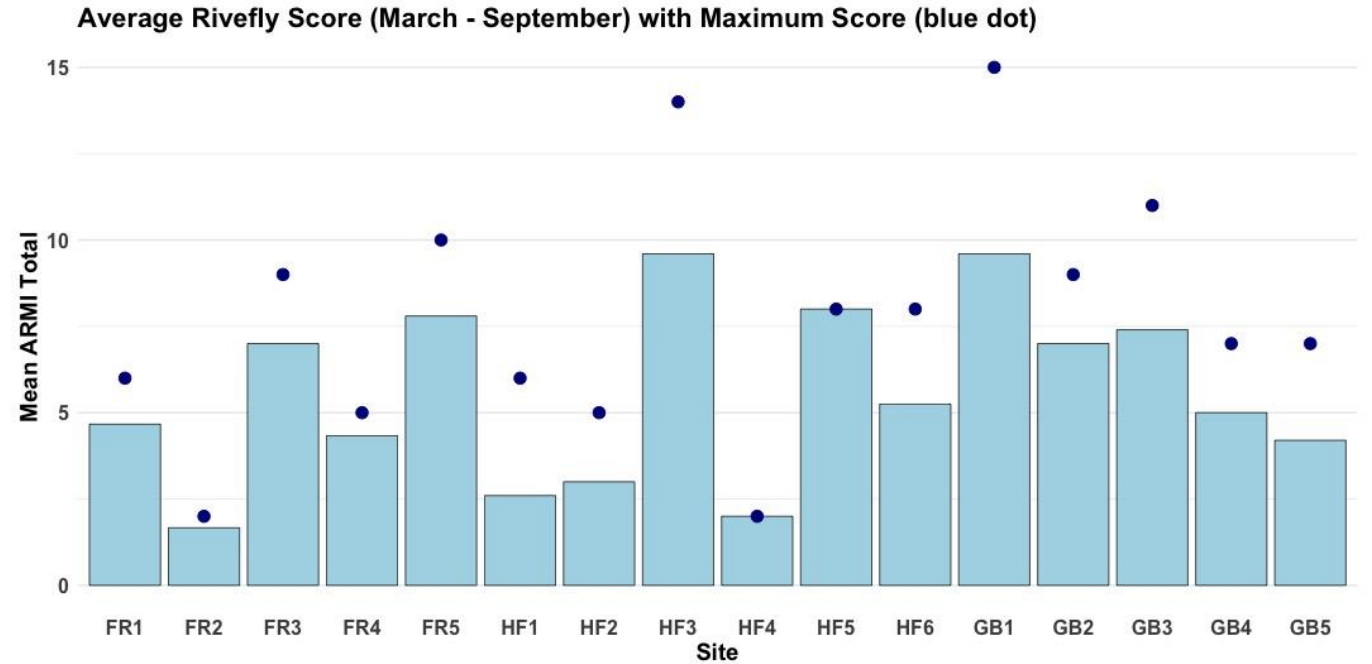
Results – Riverfly score

Average Riverfly score

Average Riverfly scores (light blue bars, based on the number and abundance of 8 different taxa) and maximum scores (dark blue dots) were greatest at Hartfield Farm (HF3) and Groombridge Forest Way (GB1), indicating that these sites have good water quality supporting pollution intolerant animals. Hartfield Forest Way (HF4) had among the lowest scores.

Riverfly Groups

All 8 Riverfly groups were identified at Hartfield Farm (HF3) and Groombridge Forest Way (GB1), and 7 were identified at Golf (FR5) and Hartfield Farm (HF3). Many sites see a decline in scores over time which is natural, but there is a comparatively large drop in score between May and August at Groombridge Forest Way (GB1) which could be due to an incident (a peak in conductivity was recorded in June, see page 13). Where there is an increase in score, this may be the result of improving volunteer technique and experience.

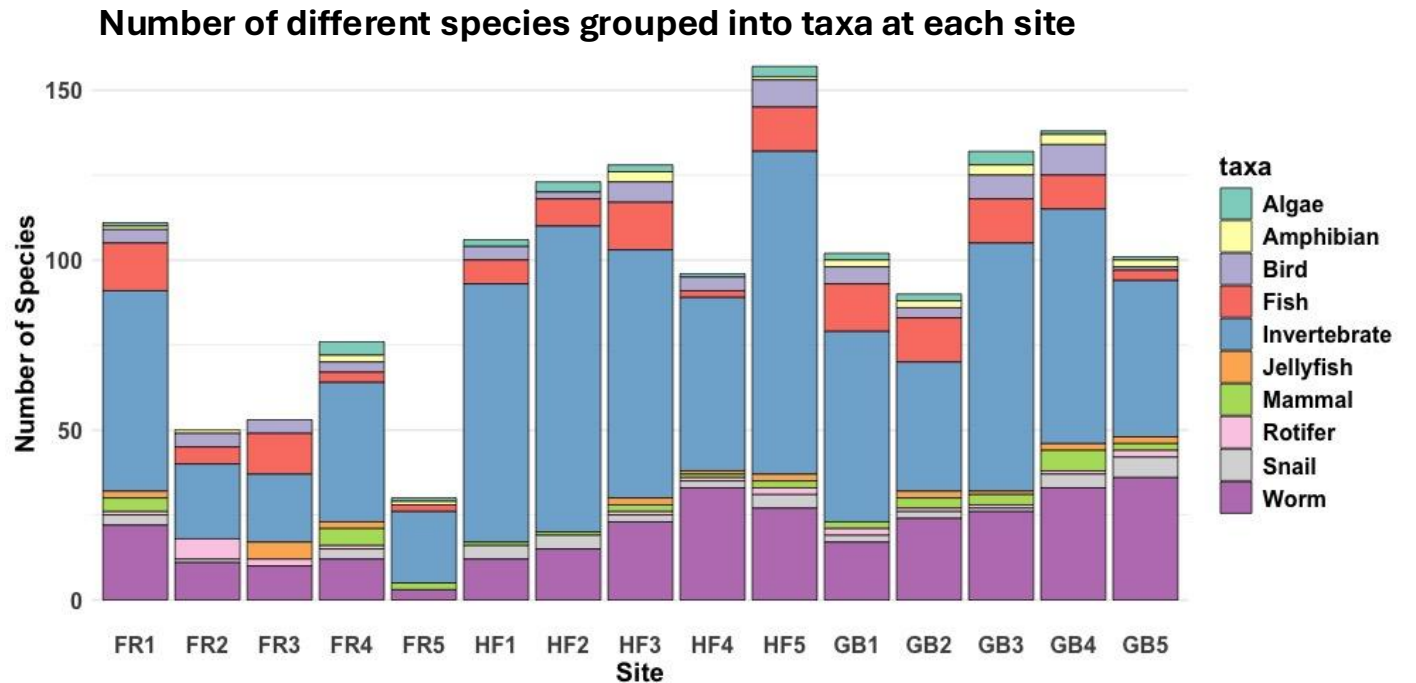


Results – eDNA

Number of species

Across 15 sites we detected 507 wild species in total. This included 11 mammals, 19 birds, 4 amphibians, and 21 species of fish.

The highest number of species was found at Beech Green Lane (HF5) with 157 detected, followed by 138 at High Rocks (GB4) and 128 at Hartfield Farm (HF3). Comparatively, the lowest cumulative number of species was detected along the Forest Row stretch (320), while the highest was detected along the Hartfield stretch (610).



Results – eDNA

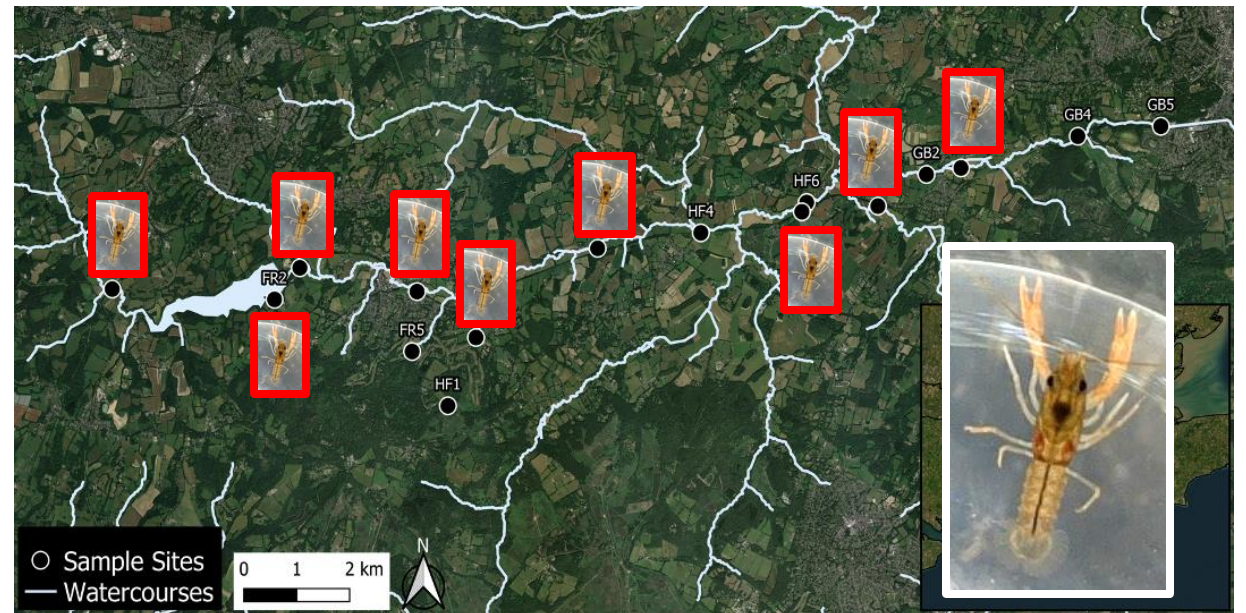
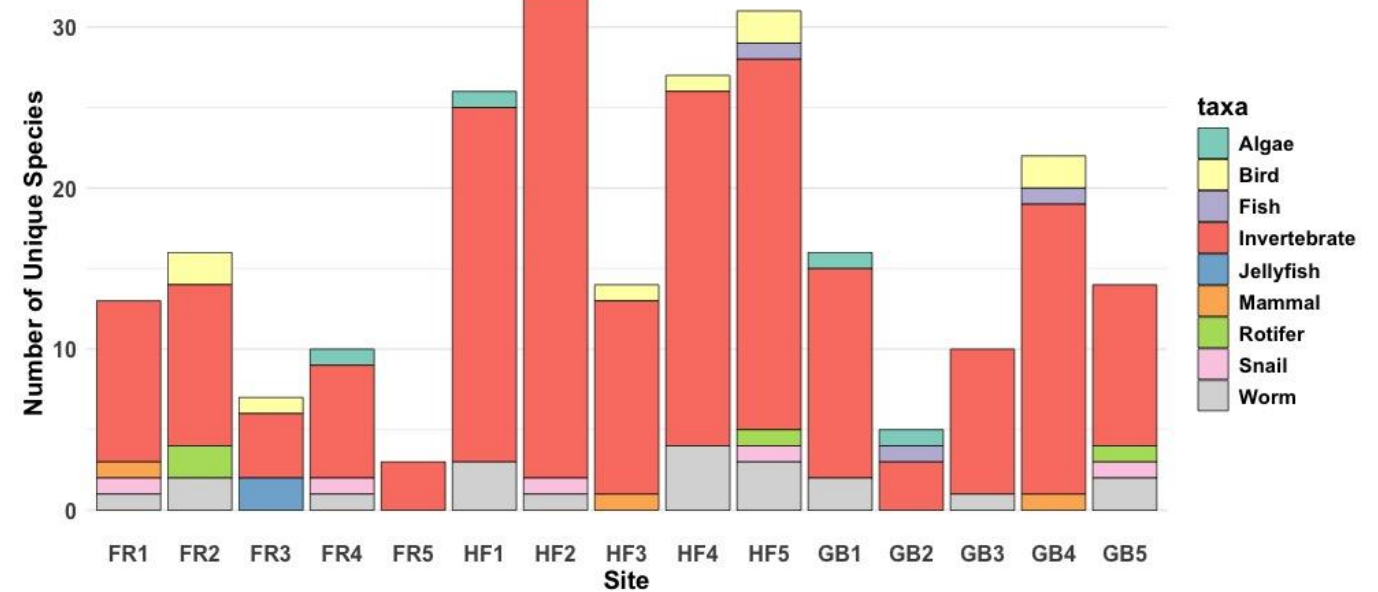
Number of unique species

At each site, we detected between 5 and 32 unique species; those that were only recorded from one site. The highest number of unique species were recorded from Off road (HF2) and included the Golden-ringed dragonfly and a mayfly species associated with slow moving freshwater.

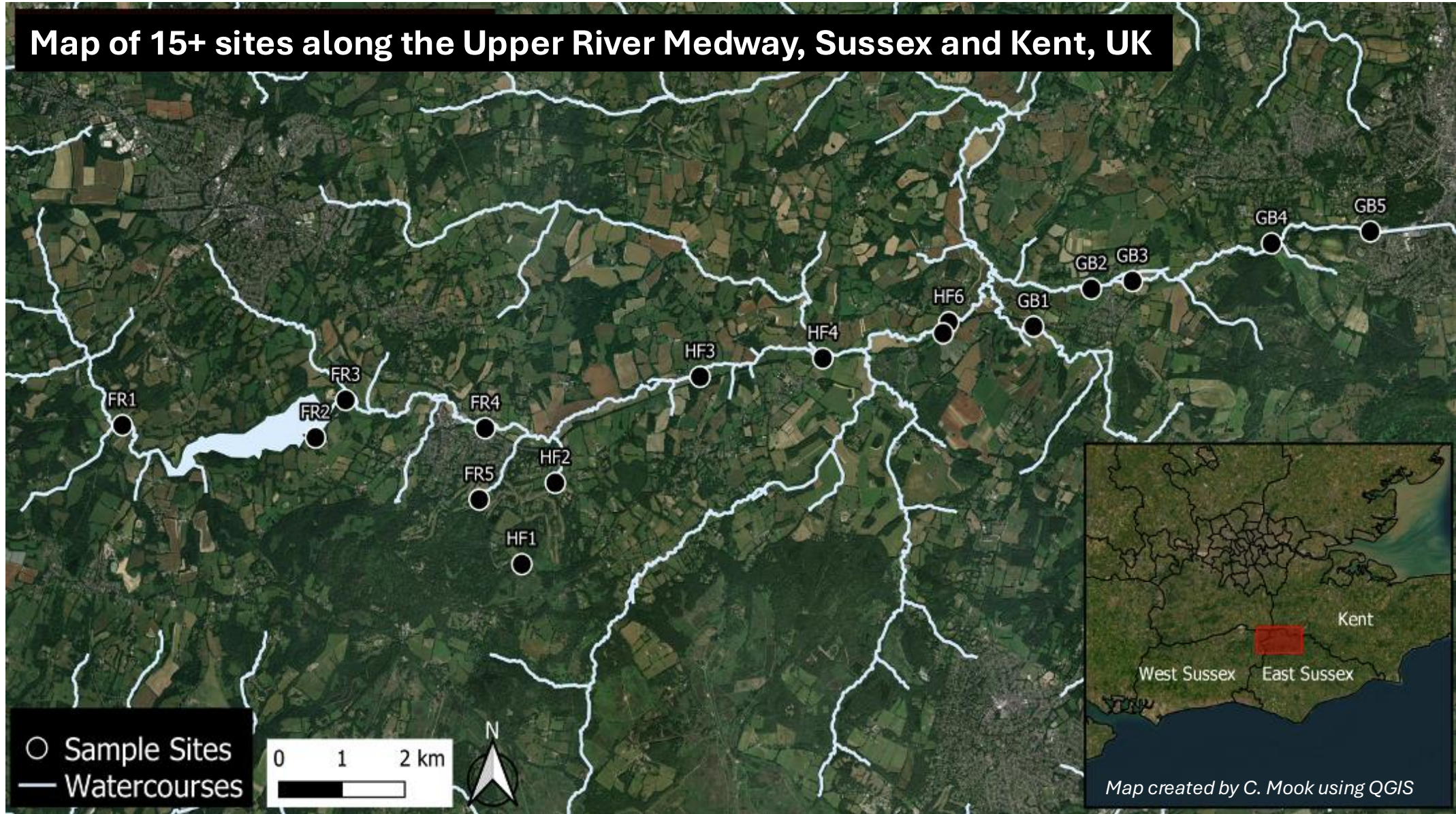
Invasive species

The invasive Signal Crayfish was detected at 8 of 15 sites (and confirmed at a 9th site from June's Riverfly kick survey). Mink were only detected at Forest Row vineyard (FR1).

Number of Unique Species within Each Taxa for Each Site



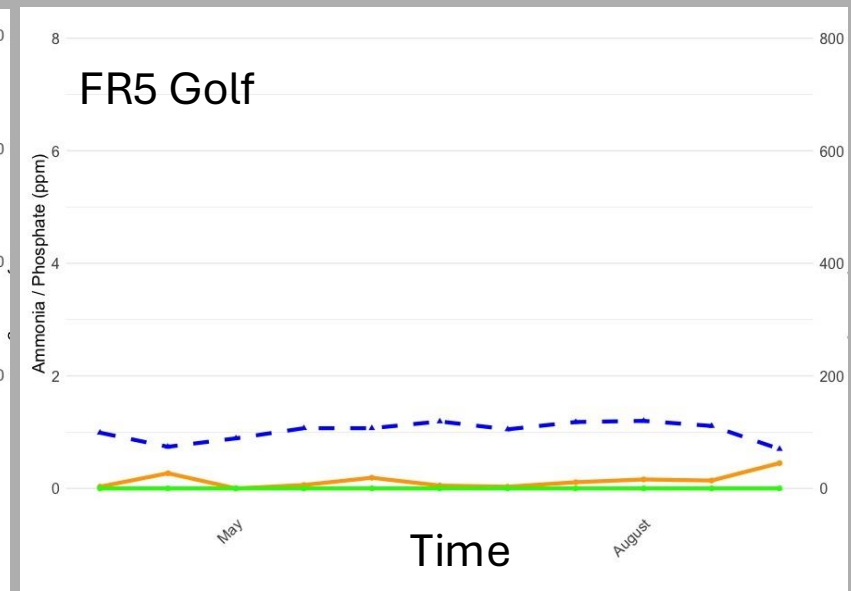
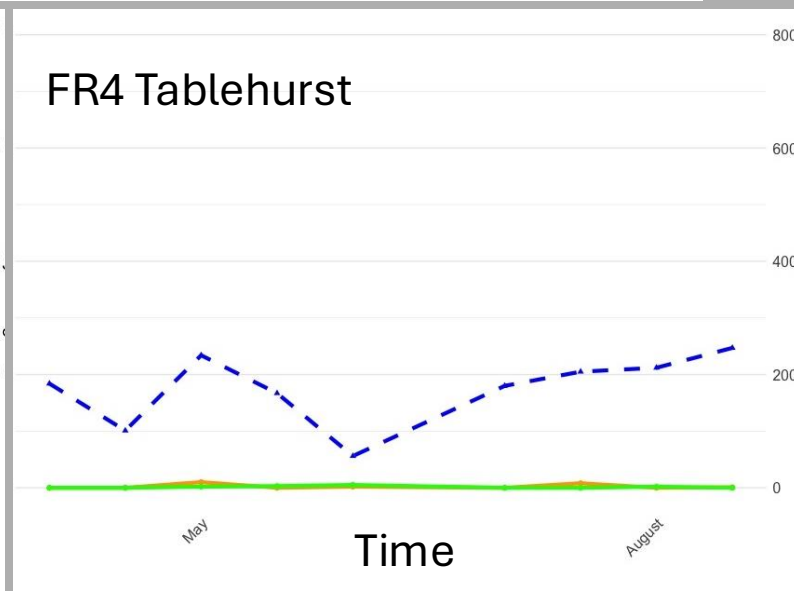
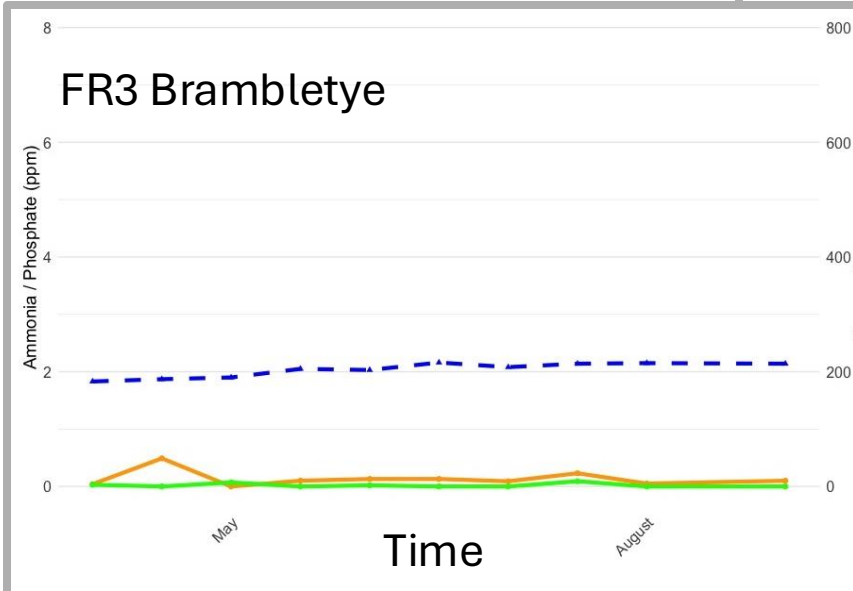
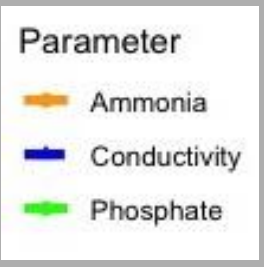
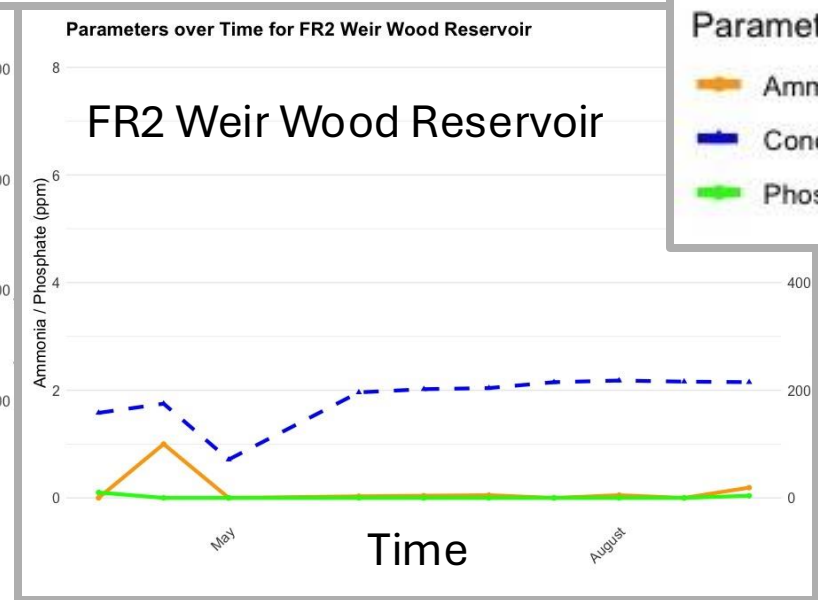
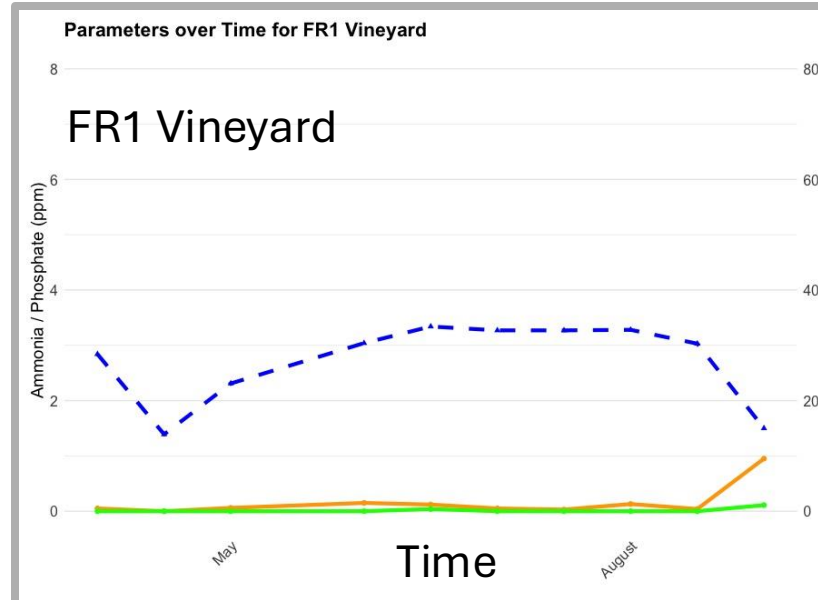
Map of sites along the Upper River Medway and Grom



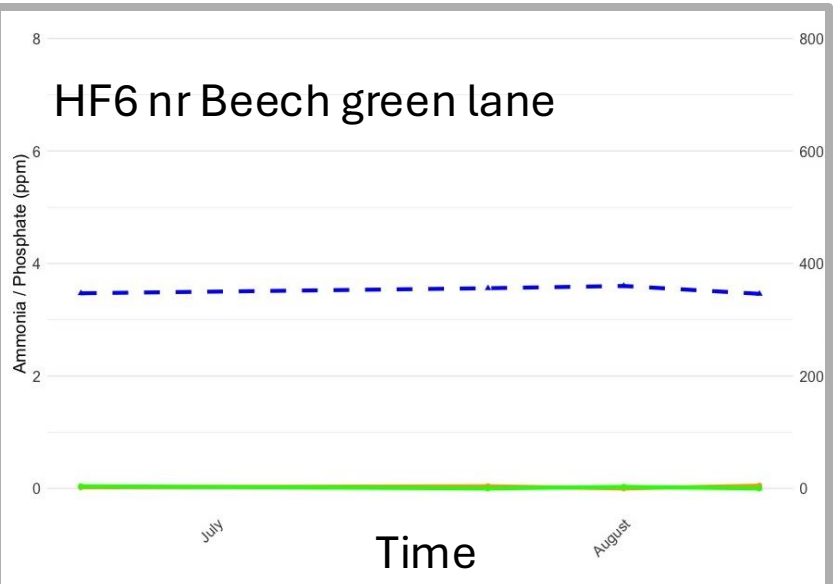
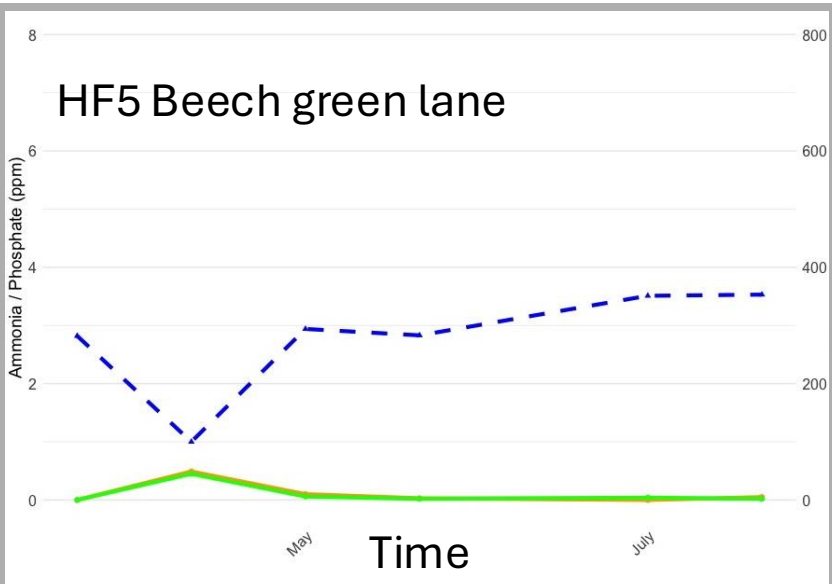
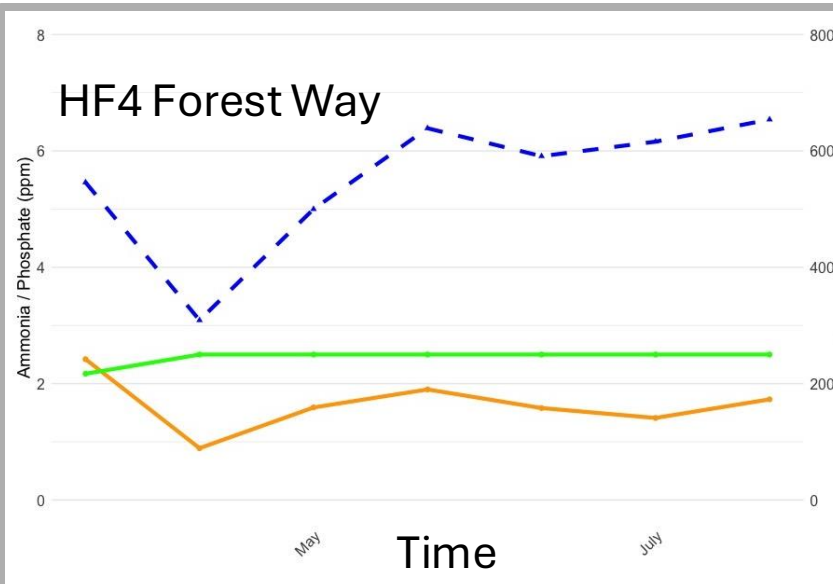
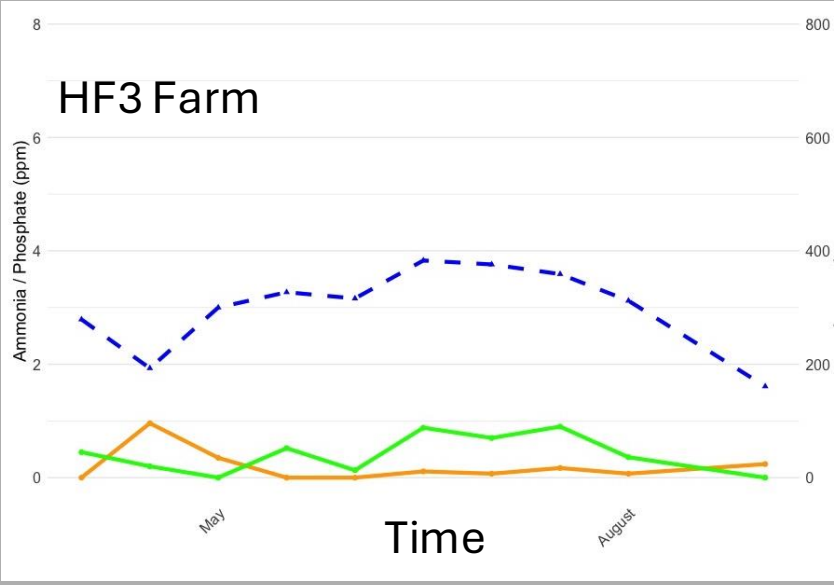
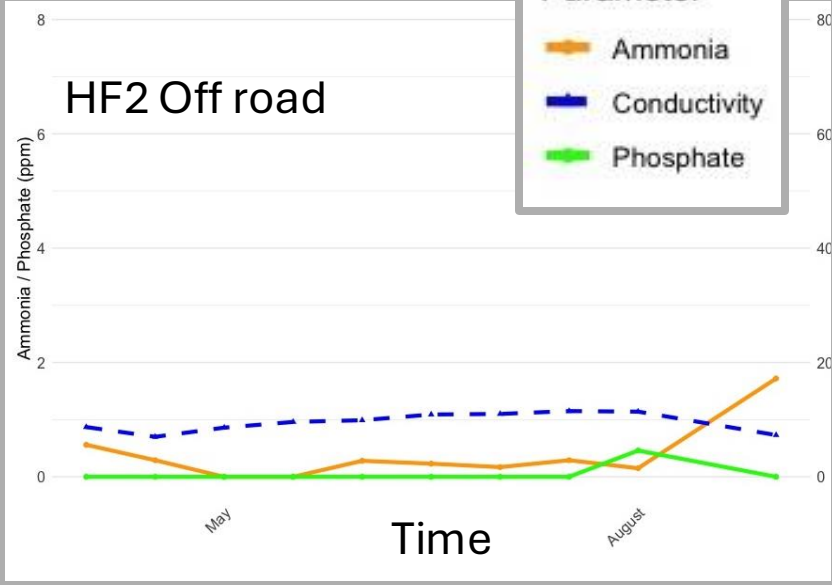
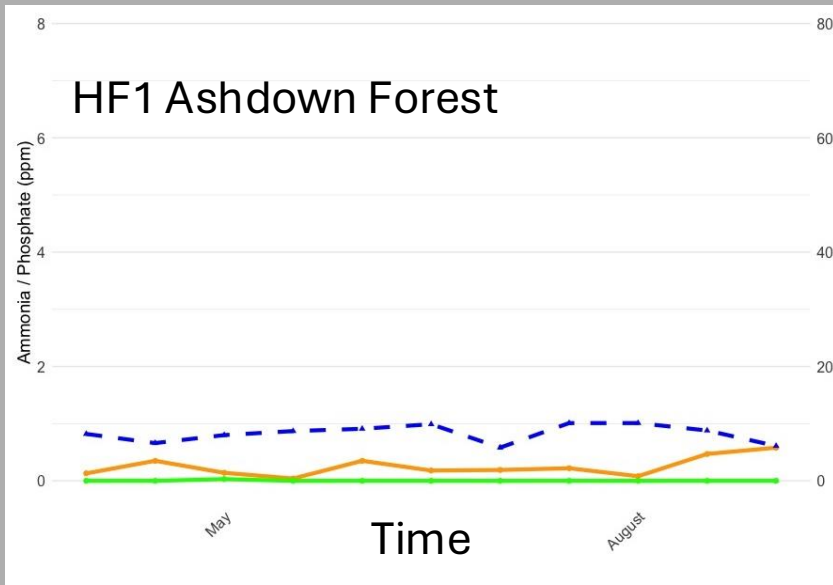
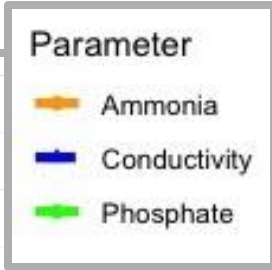
NB. HF6 was added due to HF4 & HF5 tributaries drying up in summer and the main river unsafe to sample. GB2 was also sampled before (GB2a) and after (GB2b) a sewage outfall at this site.

Forest Row sites – water parameter plots

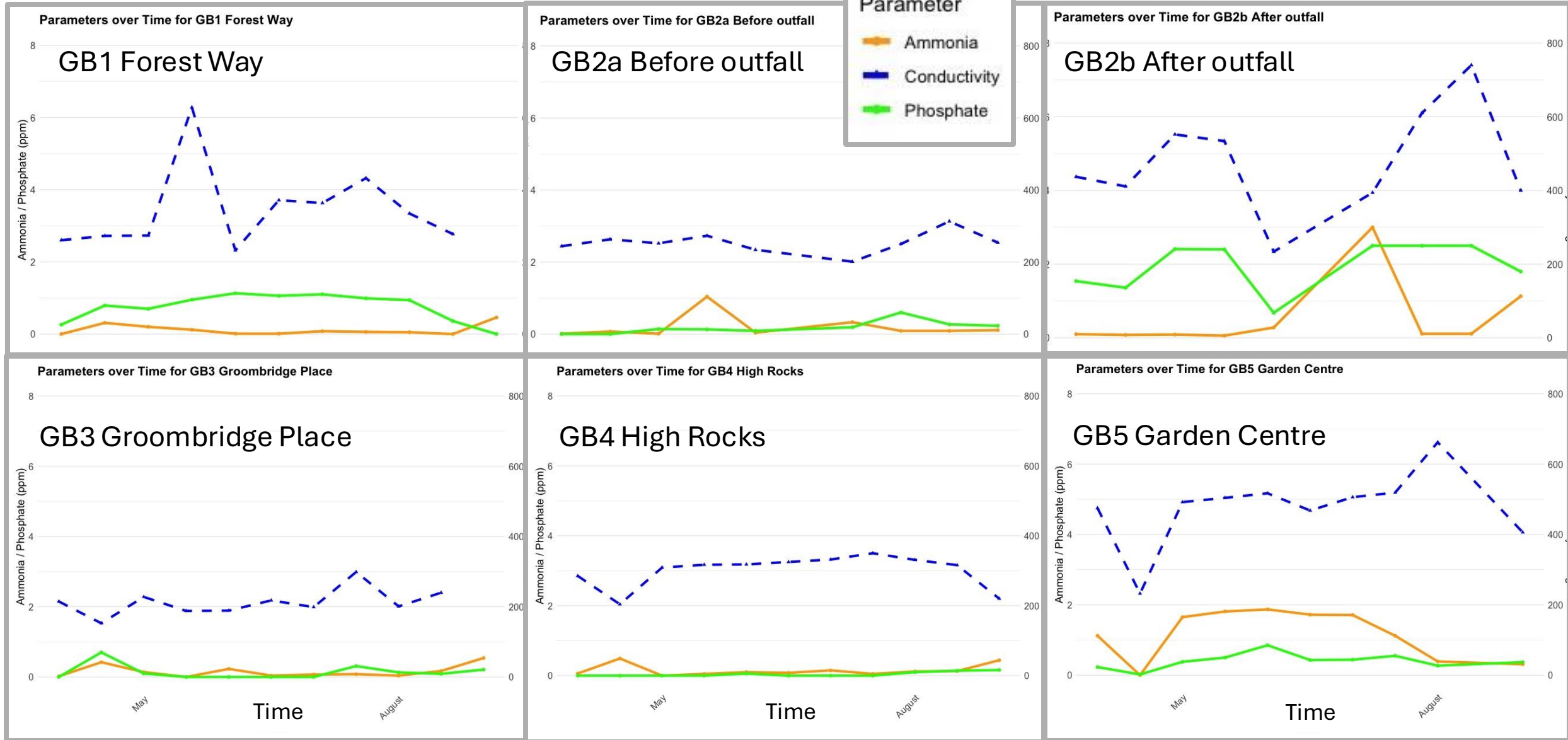
Water parameter data recorded every 2 weeks March until September. The ammonia (orange line) and phosphate (green line) axis is on the left (0-8 ppm), the conductivity (blue dashed line) axis is on the right (0-800 $\mu\text{S}/\text{cm}$).



Hartfield sites – water parameter plots



Groombridge sites – water parameter plots



Glossary

Water Parameters

Conductivity is a measure of water quality and is affected by the presence of dissolved solids such as those from sewage effluent. Conductivity naturally varies between 150 and 500 $\mu\text{S}/\text{cm}$; above this range could indicate water not suitable for certain species. A sudden change may indicate the onset of a polluting discharge.

Phosphate is a common constituent of fertilisers, manure, industrial effluent, and organic wastes in sewage. In excess it can cause a reduction in dissolved oxygen in rivers, caused by excessive algal growth. Without dissolved oxygen in the water, aquatic animals cannot survive.

Ammonia is an important natural resource in nature, but high levels can be toxic, causing lower reproduction and growth or death. It can be discharged into rivers from a range of sources including agricultural fertilisers and sewage effluent. It's important to measure temperature at same time as this can impact the levels found in freshwater. Concentrations in unpolluted rivers range from 0.2 to 1.0 ppm. Tests with a reading of 3.0 ppm or above should be repeated to confirm, then reported to the EA.

Glossary

Water quality

Riverfly ARMI scores are determined by collecting the animals from the river in a net following a standardised protocol, identifying 8 specific groups of animals (insect larvae and freshwater shrimp), and counting how many there are in each group. The score has been validated as a reliable measure to monitor changes in water health.

Biodiversity

Environmental DNA (eDNA) is DNA that organisms shed into their environment such as via skin, hair, faeces or mucus. By filtering water samples from the river, we can collect the DNA of species present as a non-invasive measure of biodiversity.

