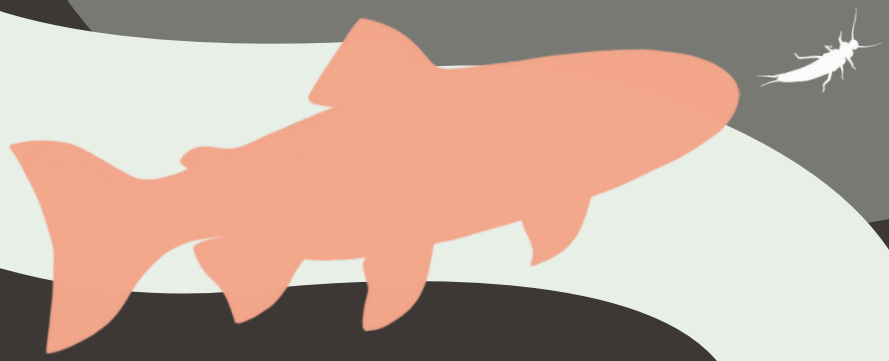
# SmartRivers

## Our progress to date



Powered by WildFish.

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# Putting the ‘science’ into citizen science

**SmartRivers, launched in 2019, continues to gather pace as the regulators continue to inadequately monitor our rivers.**

Our rivers continue to decline:

- UK Atlantic salmon populations were recently listed as **endangered** on the IUCN Red List (a re-assessment made possible by WildFish supporters).
- Almost **5,000 hours** of sewage is being discharged into waterways every single day.**
- **700 million litres** of water is currently unsustainably removed from rivers by water companies every day.***
- Not a single river in England has received a clean bill of health for chemical contamination.

Comprehensive independent monitoring is essential to drive action to improve our rivers. SmartRivers provides this evidence.

The data collected through SmartRivers has many uses:

- Providing an invaluable benchmark on river invertebrate biodiversity so future changes can be monitored.
- Pinpointing potential pressures impacting sites - allowing discussions with other stakeholders and regulators on what action is needed to address them.
- Assessing the impact of restoration work by pre and post monitoring.

Every river deserves to be a SmartRiver.

With your help, we can take action, bridge the monitoring gap and make change happen.

**This report details the progress made and processes involved in SmartRivers.**

** From Environment Agency FOI request.*
*** Environment Agency data, Event Duration Monitoring - Storm Overflows - Annual Returns*
**** Environment Agency. (2020). Meeting our Future Water Needs: a National Framework for Water Resources.*

## Contents



Almost 1/3

less water quality samples were taken by the Environment Agency in 2022 compared to 2019.*

95

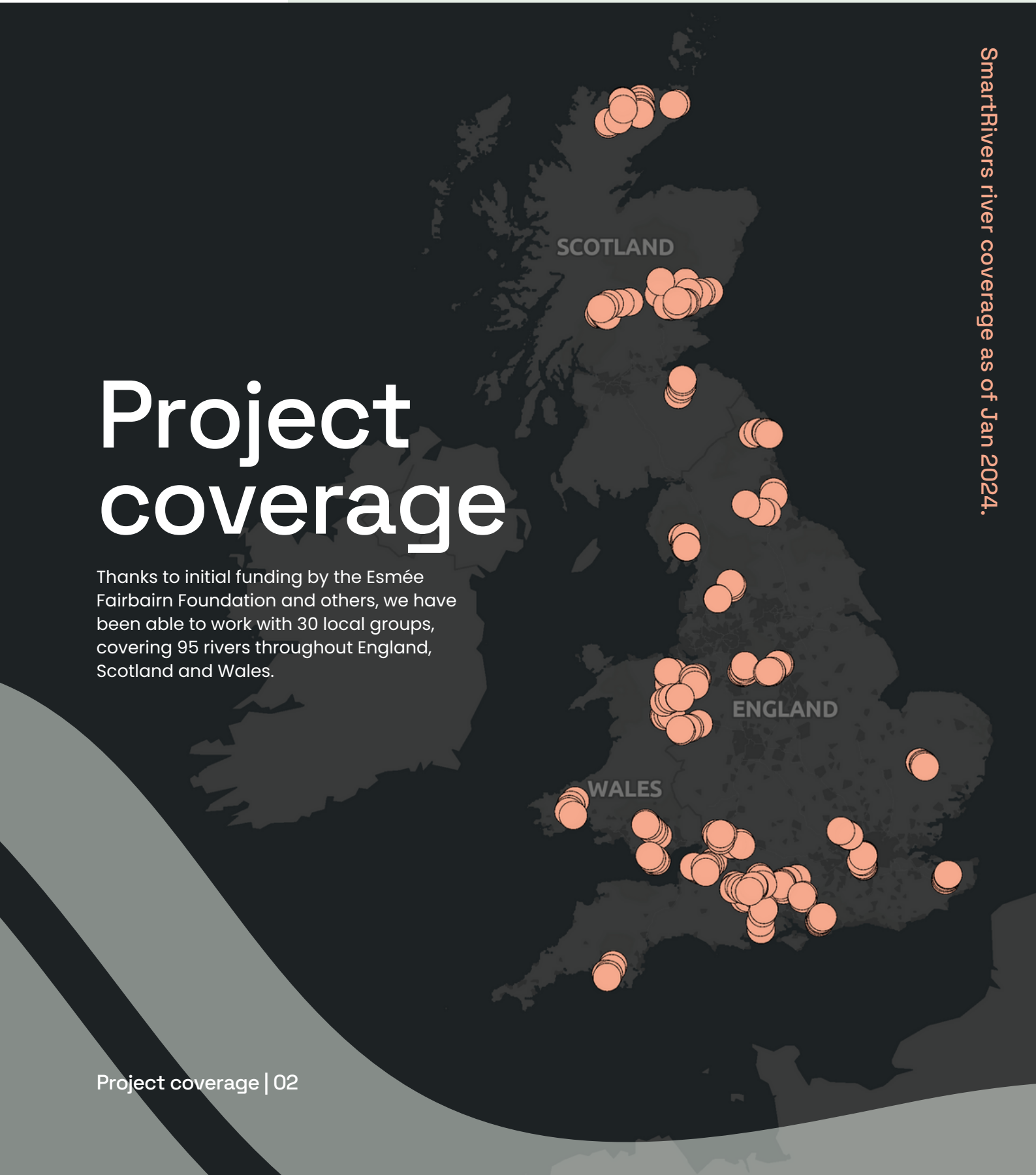
rivers

*covered by SmartRivers monitoring to date*

# 4,528 hours

## of training undertaken by volunteers so far*

**assuming every volunteer does both days of training and eight hours per day.*




SmartRivers river coverage as of Jan 2024.

# Project coverage

Thanks to initial funding by the Esmée Fairbairn Foundation and others, we have been able to work with 30 local groups, covering 95 rivers throughout England, Scotland and Wales.

**We joined SmartRivers because we are greatly concerned by the impacts of over abstraction. We hope to establish real evidence of the changes that the river is experiencing...**

John Barker, Friends of the Ems SmartRivers hub lead

# Our impact

**With support from the WildFish team, many of our hubs are using their evidence to help drive change.**

## Action for Avon

Our data with the Salisbury and District Angling Club (S&DAC) on the river Avon has continued to allow us to challenge regulatory bodies about the state of one of our iconic chalk streams.

This year using SmartRivers data from 11 sites on the upper Avon we challenged a statement from the EA that their data showed "the river Avon had not deteriorated over the last five years".

Analysis of our data, which is collected at a higher spatial and temporal resolution than the EA's, showed that while there have been some improvements to pressures such as phosphorus and sediment, we have seen strong declines in relation to chemical pressure on water quality in autumn and the general state of the invertebrate community.

We continue to work with S&DAC and the EA to tackle pressures impacting the Avon, which despite not failing its Water Framework Directive targets, everyone agrees is not what you would expect for a healthy chalk stream. This includes supplementary chemical monitoring to help understand the chemical pressures.

## Windermere super hub

The first year of the Windermere super hub saw five rivers and 16 sites professionally benchmarked in spring and autumn, and a new team of volunteers trained.

Many of our sites are positioned above and below water company assets such as wastewater treatment works (WwTW) and combined sewer overflows (CSOs).

The data from this first full year of invertebrate surveys indicates varying pressures from organic enrichment, phosphorus, siltation, and chemical pollution at the sites downstream of these assets.

Additionally, the invertebrate community seems to be suffering with up to an 88% decline in the abundance of pollution sensitive riverfly species on some becks, and that is not including the Wilfin Beck autumn survey where the survey downstream of Far Sawrey WwTW yielded just two individuals of a single species of leech!

This data has been used to support the Save Windermere campaign, highlighting the plight of the Windermere catchment and holding regulatory bodies to account for its condition.

## River Cynon

SmartRivers data flagged a decline in species abundance in the headwaters on the River Cynon.

Following further investigation and meetings with local residents, it became clear that the decline was due to unnatural drying on a section of the river.

WildFish, together with South East Wales Rivers Trust, took the data with supporting evidence to Natural Resource Wales. Following successive meetings, the regulator has now applied for funding to study the drying on the Cynon.

**We use SmartRivers to drive improvements on the ground locally, and action nationally.**

> **SmartRivers data will be an important tool to measure the impact of recent re-meandering works along the river course...**

Sarah Cooney, Bourne Rivulet volunteer for the Watercress & Winterbournes hub

# The citizen science landscape

Our rivers are polluted by a cocktail of chemicals, nutrients, sediment and sewage. In England, only 16% are considered ecologically healthy. In recent years a surge of water quality citizen science schemes have become available, connecting volunteers with their rivers and utilising them to grow the evidence base.

**Crowding in the arena can make it difficult to understand what the different schemes are capable of delivering and prevent duplication of effort. The two main categories of schemes and what they can achieve is described below.**

## 1. Water Quality testing

Monitors concentrations of parameters such as phosphate and nitrate. This only provides a brief snapshot in time. Quality control is limited.

## 2. Riverfly monitoring

Uses three minute kick-sweep sampling and a one minute hand search to collect aquatic invertebrates. Analysis of the invertebrates depends on the level chosen.

Basic riverfly monitoring involves bankside analysis to eight categories. The results are uploaded to a database where a 'trigger level' is set by the Environment Agency. If the level is breached you can request further investigation.

This is a pollution sentinel and is successful at picking up gross pollution incidents.

A mid-level scheme is available, still bankside analysis, but more categories are included and some basic impact scores can be calculated.

**SmartRivers is the highest tier of citizen science invertebrate monitoring.**

Invertebrate samples are preserved and a microscope is used to complete analysis to species-level where possible.

In many cases this is a higher resolution of analysis than used by regulators themselves. Profiling the full range of invertebrate species gives a far better assessment of water quality than a single spot sample in time. A quality control framework is built in to minimise error.

## SmartRivers is the highest tier of invertebrate monitoring by volunteers

- The sample collection methods used in SmartRivers follow the guidelines set by regulatory agencies.
- Quality control: One out of five samples for every hub each season are sent away for a full entomologist check and feedback is provided for hubs completing their own identification.
- All water quality scorecard metrics used in SmartRivers are all peer reviewed.
- SmartRivers trainers and entomologists all have excellent experience and are experts in the field.

# The process

## Establishing a hub

**1. Host organisation established and volunteers recruited.** This can be any local group, we have a wide mixture of community groups and trusts as hub leads. Approximately 10 volunteers are required to establish a hub.

**2. Site selection.** Five sample sites are chosen based on what the group are keen to investigate. For example: sites above and below restoration projects or potential polluting discharges.

**3. Professional benchmarking.** A professional scientist will come and complete an initial survey on the chosen sample sites, in spring and autumn. This provides a scientific 'baseline' for the river and underpins the ID training day.

**4. Training.** Training is two full days. The course is certified by the Institute of Fisheries Management.

## What does SmartRivers monitoring do?

- Documents biodiversity.
- Helps pinpoint sources of pollution.
- Provides evidence to help drive on the ground improvements.

**5. Independent sampling.** The hub samples twice a year (spring and autumn) and chooses a pathway:

*Pathway 1: Sample and identify*

Volunteers do all the sampling and analysis themselves. For hubs completing their own identification, we pick a sample at random each season for a quality control check – to provide volunteers with valuable feedback.

*Pathway 2: Sample and send*

Volunteers collect the sample and we get it sent to a professional lab for identification for a modest cost.

The pathways are flexible and a combination of the two is possible.

**SmartRivers data enables us to keep the focus on rivers, challenging misleading claims about invertebrate recovery...**

Dr Cyril Bennett MBE, founding member of Riverfly Partnership

# The outputs

## What data does SmartRivers produce?

2024 will see the release of new data reports and a data interpretation 'cheat sheet' for our groups.

1

## Invertebrate abundance and diversity profiles

The invertebrate records produced from SmartRivers monitoring allow us to assess changes in invertebrate diversity and abundance, to highlight areas at risk (Fig. 1).

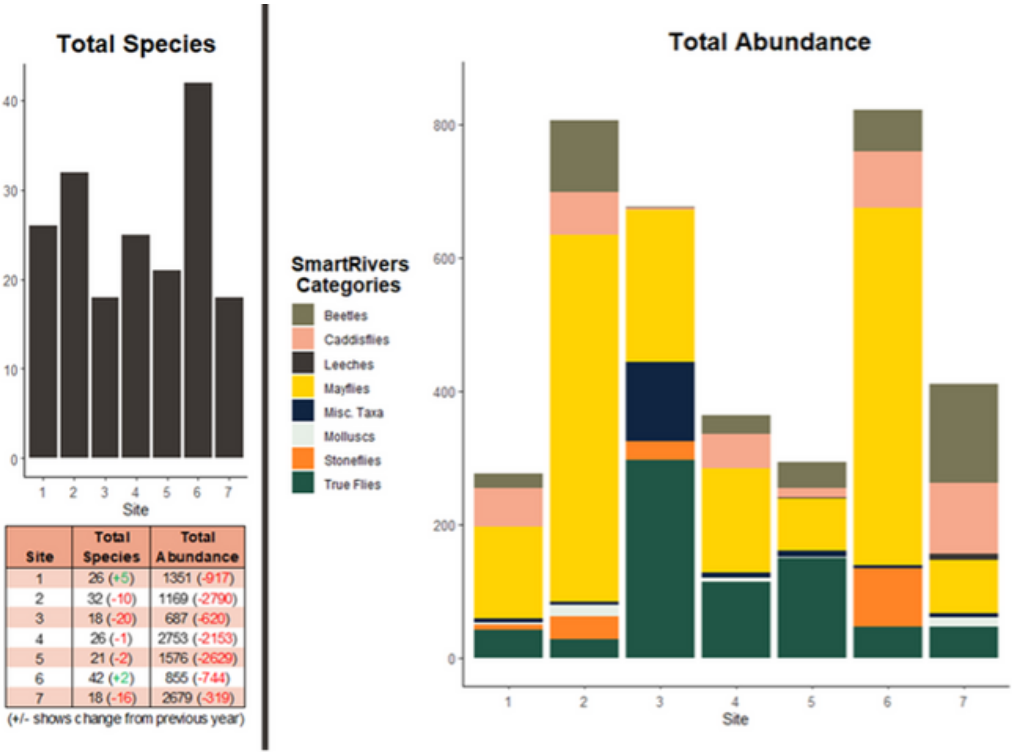
As the foundation of the food web, changes to invertebrate communities alter the natural balance of river systems. This has implications for wildlife, like fish, that rely on invertebrates as a food source.

## What are we looking for?

Generally, we want to see is a healthy diverse invertebrate community comprising a variety of different species with plenty of individuals.

Large proportions of pollution tolerant species such as non-biting midges or low proportions of pollution sensitive species of mayflies, stoneflies and caddisflies may indicate stress at a site.

Biodiversity decline (the loss of species and number of animals present) in any ecosystem is a sign of deterioration, particularly riverfly species.




| Site | Total Species | Total Abundance |
|---|---|---|
| 1 | 26 (+5) | 1351 (-917) |
| 2 | 32 (-10) | 1169 (-2790) |
| 3 | 18 (-20) | 687 (-620) |
| 4 | 26 (-1) | 2753 (-2153) |
| 5 | 21 (-2) | 1576 (-2629) |
| 6 | 42 (+2) | 855 (-744) |
| 7 | 18 (-16) | 2679 (-319) |

(+/- shows change from previous year)

*Figure 1: An example of an invertebrate survey in the new SmartRivers data report. With this data we can get an overview of invertebrate biodiversity and the change from previous years survey. The displayed data is spring 2023 from our Alyn hub, hosted by the Welsh Dee Trust.*

# Challenging national headlines

In 2023 a research article stating "Significant improvement in freshwater invertebrate biodiversity in all types of English rivers over the past 30 years" was published (1). WildFish, via SmartRivers, had the data to respond to this statement.

This claim of widespread recovery is based on assessment of richness at family level with no consideration of the actual numbers of these invertebrates, so key information was being lost. For example, while family richness may have increased, the number of species within a family could have declined. There may have been a gain of families with low numbers of species, alongside a loss of more species rich families - an important distinction to make. Additionally, while the study claims there to be low gains in the number of invasive families, we are aware that in some samples invasive invertebrates can account for the majority of invertebrates in a kick sample. Abundance data is essential to really understand changes in invertebrate communities.

Biodiversity, i.e., the variety of life in a given area, is most commonly assessed at the species-level. While not a failsafe method for capturing the complexity of natural communities (e.g., it is also important to consider the numbers of individuals and where they are congregated) it does give us a greater level of detail when assessing ecological challenges. This is because an individual species can be tolerant or sensitive to a particular threat. SmartRivers analysis is completed to species level where possible and counts are based on true abundance rather than classified on a log scale.

We recognise, as does much of the academic literature, that there have been recoveries to freshwater invertebrate communities since the later half of the 20th century, and this shows with proper funding and legislation recovery can occur. However, a key contention with this recent study is that these rates of recovery appear to have plateaued, highlighting that our systems are struggling to cope with the modern pressures our rivers are facing. This has been recognised in a larger European dataset published in Nature this year (2).

Currently, the agencies responsible for protecting our natural resources are chronically underfunded and the government appears to be actively backtracking on a variety of green policies. Research painting a glossier picture than the 'reality on the riverbank' risks detracting from the essential work conducted by various organisations who are actively trying to monitor, conserve, and restore the ecological health of our rivers. Because of SmartRivers we continue to grow the high resolution dataset that tells the real story.

*1. Qu, Y. et al. Significant improvement in freshwater invertebrate biodiversity in all types of English rivers over the past 30 years. Science of The Total Environment 167144 (2023).*

*2. Haase, P. et al. The recovery of European freshwater biodiversity has come to a halt. Nature (2023).*

## Growing the high resolution dataset that tells the real story

2

## Water quality 'scorecards'

Invertebrates are the base of aquatic food webs. They are present in rivers for months, if not years, and each species has different tolerances to pollution.

Using the list of identified invertebrate species at each site, we generate water quality 'scorecards' grading the impact of organic pollution, nutrient enrichment, sediment, chemicals and flow stress (Fig. 2).

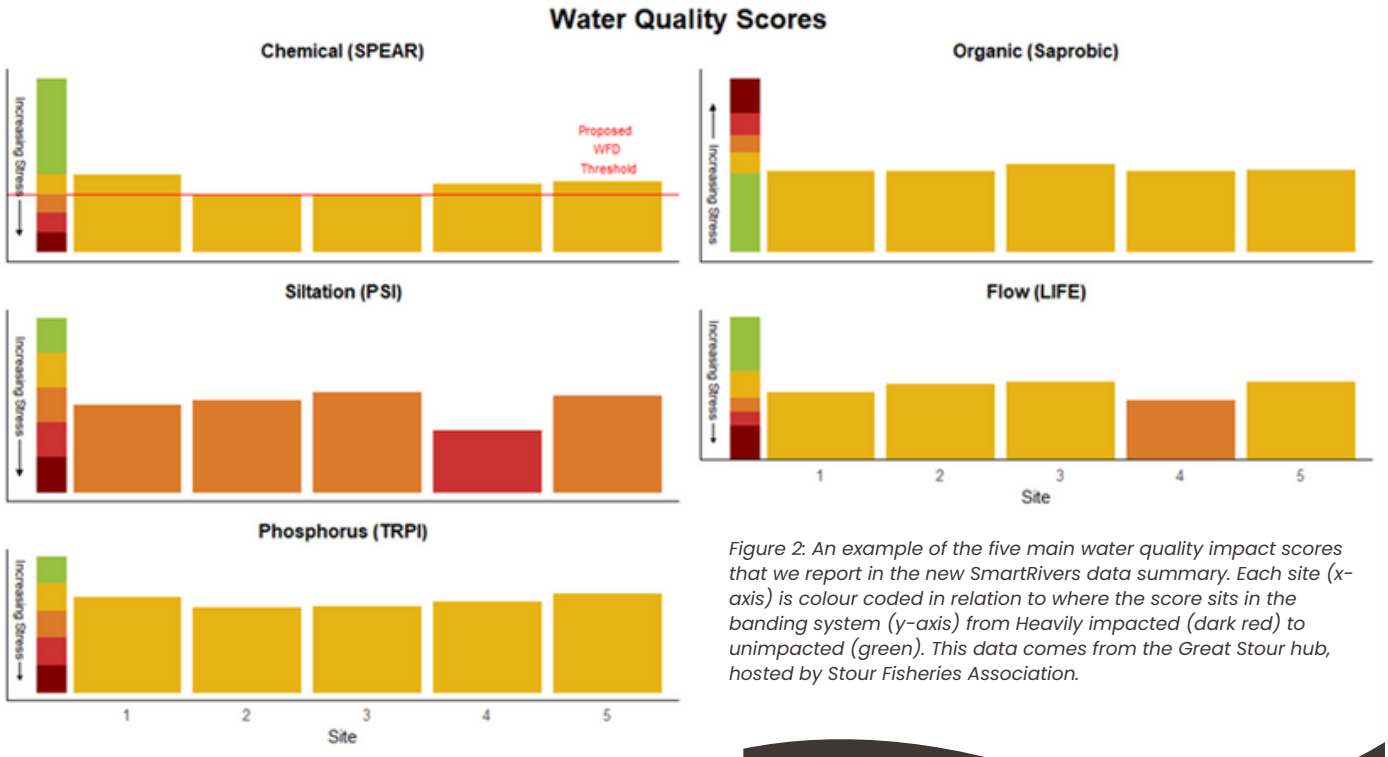



*Figure 2: An example of the five main water quality impact scores that we report in the new SmartRivers data summary. Each site (x-axis) is colour coded in relation to where the score sits in the banding system (y-axis) from Heavily impacted (dark red) to unimpacted (green). This data comes from the Great Stour hub, hosted by Stour Fisheries Association.*

## What are we looking for?

We're looking for unimpacted scores that indicate minimal ecosystem disruption from the stressors.

We use a traffic light colourway to indicate impact, so green is the goal. However, it's important to note that for some of the metrics, even a 'slight' impact score is significant for that environment - it's not just about looking for red marks.

## What happens to SmartRivers data?

- Stored online in an open access database.
- WildFish support hubs with using their data for local objectives.
- Used as evidence where applicable for WildFish national campaigning.

# Our rivers deserve the best healthcare.

Our ambition is that **all rivers** should be SmartRivers.

Every river deserves the best possible monitoring approach, one that has the scientific credibility to empower local people to fight for better protection.

Powered by WildFish.

**To find out more visit our website or get in touch:**

**www.wildfish.org**
**smartrivers@wildfish.org**