PADDLE UK

WATER QUALITY CITIZEN SCIENCE

Introduction

There is always a risk of infection caused by microorganisms when paddling in the natural environment.

However, with simple checks and some appropriate monitoring and testing, you will be in a better position to make informed decisions on where and when and how you paddle. This will help protect your health and that of others, and to campaign for cleaner waters.

The following guidance takes you through the process of testing water quality for bacteria most likely to impact on your health. There are other parameters which can be tested which impact on biodiversity and the wider health of the river, which are not covered here.

This guidance complements our water quality advice which takes you through some checks to help guide your decision on where and when to paddle and stay safe.

If you have concerns about poor water quality or are keen to understand more about your local water quality, here are some tests you may want to consider.

Microbiological testing

Testing for bacteria provides a snapshot picture of bacterial counts at the specific time of testing. It can, if regular testing is established, inform where and when you paddle and hold those responsible for pollution to account.

It takes at least 48 hrs to turnaround lab results for bacteria (due to the incubation period needed to measure their presence).

Technology is advancing quickly in this area and Paddle UK is trialling some advanced kits which bring the lab to the river, providing results in hours rather than days, as used in the River Seine during the Olympics and Paralympics.

The Bathing Waters Directive, requires member states to monitor and assess bathing water for the bacteria *Escherichia coli* (*E.coli*) and *Intestinal Enterococci (IE)* which can have an adverse impact on human health when in the right numbers.

This is based on World Health Organisation (WHO) research which recorded the frequency of stomach upsets in people bathing in differing water quality.

For this reason if you have concerns about water quality it is recommended you test for E.Coli and IE.

Which lab should I use?

Always use a recognised United Kingdom Accreditation Service (UKAS) accredited testing company. UKAS is the only body recognised by the government to assess against internationally agreed standards and is recognised by the Environment Agency.

What is the cost?

The cost of a lab test for E.Coli and IE bacteria is in the region of £20 per sample (incl. the bottle) plus courier costs of about £40.

Where should I test water quality?

Consider where recreational activities are taking place.

Consider approaching other stakeholders and local community groups to see if testing is already taking place, to enable coordination and best value.

Check for the location of any Combined Sewer Overflows (CSO). It is advised to test at two locations (one upstream of a CSO and one downstream) to assess the full impacts.

If testing from the bankside, consider if landowner consent is required and likely to be granted.

Ensure you use the same sampling point each time. For a standardised method and mark it on a map, particularly if different volunteers are taking part. Ensure all volunteers know the exact locations to be sampled.

Consider the proximity of where your volunteers live to the testing locations. This will ensure the site is easily reached and reduce travel. This also helps ensure consistency across all testing.

How often should you test water quality?

It is helpful to check the quality of the water fortnightly to build up a picture of your local situation. When there are any visible changes and ahead of any immersion activities which may be planned.

During wet weather CSOs are more likely to have discharged, so consider the speed of flow and dilution. During dry weather the flow will be slower and more concentrated.

If finances permit, it is advisable to take two samples 20 minutes apart.

Unless testing for a specific event, testing regularly over a longer period of time during both wet and dry periods, and both upstream and downstream, of any water company assets such as CSOs will provide more robust data.

Be mindful that heavy rainfall may result in relatively short periods of elevated levels due to CSO discharges.

Always refer to any additional requirements from your lab, to avoid invalidating your results.

Ordering your kit

Order your kit from a UKAS accredited lab. The sample bottles should be provided by the lab as they should be sterile and may contain preservatives.

Logistics

Samples must be returned to the lab within 24 hours, (usually in a cool box with cool packs to maintain the temperature between 2-8 degrees) so take the time to ensure you have suitable packaging (which may be provided by the lab) and a courier to hand.

Consider the time it will take to carry out the sampling to ensure it can be delivered by the courier to the lab within the 24 hour period. Note the closing time of the lab for receiving deliveries.

On site

Avoid taking samples after the immediate passing of a boat or anything else which may stir up the water, wait 20 minutes for the water to settle.

- Samples should be taken 30 cm below the water surface
- Practice with a normal bottle first to hone your technique
- Use gloves and never touch the inside of the lid or bottle to avoid contamination
- Always use the right sample container and never rinse it out first, it may contain a neutralising agent
- Always fill the container correctly following the lab instructions
- Retain the lid in the hand whilst the bottle is filling
- Fill the bottle to the top leaving a small air gap; do not touch the flow of water.
- Replace the lid.

- Ensure your bottles are properly labelled with the unique number provided by the lab, date, location, time and any other information the lab requests (such as weather conditions), to avoid getting the bottles mixed up and invalidating the specimen.

Order your test kit
Read instructions. Check sample bottles have not been tampered with
Schedule sampling date and arrange courier collection for lab analysis
Collect water sample and send to lab
Lab results provided (keep in a safe place)[1]

Interpreting results

In line with bathing waters standards, water quality is generally classed as excellent, good, sufficient or poor – based on the number of colony forming units per 100ml (cfu/100ml).

The results of the bacteria lab test are presented in cfu/100ml enabling you to establish how your local waters compare for that snapshot in time.[2]

[1] Paddle UK are exploring opportunities for a central place to keep all results

[2] For bathing waters sites there are no pass/fail standards for individual water samples, instead the classification is based on a statistical measure of all samples, based on their range to estimate the probability of higher results occurring. The classification uses either the 95% or 90% percentile depending on the classification.

There are different standards for inland and coastal bathing waters which are outlined below:

EC Bathing Water Directive 2006/7/EC				
Rating	Excellent	Good	Sufficient	Poor (Fail)
Escherichia coli (cfu/100 ml)	<500	<1000	≤900	>900
Intestinal enterococci (cfu/100 ml)	<200	<400	≤330	>330

Inland Waters

EC Bathing Water Directive 2006/7/EC				
Rating	Excellent	Good	Sufficient	Poor (Fail)
Escherichia coli (cfu/100 ml)	<250	<500	≤500	>500
Intestinal enterococci (cfu/100 ml)	<100	<200	≤185	>185

Coastal Water

It should be noted that the bathing water criteria is for people bathing (being immersed) rather than paddling, you should consider the risk posed by the planned activities.

What next?

Poor water quality may mean you need to adapt your planned activities to avoid or limit the time immersed in the water.

Check our guidance on how to stay safe >>

Always wash after contact with the water and cover any cuts.

Testing over a longer period of time will provide a clear indication of trends and how your local waters are performing.

If you are unhappy with the results, share them with your water company and MP, explaining how poor water quality is impacting on your activities and demand urgent action to end sewage pollution.

Turbidity (NTU) / Total Suspended Solids Testing

Turbidity is used to measure the presence of pathogens, bacteria and other harmful contaminants in water to nature and public health.

Low turbidity (or clear water) indicates the water contains fewer suspended solids and is cleaner.

High turbidity (or cloudy water) indicates the presence of more suspended solids which may include discharge from CSOs and other assets or run off from agricultural land.

Turbidity does not show the source or reason for the suspended solids, it is an indicator. It is advised if there are any concerns to carry out a bacteria lab test as outlined earlier.

Turbidity tests can be carried out at a laboratory, following a similar testing methodology to the bacteria testing outlined previously.

Turbidity (Under normal river levels) – white water only

Turbidity readings of <20 PPM show poor water quality and action should be taken to avoid immersion in the water.

Readings of 16-20 reflect a precautionary approach and 0-16 to take the usual precautions,when doing water based activities.

Blue-green algae - Cyanobacteria Testing

Blue-green algae is often identified with its striking iridescent green water.

If you suspect blue-green algae is present a simple visual test using a stick can be carried out. Dip the stick into the water and remove. If the stick is coated in what looks like green paint, it is likely blue-green algae.

If you are still unsure of its presence and clarity is required, laboratory analysis of water samples can be used to detect its presence.

Who should carry out the testing?

A UKAS accredited lab analysis will identify the number of algal cells per millilitre of water.

WHO provides guidance values for health protection where blue-green algae are present based on three categories: *Relatively Low, Moderate and High* and recommends that submersion is discouraged at the moderate level and prohibited at the high level.

Blue-green algae results can be available within 24 hours because the water is analysed under a microscope directly.

The test costs in the region of £100.

Where should you test the water quality?

Visual Checking for blue-green algae is recommended. Blue-green algae blooms form when the buoyant algal cells accumulate at the surface of water.

Blooms can appear quickly and/or a change in wind direction can carry the blooms to the shore where they can form a dense scum.

An increase in wind strength or a change of wind direction can break up the scums and re-disperse them within a matter of hours.

On this basis it is important to sample water from across the waterbody with a particular focus on sheltered bays, inlets and the leeward shore (at the time of sampling) to get the 'worst case scenario'.

How often should you test for water quality?

The Environment Agency provides specific values that provide a warning of the potential for bloom formation and advises that once a venue is free from surface scums/blooms and when two consecutive samples, taken at weekly intervals, indicate results below the warning threshold, immersion sports can resume.

Blue-green algae results can be available within 24 hours because the water is analysed under a microscope directly.

Logistics

Samples should be transported as soon as possible after collection in a cool box so that they arrive at the laboratory on the same day, ideally within a few hours.

Dark bottles must be used for blue green algae to prevent further photosynthesis during transportation to the lab.

Interpreting the results:

WHO has produced guidance on what steps to take if blue-green algae is identified.

No. Cells/ml	<20,000	>20,000 - < 100,000	> 100,000
Rating	Relatively Low	Moderate (Warning Threshold)	High

WHO Guidance Levels

Relatively low - If bacteria testing is measured at under 20,000 cells per millilitre of water, this is defined as relatively low risk. Signs indicating the possible presence of blue-green algae in the water are sufficient warning.

Moderate - Between 20,000 and 100,000 cells per millilitre indicates a moderate probability of adverse health issues. In these situations, it is advised against immersion activities.

High - At levels higher than 100,000 cells per millilitre, the risk of health problems is high. All immersion activities should be halted.

What next?

Blue-green algae blooms or pollution, should be reported to the Environment Agency incident line on 0800 80 70 60. If the waterbody is not within your ownership, report the occurrence to the owner.

Treatment for Blue-green algae

There are a number of treatments available for both the prevention and removal of blue-green algae. They work by either restricting nutrients to limit growth or by killing the cells - these include the use of barley straw, blue dyes and ultrasound.

They can be expensive and depending on the size of the waterbody in particular may have limited impact. Chemical treatments can be controversial because of concerns about any negative impact on plant and animal life.

PH

The pH should be monitored more often than every four weeks as it can be an early indicator of changes. It could be affected by algal and weed growth, agricultural run-off as well as waste water from industry. PH indicating testing strips are readily available online for just a few pounds.

Neutral PH should be 7, below 7, the water is more acidic, with the majority of aquatic animals prefer a range of 6.5 - 8.0.

How to share your results

It is recommended your results are kept online in a format which enables comparisons of results.

Paddle UK and the Clean Water Sports Alliance are exploring options for a centralised information hub for all watersports users to enable the information to be shared amongst groups and influence policy change.

Summary

It is advised where funding and time allow to regularly monitor river level movements, rainfall and known/visual pollution.

All these pieces of information (with microbiological results taking priority) provide an indication of water quality and associated trends.

How else can I get involved with water quality testing ?

There are a growing number of opportunities to get involved in citizen science water quality testing, here are some of those:

- **Freshwater Watch,** a global citizen science project developed by environmental charity Earthwatch Europe.
- **Planet Patrol,** a non-profit movement, united by the urgency of challenges to our natural environment, powered by a global community dedicated to environmental action.
- **Protecting Wild Waters**, Surfers Against Sewage campaign primarily aimed at supporting community groups to apply for bathing water designation,with some availability for water quality testing.

Biosecurity

Avoid spreading invasive species. Always Check. Clean. Dry.