

WYE CITIZEN SCIENCE WATER QUALITY MONITORING FIELD GUIDE



CPRE - HEREFORDSHIRE

Reminders:

- Please try to monitor at least once a week at your agreed sampling site.
- Check the health and safety guidance before and during every trip you take out into the field.
- Record your results in the field via the Epicollect app (Wye Alliance Citizen Science) or on paper (to later upload online) after every survey.
- Contact us with any issues you have.
- A full risk assessment is carried out on every sampling site and will be made available to Citizen Scientists for the sites that they are sampling

Need to Contact us?

 volunteer@cpreherefordshire.org.uk

 Andrew McRobb - 07738 188515

Things to take out into the field...

The basic water quality test kit* These items will be supplied to you	Other items you may need to source these yourself
<ul style="list-style-type: none"> • HM Digital EC-3 Probe • Hanna HI-713 Handheld Calorimeter ('Hanna Phosphate Low-range Checker') • Hach Nitrate test strips • Stainless steel jug 	<ul style="list-style-type: none"> • Clean lint cloth • Mobile phone • Paper and pen (as back up) • Hand sanitiser or plastic gloves • Rubbish bag and waste bottle • Tweezers • Syringe

*Some volunteers may be using more advanced equipment, such as ammonia testing. If advised or requested to do so by their volunteer coordinators. Instructions for using any other kit will be provided separately.

Performing water quality tests and recording your data

- Carefully follow the step-by-step instructions provided for each test to ensure accurate data collection.
- Ensure you understand your groups' health and safety guidance for carrying out each test.
- Do not carry out testing if for any reason it is not thought to be safe to do so on the day.
- Know the general range in results you should expect to get at your sampling site and, if readings look particularly out, consider repeating the test(s).
- Carefully record your data in the field on your group's Epicollect or on paper to later upload online.
- The Epicollect form allows answers within expected ranges, if you think you've got a reading outside these ranges please contact us.

Stop the spread of Invasive Non-native Species

CHECK **Check** your equipment and clothing for live organisms - particularly in areas that are damp or hard to inspect.

CLEAN **Clean** and wash all equipment, footwear and clothing thoroughly.
If you do come across any organisms, leave them at the water body where you found them.

DRY **Dry** all equipment and clothing - some species can live for many days in moist conditions.
Make sure you don't transfer water elsewhere.

Initial Survey Questions

Citizen Science ID: Your citizen Science ID will be your initials.

Organisation: Select organisation: 'CPRE' on Epicollect.

Select your site: You will be allocated a site number & name for your sampling (or possibly more than one, subject to how many sites you have agreed to cover).

Sample site location: If you do want to change your sampling site location, please get in touch with your programme manager first.

Sample date and time: the form will automatically enter the time and date you are filling in the form. If you are filling in the form at a later time or date please change these to reflect the time/date you collected the sample.

Are you able to sample safely today?

PLEASE READ THE FOLLOWING HEALTH AND SAFETY GUIDELINES AND DO NOT CONTINUE WITH A SURVEY IF ANY OF THE SAFETY GUIDELINES ARE NOT MET

Before you leave home

- Check the Risk Assessment.
- Make sure it's safe and legal for you to access the river, stream or lake.
- Is someone going with you? If not, let someone know where you're going and when you'll be back. Make sure you take your mobile phone and can call for help if needed.
- Are you wearing the right footwear? Waterproof with good grip is best.
- Check the weather: you'll need sun cream, a hat and some water in hot weather, several layers of clothing in cold weather – and waterproofs if it looks like it's going to rain.
- Consider whether recent heavy rain might have made river or riverbank conditions more dangerous.

When you arrive at the sampling site

- Are you standing somewhere stable with good footing?
- Is there a safe area to complete the water quality tests, away from the water and other hazards such as livestock or traffic?

When carrying out the survey

- The site you have been allocated should enable a sample to be collected without the need to enter the watercourse.
- If sampling from the edge, do not lean over the water.
- Ensure your chosen sampler device enables you to take a water sample safely – for example an open milk bottle secured to a stick is a good option if you're sampling from a bank or a small plastic bucket on a rope if sampling off a bridge.

River water can contain harmful bacteria that can cause ill health and potentially serious diseases such as Weil's disease (also known as Leptospirosis). You should be aware of Weil's disease and, if you feel unwell, should mention it to your doctor. Try to minimise personal contact with the water. By using a suitable sample container or a syringe there should be no need to immerse hands or fingers in the sample. Do not carry out sampling with open cuts or wounds and make sure to wash hands thoroughly between sampling and handling food. We supply a bottle of hand sanitiser gel for while you're out and about.

Any questions about health and safety? Email volunteer@cpreherefordshire.org.uk

Collecting a Water Sample

- It is now time to collect your water sample - follow the site designated to collect your sample, where the water is free-flowing.
- Perform a 'triple rinse' of your sampling container, by filling your container and then emptying it down-stream of your collection point, three times. Also rinse any other monitoring equipment (syringes, test tubes etc.) with river water before using them.
- Lower your sampling container into the water and aim to collect a sample from just below the surface.
- Transport your sample to a suitable site nearby to carry out the field tests.

Important: Take care not to disturb sediment from the riverbank or riverbed as you collect your sample from the river as this is likely to affect your results.

Avoid taking samples from stagnant or slow moving parts of the river as this is not representative of the main flow of the river.

Taking the tests - Do I have to perform all tests at the riverside?

The Environment Agency recommends citizen scientists perform water tests immediately after sampling (i.e. at the riverside). This is because there are a number of well-documented issues, especially with phosphate analysis, if the testing is delayed. We recommend performing basic testing (electrical conductivity and temperature) at site and filling a container (pre-washed three times with the river sample) so that further analyses (phosphate and nitrate/nitrite) can be performed in a calm environment indoors. All analyses should be completed within one hour of sampling.

Turbidity

This is a subjective observation in line with the EA's own protocol. Select the appropriate option of the 4 available in Epicollect.

Nitrate and Nitrite - Hach test strips

1. Carefully remove a test strip from the bottle, and immediately replace the bottle cap - avoiding getting wet fingers or moisture in the bottle (use tweezers if helpful).
2. Dip the strip into your water sample for one second. Do not shake off excess water.
3. Hold the strip horizontally with the pad facing up for 30 seconds.
4. Compare the colour of the top pad on the test strip with the top (nitrate) colour chart on the test strip bottle by holding them next to each other.
5. Select the colour and associated nitrate concentration on the colour chart that best matches the pad and record this value.
6. Compare the colour of the bottom pad on the test strip with the bottom (nitrite) colour chart on the test strip bottle by holding them next to each other.
7. Select the colour and associated nitrite concentration on the colour chart that best matches the pad and record this value.

Tip: Note that the Nitrite value must be smaller than the Nitrate value. If you get a reading where Nitrite > Nitrate you may be reading the results the wrong way round.

After recording your result

1. Dispose of the used strip responsibly. (i.e. take it home and/or place in a litter bin).
2. Store strips at home in a cool, dry place - away from extreme heat or sunlight.



Electrical conductivity and temperature - HM Digital EC-3

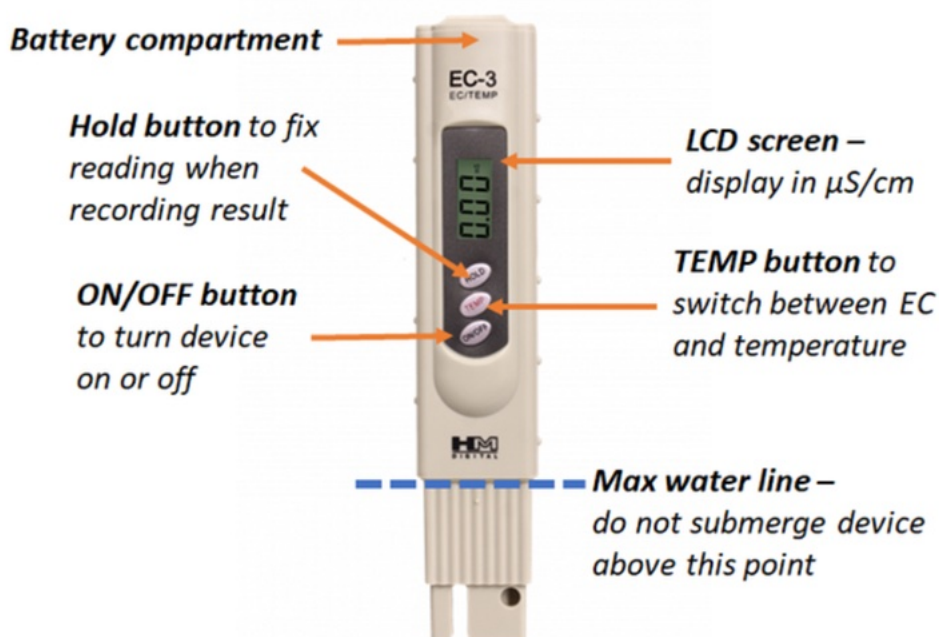
1. Remove the protective cap from the device and check it is clean and dry.
2. Turn the meter 'ON' and lower the device into the water sample, **taking care not to submerge the device above the maximum water line.**
3. Gently stir the meter in the sample and wait for the reading to stabilise, which can take some time.
4. Press the 'HOLD' button so you can fix the reading and view it out of the water.
5. Record the EC value displayed (in $\mu\text{S}/\text{cm}$). If 'X10' is displayed, multiply the value displayed by 10. EC naturally varies between different freshwater bodies (due to differences in geology) and can range from $<100 \mu\text{S}/\text{cm}$ to $>1000 \mu\text{S}/\text{cm}$ in rivers.
6. Press the 'TEMP' button to switch to the temperature display. Record the temperature value displayed (in $^{\circ}\text{C}$). (If required, press the 'TEMP' button once more to switch to $^{\circ}\text{F}$ or twice more to switch back to EC.)

After recording your result

1. Gently shake excess water off, use a lint cloth or soft paper towel to ensure the sensor is dry.
2. If the sensor appears to be dirty, you may need to rinse it in tap water when you return home.
3. Ensure the sensor is clean and dry when you put it away for storage
4. Store the device in a cool, dry place.

Long-term maintenance

1. If any error codes appear on the display screen, look to the instruction manual provided or ask your volunteer coordinator for advice.
2. If you think a battery change or recalibration is required, contact your volunteer coordinator.



Phosphate – Hanna HI-713 Handheld Colourimeter

WARNING! This test kit contains toxic reagents and should only be used after comprehensive training.

Specific guidance on health and safety for this product including PPE, test kit storage and waste disposal should be sought from your group coordinator and carefully followed each time you carry out this test



Step 1: Preparation of Sample Cuvette

- Rinse the cuvette (and syringe, if using): half fill the cuvette with river sample, replace the cap and shake vigorously for 5 seconds. Discard the contents. Repeat two more times.
- Fill the cuvette with 10 ml of river sample, making sure there is no debris in the sample, and replace the cap. *Tip: If the river sample is turbid, let the sample sit in your collection container for up to 5 minutes to allow sediment to settle, then use a syringe to carefully take 10ml of water from the clear upper layers.*
- Wipe the cuvette thoroughly with a lint-free or microfibre cloth to ensure the glass surface is dry and free of fingerprints. This is cuvette 1 (C1 – aka your blank sample) prepared.

Step 2: Zero the Checker

- Turn on the Hanna meter by pressing the Operation Button on the front. When the display reads “Add”, “C.1” with the word “Press” blinking, the meter is ready to use.
- Flip open the top of the meter and insert the filled cuvette, with the cap upwards. Close the top of the meter and press the Operation button. When the display reads “Add”, “C.2” with “Press” blinking the meter is zeroed.

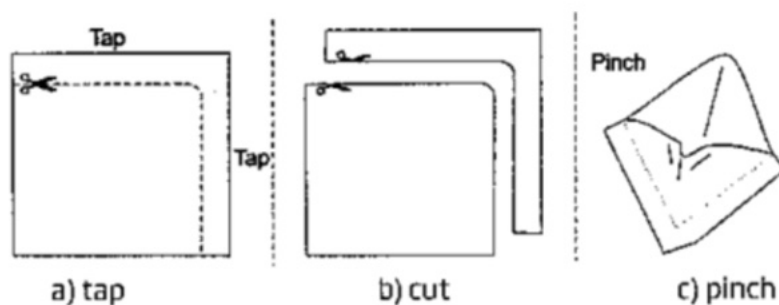
Step 3: Preparing the Reacted Sample

- Remove the cuvette from the meter, unscrew the top and carefully add a sachet of reagent (see tip below). **Make sure you are wearing gloves and eye protection when doing so.**
- Replace the cuvette top and shake gently for two minutes, until all of the reagent is dissolved. *Tip: In cold weather this might take longer, see FAQ’s for further guidance.*
- Wipe the cuvette thoroughly with a lint-free or microfibre cloth to ensure the glass surface is dry and free of fingerprints. This is cuvette 2 (C2 – aka your reacted sample) prepared.

Phosphate – Hanna HI-713 Handheld Colourimeter

Tip: Opening the Reagent Sachet (Avoid contact with the skin and eyes.)

- Take a reagent sachet and dislodge any reagent stuck in the sachet edges adjacent to the cutting guidelines by tapping with scissors or flicking with the fingers.
- Remove two sides of the sachet by cutting just inside the cutting guidelines.
- Gently push the two uncut sides together so the sachet opens up. If the sachet does not open up easily after removing two sides, use the tips of the scissors to prise open.
- Pinch the middle of the cut area to make a pouring lip (see diagram).



Step 4: Measuring the Phosphate Content

- Insert the cuvette into the meter (the display will still be showing “Add”, “C2” with “Press” flashing).
- Press and hold the on/off button until the display shows “3:00” before releasing the on/off button.
- Once the three minute countdown has finished, the display will briefly flash “- - -” before displaying the phosphate content in parts per million, for example, “0.09”.
- Record the reading that displays immediately after the timer ends. Press the Operation Button to turn the meter off, or it will automatically turn off after 2 minutes.
- If you get a reading that is unusual for your site (more than 50% variance from your typical results) take a second test to confirm the result.

Step 5: Disposal and Storage

- The toxic reagents found in this test kit must be disposed of responsibly after use – dispose of the water to which you add the reagent carefully, into a toilet or other domestic drainage. If you have any questions about disposal of test samples mixed with the reagent please speak to your volunteer group coordinator for guidance and/or refer to the safety data sheet for the reagents (HI-173-25).
- Take any non-toxic waste material or packaging home with you and dispose of it in your household waste.
- Ensure the cuvettes and syringe (if used) are clean and dry when you store them.
- Store the test kit in a cool, dry, well ventilated place, away from direct sunlight.

Algal Blooms & Pollution

If you see any signs of river pollution, or an algal bloom, please record them as part of your survey and include photos where possible. The next few pages include a guide to some of the most common, easy-to-spot signs of pollution found in UK rivers and streams for you to use as reference when out in the field.

If you see any significant signs of pollution, please report it to the relevant statutory authority on their pollution hotline and fill in our '[Incident report](#)' form:

- If in England – call the Environment Agency – 0800 807 060
- If in Wales – call Natural Resources Wales – 0300 065 3000
- If you see a combined sewer overflow (CSO) discharging raw sewage, you can also report this to Dwr Cymru / Welsh Water (0800 085 3968) and the relevant regulator.

Remember only ever look at or smell something you think might be a sign of water pollution – never touch it!

Algal blooms

Algae describes a wide range of different photosynthetic organisms that live in water. When one type of microscopic algae or algae-like bacteria grows out of control, due to excess nutrients in the water, it causes an algal bloom. Algal blooms have the negative effect of reducing the amount of light able to penetrate through the water column and therefore the amount of oxygen in water; some algae can also form a "slimy" coating on the river bed, or form mats or patches on sand / silt beds, smothering important habitats. In some cases, algal blooms also produce toxins harmful to both aquatic life and humans.

Cyanobacteria (a group of photosynthetic bacteria, also known as blue-green algae) are the most common culprit of toxic algal blooms in freshwaters. However, the EA's algae surveys and sonde data have not shown any harmful blue-green algae (cyanobacteria) blooms in the Wye. In the Wye two types of bloom are known to occur:

- Free-floating (planktonic) blooms, which are caused by single-celled algae (can be colonial), usually microscopic algae and cyanobacteria.
- Filamentous algal blooms on the riverbed, which are formed by multi-cellular algae, which can smother stones and other submerged plants.

Filamentous algae start to grow in Spring and is most prevalent in the summer months. Most of the filamentous algae seen in the Wye are simply a form of green algae (Chlorophyceae), or brown algae that grow on the riverbed. These types of algae pose no risk to humans. However, they can pose a danger to fish as they use up oxygen overnight which can lead to fish kills.¹

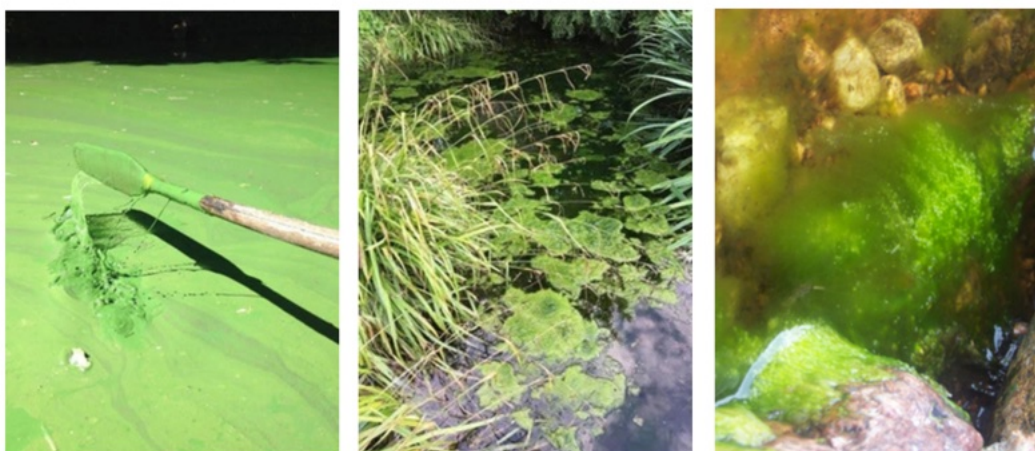
ID TIP: The Centre for Ecology & Hydrology suggest poking scum with a stick to see whether it breaks into small particles or irregularly shaped lumps – if it does, it's likely cyanobacteria. If not, and you see tiny (2-4mm) leaves it's probably duckweed, or if you see clumps of hairlike strands or soft tubes it's probably filamentous algae. Take a look at [CEH's Bloomin' Algae app](#) (free) or website for more photos, info and tips!

Cyanobacteria (blue-green algae) can be a range of colours and appear as wisps or as a foam in water, lumpy, thick and paint-like or as a cloudy haze in water.

The images below, provided with descriptions by the Centre for Ecology and Hydrology (CEH)

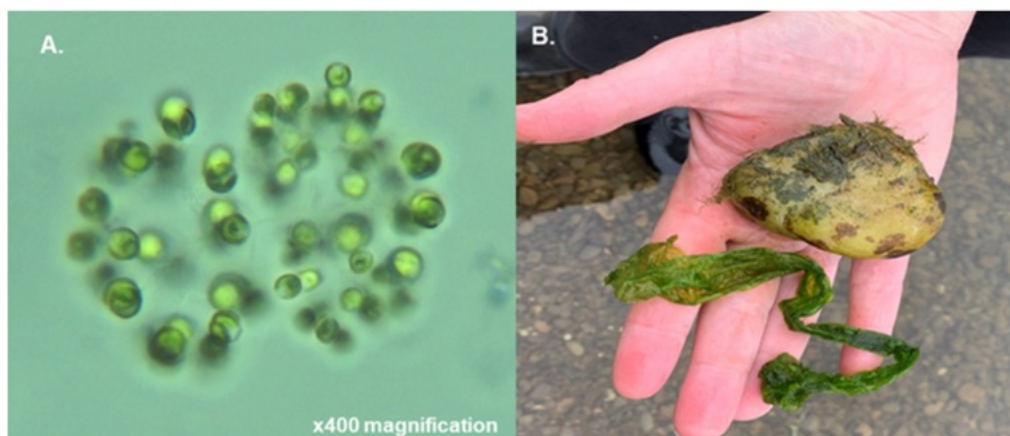


Duckweed (left) and filamentous algae (middle & right) can look like blue-green algae.



Examples of free-floating microscopic alga (A; Dictyosphaerium), and filamentous algae (B) growing on the riverbed at Ross on Wye in 2022.

Images provided by the EA



Pollution

Foam/froth

Foam found in rivers can be naturally occurring, forming due to the break-down of organic matter combined with increased flow or turbulence. However, foam can also be formed as a result of synthetic substances, such as detergents, entering the water. Foam from natural sources is usually light brown in colour, may smell earthy and is usually dispersed over a large area. It forms in places with high turbulence and collects in slow moving parts of the river. Foam from human sources is usually bright white in colour, may smell soapy and will usually accumulate near the source.

Foam from a natural source



Foam from a synthetic source



Oily film/scum on water

Many oily sheens found in rivers are formed as a result of naturally occurring iron oxidizing bacteria, and do not pose a threat to the environment. However, some oil sheens are formed as a result of petroleum entering the water and are toxic to wildlife and humans.

A quick and easy way to tell the difference between naturally occurring oil sheens and those that indicate pollution is to use a stick to poke, or - if you can't reach - throw a small rock at the oil sheen. If the sheen is bacterial - it will break into smaller bits when disturbed which will then stay separated. If the oil sheen is petroleum - it will swirl together when disturbed and quickly reform. Polluting sheens will also smell like petroleum, whereas bacterial sheens won't.

Bacterial oil sheen



Petroleum oil sheen



Other - Sewage fungus

'Sewage fungus' is actually a mass of a particular type of filamentous bacteria, not a fungus. It grows in high nutrient environments, such as those around sewage discharges and is a sign of a medium to long-term contamination issue. It is usually grey-brown in appearance and can grow on almost any surface in a river channel.



Other - Sewage waste, odours and discolouration

Sewage related litter or waste – including cotton buds, sanitary products, nappies, wet wipes, dental floss, hair balls and more - are a strong indicator that sewage pollution has entered a river. This is likely to be the result of untreated sewage entering from a combined sewage overflow (CSO).

Chemical or detergent-like smells and grey water in rivers can also indicate sewage pollution. You can often track these signs of pollution to their source – a contaminated surface water drain entering the river. This is commonly seen in urban catchments suffering from residential plumbing misconnections, but can also indicate contamination from industrial sources or road run-off. If you smell something unnatural in the water, try and figure out what it smells like as this can often help detect the source of pollution (e.g. sewage, agricultural, urban or industrial).



Other things to look out for...

Diffuse pollution entering rivers from agricultural land can often be difficult to spot. However, there are some common signs of poor land management to look out for across rural catchments that mean diffuse pollution is more likely to enter a river during heavy rainfall events. These signs include river bank 'poaching', done by farm animals as they access river water to drink, and fields left bare between cropping or due to overgrazing. Chemicals and nutrients applied to farmland enter the river during rainfall events via surface water run-off and can have a significant impact on water quality.

Slurry entering rivers as a result of leaks from slurry pits, or leachate draining from uncovered manure piles, can also be a serious form of pollution in agricultural areas. You may be able to spot slurry or leachate entering a river because it is usually a distinctly different colour (and smell) from the soil carried by surface run-off.

Slurry entering a river



And finally...

Fixed point photo

Please take a photo of the river at your sampling site from the same fixed point each time.

Wildlife Species

*Photos of wildlife on the Wye provided by Stewart Roberts.

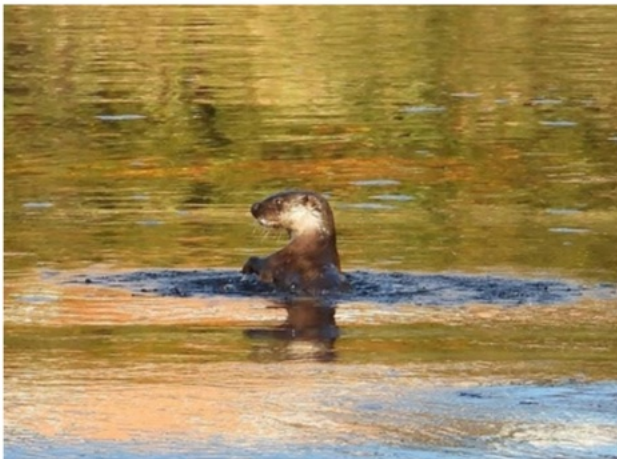
Ranunculus (Water crowfoot)*



Kingfisher*



Otter*



Otter (spraint)



Salmon (pink) - Female Top, Male Bottom



Salmon (Atlantic)



Crayfish (native whiteclawed)



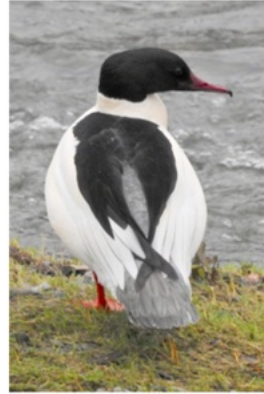
Crayfish (invasive signal)



Goosander (female)*



Goosander (male)*



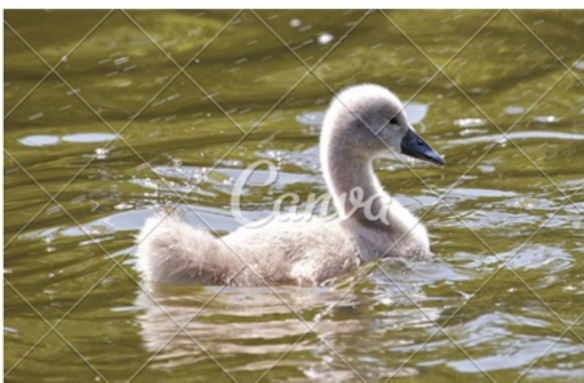
Dipper*



Cormorant*



Cygnets (young grey/light brown swans)



Other comments/concerns

Be sure to record anything unusual you observe and highlight any issues you had carrying out your survey.

Don't forget to hit the upload icon to submit the form once you've completed it.

Tip: you can save the form and come back to it to fill the rest in later.

Epicollect

Installing the EpiCollect App and Adding the Wye Alliance project...

The four Citizen Science organisations collecting data in the Wye catchment (Friends of the River Wye, the Campaign for Rural England (Herefordshire), the Wye Salmon Association and the Dore Citizen Science group) use a common data collection form. To use this you will need to load it into your EpiCollect app as a new project.

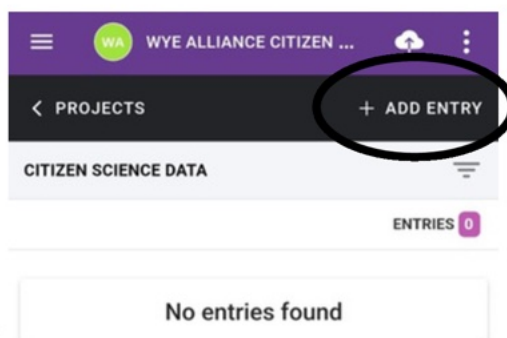
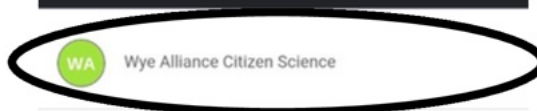
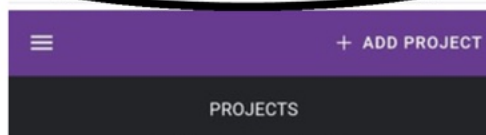
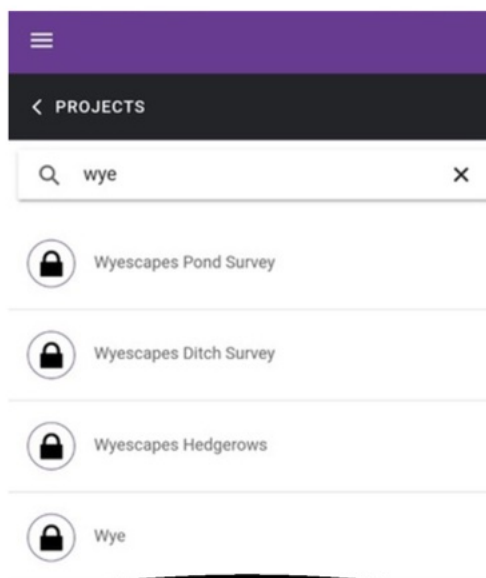
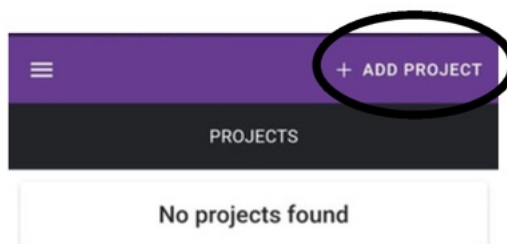
To install EpiCollect on your phone: search for “EpiCollect5” on your phone’s App store.

To load the project

1) Start EpiCollect5 on your phone, then click on the “+ Add Project” button.

3) Type “Wye” in the search box and then click “Wye Alliance Citizen Science”.

4) The new project will then be loaded and added to your list. You can now start using the project by selecting it from your list of projects and clicking “+ADD ENTRY”.

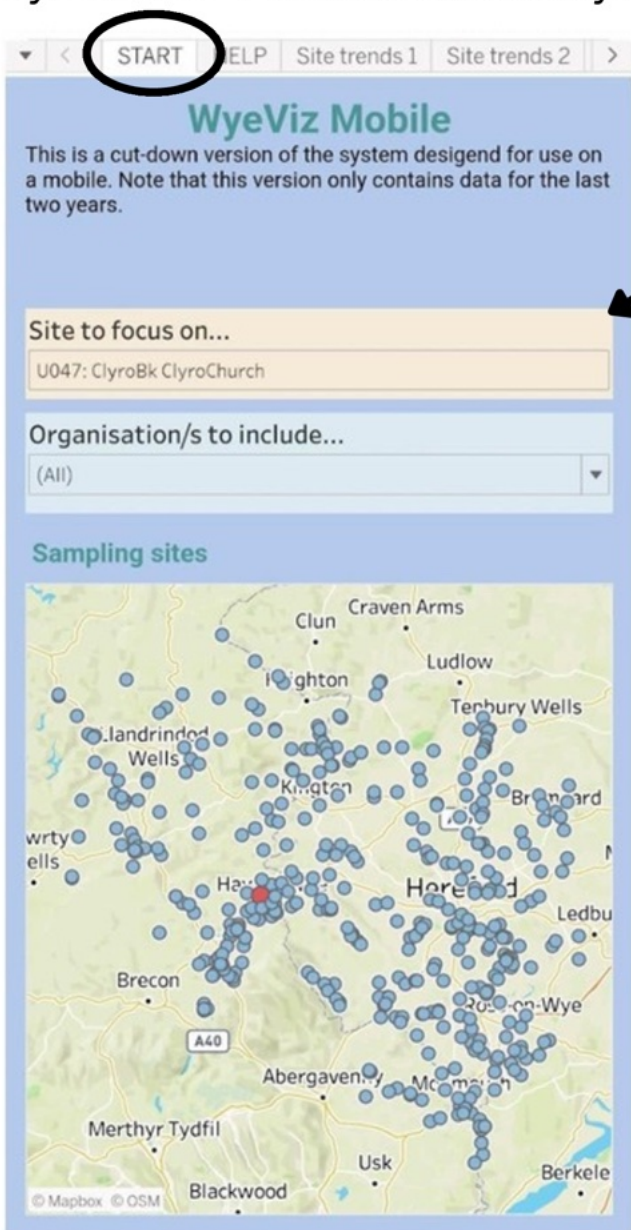


Wye Viz

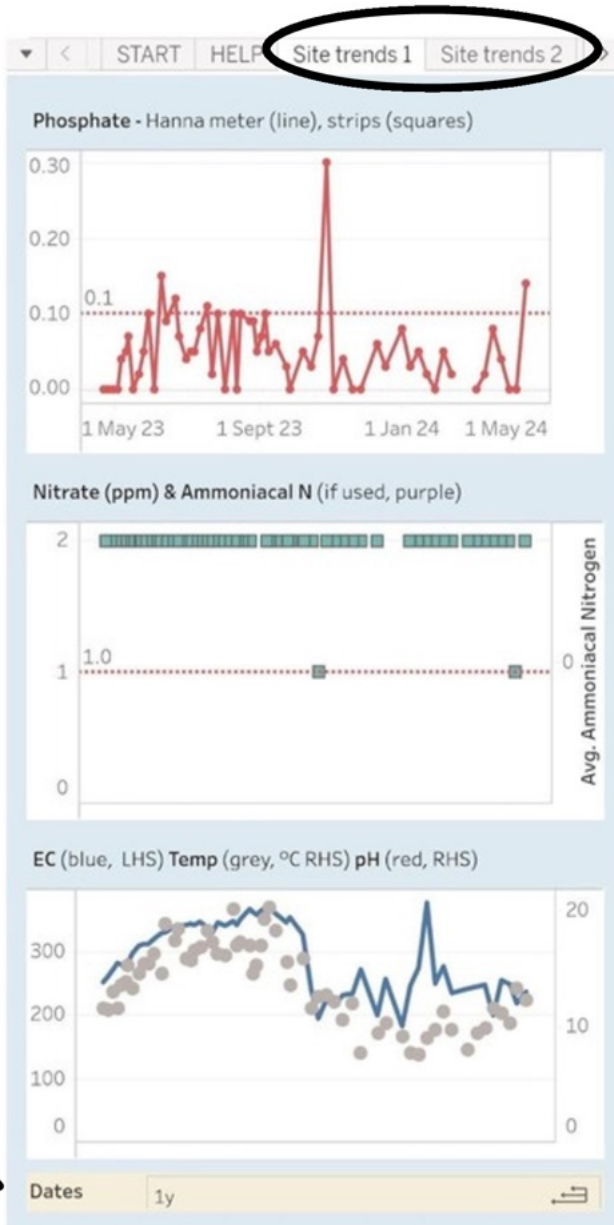
What is WyeViz?

WyeViz is a set of data visualisations (interactive dashboards) that analyse the data collected by citizen scientists working across the catchment areas of the River Wye, working as part of Friends of the River Wye, the Wye Salmon Association, the Dore Citizen Science group and the Campaign for Rural England, Herefordshire.

WyeViz Mobile - How to view the data for your (or any) site



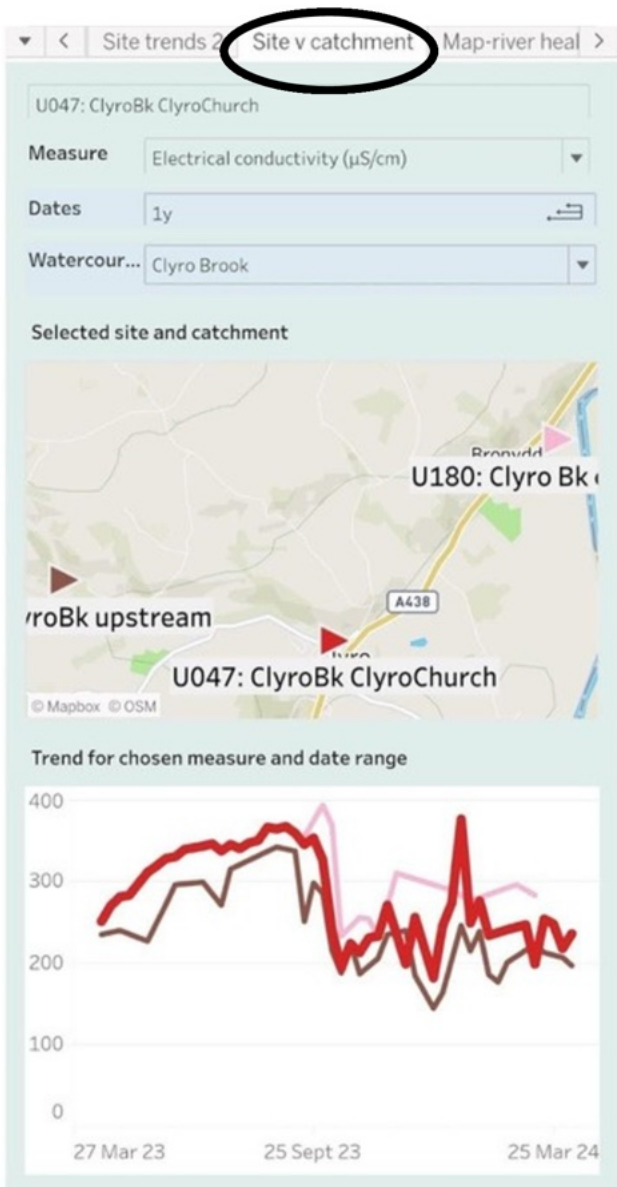
Navigate to the 'START' Tab and choose a site to focus on from the yellow list.



Navigate to tabs 'Site Trends 1' and 'Site Trends 2' to see the data collected at the chosen site.

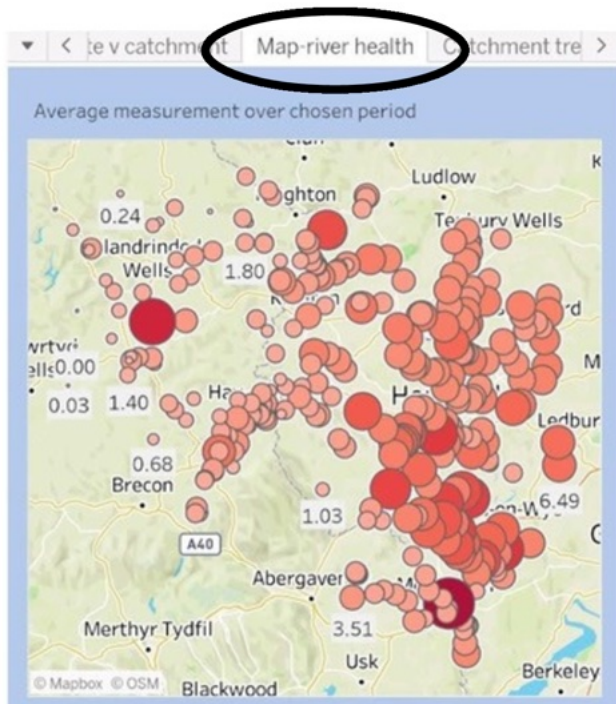
Use the 'Dates' selector to switch between showing the last month, 3 months or year's worth of data.

See what's going on across the catchment



Use the 'Site v Catchment' tab to see how data for your chosen site compares to those nearby.

Use the 'Measure' selector to look at different measurements (nitrates, phosphates, etc.).



Use the 'Map river health' tab to see how a measure varies across the catchment.

Use 'Watercourse trend' tab to see which rivers are the most polluted (touch a data point to see the river's name & more details).

The full version of WyeViz is available via the Friends of the River Wye website.

Further support and guidance

Scan the QR code below to access the mobile version of WyeViz.



There is a video introduction to using WyeViz available on the Friends of the River Wye YouTube channel.

Videos demonstrating how to use each piece of kit are also available on the [Friends of the River Wye YouTube channel](#).

Further detailed guidance and FAQ's are available via the Friends of the River Wye website:

<https://www.fouw.org.uk/citizen-science-training>

This guidance is based on methodology developed by Cardiff University.

What do your results mean?

	Good/high water quality		Moderate water quality		Poor water quality		Very poor water quality	
	0	0.09	0.10	0.27	0.28	2.31	2.32	or higher
Hanna phosphate result - ppm [PO4]3-								
What should I do?	This is what we want to see! Keep testing and hopefully water quality remains good. It's as valuable to know low levels as high to help isolate problem areas.		This level is higher than official compliance levels in the Wye and Lugg* and could be a risk to the river ecosystem - if persistent, inform your programme manager.		This level is of real concern - if it's unusual for your site, verify your result and report to your programme manager. If there are clear signs (sight or smell) of pollution, contact NRW or the EA immediately.		This level is higher than should ever be seen in the river - verify your result and report immediately to your programme manager. If there are clear signs (sight or smell) of pollution, contact NRW or the EA immediately.	

Note: all sections of the Wye and Lugg, as well as the main Welsh tributaries, have their own average phosphate compliance targets. These are available in Wye Vtz.

	Good/high water quality		Moderate water quality		Poor water quality		Very poor water quality	
	0		1		2	5	or higher	
Nitrate strip result - ppm NO-3								
What should I do?	This is what we want to see! Keep testing and hopefully water quality remains good. It's as valuable to know low levels as high to help isolate problem areas.		This level is higher than recommended levels and a risk to the river ecosystem - if persistent, inform your programme manager.		This level is of real concern; while there are no official nitrate thresholds, it may be evidence of pollution - if persistent, inform your programme manager. If there are clear signs (sight or smell) of pollution, contact NRW or the EA immediately.		This level is higher than should ever be seen in the river - verify your result and report immediately to your programme manager. If there are clear signs (sight or smell) of pollution, contact NRW or the EA immediately.	