WESTCOUNTRY RIVERS TRUST CITIZEN SCIENCE

MONITORING OF THE PAR RIVER AND ITS TRIBUTARIES

The monitoring group operates under the citizen science scheme run by the Westcountry Rivers Trust. The Friends of Luxulyan Valley, The Friends of Par Beach, and the G7 Legacy Project for Nature Recovery have helped. Comments and opinions in this report are not necessarily shared by these organisations.

MAY 2023

Riverfly survey at Lady Rashleigh Mine **Photo: Dave Burrell**

A. OUR MAY 2023 FINDINGS AT A GLANCE (SEE SECTIONS C TO J FOR FULL PICTURE)

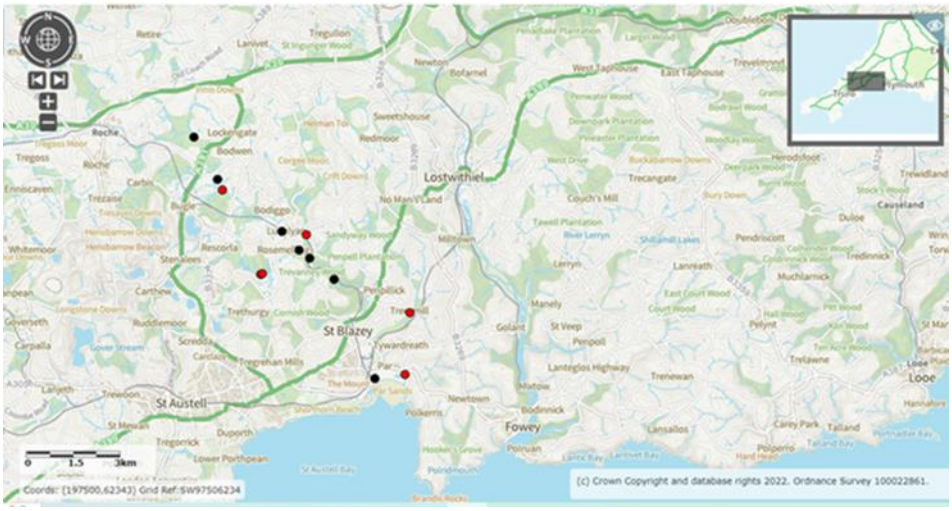
We sampled at 11 locations but the findings of Cathy Trodd at Bridge Park on the Treesmill Stream are included in this table.

CRITERIA	UPPER PAR (UPSTREAM OF CONFLUENCE WITH BOKIDDICK STREAM NEAR BLACK HILL CAR PARK) 4 SAMPLE LOCATIONS	LOWER PAR (FROM CONFLUENCE WITH BOKIDDICK STREAM TO SEA) 3 SAMPLE LOCATIONS	TRIBUTARIES OF UPPER PAR (CARBIS STREAM, BOKIDDICK STREAM) 2 SAMPLE LOCATIONS	TRIBUTARIES OF LOWER PAR (TREESMILL/TYWARDREATH MARSH STREAM & POLMEAR STREAM) 3 SAMPLE LOCATIONS
TEMPERATURE (SHOULD NOT EXCEED 18˚ CELSIUS)	Average 12.05˚ Celsius	Average 15.06˚ Celsius	Average 11.9˚ Celsius	Average 14.93˚ Celsius
TOTAL DISSOLVED SOLIDS (SHOULD NOT EXCEED 300 PPM)	105.25 PPM	239 PPM (BUT 485 AT BEACH)	128 PPM	133.33 PPM
TURBIDITY (SHOULD BE <12 ON SECCHI TUBE. FOR AVERAGING ANY READING <12 IS COUNTED AS 11)	11	11	12	11
PHOSPHATES (SHOULD NOT EXCEED 100 PPB)	250 PPB	233.33 PPB	0 PPB	O PPB
RIVERFLY TRIGGER LEVEL (SHOULD BE ≥ 6)	N/A	11	N/A	N/A
E.COLI (SHOULD NOT EXCEED 84 MPN/100ML BUT RESULTS NEED EXPERT CONFIRMATION)	N/A	136 MPN/100ML (HIGH RISK/PROBABLY UNSAFE – USA RECREATIONAL BATHING WATER STANDARDS)	483 MPN/100ML (VERY HIGH RISK/UNSAFE– USA RECREATIONAL BATHING WATER STANDARDS)	N/A
TOTAL COLIFORMS (SHOULD NOT EXCEED 84 MPN/100ML BUT RESULTS NEED EXPERT CONFIRMATION)	N/A	>1000 MPN/100ML (VERY UNSAFE - USA RECREATIONAL BATHING WATER STANDARDS)	>1000 MPN/100ML (VERY UNSAFE - USA RECREATIONAL BATHING WATER STANDARDS)	N/A
WILDLIFE EVIDENCE	Speckled Wood butterfly, pond skaters.	Dippers, otter spraint, swans, geese, white butterfly, 7 types of riverfly larvae (out of 8 sought).	None	Fish, midges.
VISIBLE EVIDENCE OF POLLUTION	FOAM	NONE	DEBRIS, SOME CHINA CLAY.	NONE

B. MAY 2023 MONITORING POINTS

This month monitoring occurred at the 11 regular locations, plus the spring riverfly and CSI monitoring at 2 additional locations on a tributary, the Treverbyn Stream, at Innis. 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

Reference is also made to the WRT citizen science monitoring carried out by Cathy Trodd on the Treesmill Stream at Bridge Park (SX 07695 54528). It has not been possible to make contact to obtain permission to do so.

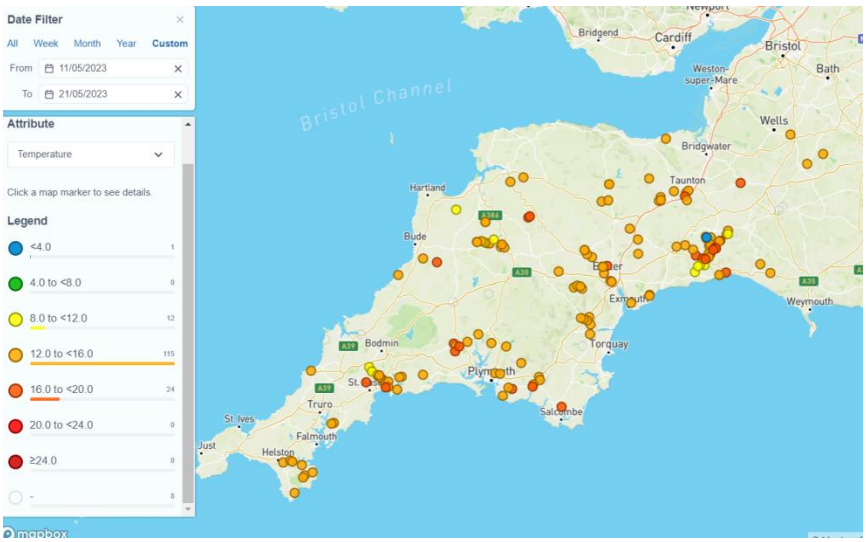
LOCATION	DATE	TYPE OF CHECK	MONITORED BY
Criggan Moors, Par River, SX 01882 61133	12/5/2023	CSI sample & Cartographer record.	Roger Smith
South of Minorca Lane, Par River, SX02668 59747	12/5/2023	CSI sampling. Cartographer record.	Roger Smith
Carbis Stream SX 02834 59401	12/5/2023	CSI sampling. Cartographer record.	Roger Smith
Luxulyan allotments, Par River, SX 04732 58045	12/5/2023	CSI sampling. Cartographer record.	Roger Smith
Cam Bridges, Par River, SX 05292 57454	12/5/2023	CSI sampling. Cartographer record.	Roger Smith
Gatty's Bridge, Bokiddick Stream SX 05531 57953	12/5/2023	CSI sampling. Cartographer record.	Joan Farmer
Treffry Viaduct, Par River, SX 05650 57179	12/5/2023	CSI sampling. Cartographer record.	Joan Farmer, Roger Smith
Lady Rashleigh Mine, Par River, SX 06451 56509	12/5/2023	CSI sampling. Cartographer record. Riverfly. Bacteria sample.	Dave Burrell, Joan Farmer, Veronica Jones, Roger Smith
Treesmill, Tywardreath Stream, SX 08873 55385	15/5/2023	CSI sampling. Cartographer record.	Maggie Tagney
Par Beach slipway, SX 0776 53261	20/5/2023	CSI sampling. Cartographer record.	Brian Harrisson
Polmear Stream, Ship Inn SX 08749 53417	20/5/2023	CSI sampling. Cartographer record.	Simon Tagney

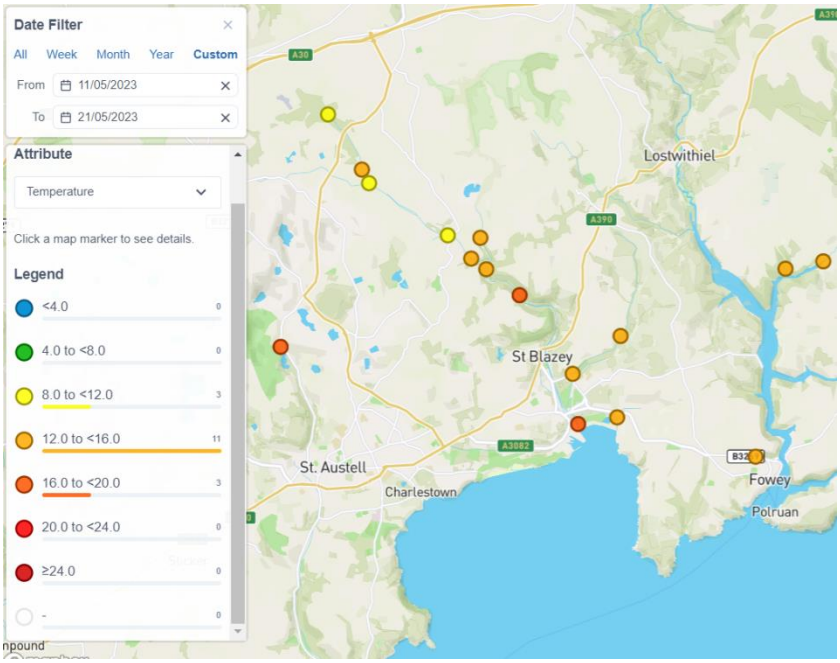
C. TEMPERATURE

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.

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





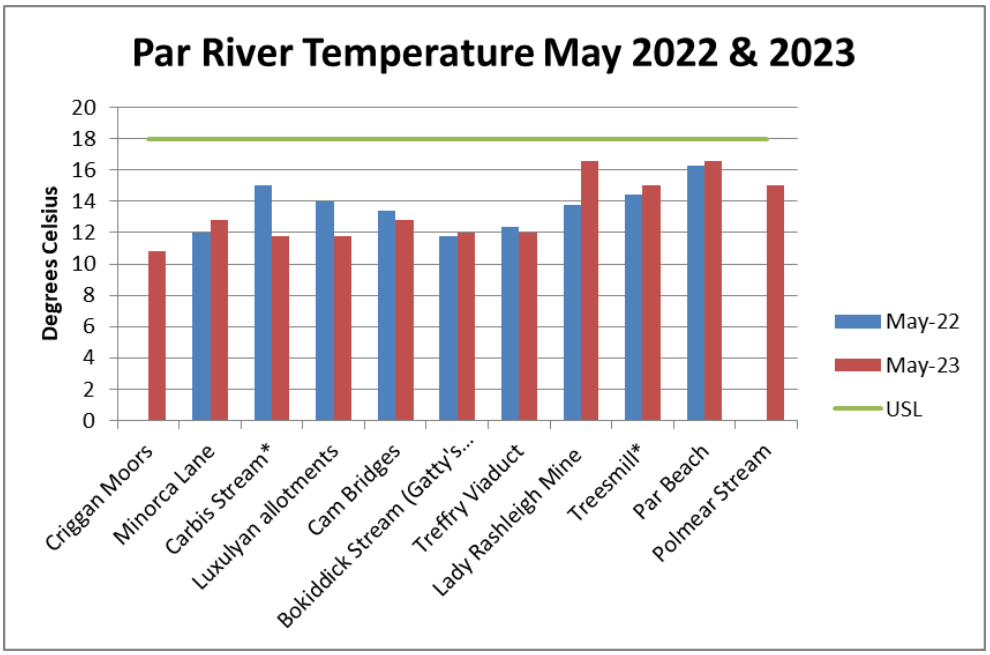
3. Results May 2023

PAR RIVER/TRIBUTARY	LOCATION	Temperature ˚Celsius
Par	Criggan Moors, SX 01882 61133	11
Par	South of Minorca Lane, Par River, SX 02657 59788	12.8
Tributary	Carbis Stream SX 02834 59401	11.8
Par	Luxulyan allotments, Par River, SX 04732 58045	11.8
Par	Cam Bridges, Par River, SX 05292 57454	12.8
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	16.6
Tributary	Treesmill, Tywardreath Stream, SX 08873 55385*	15
Par	Par Beach slipway, SX 0776 53261	16.6
Tributary	Polmear Stream, Ship Inn, SX 08749 53417	15

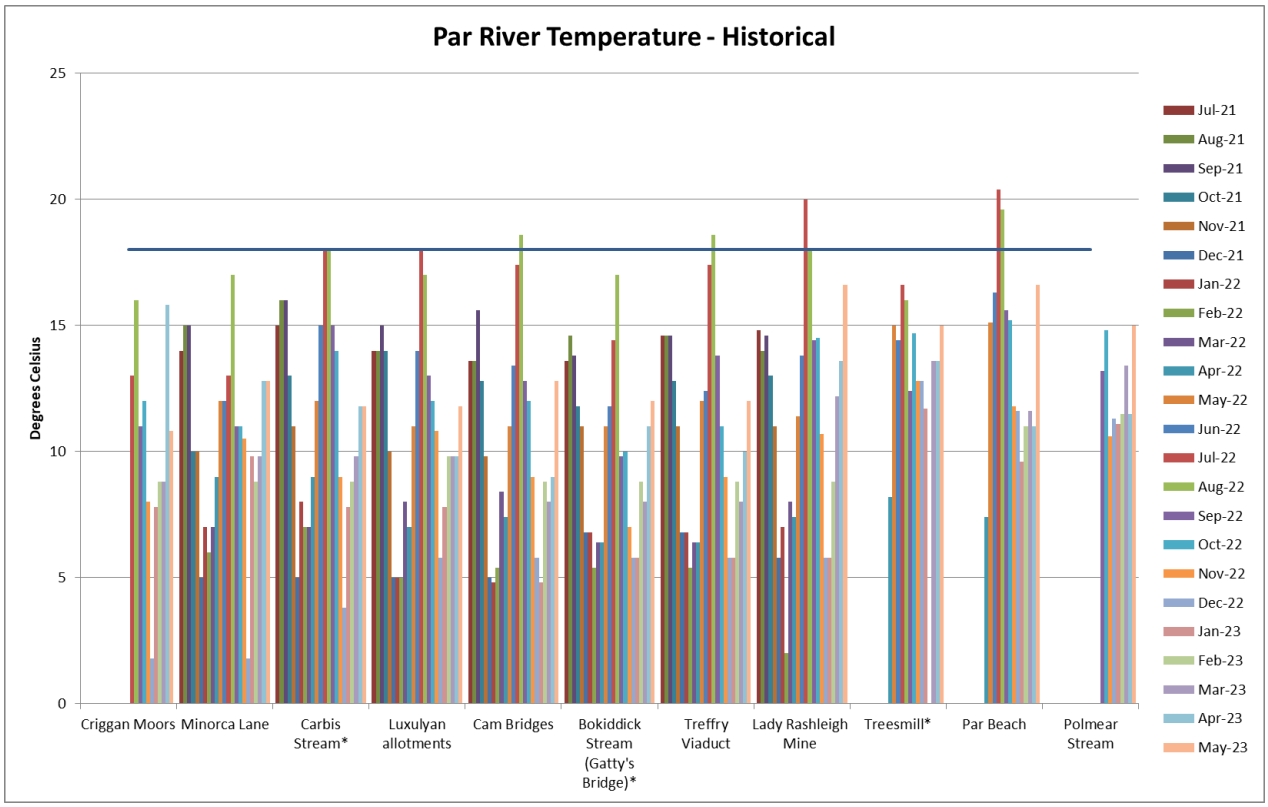
***14.8 ˚ Celsius at Bridge Park on Tywardreath Stream (SX 07695 54528).**

4. **Graph** May 2023 (**and** May 2022 for comparison)

USL – Upper Safe Limit Our assumption is that 18˚ Celsius is the upper safe limit for fish. This simplification is a useful rule of thumb.



*indicates a tributary of the Par River.



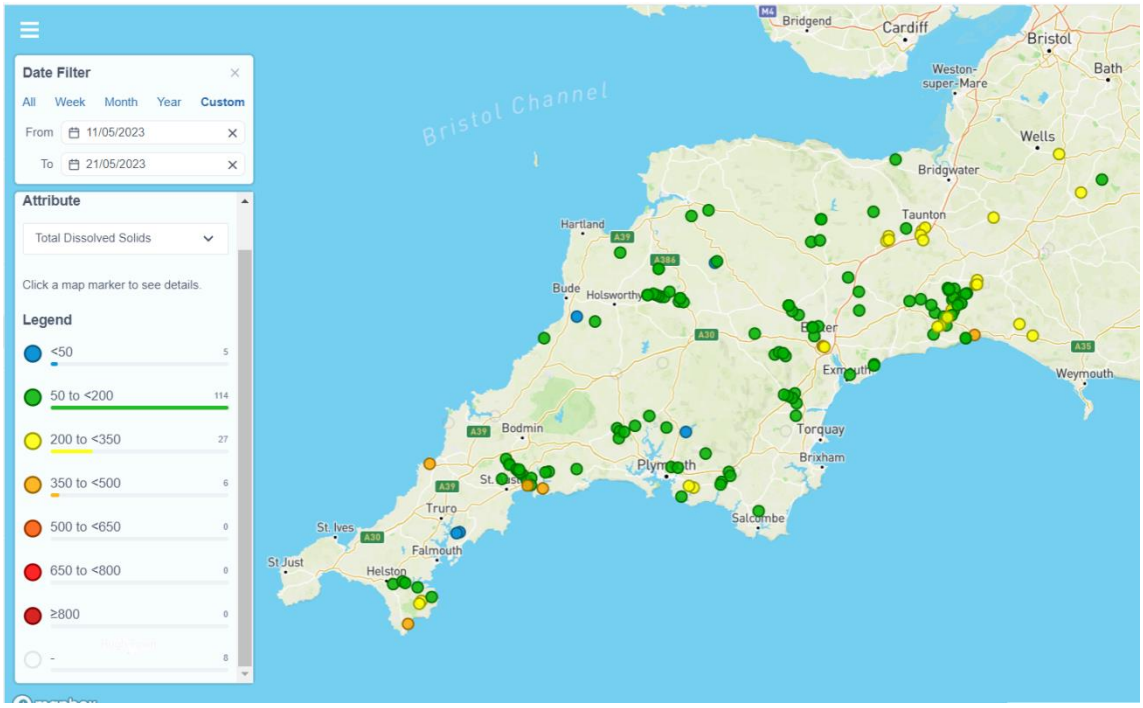
*indicates a tributary of the Par River.

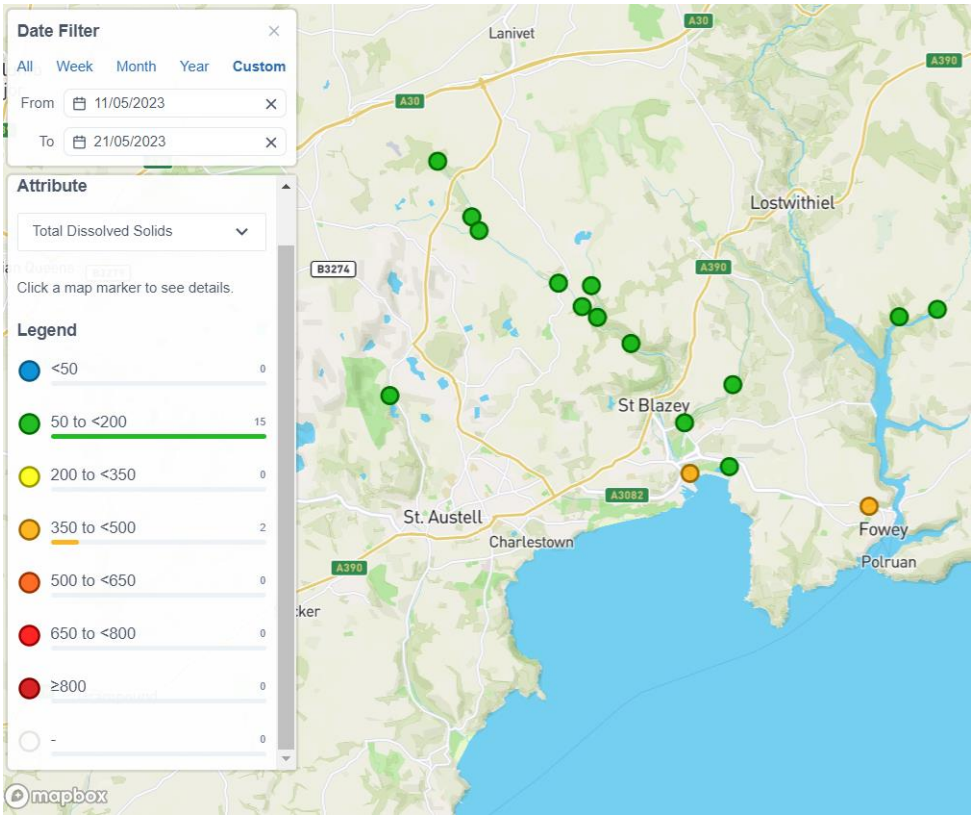
D. TOTAL DISSOLVED SOLIDS

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 May 2023

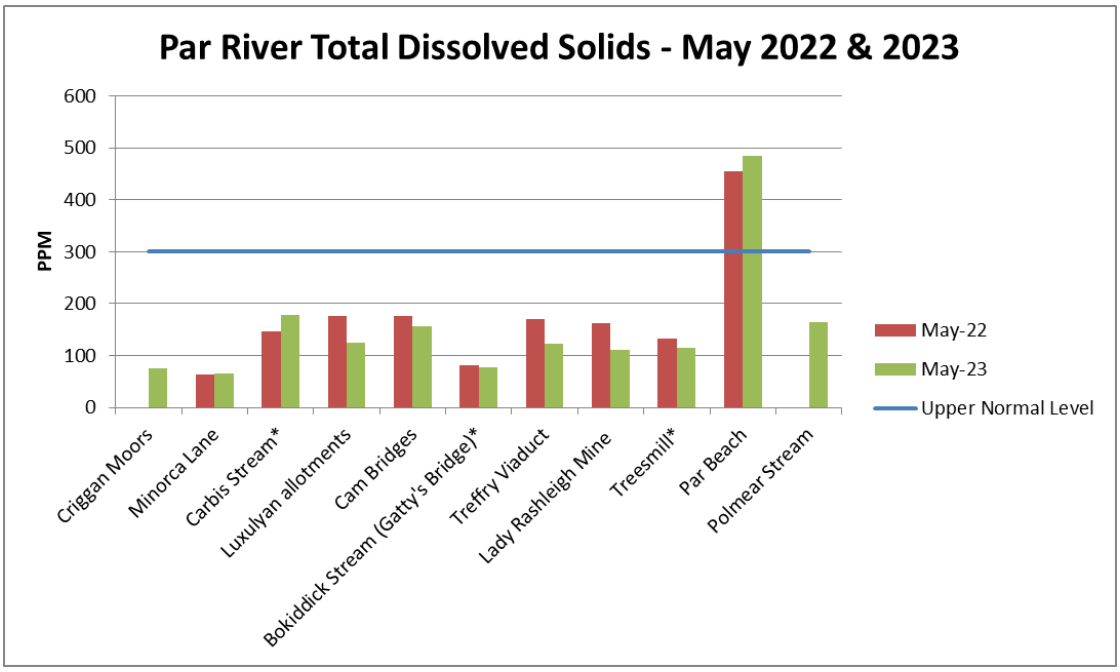
PAR RIVER/TRIBUTARY	LOCATION	Total Dissolved Solids PPM
Par	Criggan Moors, SX 01882 61133	75
Par	South of Minorca Lane, Par River, SX 02657 59788	65
Tributary	Carbis Stream SX 02834 59401	178
Par	Luxulyan allotments, Par River, SX 04732 58045	124
Par	Cam Bridges, Par River, SX 05292 57454	157
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	78
Par	Treffry Viaduct, Par River, SX 05650 57179	122
Par	Lady Rashleigh Mine, Par River, SX 06451 56509	110
Tributary	Treesmill, Tywardreath Stream, SX 08873 55385*	115
Par	Par Beach slipway, SX 0776 53261	485
Tributary	Polmear Stream, Ship Inn, SX 08749 53417	165

*** 120 PPM at Bridge Park on Tywardreath Stream (SX 07695 54528).**

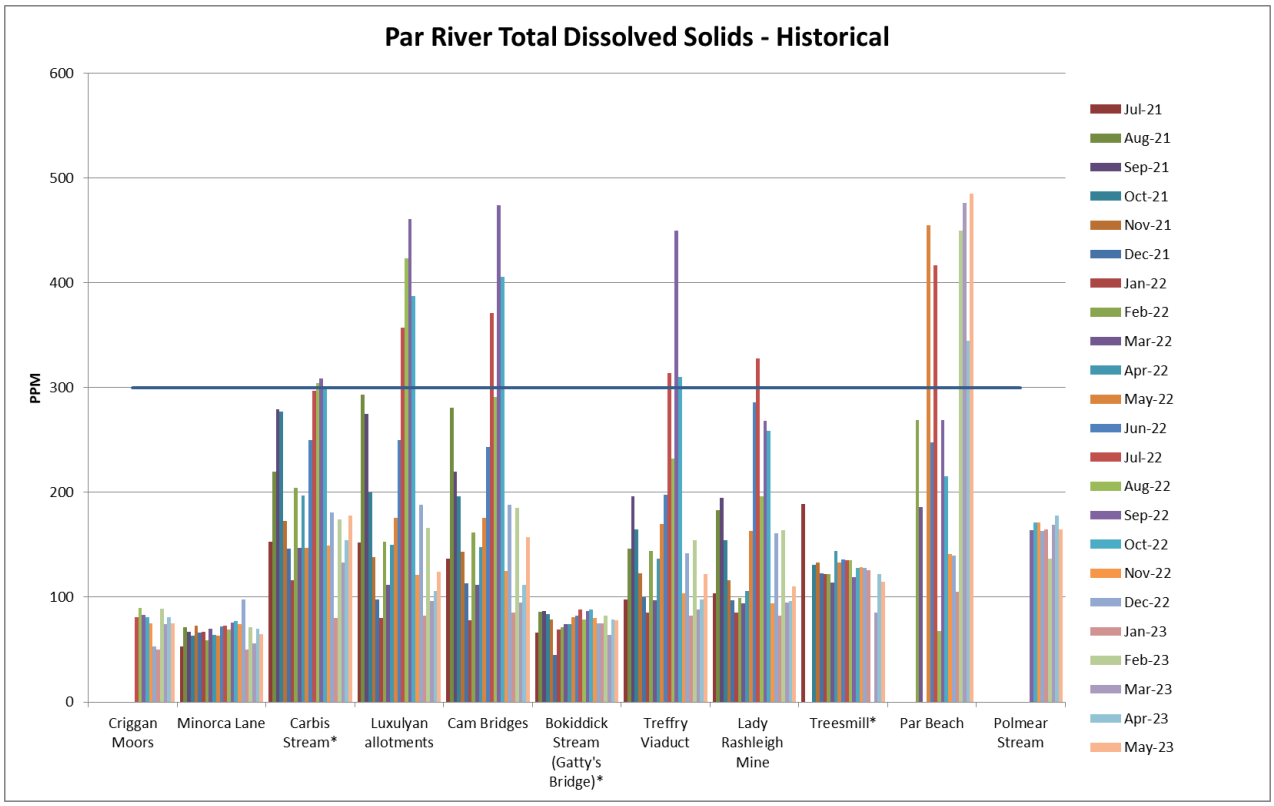
4. Graph May 2023 (and May 2022 for comparison)

Upper Normal Level

The WRT advice is: 'TDS levels vary between catchments due to natural geology etc. We generally say that after 6 months of sampling you should have an idea of what is 'normal' for your river. Looking at the scorecards for the Lower Par for 2020 and 2021 I would say that anything above 300 ppm is too high.'



* indicates a tributary of the Par River.



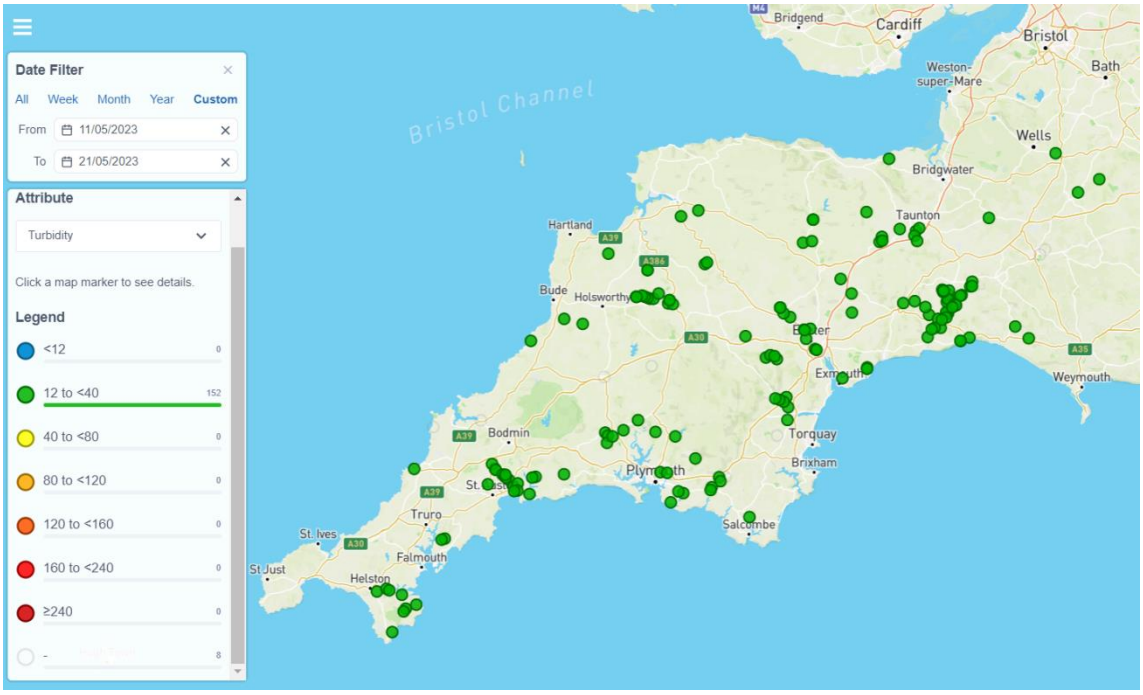
* indicates a tributary of the Par River.

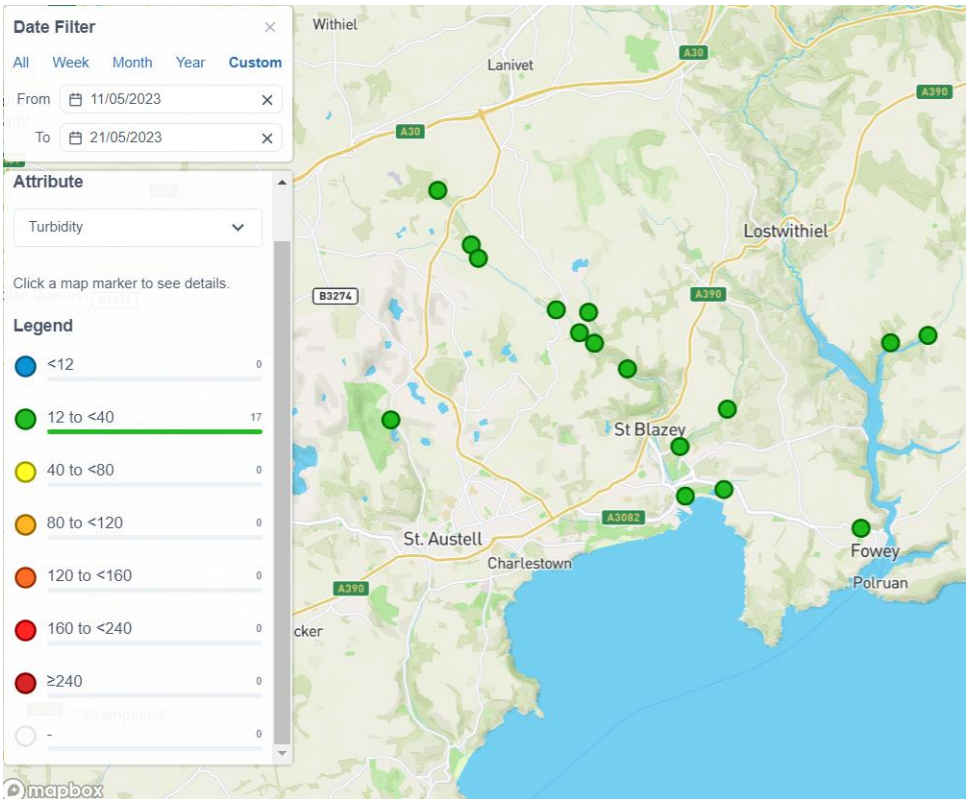
E. TURBIDITY

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.


Date Filter
All Week Month Year Custom
From 11/05/2023
To 21/05/2023
Attribute
Turbidity
Click a map marker to see details.
Legend
<12 0
12 to <40 152
40 to <80 0
80 to <120 0
120 to <160 0
160 to <240 0
≥240 0
- 8
Bristol Channel
Bridgend
Cardiff
Bristol
Bath
Weston-super-Mare
Wells
Bridgwater
Taunton
Hartland
Bude
Holsworth
Bodmin
Torquay
Brixham
Plymouth
Truro
St Ives
Falmouth
Helston
St Just
Salcombe
Weymouth

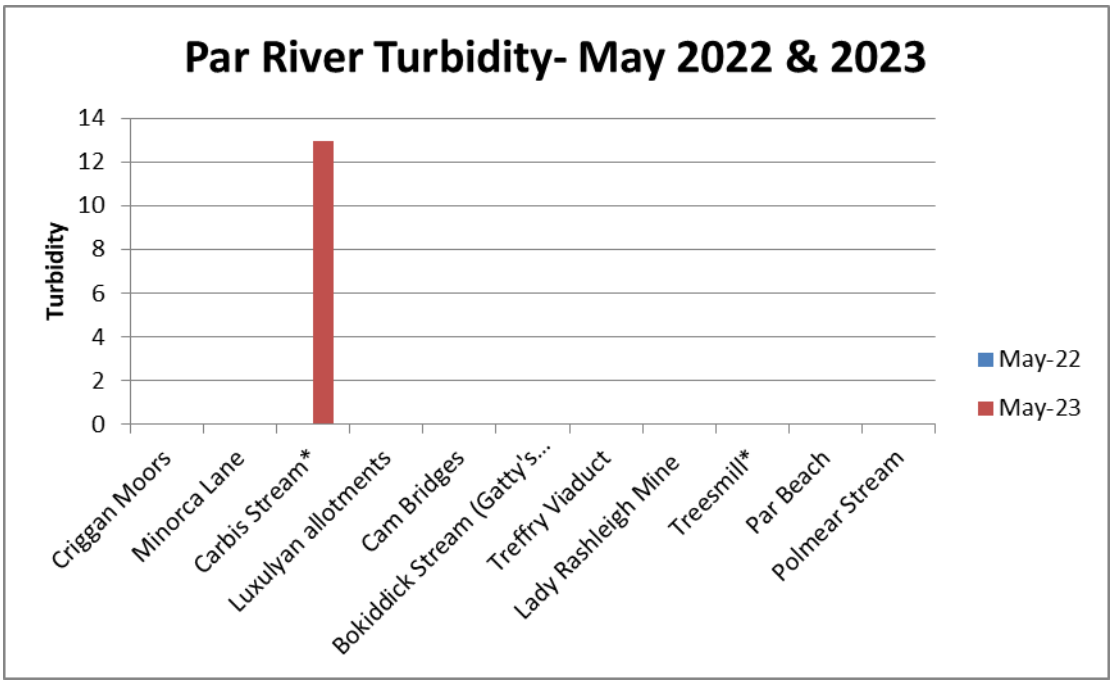

Date Filter
All Week Month Year Custom
From 11/05/2023
To 21/05/2023
Attribute
Turbidity
Click a map marker to see details.
Legend
<12 0
12 to <40 17
40 to <80 0
80 to <120 0
120 to <160 0
160 to <240 0
≥240 0
- 0
Withiel
Lanivet
Lostwithiel
St Blazey
St. Austell
Charlestown
Fowey
Polruan
B3274
A30
A390
A3082
mapbox

3. Results May 2023

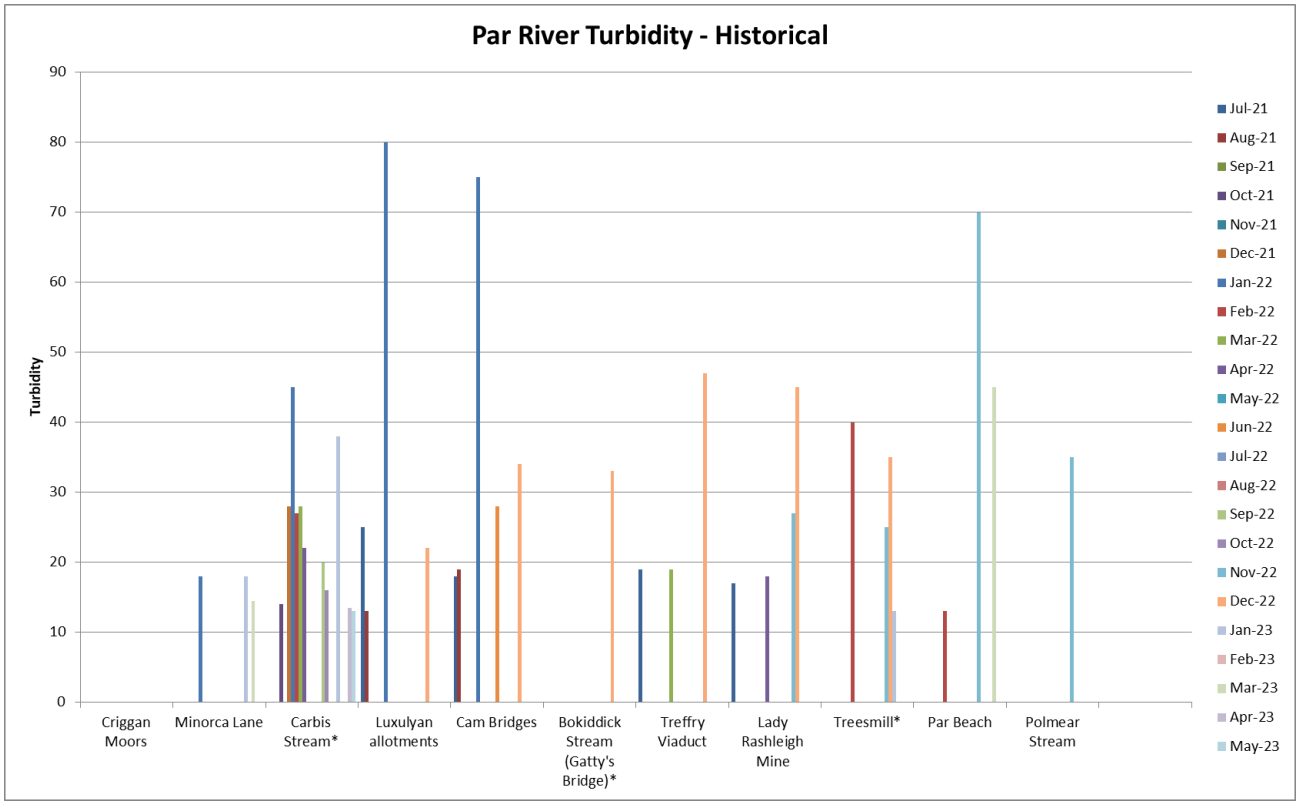
PAR RIVER/TRIBUTARY	LOCATION	Turbidity
Par	Criggan Moors, SX 01882 61133	0
Par	South of Minorca Lane, Par River, SX 02657 59788	0
Tributary	Carbis Stream SX 02834 59401	13
Par	Luxulyan allotments, Par River, SX 04732 58045	0
Par	Cam Bridges, Par River, SX 05292 57454	0
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	0
Par	Treffry Viaduct, Par River, SX 05650 57179	0
Par	Lady Rashleigh Mine, Par River, SX 06451 56509	0
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

*** <12 (0 for purposes of table and graph) at Bridge Park on Tywardreath Stream (SX 07695 54528).**

4. **Results May 2022 and 2023**



* indicates a tributary of the Par River.



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.)

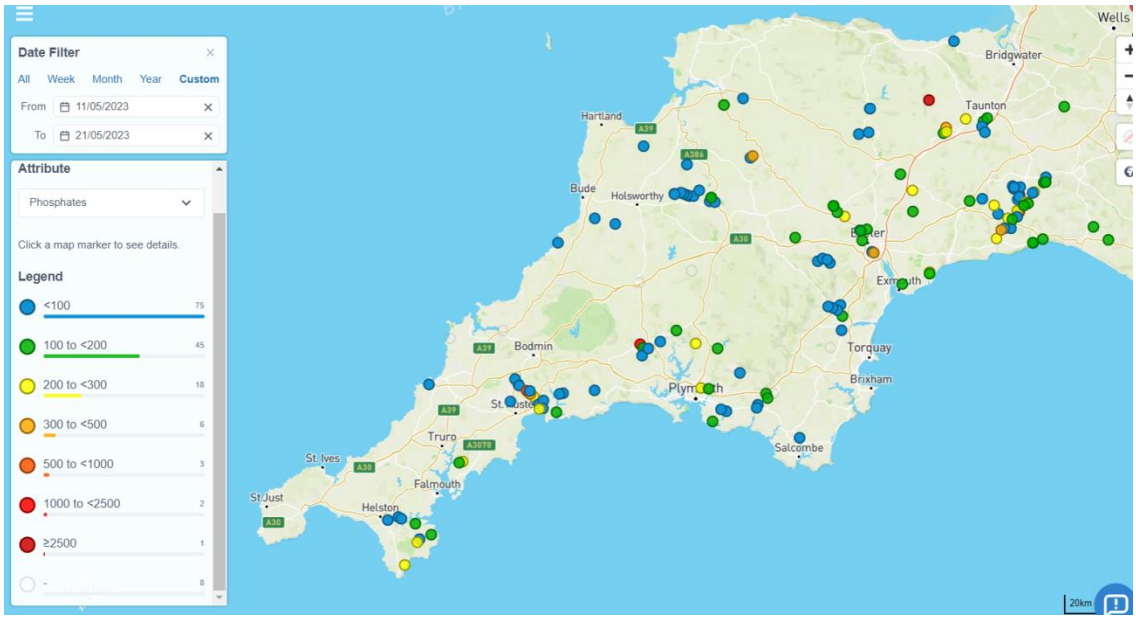
Ranges on phosphate diagnostic colour chart:

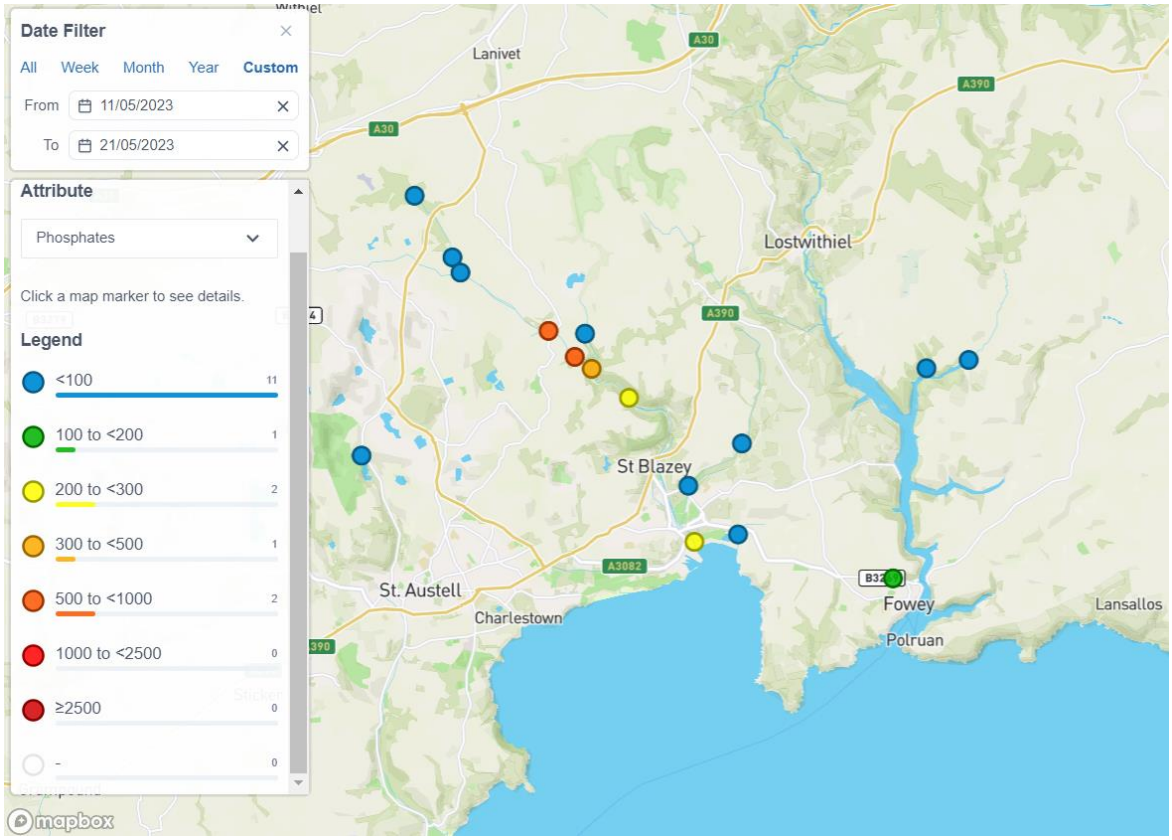
0 – 100 OK

200 – 300 HIGH

500 – 2500 – TOO HIGH

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



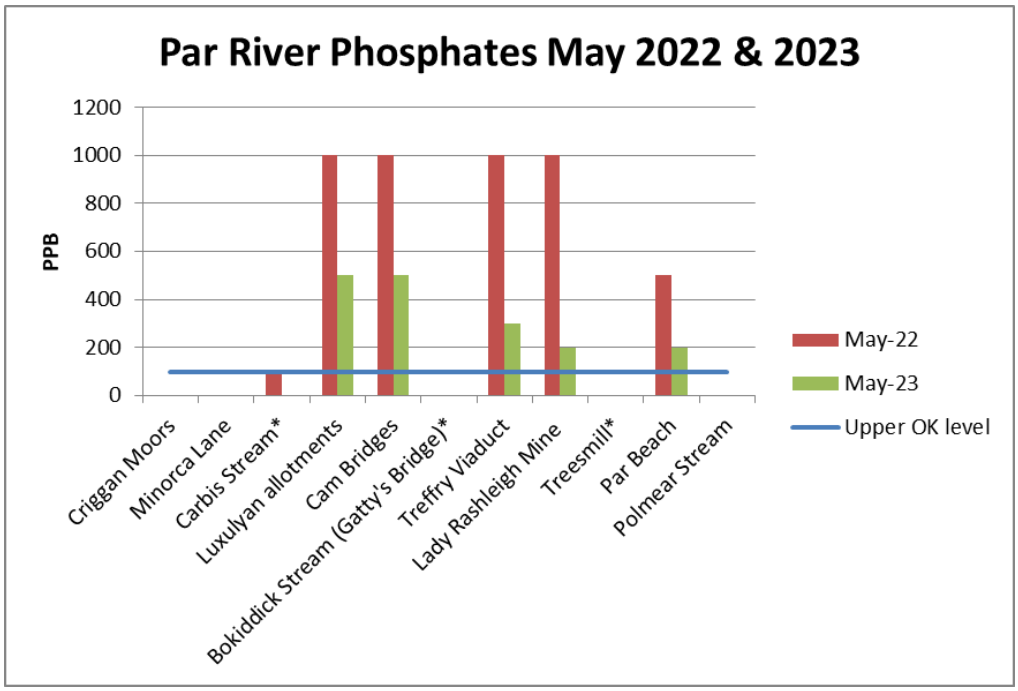


3. Results May 2023

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	500
Par	Cam Bridges, Par River, SX 05292 57454	500
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	0
Par	Treffry Viaduct, Par River, SX 05650 57179	300
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	200
Tributary	Polmear Stream, Ship Inn, SX 08749 53417	0

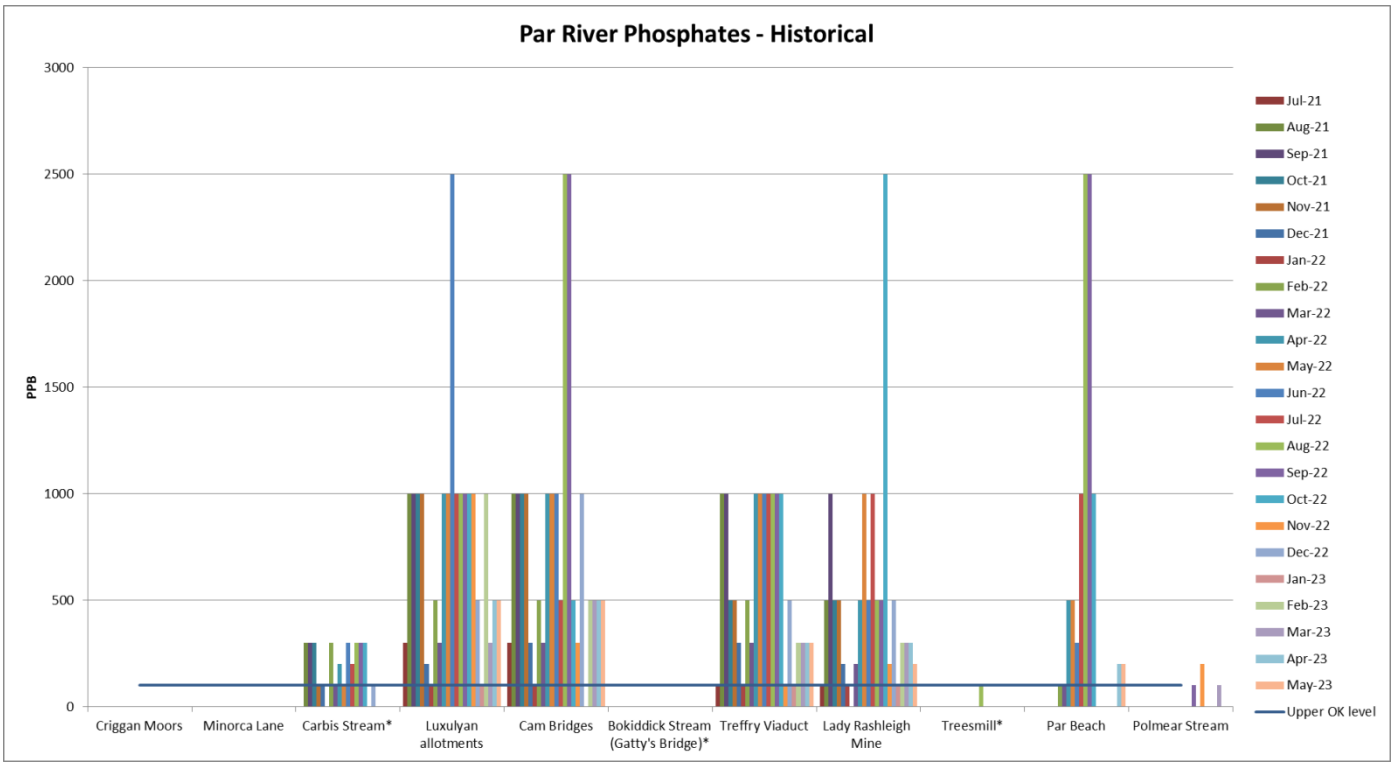
*** 0 PPB at Bridge Park on Tywardreath Stream (SX 07695 54528).**

4. Phosphates May 2022 and 2023



*indicates a tributary of the Par River. USL is 100 Parts Per Billion which, according to WRT, is the Upper Safe Level.

5. Phosphates – Historical



*indicates a tributary of the Par River. USL is 100 Parts Per Billion which, according to WRT, is the Upper Safe Level.

G. BACTERIA (E.COLI (EC) & TOTAL COLIFORM (TC)

1. A sample was taken from the Par River at Lady Rashleigh Mine (SX 06451 56509). Joan Farmer incubated the samples.

2. Key information:

(a) What is the difference between total coliform and E. coli?

Total coliform is a large collection of different kinds of bacteria. Faecal coliform are types of total coliform that exist in faeces. E. coli is a subgroup of faecal coliform.
https://doh.wa.gov/sites/default/files/legacy/Documents/Pubs//331-181.pdf

(b) Why is E. coli in river water a concern?

The presence of E. coli **indicates faecal contamination of the drinking water** and as a result, there is an increased risk that enteric pathogens may be present. https://www.canada.ca/en/health-canada/programs/consultation-e-coli-drinking-water/document.html

Particular thanks are due to Joan Farmer for allowing the use of her home for the unpleasant process of incubating the samples and also for contacting the manufacturers of the kit in North Carolina, USA, for guidance on the results. Thanks too to Ross Tonkin for sharing his professional expertise.

(c) Interpreting the river group results:

Aquagenx CBT EC+TC MPN Kit gives a guide to help interpret the results of the incubated samples. This is an attempt at a simple guide linked to the **United States Environmental Protection Agency Recreational Water Health Risk Category Based on Most Probable Number (MPN) and Upper 95% Confidence Level.** However, this simplification should be used with caution until it has been checked by someone with relevant expertise.

MPN/100mL	Health Risk Category
0	**Low Risk/Safe**
10 - 40	**Low Risk/Probably Safe**
47 – 84	**Low Risk/Possibly Safe**
91 - 96	**Intermediate Risk/Possibly Safe**
136 - 171	**High Risk/Probably Unsafe**
326 - 483	**Very High Risk/Unsafe**
>1000	**Very Unsafe**

3. Monthly results including May 2023

MONTH & TEST	**Criggan Moor (Upper Par) SX01882 61133 Sample & Result Dates, Score & Health Risk**	**Minorca Lane (Upper Par) SX02657 59788 Sample & Result Dates, Score & Health Risk**	**Lady Rashleigh Mine (Lower Par) SX06451 56509 Sample & Result Dates, Score & Health Risk**	**NOTES ON WEATHER, TEST ETC**
FEBRUARY 2022				
E.coli	n/a	n/a	21/02/2022 (23/02/2022; 24/02/2022) **483[1]** **Very High/ Unsafe** **483[2]** **Very High Risk /Unsafe**	Rain prev. 24 hrs

Total Coliform	n/a	n/a	21/02/2022 (23/02/2022; 24/02/2022) **>1000** **Very Unsafe** **>1000** **Very Unsafe**	Rain prev. 24 hrs
MARCH 2022				
E.coli	n/a	n/a	21/03/2022; 24/02/2022 **136** **High Risk.** **Probably unsafe.**	Dry
Total Coliform	n/a	n/a	21/03/2022; 24/02/2022 **>1000**[3] **Very Unsafe**	Dry
APRIL 2022	**Criggan**	**Minorca Lane**	**Lady Rashleigh**	
E.coli	n/a	n/a	16/04/2022; 18/04/2022 **326** **Very High Risk /Unsafe**	Dry and sunny following rain. Temp over 30˚ C.
Total Coliform	n/a	n/a	16/04/2022; 18/04/2022 **>1000** **Very Unsafe**	Dry and sunny following rain. Temp over 30˚ C. Definitely blue in compartments 4 & 5.
MAY 2022				
E.coli	n/a	n/a	9/05/2022; 11/05/2022 **136** **High Risk. Prob. Unsafe**	Dry
Total Coliform	n/a	n/a	9/05/2022; 11/05/2022 **>1000** **Very Unsafe**	Dry Def. blue
JUNE 2022				
E.coli	n/a	n/a	27/06/2022; 29/06/2022 **483** **Very High Risk/ Unsafe**	Rain in prev. 24 hours
Total Coliform	n/a	n/a	27/06/2022; 29/06/2022 **>1000** **Very Unsafe**	Rain in prev. 24 hours Def. blue

JULY 2022				
E.coli	n/a	n/a	18/07/2022; 20/07/2022 **47** **Low Risk/Possibly Safe**[4]	Dry
Total Coliform 18/07/2022; 20/07/2022	n/a	n/a	18/07/2022; 20/07/2022 **483** **Very High Risk/ Unsafe**	Dry
AUGUST 2022	**Criggan**	**Minorca Lane**	**Lady Rashleigh**	
E.coli	19/08/2022 **483** **Very High Risk/ Unsafe**	19/08/2022 **483** **Very High Risk/ Unsafe**	21/08/2022; 23/08/2022 **483** **Very High Risk/ Unsafe**	
Total Coliform	19/08/2022 **>1000** **Very Unsafe**	19/08/2022 **>1000** **Very Unsafe**	21/08/2022; 23/08/2022 **>1000** **Very Unsafe**	Light rain
SEPTEMBER 2022	**Criggan**	**Minorca Lane**	**Lady Rashleigh**	
E.coli	16/09/2022 **483** **Very High Risk/ Unsafe**	16/09/2022 **136** **High Risk/Probably Unsafe**	17/09/2022; 19/09/2022 **483** **Very High Risk/ Unsafe**	No rain
Total Coliform	16/09/2022 **>1000** **Very Unsafe**	16/09/2022 >1000 Very Unsafe	17/09/2022; 19/09/2022 **>1000** **Very Unsafe**	No rain
OCTOBER 2022	**Criggan**	**Minorca Lane**	**Lady Rashleigh**	
E.coli	17/10/2022 **483** **Very High Risk/ Unsafe**	17/10/2022 **47** **Low Risk/Possibly Safe**	15/10/2022 **483** **Very High Risk/ Unsafe**	Dry. Light rain in previous 24 hours. River low.
Total Coliform	17/10/2022 **>1000** **Very Unsafe**	17/10/2022 **>1000** **Very Unsafe**	15/10/2022 **>1000** **Very Unsafe**	Dry. Light rain in previous 24 hours. River low.
NOVEMBER 2022	**Criggan**	**Minorca Lane**	**Lady Rashleigh**	
E.coli	No sample	16/11/2022 **483** **Very High Risk/ Unsafe**	16/11/2022 **483** **Very High Risk/ Unsafe**	Heavy rain
Total Coliform	No sample	16/11/2022 **>1000** **Very Unsafe**	16/11/2022 **>1000** **Very Unsafe**	Heavy rain
DECEMBER 2022	**Criggan**	**Minorca Lane**	**Lady Rashleigh**	
E.coli	No sample	No sample	18/11/2022 **483** **Very High Risk/ Unsafe**	Heavy rain
Total Coliform	No sample	No sample	18/11/2022 **>1000** **Very Unsafe**	Heavy rain

JANUARY 2023	Criggan	Minorca Lane	Lady Rashleigh	
E.coli	No sample	No sample	No sample	
Total Coliform	No sample	No sample	No sample	
FEBRUARY 2023	**Criggan**	**Minorca Lane**	**Lady Rashleigh**	
E.coli	No sample	No sample	**136** **High Risk. Prob. Unsafe**	Light rain in previous 24 hours. River level average or slightly lower.
Total Coliform	No sample	No sample	**136** **High Risk. Prob. Unsafe**	Light rain in previous 24 hours. River level average or slightly lower.
MARCH 2023	**Criggan**	**Minorca Lane**	**Lady Rashleigh**	
E.coli	No sample	No sample	22/3/2022 **>1000** **Very Unsafe**	Light rain in previous 24 hours.
Total Coliform	No sample	No sample	22/3/2022 **>1000** **Very Unsafe**	Light rain in previous 24 hours.
APRIL 2023	**Criggan**	**Minorca Lane**	**Lady Rashleigh**	
E.coli			18/4/2023 **483** **Very High Risk/ Unsafe**	No rain in previous 24 hours. River level average
Total Coliform			18/4/2023 **>1000** **Very Unsafe**	No rain in previous 24 hours. River level average
MAY 2023				
E.coli			**12/5/2023** **136** **High Risk. Prob. Unsafe**	Light rain in previous 24 hours.
Total Coliform			**12/5/2023** **>1000** **Very Unsafe**	Light rain in previous 24 hours.

1. Readings taken twice on the 1st sample as it took 12 hours to reach the minimum temperature of 25 degrees.

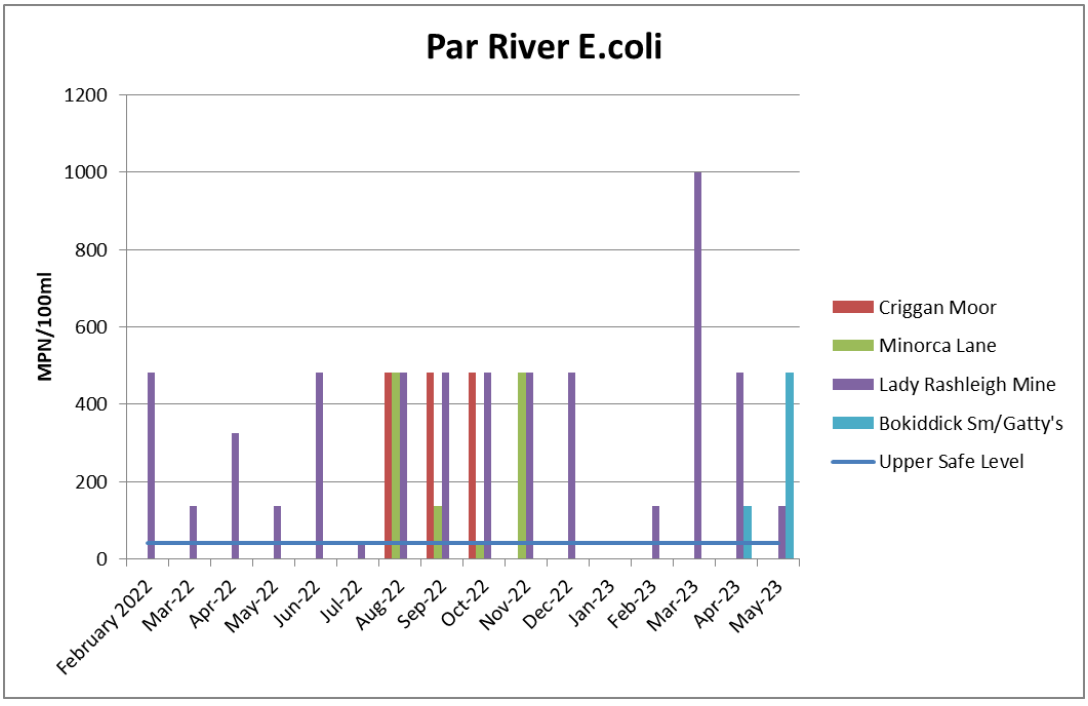
2. Originally >1000 but I now believe this reading should be 483 and the traces of blue in compartment 5 had leaked out of one of the other compartments as the clip was not positioned exactly along the maximum fill line.

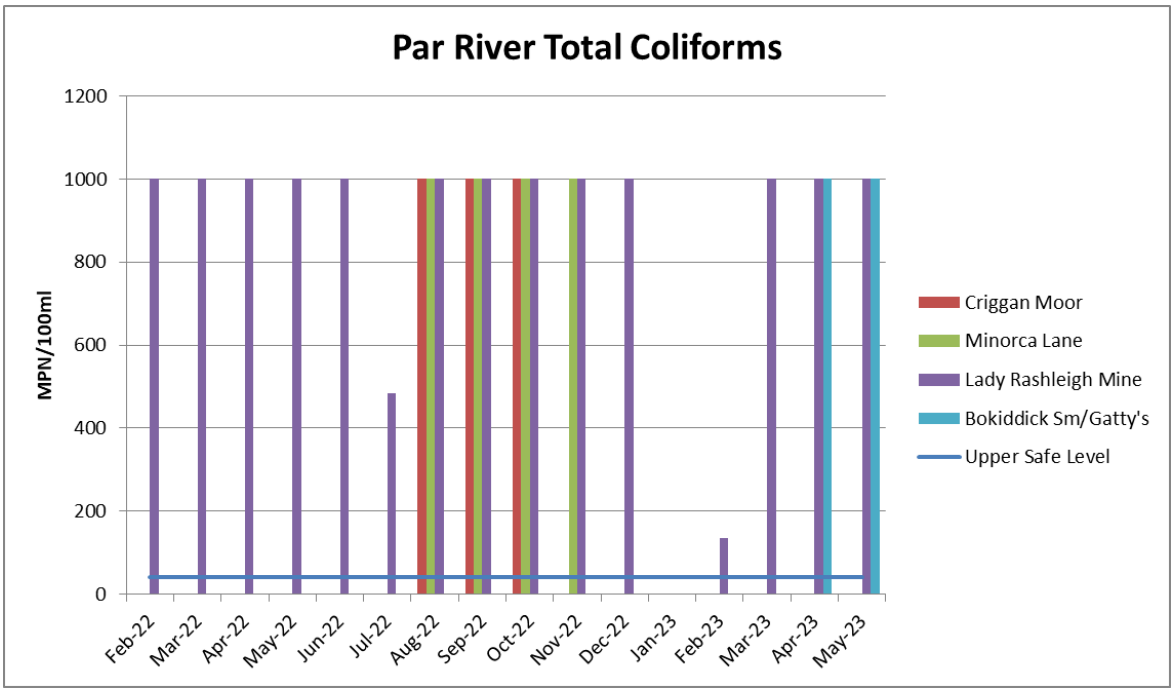
3. Compartments 4 and 5 had only very pale blue fluorescence in UV light, but definitely glowed with no trace of yellow. Aquagenx company confirmed that fluorescence under UV light indicates positive for total coliforms.

4. Due to hot weather, limited additional heat was added. The temperature for most of the time was between 25 and 30 so should have been left for 40-48 hours. Insufficient time given (36 hrs) so results may be wrong.

Additional samples have been taken from the Bokiddick Stream at Gatty's (SX 05531 57953):

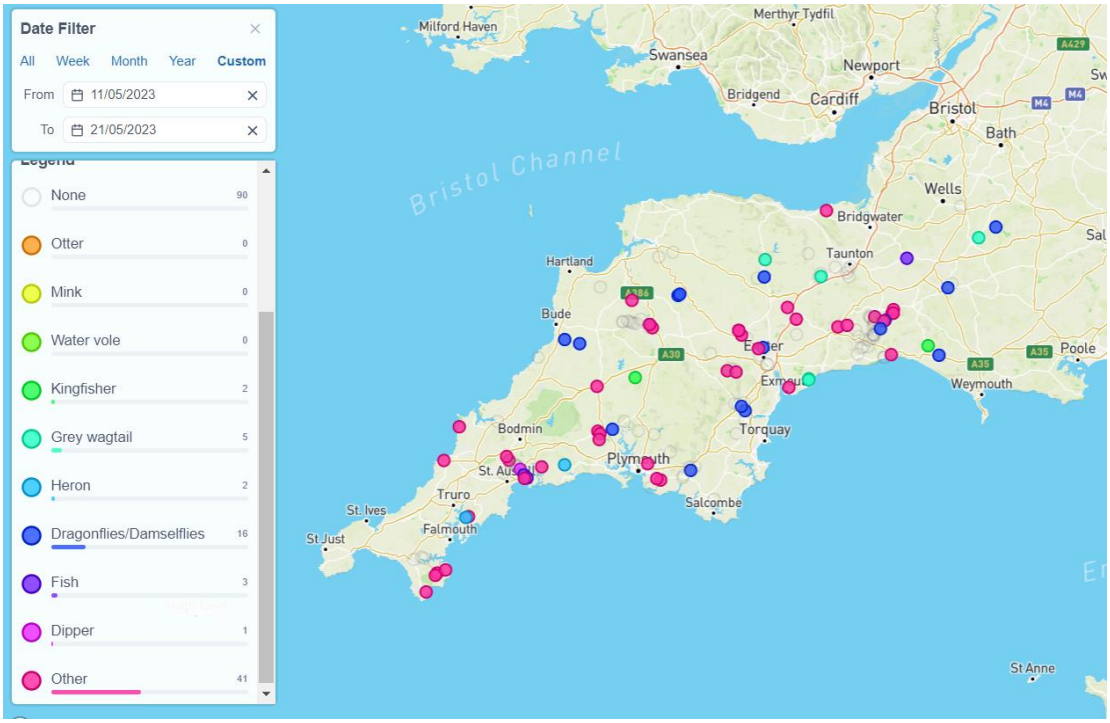
APRIL 2023				
E.coli			18/4/2023 **136mpn/100ml, so High Risk/Probably Unsafe**	No rain in previous 24 hours. River level average
Total Coliform			18/4/2023 **>1000 Very Unsafe**	No rain in previous 24 hours. River level average
MAY 2023				
E.coli			**12/5/2023 483 Very High Risk/ Unsafe**	No rain in previous 24 hours. River level average
Total Coliform			**12/5/2023483 >1000 Very Unsafe**	No rain in previous 24 hours. River level average

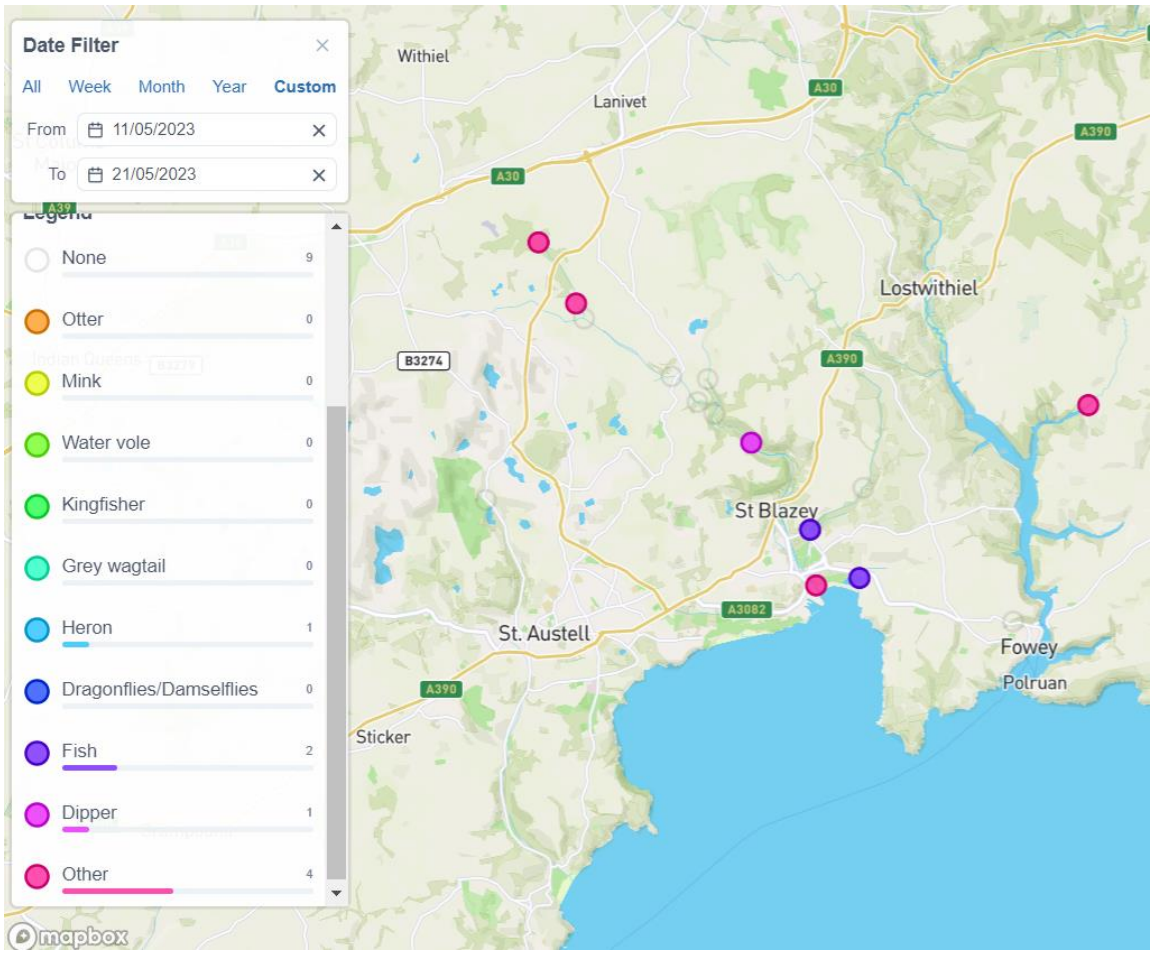




H. WILDLIFE (FOR OTTER REPORT SEE SECTION I)

(a) Maps





(b) Wildlife sightings at the monitoring points included:

PAR RIVER/TRIBUTARY	LOCATION	WILDLIFE NOTED
Par	Criggan Moors, SX 01882 61133	Speckled Wood butterfly
Par	South of Minorca Lane, Par River, SX 02657 59788	Pond skaters
Tributary	Carbis Stream SX 02834 59401	None.
Par	Luxulyan allotments, Par River, SX 04732 58045	None.
Par	Cam Bridges, Par River, SX 05292 57454	None
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	Dipper
Par	Treffry Viaduct, Par River, SX 05650 57179	None
Par	Lady Rashleigh Mine, Par River, SX 06451 56509	Dipper Riverfly nymphs: Cased Caddisfly, Caseless Caddisflies, Flat-bodied upwings, Blue-winged olive, Olives, Stoneflies, and Freshwater Shrimps.
Tributary	Treesmill, Tywardreath Stream, SX 08873 55385*	None
Par	Par Beach slipway, SX 0776 53261	Swans, geese, White butterfly
Tributary	Polmear Stream, Ship Inn, SX 08749 53417	Fish, midges

*** Fish at Bridge Park on Tywardreath Stream (SX 07695 54528).**

I. OTTER SURVEY MAY 2023

1. SURVEY CONDITIONS

Date & time	12/5/2023, 15/5/2023
Surveyors	Roger Smith, Dave Burrell, Joan Farmer, Veronica Jones, Layla Ousley
Areas surveyed	Upper Par (Criggan Moors and Minorca Lane); Par River from STW to Cam Bridges; Par River from Treffry Viaduct to Par Beach slipway.
Weather	No rain previously
River level	Average
River flow	Steady
Water quality	Phosphate readings 500 PPB at the highest (Luxulyan allotments), 500 at Cam Bridges, 300 at Treffry Viaduct and 200 at Lady Rashleigh Mine and Par Beach slipway. All readings zero upstream from the allotments. High bacteria levels at LRM and Gatty's.
Other wildlife	Dippers at Lady Rashleigh Mine and downstream from Ponts Mill. Riverfly nymphs at LRM.

2. EVIDENCE FOR OTTERS ✓

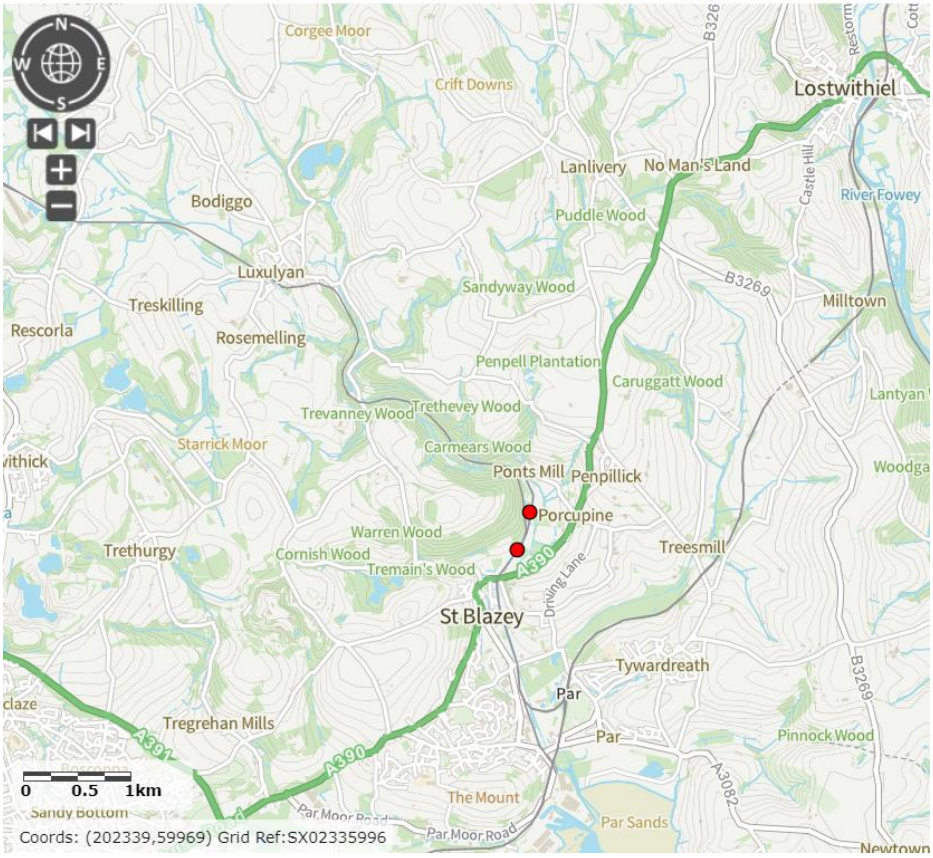
EVIDENCE	SEEN/ ORKS*	LOCATION	NOTES
Spraint - fresh			
Spraint – recent	✓*	SX 0733 5577 Downstream from Ponts Mill sluice & upstream from footbridge.	
	✓*	SX 0722 5542 Stone in river near path south of Prideaux Wood china clay works (disused) – stone in river.	Fish bones visible.
Spraint - old			
Anal jelly			
Sign heap			
Staining			
Tracks			
Path			
Slide			
Holt			
Hover			
Couch			
Live sighting			
Corpse			

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

3. MAP

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

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.



4.
PHOTOGRAPHS

No photographs were taken.

5. COMMENTS

Spraint confirmed by Layla Ousley (WRT Land & Fisheries Officer).

J. ARMI RIVERFLY SURVEY

Three of the group (Joan Farmer, Veronica Jones and Roger Smith) have undertaken the training to carry out Riverfly Surveys under the Anglers' Riverfly Monitoring Initiative (https://www.riverflies.org/rp-riverfly-monitoring-initiative). In short, sampling for 8 riverfly groups is carried out using standardised methods with scores calculated for their abundance. Information is passed to ARMI and the ORKS database. If the score does not reach a trigger level (in our case trigger level was raised from 5 to 6 in May 2022), the Environment Agency must be informed immediately

since it is highly likely to indicate that the water is polluted. Our group received approval to sample at two sites: Luxulyan allotments (SX 04743 58054) and Lady Rashleigh Mine (SX 06453 56500). We have decided, for the time being, to concentrate on the latter.

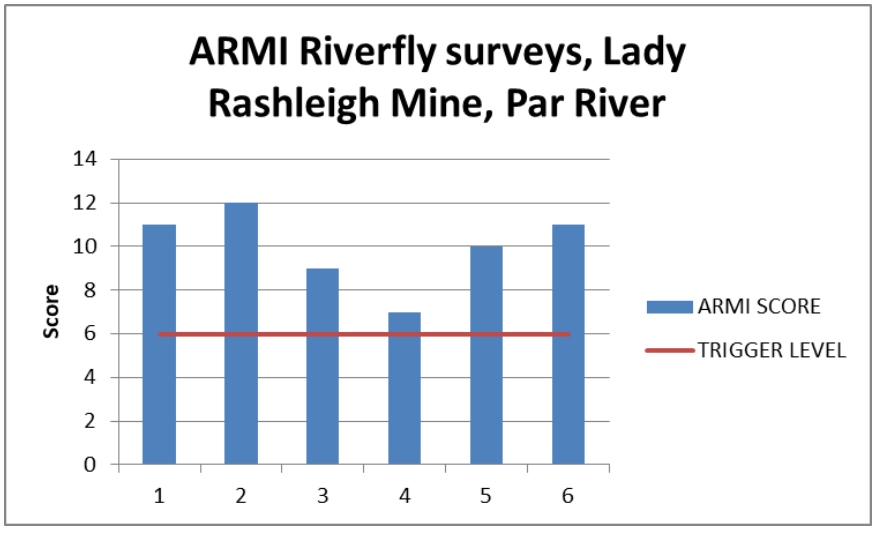
It is impossible to count every invertebrate so this counting method is used:

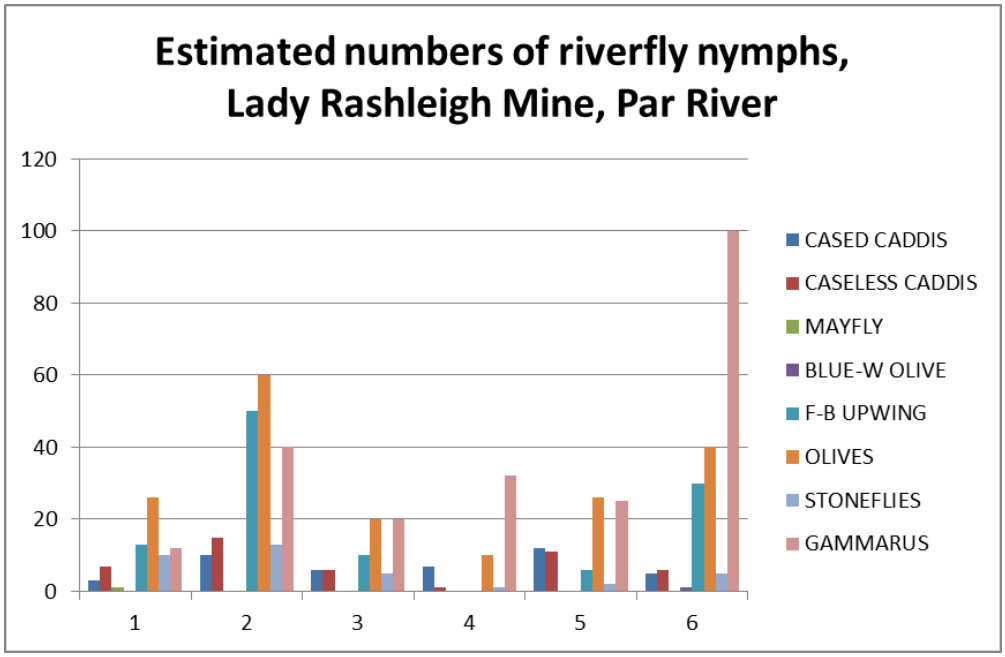
Abundance	Score	Estimated Number
1-9	1	Quick count
10-99	2	Nearest 10
100-999	3	Nearest 100
>1000	4	Nearest 1000

Results of survey at Lady Rashleigh Mine (SX 06451 56509) carried out by Dave Burrell, JoaFarmer, Veronica Jones and Roger Smith on 12th May 2023

	SPECIES	NUMBER	CATEGORY
Trichoptera			
1	**Cased Caddisfly**	**5**	**1**
2	**Caseless Caddisfly**	**6**	**1**
Ephemeroptera 3 tails			
3	**Mayfly (Ephemeridae)**	**0**	**0**
4	**Blue-winged olive (Ephemerellidae)**	**1**	**1**
5	**Flat-bodied up-wings (Heptageniidae)**	**30**	**2**
6	**Olives (Baetidae)**	**40**	**2**
Plecoptera 2 tails			
7	**Stoneflies**	**5**	**1**
Gammaridae			
8	**Freshwater Shrimp**	**100**	**3**
			11

CATEGORY TOTAL	**11**
TRIGGER LEVEL	**6**





Excel is playing up so dates can't be put on the riverfly charts. Our surveys were conducted on these dates:

SURVEY NUMBER ON CHART	DATE OF SURVEY
1	21-Mar-22
2	16-Apr-22
3	09-May-22
4	18-Jul-22
5	18-Apr-23
6	21-Mar-22
7	18-Apr - 2023
8	12-Apr-2023

K. DISCUSSION

1. Positive observations

(a) The ARMI riverfly trigger level was exceeded at Lady Rashleigh Mine on the Lower Par and numbers of nymphs were higher than for all previous surveys. A Blue-winged Olive was found for the first time.

(b) There were some encouraging wildlife sightings, including fish, otter spraint and dippers.

(c) Phosphate levels, though high in places, were significantly lower than in May 2022 but this is an insufficient basis for drawing general conclusions.

(d) China clay pollution on the Carbis Stream was not on the scale seen at other times.

2. Points of concern

(a) Taken at face value the bacteria tests are worrying. The main testing site at Lady Rashleigh Mine in the popular Luxulyan Valley had very high levels of Total Coliforms, and although its E.coli score was less than on previous occasions, it would still be classed as 'High Risk, Probably Unsafe' according to the US Aquagenx test. The scores for E.coli and Total Coliforms on the Bokiddick Stream at Gatty's ('Very High Risk/Unsafe' and Very Unsafe' respectively, according to the US Aquagenx test) are concerning since on other measures this waterbody has seemed to be relatively clean and healthy.

(b) Phosphate levels are still too high.

(c) Total Dissolved Solids remain high at Par Beach Slipway where phosphate levels are 'High' (WRT guidelines).

3. Areas of doubt

(a) We cannot be sure about the validity of our bacteria results, or the suitability of the Aquagenx test for rivers, until expert guidance is received. This testing was, to our knowledge, a pilot funded by G7 funds so it is hoped there will be an evaluation. Our most tested site, at Lady Rashleigh Mine, in Luxulyan Valley gives contradictory results: riverfly scores that meet or exceed the ARMI trigger level and encouraging wildlife observations (including otter spraint, although not this month); yet phosphate levels, though reduced in May, are high and the bacteria scores (despite lower E.coli than usual) are worrying, particularly for a location used by so many people.

(b) If we are correct in thinking bacteria levels are high, what is the cause (or causes)? It would seem, on the admittedly fragile basis of our small number of surveys, to be a phenomenon that is not confined to the main river, or to the stretch downstream from the St Austell North STW at Luxulyan. If the Bokiddick Stream at Gatty's is yielding high bacteria scores, a stream that has always seemed clean, and which does not flow through densely settled areas, what is causing it?

(c) Would phosphate levels be reduced to an acceptable level (less than 100 parts per billion) if action was taken at the South West Water St Austell North STW to reduce the phosphate content of the treated effluent discharged into the river?

(d) What is causing the high readings for Total Dissolved Solids and Phosphates at Par Beach slipway and what does this mean for the quality and safety of the water, particularly for people and animals using the beach?

L. 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, Chloe Lake, David

Edwards, Claire and Gary Phillips, Jenny Heskett, Nick Taylor, Jeremy Roberts, Mat Bateman, Colin Pringle, Matt Healey, Simon Browning, Lydia Deacon, Layla Ousley, Jack Middleton and Nicola Rogers 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, June 2023