WSRT River Guardians - Water Quality Monitoring Handbook

Signing Up – 5 Steps

1. Read this manual, particularly the **'safety guidelines'** (you will have to agree to follow them in the field).

2. If you would like to sign up after reading the manual, fill out the 'sign up form', or send an email to **keir@art.org.uk** with your details.

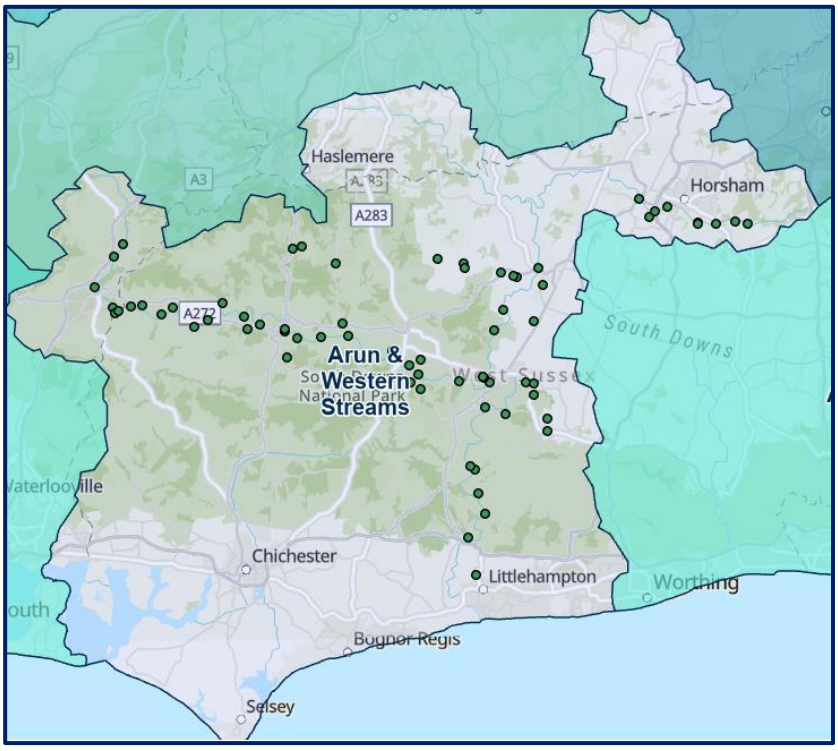
3. We will send you an email with potential sample points and set you up with a login for **Cartographer**. The Cartographer link will come separately to the email from WSRT.

4. Go out and do your **Dry Run** survey(s). Enter the results on Cartographer.

5. You will receive your **Water Quality Test kit** following a successful dry run and you are good to go with your monthly surveys!

Selecting a Monitoring Site

WSRT will contact you regarding potential monitoring sites, these may be sites previously monitored by the Environment Agency providing historical datasets (20 years+) to compare your results. Or a site not previously monitored, but easily accessible by footpath or bridge.



Safety Guidelines

Before You Go

1. Make sure it's **safe** and **legal** for you to access the river, stream, or lake. This shouldn't be a problem as WSRT sites are almost always bridges and public access footpaths.

2. Is someone going with you? If not, **let someone know where you are going** (what3words or GPS location) and when you plan on returning.

3. Do you have a **mobile phone** or way to call for help in an emergency?

4. Are you wearing the right **footwear**? Waterproof with good grip is best!

5. Check the **weather**: you will 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! Also consider whether recent heavy rain might have made river or riverbank conditions more dangerous.

When carrying out the survey

1 - If the **water level** is too high or fast to allow safe sampling, you can just do the observational measurements. Even if you are sampling from a bridge, you may feel unsafe collecting a sample in high flows.
2 - Try to avoid disturbing the **riverbed** when sampling as this will affect the sample.
3 - River water can contain **harmful bacteria** that can cause illness 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, speak to your doctor. For this reason – and for sample integrity – try to **minimise personal contact with the water**. By using a suitable sample container (such as a small paint bucket on a rope) and the syringe provided there should be no need to immerse hands or fingers in the sample. However, wearing PPE such as gloves (marigolds, work gloves or latex) is still advised.
4 - Do not conduct 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 when you are out and about.

Your 'Dry Run' Survey

A 'dry run' survey or visual assessment will be your primary survey as an WSRT water quality volunteer. It is simply the normal survey without the water quality measurements (for help with the form use the WSRT Water Quality Survey Form).

Why do we ask you to do a 'dry run' survey?

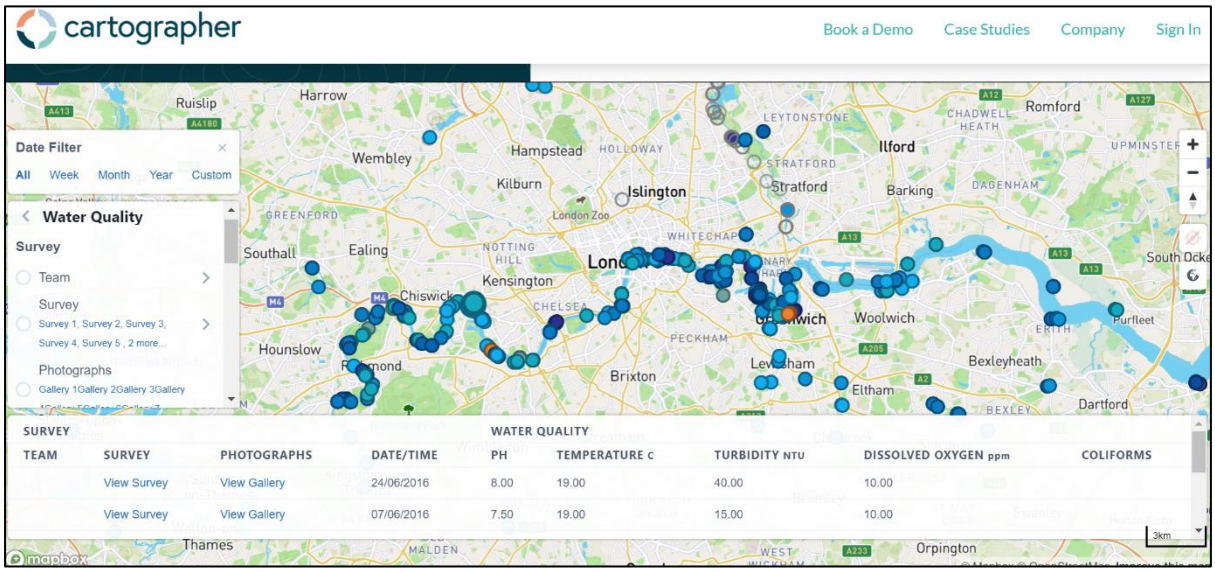
1. It allows you to 'trial' WSRT's survey. We like you to be able to survey monthly and a 'dry run' enables you to work out if water quality monitoring is for you.
2. To check if the site is safe and accessible.

3. It is a chance to identify how you will collect a sample when you have your water quality kit, i.e. a bucket on a rope from a bridge or a bucket on a stick from the bank or gravel bar.
4. Once you have uploaded the survey to Cartographer, you are logged on our system and we will send you your water quality testing kit.

If you would prefer to stay as an observer only, rather than a sampler, simply let us know you would like to carry out visual assessments full time.

Using Cartographer

Once you have completed your 'dry run' survey upload your findings to the online data platform, Cartographer.
This is the online version of your paper survey form, hosted by Cartographer. Every survey needs to be logged for it to count and for you to go on the list for a water quality kit.



The Water Quality Kit

It's important to us that we make our kits free of charge, as time and commitment is what we value and appreciate from our citizen scientists. That said it is always really helpful if people are able to make a donation towards the cost. The kits cost us £100+ to put together and you can donate as much or as little as you like here: WSRT Donate.

Once you have completed a dry run at all your sites you will automatically qualify for one of our water quality kits. We aim to send the kits out fortnightly (dependant on supply)

Phosphate reagent comes in extra boxes of 25, each box costs around £12, Nitrate strips come in pots of 25, each pot costs around £20. Send an email to keir@arrt.org.uk when you have run out and need more of either of these components.

What's in the kit?

Total Dissolved Solids (TDS)

TDS relates to the conductivity of the water. The more minerals, salts and metals that are dissolved in the water the more conductive it gets.

Low levels of dissolved solids in waters such as those near to the source of the river (Upper Rother and Arun), are a result of very low levels of input from the surrounding landscape. As the river runs down to the sea through the catchment it collects material from many different inputs, some natural and some man-made such as farms, sewage plants, factories, and residential areas. This typically increases the amount of solids dissolved in the water resulting in a higher reading.
Harmful pollution of inorganic materials from things like sewage, slurry and factory discharge usually elevates your TDS reading. However, pollutants such as oil can lower TDS/conductivity, therefore this measurement should be used as a general indicator of water quality. Not a specific measure of toxicity.

Geology will influence the normal level of conductivity in a watercourse (e.g. areas dominated by granite generally give a lower conductivity than those with limestone). Regular monitoring allows a baseline to be formed and will detect changes in Total Dissolved Solids which are indicative of pollution.

Temperature

Temperature changes with the seasons; however, you do get variation within that, particularly in small rivers and streams. Water temperature controls many aquatic species life cycles so it's vitally important to river ecosystems. Measuring temperature also helps us track the impact of our warming climate on our waterbodies.

Turbidity Tube

Turbidity is a measure of water clarity – how clear the water is. Water can become more turbid (murky) when there are a lot of particles suspended in it, for example from soil washing into the rivers, or dirt washing off roads during rainfall. These particles can cause problems in the river, for example smothering the gravels on the riverbed which fish need to lay eggs.

Turbidity is of specific importance within our catchment as the Rother is regarded as the most erodible catchment in the UK, largely due to its Greensand geology. Monitoring turbidity allows us to assess the levels of sediment entering our rivers. A dramatic increase of sediment can have serious implications on aquatic habitats and fish spawning zones.

It is a good idea to sample your river after different weather conditions to understand how it responds to rainfall or drought.

Phosphate Checker

Phosphate occurs naturally within the river ecosystem, but in very low levels under 50 ppb. Therefore, higher levels may indicate pollutants Phosphate is found in animal and human waste, cleaning chemicals, industrial runoff, and fertiliser so this can be a good indicator of pollution.

Having raised levels of phosphate can lead to increases in plant growth within the watercourse, leading to a depletion of oxygen due to the plant's aerobic respiration during the night. Without oxygen aquatic species cannot survive and the river ecosystem collapses. It is important to note that phosphate is taken up by plants s you may get a low reading but high plant growth, indicating eutrophication.

Remember, the phosphate checker has an accuracy of ± 0.04 ppm. So, a 0.00 ppm reading does not mean there is no phosphate present, it will be between 0.00 and 0.04 ppm. A 2.5 ppm reading does not mean that is the total phosphate, it means that it is in excess of 2.5 ppm.

Nitrates

Nitrates are chemicals which dissolve in water. If there is too much nitrate in a waterbody it will cause a growth in green algae as the plant uses up the excess nutrients. Algae in the water reduces the amount of sunlight reaching aquatic plants and stops their growth. An increase in nitrate levels can be caused by a variety of reasons, such as fertiliser runoff from farmland or by raw sewage entering the water.

Sampling Vessel

We recommend a simple small bucket with a sturdy metal handle to attach rope/paracord to. Whatever you use, make sure it is dedicated to your sampling and not used for other activities. These can be easily obtained from your local DIY store/amazon. It doesn't need to be big (1L -5L recommended), but as a guide the turbidity tube will be filled from a 1.5 litre pot. These are ideal if you are sampling from a bridge or steep bank as you can attach a rope to the handle.

Before sampling, ensure you rinse out the vessel with the river water at least twice to wash out any unwanted residue. Tap water often has exceedingly high phosphate so if you have washed your kit make sure it is rinsed thoroughly with your sample water before testing.

Taking Water Quality Readings

Utilise **WSRT's Survey Form Guide** to assist with every step of monitoring Water Quality in the field.

Please watch these 'How to..' video's to help you successfully complete a water quality survey. Cardiff University How to...Water Quality survey (Available on YouTube).

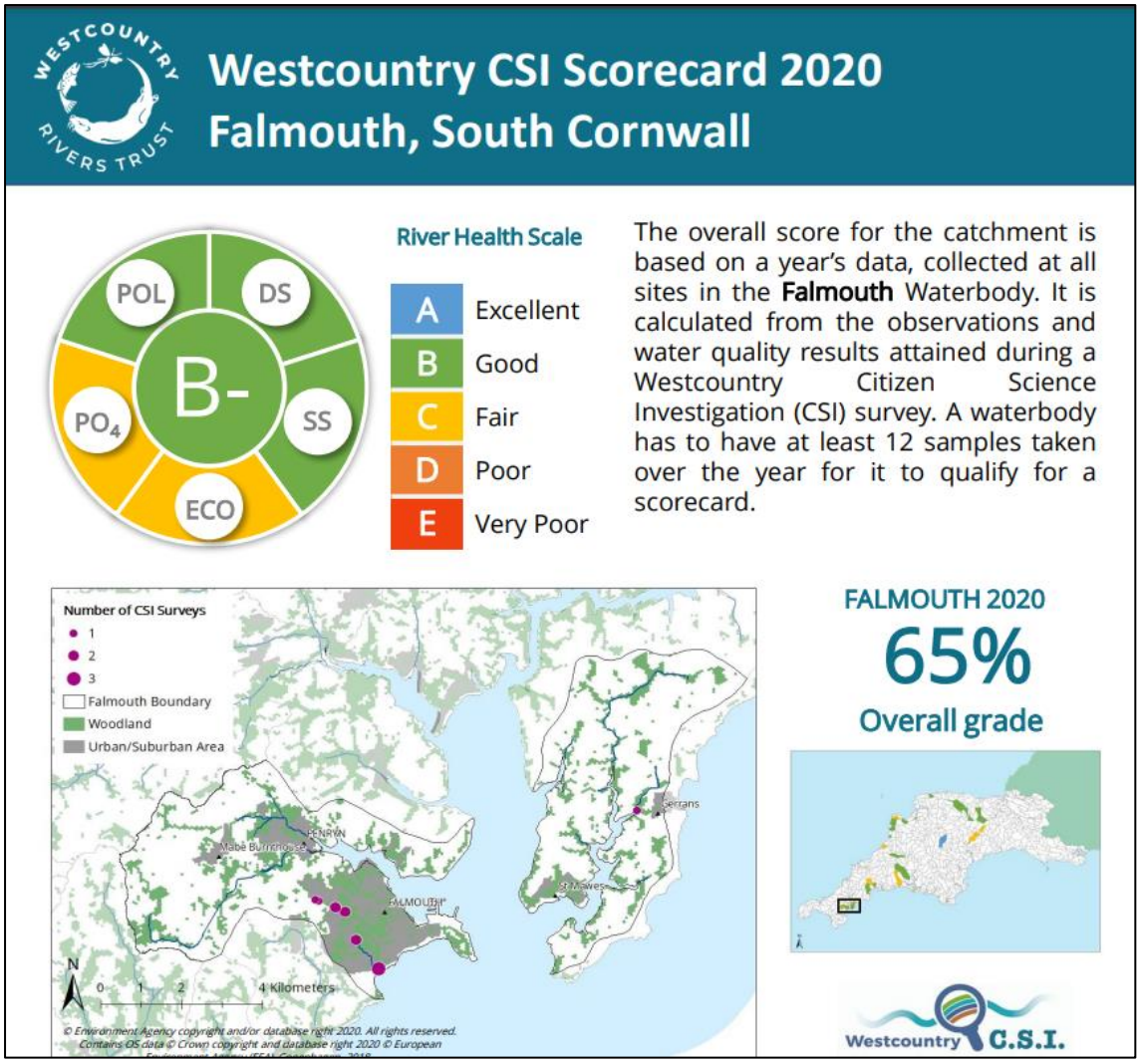
You are now all set to carry out your full WSRT Water Quality surveys!

Aim to sample at least monthly at your survey site(s). As the year progresses you will be able to build a nice picture of how your local waterbody changes with the seasons.

Scorecards

We aim to produce annual scorecards detailing the average score of our waterbodies (A to F) based on the water quality indicators you will be monitoring, in addition to visual observations of pollution and wildlife/invasive species identified. For an accurate long-term average to be determined12 months of collected data is needed.

This allows you and your fellow citizen scientists to see the actual state of our rivers thanks to the data you have collected.



Kit Maintenance

Although the kit is designed for fieldwork and for getting wet, it does still require some care and attention to help it last the test of time.

- Wiping down each part of your test kit with a small rag or cloth will keep it clean and minimise the amount of potentially harmful bacteria you take home with your kit.
- It's advised to give your kit a light rinsing with tap water after your survey just to remove any bacteria/germs. Make sure to rinse your water sampling vessel at least two/three times with river water at your site before your next survey.

Top Tips

Follow these helpful hints and avoid these mistakes when surveying and entering your data:

- Rinse your sampling vessel with site water at least twice before use.
- Bring a small pair of scissors to open the phosphate reagent sachet, it makes pouring much easier, trust us!
- Start completing your phosphate measurements first! The Hanna Phosphate checker takes 3 minutes to provide a reading after entering your water quality sample, in this time, maybe take some visual observations of your site's wildlife/pollution state, or take your Temperature and Total Dissolved Solids (TDS) readings.

- Take care not to disturb riverbed or bank side sediment as you collect your sample with either your body or your sampling container.
- Avoid taking your sample from stagnant or very slow-moving areas within the river.

Interpreting your Results

When you begin sampling on your river and stream it may be difficult to know what your results mean, are they good or bad?
The first thing to do is to find out more information about the catchment and waterbody you are sampling in. Below are a couple of Environment Agency websites that will give you an idea of the current state of your waterbody (Catchment Data Explorer) and past data that has been collected near or on your sample sites (WIMS data) as well as The Rivers Trust's 'Is my river fit to play in' map, which is a fantastic resource for finding out more about your local sewage works and CSO's discharges.
Please note that the data on WIMS is just the raw data values with no interpretation of results. For your information the conversion from TDS to Conductivity = TDS/0.67 (approx.)

Environment Agency Water Quality Sampling Sites (Open WIMS)

EA Catchment Data Explorer for Arun & Western Streams

This will hopefully give you an idea of what to expect from your sampling. However, you may find that your river or stream is not classified by the Environment Agency, in which case your data could be the only evidence of water health anybody has!
It is also worth investigating what land use is upstream of your monitoring point. You may already know this, but if not, use MAGIC Map Viewer (Defra) or Ordnance Survey Maps Online and zoom into your sample point.
The longer you observe your river or stream the more you will get to know it and see how it can change dramatically through seasons, weather conditions and anthropogenic input.

Remember, one result showing elevated levels of Phosphate, Nitrate or TDS is not necessarily indicative evidence of pollution in the river. However, 12 months of continued data collection painting a picture of poor river health is much more significant and likely to demand further inspection or change.

During dry conditions, the waterbody you sample may well reduce in size significantly, some may even dry up (ephemeral streams). When there is little water in the stream you may see a rise in phosphate and dissolved solid values as there is very little dilution. A pollution event during dry spells can have a much greater impact on the aquatic ecology due to the concentration of pollutants. When a river experiences flood conditions, it will often be brown due to sediment runoff from the surrounding landscape. Make sure you are constantly assessing the risk of sampling during these conditions as not only is it dangerous, but the data collected could be of little value due to dilution.

Accessing Data on Cartographer

Once you start recording and uploading data online, it can be accessed through Cartographer. You will be able to view patterns of your Water Quality data over time, as well as utilising the Interactive Data Explorer to see what is happening elsewhere in the catchment!

It is a good idea to explore the map on Cartographer where you can toggle between the different parameters and explore trends across the Arun & Rother Catchment. The longer a site is monitored, the clearer the patterns of results show the state of the waterbody.

FAQs

I have run out of phosphate reagent sachets. How can I get some more?
Email keir@arrt.org.uk with your name and address and we will send you more. If you can donate anything towards the cost (£12/box of 25) that is always appreciated!

I have run out of nitrate test strips. How can I get some more?
Email keir@arrt.org.uk with your name and address and we will send you more. If you can donate anything towards the cost (£20/pot) that is always appreciated!

I sample at a bridge. Is it better to take the sample upstream of the bridge or downstream?
The bridge should have very little influence on your sample, so your number one priority is to collect your sample from a safe and accessible site. If you are sampling from the bridge itself, it is probably best to sample from the downstream side so you can see your bucket as it's raised/lowered and it doesn't get swept beneath the bridge.

I've seen foam on the water at my survey site. How do I know if this is natural foam or a result of chemicals?
Foam that is white and has a soapy fragrance suggests human input. See 'Guide to Foam' in the 'Resources' section for more info.

Not much wildlife is going to hang around if I am crashing about at the survey site. Should I approach quietly and sit and watch for a while before starting the tests?
Yes, we encourage you to take time over your survey. Sitting by the riverbank is not only good for spotting wildlife but it is also a fantastic way to reset the mind and body and improve your mental wellbeing.

A milk bottle on a cane isn't long enough to reach the water from the bridge. What else can I make to get my sample?
A small paint bucket (2 to 5 Litres is best), attach a length of rope or paracord to the handle and lower off the bridge. Be mindful that the bigger the bucket the heavier it will be if it fills up!

How important is it to always sample from the exact same spot?
For the data to be consistent it is particularly important to stick to the same spot every month. However, that doesn't stop you adding in the odd survey if you see something interesting when you are out and about elsewhere.

At my survey site how far should I look around when I make visual observations? If I can see something from the survey site but it is some way away, is it OK to record it?

We recommend you record observations within 50 metres either side of your survey site. The only exception being for wildlife which perhaps has been disturbed by your presence and moved further away.

I sample at a bridge. Do I classify the bridge as a dam on the river? It does affect the flow as it goes through the arches.

It will affect the flow but only class it as a dam if it restricts aquatic or wildlife passage in the river.

Should I wash out the testing kit with clean tap water after use or can I swirl it around in the river water?

It is good practice to clean and dry the kit when you get back from your survey. Just remember to rinse out your kit with sample water at least twice before you take your next sample to get rid of tap water residue which can be remarkably high in phosphate.

How do I know what the testing results mean?

See 'The Water Quality Kit' and 'Interpretating your results'. That information combined with your knowledge of your catchment should give you an idea of what your results are indicating. However, it should also be noted that the water quality kit will not tell you what is causing elevated levels or where it is coming from. Instead, it is providing you with the tools to understand the general health of your river. It is also a good idea to explore the map on Cartographer where you can toggle between the different parameters and explore trends across the Arun & Rother Catchment. The longer a site is monitored, the clearer the patterns of results show the state of the waterbody.

Is there any easy way to compare results from the same site over many months?

All data is available for you to view and download from the Cartographer website. Just go to the map and zoom into your sample points, using the layer list to select what you wish to view. It will generate graphs automatically or you can download your data to perform further analysis. Annual scorecards will be produced averaging data collected, ranking it on a scale of A down to F depending on the rivers state.

Does the testing kit pick up human sewage?

Phosphates will generally be present in sewage that has been discharged from a sewage works both treated and untreated. Ideally the best test to use for the impact on humans of sewage, is bacteria tests which are more expensive but if the interest and funding is there it could be a promising investment for a group.

What causes high phosphate levels, and what level is a ‘high’ level?

Please see The Water Quality Kit chapter (above) and West Country Rivers Trust’s Phosphorus in Freshwater CSI Guide for details.

If there is no fence between a pasture field and the river, but there are no cattle in the field, do I still tick the box for cattle having access to the river?

If there is clear evidence of recent poaching, then yes. However, if there is no visual impact of cattle on the stream then you should select no. You can always add observations such as these into the notes section.

How do I know if my river is healthy?

Have a look on Catchment Data Explorer which gives the Water Framework Directive score for your waterbody. It may be that your waterbody is not tested by the Environment Agency, in which case your data may be the only evidence of river health. You could look at taking on Riverfly sampling to give a picture of ecological health alongside your WSRT water quality sampling.

Does WSRT offer any training I can attend to learn more about what I'm doing as a volunteer?

Where funds are available, we do run training events, get into contact via keir@arrt.org.uk if you are interested.

Should I tick the box if I can see that water from the road/field/farm would run off into the river, or if the river has a high sediment load?

No, only tick the box if you actually see run-off entering the river/stream at the time and location of the survey. Also note that 'Farm run-off (slurry/silage)' is a potentially serious pollutant and if you see it entering a stream you should call the EA Incident hotline (and take a picture if possible).

Resources

To download copies of WSRT's or Westcountry Citizen Science Investigator resources, please click the relevant box below:

WSRT Survey Form

WSRT_WQ_SurveyFormGuide

WSRT Pollution & Water Quality Guide

Advice on Reporting Form Incidents

Field Guide – Invasive Plants

Field Guide – Wildlife

Health & Safety – Water Quality Monitoring Risk Assessment

WestCountry Rivers Trust Phosphorus in Freshwater

WestCountry Rivers Trust Guide to River Fungus and Foam

Keep in Touch

Sign up for Newsletters, Check website for updates.

View WSRT's Instagram: @westernsussexrivers Facebook: Western Sussex Rivers Trust

Email: keir@arrt.org.uk for more information or support.

See www.WSRT.org.uk for more information.

Signing Up

Want to get involved monitoring your local river? Simply email keir@arrt.org.uk stating your **postcode** and that you have read our **safety guidelines** (found in this manual). We look forward to welcoming you into the WSRT Citizen Science community!

Keep up to date with WSRT!

@westernsussexrivers

Western Sussex Rivers Trust

Scan to become an WSRT Volunteer!

Report an incident:

Call the Environment Agency Incident hotline (Telephone: 0800 80 70 60) to report: • flooding • blockages which could cause flooding to main rivers • pollution • unusual changes in the flow of water • collapsed or badly damaged banks.

CaSTCo (Catchment Systems Thinking Cooperative) Making sure that people count at the heart of rivers' recovery.

CaSTCo

Western Sussex Rivers Trust

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