



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

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Cardiff University



Natural  
Environment  
Research Council

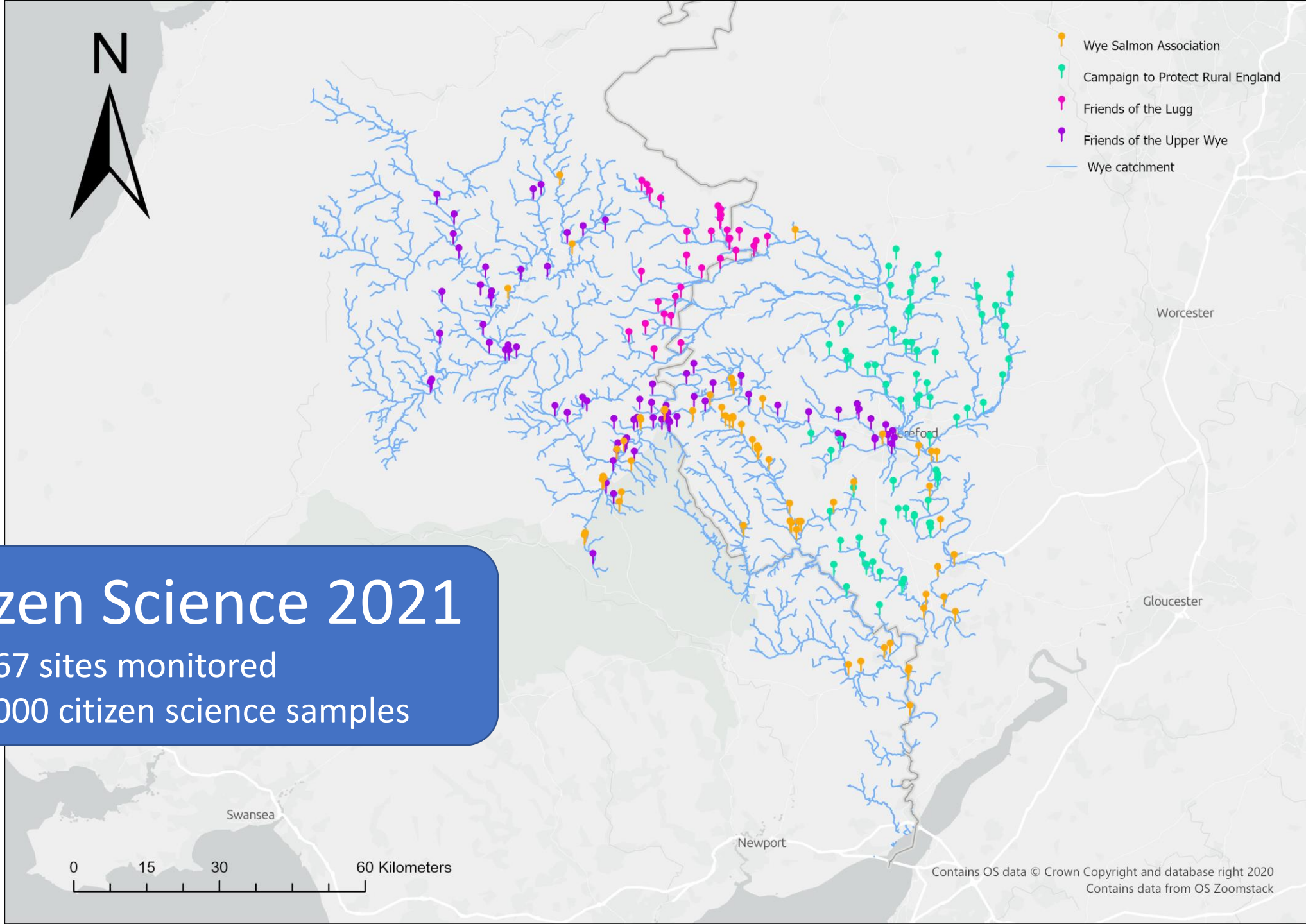
Photo credit: Country Life  
(The River Wye at Symonds Yat)



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

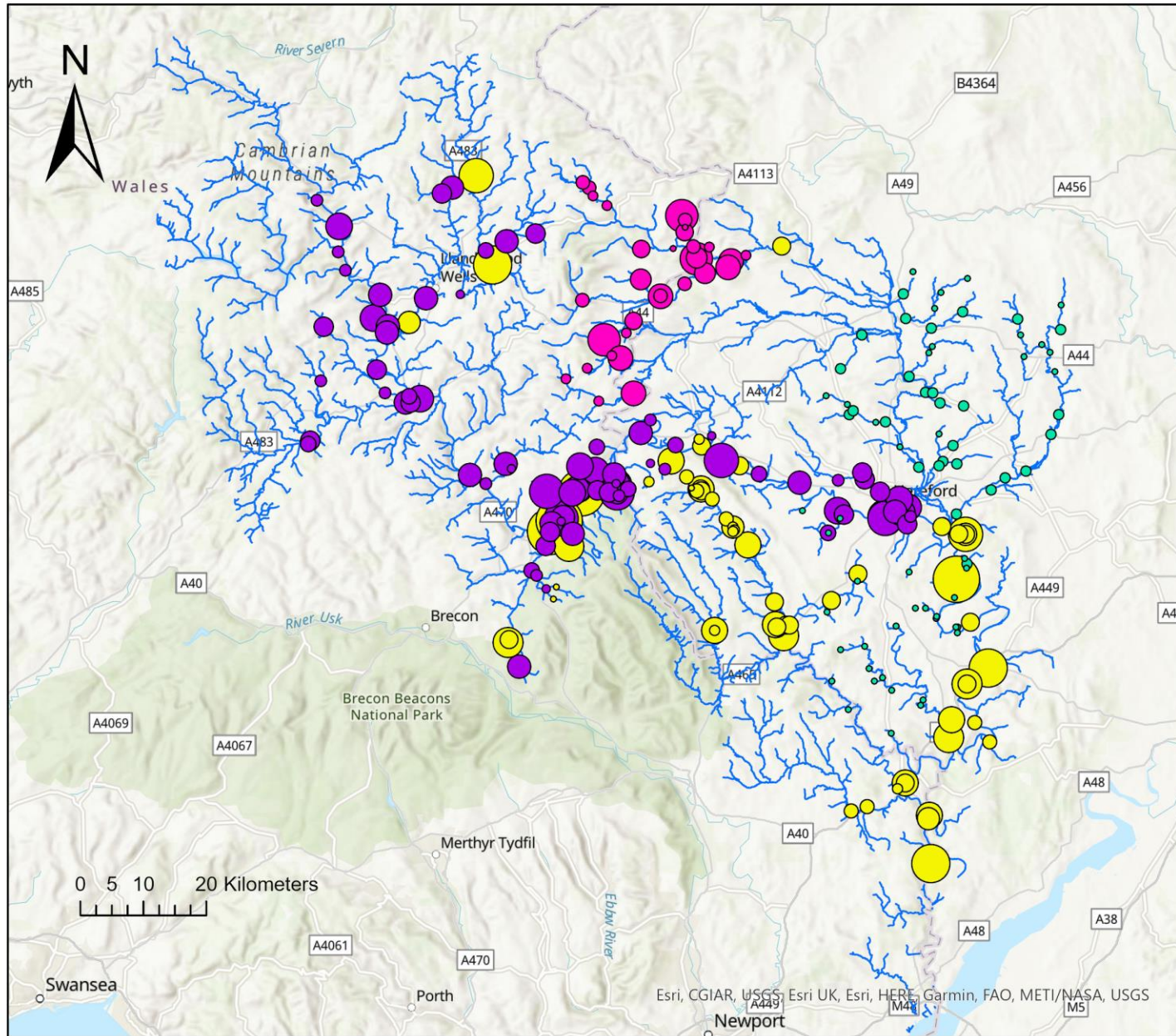
**Citizen Science 2021**

- > 267 sites monitored
- > 4000 citizen science samples



0 15 30 60 Kilometers

Contains OS data © Crown Copyright and database right 2020  
Contains data from OS Zoomstack



- 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

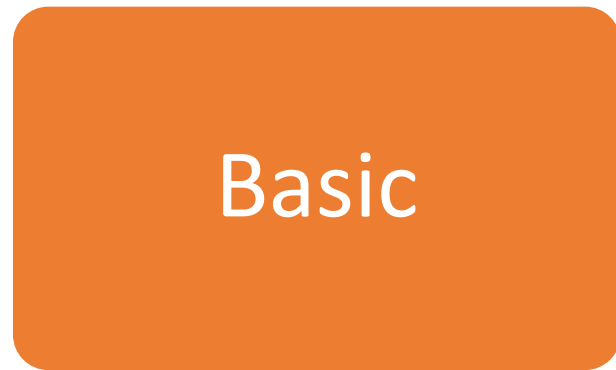
Rainfall in the last 24 hours

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  
(NO<sub>3</sub>-N)  
test strips



La Motte Phosphate (PO<sub>4</sub><sup>3-</sup>)  
test strips

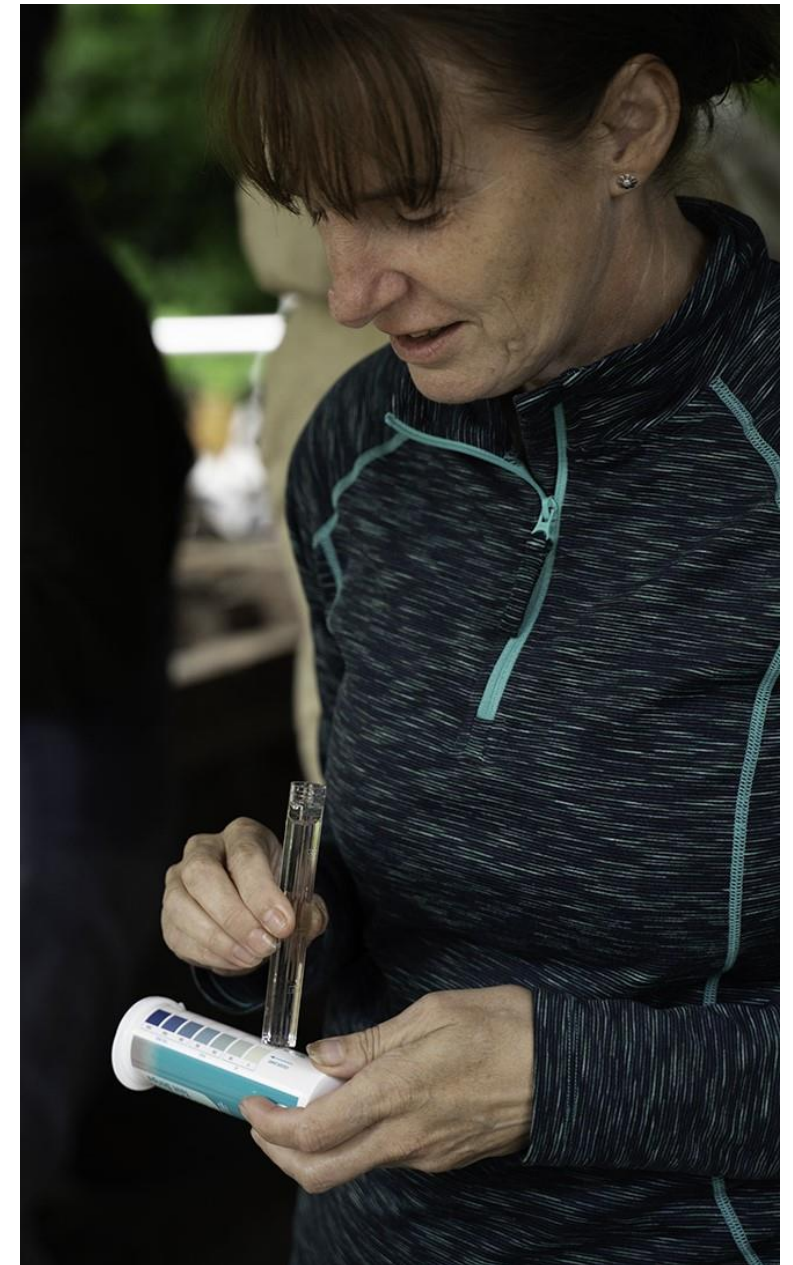
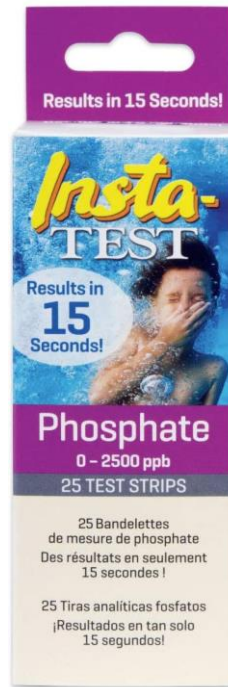
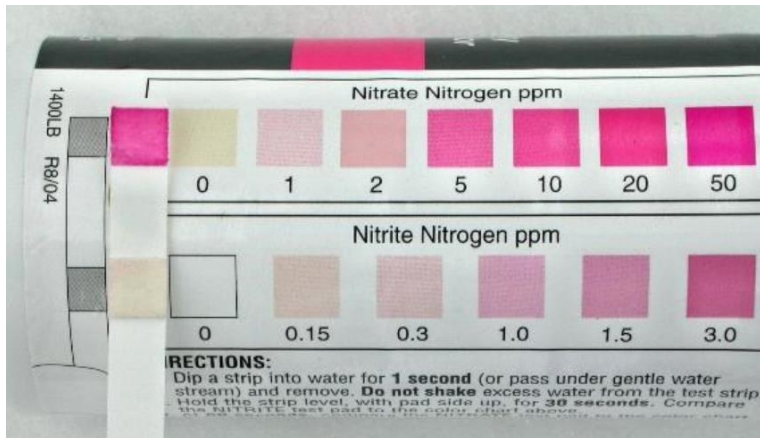
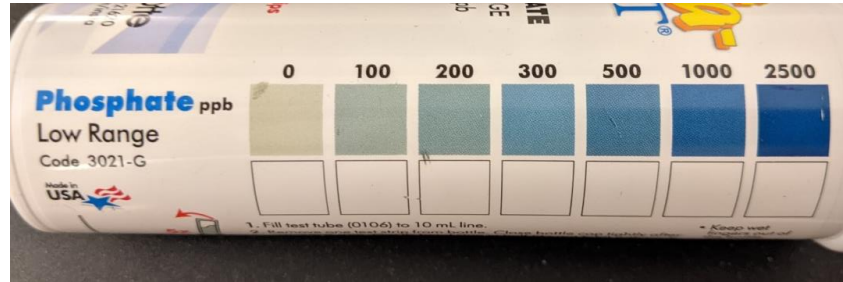


Photo credit:  
biotechnologysolutions.com

Photo credit: Richard Greatrex, FOUW

# Handheld digital colorimeters



Credit: Morgan Jones, WSA

## Hanna Phosphate Low Range Handheld Colorimeter

Measures:  
Phosphate ( $\text{PO}_4^{3-}$ ) in ppm

Range:  
0.00 to 2.50 ppm (mg/L)

Manufacturer's stated precision:  
 $\pm 0.04$  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  $\mu\text{S}$  ( $\mu\text{S}/\text{cm}$ )

Temp. Range:  
→ 0 – 80 degrees Celsius

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



**pH probe**



Credit: Eamon Bourke, FOUW



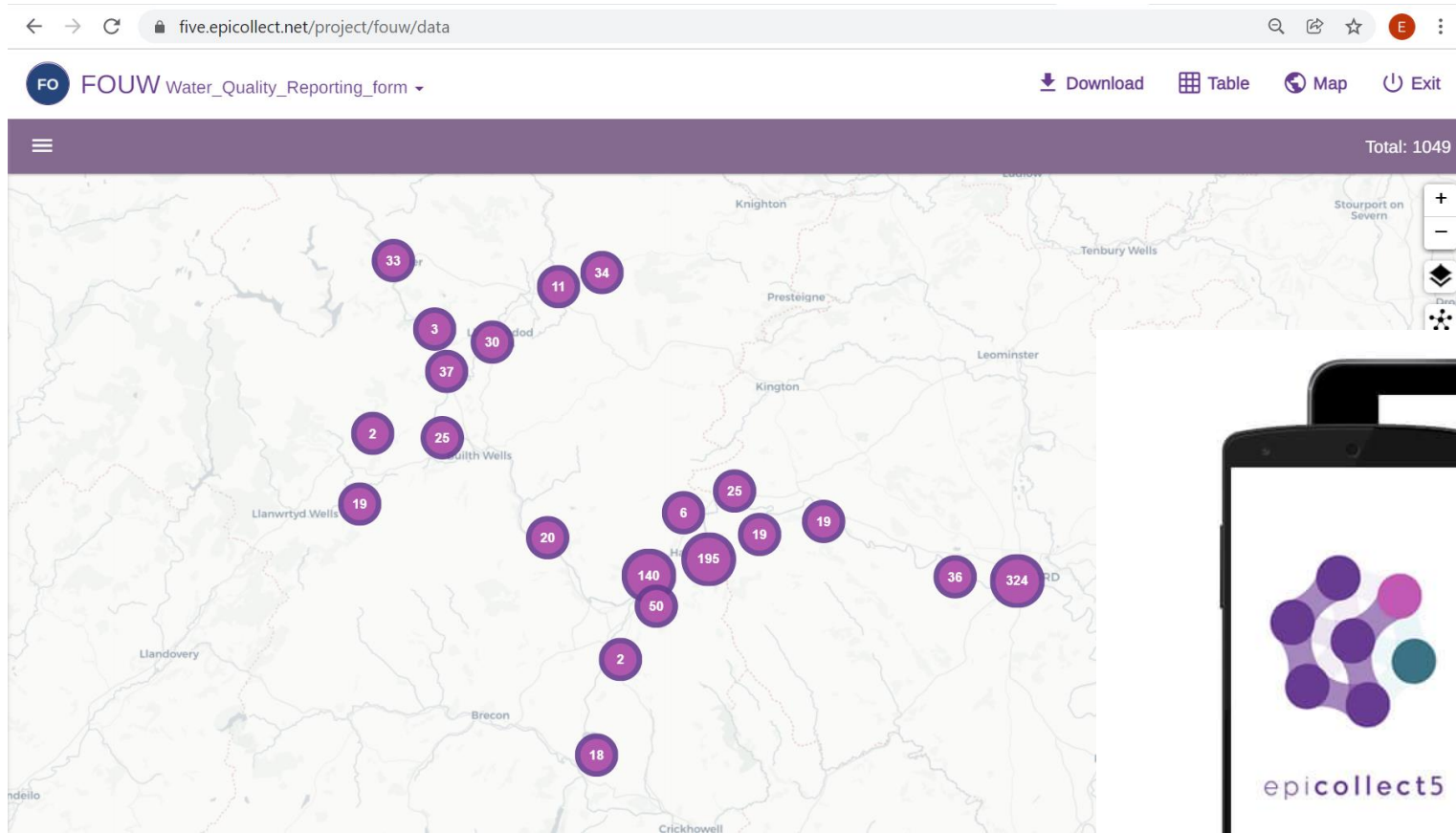
Credit: Shelly signs

**Water level gauge**

**Secchi tube**



# How is data being recorded?



# What can the data show us?



Patterns in water quality across  
a wide area



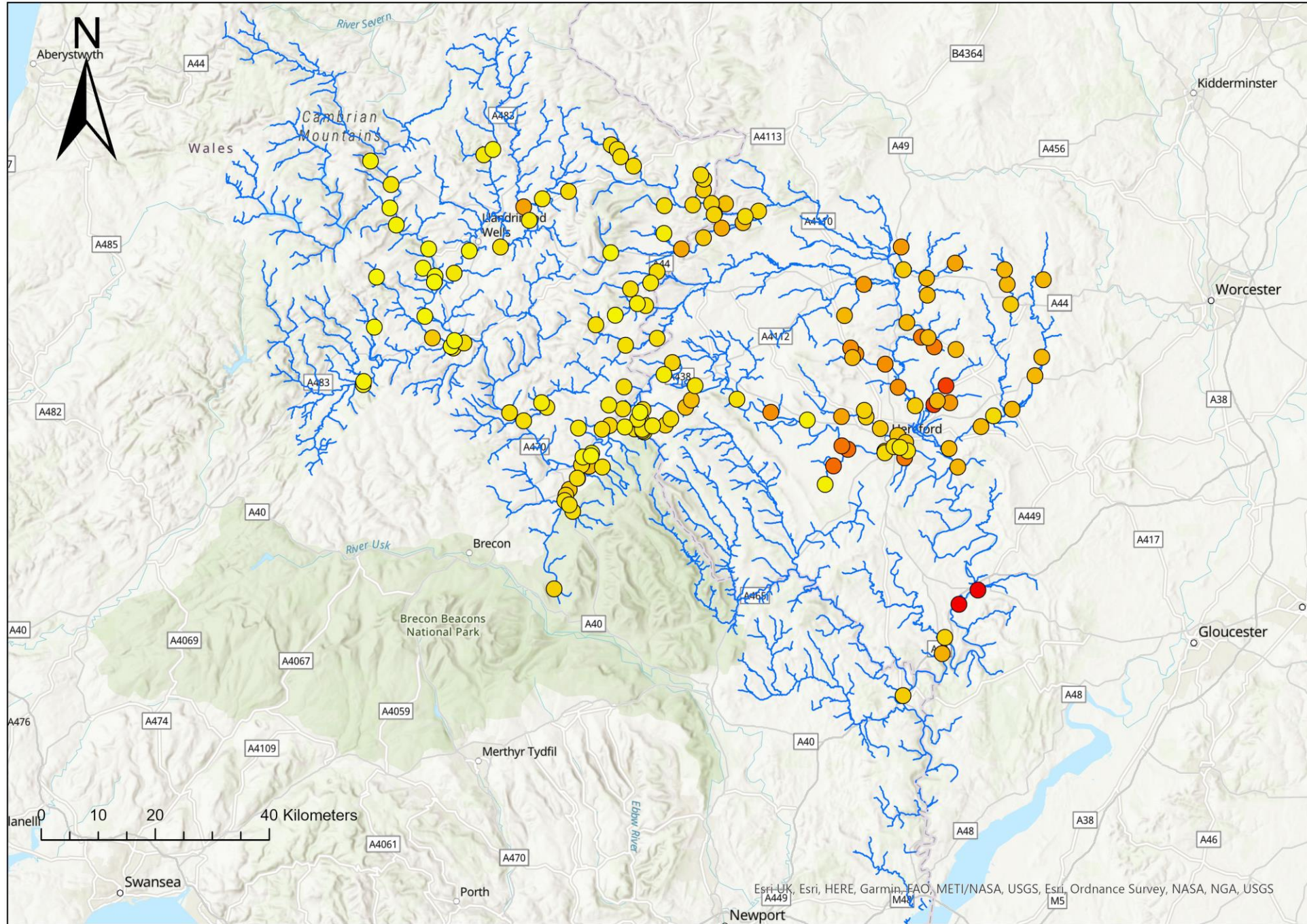
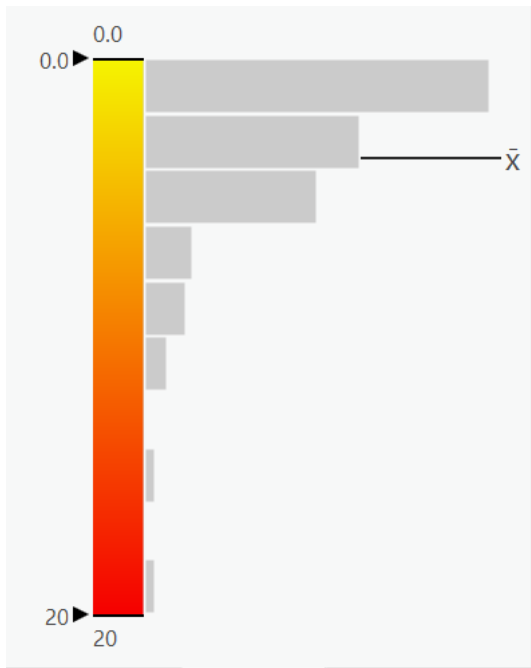
Trends in water quality over  
time



Potential problem sites or  
regions

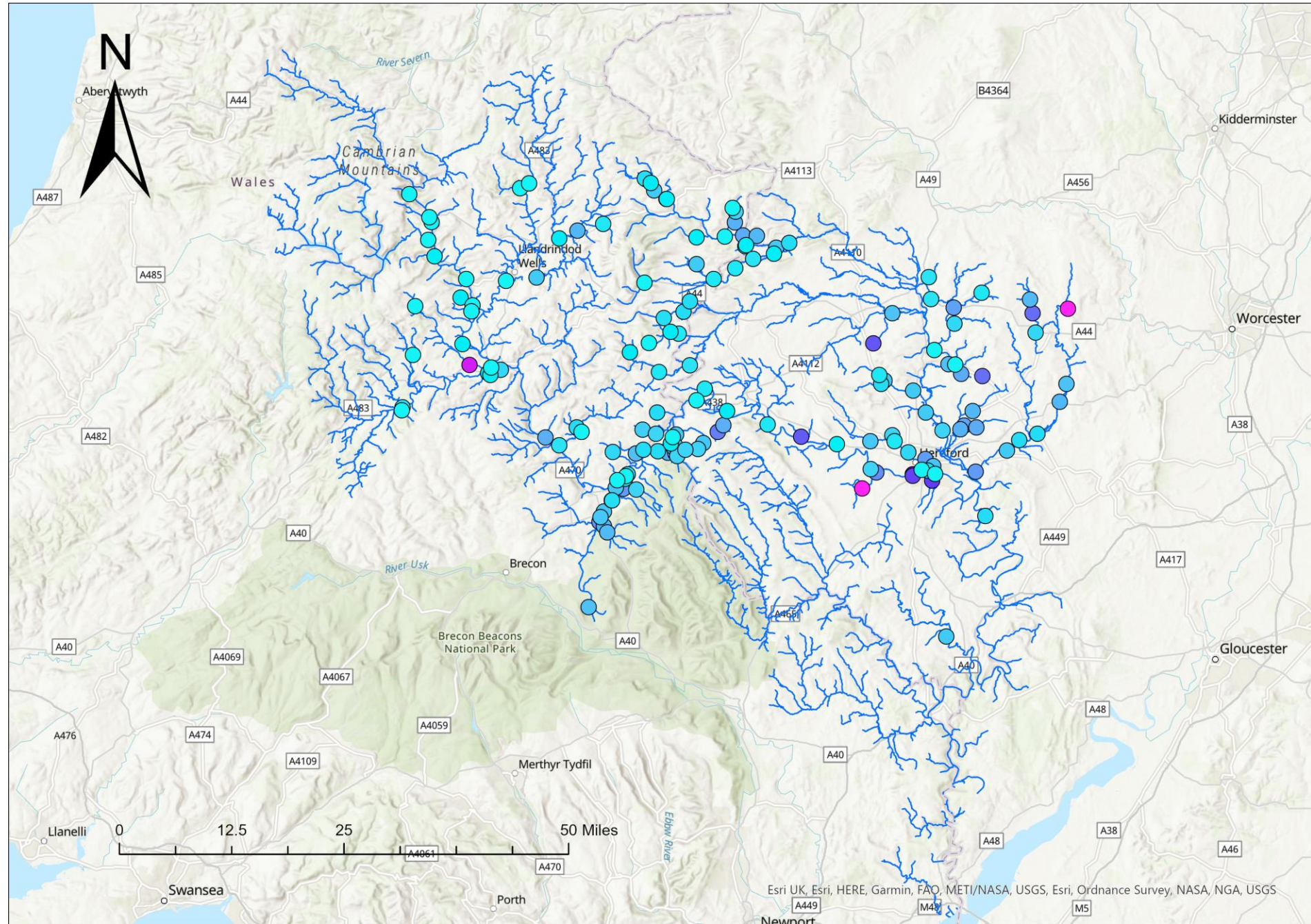
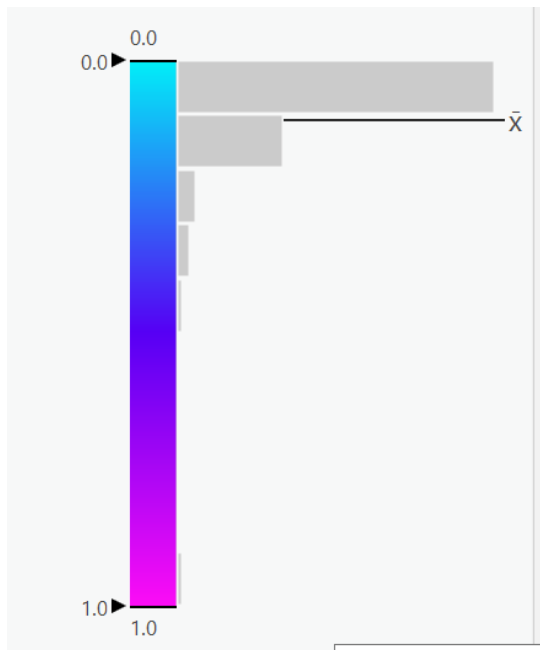
# Mean Nitrate ( $\text{NO}_3\text{-N}$ ) concentrations in ppm

Hach nitrate test strips



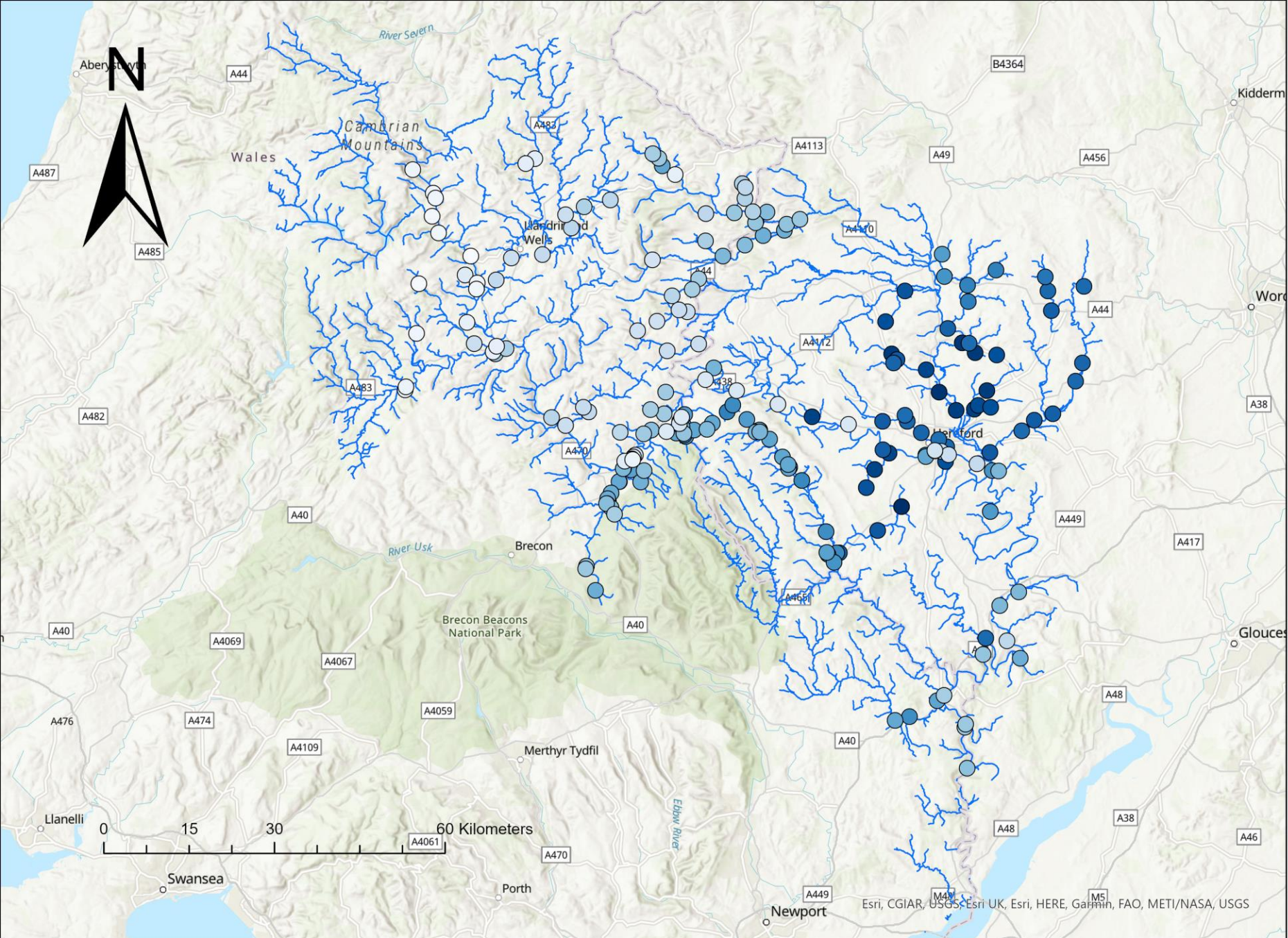
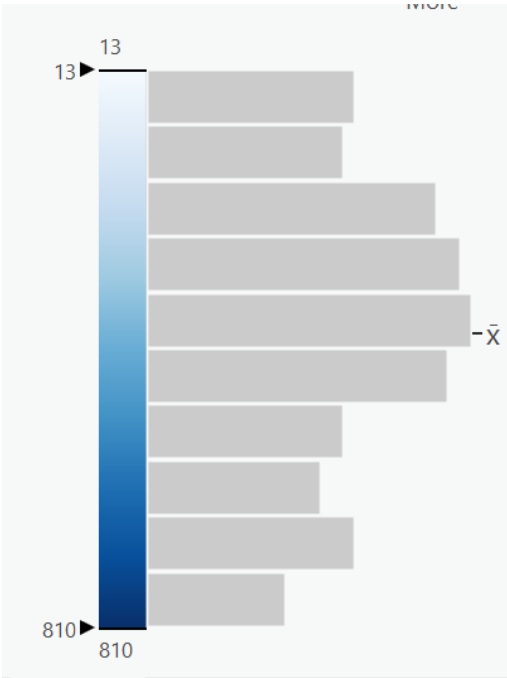
# Mean Phosphate ( $\text{PO}_4^{3-}$ ) concentrations in ppm

La Motte phosphate test strips



# Mean Electrical Conductivity in Microsiemens $\mu\text{S}$

Using HM Digital EC-3 or TDS-3





# Wye Catchment Mass Sampling Events Autumn 2021

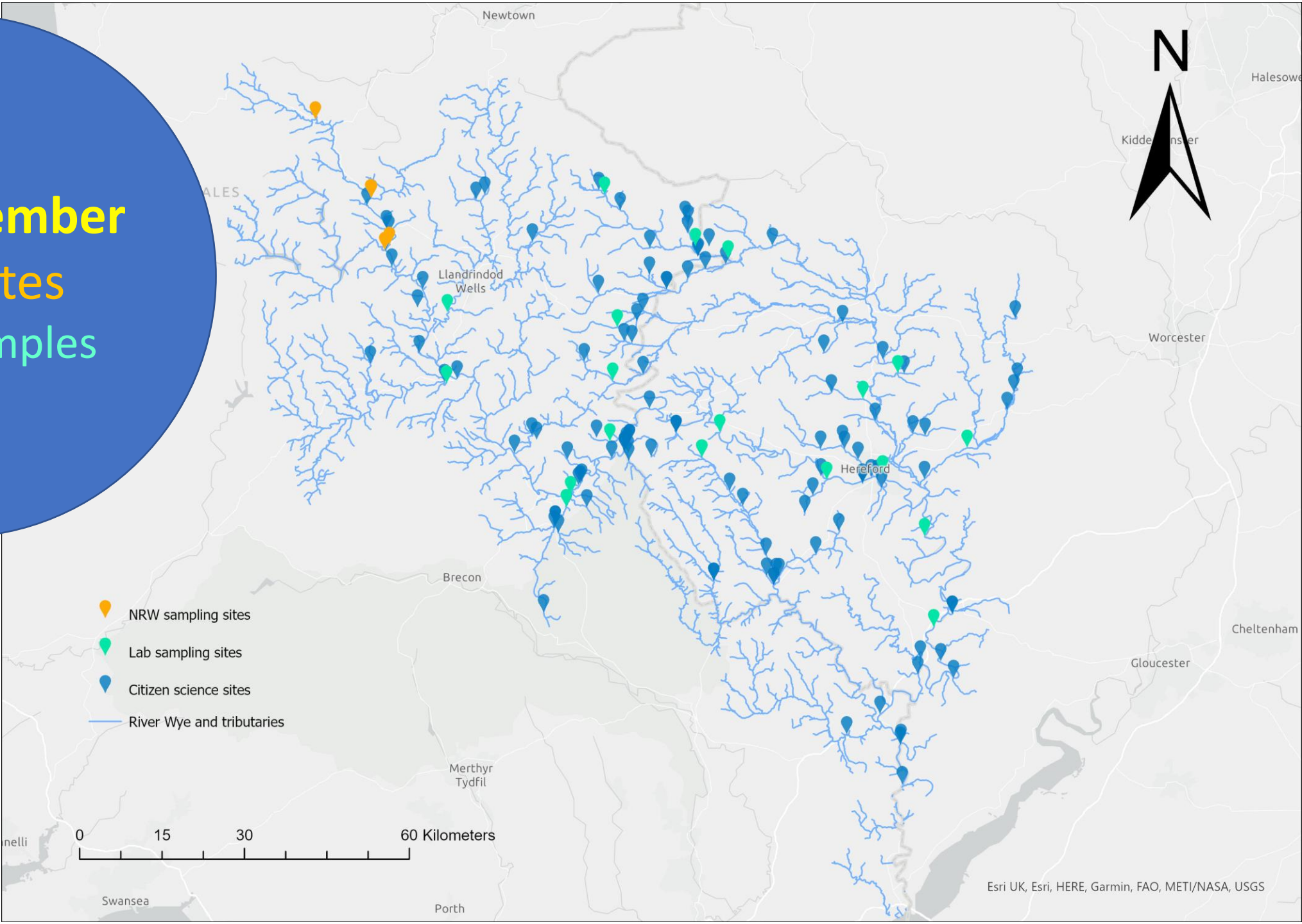
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Photo credit: Richard Greatrex, FOUW



**21<sup>st</sup> September**  
**>135 sites**  
**20 lab samples**

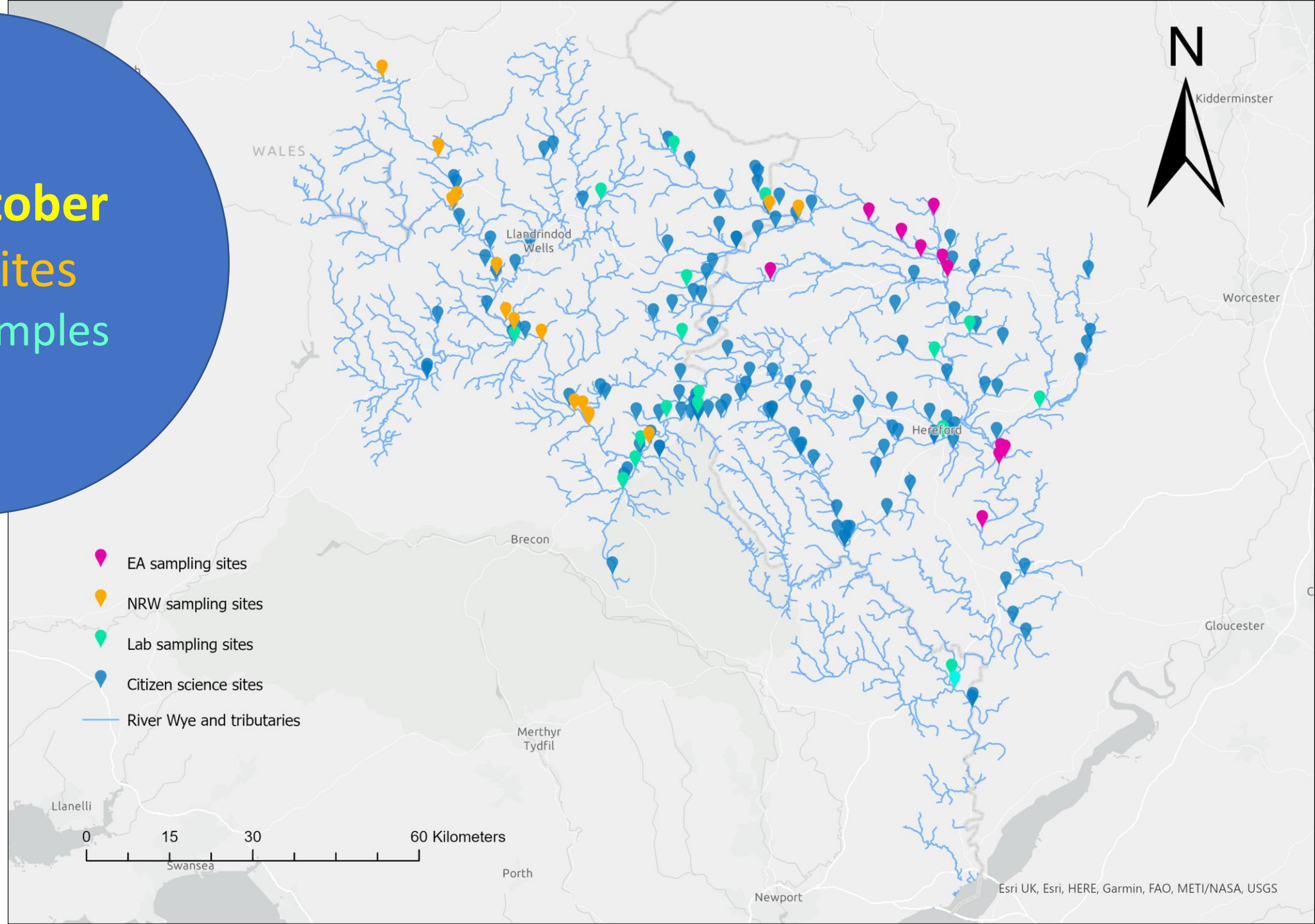


- NRW sampling sites
- Lab sampling sites
- Citizen science sites
- River Wye and tributaries

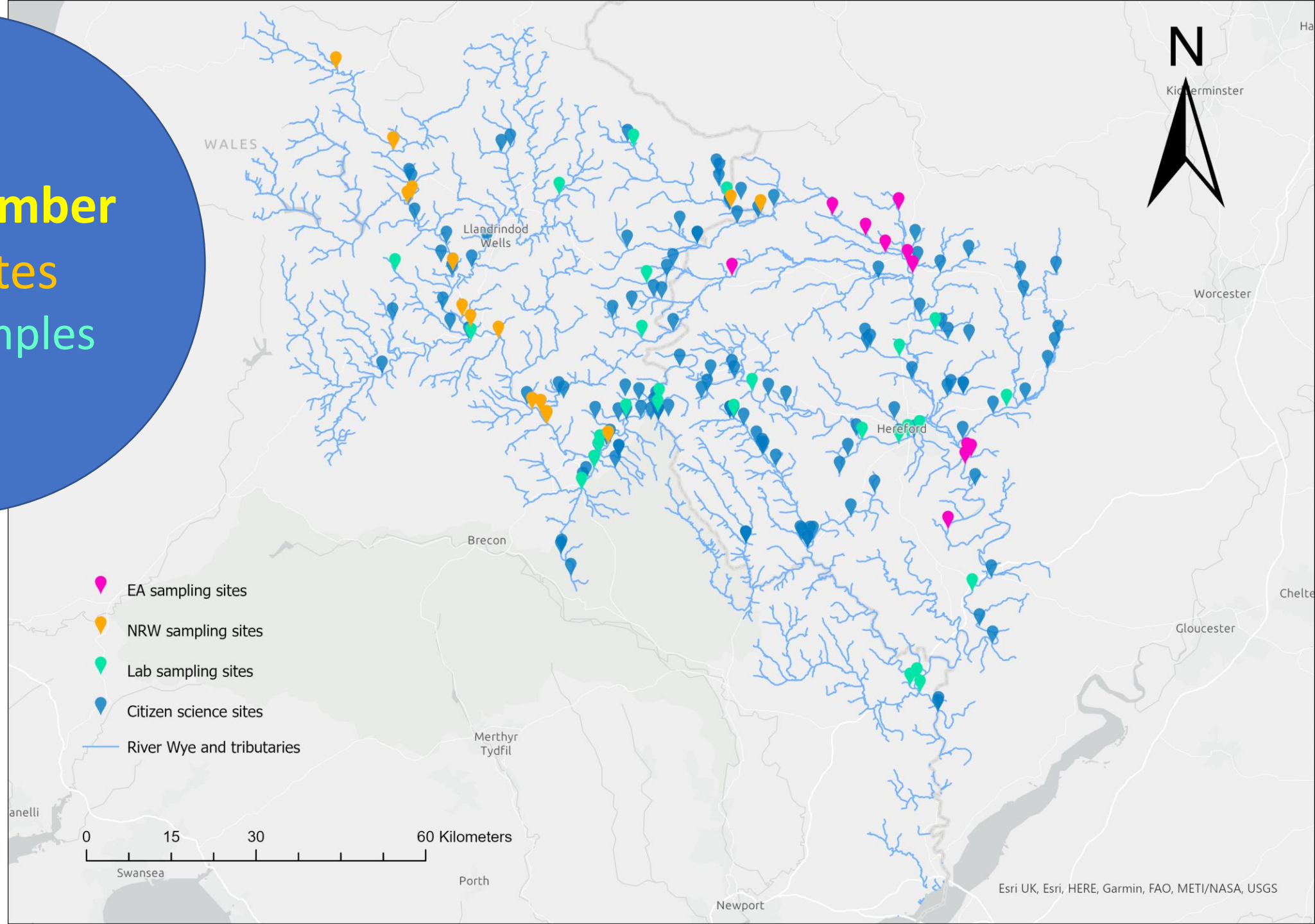
0 15 30 60 Kilometers



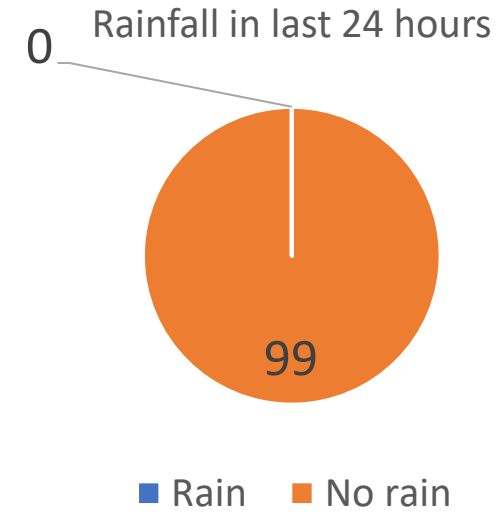
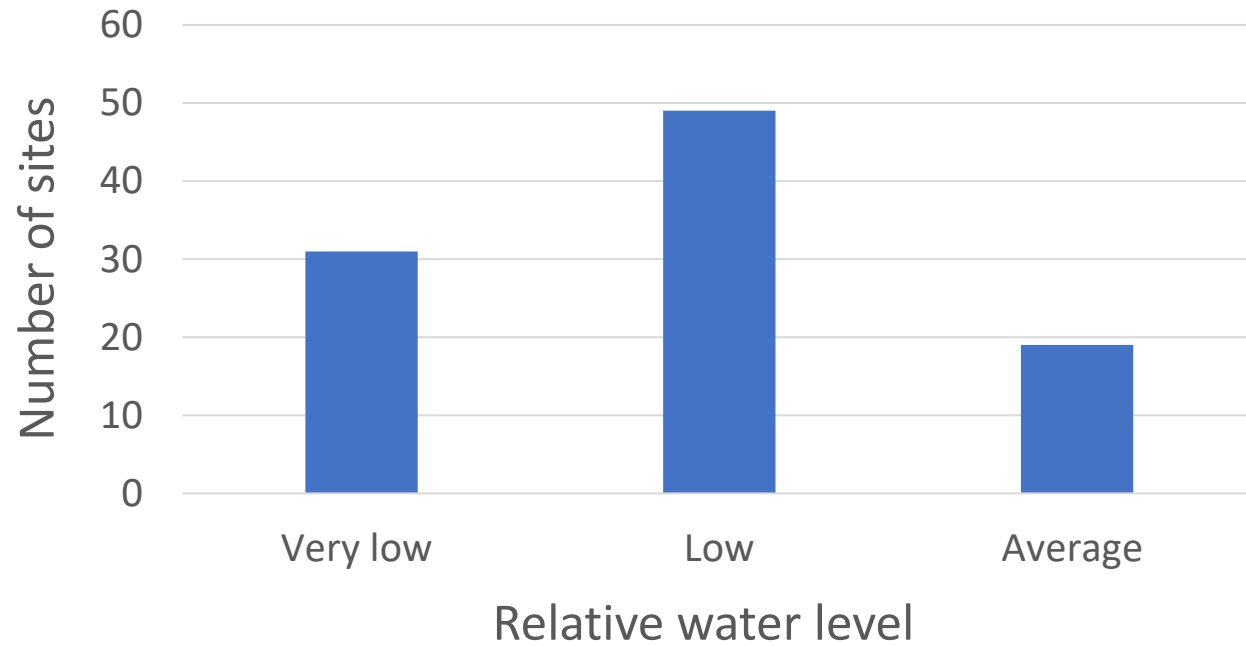
**19<sup>th</sup> October**  
**>145 sites**  
**20 lab samples**



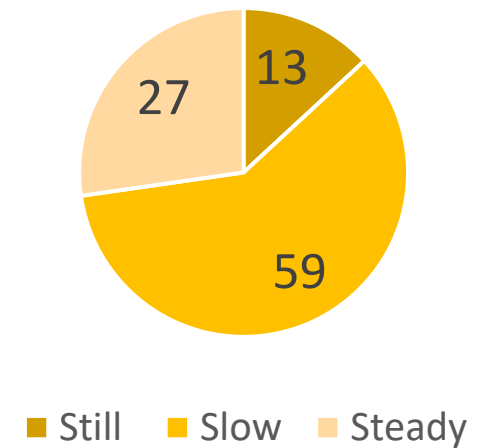
**16<sup>th</sup> November**  
**>165 sites**  
**30 lab samples**



# Snapshot: September mass sampling event



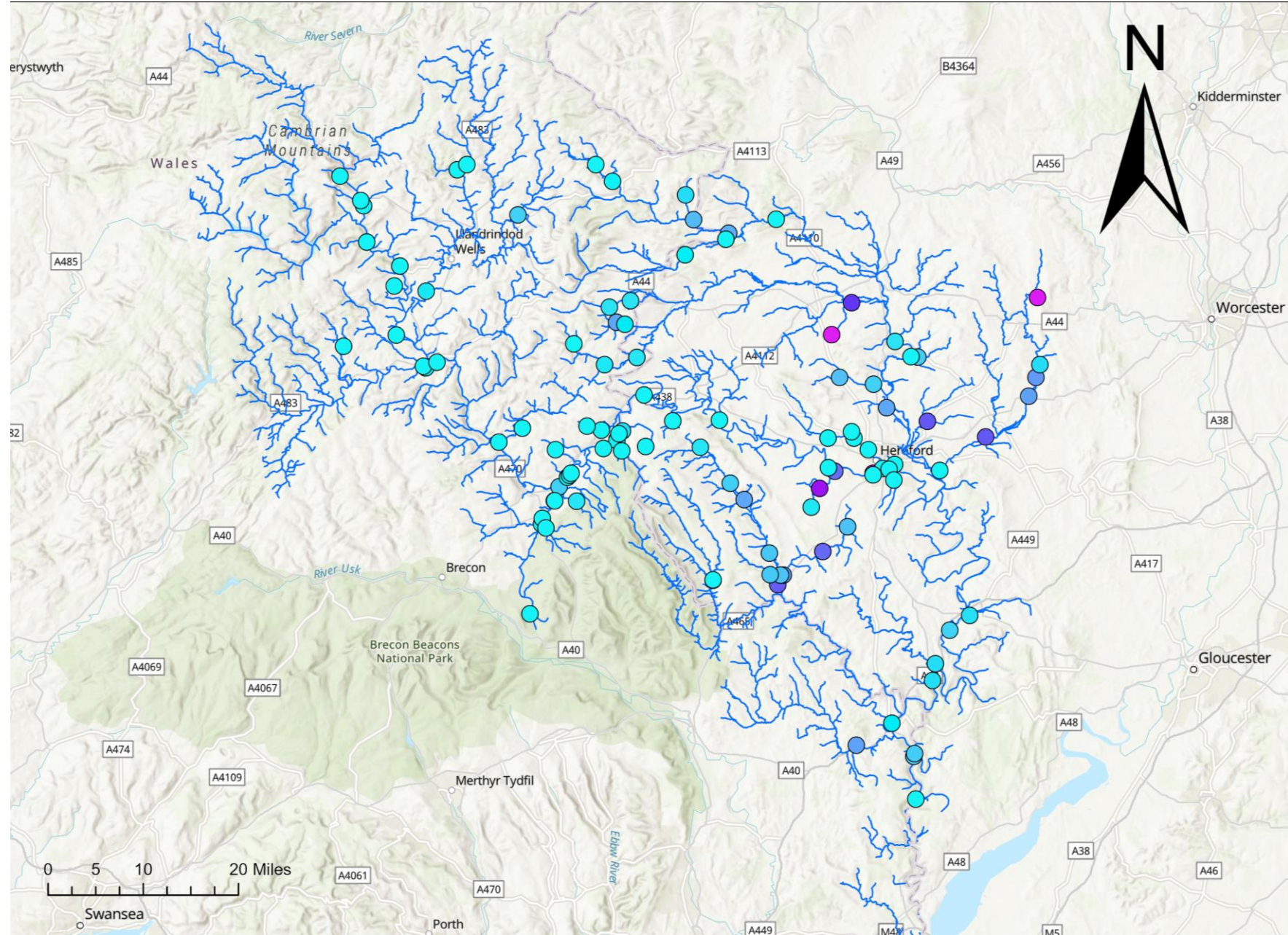
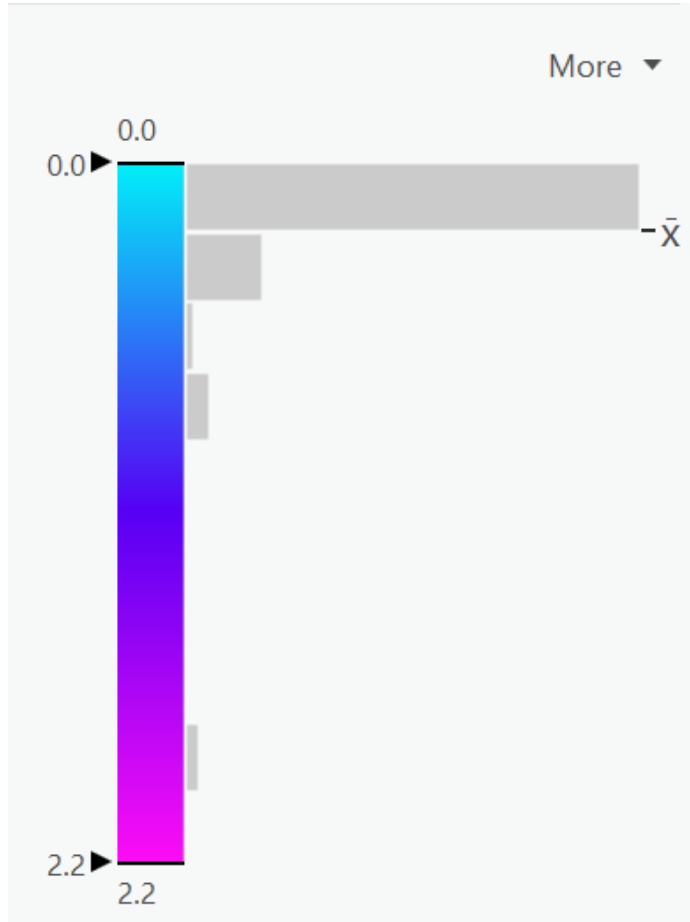
Flow description



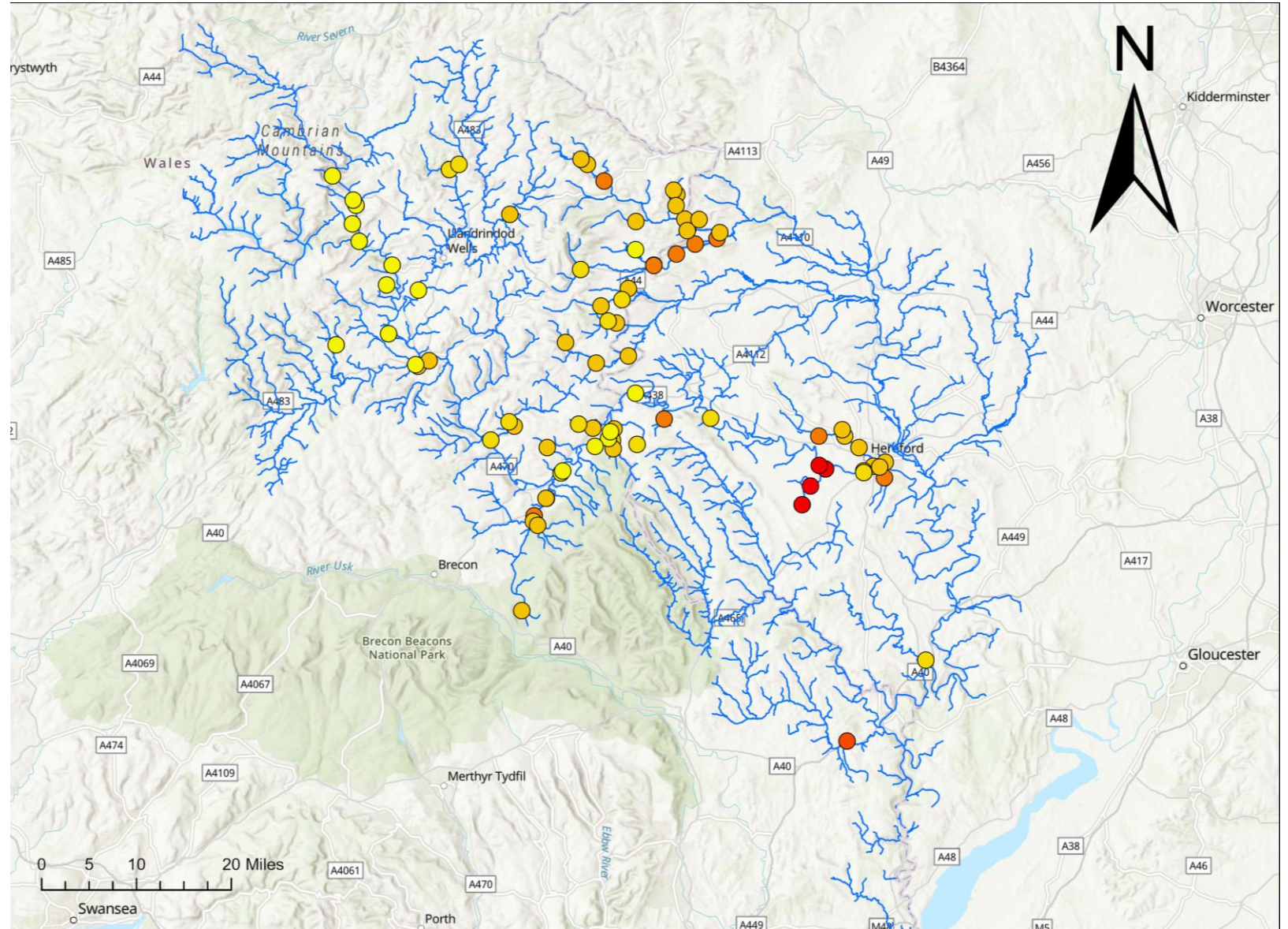
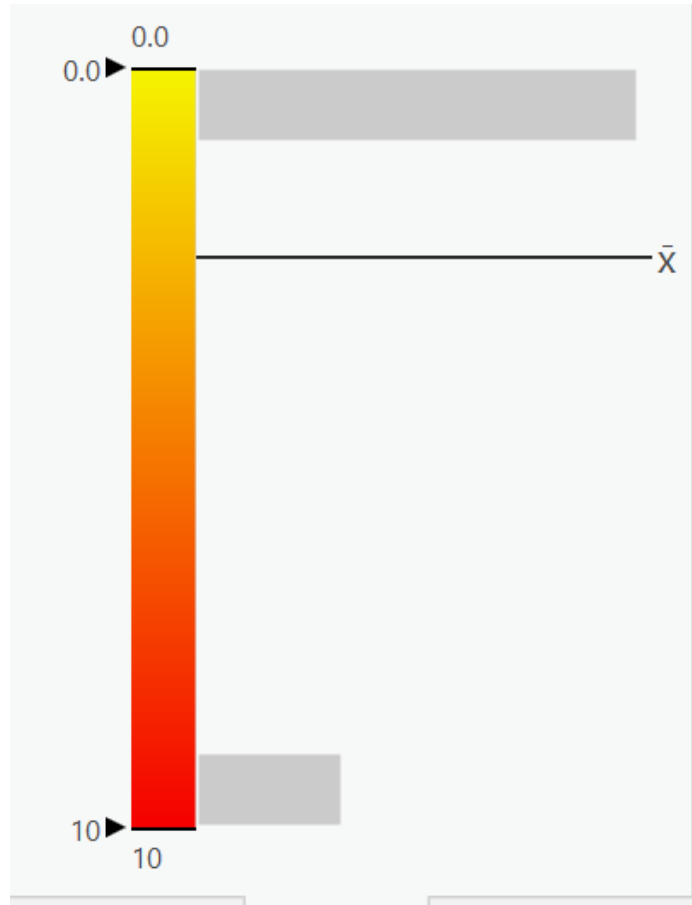
1 algal bloom sighting

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



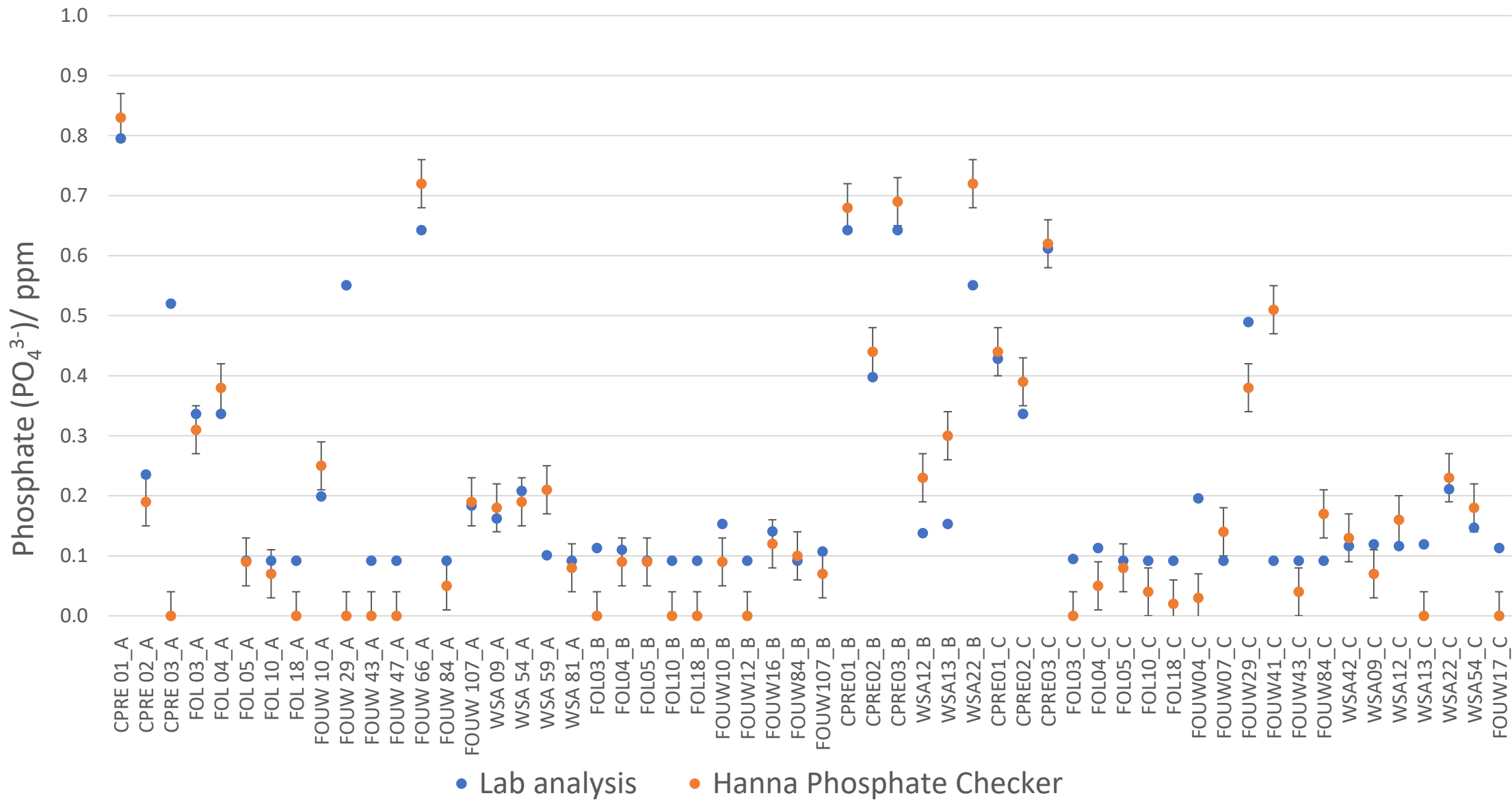
La Motte Phosphate ( $\text{PO}_4^{3-}$ ) test strips



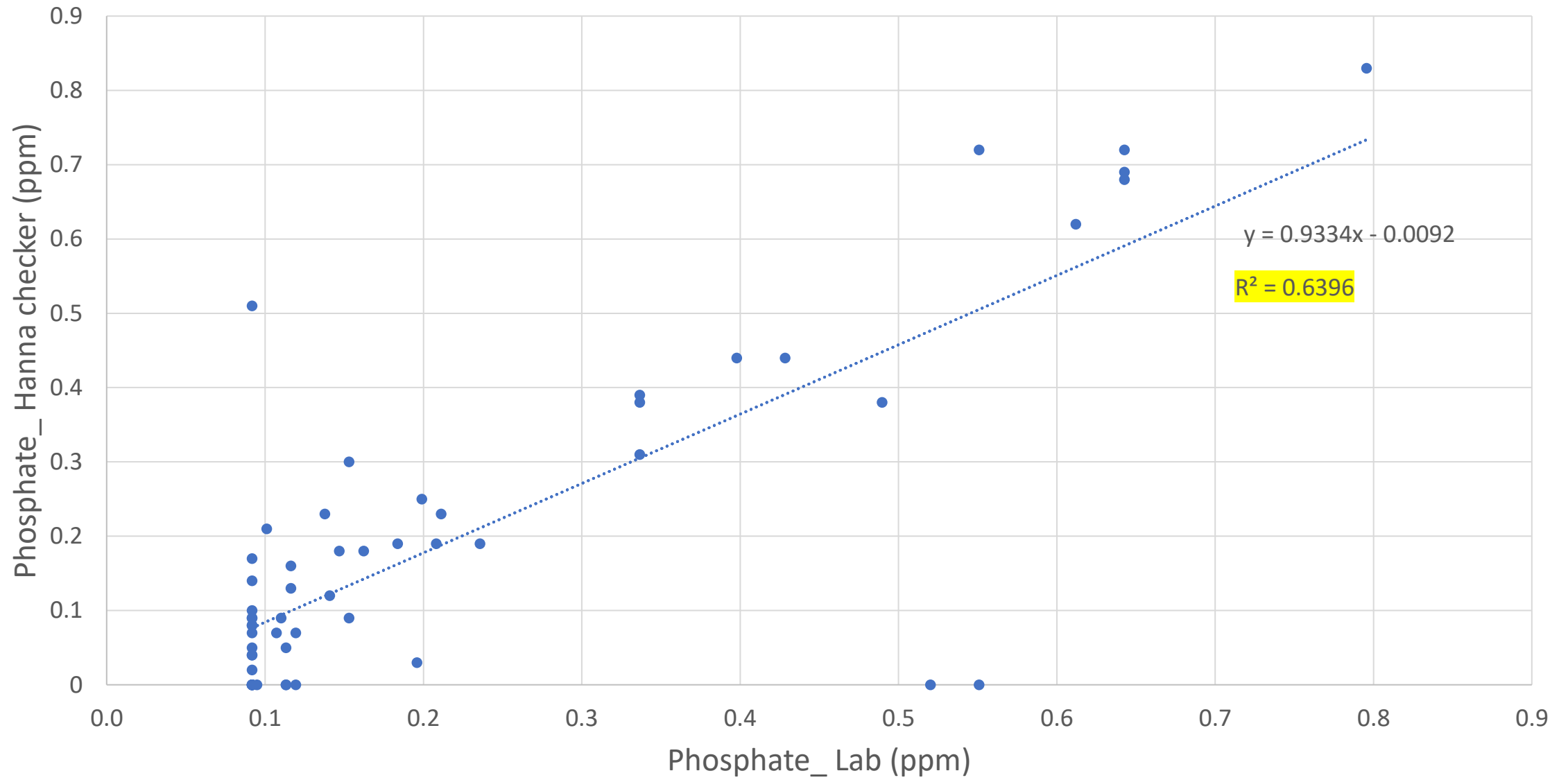
Hanna Phosphate ( $\text{PO}_4^{3-}$ ) Low Range Handheld Colorimeter

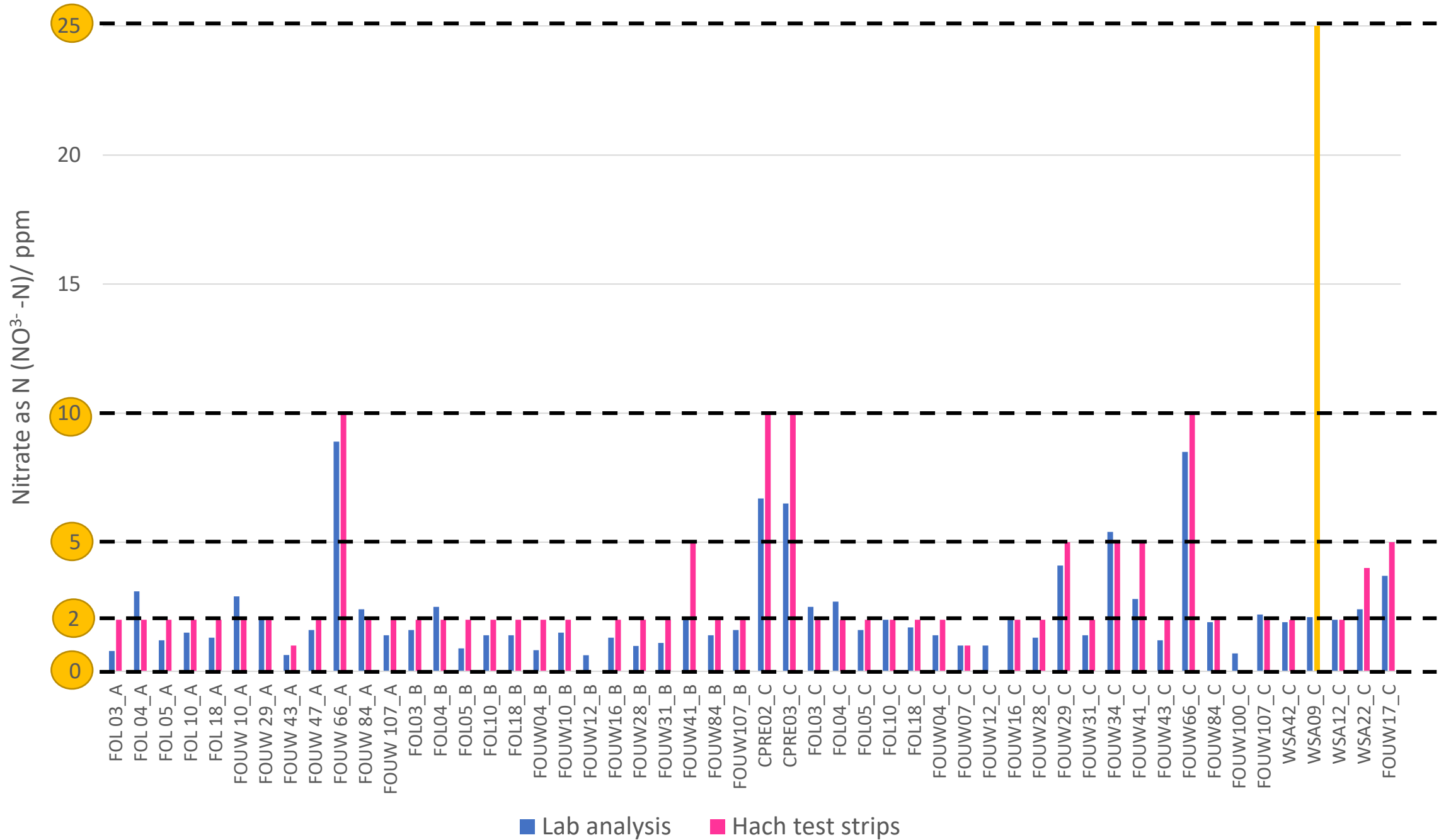


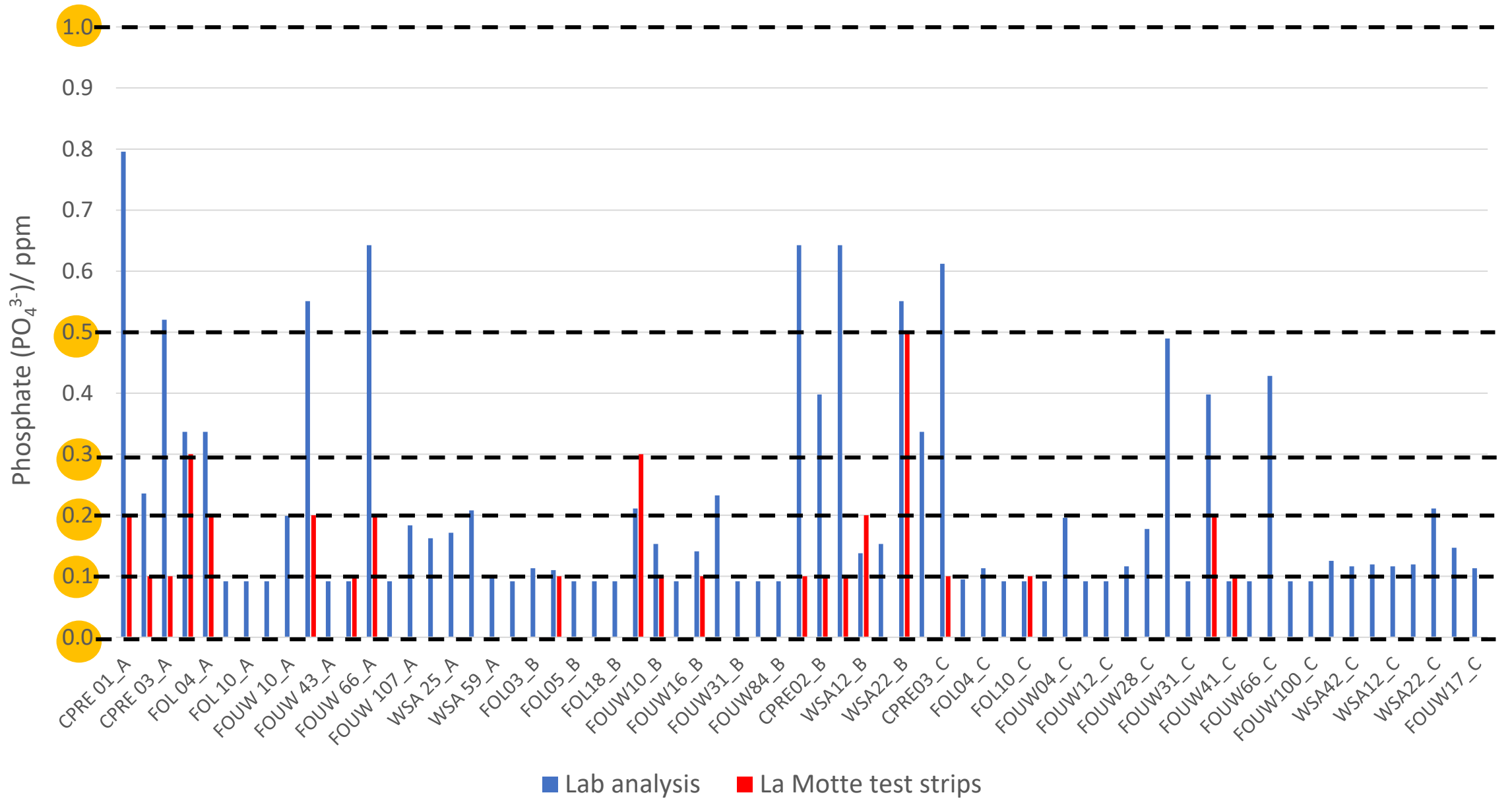
Hach Nitrate ( $\text{NO}_3\text{-N}$ ) test strips













Credit: Richard Greatrex, FOUW

