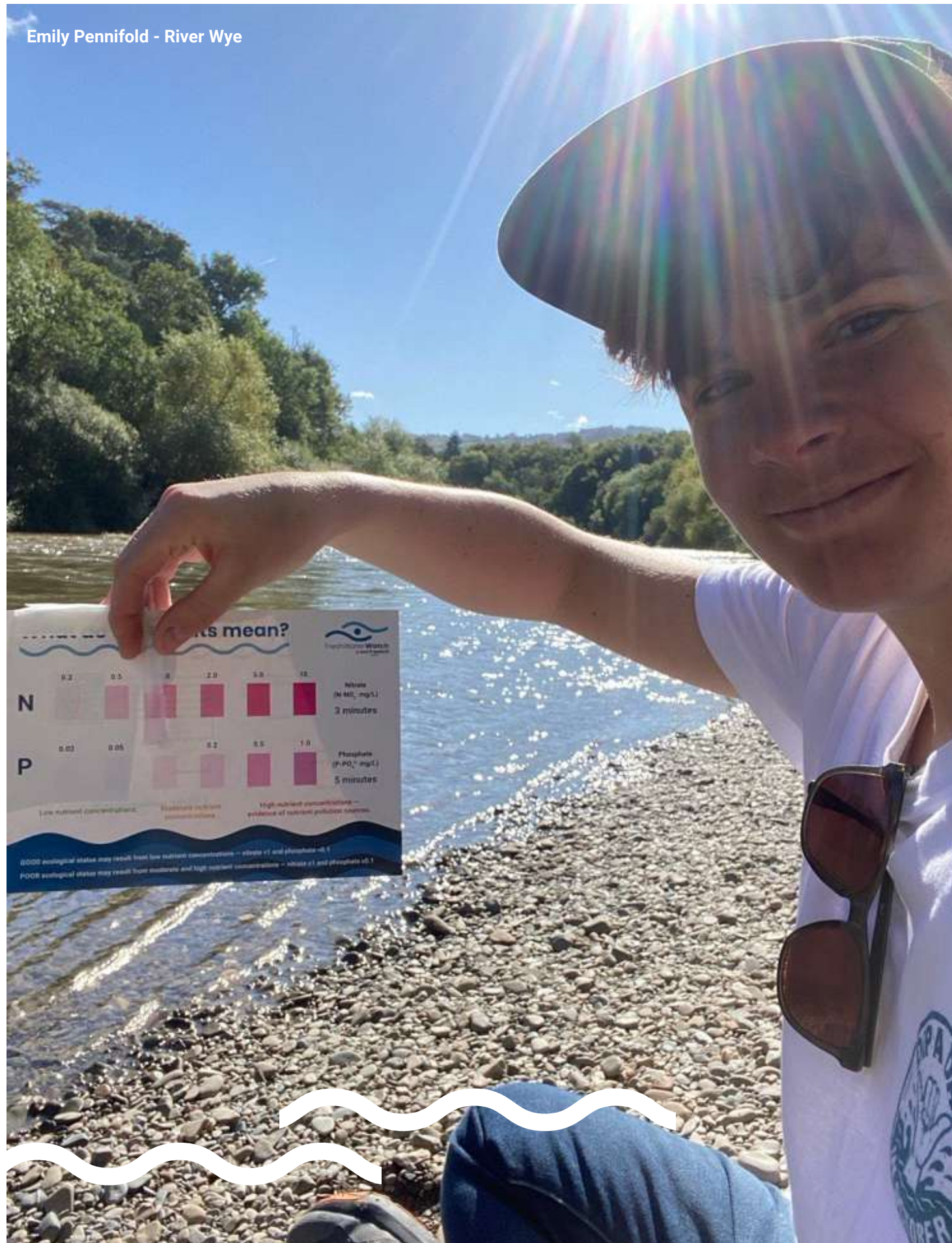




Great UK WaterBlitz Autumn 2025 Report



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Thank you to all the participants of the **Great UK WaterBlitz** who made this report possible.

Executive summary

Water sustains all life on our planet. Our world depends on an adequate supply of fresh, clean water. Despite this, the UK's freshwater ecosystems are failing. The seriousness of the situation has been unclear due to incomplete or missing data. This is where citizen science comes in.

September saw the fourth Great UK WaterBlitz, and once again thousands of concerned volunteers went out to investigate their local freshwater: **5,708 volunteers collected data from 3,430 freshwater sites.**

This means, that over four long weekends between 7 June 2024 and 22 September 2025 an incredible **20,800 people have taken over 11,000 freshwater measurements.** This powerful series of snapshots is building a picture of seasonal variations in the consistently poor water quality across the UK.

Of the 3,430 sites investigated in this WaterBlitz, **60% showed poor water quality.** This is in line with previous WaterBlitzes and a **negligible improvement** from the 75% and 61% poor water quality recorded in June and September of 2024, and 66% in April 2025.

The challenges to many waterbodies in the UK are due to the complex and interconnected range of pollution sources: sewage discharge, agriculture and urban runoff. Our rivers have been historically stressed by farming and are being pushed to the brink by outdated and inadequate sewage treatment works. There is, therefore, a pressing need for both **improvements to wastewater treatment processes** and **more sustainable agricultural practices** to reduce threats to vulnerable freshwater systems and species.

Through the FreshWater Watch programme,

we enable communities to gather real-time water quality data, measuring the nitrates and phosphates that are present in both agricultural runoff and urban wastewater. These nutrients are indicative of other pollutants – chemical and biological - being present. By working together with Imperial College London, we have investigated further chemical contamination in our waterways and have seen that every single water sample analysed in the laboratory contains other pollutants, many of which present some level of risk to aquatic life.

Earthwatch Europe champions citizen science. We empower our dedicated citizen scientists to gather accurate and timely information on water conditions time and time again, providing incredibly valuable insights that complement official monitoring efforts and ensure transparency and accountability from all types of polluters. We strongly call on authorities to continue working with us to engage communities and integrate citizen science into national freshwater monitoring frameworks. At the same time, we encourage citizen scientists to continue their essential work in monitoring and championing the health of their local rivers, lakes, ponds, and streams.

We want to see data-driven change to ensure that our future rivers are healthy from source to sea.



Coggeshall Cold Water Dippers, Gosfield Lake, Essex



Key Findings

- **60%** of datapoints across the UK show poor water quality, with unacceptable levels of nutrient pollution
- Over four WaterBlitzes, England consistently has the worst water quality in the UK; this autumn **66%** of sites tested had unacceptable levels of nutrient pollution
- Once again, our data suggest the **Thames river basin district has the worst water quality in the UK**, with **81%** of measurements showing unacceptable levels of nutrient pollution; despite the **Thames Tideway Tunnel** becoming fully operational in February of this year
- The counties of **Tyrone** in Northern Ireland, **Mid Glamorgan** in Wales, and the four counties of **Argyll and Bute, Ayrshire and Arran, City of Aberdeen** and **Dunbartonshire** in Scotland have the best water quality, with 100% of measurements indicating low levels of nutrient pollution
- In England, the county of **Northumberland** has the best water quality, with 94% of measurements indicating good ecological status
- **Cambridgeshire** has the worst water quality in the UK, with 91% of measurements indicating high pollution levels
- Every freshwater sample has **additional chemical contamination** evidencing pollution from sewage discharges and agricultural runoff
- Of the 20 chemicals assessed, 12 of them are present at concentrations that pose risks to aquatic life
- **Antibiotics** are found at concentrations that suggest we should consider antimicrobial resistance developing in our freshwaters
- Illicit drugs such as **ketamine** are prevalent in our waterways (although they pose limited risk to aquatic life)
- The insecticide **imidacloprid** is found at high concentrations in some samples from across the UK; posing moderate to high risk to aquatic invertebrates which are vitally important for ecological health

//

Being involved with this project opened our eyes to our local river, the River Tamar, especially finding out the pollution levels. Our river is a huge feature of our town, and we all have links to it. Our school is named after Isambard Kingdom Brunel who built the rail bridge over it! We felt like 'real' scientists using the kit we were sent, and all the children were really focused!

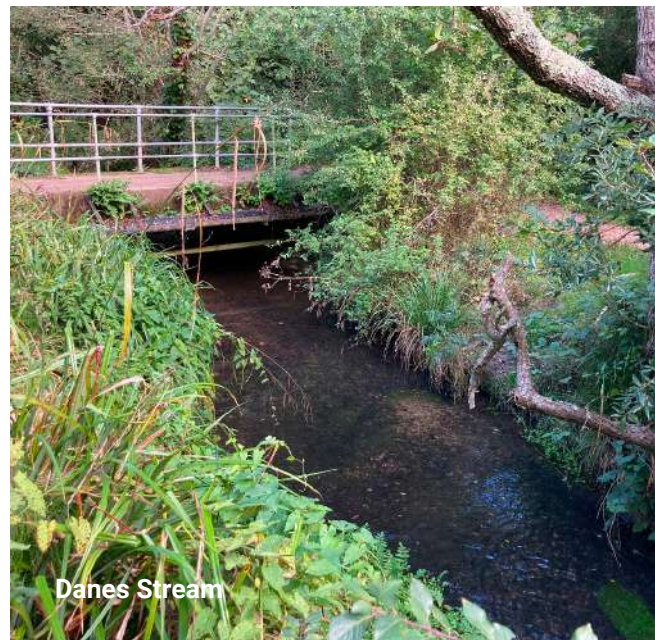
Sara McKillop, teacher at Brunel Primary and Nursery Academy, Cornwall

//

Brunel Primary School & Nursery Academy - River Tamar



An introduction to water pollution



Why are nitrates and phosphates so important and how are they officially monitored?

Nitrates and phosphates occur naturally in the environment and are essential for plant growth; but high concentrations trigger a process called **eutrophication**. The Environment Agency¹ estimates that **agriculture** accounts for 50-60% of nitrate pollution in the water environment, whilst



sewage effluent contributes about 25-30%. Conversely, for phosphates, **urban wastewater** contributes 73% of total phosphorous to watercourses, while agriculture contributes only 20%². In terms of nutrient pollution, our rivers have been historically stressed by farming and are presently worsened by sewage.

You can learn more about [nitrates and phosphates here](#).

Different government agencies are responsible for monitoring water across the UK. In Northern Ireland, the **Northern**

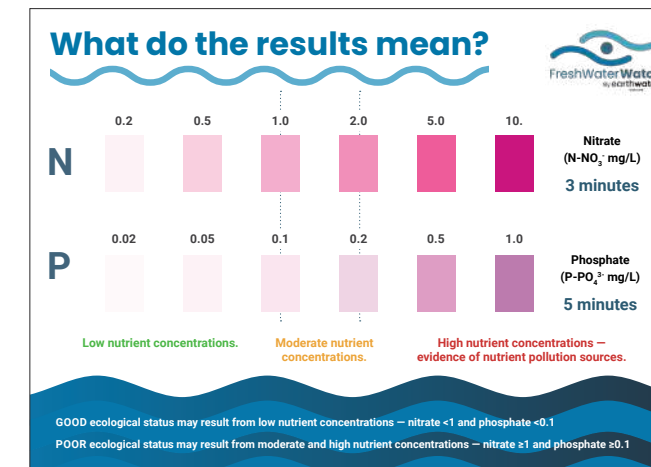


Figure 1. An explanation of the nitrate and phosphate results.

Ireland Environment Agency is responsible for monitoring nutrients and water quality; in Scotland, the **Scottish Environment Protection Agency** ensures water meets environmental standards; in Wales, **Natural Resources Wales** manages water resources; and in England, the **Environment Agency** is responsible for the quality of water.

The Environment Agency monitors many elements of a waterbody, as well as the characteristics of the surrounding catchment. Waterbodies are assigned one of five classes - high, good, moderate, poor, or bad – with the overall assessment based on a minimum of eight samples taken over three years. The Environment Agency applies **different standards** for nutrients to different types of rivers based on their varying levels of **ecological tolerance** to nutrient concentration, which is linked to wider factors such as altitude, and how “hard” or “soft” (mineralised) the water is.

In the Great UK WaterBlitz, we combine measurements of nitrate (N) and phosphate (P) taken by citizen scientists within a river sub-basin, based on at least five samples

per sub-basin. Waterbodies with **acceptable** water quality show evidence of **low** nutrient pollution (<1.0 ppm N and <0.1 ppm P). Waterbodies with **unacceptable** water quality show **moderate to high** levels of nutrient pollution (>1.0 ppm N or >0.1 ppm P) (Figure 1). We apply the same criteria **nationally**, without taking site-specific standards into account.

How is wastewater treated?

Urban wastewater (or sewage) is a mix of domestic wastewater, wastewater from industry, and rainwater run-off from roads. Every day in the UK, 347,000 kilometres of sewers collect over 11 billion litres of wastewater which is treated at about 9,000 sewage treatment works, and then discharged to inland waters, estuaries and the sea³. Wastewater treatment involves settling out the solid matter (primary treatment), using bacteria to break down the organic substances (secondary treatment), and – at some treatment works - removing **nitrates and phosphates** (tertiary treatment) through sand filtration, activated carbon filtration, and chemical oxidation.

However, the technology was not originally designed to completely remove the large numbers of modern chemicals from urban wastewater. This includes several every day-use chemicals, such as pharmaceuticals, personal care products, pesticides and household chemicals.

During heavy rainfall the capacity of sewers can be exceeded, which may mean the overload of sewage works with the potential for sewage to back up into peoples' homes. To reduce this risk, combined sewer overflows bypass the treatment works and discharge untreated sewage directly into the receiving waterbody.

Results

The picture of freshwater quality across the UK

Citizen scientists uploaded 3,430 datasets of nitrate and phosphate concentrations as well as observational data over a four-day period (19-22 September). Participants were asked to select the type of freshwater body they were investigating from a pre-determined list.

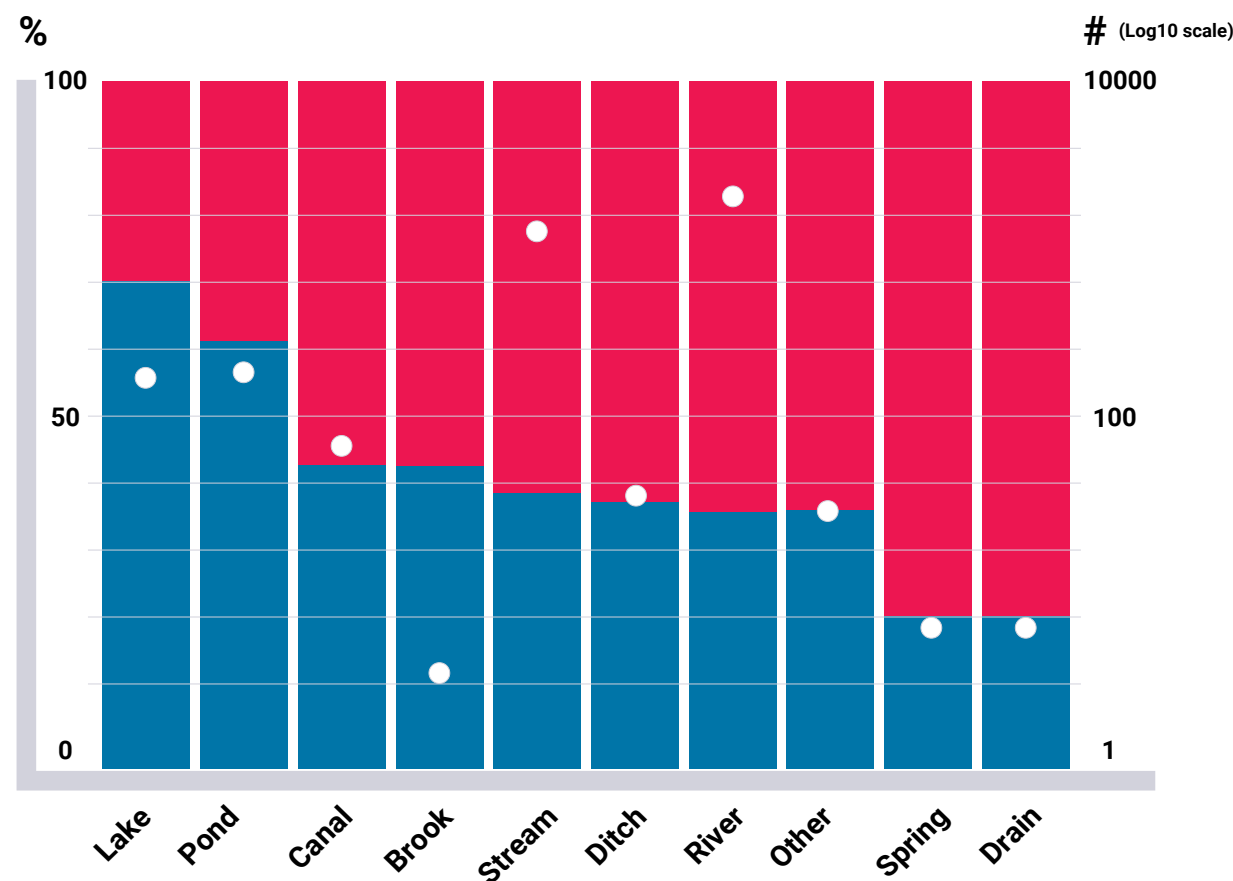


Figure 2. Water quality across the UK's freshwater bodies

Our data show that across the UK, most participants tested rivers and streams (Figure 2). Our data also suggest that springs

and drains were more polluted than other freshwater bodies; the latter is probably not surprising!

How does water quality differ between countries and over time?

Of the 3,430 surveys, 2,856 were collected in England; 200 were collected in Scotland; 208 measurements were taken in Wales; and 166 datapoints were gathered in Northern Ireland. The data indicate that **England has the worst water quality in the UK**. 66% of measurements taken across England's waters indicate unacceptable levels of nutrient pollution. In comparison 32% of measurements in Scotland and 27% of measurements in Wales and Northern Ireland showed poor water quality (Figure 3).

As we continue to collect more data over repeated WaterBlitzes the findings of previous WaterBlitzes are confirmed as a trend. **Taking the average across all four WaterBlitzes**, 34% of measurements in Wales and Northern Ireland, and 36% of measurements taken in Scotland indicate poor water quality. In comparison, 71% of measurements in England indicate poor water quality.

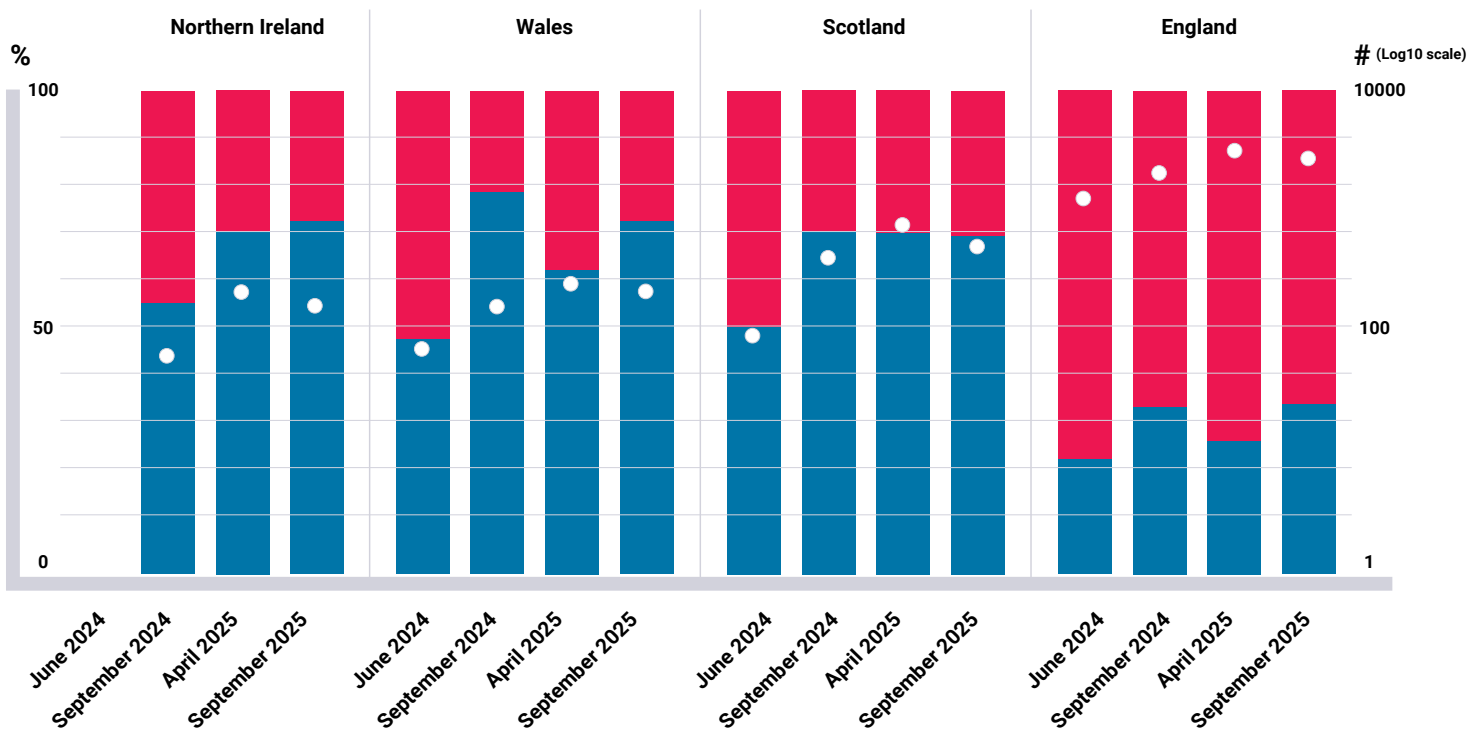
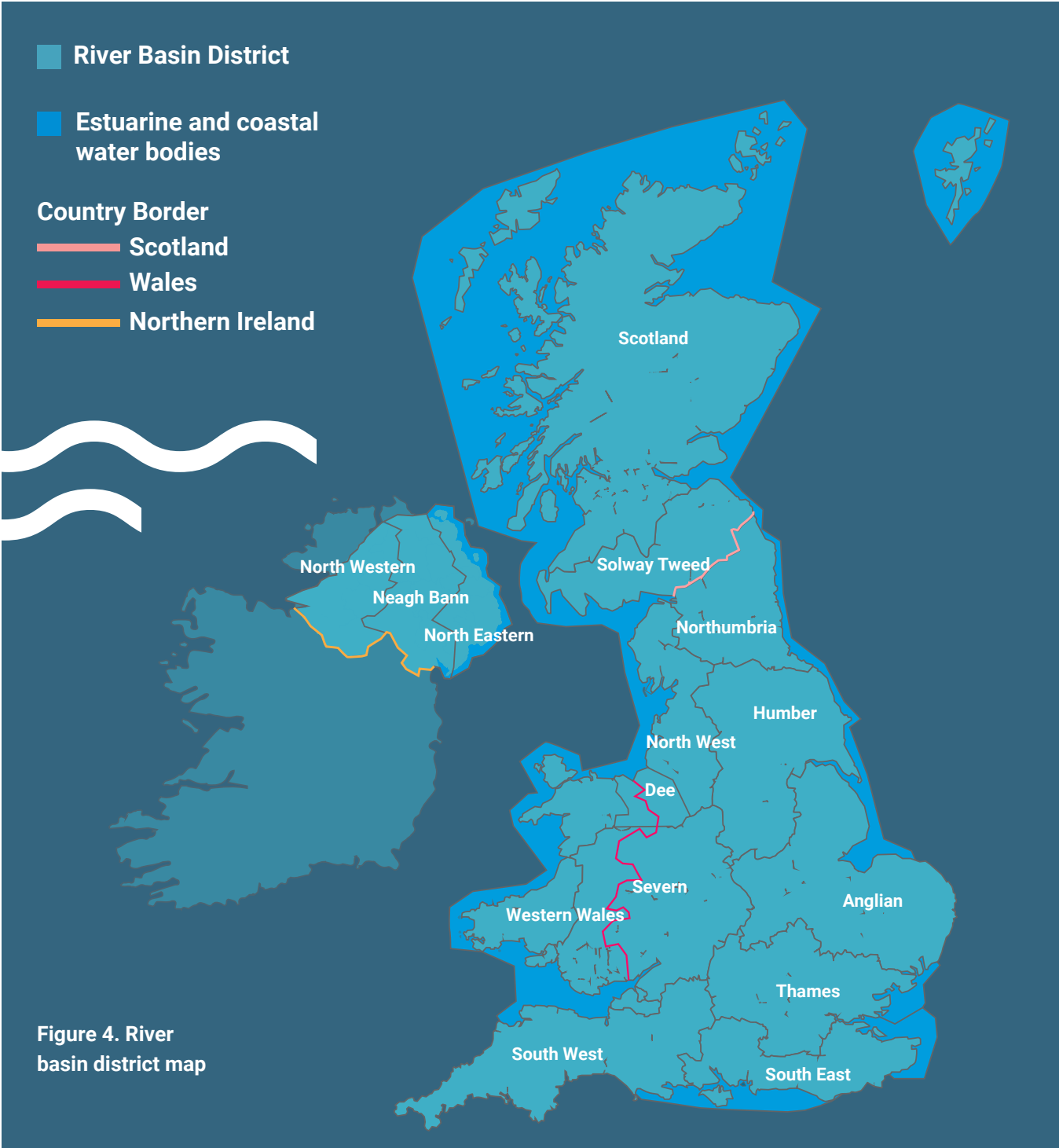


Figure 3. National overview of water quality over time

In Figure 3 we can see that **Autumn WaterBlitzes** (September 2024 and September 2025) generated better water quality results than June 2024 and April 2025; particularly in England and Wales. Although these results **indicate a seasonal variation**,

we need more data and further analyses of weather patterns to confirm this apparent trend. It is important that we continue with our biannual WaterBlitzes to further improve national coverage, and support robust, longer-term analysis of the UK's water quality.

Which river basin districts are worst hit?



A river basin, also known as a drainage basin, is an ecological term for the area of land around a river from which all water is drained. A **river basin district** includes one or more river basins. Each river basin district has a river basin management plan that outlines the objectives, standards, and measures for managing water (Figure 4).

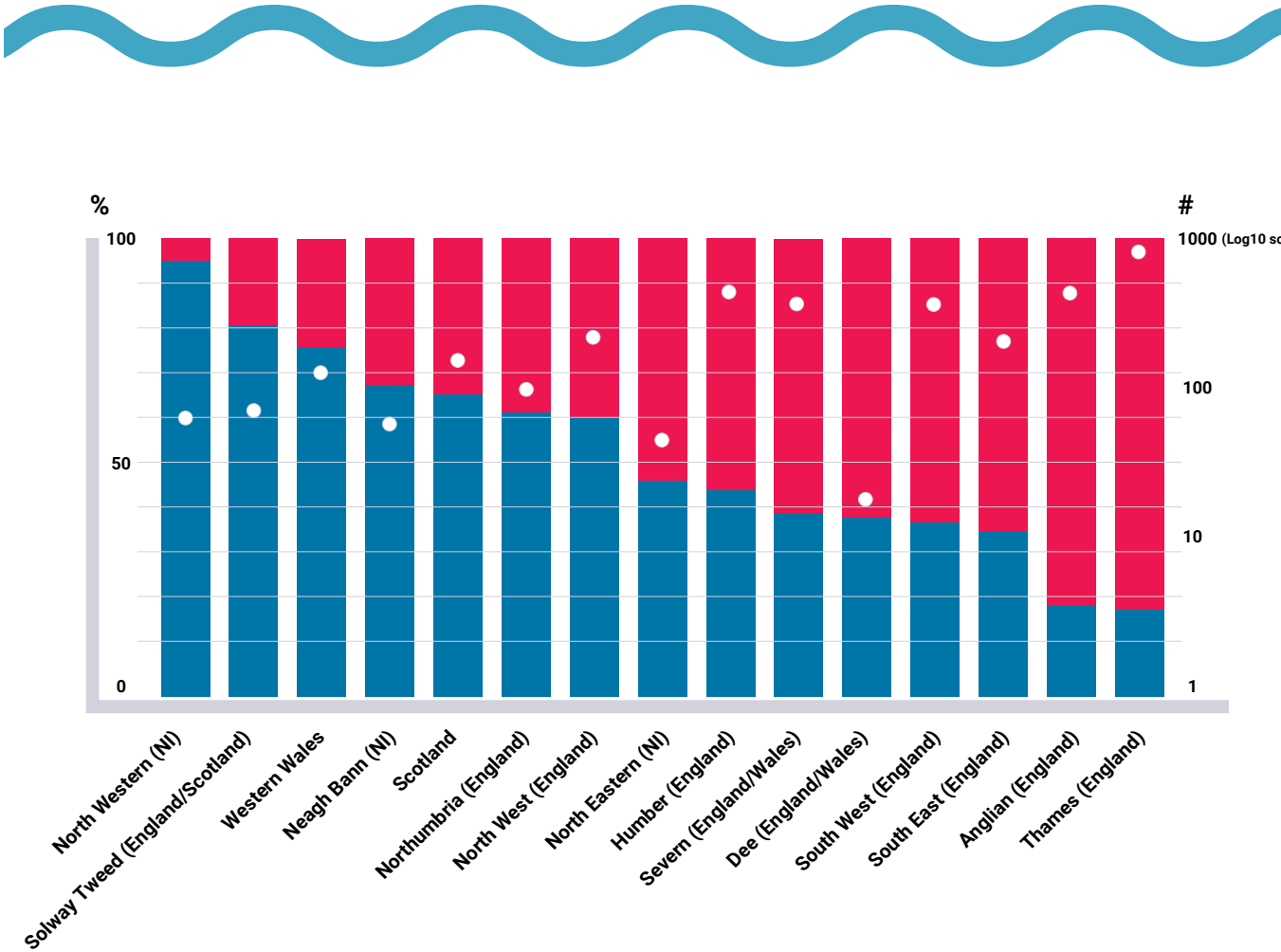
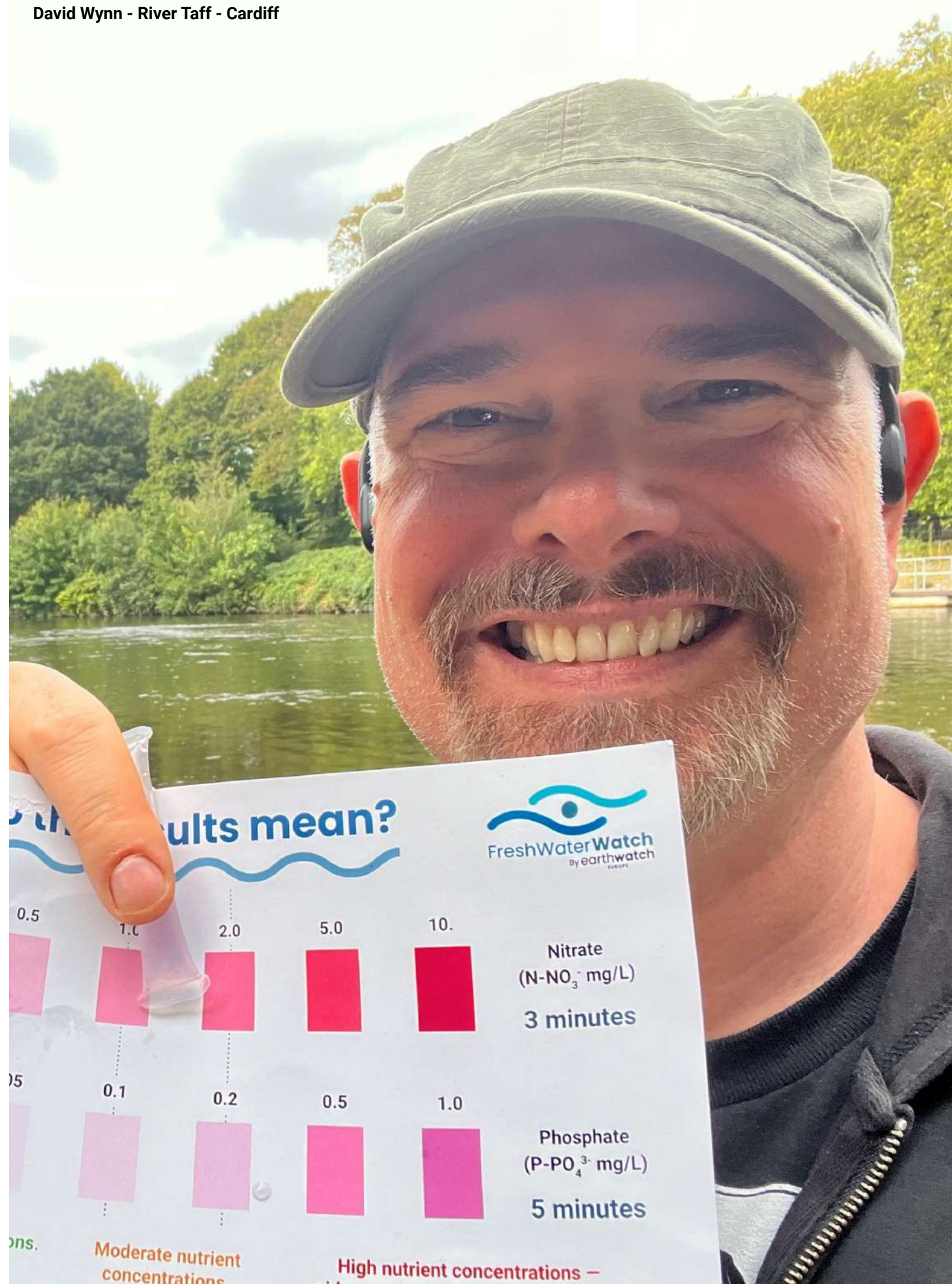


Figure 5. Water quality by river basin district

The results in Figure 5 suggest that the **North Western river basin district in Northern Ireland has the best water quality in the UK**, with 95% of the 64 measurements indicating low concentrations of nutrient pollution.

As in all three previous WaterBlitzes, the **Thames river basin district has the worst water quality in the UK**, with less than 20% of measurements showing good water quality (based on 754 datapoints).



“

Our rivers are taken for granted and often used as dumping grounds by polluting industries. However, clean rivers are essential for healthy biodiversity in and around them and are great for our own health and wellbeing. With that in mind, I thought it was essential to be part of Earthwatch's initiative to map the condition of our waterways. I chose the River Taff, because it is a beautiful river through the centre of Cardiff where I live. It has taken decades of effort to improve its cleanliness and attractiveness. We should not let the river slide back into the dreadfully polluted state it was in during the 1970s!

David Wynn, River Taff, Cardiff

”

Which river basins are most polluted?

We can delve deeper into the data to look at specific river basins (Figure 6). For example, in the **North Western** river basin district of Northern Ireland, all five river basins for which data were available recorded at least 80% good water quality measurements; with measurements in two of these basins having 100% good water quality.

In stark contrast, fifteen out of the seventeen river basins sampled by citizen scientists in the **Thames** region had less than 50% of measurements indicating good ecological status. However, it is important to note that

80% of measurements in the **Essex South** river basin indicated good water quality, suggesting that not all freshwater bodies in the region are equally polluted and that more attention to land and wastewater management could improve water quality in this region.

Why do river basins in the Thames river basin district fare so badly?

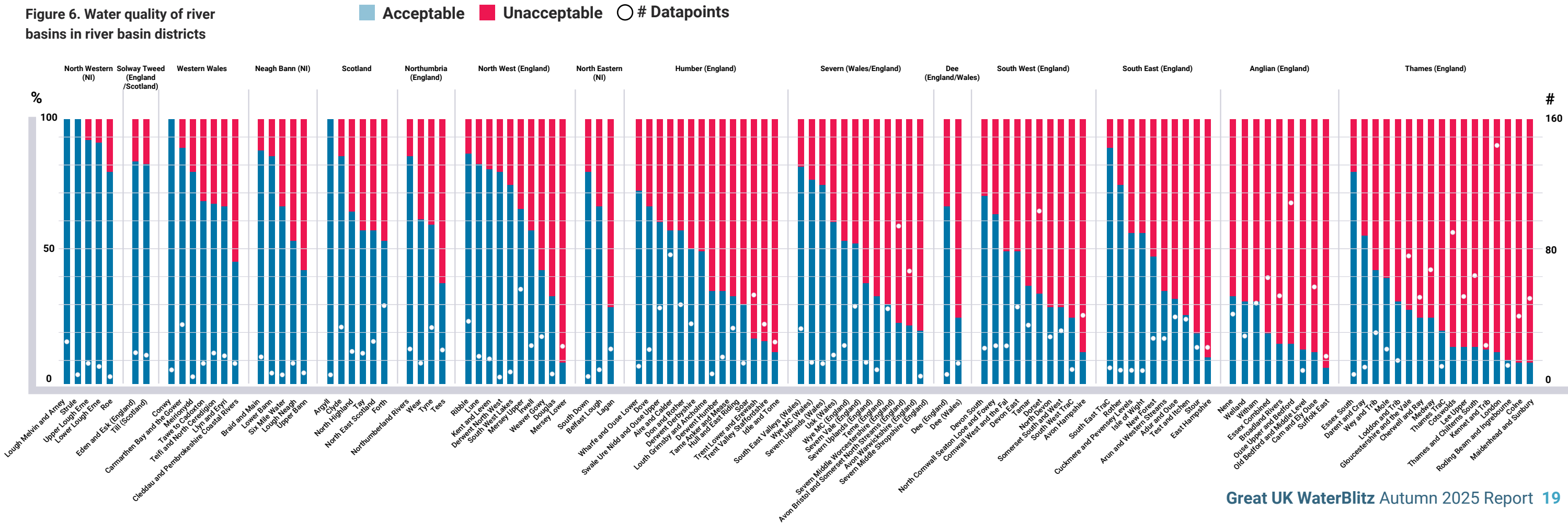
Land use plays a key role. In the Thames river basin district, most of the land is used for artificial surfaces (37%); although this is

comparable to other river basin districts with better water quality. The increased pressure on freshwater bodies in this region comes also from the relatively high proportion of land used for agriculture (36%), the comparatively small forest and semi-natural areas (22%), and very few wetlands (3%) (see April's WaterBlitz report for more details).

Furthermore, independent analysis conducted by the volunteer-led Oxford Rivers Improvement Campaign (ORIC) has estimated that more than half of Thames Water's 351 sewage treatment works are currently operating without sufficient capacity to treat the volumes of sewage they receive:

94 have between 80–100% of the necessary treatment capacity, 70 operate between 60–80%, and 17 sites function at less than 60%; meaning untreated sewage discharges happen more frequently. Importantly, **most of the worst-performing works are found upstream of London in headwater streams and tributaries of the River Thames**. Here, raw or partially treated sewage is likely to be more harmful to river ecosystems, because small waterbodies cannot dilute pollutants effectively⁴. This might help to explain the ongoing poor water quality in the Thames river basin district, despite the recent opening of the Thames Tideway Tunnel in London.

Figure 6. Water quality of river basins in river basin districts

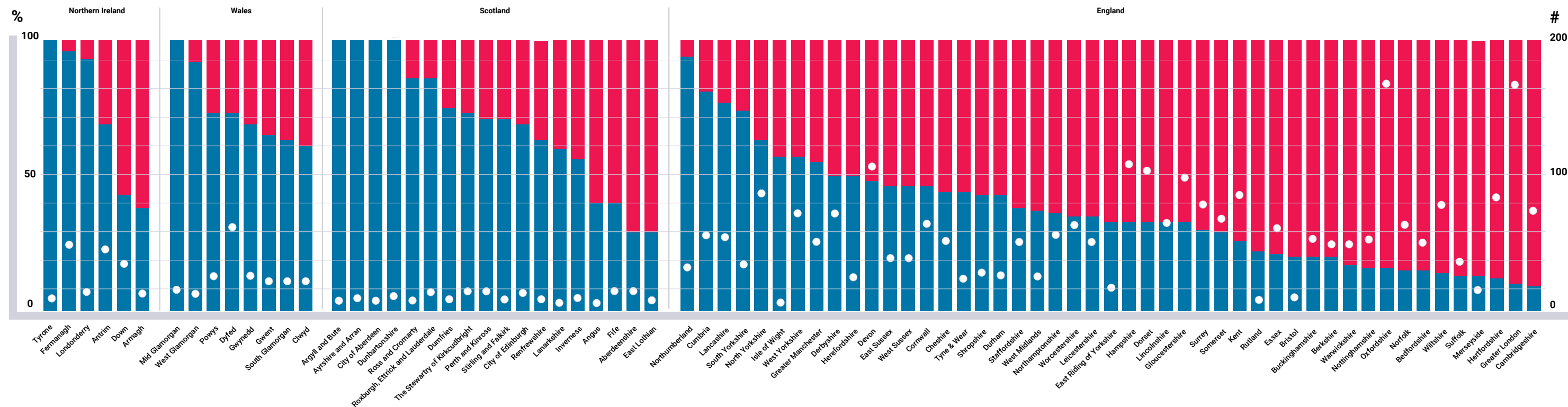


How healthy is freshwater in your county?

In this report we have used ceremonial counties because local governmental legislation counties are continually updated, with boundaries that change over time.

Figure 7. Water quality by county

Acceptable Unacceptable # Datapoints



We have ranked counties by country and by water quality so that you can see the percentage of unacceptable water quality measurements taken in your county, and how it compares to others (Figure 7). Thanks to your increasing sampling efforts from WaterBlitz to WaterBlitz, the number of counties we can include has risen from 56 in June and 67 in September 2024, to 82 this April and 79 this September.

Our data show that the counties of **Tyrone** in **Northern Ireland**, **Mid Glamorgan** in **Wales**, and the four counties of **Argyll and Bute**, **Ayrshire and Arran**, **City of Aberdeen** and **Dunbartonshire** in **Scotland** have the best water quality in the UK, with 100% of measurements indicating good water quality and low nutrient concentrations (based on 9, 17, 7, 8, 7 and 10 datapoints respectively). In England, the county of **Northumberland**

has the best water quality, with 94% of measurements indicating low nutrient pollution (34 datapoints).

Cambridgeshire has the worst water quality in the UK, with 91% of measurements indicating poor water quality (based on 77 datapoints).

A shout out to the residents of **Oxfordshire**, who took the greatest number of measurements - 172!

Note that while there is a possible relationship between the number of datapoints and unacceptable water quality, this is possibly due to larger volumes of data being collected where there are naturally more people; in urban areas where there are fewer green spaces and more pressure on sewage treatment works.

What else is in our rivers?

Over a thousand individuals across the UK collected water samples to send to Imperial College London for additional chemical analysis.

The full analysis of around 200 chemicals in these samples is still underway, but once completed, the **200,000-point dataset will be the largest of its kind generated through the power of citizen science for these additional substances**. An analysis of the complete dataset will be published in a peer-reviewed journal as soon as possible.

For this report, we present data from the first 100 samples analysed to give a representative picture of chemical pollution entering our freshwaters. Note that this selection **expands last September's geographical scope from England to the whole of the UK** (Figure 8).

The most frequently occurring chemicals across these 100 samples are a mix of pharmaceutical agents, illicit drugs, antibiotics, and pesticides (Figure 9).

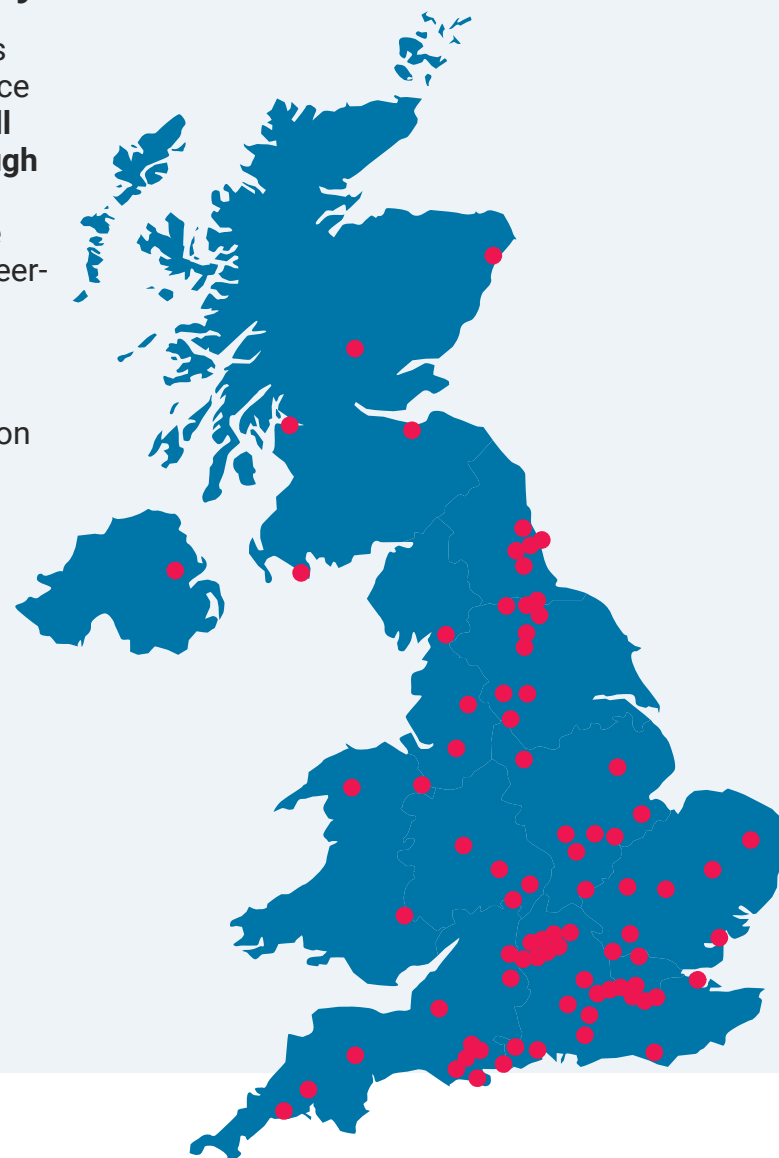


Figure 8. Distribution of samples for additional chemical analysis

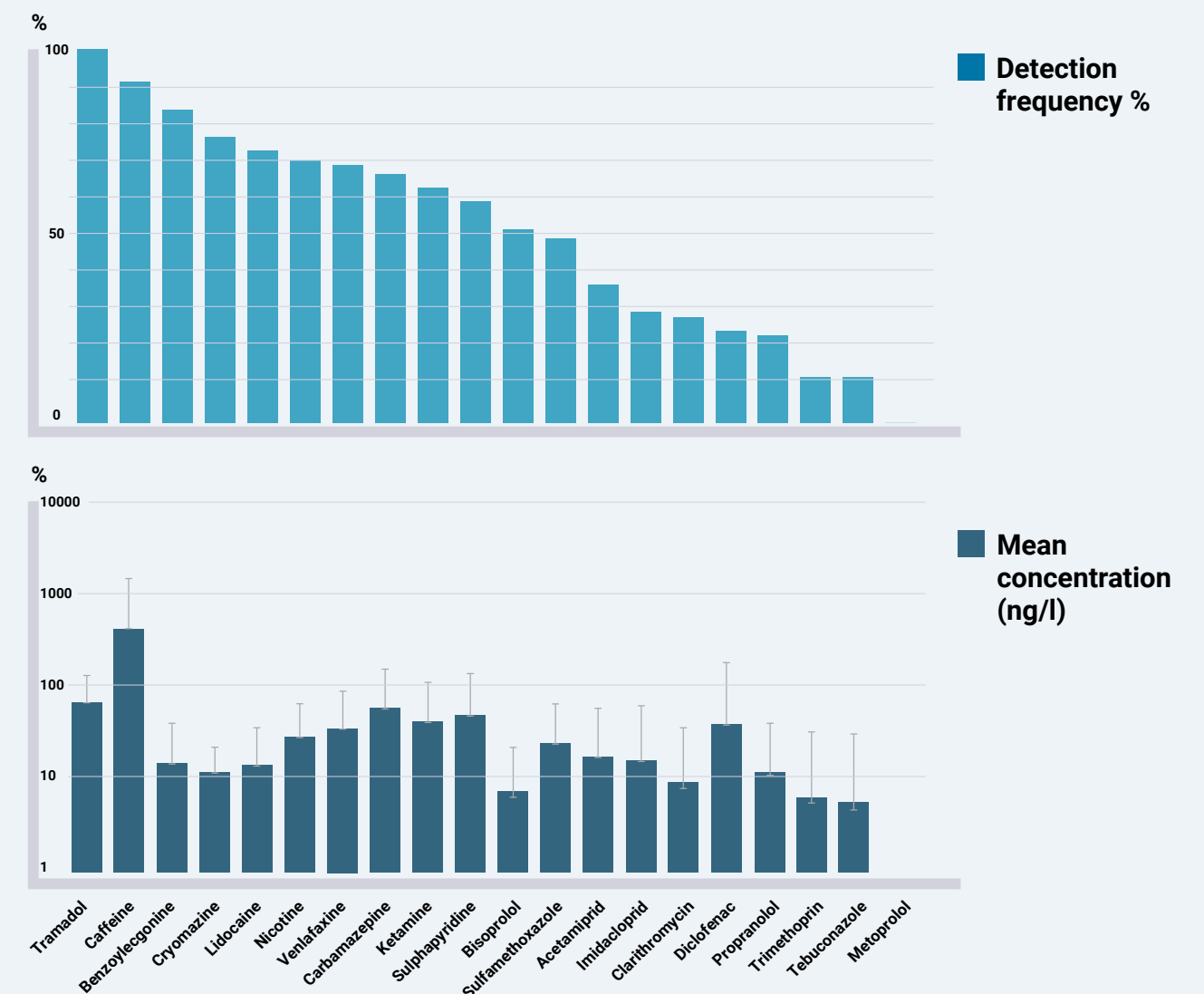


Figure 9. A selection of 20 chemicals frequently detected during this WaterBlitz (top) and the mean concentration at which they were detected (bottom). Across 100 samples, tramadol is the most frequently detected chemical, while caffeine has the highest mean concentration

Two of the most frequently occurring chemicals are **natural stimulants: caffeine** – found in tea, coffee and cacao plants – and **nicotine** – found in tobacco products – were detected in 74% and 57% of samples, respectively.

Seven **pharmaceutical agents** are in a high percentage of samples: two beta-blockers, **bisoprolol** (42%) and **propranolol** (19%); the antidepressant **venlafaxine** (56%); opioid pain relief, **tramadol** (81%); local anaesthetic, **lidocaine** (59% of samples);

as well as **carbamazepine** (54%) used to treat epilepsy; and **diclofenac** (20%), a non-steroidal anti-inflammatory drug used in both human and veterinary medicine.

Illicit drugs are also frequently detected: **ketamine** (found in 51% of samples) is used medically for anaesthesia, but it is also increasingly mis-used across the UK. **Benzoyllecgonine** (68%) is a metabolite – or breakdown product – of cocaine.

Three **antibiotics** are some of the most frequently occurring chemicals: **sulfamethoxazole** (40%) and **trimethoprim** (10%), used to treat urinary tract infections; **clarithromycin** (23%), used to treat a range of infections; and **sulphapyridine** (48% of samples) which is a veterinary antibiotic.

Finally, **pesticides** make up a large portion of the most frequently detected chemicals in freshwaters across the UK: **tebuconazole**, a broad-spectrum fungicide (10%); **cryomazine**, an insect growth regulator (62%); **acetamiprid**, a neonicotinoid pesticide (30%); and **imidacloprid** a systemic insecticide found in 24% of samples tested.

How harmful are these chemicals to our precious waterways? Figure 10 shows the risk they pose to aquatic life: from high, to medium and low risk. Of the twenty compounds investigated, twelve of them were detected at concentrations which could pose a risk to aquatic life; and of this initial analysis 11% of all measurements made indicated risks to aquatic life from these substances.

While the presence of illicit drugs such as ketamine in our freshwaters is concerning – indicative of potential misuse across the country, as well as our struggling wastewater treatment infrastructure – they are not

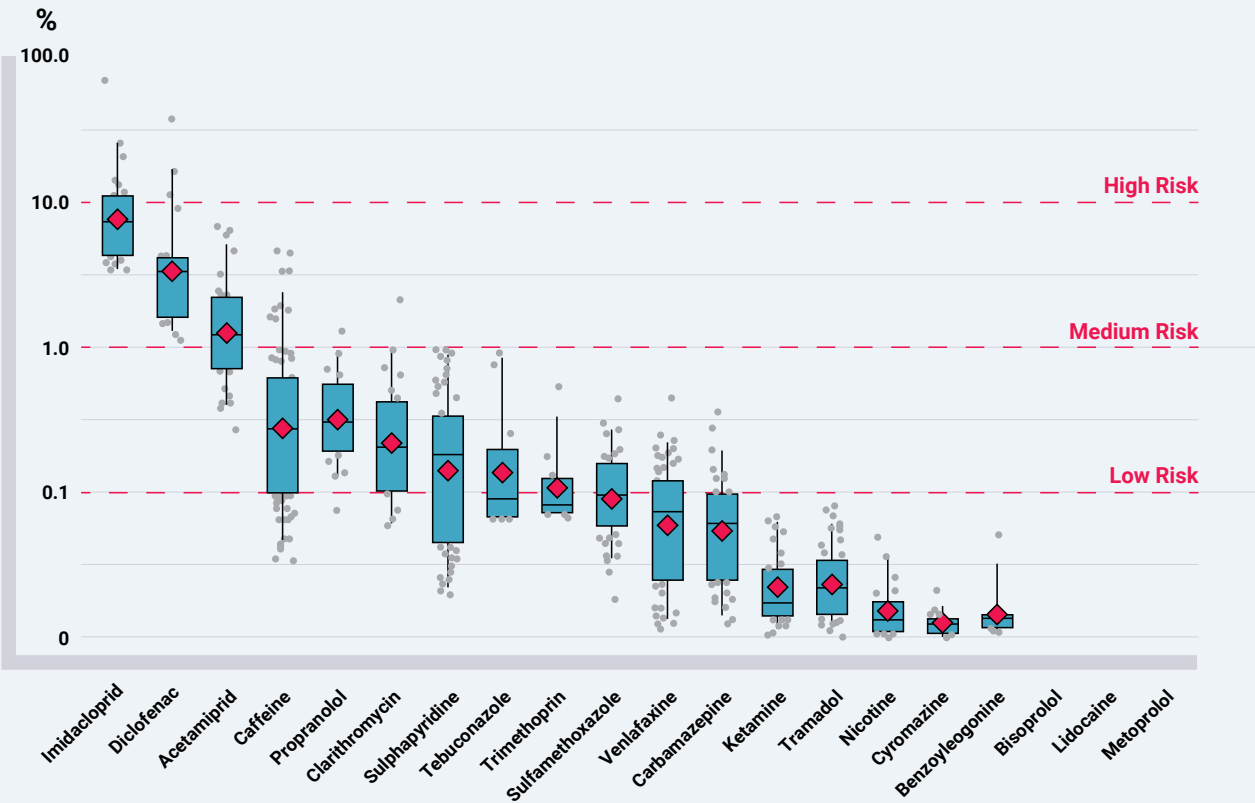
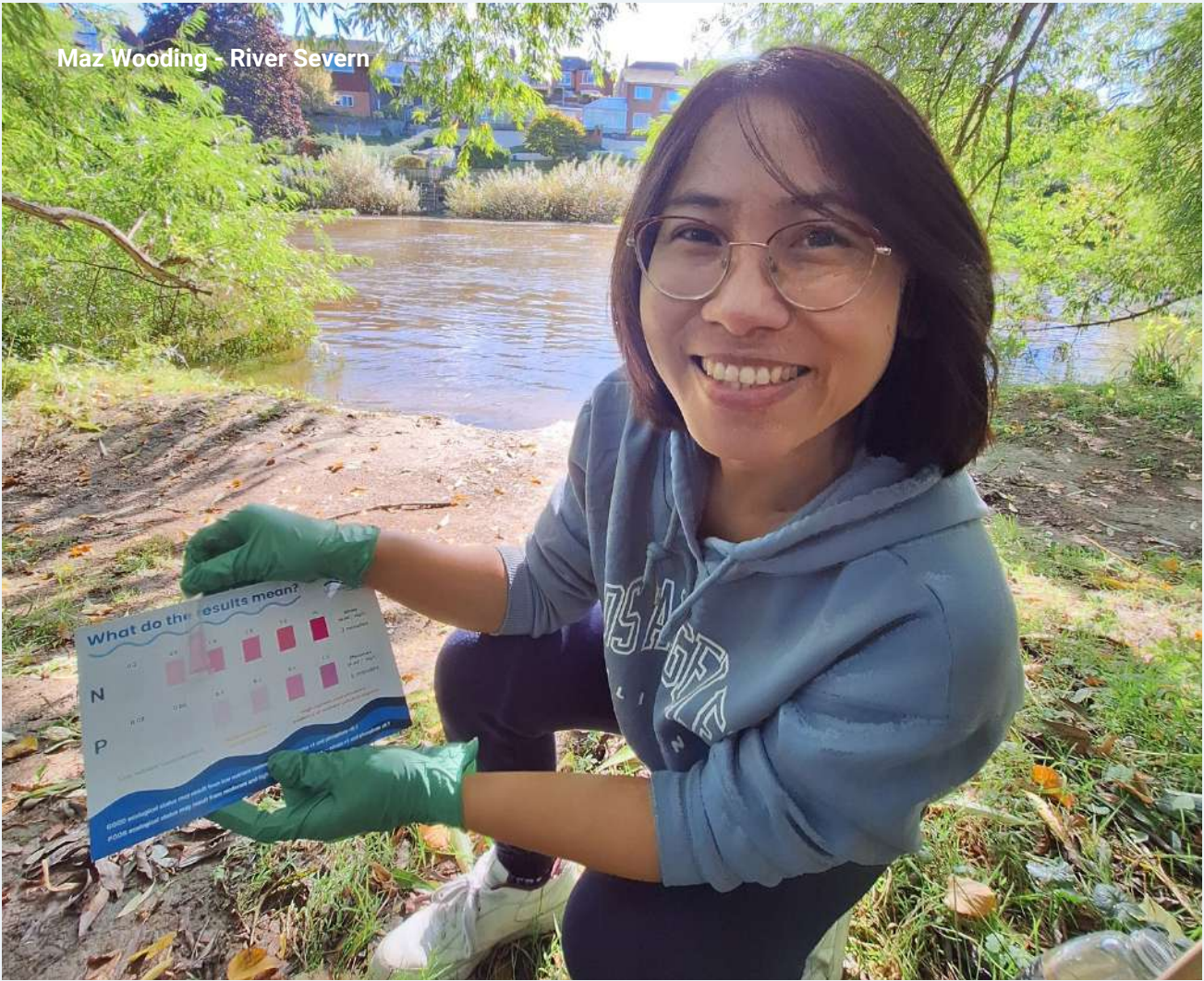


Figure 10. Chemicals and the risk they pose to aquatic life at the concentrations measured. The boxes represent the interquartile range, the lines represent the median and the red dot, the average. Whiskers are the 5/95th centile and dots above/below this are outliers.



detected at concentrations that pose risk to aquatic life.

More worryingly are the environmental risks of the antibiotics clarithromycin, sulfamethoxazole and sulphapyridine, which are **detected at concentrations at which we should consider the chances of antimicrobial resistance developing in our waterways.**

Most alarming of all, however, are the concentrations at which we detect imidacloprid. Despite being banned for

agricultural use several years ago due to its detrimental impact on pollinator numbers, imidacloprid’s continued use in tick and flea treatments for pets allows it to enter our waterways. Our data show that **in every sample in which it is detected, imidacloprid is found at concentrations which pose moderate to high risks to aquatic life.** The severity of this finding cannot be overstated. Aquatic invertebrates are the foundation of freshwater ecosystems, and their vulnerability to this insecticide could have potentially catastrophic consequences.

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We are studying and making artwork around our local river, the River Washford, which includes looking at the ecological status and water quality. The river is part of the community where we are based as artists. Collecting water and testing felt important.

River Washford Rising is a collaborative project between two artists, Catherine Heard and Jenni Dutton, and the River Washford herself – recognising the river as an active voice and creative partner. Together we weave new mythologies and future folklore through art, sound, and story, drawing on the river's history, presence, and rhythms as both medium and muse. The recent 1940s Weekend, an annual event in Watchet, happened to coincide with the Great UK WaterBlitz, hence our period dress!

Catherine Heard, River Washford, Somerset

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What do we know about our participants' experience?

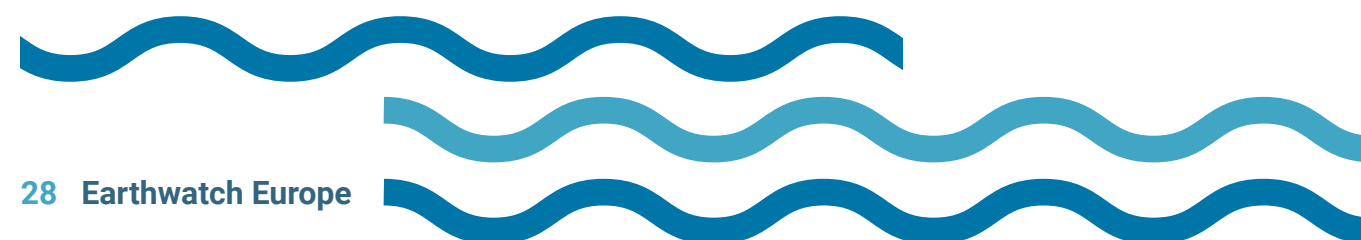


5,708 participants took part in the WaterBlitz and 628 responded to our questionnaire about their experience.

35% of participants had not been involved in the environmental sector before the WaterBlitz, and 43% had previously taken part in a WaterBlitz event (thank you!). Most people wanted to do something for the environment (89%) or had a personal interest in a local waterbody (64%).

As in previous WaterBlitzes, many participants agreed that their understanding

of water quality issues and river health was improved through taking part (75%); and 21% reported a positive shift in their relationship with nature. We're really pleased that, as a result of taking part in our WaterBlitz, 39% of participants report that they will start taking part in other citizen science initiatives and 21% will get involved in local environmental initiatives.



Kells Connor and Glenwherry Angling Club - Antrim, Northern Ireland

What can I do and where do we go from here?

There are many actions that we can take as individuals, that will collectively add up and ease the pressure on our freshwater systems.

Outside, a **water butt** connected to the drainpipes from our roofs can reduce the volume of rainwater running into the sewage system. Additionally, making our gardens and driveways more **permeable** allows surface water to soak into the ground rather than into drains. In built-up urban areas, rainwater runs off faster and has less chance to soak into the ground than in areas with more green spaces such as parks and pastures. Paving over lawns and flowerbeds to make driveways and patios adds up to an increased risk to freshwater health.

The average person in the UK uses 142 litres of water per day, peaking during our morning and evening personal hygiene and cooking activities. Lowering overall water consumption puts less pressure on water resources, and using water at off-peak times helps the sewage system to cope better throughout the day. Being mindful of what we put down the toilet or pour down the drain reduces the risk of blockages as well as pollutants entering freshwater bodies. Using eco-friendly cosmetic and cleaning products, avoiding products which contain

PFAS (including clothing and cook wear), as well as over-washing manmade materials like polyester, reduces chemicals and microplastics flowing into freshwater bodies. Remember, **what we pour down our sink cycles back to our drink**.

Finally, one specific, concrete action that all pet owners should strongly reconsider is whether all-year-round preventative spot-on treatment for ticks and fleas is needed for their pet. They should **consult their vets for professional advice** about what their pet really requires, based on a risk assessment of their pet's health, lifestyle and likelihood of infestation. For example, some animals that are kept indoors, may not need this treatment at all; and for those that do venture outside, regular washing of pet bedding, and grooming with the use of flea combs can help prevent fleas. Pets who require treatment for infestation should avoid watercourses. For more information, see the briefing paper published by the Imperial College London's Grantham Institute for Climate Change and the Environment, which includes a list of recommendations.



Monkey Island, River Thames

In April 2026 we will focus our Great UK WaterBlitz efforts on engaging school children and youth groups to support freshwater education and action. In the meantime, you can explore some of our freshwater educational resources developed as part of the ProBleu project.

Earthwatch Europe believes in the power of data for change.

We believe in open, transparent data. It's why all our graphs have been plotted to include the number of datapoints; so that you can see how large a dataset has been used to draw conclusions. We want to see the same level of transparency and, indeed, accountability from all types of polluters: from agriculture, urban run-off and sewage overflows.

We want to see the **law enforced**, so that pollution from all sources – sewage, agriculture and road runoff – becomes **unprofitable**. We want to see government monitoring and mitigation focused on **ecologically sensitive areas** including protected nature sites and chalk streams; and for **nature-based solutions** to be prioritised. We want to see Government take action to **engage and empower** communities to monitor and protect their local freshwaters.

We believe that citizen scientists can provide extensive, accurate, and timely information on water quality at a national level. We've shown that our participants can generate

robust datasets and reliable status reports on how seasonal variations can impact pollution dynamics and water quality. While acknowledging that the Environment Agency has steadily increased the number of water quality measurements they take annually, we nevertheless urge authorities to recognise the added power of citizen science for freshwater monitoring at a national scale. We recommend that citizen-generated data be integrated into statutory freshwater monitoring frameworks to help identify poor water quality regions, allowing Government resources to be targeted on these priority areas.

Finally, based on the results of this WaterBlitz, **we call upon Government to implement better regulations for the environmental risk assessment of spot-on tick and flea pet medications like imidacloprid and especially regarding their blanket preventative use on pets in the UK.**

A healthy freshwater future starts today. With each and every one of us monitoring and advocating for our local rivers, streams, lakes and ponds.

Please join us in April 2026 for our next Spring WaterBlitz, and continue the fight for healthy fresh water.

Methods



Participant recruitment and feedback

Citizen scientists were recruited through promotional campaigns on social media. Following the WaterBlitz, all participants were sent a follow-up questionnaire to report on their experience of the WaterBlitz and their knowledge, attitudes and behaviours towards nature.

Nutrient testing

The FreshWater Watch (FWW) measurements of nitrate and phosphate are made colourimetrically in closed tubes using a standard plastic cuvette for a fixed volume of 1.5mL. Nitrate measurements are based on the Griess reaction, with a reduction reaction using zinc, which reduces the nitrate (NO₃⁻) to nitrite (NO₂⁻) and a colourimetric reaction for the determination of nitrite. PO₄ is detected using 4-amino-antipyrine with phosphatase enzyme to produce hydrogen peroxide, which then undergoes a colourimetric reaction. Both colours are compared to standard reference colour charts provided to the citizen scientists, assigning colour brightness to one of seven concentration intervals. Side-by-side measurements have shown an overall accuracy of 75% to 85% of the citizen scientist estimated PO₄ concentrations compared to concentrations measured at the same site and day by professional scientists using standard laboratory analysis

^{5,6}. Participants submitted data via the ArcGIS Survey123 app, the FWW platform or via paper copy. All data uploaded from the 19th of September until 1.30pm on the 23rd of September were included in the analysis (following quality control). Additional data uploaded outside of this period were not included in the analysis but could still be visualised on the public map and will form part of the overall FWW database.

Nutrient data analysis

On closing the survey, the data were exported, and quality control was undertaken. This included checking locational accuracy, with automated emails sent directly to participants to correct their own geolocation, as well as the removal of incomplete and duplicate records, and the removal of saltwater surveys as indicated in participant notes (e.g., “sea”, “harbour”, “tidal river at high tide” etc.). Each record/survey result was then enriched with nitrate and phosphate nutrient pollution ratings based on the measured concentrations, from which in turn the acceptable/unacceptable water quality classification was generated (based on the N and P thresholds mentioned earlier in the report). Lastly, our FWW narrative water quality feedback was generated for each survey, using a matrix based on the nitrate and phosphate measurements and the observed parameters, and providing the citizen scientists with immediate qualitative

information about their waterbody, via the survey app.

For the spatial analysis of the data points, we enriched our data set using geospatial layers including Open OS Boundaries, WFD (Water Framework Directive) for England and Wales, and SEPA (Scottish Environment Agency).

Polygons for spatial analysis

The following polygons were used for spatial analysis:

- Country, from Ordnance Survey Boundary-Line™ consisting of the ‘Country Region’ shapefile and can be found at <https://osdatahub.os.uk/downloads/open/BoundaryLine>
- County, from
 - Ordnance Survey Boundary-Line™ consisting of the ‘Boundaryline ceremonial counties region’ shapefile for England, Scotland and Wales, which can be found at <https://osdatahub.os.uk/downloads/open/BoundaryLine>
 - ‘Northern Ireland, County, Boundaries’ shapefile. This data was collected by Ordnance Survey Northern Ireland and can be found at <https://www.opendatani.gov.uk/> on the open data NI portal.
- River basin districts/management area (using RBID_NAME) field as defined by the WFD Surface water management catchments (Cycle 2) database.
- River basin (using MNCAT_NAME) field as defined by the Water Framework Directive (WFD) Surface water management catchments (Cycle 2) database, enhanced by Welsh sub-regions (field name ManCatID, and ManCatName) from WFD River Waterbody Catchments Cycle 2.
- Geolocation quality control: Using Building and ImportantBuilding shaped file polygons from OS Openmap <https://osdatahub.os.uk/downloads/open/OpenMapLocal> to determine points that were recorded at a building instead of a waterbody. This was then checked against distance from SurfaceWater waterbody shape file polygons and lines from the following sources - OS Open Rivers <https://osdatahub.os.uk/downloads/open/OpenRivers> HYPERLINK “<https://osdatahub.os.uk/downloads/open/OpenRivers>”, OpenStreetMap <https://www.openstreetmap.org/> and regional extracts from Geofabrik <https://download.geofabrik.de/europe/united-kingdom-latest.osm.pbf>. Geolocations were then corrected accordingly.





Datapoints per polygon

The number of datapoints per polygon was determined to assess the representativity of the data. All datapoints were included in the overall, national, and River Basin District analyses. River basins and counties with fewer than 5 datapoints were excluded from analysis at those levels.

Of the 157 river basins defined by the WFD Surface Water Management Catchments Cycle 2 polygons (see Polygons for spatial analysis above), 141 were sampled, and 116 had more than 5 data points. These river basins contained 97.8% of the 3,430 datapoints that were collected by citizen scientists during the WaterBlitz.

Of the 97 counties defined by boundary shapefiles (see Polygons for spatial analysis above), 92 were sampled, and 79 had more than 5 data points. These counties contained 99.2% of the 3,430 datapoints that were collected by citizen scientists during the WaterBlitz.

Data sources

- Earthwatch Europe – Great UK WaterBlitz April 2025
- OS Open Boundaries Data source link
- OS OpenMap Local Data source link
- OS Open Rivers Data source link
- OpenStreetMap via Geofabrik Data source link
- SEPA River Basin Districts Data source link
- Water Framework Directive (WFD) River Basin Districts Cycle 2 Data source link
- WFD Surface Water Management Catchments Cycle 2 Data source link

Tools used

- ESRI ArcGIS Python API
- ESRI ArcGIS Online and Python Notebooks
- ESRI ArcGIS Pro
- Microsoft Excel (Microsoft Office 365)
- Microsoft Visual Studio Code
- Pandas library

Chemical testing

Citizen scientists sent paired (duplicate) samples to Earthwatch Europe for freezing, after which the samples were transported to Imperial College London (thank you, Mr Woods!). Note that some samples were held by Royal Mail at room temperature for a number of days before release, meaning that there is a possibility that some samples may have partially degraded. Upon arrival at Imperial College, samples were checked for damage and one sample from each pair was selected for analysis, whilst the other kept as a spare. The code on each sample was linked to the GPS coordinates provided by the participant who had collected the sample.

The samples were then analysed using a technique called liquid chromatography-tandem mass spectrometry (LC-MS/MS), according to Egli et al⁷. Briefly, a 900 µL aliquot of the sample was taken to a second tube and spiked with a range of internal standards to help with quantification. The samples were then passed through a 0.2 µm filter before 10 µL was injected directly on to the LC-MS/MS in triplicate. The instrument

monitored for a chemical retention time and a set of specific ion fragmentation transitions for all the chemicals we targeted, and provided multiple reaction monitoring (MRM) with a minimum of two transitions per compound. The detection limit for all compounds was 3 ±5 ng/L (nanograms per litre). Comparing the retention time and MRM with those recorded for the same substances in a library allowed us to identify the substance. The intensity of the signals obtained was then used to derive the measured environmental concentration (MEC) of the substance, by comparison with a calibration series of the compounds prepared using artificial freshwater.

For environmental risk assessment, the lowest predicted no-effect concentration (PNEC) of each compound was taken from the NORMAN Ecotoxicology database⁸ to calculate a risk quotient, i.e., MEC/PNEC. Risk quotients of <0.1 were considered of insignificant risk; 0.1-1.0 were low risk; 1.0-10 were medium risk and those >10 were high risk.





Lesley Westbrook - River Great Ouse,
Hartford, Cambridgeshire

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I took part as the river is integral to the heritage and culture of our local area. It's a vital ecosystem that is being ravaged by agricultural practices and pollution and I wanted to help be part of the solution. My two-year-old Annalise and 4-year-old Louis were also part of it, getting them excited about citizen science was an added bonus!

Lesley Westbrook, River Great Ouse,
Hartford, Cambridgeshire

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