

An aerial photograph of a forest with vibrant autumn foliage in shades of yellow, orange, and green. A river flows through the forest on the right side of the image. The background is slightly faded to make the text stand out.

Data from a year of citizen science monitoring across the Wye Catchment

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Cardiff University



Natural
Environment
Research Council

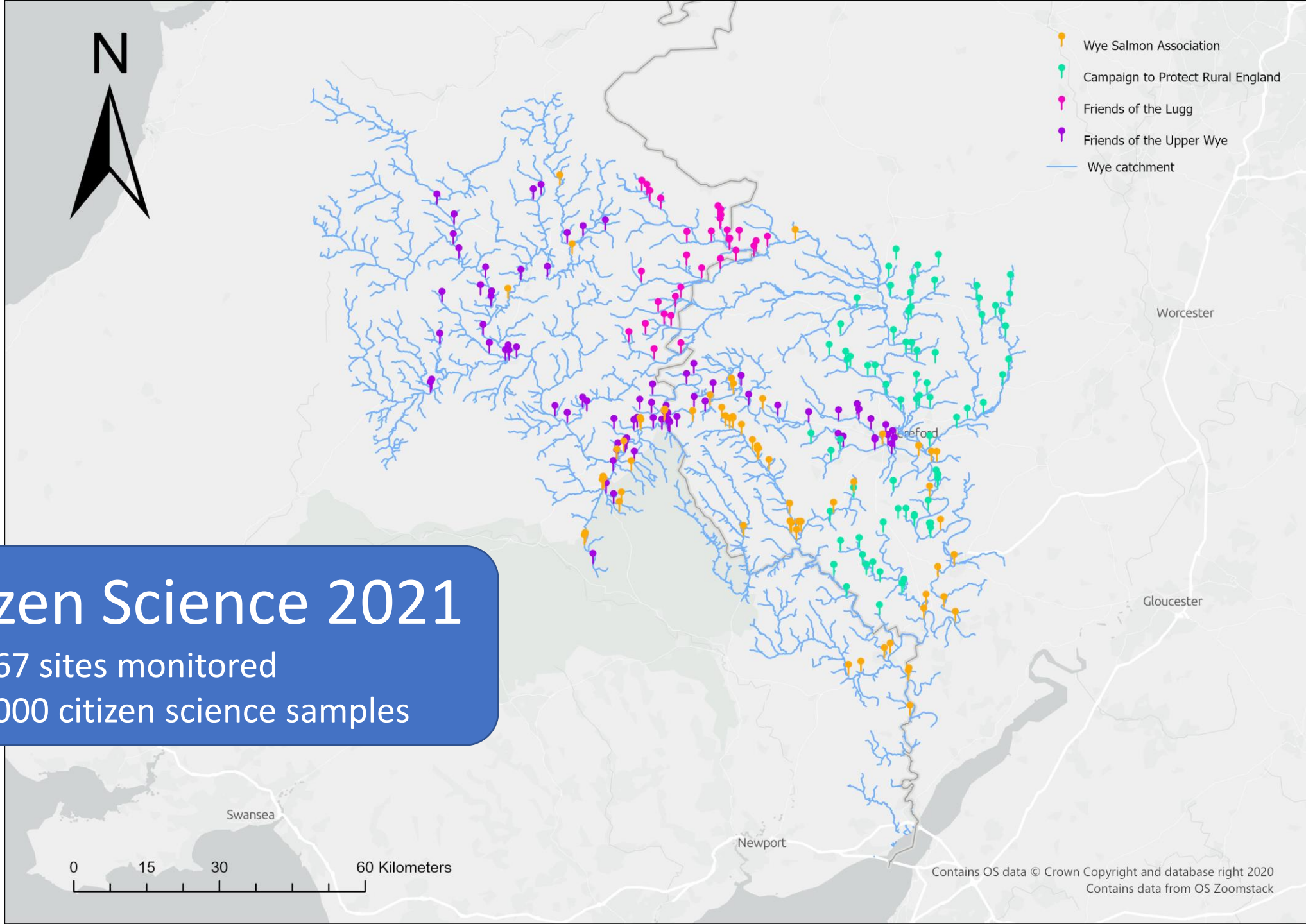
Photo credit: Country Life
(The River Wye at Symonds Yat)

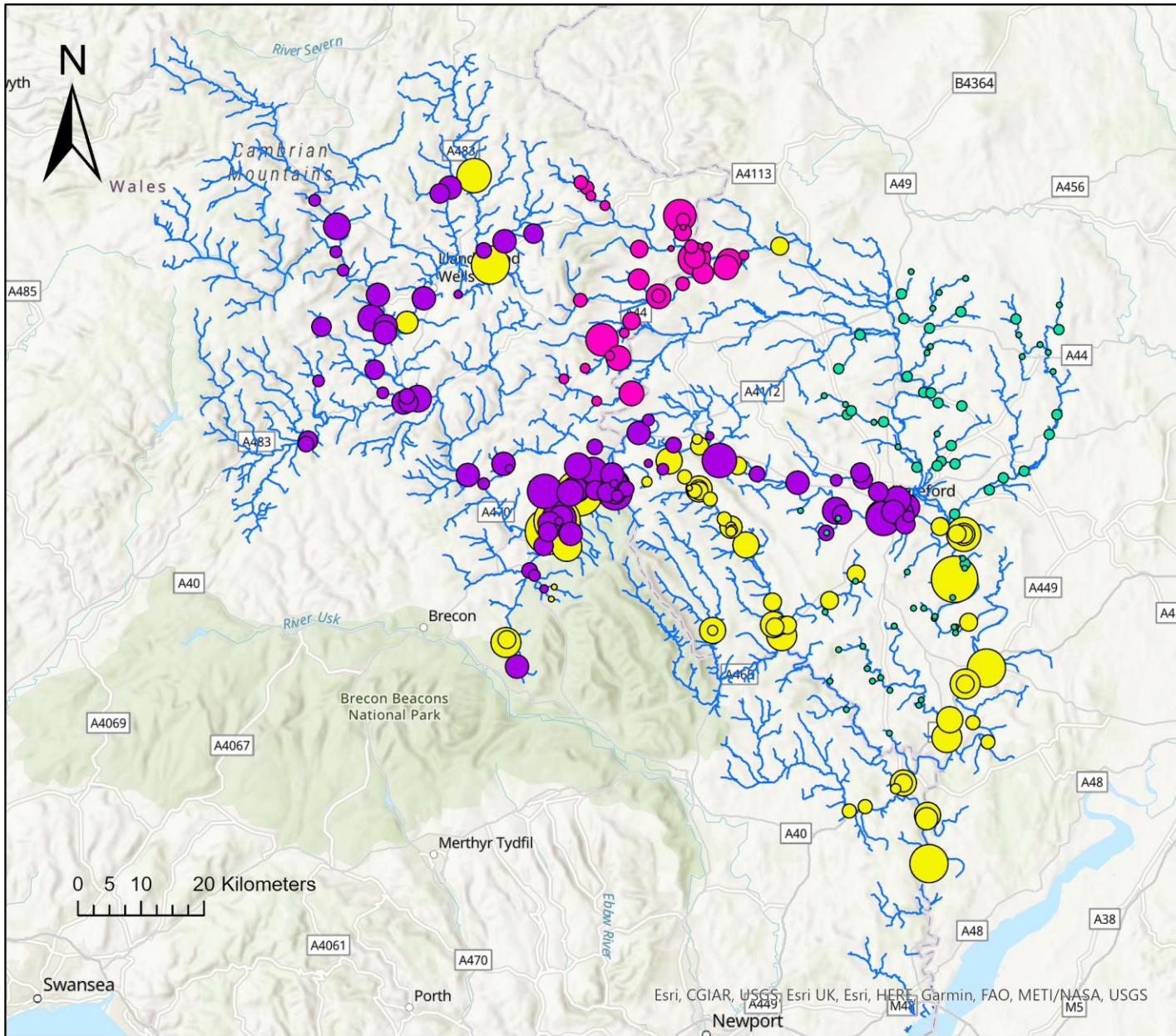


- Wye Salmon Association
- Campaign to Protect Rural England
- Friends of the Lugg
- Friends of the Upper Wye
- Wye catchment

Citizen Science 2021

- > 267 sites monitored
- > 4000 citizen science samples





- CPRE**
 Sample size
 ● 1 - 3
 ● 4 - 9
- FOUW**
 Sample size
 ● 1 - 7
 ● 8 - 14
 ● 15 - 19
 ● 20 - 24
 ● 25 - 29
 ● 30 - 34
 ● 35 - 46
- WSA**
 Sample size
 ● 2
 ● 3 - 6
 ● 7 - 10
 ● 11 - 16
 ● 17 - 20
 ● 21 - 25
 ● 26 - 34
 ● 35 - 45
 ● 46 - 55
 ● 56 - 65
- FOL**
 Sample size
 ● 1 - 3
 ● 4 - 12
 ● 13 - 20
 ● 21 - 25
 ● 26 - 30
 ● 31 - 37
 ● 38 - 43

Campaign to Protect Rural England (CPRE)
 → 73 active sites
 Started in September 2021

Friends of the Upper Wye (FOUW)
 → 93 active sites
 Started in June 2021

Wye Salmon Association (WSA)
 → 69 active sites
 Started in 2020

Friends of the Lugg (FOL)
 → 33 active sites
 Started in June 2021

What is being measured or observed?

Phosphate

Nitrate

Electrical conductivity/ TDS

Temperature

Turbidity

pH

Ammonia

Water level

Flow

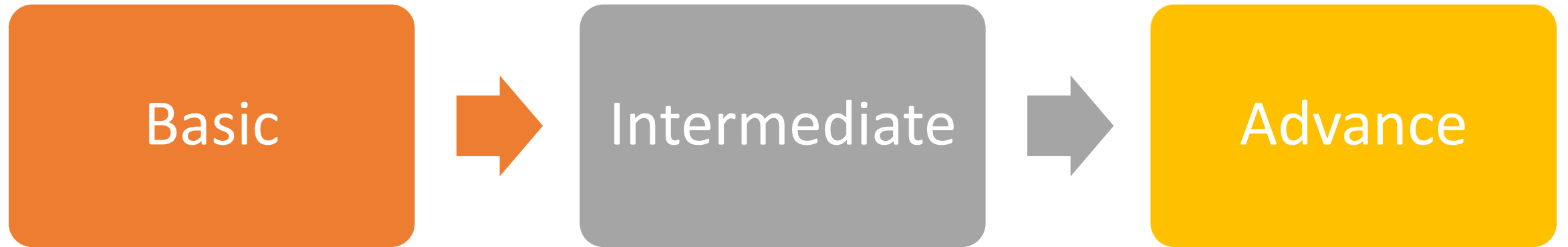
Rainfall in the last 24 hours

Presence of algal blooms

Presence of pollution

What equipment is being used?

Increasing cost and time commitment



Expected increasing limit of detection, precision and accuracy



Test strips

Hach Nitrate
(NO₃-N)
test strips



La Motte Phosphate (PO₄³⁻)
test strips

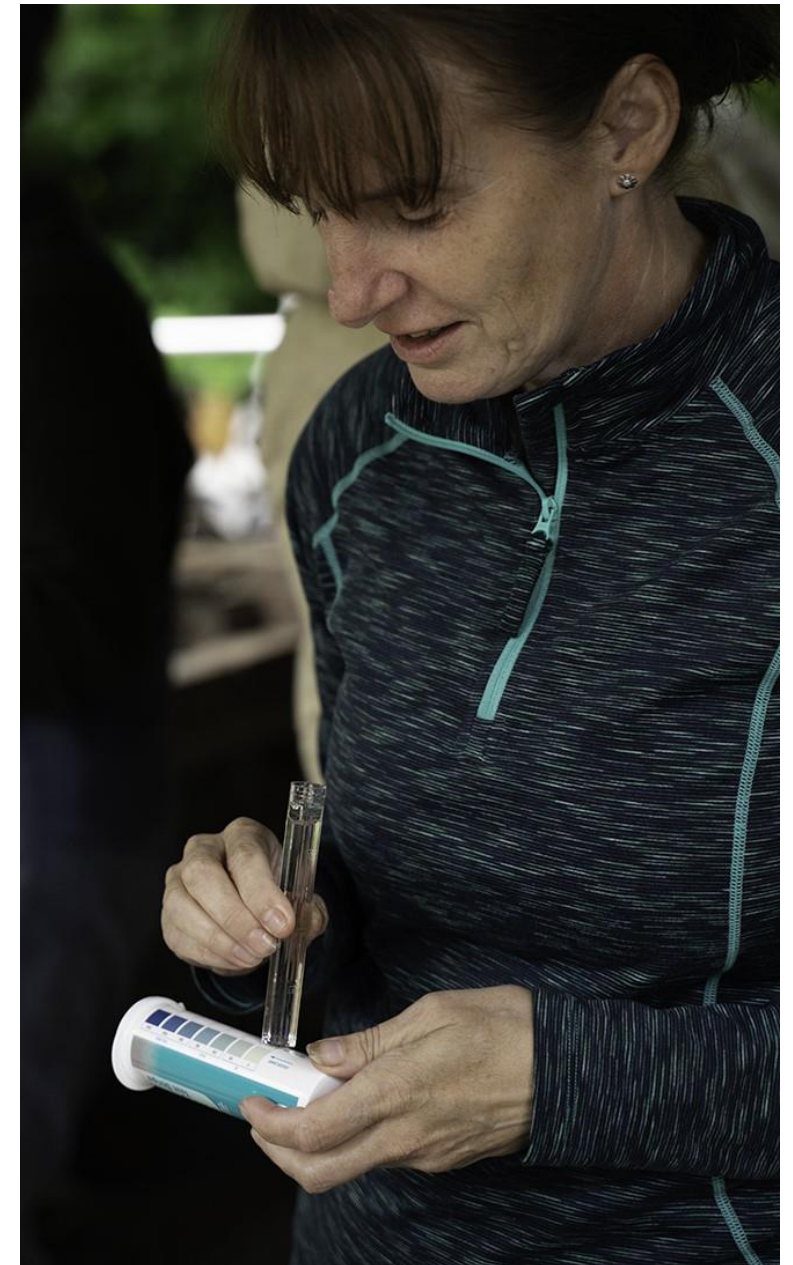
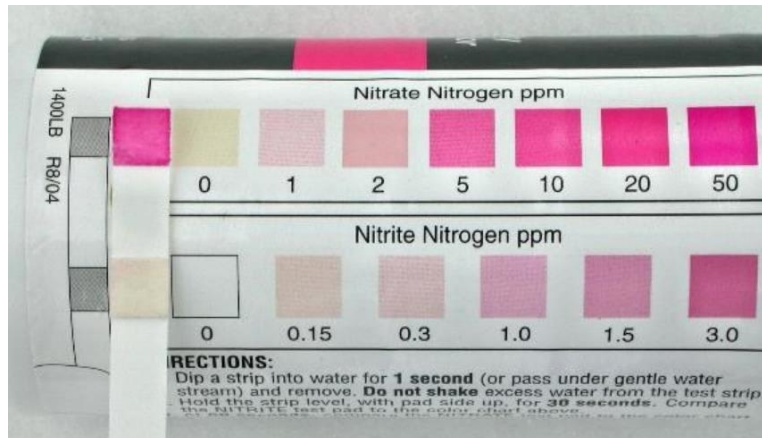
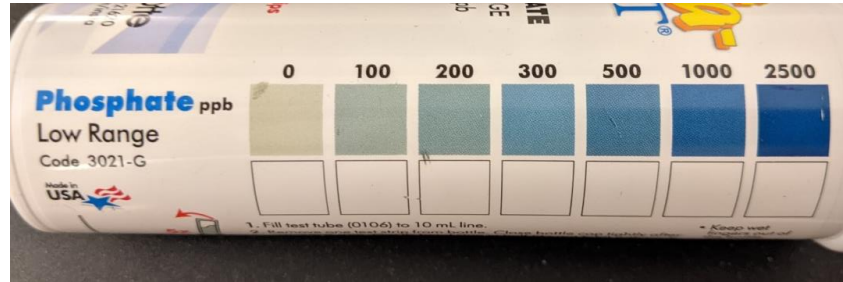


Photo credit:
biotechnologysolutions.com

Photo credit: Richard Greatrex, FOUW

Handheld digital colorimeters



Credit: Morgan Jones, WSA

Hanna Phosphate Low Range Handheld Colorimeter

Measures:
Phosphate (PO_4^{3-}) in ppm

Range:
0.00 to 2.50 ppm (mg/L)

Manufacturer's stated precision:
 ± 0.04 ppm (mg/L)

*Alternative, more expensive
digital colorimeter for phosphate*



Hanna 'phosphate checker'



Hach DR300

Handheld sensors and other devices



HM Digital EC-3 Probe

Measures:
Electrical conductivity and
temperature

EC Range:
→ 0 – 9990 μS ($\mu\text{S}/\text{cm}$)

Temp. Range:
→ 0 – 80 degrees Celsius

Manufacturer's stated
accuracy:
→ +/- 2%



pH probe



Credit: Eamon Bourke, FOUW

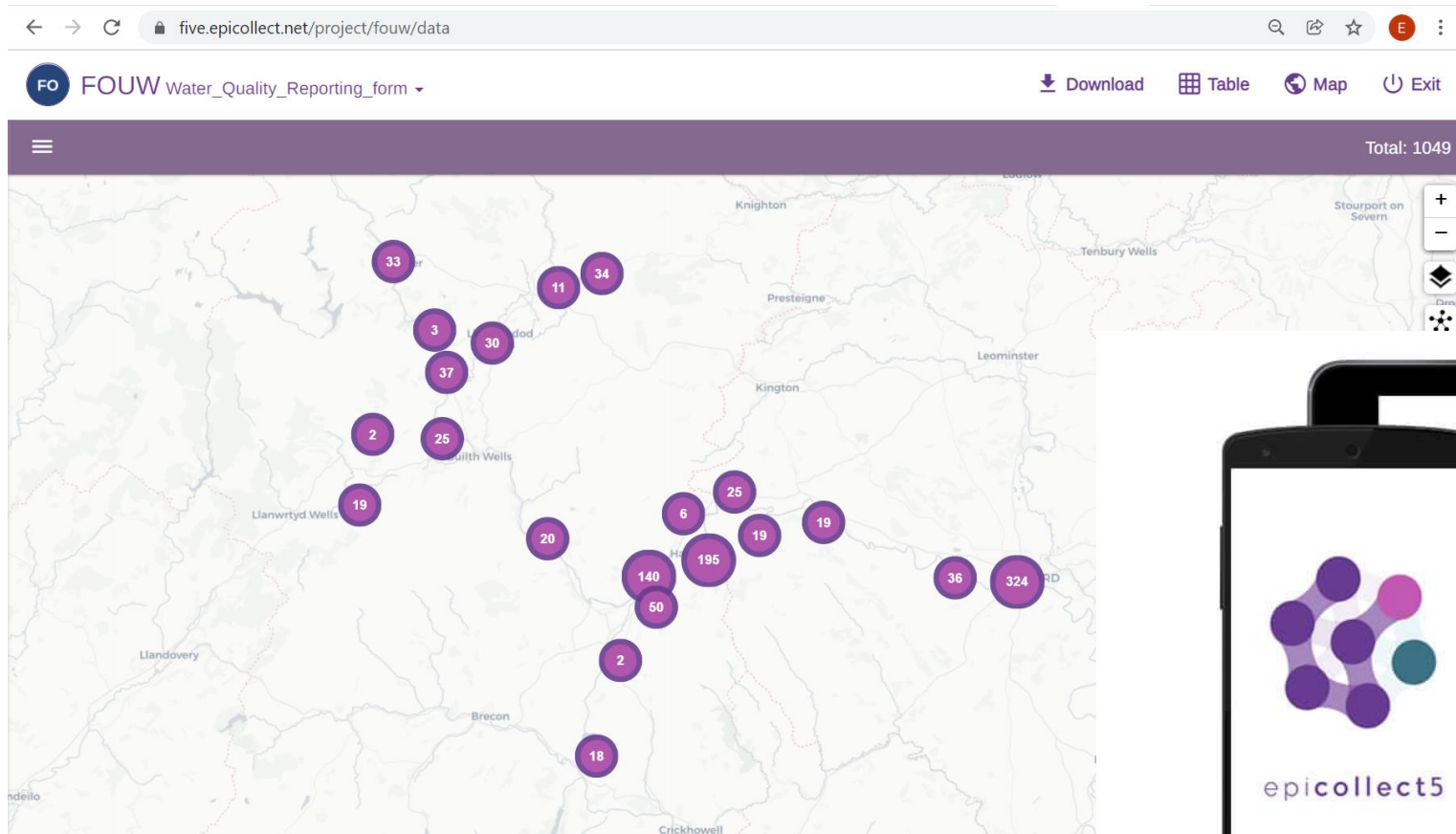


Credit: Shelly signs

Water level gauge

Secchi tube

How is data being recorded?



What can the data show us?



Patterns in water quality across
a wide area



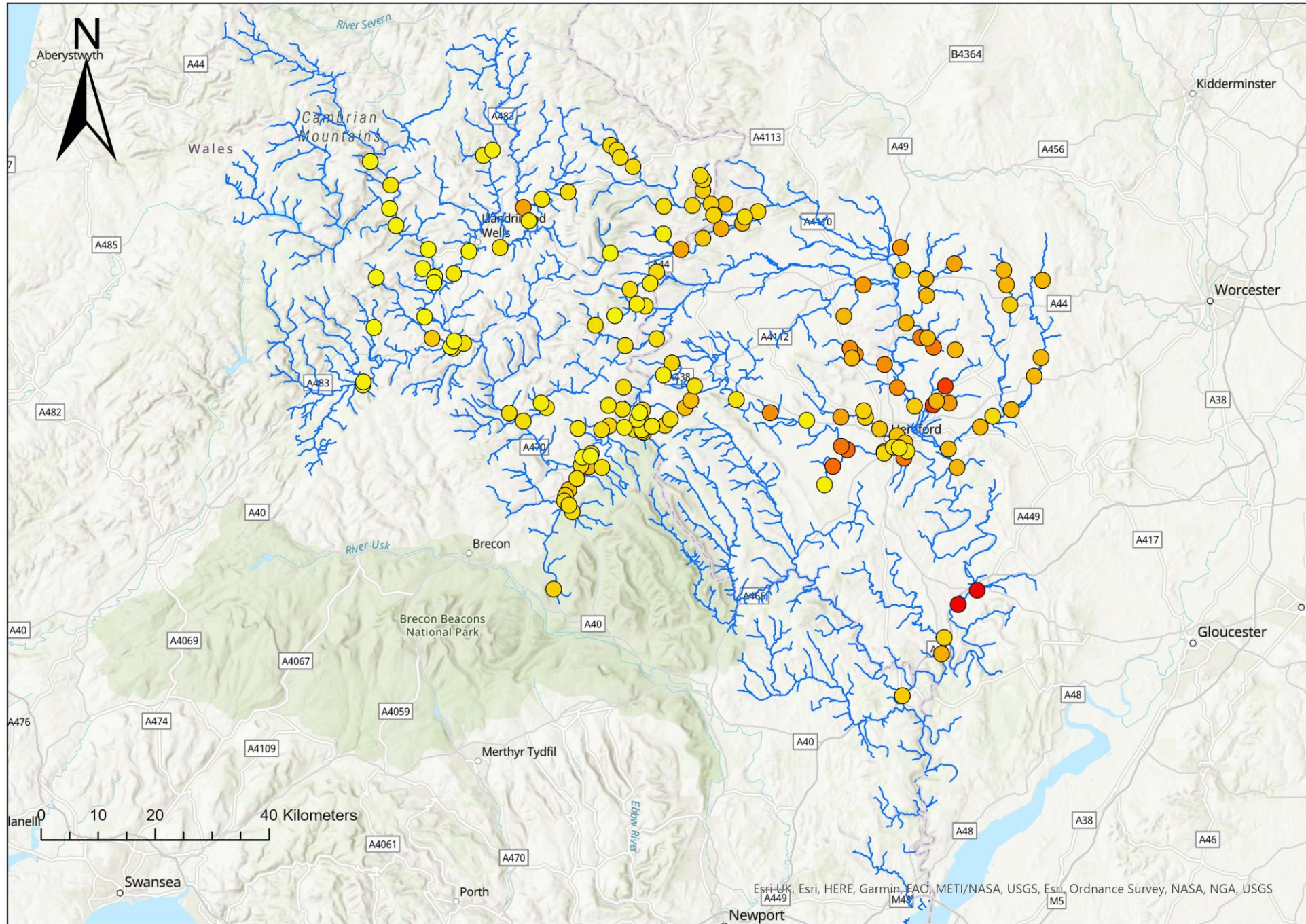
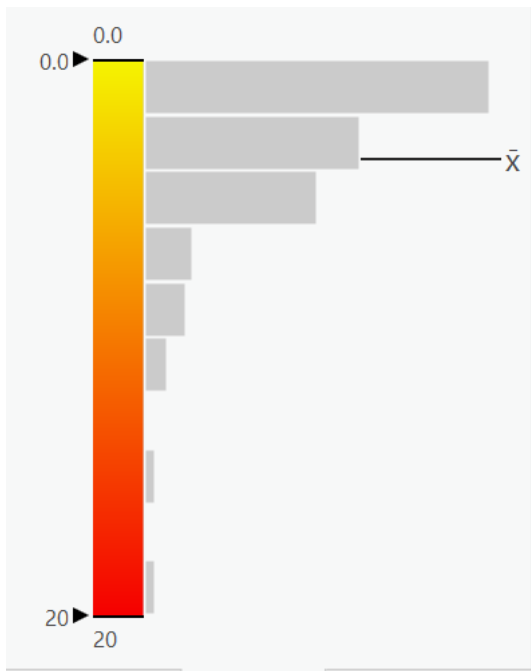
Trends in water quality over
time



Potential problem sites or
regions

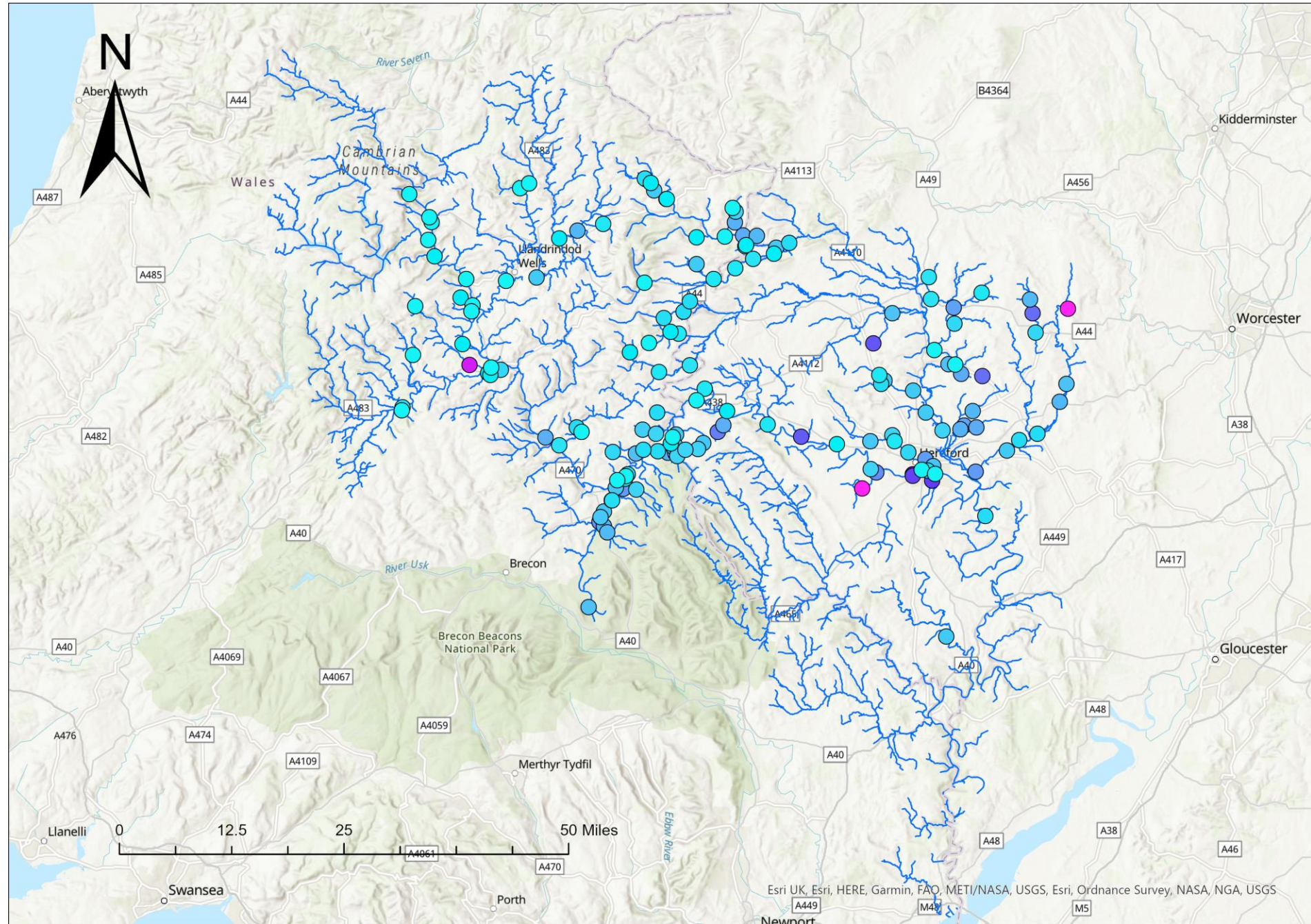
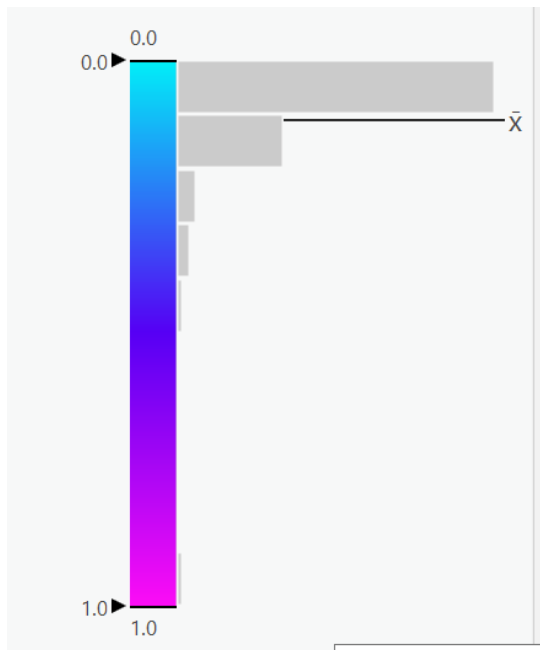
Mean Nitrate ($\text{NO}_3\text{-N}$) concentrations in ppm

Hach nitrate test strips



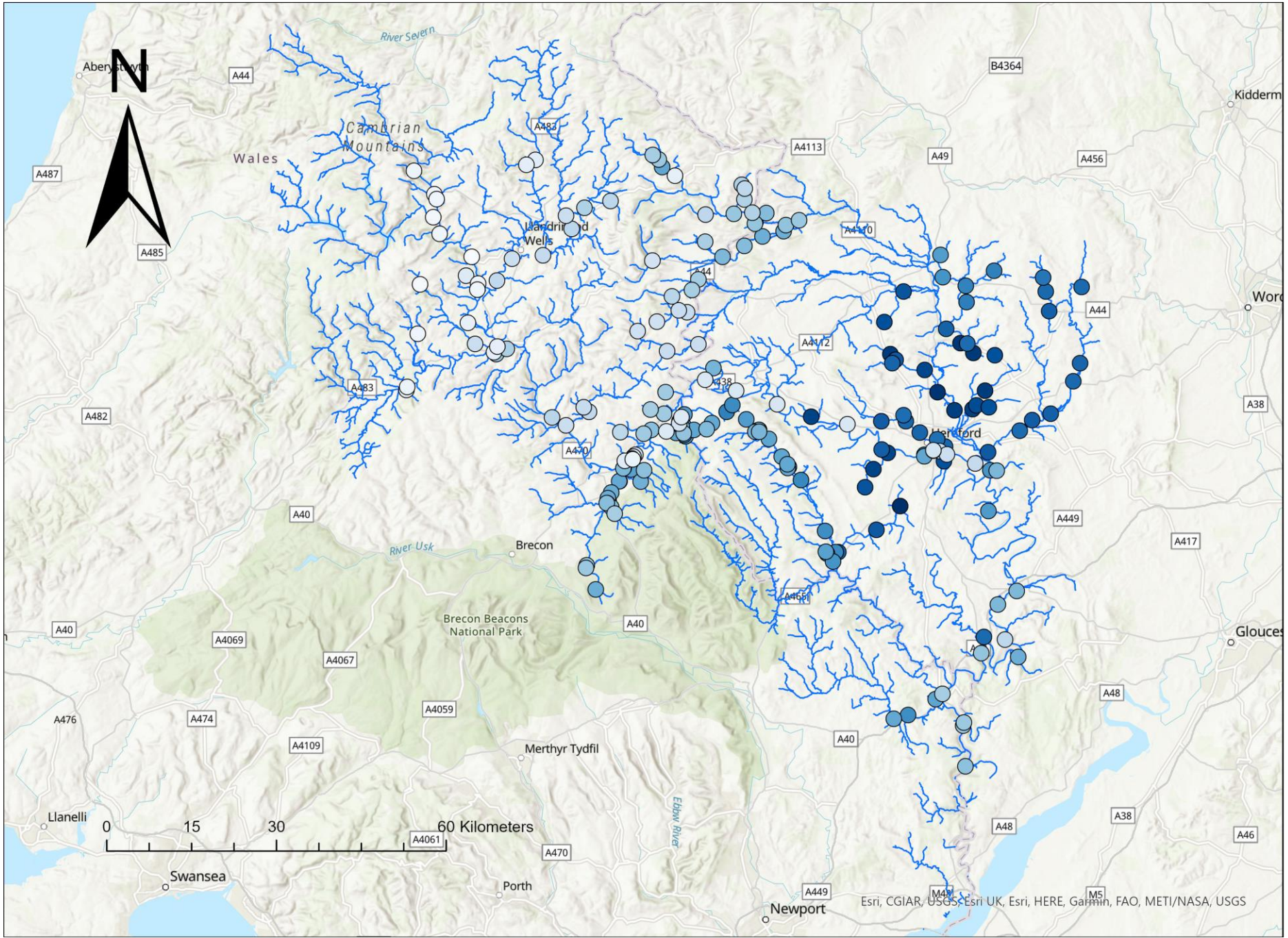
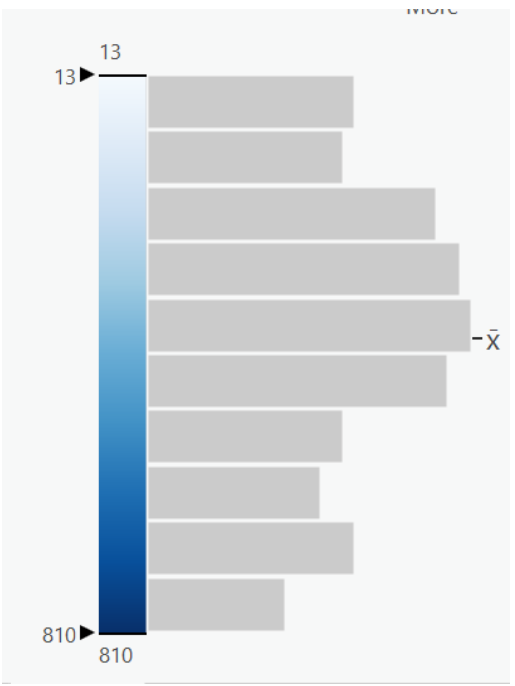
Mean Phosphate (PO_4^{3-}) concentrations in ppm

La Motte phosphate test strips



Mean Electrical Conductivity in Microsiemens μS

Using HM Digital EC-3 or TDS-3





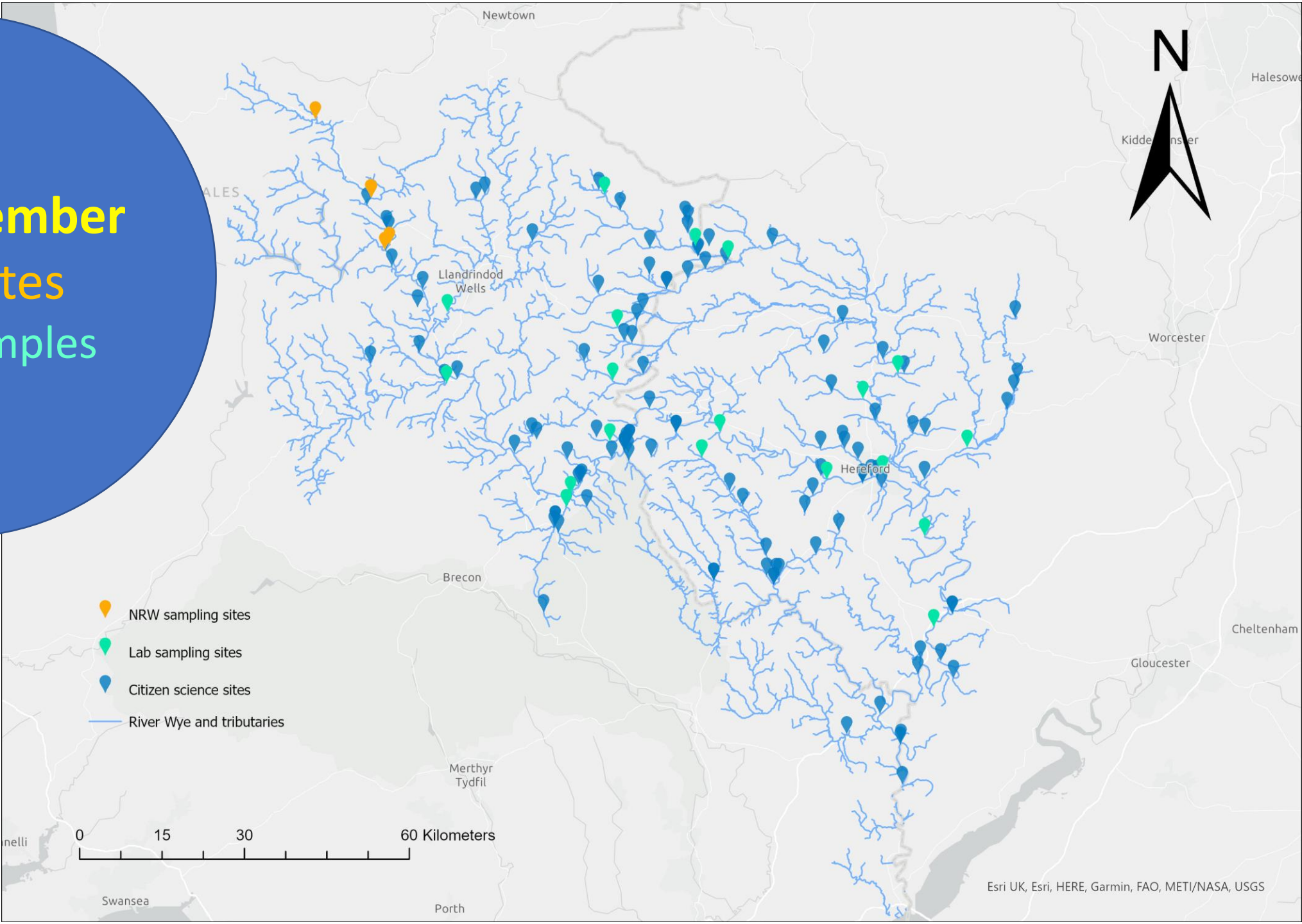
Wye Catchment Mass Sampling Events Autumn 2021



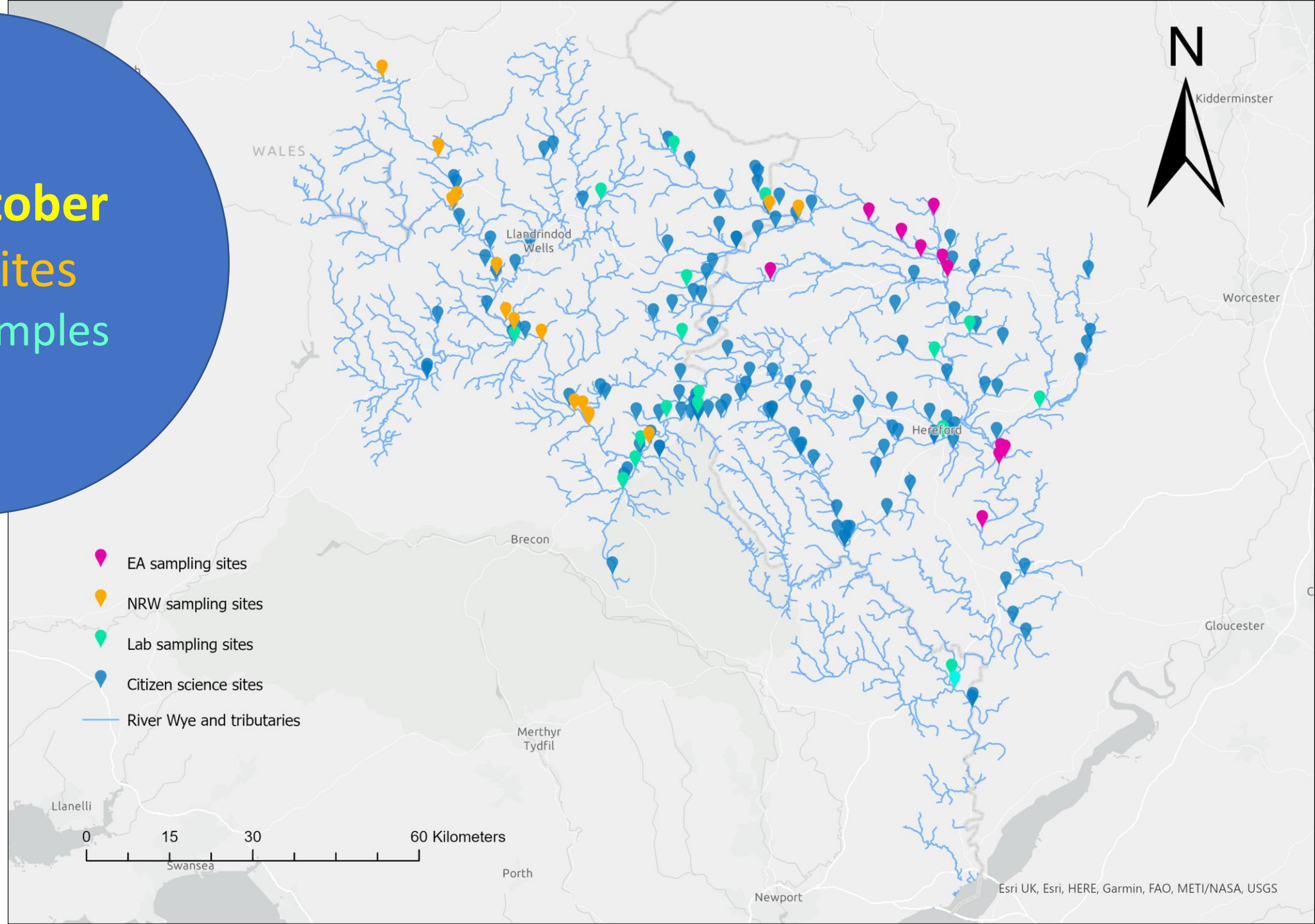
Photo credit: Richard Greatrex, FOUW



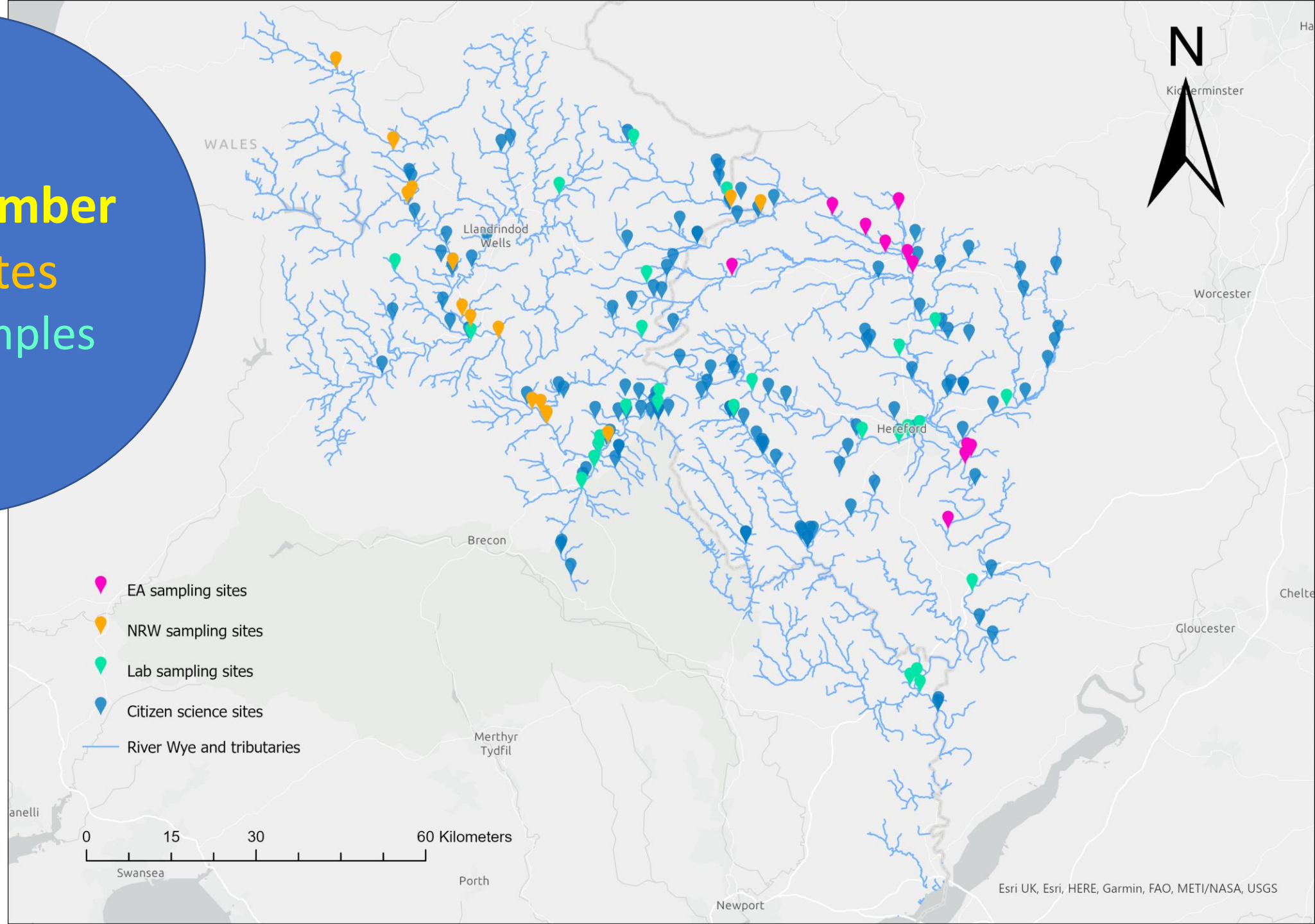
21st September
>135 sites
20 lab samples



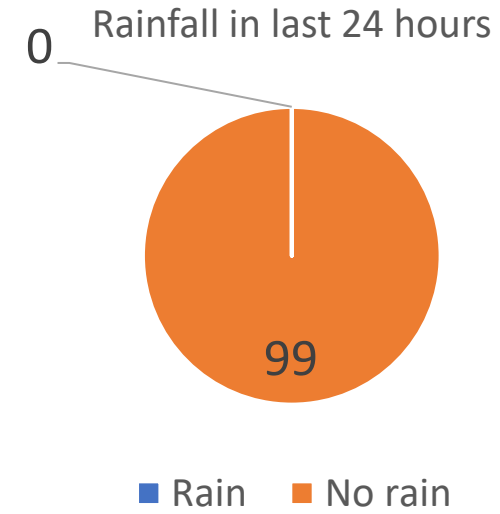
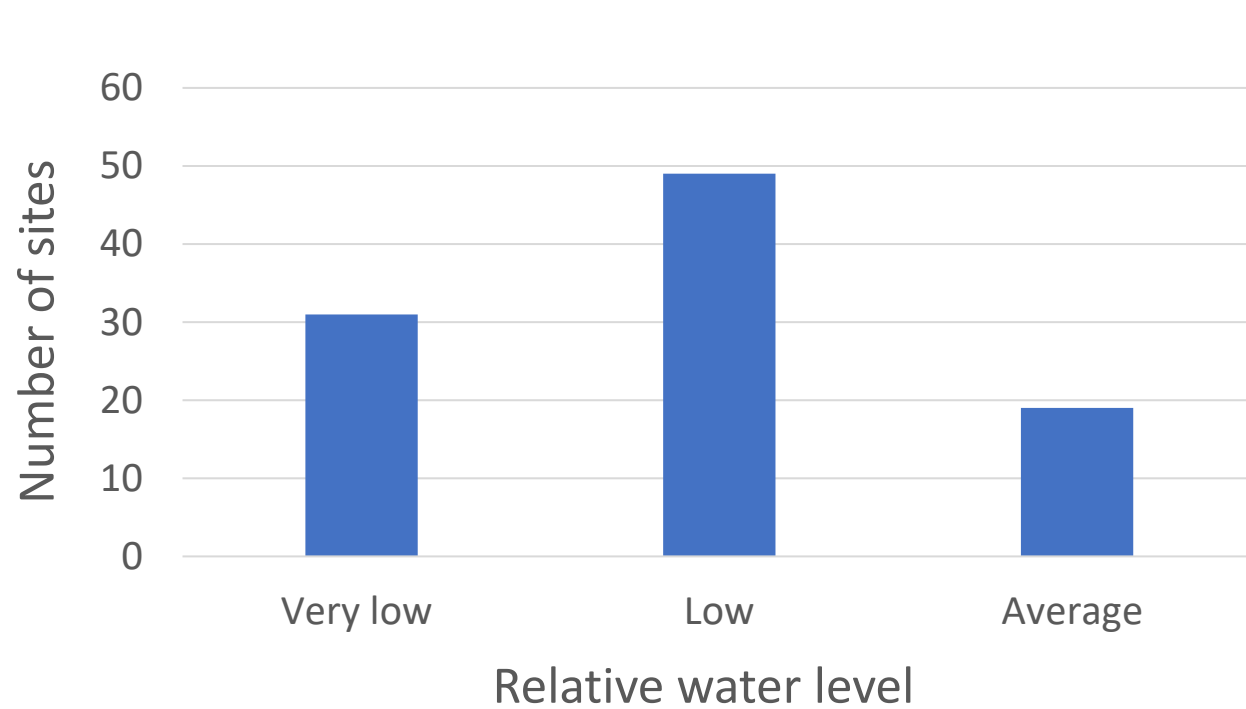
19th October
>145 sites
20 lab samples



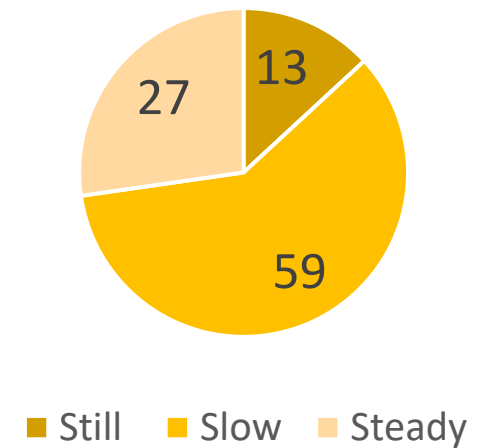
16th November
>165 sites
30 lab samples



Snapshot: September mass sampling event



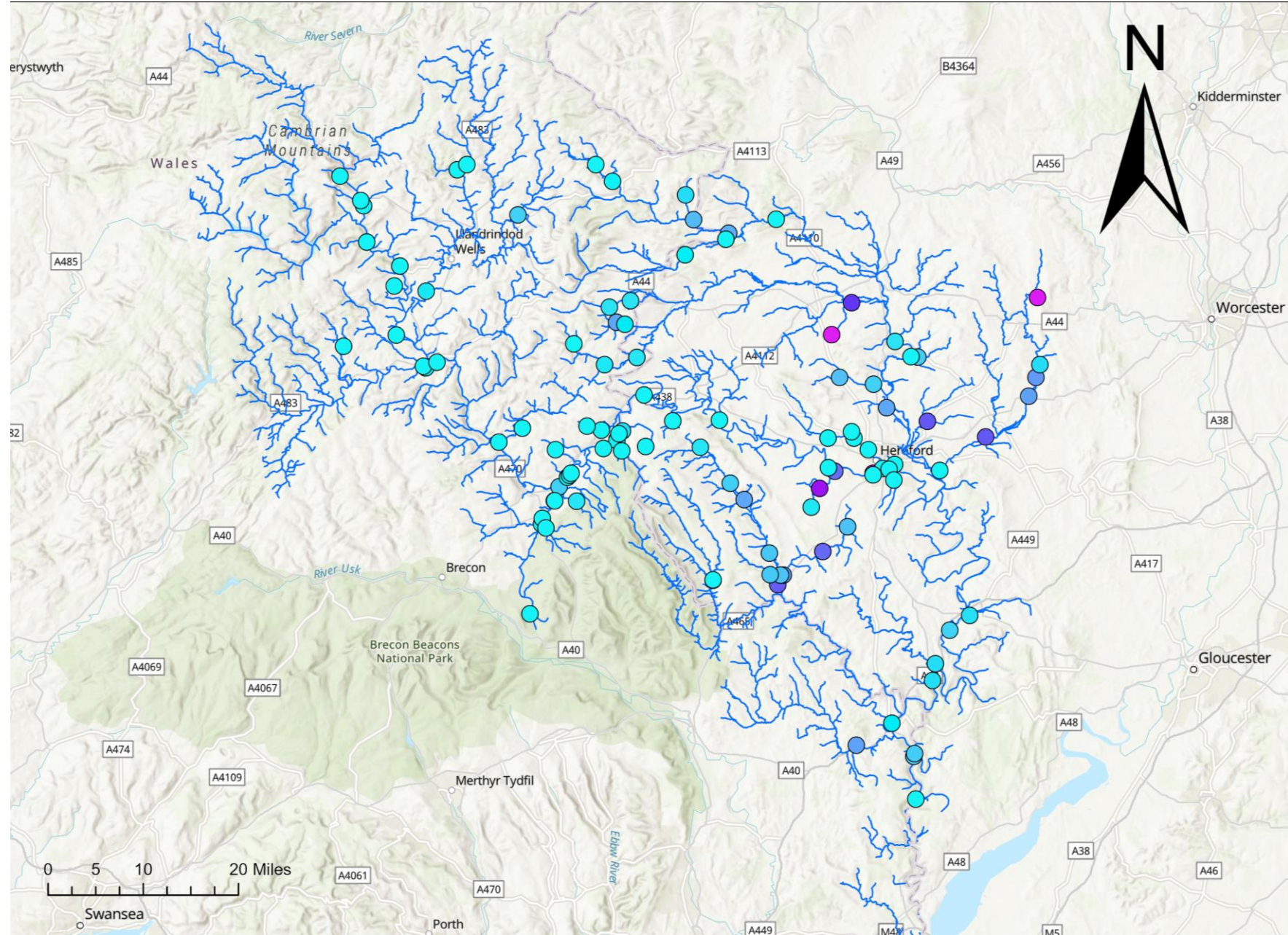
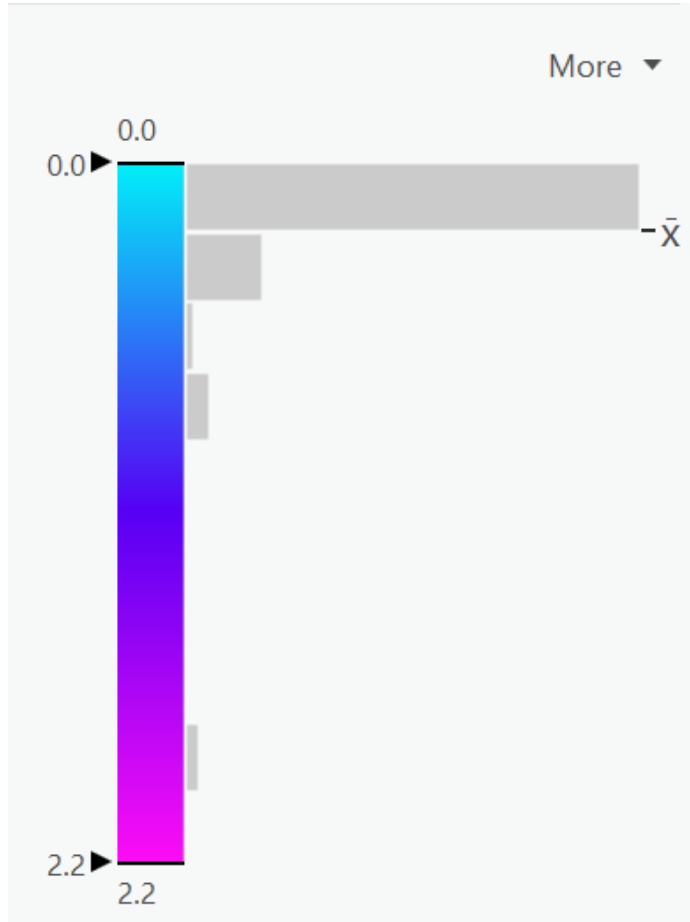
Flow description



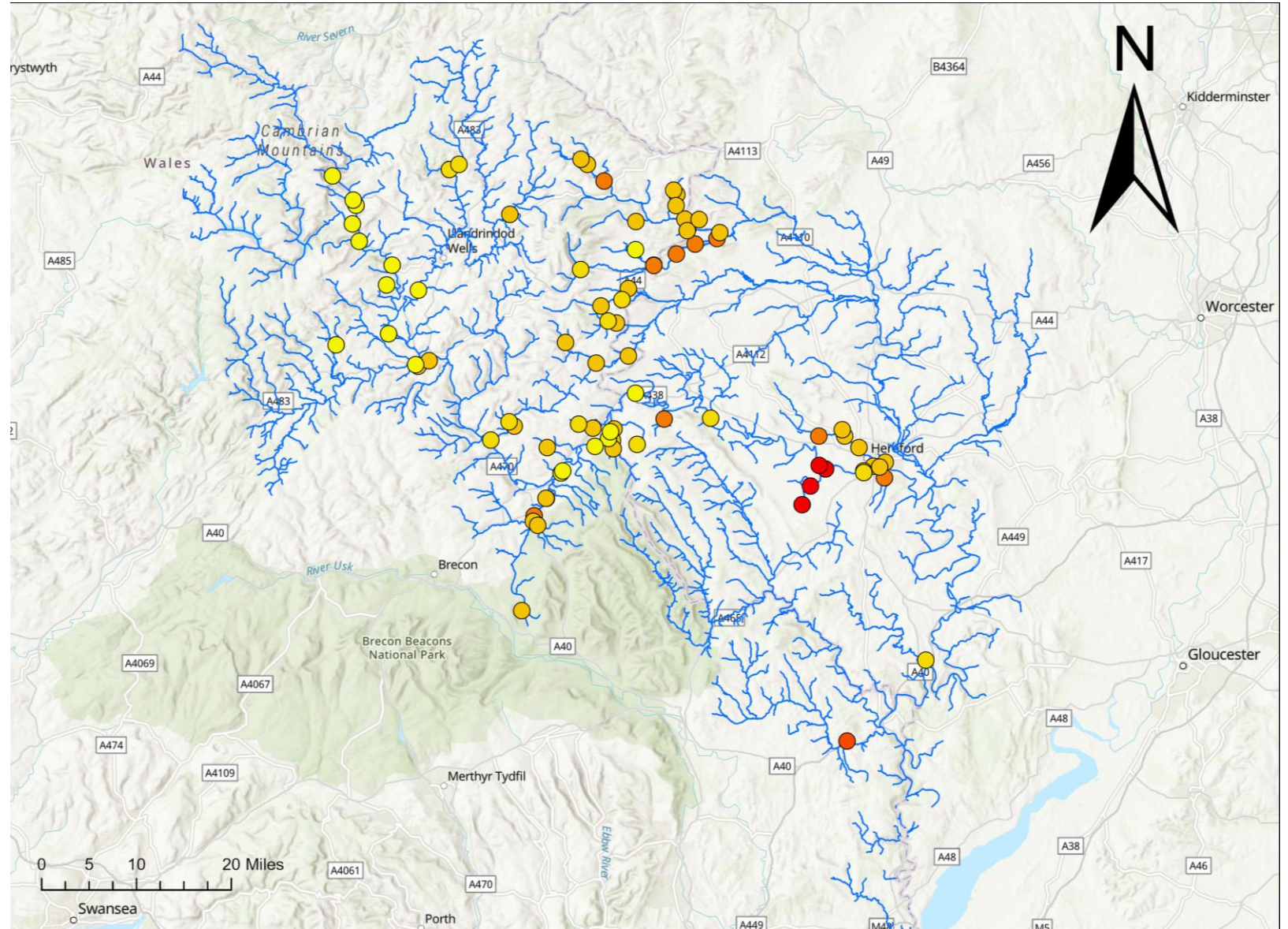
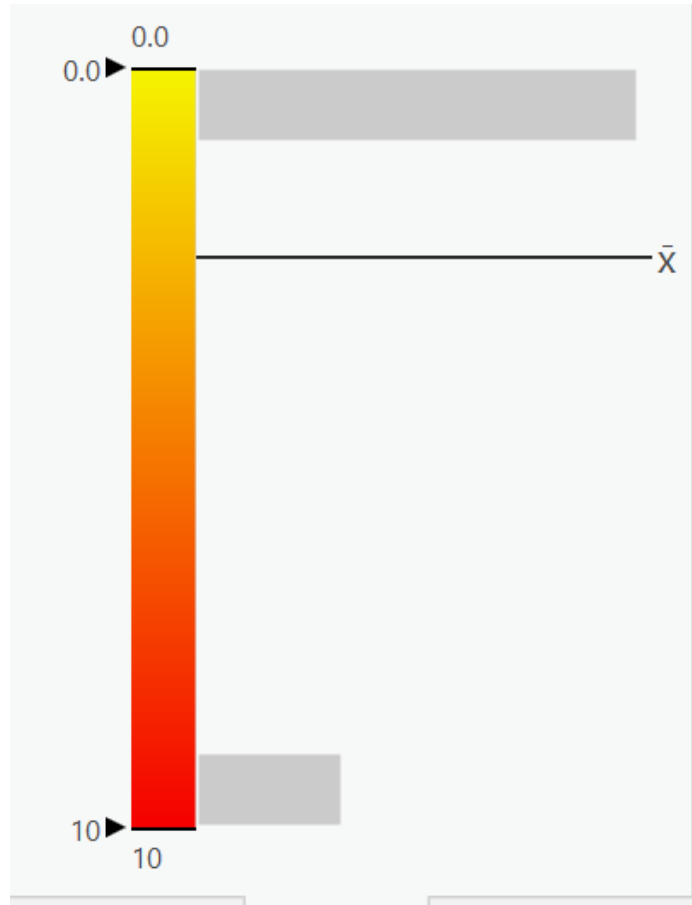
1 algal bloom sighting

8 signs of pollution identified

September _ Phosphate _ Hanna Checkers (ppm)



September_Nitrate_Hach test strips (ppm)

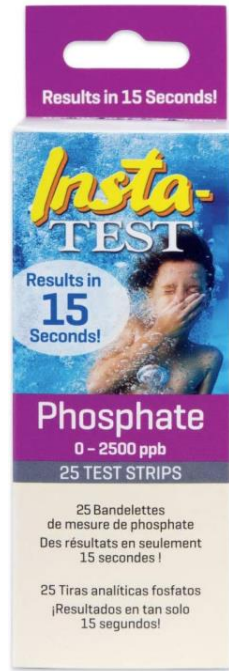




Field and lab nutrient
analysis compared

What did we compare?

- Phosphate – La motte test strips and Hanna low range P checkers
- Nitrate – Hach test strips
- UKAS accredited lab - LPM036 Determination of Nutrients by Aquakem 600 Discrete analyser



La Motte Phosphate (PO_4^{3-}) test strips



Hanna Phosphate (PO_4^{3-}) Low Range Handheld Colorimeter



Hach Nitrate ($\text{NO}_3\text{-N}$) test strips

