



Appendix 1: Detailed Evidence Summary Wye and Lugg SSSI

Natural England November 2022

This document summarises the key evidence used to undertake an interim assessment of the condition of some of the features on both the River Wye and River Lugg Sites of Special Scientific Interest (SSSIs). Further detailed information on the attributes/targets used is available in the Monitoring Specifications for the River Wye and River Lugg SSSIs. If you would like a copy of the Monitoring Specifications, please e-mail west.mindlands.enquiries@naturalengland.org.uk

Macrophytes, Diatoms and Macroinvertebrates

Macrophytes, Diatoms and Macroinvertebrates form a mandatory part of the condition assessment for the interest feature 'rivers and streams' (The River Wye is a H3260 Ranunculion type river).

The target status for macrophytes, diatoms and macroinvertebrates is High Ecological Status (HES).

All of WFD waterbodies within the Wye/Lugg SAC are classified as either moderate or good WFD status for macrophytes and phytoplankton (combined) and therefore fail to meet the designated site target. Units 2 and 3 declined in status from Good to Moderate between 2014 and 2015. Units 4 saw a class improvement between 2016 and 2019 from moderate status to good. Units 5 and 6 have remained at moderate status since reporting in 2014.

Macroinvertebrates fail to meet the target in part or all of units 4, 5 and 6.

Table 1. Classification of macrophytes and macroinvertebrates as displayed on Catchment Data Explorer <https://environment.data.gov.uk/catchment-planning/ManagementCatchment/3117>

Unit		WFD WBID	Plant community	Macro-invertebrates
			SAC/SSSI Target is HES	SAC/SSSI Target is HES
2	Brockweir Bridge to Monmouth	GB109055037111	Moderate*	
3	Monmouth to Ross	GB109055037111	Moderate*	
		GB109055037112	Good**	
4	Ross to Lugg Confluence	GB109055037112	Good**	High
	Lugg Confluence to Hereford	GB109055037112	Good**	High
		GB109055037113	Moderate	Good*
5	Hereford to Bredwardine Bridge	GB109055037113	Moderate	Good*
6	Bredwardine Bridge to Whitney Toll	GB109055037113	Moderate	Good*
		GB109055037116	Unknown as NRW	

7	Whitney Toll to Hay	GB109055037116	Unknown as NRW	
1	R Lugg (Wye SAC) Wye Confluence to Bodenham Weir	GB109055036790	Moderate	
		GB109055042030	Moderate	
2	Bodenham Weir to Leominster	GB109055042030	Moderate	
3	Leominster to Mortimers Cross	GB109055042030	Moderate	
4	Mortimers Cross to Presteigne	GB109055042030	Moderate	

* Indicates evidence that the situation is declining

** Indicates evidence that the situation is improving

Atlantic salmon

Both rivers are deemed to be iconic for their salmon population. Salmon are a notified feature of the River Wye SSSI and SAC, and a feature component of clay river health in the Lugg. The salmon population of the River Wye is at a critical state, with the salmon run estimated at around 2000 to 3000 down from 50,000 a year, with angling catches down 94% from their peak in 1967 (River Wye Salmon Action Plan 2019).

Fundamental to the assessment of stock is the site Conservation Limit. The Conservation Limit (CL) defines the minimum number of fish we want to see spawning in the river. The CL for each river is set at a stock size (defined in terms of eggs deposited) below this limit further reductions in spawner numbers are likely to result in significant reductions in the number of juvenile fish produced in the next generation. The conservation objective for the River Wye & Lugg is to meet or exceed its CL in at least four years out of five.

NRW & the EA published their **Proposed new salmon and sea trout rod fishing byelaws for the Wye in England 2021**, the report states

“... evidence emerging from the salmon stock assessments indicates **a continued decline in the status of salmon in the River Wye**, with substantial deficits in the number of spawning adults apparent in the Wye and neighbouring rivers such as the rivers Severn and Usk.”

Table 3 and figure 1 provides a summary of the Wye Salmon stock assessment. The Wye stock assessment covers the whole catchment including the River Lugg.

Since 2015 there has been a decline in fry across the catchment. Recruitment was especially poor in 2016. The poor fry numbers have been reflected in low parr numbers in 2017 (Figure 2).

Table 2. CSMG targets for Atlantic salmon from

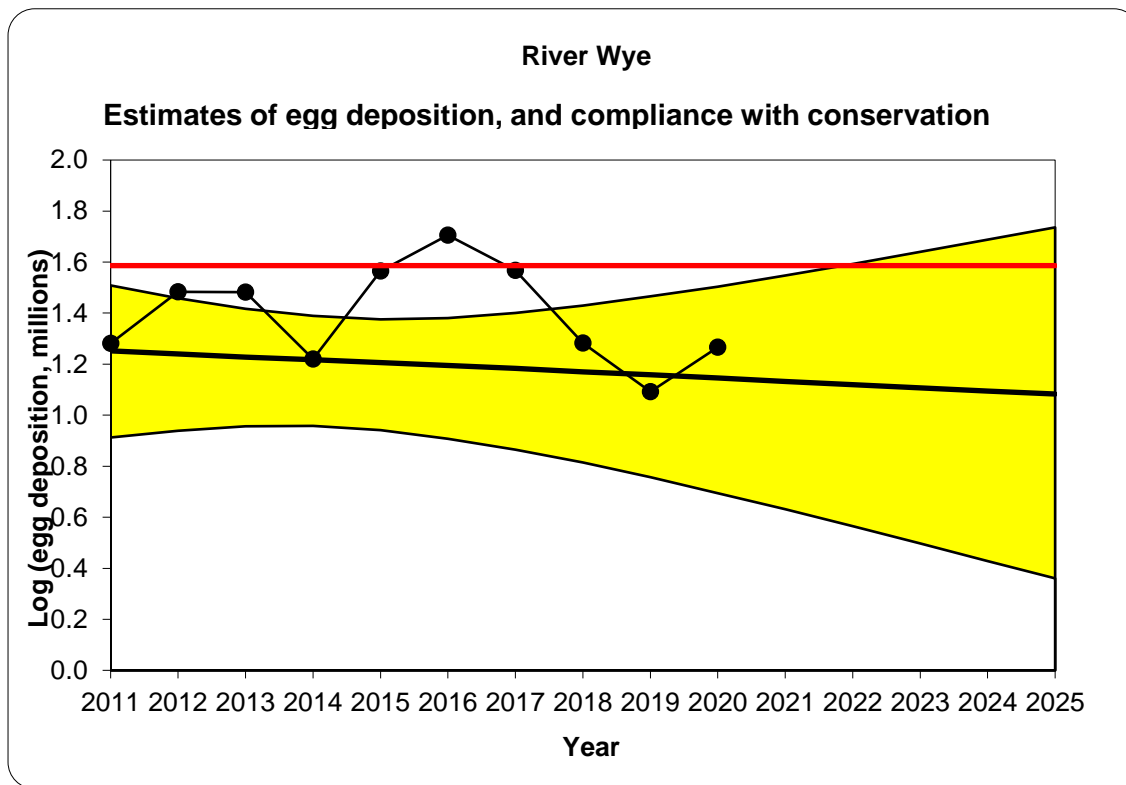
<https://hub.jncc.gov.uk/assets/9b80b827-b44b-4965-be8e-ff3b6cb39c8e>

Favourable Condition Table 5 – Atlantic salmon (*Salmo salar*)

Details of the standard method for population assessment can be found in the monitoring protocol for Atlantic salmon.

Attribute *discretionary	Target	Method of Assessment	Comments
POPULATION			
a. Spatial extent	Should reflect distribution under near-natural conditions.	Electrofishing	Juvenile Atlantic salmon should be present in all areas of the catchment to which they have natural access. This does not include areas above naturally impassable barriers, but areas where access has been limited by man-made obstructions should be identified. See the associated monitoring protocol for further details.
b. Population density: juveniles	These should not differ significantly from those expected for the river type/reach under conditions of high physical and chemical quality.	Quantitative, semi-quantitative and timed electrofishing	Juvenile densities vary naturally between rivers and between survey sites on rivers, depending on the productivity and natural habitat character of the system. Observed densities therefore need to be assessed in relation to the expectation for each river and each river reach. See the associated monitoring protocol for further details.
c. Population density: adult run size	Total run size at least matching an agreed reference level, including a seasonal pattern of migration characteristic of the river and maintenance of the multi-sea-winter component.	Fish counters where available Rod catch data	The numbers of returning salmon should be sufficient to ensure that all naturally available spawning and nursery habitat is utilised. Different rivers have different seasonal patterns of adult migration associated with the environmental characteristics of the catchment and river system. Multi-sea winter fish are an important component of a natural salmon run and have declined considerably in recent years. The data available to assess this attribute vary widely across the UK. See the associated monitoring protocol for further details.

Figure 1 River Wye salmon spawning compliance assessment 2020







Key to graphs	
	20 th percentile trend line (in a 10 year period around 2 annual egg deposition values would be expected to fall below this line)
	Annual egg deposition estimates
	Conservation Limit
	Upper and lower boundaries of the Bayesian Credible Interval.

Table 3 summary of salmon stock status on the Rivers Wye: provisional assessment results for 2020¹

Salmon stock status on the Rivers Wye	
Current compliance status (2020)	At Risk
Predicted (+5yr) compliance status (2025)	Probably at Risk
Trend*	Declining (-)
Conservation Limit	38.57 million eggs
Management Target	48.69 million eggs
Egg deficit on MT**	24.52 million eggs
Spawner deficit***	8,175

* Declining trend: Slight (-); Moderate(--); Steep (---)

** Egg deficit based on 5-year mean 2016-2020

** Spawner deficit expressed as 8lb fish equivalents; where average fecundity = 3,000 eggs per fish

White Clawed Crayfish (Atlantic Crayfish)

Native white clawed crayfish are a notified feature of the River Wye and an indicator of the health of the clay river feature in the River Lugg. Surveys were undertaken in 2013 by Hills ecology on Units 3-7 of the River Wye and Units 1-4 of the River Lugg.

The result of this survey indicate that the species is in 'unfavourable' condition for units 1-4 of the River Lugg, and either unfavourable or part destroyed for units 3-7 of the River Wye due to either the absence of white clawed crayfish, and/or the presence of non-native signal crayfish. Further investigation into habitat availability and historic survey data may be required to determine whether the status is unfavourable-declining, or part destroyed

(https://www.therrc.co.uk/sites/default/files/files/Designated_Rivers/wyedrafttechnicalreport.pdf).

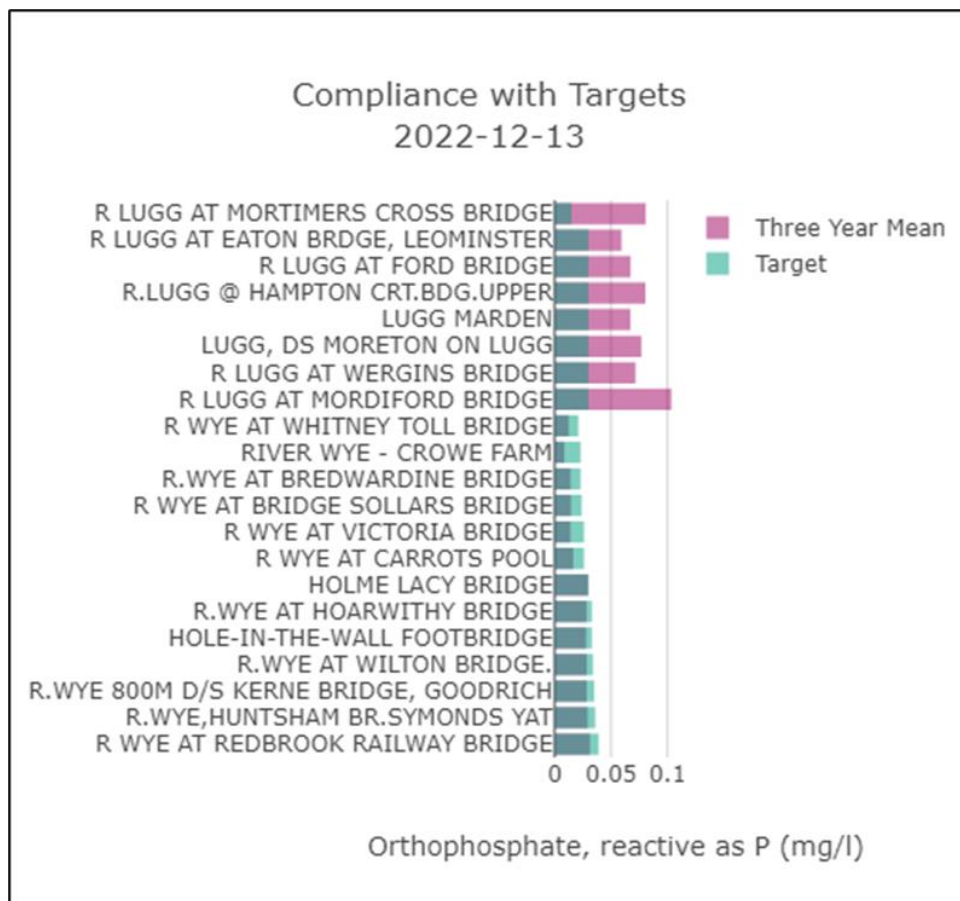
¹ Source NRW Technical Case 2021

Water Quality Analysis – River Wye & Lugg

Water quality is not a notified feature of the SSSIs, it is one of the attributes assessed to indicate the health of the Rivers. Water quality targets are set out in the Monitoring Specifications for both the River Lugg SSSI and the River Wye SSSI.

Figure 2. River Wye & Lugg Ortho-P Current Compliance with Targets.

Figure 2 illustrates that for each monitoring location on the River Lugg, the Ortho-P target for the three-year mean target is currently being exceeded. The water quality data presented for the River Wye illustrates for each monitoring location that water quality is not currently exceeding the three year mean target.



EA WFD Classification – Phosphate (up to 2019)

The water body - **Lugg - conf Norton Bk to conf R Arrow** – deteriorated from High to Moderate status for Phosphorus between the 2015 – 2019 classification.

The river Wye remain, increased or stayed at high or good throughout this period.

Table 4. EA Phosphate classification for the Wye & Lugg main river sections.

Catchment	Water Body	Physico-chemical element	2015	2016	2019
River Lugg	Lugg - conf Norton Bk to conf R Arrow Water Body	Phosphate	High	Good	Moderate

River Lugg	Lugg - conf R Arrow to conf R Wye Water Body	Phosphate	Good	Good	Good
River Wye	Wye - Bredwardine Br to Hampton Bishop Water Body	Phosphate	High	Good	High
River Wye	Wye - Hampton Bishop to conf Kerne Br Water Body	Phosphate	High	High	Good
River Wye	Wye - conf Walford Bk to Bigswear Br Water Body	Phosphate	Good	High	High

Water Quality Trends

The following graphs illustrate the trend in water quality over the past 20 years in the Wye and Lugg catchments. The monitoring locations are ordered upstream to downstream.

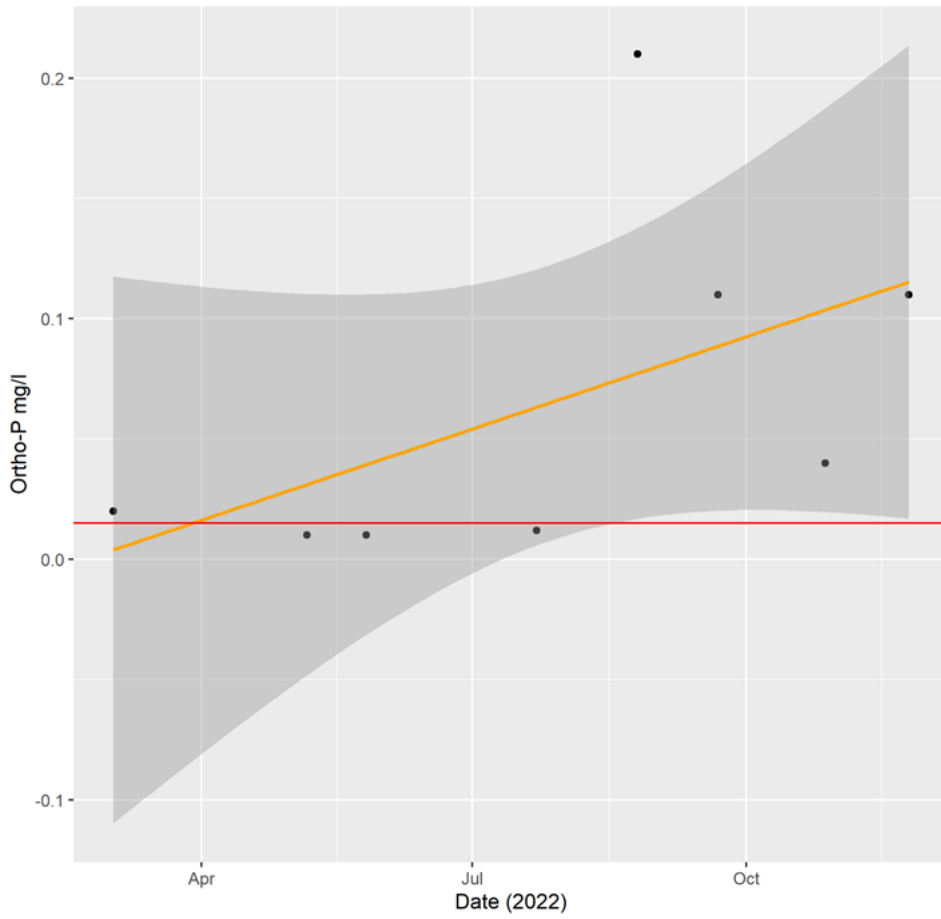
The **red line** is the site target for Ortho-P

The **orange line** plots a linear regression line with 95% Confidence Interval (CI)

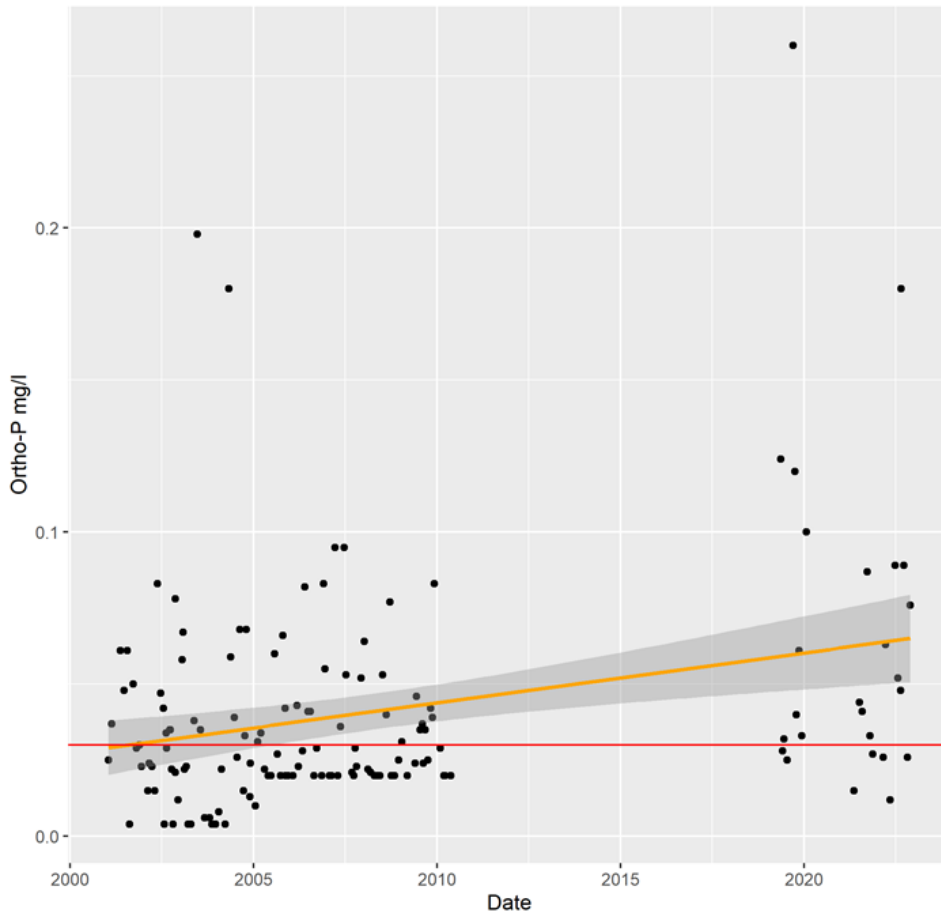
River Lugg

Each of the plots for the monitoring locations along the River Lugg (u/s à d/s) show Ortho-P concentrations either increasing or stable over the past 20+ years – demonstrated by the positive or neutral linear regression lines.

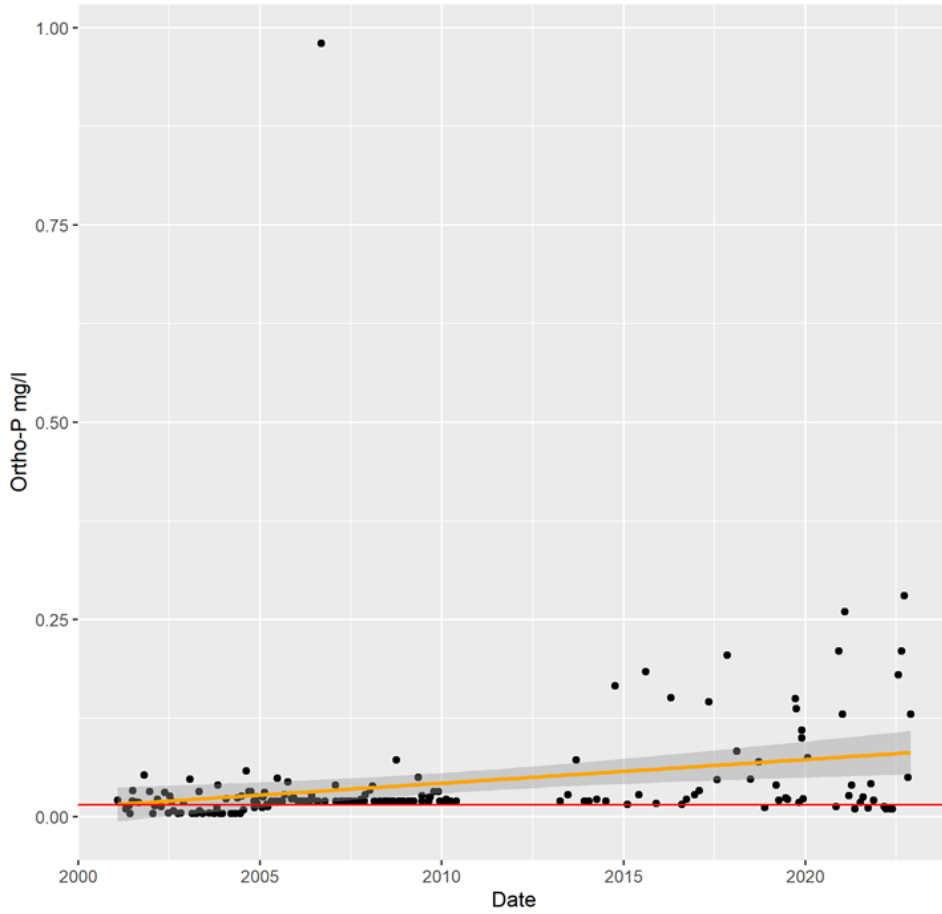
River Lugg - Hindwell Brook Orthophosphate Concentration



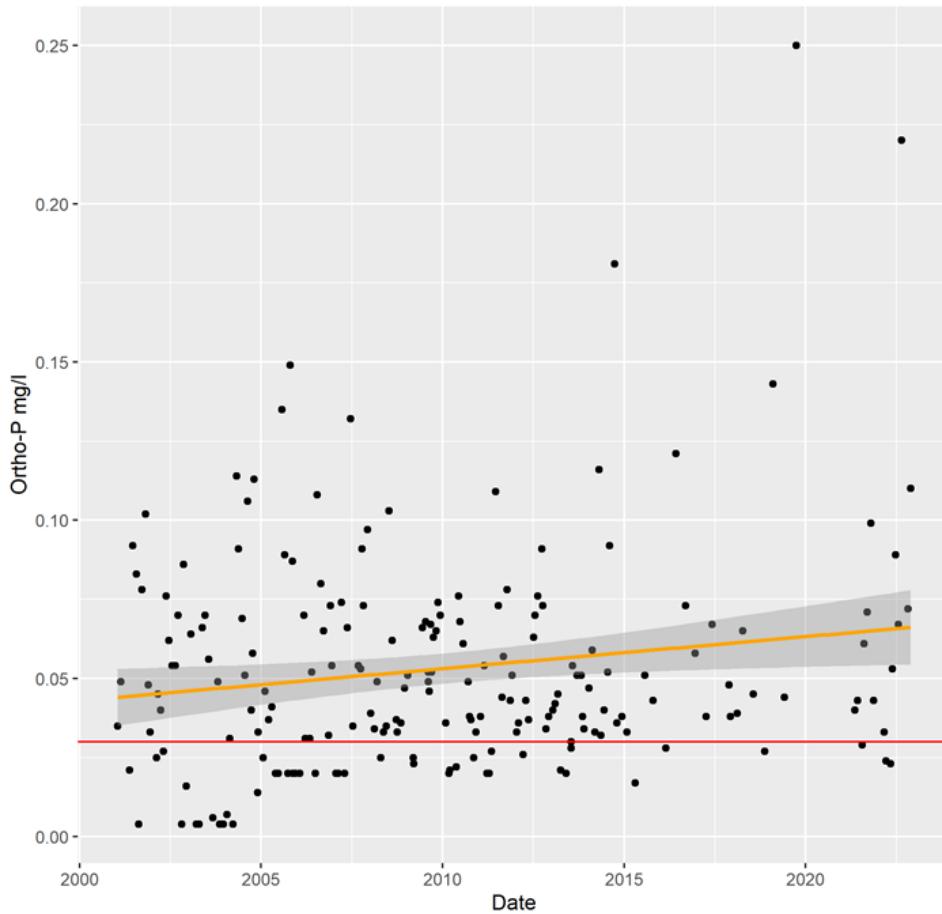
River Lugg - Eaton Bridge Orthophosphate Concentration



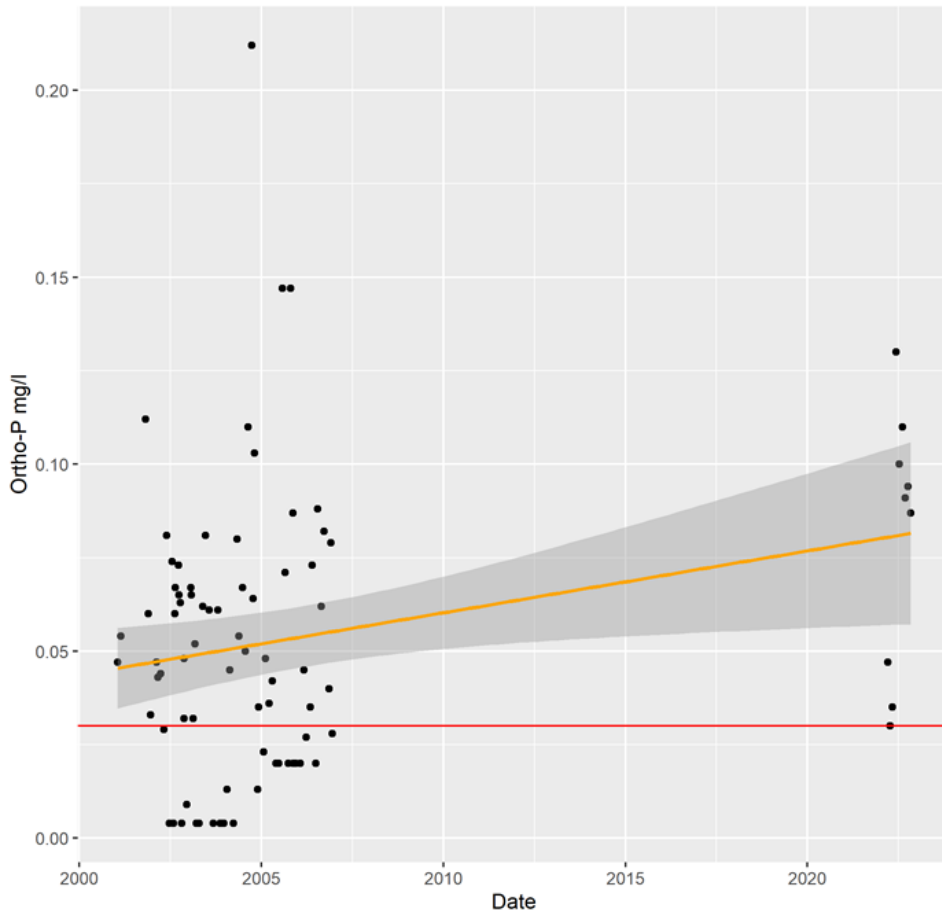
River Lugg - Mortimer Cross Orthophosphate Concentration



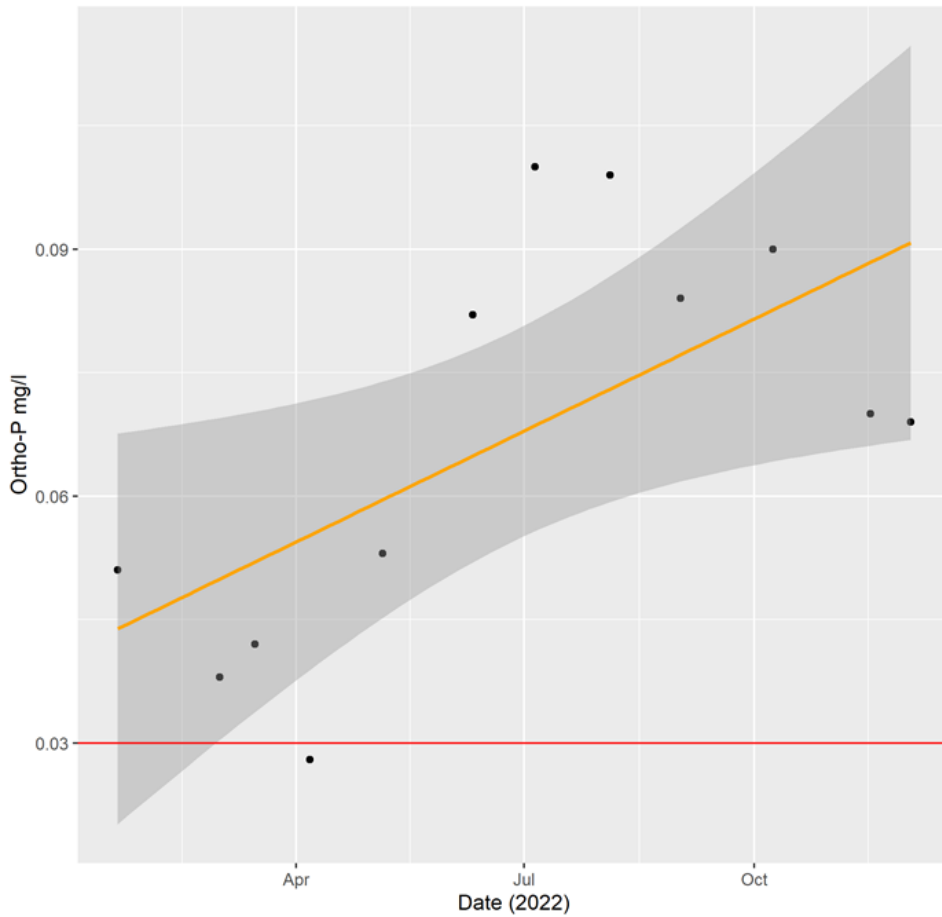
River Lugg - Ford Bridge Orthophosphate Concentration



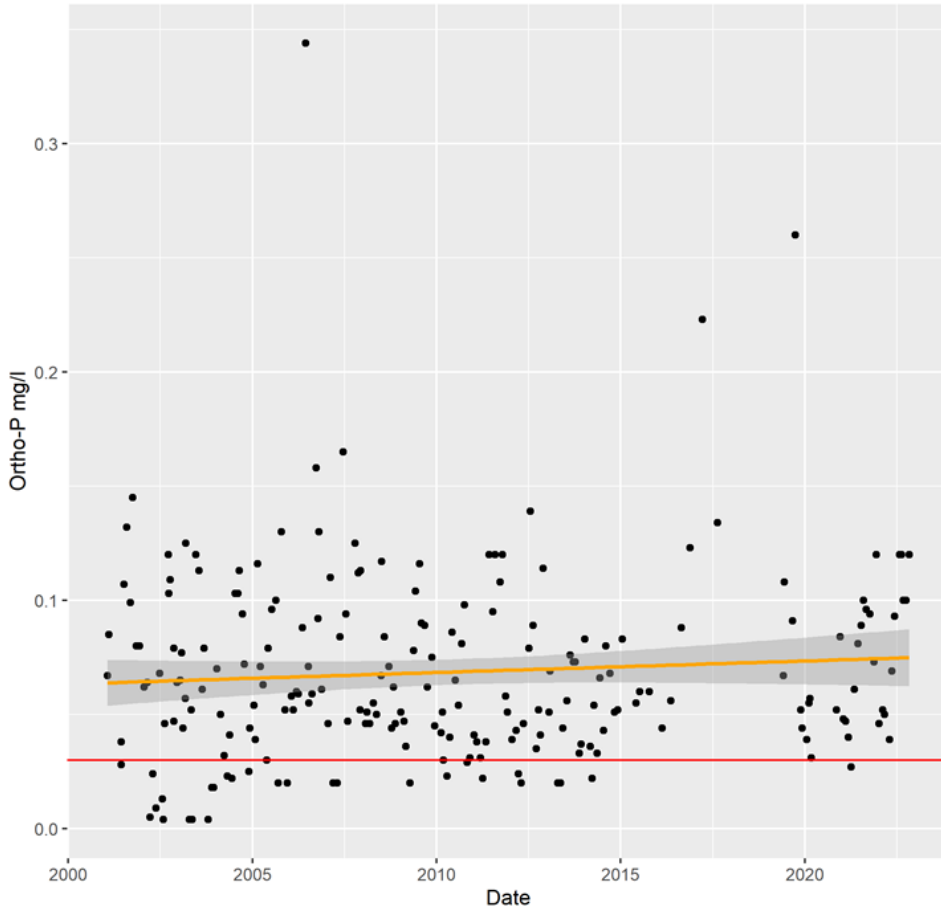
River Lugg - Hampton Orthophosphate Concentration



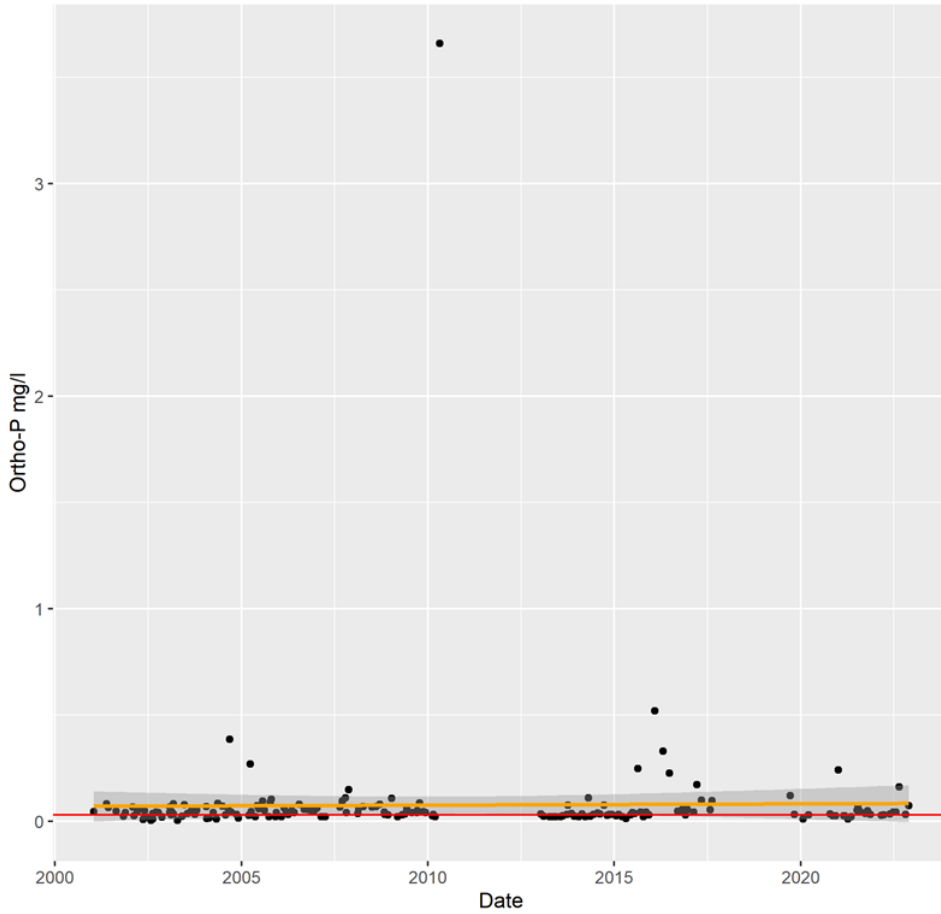
River Lugg - Marden Orthophosphate Concentration



River Lugg - Wergins Bridge Orthophosphate Concentration

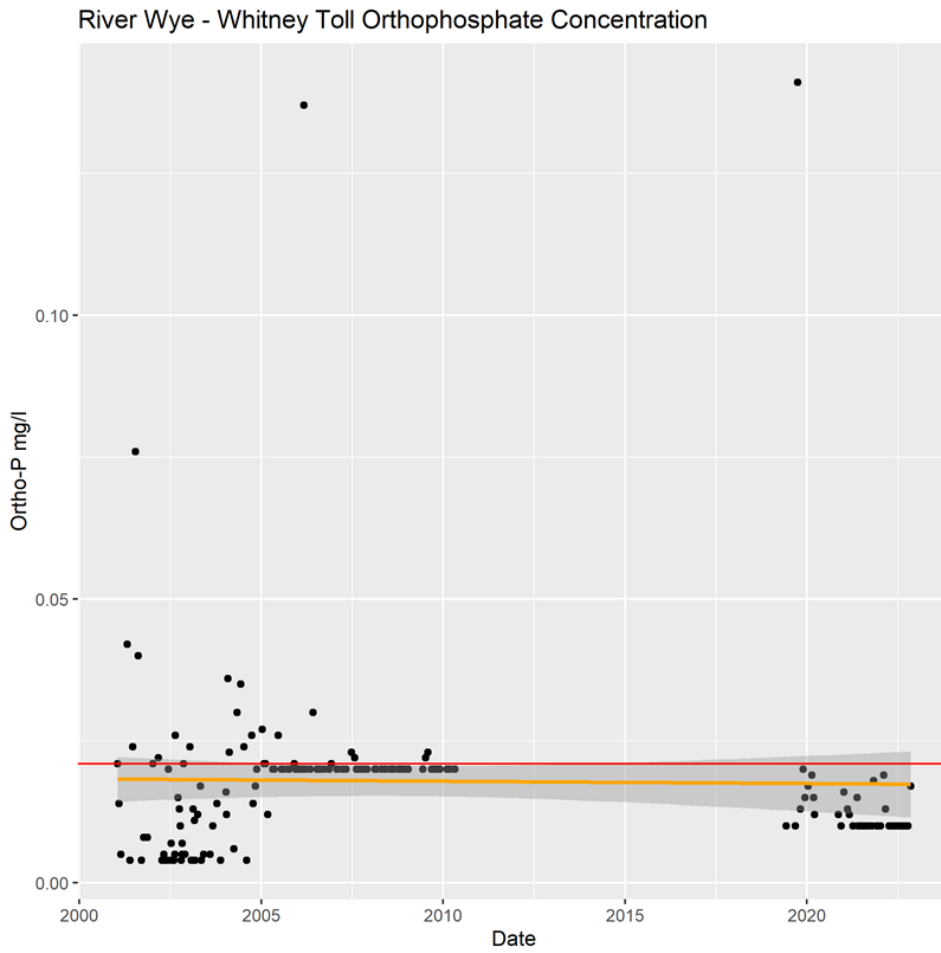


River Lugg - c.w. River Arrow Orthophosphate Concentration

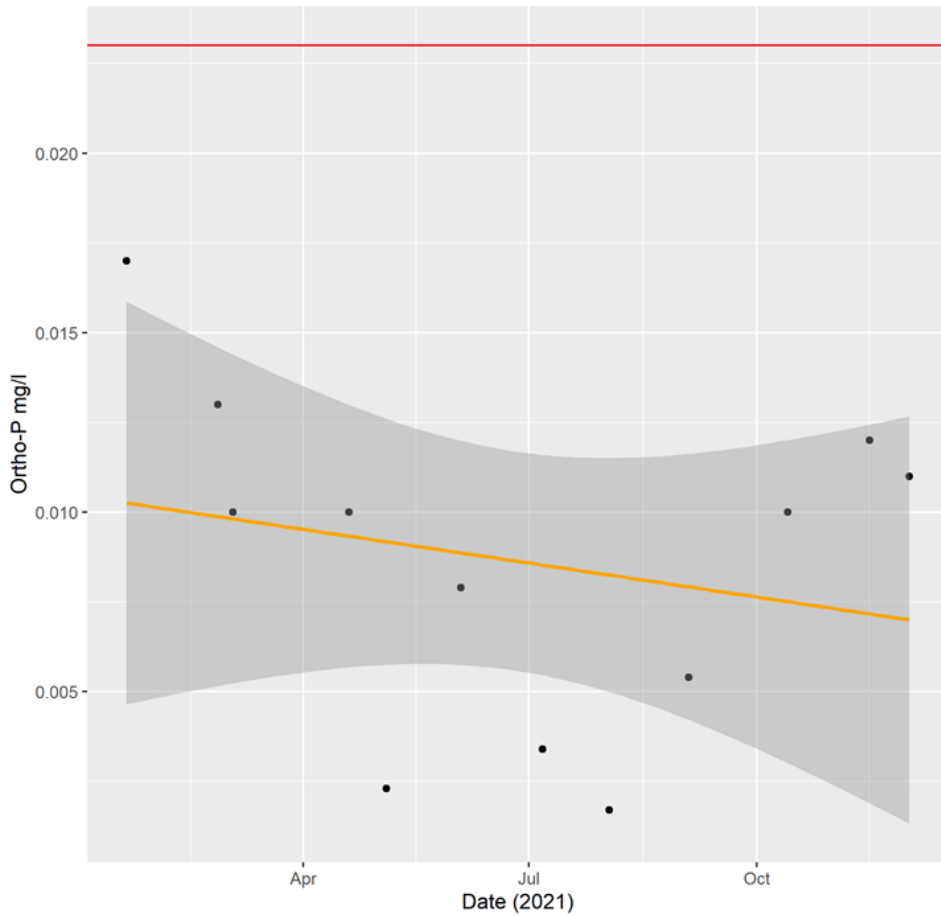


River Wye

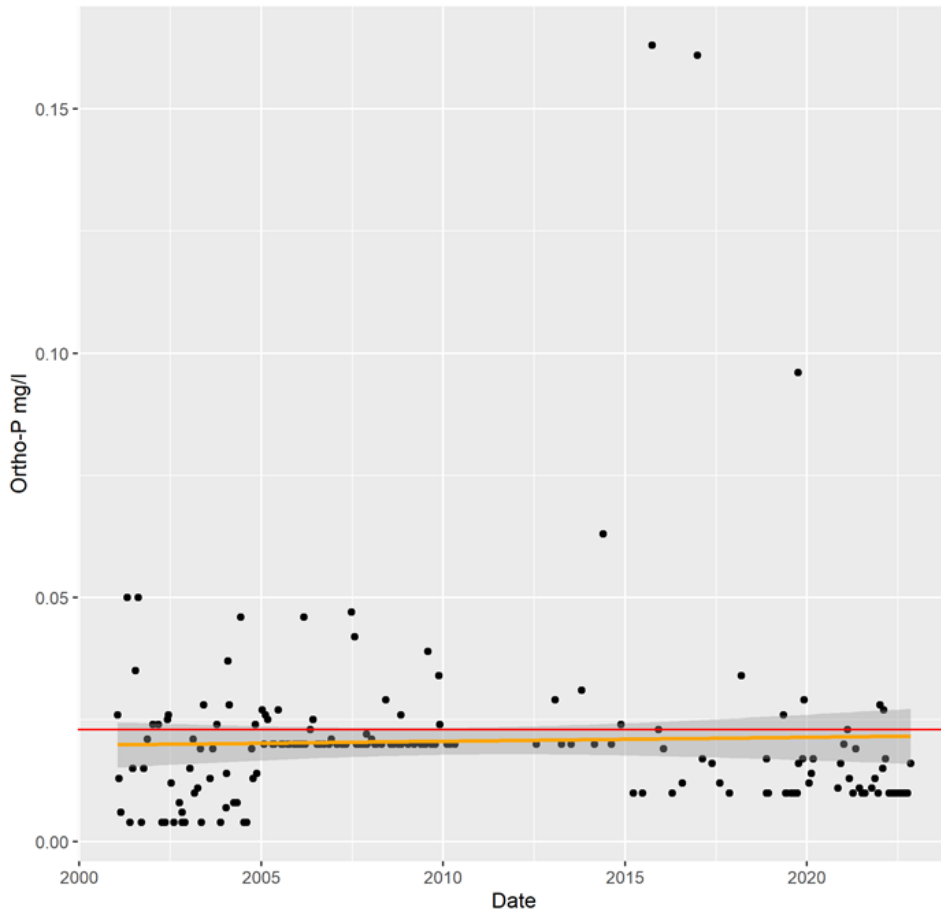
Each of the plots for the monitoring locations along the River Wye (u/s à d/s) show Ortho-P concentrations generally either stable or slightly declining over the past 20+ years – demonstrated by the neutral or negative linear regression lines.



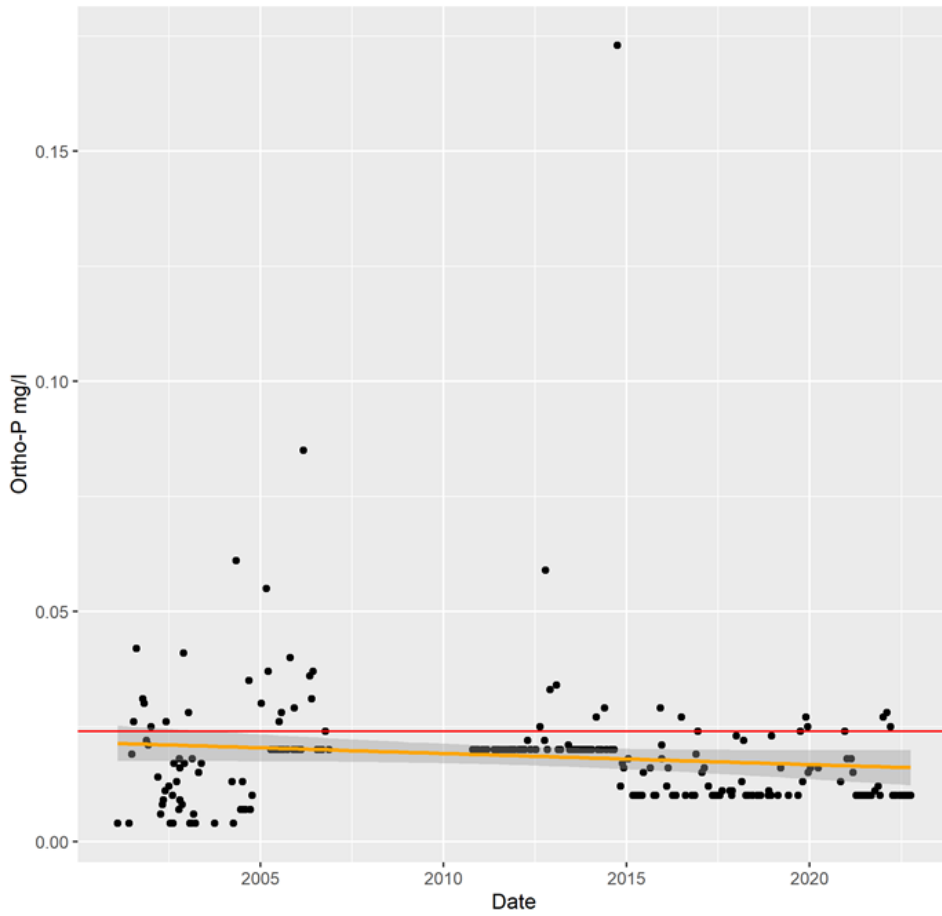
River Wye - Crowe Farm Orthophosphate Concentration



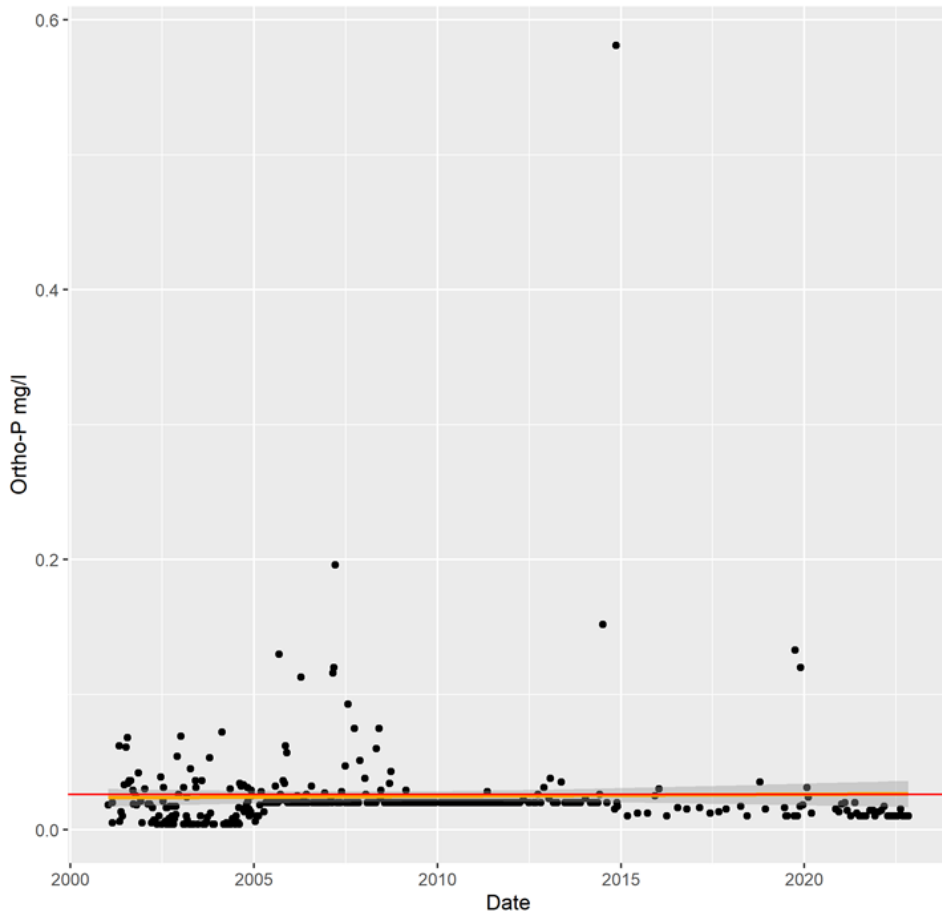
River Wye Bredwardine Bridge Orthophosphate Concentration



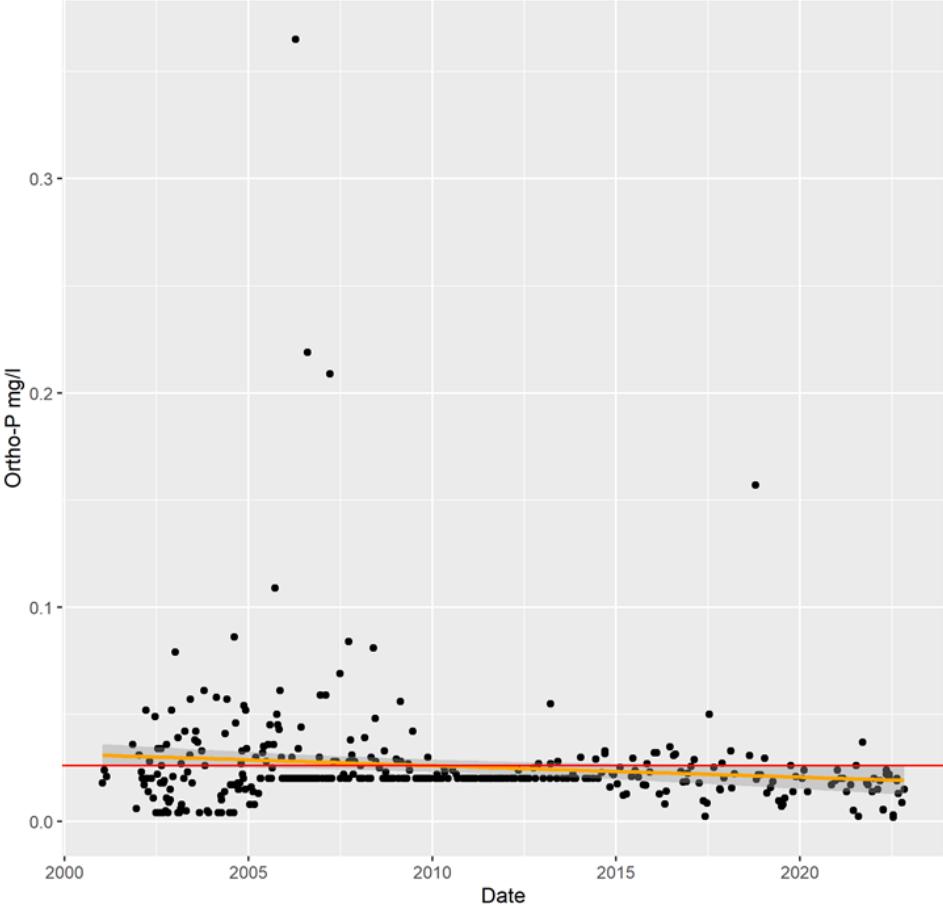
River Wye - Sollars Bridge Orthophosphate Concentration



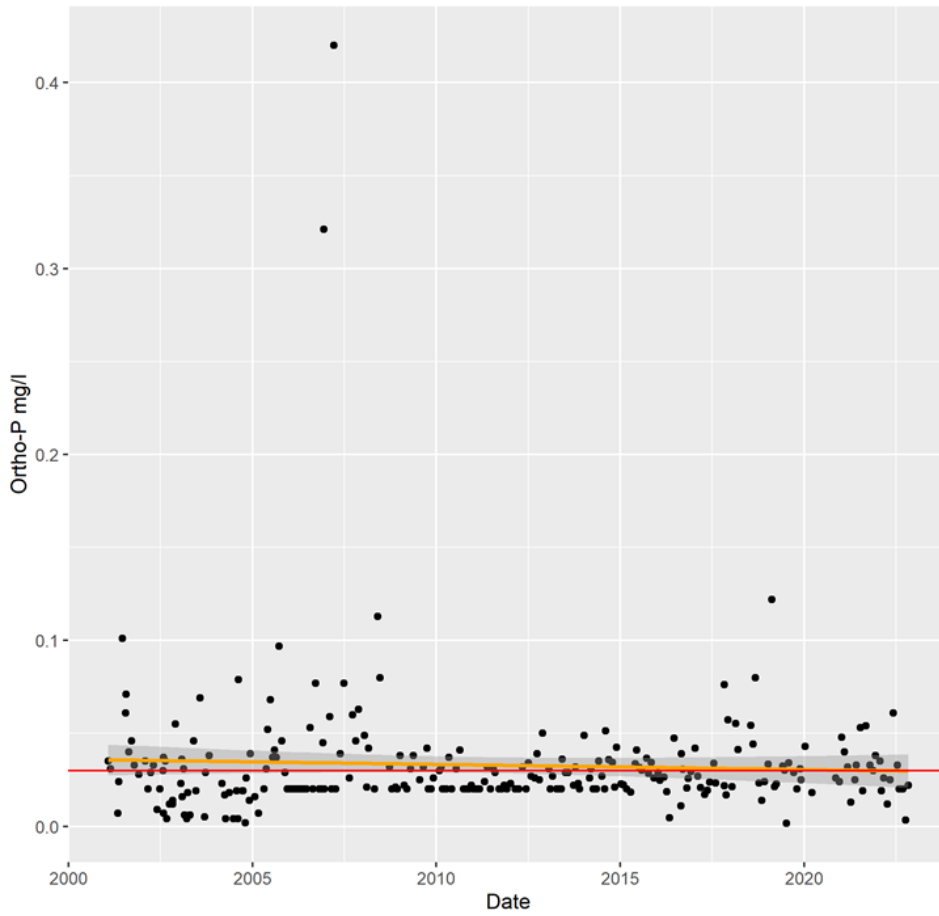
River Wye Victoria Bridge Orthophosphate Concentration



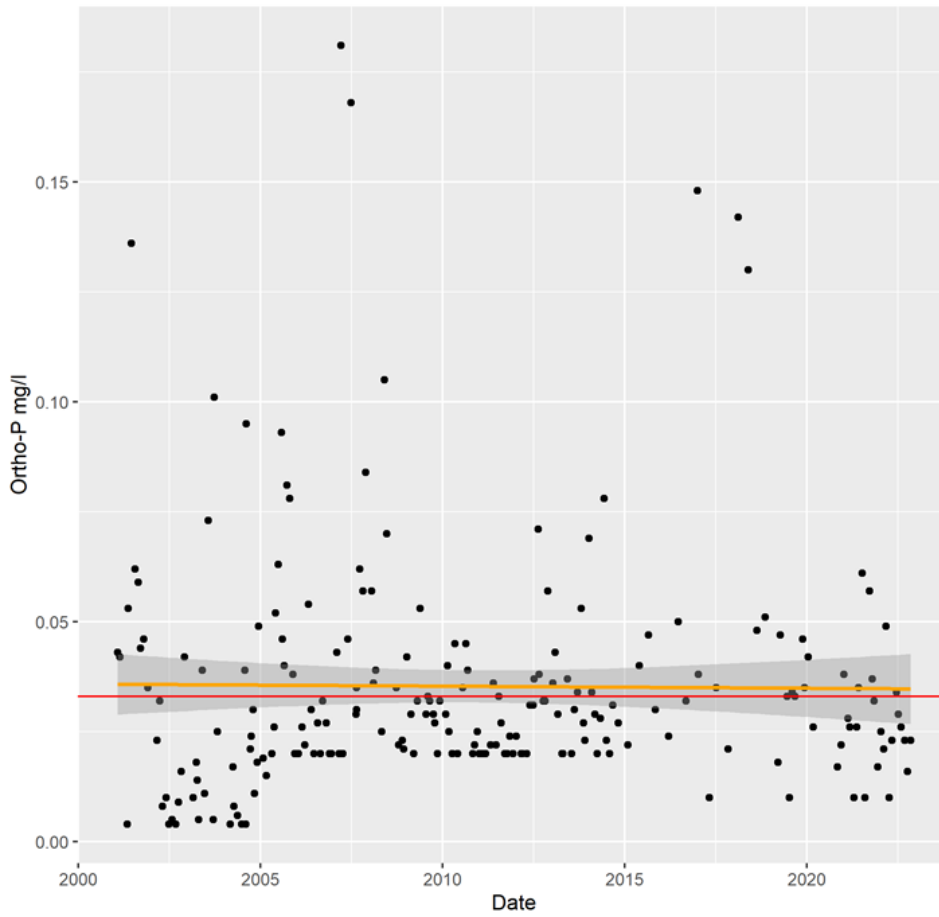
River Wye - Carrots Pool Orthophosphate Concentration



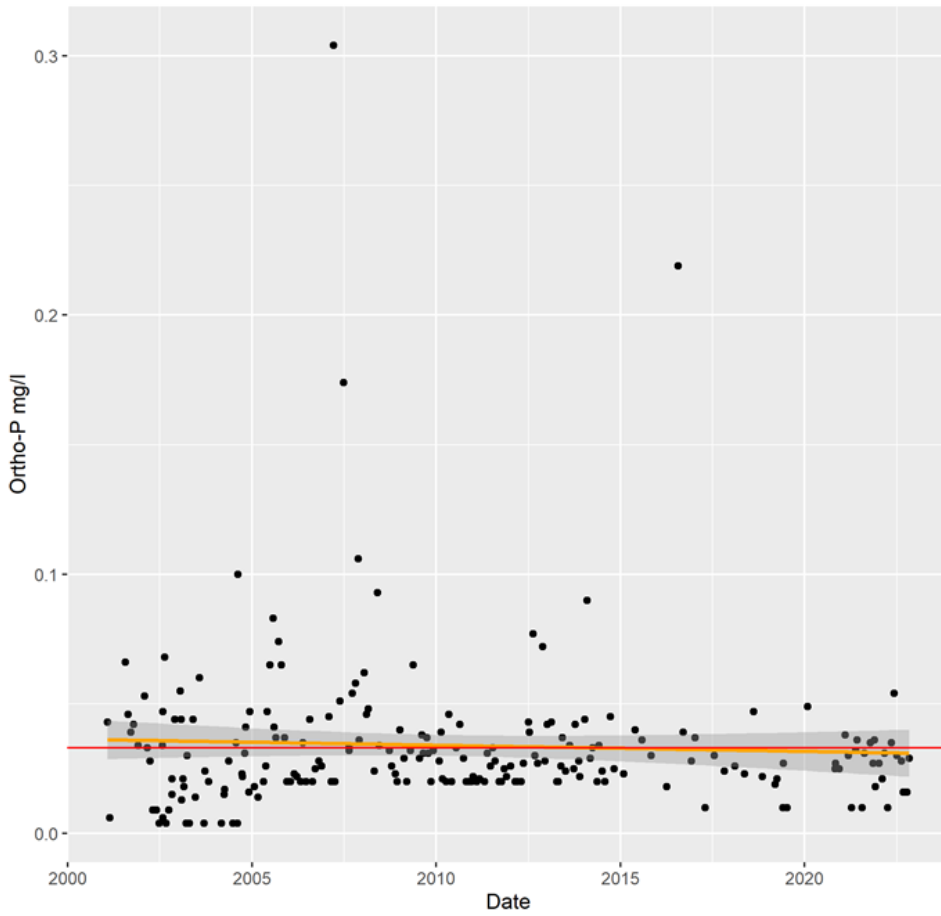
River Wye - Holme Lacy Orthophosphate Concentration



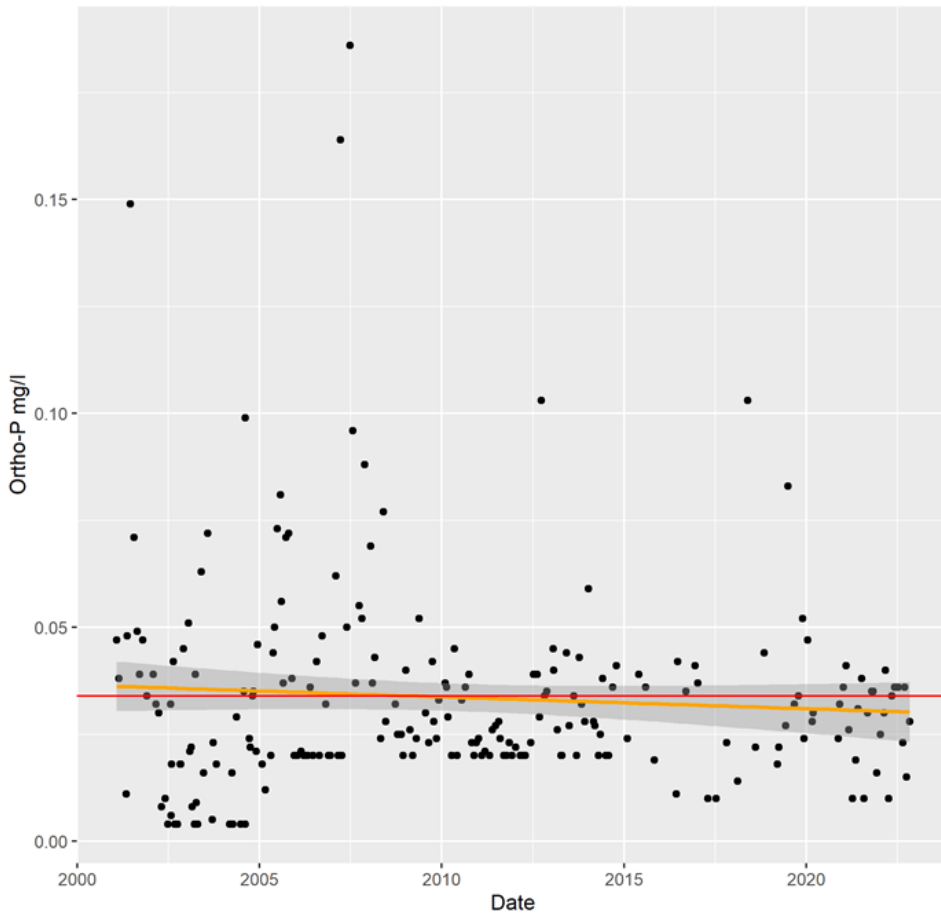
River Wye - Hoarwithy Bridge Orthophosphate Concentration



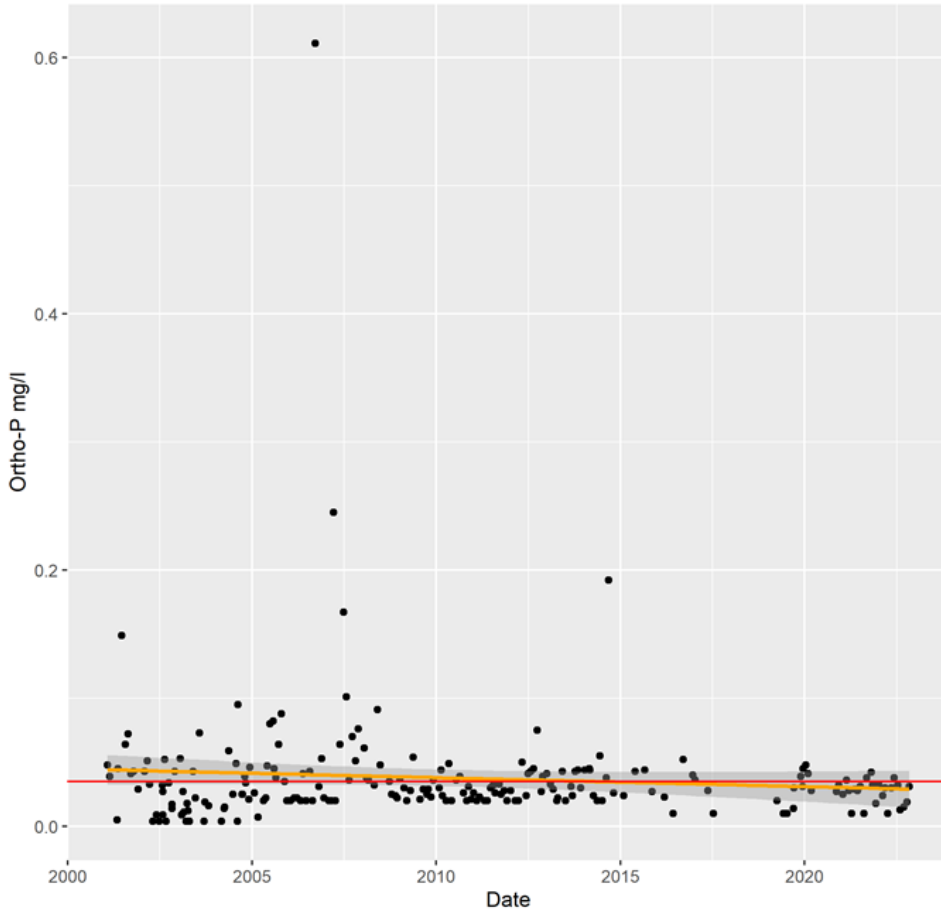
River Wye - Hole in the wall Orthophosphate Concentration



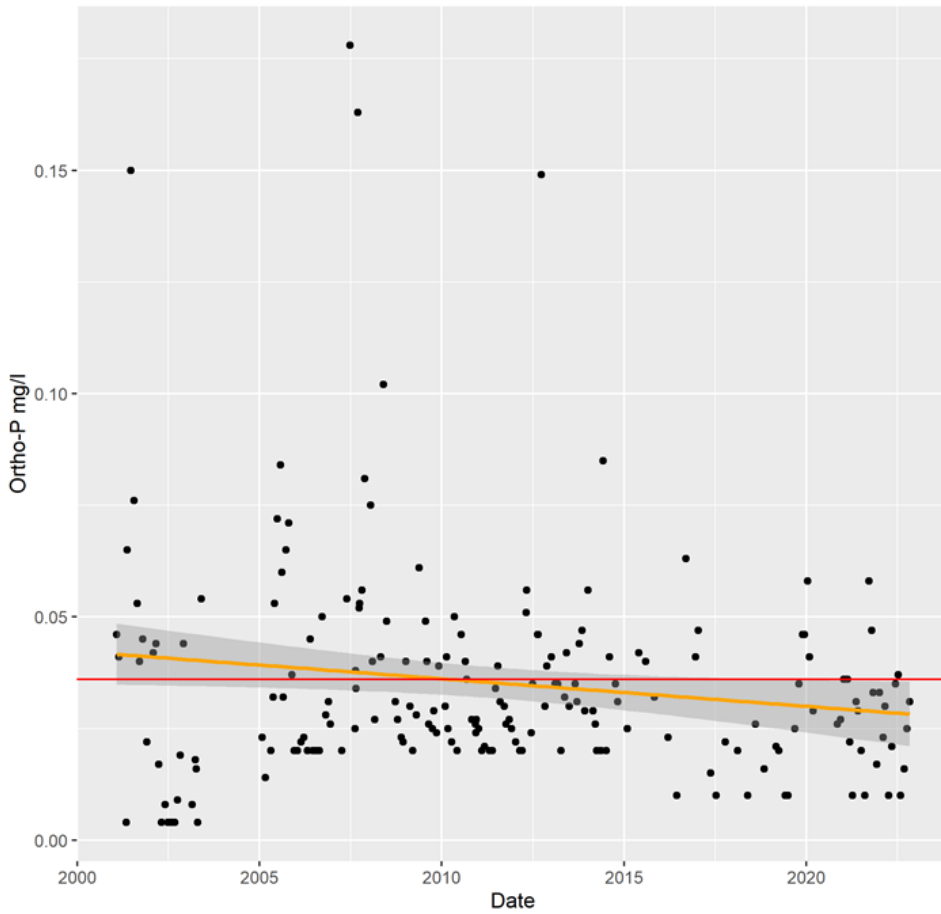
River Wye - Wilton Bridge Orthophosphate Concentration



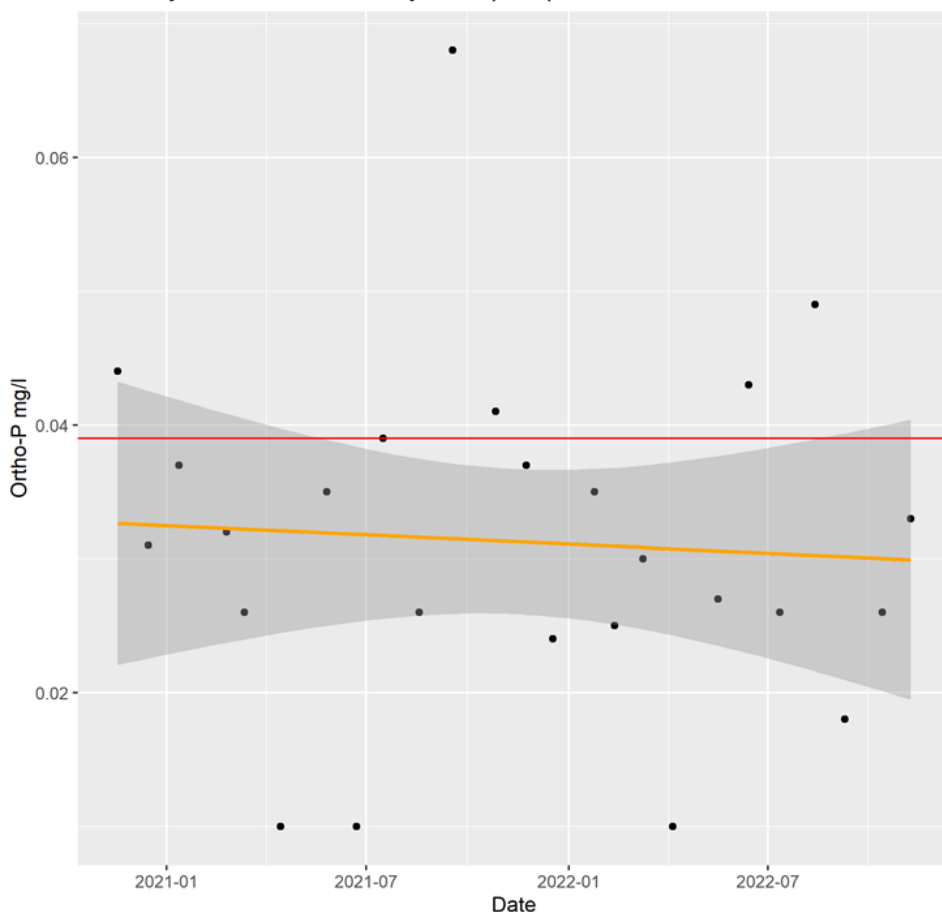
River Wye - Kerne Bridge Orthophosphate Concentration



River Wye - Huntsham Bridge Orthophosphate Concentration



River Wye - Redbrook Railway Orthophosphate Concentration



Consideration of changes to site condition.

There is evidence of failing condition on every unit of the River Wye and River Lugg (see table 4 and 5 below). Phosphate targets are exceeded on every unit of the river Lugg and the evidence shows phosphate levels to be increasing, demonstrating declining water quality. The River Wye is meeting its phosphate targets but is showing clear symptoms of eutrophication, despite stable phosphate levels, exacerbated by elevated water temperatures. This is supported by the moderate status of macrophytes & phytobenthos (this also encompasses algae trends).

White Clawed Crayfish have declined in both the Wye and Lugg.

The evidence from the assessment of Wye catchment salmon stocks (including the Lugg) suggests the number of Atlantic salmon returning to the catchment is in decline such that they are below the Conservation Limit and as a result Bylaws have been introduced.

Although there is much being done to try and address declines in both salmon and white clawed crayfish, there remains some uncertainty around the causes of the declines and therefore we cannot be assured that all necessary management is currently in place to deem the site to be recovering.

Regarding the decline in water quality on the Lugg, again despite significant efforts to address the issue by multiple stakeholders, given the continued declines we cannot be certain that the current measures in place will reverse this decline and further investigation is required.

Based on the evidence above, the site condition has been changed from Unfavourable Recovering to Unfavourable Declining based on CSMG as per the table below:

Table 5: Change in Condition for River Wye and River Lugg SSSIs monitoring units

Unit	SSSI	Reach	Condition prior to 30 May 2023	Updated condition from May 2023
1	River Wye	Tidal river - Estuary to Brockweir Bridge	Favourable	Unfavourable - Declining
2	River Wye	Brockweir Bridge to Monmouth	Unfavourable - Recovering	Unfavourable - Declining
3	River Wye	Monmouth to Ross	Unfavourable - Recovering	Unfavourable - Declining
4	River Wye	Ross to Hereford	Unfavourable - Recovering	Unfavourable - Declining
5	River Wye	Hereford to Bredwardine Bridge	Unfavourable - Recovering	Unfavourable - Declining
6	River Wye	Bredwardine Bridge to Whitney Toll	Unfavourable - Recovering	Unfavourable - Declining
7	River Wye	Whitney Toll to Hay	Unfavourable - Recovering	Unfavourable - Declining
1	River Lugg	Bodenham Weir to Confluence with Wye	Unfavourable - Recovering	Unfavourable - Declining
2	River Lugg	Bodenham Weir to Leominster	Unfavourable - Recovering	Unfavourable - Declining
3	River Lugg	Leominster to Mortimers Cross	Unfavourable - Declining	Unfavourable - Declining
4	River Lugg	Mortimers Cross to Presteigne	Unfavourable - Recovering	Unfavourable - Declining

Table 6. Summary of evidence and changes to condition by feature for the Wye SSSI

The following tables show a summary of the features assessed, condition and evidence used.

SSSI Notified Feature #	Monitored (Reportable) Feature	Designation (SSSI/SAC)	Unit No							Evidence
			1	2	3	4	5	6	7	
Atlantic stream crayfish	S1092 White-clawed (or Atlantic stream) crayfish <i>Austropotamobius pallipes</i>	SSSI, SAC								Crayfish survey (2013).
Sea lamprey	S1095 Sea lamprey, <i>Petromyzon marinus</i>	SSSI, SAC	*	*	*	*	*	*	*	
Brook lamprey	S1096 Brook lamprey, <i>Lampetra planeri</i>	SSSI, SAC	*	*	*	*	*	*	*	
River lamprey	S1099 River lamprey, <i>Lampetra fluviatilis</i>	SSSI, SAC	*	*	*	*	*	*	*	
Allis shad	S1102 Allis shad, <i>Alosa alosa</i>	SSSI, SAC	*	*	*	*	*	*	*	
Twaite shad	S1103 Twaite shad, <i>Alosa fallax</i>	SSSI, SAC	*	*	*	*	*	*	*	
Atlantic salmon	S1106 Atlantic salmon, <i>Salmo salar</i>	SSSI, SAC								Not achieving conservation limits, 2019 showed declining figures & overall declining trend.
Bullhead	S1163 Bullhead, <i>Cottus gobio</i>	SSSI, SAC		*		*	*	*	*	
Common otter	S1355 Otter, <i>Lutra lutra</i>	SSSI, SAC		*	*	*	*	*	*	
Invertebrates associated with riffles, river shingles and saltmarsh	Invert. assemblage W111 shingle bank	SSSI	*	*	*	*	*	*	*	
Invertebrates associated with river deadwood	Invert. assemblage W114 stream & river margin	SSSI	*	*	*	*	*	*	*	
Invertebrates associated with bankside vegetation.	Invert. assemblage W122 riparian sand	SSSI	*	*	*	*	*	*	*	

Aquatic plant communities - rivers on sandstone, mudstone and hard limestone	Rivers and Streams	SSSI	*							Evidence base used WFD macrophyte, phytobenthos & invertebrate classification data
Aquatic plant communities - clay rivers										
Aquatic plant communities - lowland rivers with minimal gradient	H3260 Water courses of plain to montane levels with <i>R. fluitantis</i>	SAC			*	*	*	*	*	
Certain flowering plants and bryophytes										
Beds of water crowfoot (<i>Ranunculus</i> spp.)										

Table 7. Summary of evidence and changes to condition by feature for the Lugg SSSI

SSSI Notified Feature #	Monitored (Reportable) Feature	Designation (SSSI/SAC)	Unit No				Evidence
			1	2	3	4	
Clay river displaying a transition from nutrient poor to naturally nutrient rich water chemistry	Rivers and streams	SSSI					Evidence base used EA water quality monitoring data (reactive phosphorus – WFD no deterioration – failure report) & WFD macrophyte reporting.
River plant communities	H3260 Water courses of plain to montane levels with <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation	SAC					Evidence base used EA water quality monitoring data (reactive phosphorus – WFD no deterioration – failure report). & WFD macrophyte reporting
Clay river displaying a transition from nutrient poor to naturally nutrient rich water chemistry	River Lamprey	SAC	*				
	Sea Lamprey	SAC	*				
	Brook Lamprey	SAC	*	*	*	*	
	Allis Shad	SAC	*				

	Twaite Shad	SAC	*	*	*	*	
	Atlantic Salmon	SAC					Not achieving conservation limits, 2019 showed declining figures & overall declining trend.
	Bullhead	SAC	*	*	*	*	
	Invertebrate assemblage W1 flowing water	SAC	*	*	*	*	
	White Clawed Crayfish	SAC					Crayfish survey (2013).
Common otter	Otter	SSSI/SAC	*	*	*	*	

List of notified features as confirmed by Natural England's Citation Review project in May 2023. This project establishes a robust and consistent approach to interpreting the notified features described on every SSSI Citation. Work is ongoing to update Monitoring Specifications (formerly SSSI Favourable Condition Tables) and the information on Designated Site Viewer to reflect the refined list of notified features and how these relate to what is monitored 'in the field' (monitored (reportable) features). These changes do not impact the evidence and conclusions reached in November 2022 and captured in this document.

* Not assessed

 = Declining condition

When undertaking a condition assessment, the unit status should reflect the status of the feature with the lowest condition score.

Vicki Howden - West Midlands Senior Freshwater advisor (June 2022)

Daisy Burris - West Midlands Freshwater Adviser (November 2022)

Claire Minett – Operations Manager (November 2022)

Jonathan Blowers – Operations Manager (updated May 2023) to reflect Natural England's revised approach to interpreting and naming notified features resulting from an ongoing review of SSSI Citations.