WildFish.

SmartRivers

Our progress to date

The right blend of citizen and science

Our rivers need us more than ever. Despite their well known deterioration, the coverage, resolution and frequency of national monitoring regimes continues to decline.

Water quality sampling by the Environment Agency **declined 74%** between 2013 and 2021. Without effective monitoring we cannot pinpoint the pressures and take action to improve our rivers. In the current financial climate, the only way to achieve the coverage of monitoring required to effectively protect our rivers is through volunteers.

We wanted to help bridge the monitoring gap, but to do so in a meaningful and scientifically robust way. Without these things, we knew regulator acceptance of the data would be limited, defeating the objective of providing missing data to drive action.

After a considerable development period and consultation with a variety of experts in the field, we launched our nationwide citizen science scheme, SmartRivers, in 2019.

This report details the progress made and processes involved in SmartRivers since its launch.

Contents

74%

Reduction in water quality sampling by the Environment Agency between 2013 and 2021.

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 <u>highest level</u> scheme.

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 standard of citizen science.

- 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.

My work for SmartRivers is incredibly rewarding.

I see the huge enthusiasm for the training from people who really care about the health of rivers.

Dr. Roger Owen, SmartRivers trainer and former Head of Ecology at SEPA.

How it works

The set up process

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.

What information is produced?

Biodiversity records:

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.

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

Finding specific invertebrate species can tell us a variety of things.

1. Insight into climate change

Invertebrates respond to river warming in divergent ways. Some can adapt, others will disappear.

The upland summer mayfly (*Ameletus inopinatus*) is recognised as a species affected by rising water temperatures. It typically requires higher-up, colder water conditions - making higher altitude Scotland rivers an increasingly important refuge for this species under further climate change.

This species was found in our benchmarking of the River South Esk (Angus), which is a low altitude for the species, suggesting some adaptation to changing conditions.

2. Detecting rare species

We can learn more about the distribution of rare species and find new sites.

The scarce iron blue mayfly (*Baetis digitatus*) has a Nationally Scarce conservation status and is classed as a vulnerable species.

Our Avon SmartRivers hub found this species at three of their sites in 2022, highlighting the importance of protecting this river from further deterioration.

3. Finding invasive species

Non-native invasive species are flagged in our monitoring, which can help track their spread.
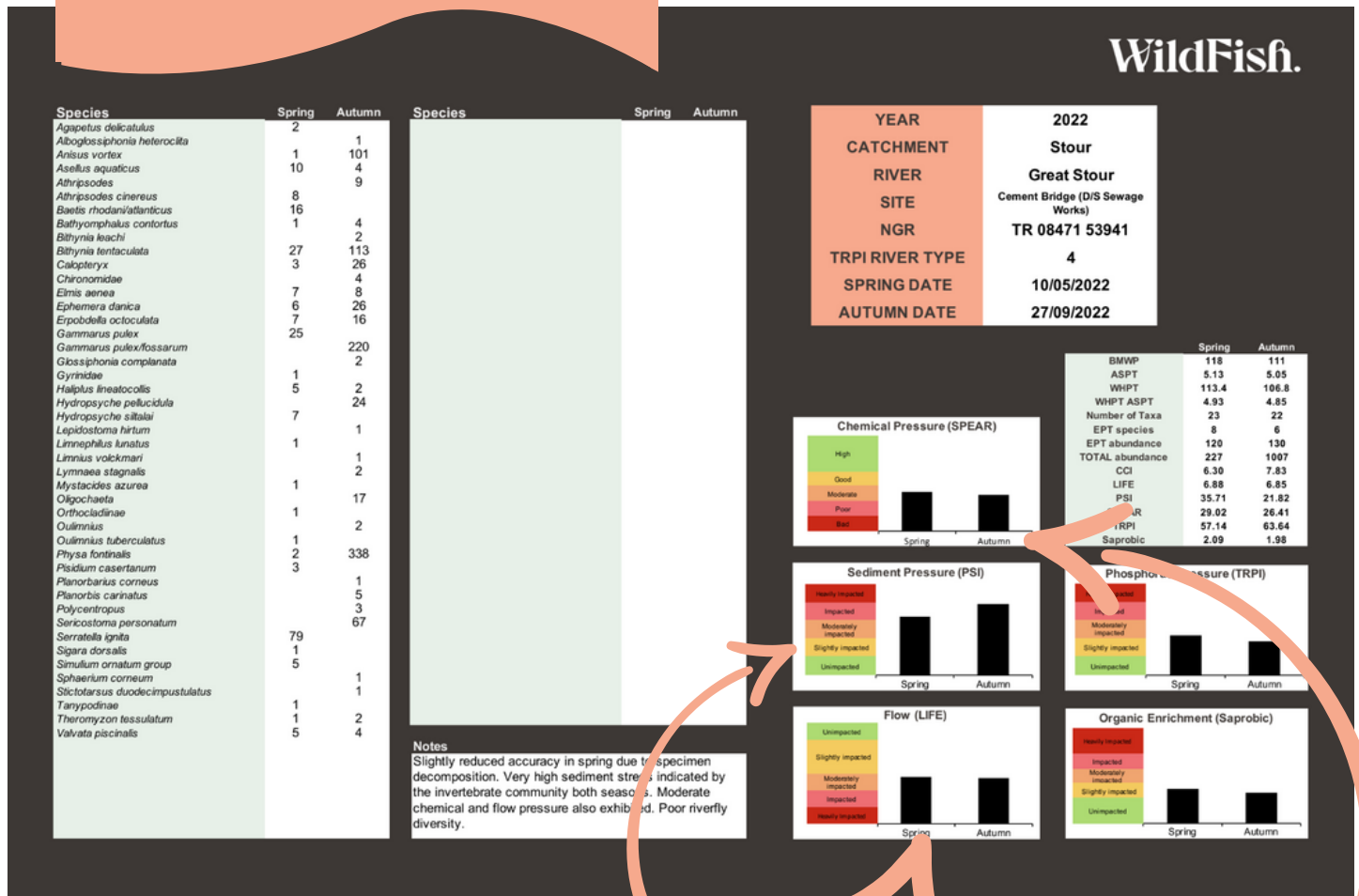
We have picked up signal crayfish at many of our sites. Invasives like this change community structure, predating on or outcompeting other invertebrates.

High quality, usable data is why we go the extra mile and identify to species-level.

The water quality 'scorecard':

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.

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Species	Spring	Autumn
Agapetus delicatulus	2	
Alboglossiphonia heteroclita		1
Anisus vortex	1	101
Asellus aquaticus	10	4
Athripsodes		9
Athripsodes cinereus	8	
Baetis rhodani/atlanticus	16	
Bathyomphalus contortus	1	4
Bithynia leachi		2
Bithynia tentaculata	27	113
Calopteryx	3	26
Chironomidae		4
Elmis aenea	7	8
Ephemera danica	6	26
Erpobdella octoculata	7	16
Gammarus pulex	25	
Gammarus pulex/fossarum		220
Glossiphonia complanata		2
Gyrinidae	1	
Haliplus lineatocollis	5	2
Hydropsyche pellucidula		24
Hydropsyche siltalai	7	
Lepidostoma hirtum		1
Limnephilus lunatus	1	
Limnius volckmari		1
Lymnaea stagnalis		2
Mystacides azurea	1	
Oligochaeta		17
Orthocladiinae	1	
Oulimnius		2
Oulimnius tuberculatus	1	
Physa fontinalis	2	338
Pisidium casertanum	3	
Planorbarius corneus		1
Planorbis carinatus		5
Polycentropus		3
Sericostoma personatum		67
Serratella ignita	79	
Sigara dorsalis	1	
Simulium ornatum group	5	
Sphaerium corneum		1
Stictotarsus duodecimpustulatus		1
Tanypodinae	1	
Theromyzon tessulatum	1	2
Valvata piscinalis	5	4

Species	Spring	Autumn

Notes
Slightly reduced accuracy in spring due to specimen decomposition. Very high sediment stress indicated by the invertebrate community both seasons. Moderate chemical and flow pressure also exhibited. Poor riverfly diversity.

YEAR	2022
CATCHMENT	Stour
RIVER	Great Stour
SITE	Cement Bridge (D/S Sewage Works)
NGR	TR 08471 53941
TRPI RIVER TYPE	4
SPRING DATE	10/05/2022
AUTUMN DATE	27/09/2022

	Spring	Autumn
BMWP	118	111
ASPT	5.13	5.05
WHPT	113.4	106.8
WHPT ASPT	4.93	4.85
Number of Taxa	23	22
EPT species	8	6
EPT abundance	120	130
TOTAL abundance	227	1007
CCI	6.30	7.83
LIFE	6.88	6.85
PSI	35.71	21.82
SPEAR	29.02	26.41
TRPI	57.14	63.64
Saprobic	2.09	1.98

Chemical Pressure (SPEAR)

Sediment Pressure (PSI)

Phosphorus Pressure (TRPI)

Flow (LIFE)

Organic Enrichment (Saprobic)

This scorecard from 2022 is telling us that <u>very high</u> sediment stress, <u>moderate</u> chemical stress and <u>moderate</u> flow stress are being indicated by the invertebrate community present at this site.

When multiple years of data are available we look at the outputs in the context of the catchment and help facilitate next steps to improve the river and its wild fish population if required.

> "**SmartRivers data is the currency local groups like us can use that regulators will actually take notice of. It's our best hope to drive improvements for our river.**"

David Holroyd, Wiltshire Fishery Association SmartRivers hub lead.

36
rivers
have had SmartRivers monitoring so far

3,472 hours
of training undertaken by volunteers so far*

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

Project coverage

Thanks to initial funding by the Esmée Fairbairn Foundation and others, we have been able to work with over 20 local groups, covering 36 rivers throughout England, Scotland and Wales.

SmartRivers river coverage as of Jan 2023.

Our impact

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

Bakkavor, River Itchen catchment

Chemical pressure highlighted in our data. No-one was looking before us so continual damage was being made from discharged pesticides into the River Itchen.

The Bakkavor site closed in 2020 rather than investing in the technology to stop the pollution.

This case study led to a national review of just under 50 other food washing permits, which could also be currently discharging pesticides unmonitored or regulated into surface or groundwater around England. This investigation is still on-going.

Action for Avon

Our data has led to the EA admitting that despite not failing its Water Framework Directive targets, the flylife in the river is not what you would expect for a healthy chalkstream.

A variety of local investigations in collaboration with the EA and water company are underway to try and address the issues.

This case study has provided invaluable evidence to inform the National CaBA Chalkstreams strategy on the need for bespoke targets for chalkstreams.

Windermere super hub

In conjunction with local activist Matt Staniek, a SmartRivers super-hub is being established around the Windermere catchment to raise awareness of the impacts of sewage in this iconic freshwater landscape. Initial invertebrate samples indicated a 44% decline

in species below United Utilities sewage treatment works in the area.

Wider integration

Data from both citizen science and statutory monitoring schemes is extremely fragmented. From different user interfaces to different access permissions - finding current and historical data on river health is not straightforward. When we created SmartRivers, one of our main objectives was to feed our results into existing platforms, so it could someday be part of a 'one stop shop' for river monitoring data.

We have made progress towards this goal through integration into the UK Centre for Ecology & Hydrology (CEH) Freshwater Data Portal. This portal contains a comprehensive collection of data. Viewing citizen science data alongside Agency monitoring data in this way allows more effective visualisation about pressures on the environment as well as the way wildlife is responding to them.

SEPA are keen to trial use of citizen science data to see if this can assist their regulatory and classification activities. They have agreed to run a trial on at least one of our Scottish hubs (Lothian Esk and possibly also the Angus Esk) to work out and refine the processes by which SmartRivers would provide SEPA with ecological river data.

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

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.

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

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