MONITORING OF THE PAR RIVER AND ITS TRIBUTARIES

The monitoring group operates under the citizen science scheme run by the Westcountry Rivers Trust. Comments and opinions in this report are those of the authors only.

FEBRUARY 2024

Looking downstream from new monitoring point at Lavrean (SX 03134 59164).

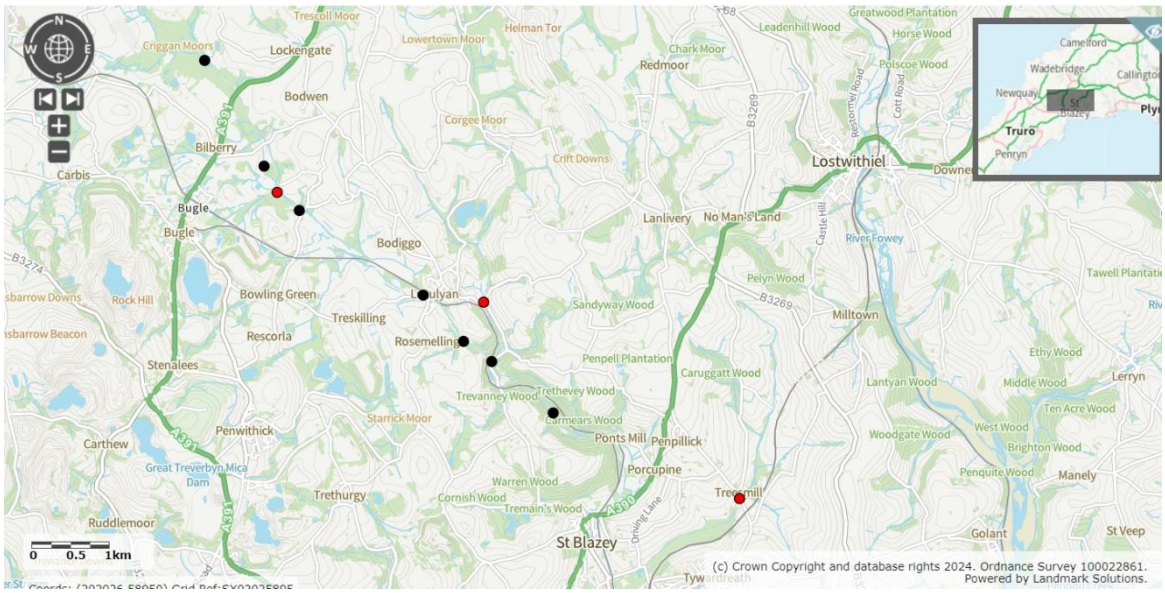
A. OUR FEBRUARY 2024 FINDINGS AT A GLANCE (SEE SECTIONS C TO J FOR FULL PICTURE)

We sampled at 12 locations, including a new one on the Upper Par near Lavrean. The red highlighting shows points of concern.

CRITERIA	UPPER PAR (UPSTREAM OF CONFLUENCE WITH BOKIDDICK STREAM NEAR BLACK HILL CAR PARK) 5 TESTING LOCATIONS	LOWER PAR (FROM CONFLUENCE WITH BOKIDDICK STREAM TO SEA) 3 TESTING LOCATIONS	TRIBUTARIES OF UPPER PAR (CARBIS STREAM, BOKIDDICK STREAM) 2 TESTING LOCATIONS	TRIBUTARY OF LOWER PAR (POLMEAR STREAM) 2 TESTING LOCATIONS
TEMPERATURE (SHOULD NOT EXCEED 18˚ CELSIUS)	Average 10.48˚ Celsius	Average 11.76˚ Celsius	Average 11.2˚ Celsius	Average 12.5˚ Celsius
TOTAL DISSOLVED SOLIDS (SHOULD NOT EXCEED 300 PPM)	70.4 PPM	**350.33 PPM*** ***877 at Par Beach slipway**	78 PPM	133 PPM
TURBIDITY (SHOULD BE <12 ON SECCHI TUBE. FOR AVERAGING ANY READING <12 IS COUNTED AS 11)	10	5.66	32.5	11.5
PHOSPHATES (SHOULD NOT EXCEED 100 PPB)	60 PPB	**133.33 PPB**	0 PPB	0 PPB
RIVERFLY TRIGGER LEVEL (SHOULD BE ≥ 6)	N/A	Sampling suspended until next spring.	N/A	N/A
WILDLIFE EVIDENCE	Squirrel	Dipper, heron, squirrel, ducks	Otter spraint (not at CSI spot), robin, woodpigeon, heron, egret, mallard ducks, rook	Jay, great tit, dunnock (all heard)
EVIDENCE OF POLLUTION	Smell (Cam Bridges), foam.		Debris, china clay, litter	None

B. FEBRUARY 2024 MONITORING POINTS

This month monitoring occurred at 12 locations. Monitoring points along the main Par River are shown in black. Those in red are on tributaries. **Source:** https://magic.defra.gov.uk/MagicMap.aspx



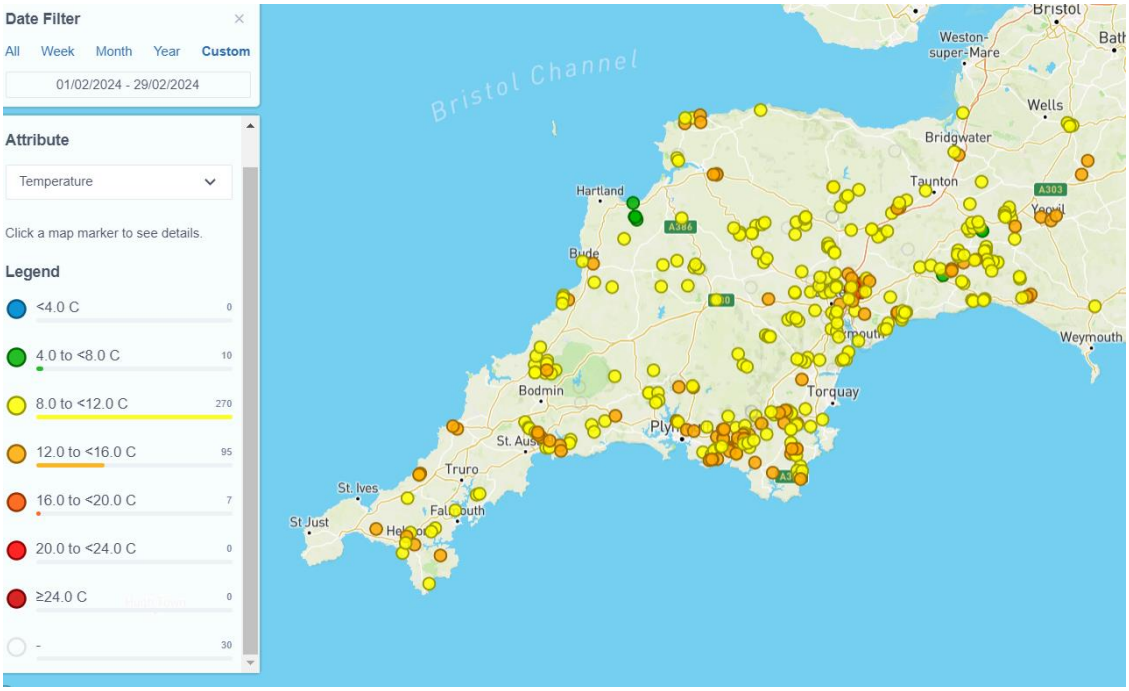
LOCATION	DATE	TYPE OF CHECK	MONITORED BY
Criggan Moors, Par River, SX 01882 61133	10/2/2024	CSI sample & Cartographer record.	Roger Smith
South of Minorca Lane, Par River, SX02668 59747	10/2/2024	CSI sampling. Cartographer record.	Roger Smith
Carbis Stream SX 02834 59401	10/2/2024	CSI sampling. Cartographer record.	Roger Smith
Lavrean, Par River SX 03134 59164 NEW SITE	10/2/2024	CSI sampling. Cartographer record.	Roger Smith
Luxulyan allotments, Par River, SX 04732 58045	10/2/2024	CSI sampling. Cartographer record.	Roger Smith
Cam Bridges, Par River, SX 05292 57454	11/2/2024	CSI sampling. Cartographer record.	Roger Smith
Gatty's Bridge, Bokiddick Stream SX 05531 57953	14/2/2024	CSI sampling. Cartographer record.	Joan Farmer
Treffry Viaduct, Par River, SX 05650 57179	14/2/2024	CSI sampling. Cartographer record.	Joan Farmer
Lady Rashleigh Mine, Par River, SX 06451 56509	14/2/2024	CSI sampling. Cartographer record.	Dave Burrell, Joan Farmer
Treesmill, Tywardreath Stream, SX 08873 55385	18/2/2024	CSI sampling. Cartographer record.	Maggie Tagney
Par Beach slipway, SX 0776 53261	12/2/2024	CSI sampling. Cartographer record.	Brian Harrisson
Polmear Stream, Ship Inn SX 08749 53417	12/2/2024	CSI sampling. Cartographer record.	Simon Tagney

C. TEMPERATURE

1. This is the WRT's explanation of why this is monitored:

Temperature is a vital parameter within the river ecosystem. It controls many of the aquatic species life cycles. Temperature fluctuates with the seasons; however, you do get variation within that, particularly in small rivers and streams. Another important reason to measure temperature is to track the impact of our warming climate on our waterbodies.

Geographical comparison. Source: Cartographer.



3. Results February 2024

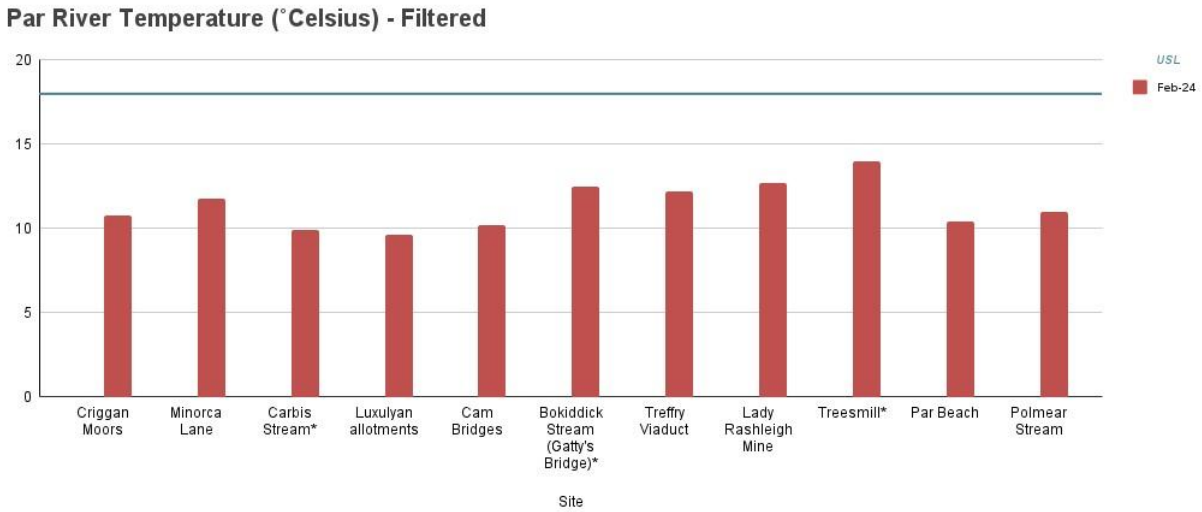
PAR RIVER/TRIBUTARY	LOCATION	Temperature ˚Celsius
Par	Criggan Moors, SX 01882 61133	10.8
Par	South of Minorca Lane, Par River, SX 02657 59788	11.8
Tributary	Carbis Stream SX 02834 59401	9.9
Par	Lavrean, Par River SX 03134 59164 NEW SITE	10
Par	Luxulyan allotments, Par River, SX 04732 58045	9.6
Par	Cam Bridges, Par River, SX 05292 57454	10.2
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	12.5
Par	Treffry Viaduct, Par River, SX 05650 57179	12.2
Par	Lady Rashleigh Mine, Par River, SX 06451 56509	12.7
Tributary	Treesmill, Tywardreath Stream, SX 08873 55385	14
Par	Par Beach slipway, SX 0776 53261	10.4
Tributary	Polmear Stream, Ship Inn, SX 08749 53417	11

Results above the temperature at which fish and other organisms can function healthily will be shown in red. At present, 18 ˚Celsius is being used as the upper safe limit for fish and other creatures, although 20˚ Celsius has recently been suggested by WRT instead.

From December 2023 all readings have been taken with the new thermometer/TDS device. Previously, all Upper Par readings, except for Lady Rashleigh Mine, have been taken with the old device. There is a worrying discrepancy with the readings on the older devices.

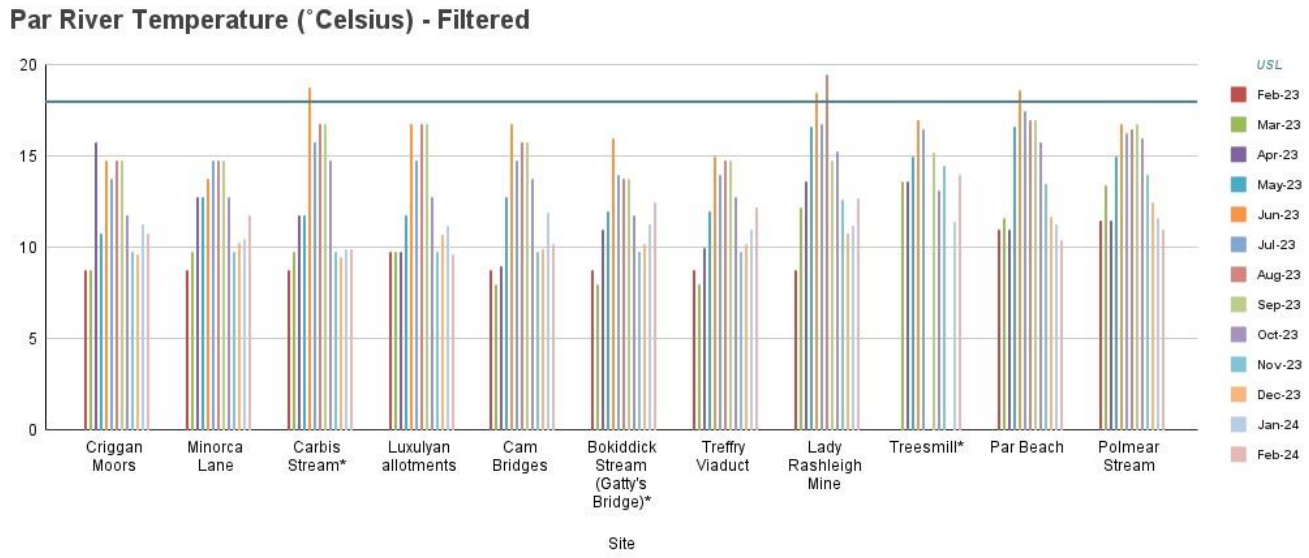
4. Graphs

(a) This month



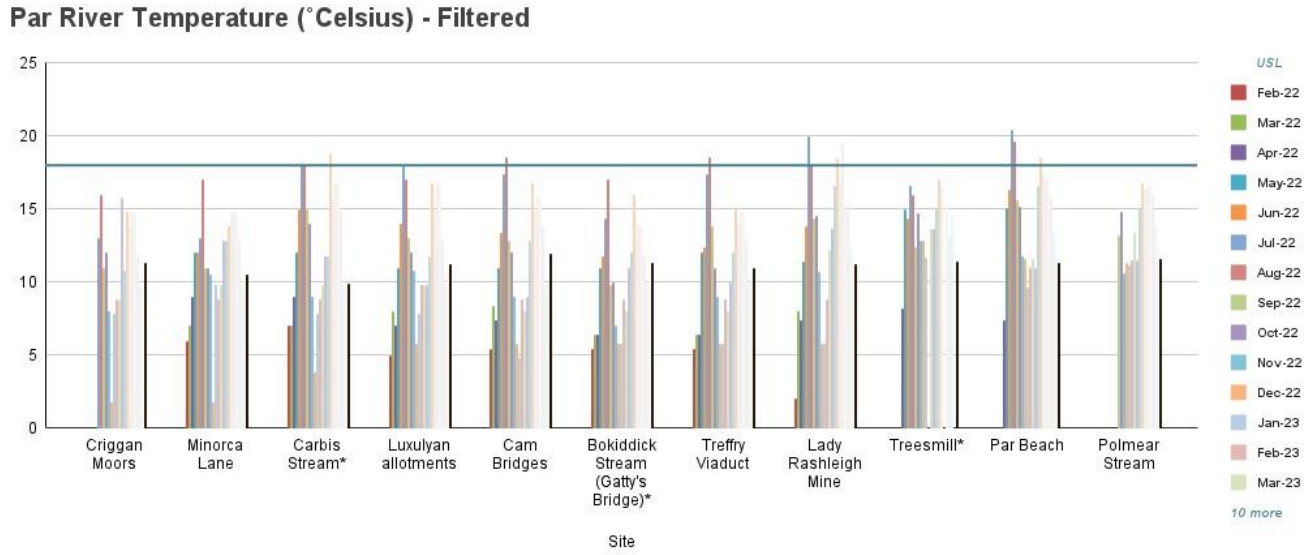
*Indicates a tributary.

(b) From 1st February 2023 to now



*Indicates a tributary.

(c) From 1st February 2022 until now:



*Indicates a tributary.

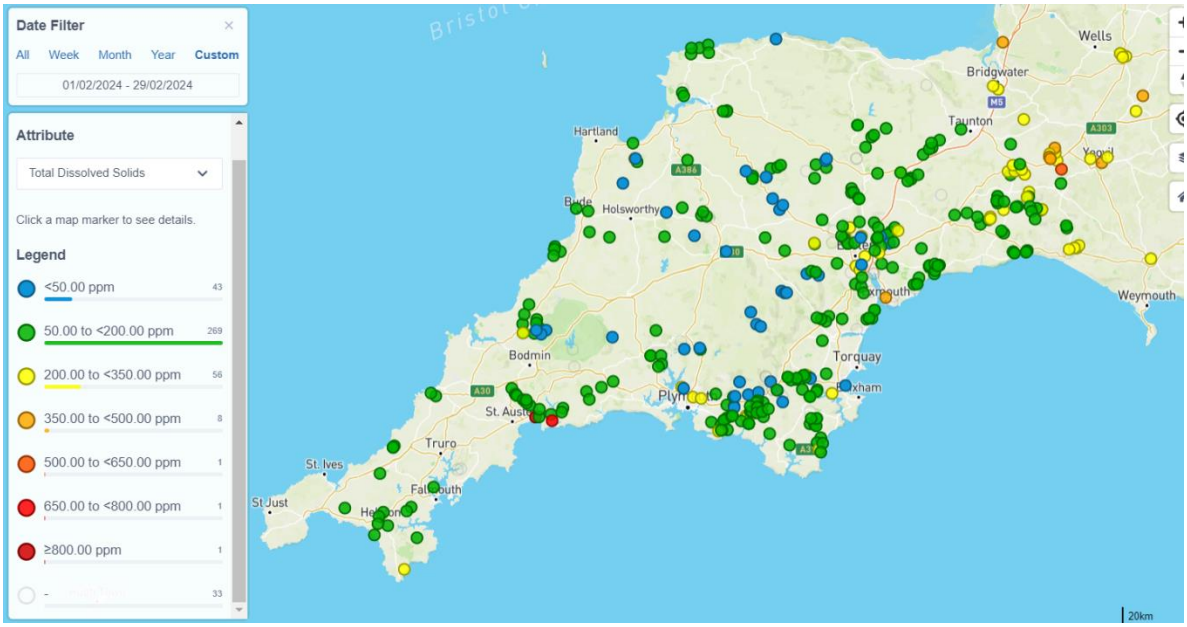
D. TOTAL DISSOLVED SOLIDS

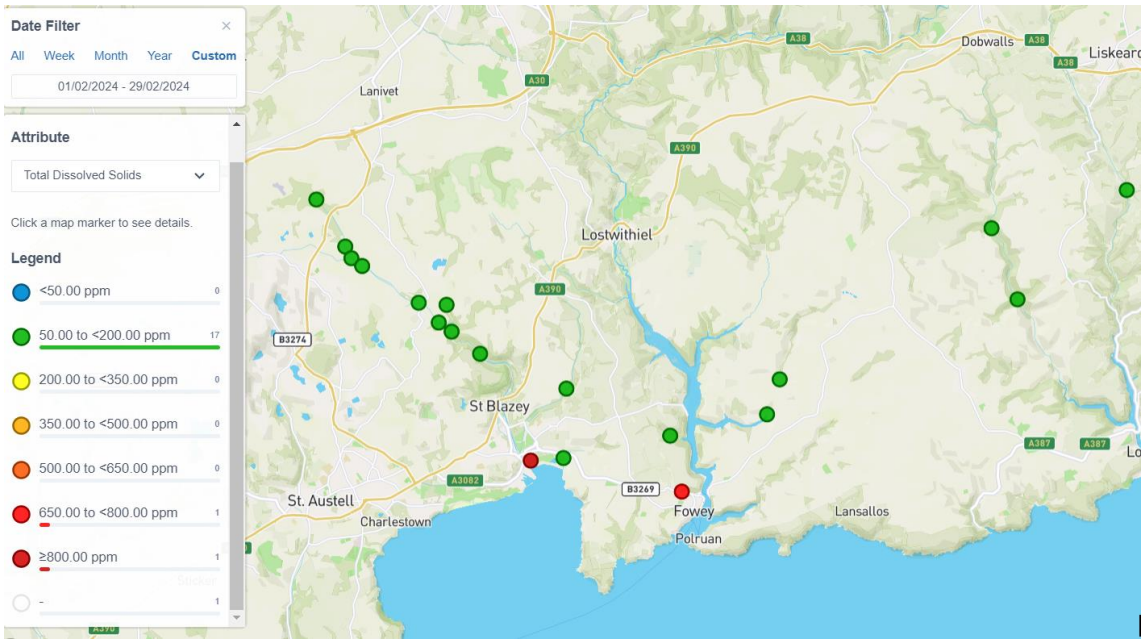
1. We measure these in ppm (parts per million). This is the WRT's explanation:

Total Dissolved Solids (TDS) is directly related to the conductivity of the water. The more minerals, salts and metals that are dissolved in the water the more conductive it gets. Low levels of dissolved solids in waters such as those on Dartmoor near to the source of the river are a result of very low levels of input from the surrounding landscape. As the river runs down to the sea it

collects material from many different inputs, some natural and some man-made such as farms, sewage plants, factories and residential areas. This typically increases the amount of solids dissolved in the water leading to a higher reading. Harmful pollution from things like sewage, slurry and factory discharge will usually elevate your TDS reading. However, some pollutants such as oil can lower conductivity; therefore it should be used as a general indicator of water quality not a specific measure of toxicity. Geology will influence the normal level of conductivity in a watercourse (e.g. Areas dominated by granite generally give a lower conductivity than those with limestone). Regular monitoring will allow the detection of changes in conductivity which can indicate pollution.

2. Geographical comparison. Source: Cartographer.





3. Results February 2024

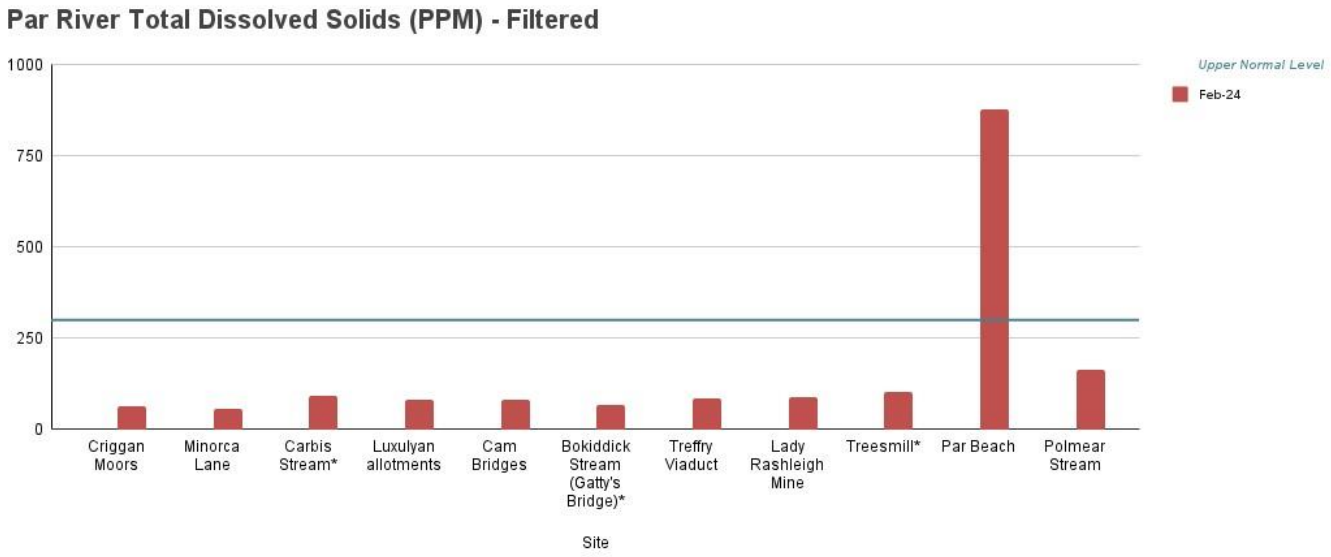
PAR RIVER/TRIBUTARY	LOCATION	Total Dissolved Solids PPM
Par	Criggan Moors, SX 01882 61133	64
Par	South of Minorca Lane, Par River, SX 02657 59788	56
Tributary	Carbis Stream SX 02834 59401	91
Par	Lavrean, Par River SX 03134 59164 NEW SITE	70
Par	Luxulyan allotments, Par River, SX 04732 58045	81
Par	Cam Bridges, Par River, SX 05292 57454	81
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	65
Par	Treffry Viaduct, Par River, SX 05650 57179	86
Par	Lady Rashleigh Mine, Par River, SX 06451 56509	88
Tributary	Treesmill, Tywardreath Stream, SX 08873 55385	103
Par	Par Beach slipway, SX 0776 53261	877
Tributary	Polmear Stream, Ship Inn, SX 08749 53417	167

Upper Normal Level

The WRT advice for this river is that it should not exceed 300 ppb.

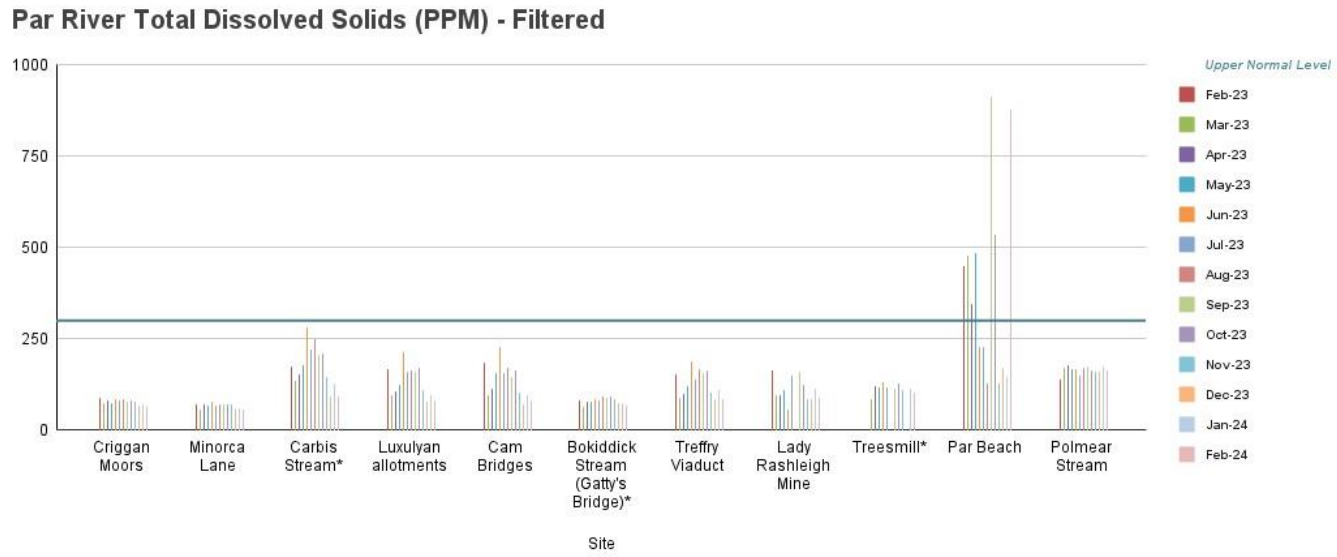
4. Graphs

(a) This month



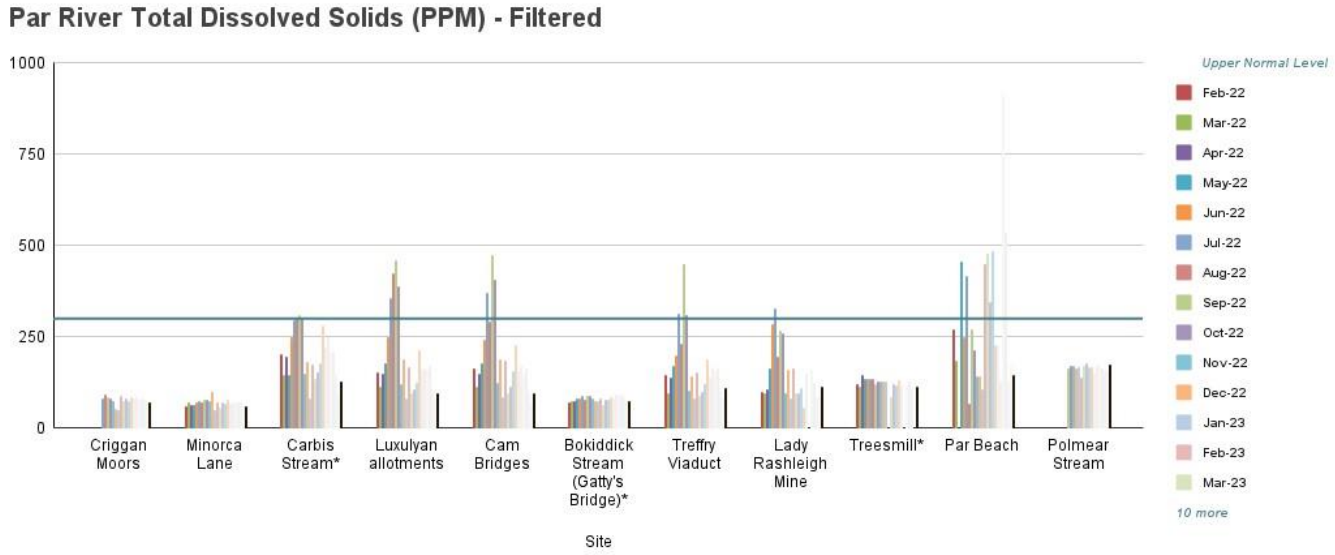
*Indicates a tributary.

(b) From 1st February 2023 to now



*Indicates a tributary.

(c) From 1st February 2022 until now:



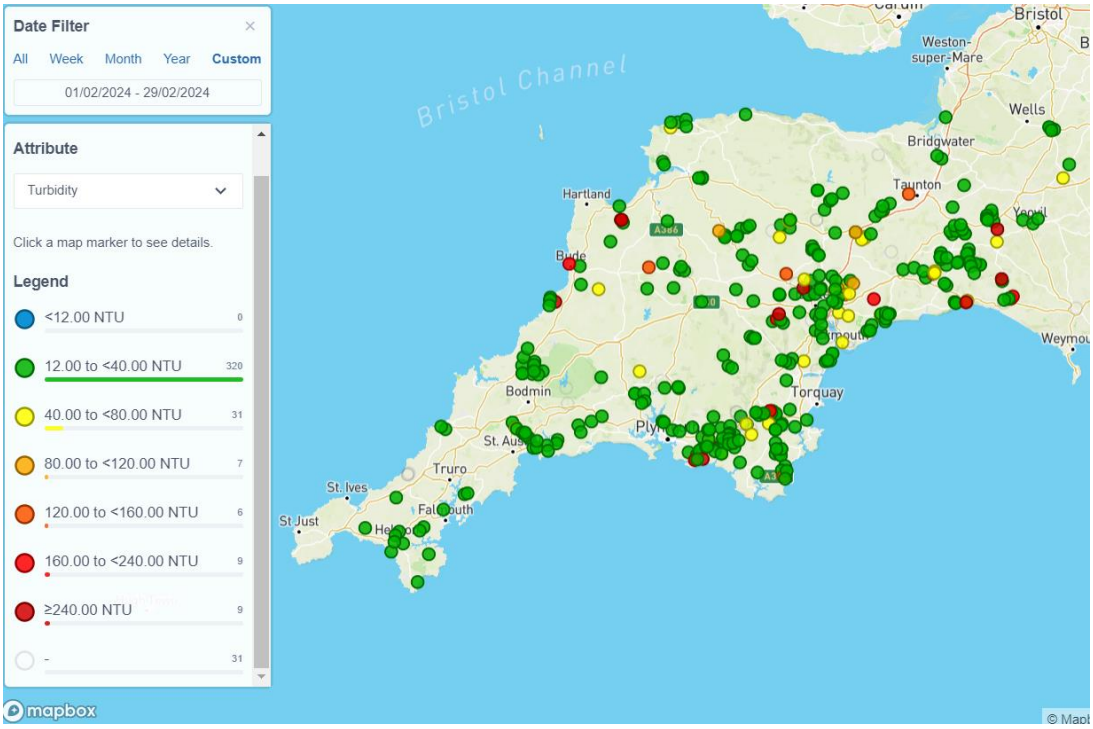
E. TURBIDITY

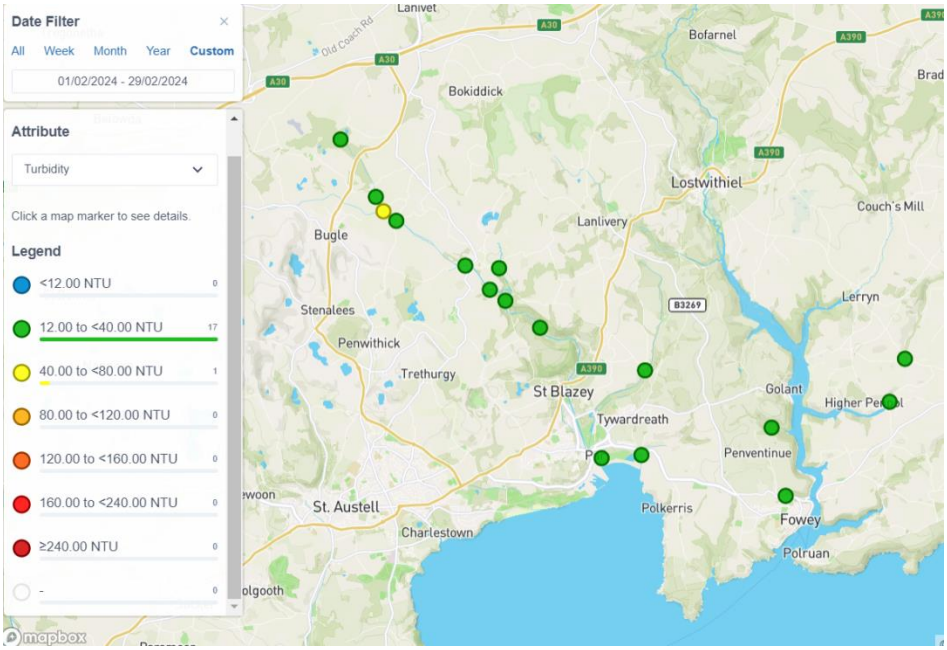
1. This is the WRT explanation of this measure:

Turbidity tube is a measure of the optical clarity of the water. The more suspended particles in the water the lower the clarity and the higher the turbidity. You will often find your waterbody gets more turbid after heavy rainfall due to soil running off the fields and sediment being mixed into the water column. This loss of topsoil is both a problem for farmer and river. It can often contain chemicals from the fertiliser and pesticides used on the land. An increase in sediment level on the substrate of the river can cause smothering of habitat by removing light and oxygen.

Aquatic wildlife such as the less mobile invertebrates and fish eggs struggle to survive in low oxygen conditions and without light, plants are unable to grow. It is a good idea to sample your river after different weather conditions to understand how it responds to rainfall or drought.

2. **Geographical comparison.** Where scores are shown as 0, it means that the reading using the Secchi tube was <12. Source: Cartographer. Most of our results should have blue dots (<12) but Cartographer shows them as 12 (green dots).



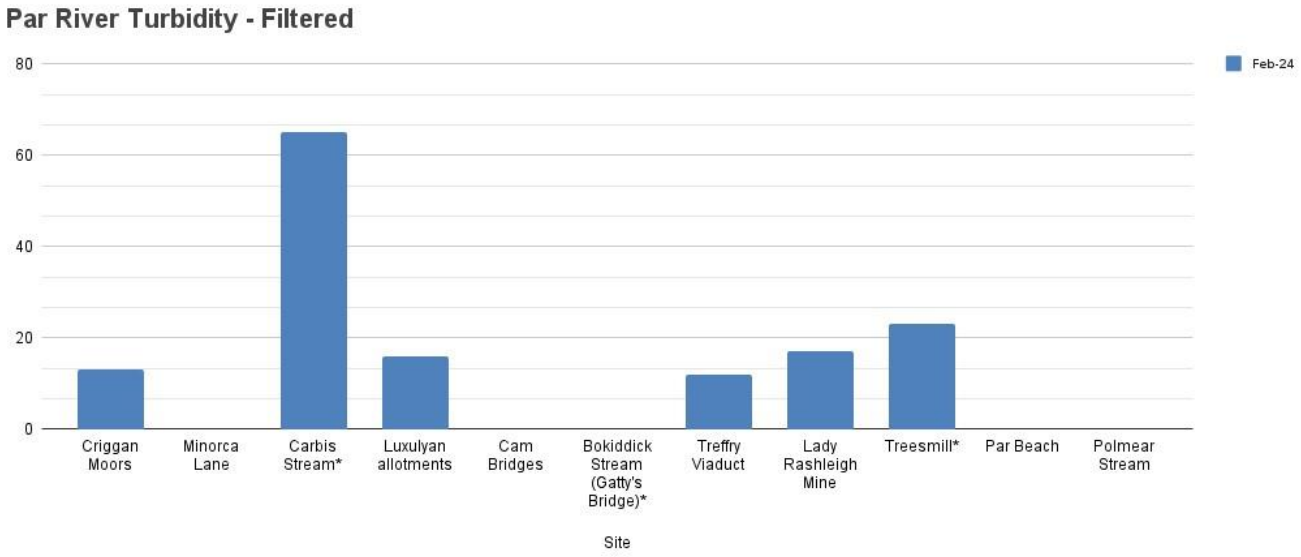


3. Results February 2024

PAR RIVER/TRIBUTARY	LOCATION	Turbidity
Par	Criggan Moors, SX 01882 61133	13
Par	South of Minorca Lane, Par River, SX 02657 59788	<12
Tributary	Carbis Stream SX 02834 59401	65
Par	Lavrean, Par River SX 03134 59164 NEW SITE	21
Par	Luxulyan allotments, Par River, SX 04732 58045	16
Par	Cam Bridges, Par River, SX 05292 57454	<12
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	<12
Par	Treffry Viaduct, Par River, SX 05650 57179	12
Par	Lady Rashleigh Mine, Par River, SX 06451 56509	17
Tributary	Treesmill, Tywardreath Stream, SX 08873 55385	23
Par	Par Beach slipway, SX 0776 53261	<12
Tributary	Polmear Stream, Ship Inn, SX 08749 53417	<12

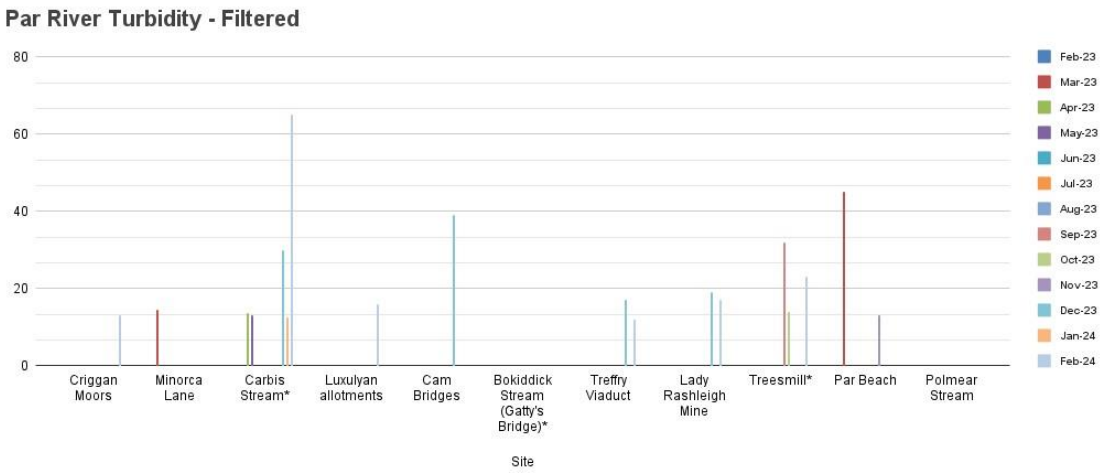
4. Graphs

(a) This month



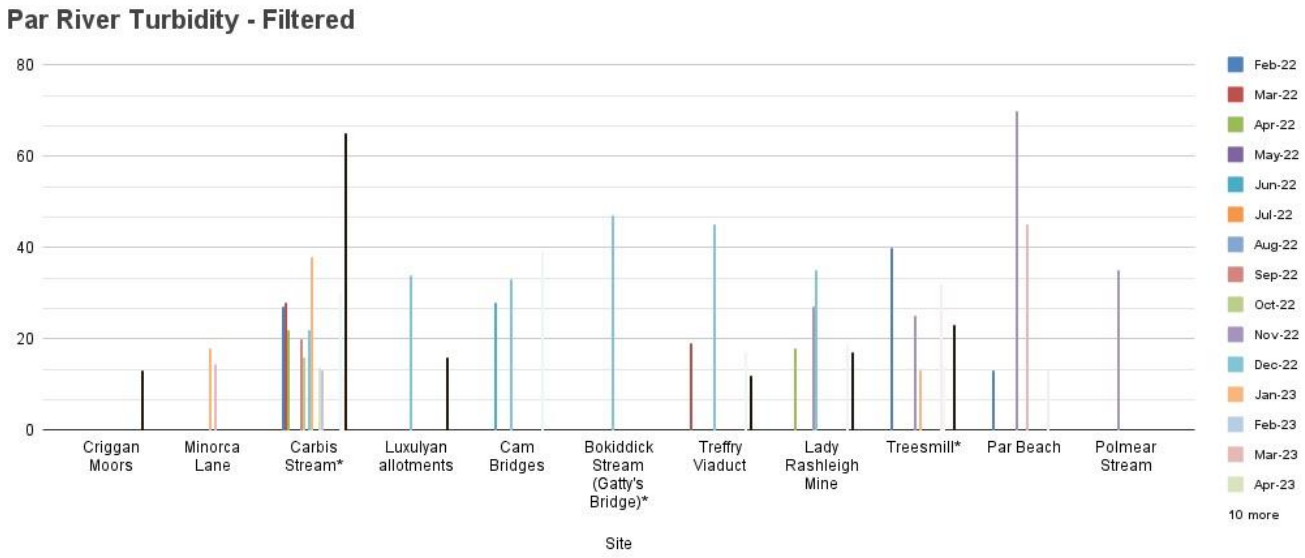
*Indicates a tributary

(b) From 1st February 2023 to now



*Indicates a tributary

(c) From 1st February 2022 until now:



*Indicates a tributary

F. PHOSPHATES

1. This is the WRT's explanation of this measure.

Phosphate occurs naturally within the river ecosystem, but in very low levels under 0.05 mg/l. Therefore, higher levels may indicate anthropogenic input. Phosphate is found in animal and human waste, cleaning chemicals, industrial runoff and fertiliser so this can be a good indicator of pollution. Having raised levels of phosphate can lead to increases in plant growth within the watercourse. This leads to a depletion of oxygen due to the plant's aerobic respiration during the night. Without oxygen aquatic species cannot survive and the river ecosystem collapses. (It is important to note that

phosphate is taken up by plants. You may get a low reading but high plant growth, indicating eutrophication.)

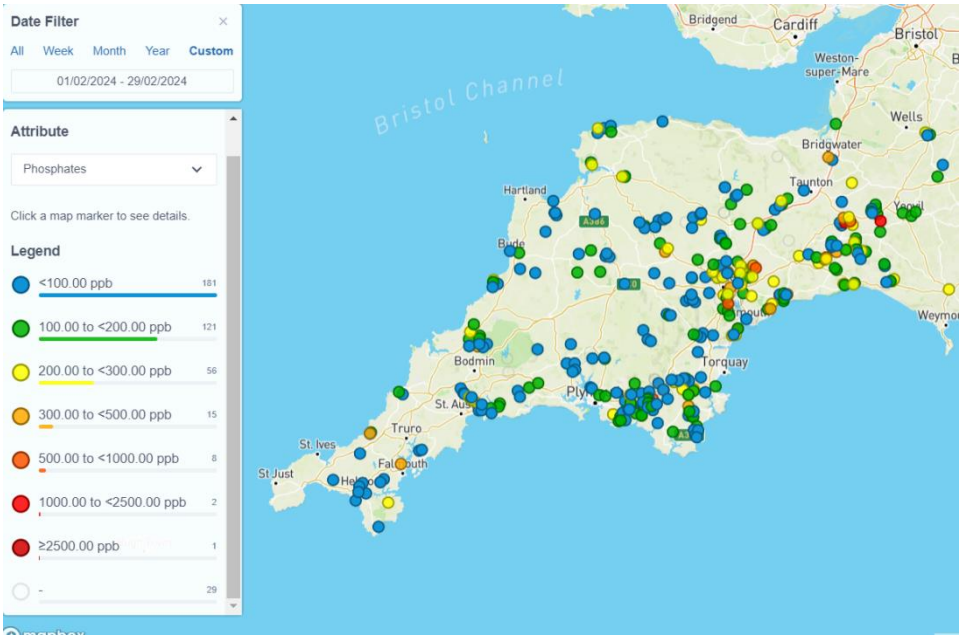
Ranges on phosphate diagnostic colour chart:

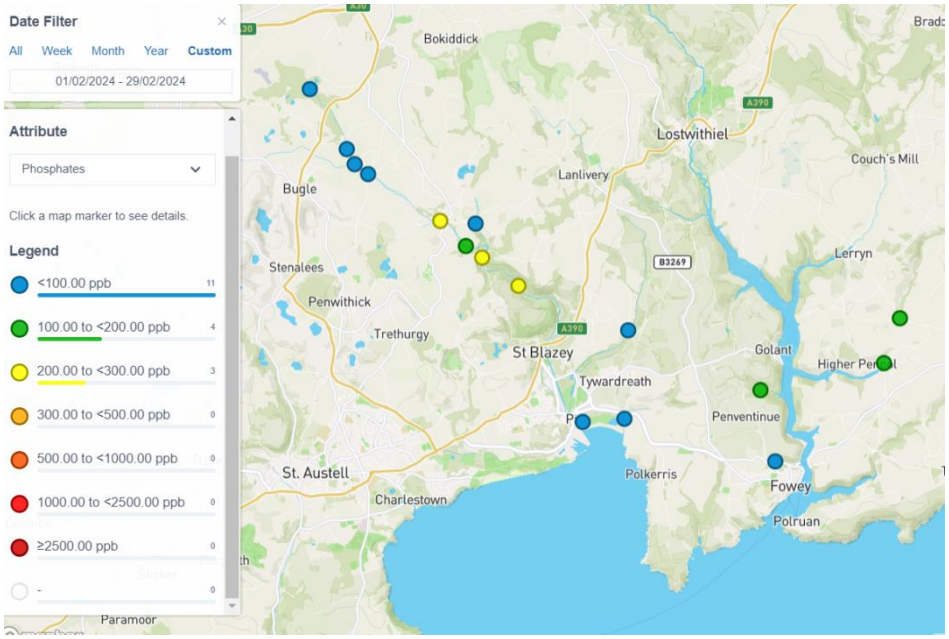
0 – 100 OK

200 – 300 HIGH

500 – 2500 – TOO HIGH

2. **Geographical comparison.** Source: Cartographer





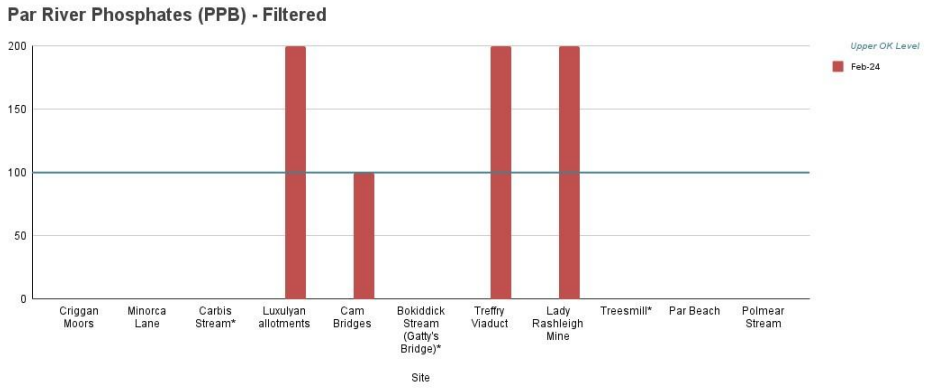
3. Results February 2024

PAR RIVER/TRIBUTARY	LOCATION	Phosphates PPB
Par	Criggan Moors, SX 01882 61133	**0**
Par	South of Minorca Lane, Par River, SX 02657 59788	**0**
Tributary	Carbis Stream SX 02834 59401	**0**
Par	Luxulyan allotments, Par River, SX 04732 58045	**0**
Par	Lavrean, Par River SX 03134 59164 NEW SITE	**200**
Par	Cam Bridges, Par River, SX 05292 57454	**100**
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	**0**
Par	Treffry Viaduct, Par River, SX 05650 57179	**200**
Par	Lady Rashleigh Mine, Par River, SX 06451 56509	**200**
Tributary	Treesmill, Tywardreath Stream, SX 08873 55385	**0**
Par	Par Beach slipway, SX 0776 53261	**0**
Tributary	Polmear Stream, Ship Inn, SX 08749 53417	**0**

Results in red show phosphate levels that are High (WRT advice).

4. Graphs

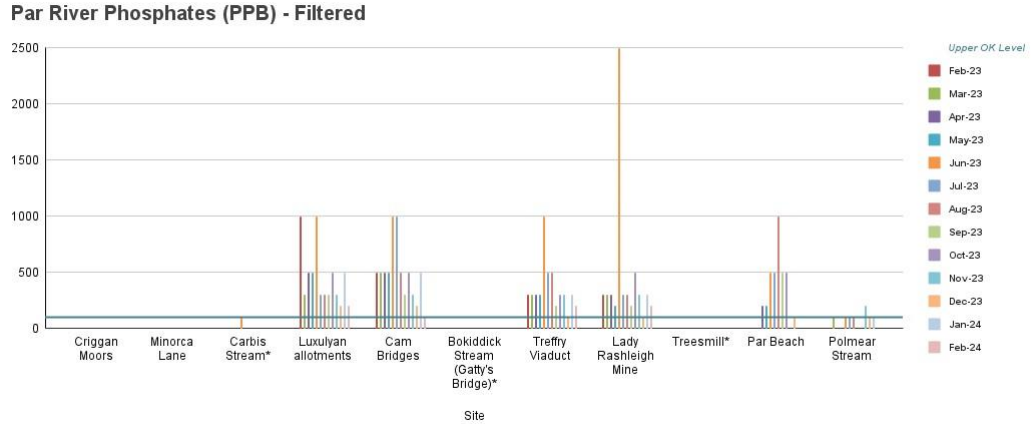
(a) This month



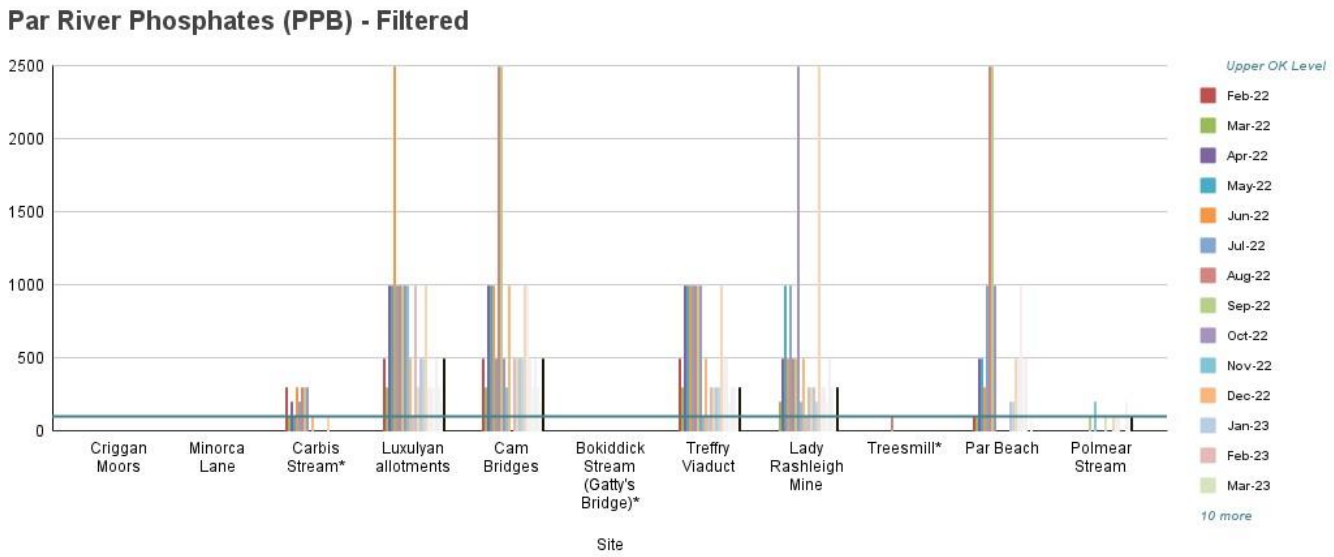
*Indicates a tributary

(b) From 1st February 2023 to now

*Indicates a tributary



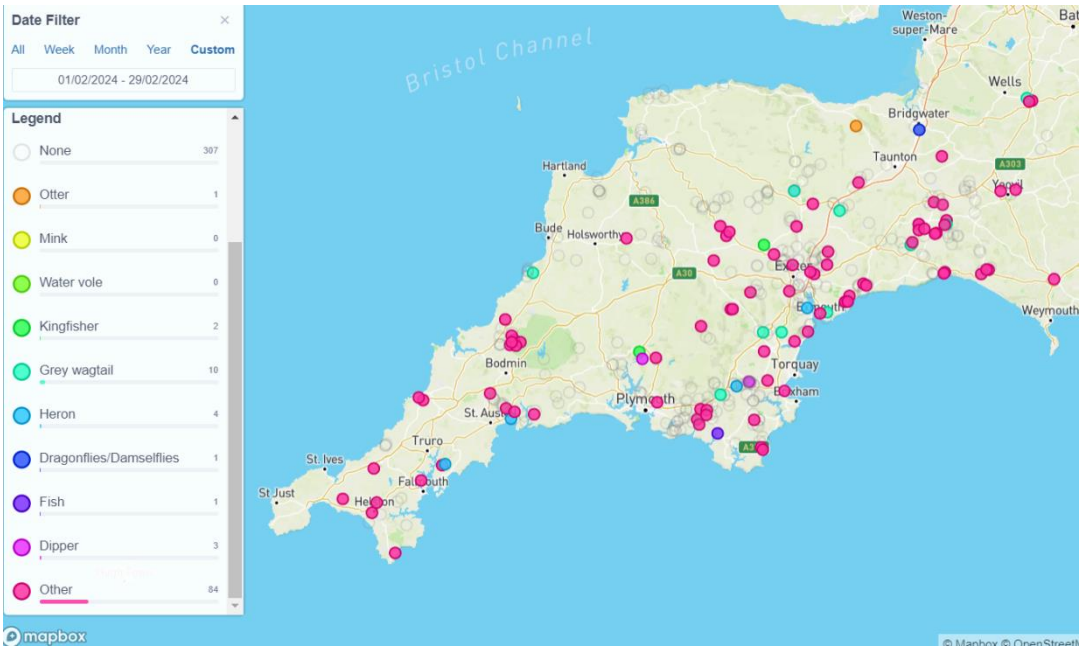
(c) From 1st February 2022 until now:

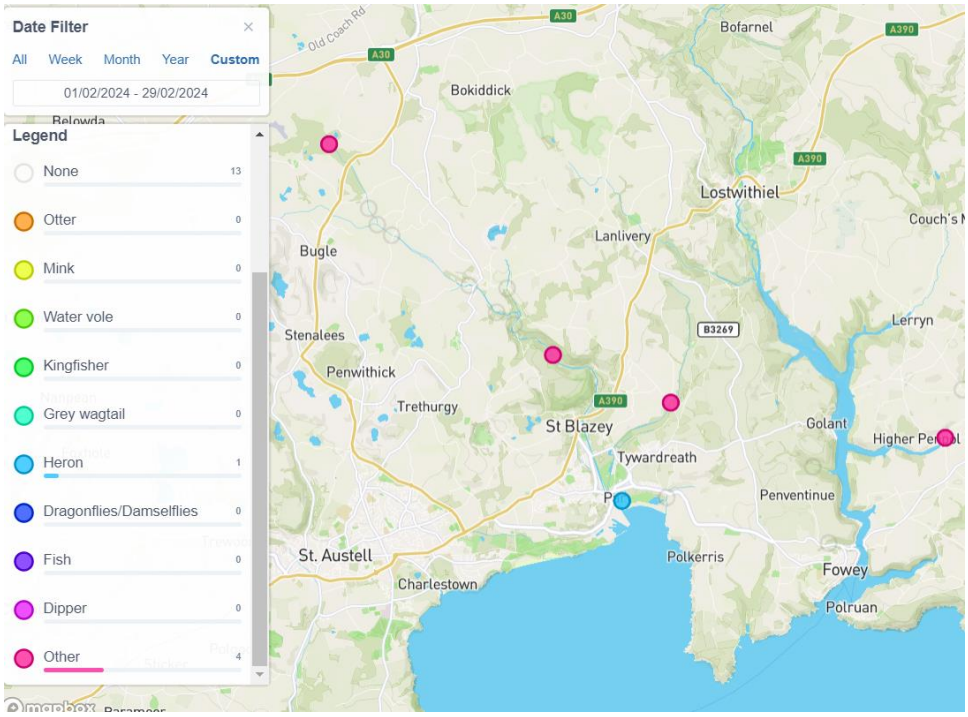


*Indicates a tributary

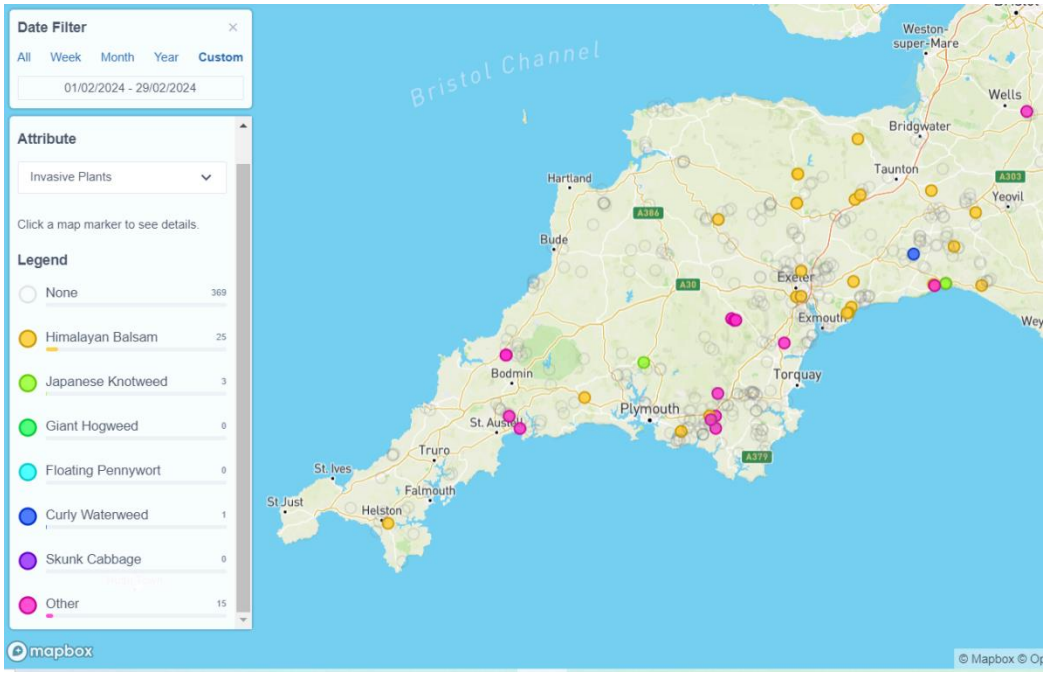
G. WILDLIFE (FOR OTTER REPORT SEE SECTION I) & INVASIVE PLANTS

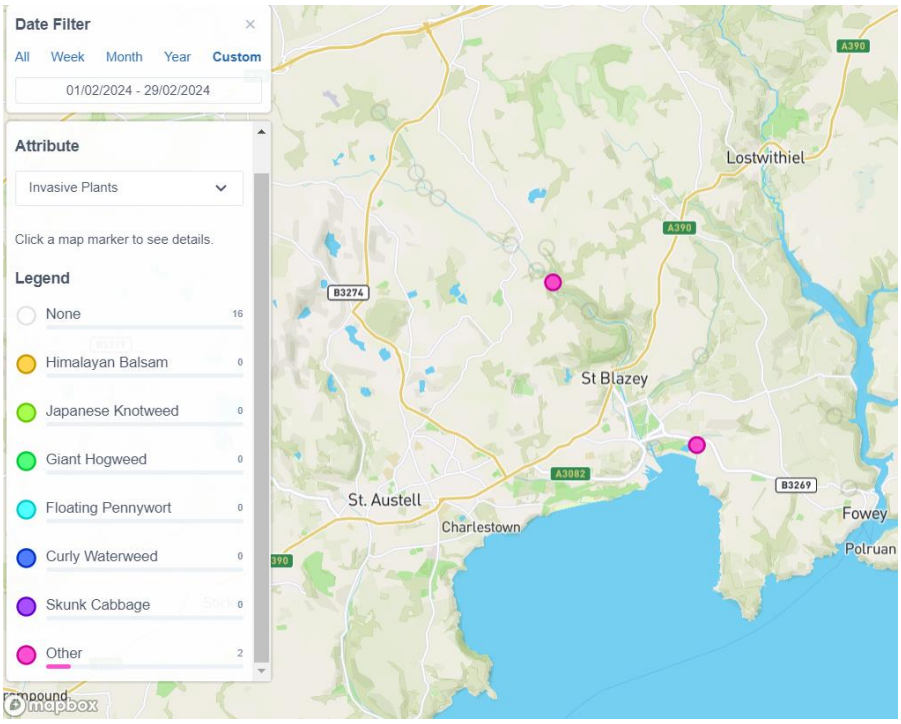
(a) Wildlife maps





(b) Invasive plants maps





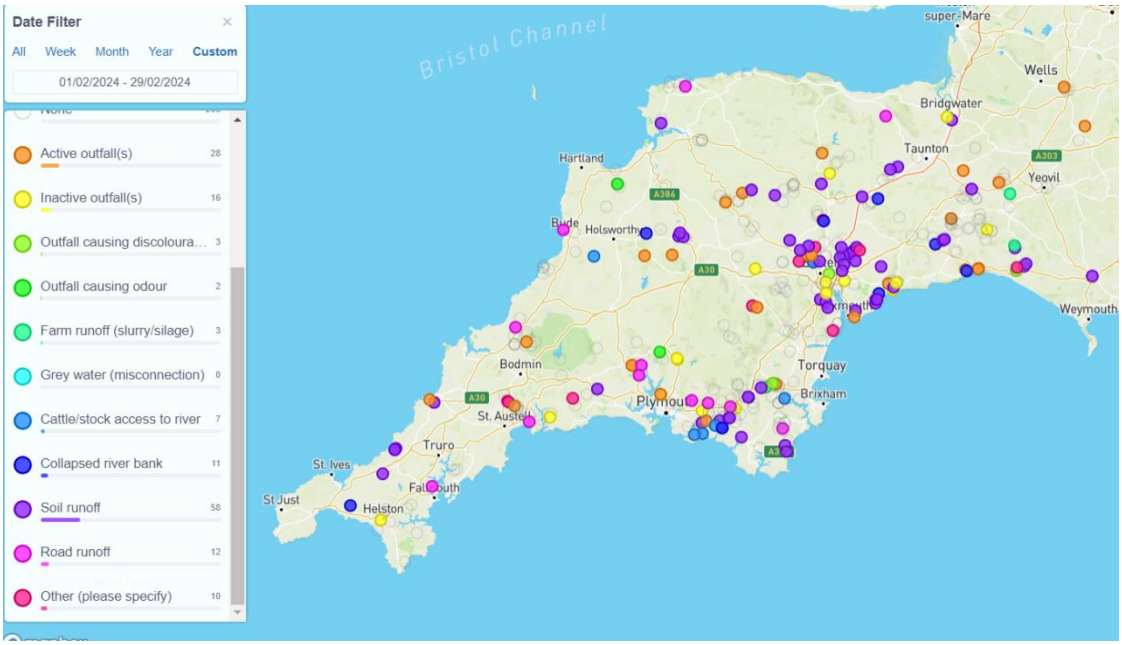
(c) Wildlife & Invasive Plants sightings at the monitoring points included:

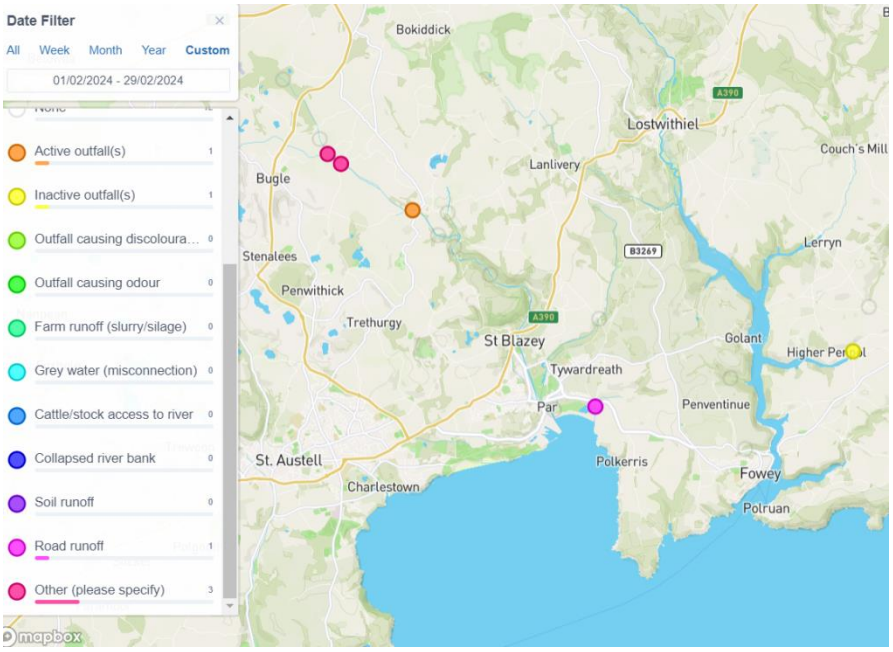
PAR RIVER/TRIBUTARY	LOCATION	WILDLIFE NOTED	INVASIVE PLANTS NOTED
Par	Criggan Moors, SX 01882 61133	Squirrel	None
Par	South of Minorca Lane, Par River, SX 02657 59788	None	None
Tributary	Carbis Stream SX 02834 59401	None	None
Par	Lavrean, Par River SX 03134 59164 NEW SITE	None	None
Par	Luxulyan allotments, Par River, SX 04732 58045	None	None
Par	Cam Bridges, Par River, SX 05292 57454	None	Hemlock water dropwort
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	None	None
Par	Treffry Viaduct, Par River, SX 05650 57179	None	Hemlock water dropwort
Par	Lady Rashleigh Mine, Par River, SX 06451 56509	Robin, woodpigeon	None
Tributary	Treesmill, Tywardreath Stream, SX 08873 55385	Jay, great tit, dunnock (heard not seen)	None
Par	Par Beach slipway, SX 0776 53261	Heron, egret, mallard ducks, rook	None
Tributary	Polmear Stream, Ship Inn, SX 08749 53417	None	Hemlock water dropwort

Otter spraint was found at Ponts Mill (downstream from Lady Rashleigh Mine)

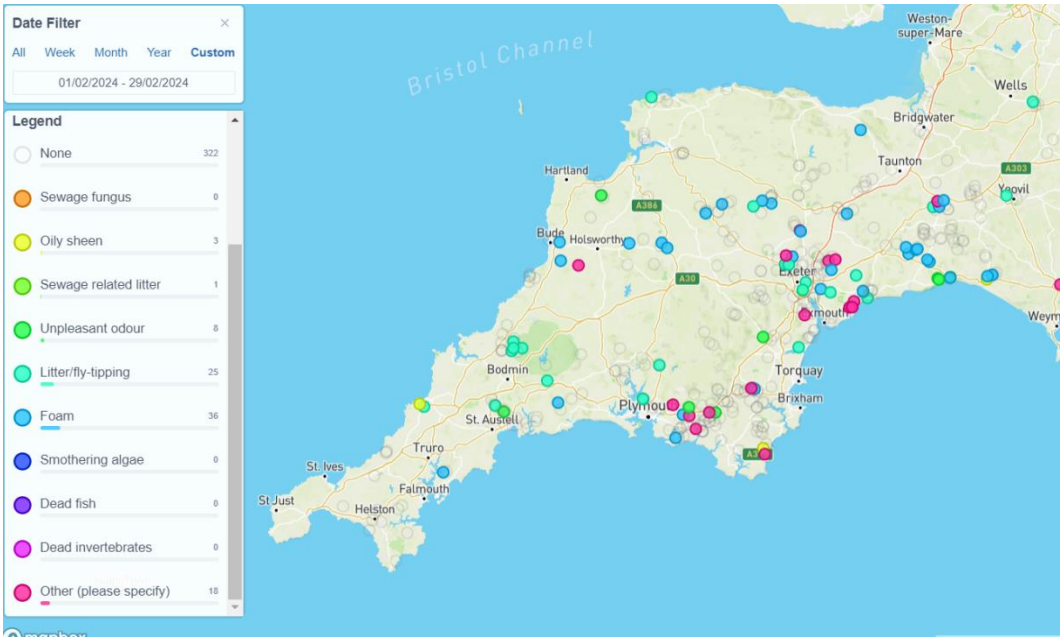
H. POLLUTION SOURCES AND EVIDENCE

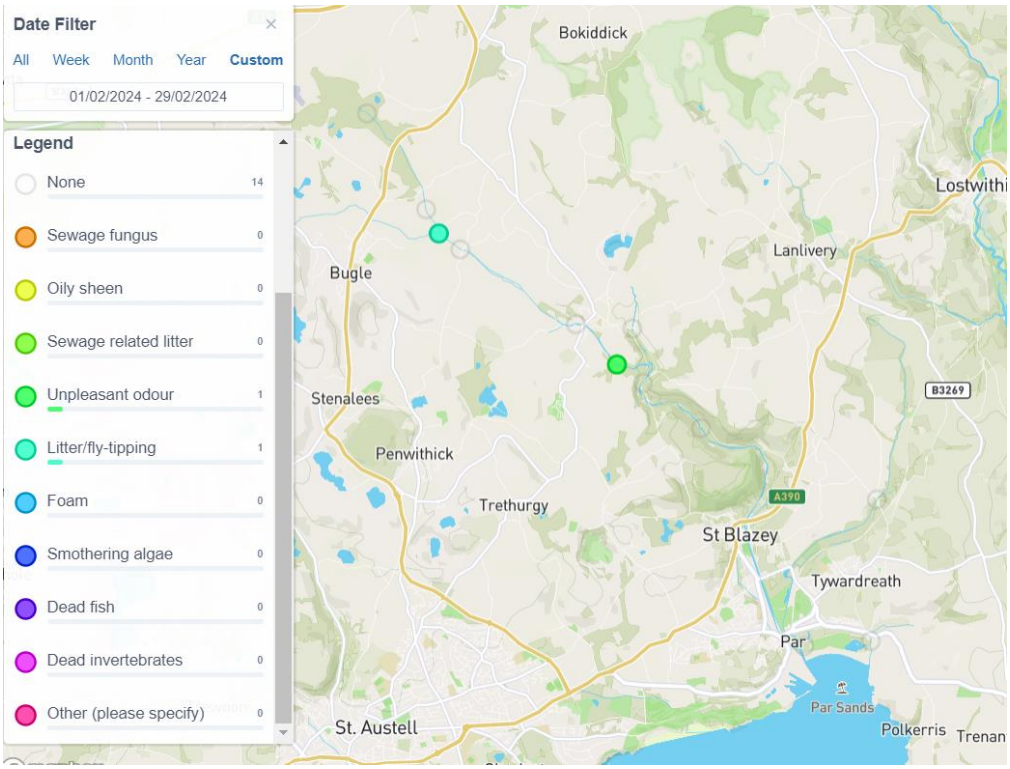
1. Pollution sources





2. Pollution evidence





I. OTTER SURVEY, FEBRUARY 2024

FEBRUARY 2024

1. SURVEY CONDITIONS

Date & time	10, 11 & 14/2/2024
Surveyors	Roger Smith, Dave Burrell, Joan Farmer
Areas surveyed	Upper Par (Criggan Moors and Minorca Lane); Par River from STW to Cam Bridges; Par River from Treffry Viaduct to south of Prideaux Wood china clay works.
Weather	Heavy rain in previous 24 hours
River level	High
River flow	Steady to surging
Water quality	Phosphate readings 200 PPB at the highest (Luxulyan allotments, Treffry Viaduct and Lady Rashleigh Mine) and 100 at Cam Bridges. All readings zero upstream from the allotments.
Other wildlife	Squirrel, robin and woodpigeon.

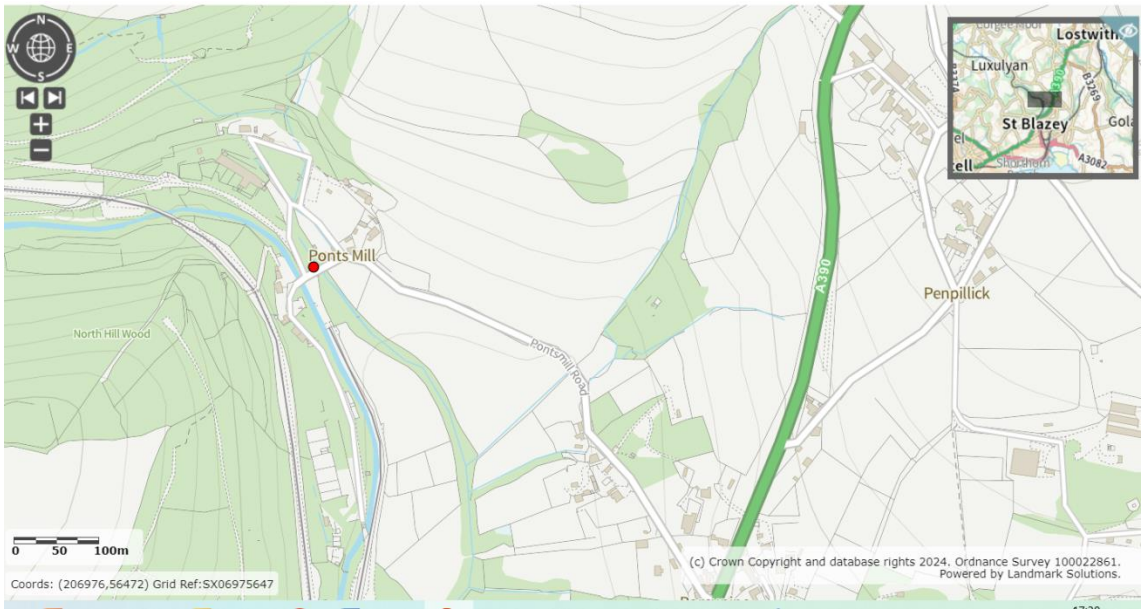
2. EVIDENCE FOR OTTERS ✓

EVIDENCE	SEEN/ ORKS*	LOCATION	NOTES
Spraint - fresh			
Spraint – recent	✓*	SX 07312 56164 On stone in gully adjacent to the canal bridge at Ponts Mill (upstream side).	
Spraint - old			
Anal jelly			
Sign heap			
Staining			
Tracks			
Path			
Slide			
Holt			
Hover			
Couch			
Live sighting			
Corpse			

***Report sent to ORKS:** **https://erccis.org.uk/**

3. MAP

Red dots – definite evidence. Recorded on ORKS.
Black dots – possible evidence. Not recorded on ORKS.
Green dots – definite evidence but may have been recorded in the previous month, e.g. old spraint.



Source: https://magic.defra.gov.uk/MagicMap.aspx

4. PHOTOGRAPHS

Old spraint with fish bones and scales.

The gully. Spraint has been found here before.

5. COMMENTS

High river levels meant that other regular sprainting spots were submerged.

Spraint at this location is found more often at river level on sand beneath the bridge. But it has been found in this gully before.

J. DISCUSSION

1. Positive observations

(a) Phosphate levels were lower than usual, with no sample being classed as *Too High* (WRT guidance).

2. Despite the poor weather there were some encouraging signs of wildlife, including a heron and egret, as well as otter spraint (and therefore, indirect evidence of fish).

3. Sampling took place at a new location (results not yet incorporated in the graphs), on the main Par River just upstream from Lavrean Bridge. This was chosen to test the impact of the clay pollution in the Carbis Stream downstream from the confluence and also because this stretch of river has seen habitat improvements carried out as part of the Par Improvement Plan.

2. Points of concern

(a) Phosphate levels were *High* (WRT classification) on the main river downstream from St Austell North STW at Luxulyan, although the high volume of water probably caused dilution.

(b) The Carbis Stream flowed almost white, suggesting the presence of china clay.

Looking downstream at the confluence of the Par River (left) and Carbis Stream (right).

(c) The Total Dissolved Solids reading at Par Beach Slipway (SX 0776 53261) was a record 877 parts per million (ppm). This is a concern. We do not know why this is (see Areas of Doubt below) but note the WRT guidance that:

'As the river runs down to the sea it collects material from many different inputs, some natural and some man-made such as farms, sewage plants, factories and residential areas. This typically increases the amount of solids dissolved in the water leading to a higher reading. Harmful

pollution from things like sewage, slurry and factory discharge will usually elevate your TDS reading.'

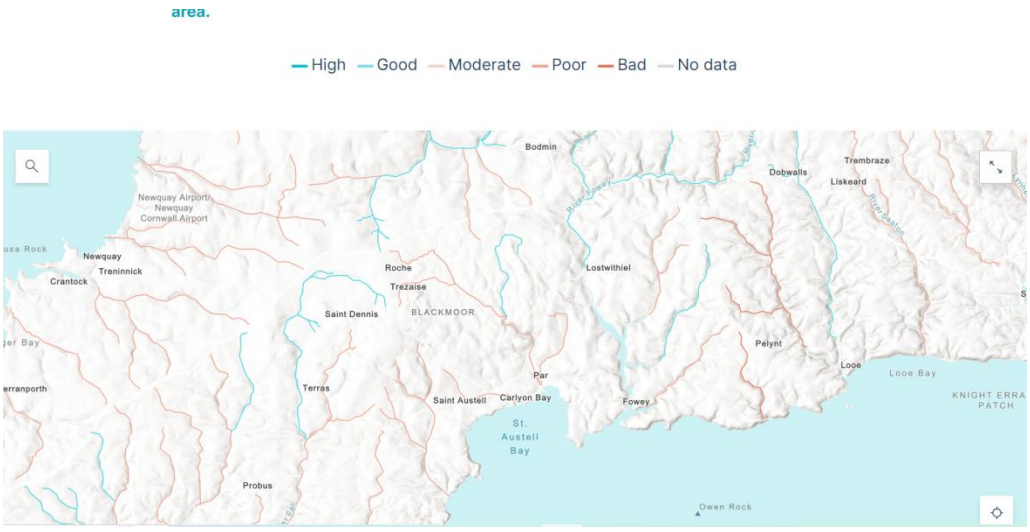
Anecdotal guidance given to us suggested that a river like ours should not exceed 300 ppm.

(d) High river levels in February were unsurprising but provided a further reminder that our river is heavily modified for most of its length and that interventions such as recreating meanders and wetland areas would slow its flow and reduce the problems raised levels linked to the climate emergency.

(e) The unexplained smell at Cam Bridges, associated by some observers with sewage, was noticeable. [On 1st March 2024, someone who has worked in the water industry informed me of a smell in the Par River in Luxulyan Valley that he attributed to the presence of sewage, probably being released as a result of the excessive turbulence.]

(f) River health nationally is a major concern. The Rivers' Trust's *State of Our Rivers 2024* report can be found via this link: https://theriverstrust.org/ . This screen shot shows the ecological health of our local rivers (the colours are not easy to distinguish from each other):

Only the Bokiddick Stream has at least *Good* ecological health. Perhaps surprisingly, the Treesmill does not merit *Good*.



The situation for chemical health is depressing:

3. Areas of doubt

'…there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns—the ones we don't know we don't know', **Donald Rumsfeld, 2002**.

(a) Phosphates and TDS at Par Beach Slipway

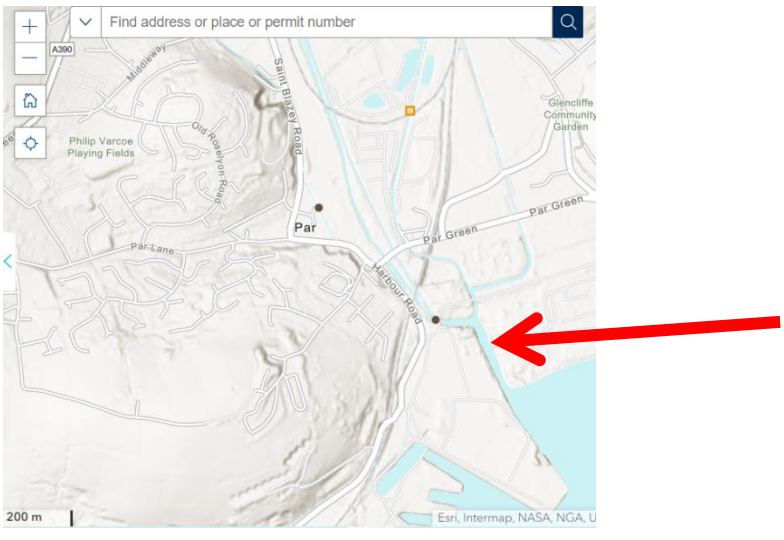
Brian Harrisson has checked back over his readings at Par Beach Slipway over the last 15 months and has raised important questions about the levels of Phosphates and Total Dissolved Solids:

(i) Phosphate levels are 'remaining low for the fourth month in a row. This pattern was the same last winter. The pattern seems to be they start rising in March, getting too high by June and continuing too high until November'. This is similar to other observations on the 'Phosphate stretch' of the Par River, which is from the St Austell North STW at Luxulyan downstream. The influence of the STW on Phosphate levels is a 'known known' but is it the only factor? Brian asks:

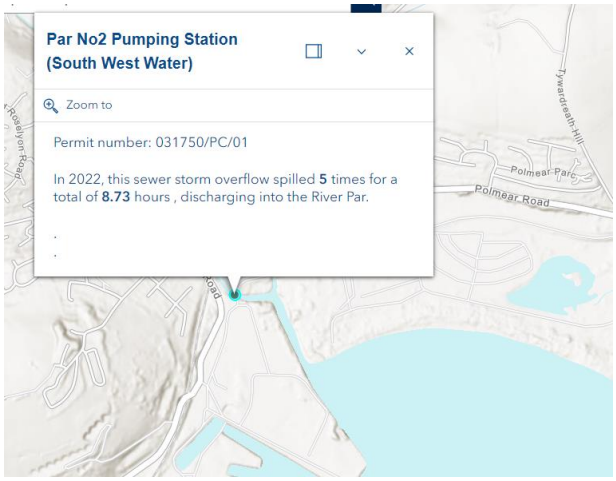
- Do faster winter flows wash out the phosphate?
- Do farmers only use fertilisers in summer months?

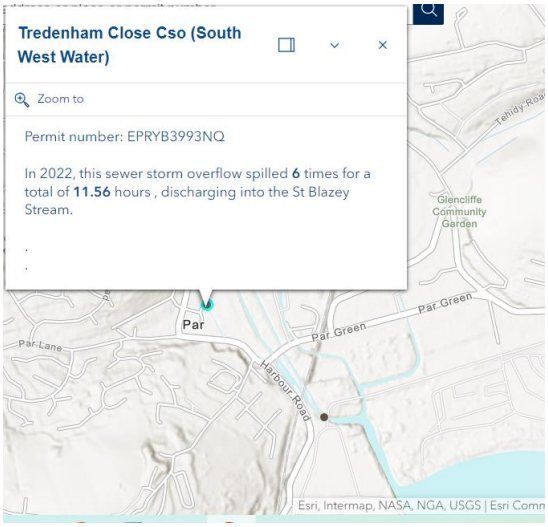
(ii) The Total Dissolved Solids at Par Beach Slipway are, if anything, more puzzling and February's reading of 877 ppm is an unwanted record. Brian has asked if 'faster flows, following heavy rain, cause more minerals to be dissolved causing a rise in TDS?' In discussion, Joan Farmer noted that TDS readings on the Caff Stream in Station Wood, tributary to the Fowey, have often been high in the last few years and that this that had been attributed to salt. Given the tidal nature of the slipway location, this might seem a possible explanation. However, Simon Tagney noted that he used 'a simple refractive salinity meter … at Par Slipway directly after Brian got the high TDS reading (which I checked with my TDS meter as well) and got a very nearly zero reading for salt'!

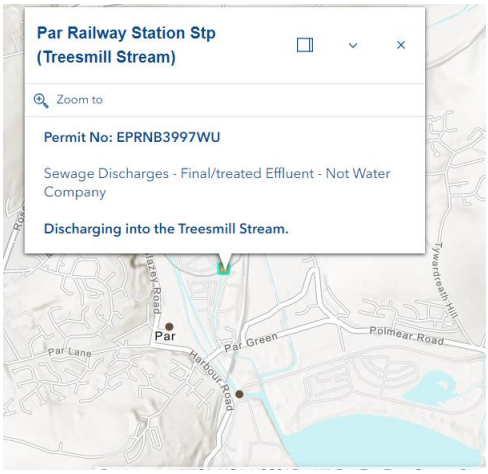
It may not be relevant but the Rivers Trust's Sewage Map shows 3 sewage discharge points close by. Brown circles denote storm overflows with event duration monitoring. The yellow squares indicate treated sewage discharges; the arrow indicates the approximate location of the monitoring point.



This is the information given about these 3 locations:







There is **no reason** to suspect that any of these discharges is harmful or relevant to the high TDS readings at the slipway and they have been included only to provide geographical context.

(b) We have suspended riverfly monitoring for the winter months which limits our knowledge of river quality.

K. OUR GROUP AND SUPPORTERS

Monitoring is part of the Citizen Science programme run by the West Country Rivers Trust (WCRT) and is carried out monthly by volunteers, including Dave Burrell; Joan Farmer; Veronica Jones; Sue Perry; Roger Smith; Simon Tagney; Maggie Tagney; and Brian Harrisson. They have received training from Lydia Ashworth, Junior Evidence and Engagement Officer of the West Country Rivers Trust (https://wrt.org.uk/project/become-a-citizen-scientist/). Results are logged on the Cartographer website. The support and advice given by Ross Tonkin, Lloyd Paynter, Chloe Lake, David Edwards, Claire and Gary Phillips, Chris Bartram, Jenny Heskett, Nick Taylor, Jeremy Roberts, Mat Bateman, Colin Pringle, Matt Healey, Simon Browning, Lydia Deacon, Layla Ousley, Eva Edgeworth, Jack Middleton, Anna Seal, Jade Neville, Nicola Rogers and Callum Lewis is greatly appreciated. The interest and encouragement offered by Environment Agency officers, especially Lisa Best, Lisa Goodall and Peter Scobie, have been invaluable.

Report compiled by Dave Burrell, Joan Farmer and Roger Smith, March 2024