WESTCOUNTRY RIVERS TRUST CITIZEN SCIENCE

The monitoring group has been helped by the Westcountry Rivers Trust, the Friends of Luxulyan Valley and the G7 Legacy Project for Nature Recovery. Comments and opinions in this report are not necessarily shared by these organisations.

MONITORING OF THE PAR RIVER AND ITS TRIBUTARIES

JUNE 2022

CONTENTS & PAGES

A. KEY POINTS FROM WRT CSI MONITORING IN MAY 2022

1. Phosphate levels were Too High once again.
2. Levels of bacteria at Lady Rashleigh Mine were *Very High Risk/Unsafe* (E.coli) and *Very Unsafe* (Coliforms).
3. It was not possible to conduct riverfly sampling because someone forgot to bring the net.
4. Otters and fish were shown to be present.

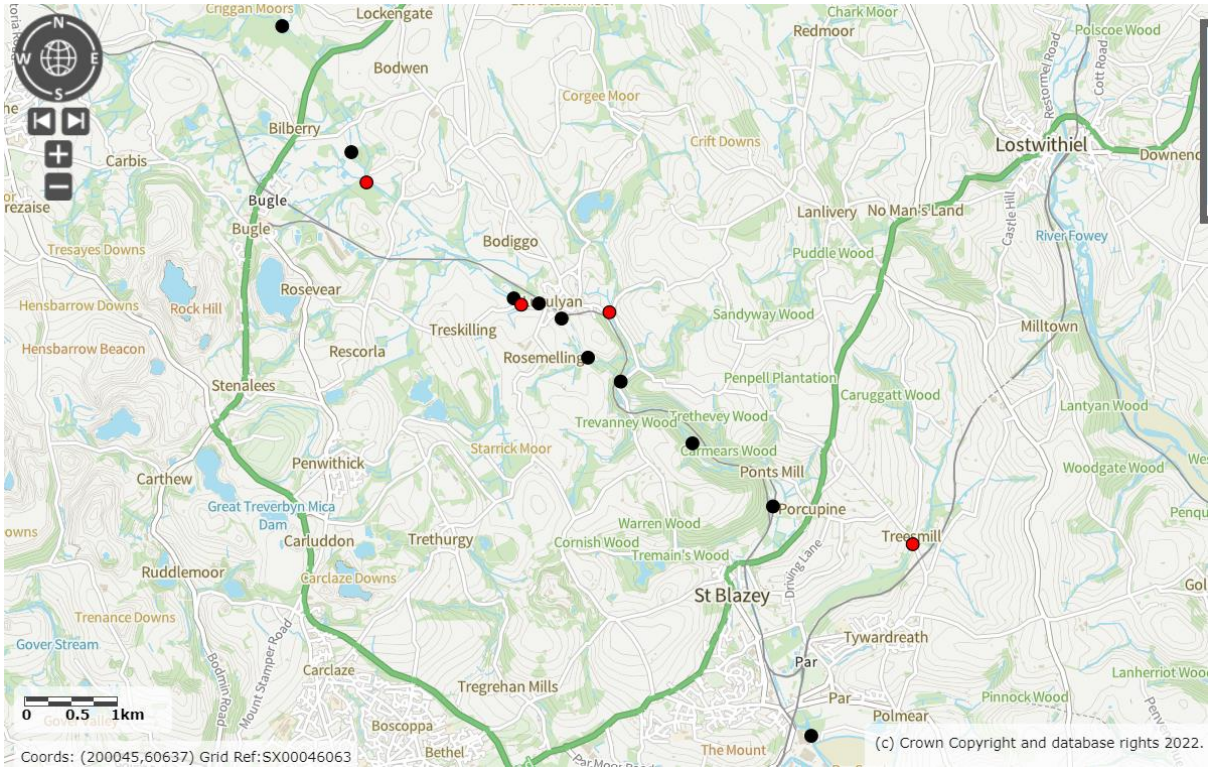
B. OUR GROUP

Monitoring is part of the Citizen Science programme run by the West Country Rivers Trust (WCRT) and is carried out monthly by volunteers from the Friends of Luxulyan Valley. The team comprises: Dave Burrell; Joan Farmer; Veronica Jones; Sue Perry; Roger Smith. They have received training from Lydia Deacon, 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 and Lydia Deacon is greatly appreciated. The interest and encouragement offered by Environment Agency officers, especially Lisa Best, has been invaluable.

C. JUNE 2022 MONITORING POINTS

This month we monitored at 14 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



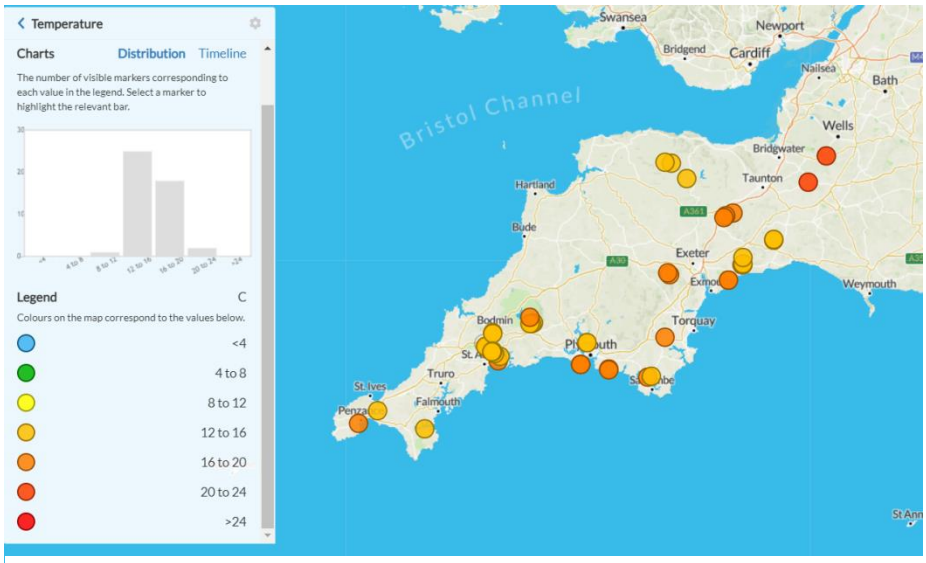
LOCATION	DATE	TYPE OF CHECK	MONITORED BY
Criggan Moors, Par River, SX 01882 61133	26/06/2022	Visual check. Cartographer record.	Roger Smith
South of Minorca Lane, Par River, SX 02657 59788	26/06/2022	CSI sampling. Cartographer record.	Roger Smith
Carbis Stream SX 02834 59401	26/06/2022	CSI sampling. Cartographer record.	Roger Smith
Downstream St Austell North STW SX 0446 5811	26/06/2022	Visual check.	Joan Farmer, Veronica Jones, Chloe Lake, Roger Smith.
Treverbyn Stream, SX 04532 58033	26/06/2022	Visual check.	Joan Farmer, Veronica Jones, Chloe Lake, Roger Smith.
Luxulyan allotments, Par River, SX 04732 58045	26/06/2022	CSI sampling. Cartographer record.	Joan Farmer, Veronica Jones, Chloe Lake, Roger Smith.
Luxulyan SWW pumping station, Par River, SX 05033 57849	26/06/2022	Visual check.	Joan Farmer, Veronica Jones, Chloe Lake, Roger Smith.
Cam Bridges, Par River, SX 05292 57454	26/06/2022	CSI sampling. Cartographer record.	Joan Farmer, Veronica Jones, Chloe Lake, Roger Smith.
Gatty's Bridge, Bokiddick Stream SX 05531 57953	26/06/2022	CSI sampling. Cartographer record.	Joan Farmer, Veronica Jones, Chloe Lake, Roger Smith.
Treffry Viaduct, Par River, SX 05650 57179	26/06/2022	CSI sampling. Cartographer record.	Joan Farmer, Veronica Jones, Chloe Lake, Roger Smith.
Lady Rashleigh Mine, Par River, SX 06451 56509	27/06/2022	CSI sampling, Riverfly, E.coli, Total Coliform. Cartographer record.	Joan Farmer, Veronica Jones, Roger Smith.
Ponts Mill, Par River, SX 07354 55875	27/06/2022	Visual check. Cartographer record.	Veronica Jones, Roger Smith.
Treesmill, Tywardreath Stream, SX 08873 55385	27/06/2022	CSI sampling. Cartographer record.	Veronica Jones
Par Beach slipway, SX 0776 53261	27/06/2022	CSI sampling. Cartographer record.	Veronica Jones

D. TEMPERATURE

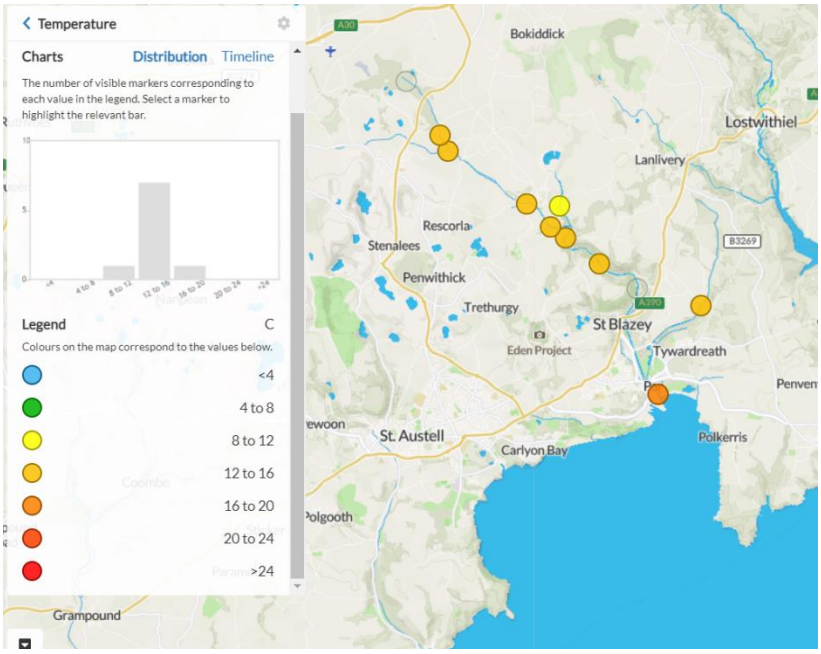
1. This is the WRT's explanation of why this is monitored:

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.



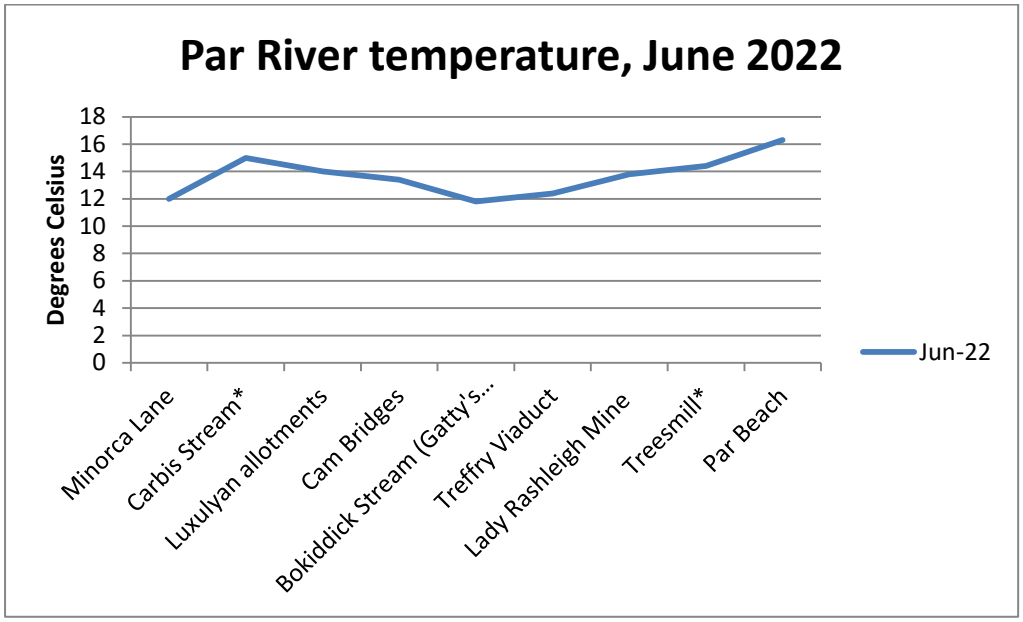
WRT results across the region



Par catchment results

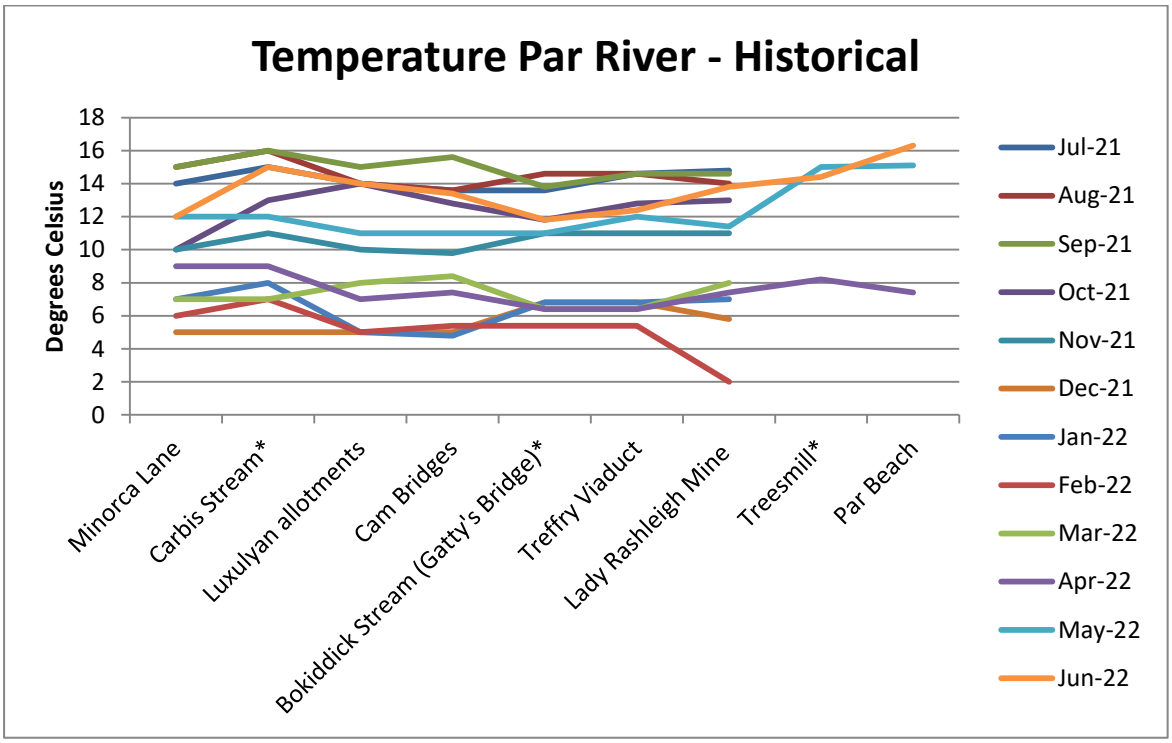
3. Results June 2022

PAR RIVER/TRIBUTARY	LOCATION	Temperature ˚Celsius
Par	South of Minorca Lane, Par River, SX 02657 59788	12
Tributary	Carbis Stream SX 02834 59401	15
Par	Luxulyan allotments, Par River, SX 04732 58045	14
Par	Cam Bridges, Par River, SX 05292 57454	13.4
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	11.8
Par	Treffry Viaduct, Par River, SX 05650 57179	12.4
Par	Lady Rashleigh Mine, Par River, SX 06451 56509	13.8
Tributary	Treesmill, Tywardreath Stream, SX 08873 55385	14.4
Par	Par Beach slipway, SX 0776 53261	16.3

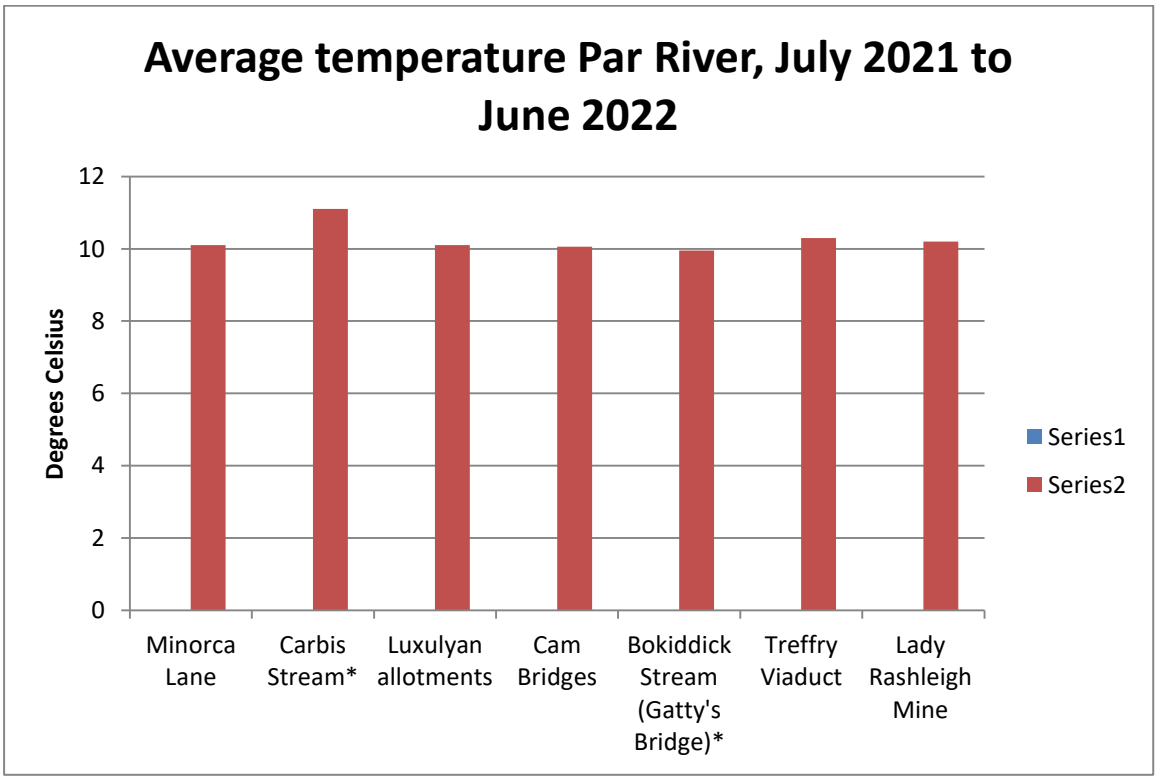


*indicates a tributary of the Par River.

3. **Historical data** on temperature:



4. Historical average temperatures (excluding Par Beach and Treesmill):

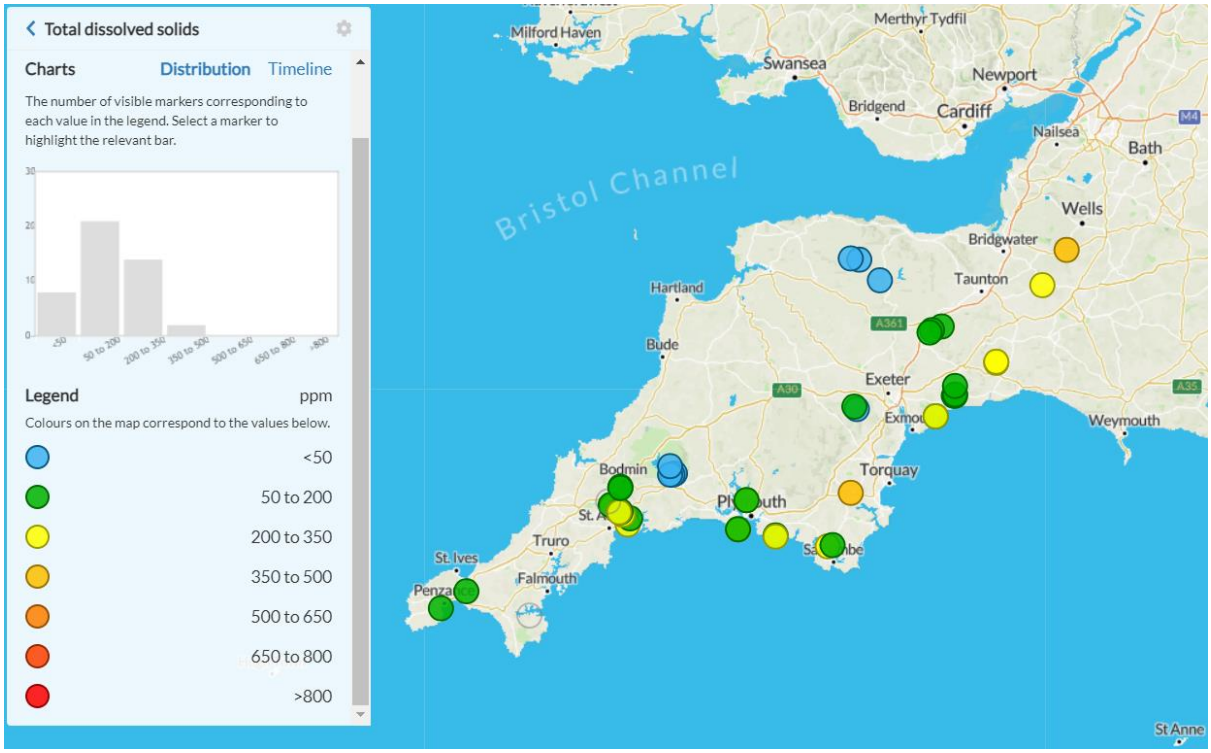


TOTAL DISSOLVED SOLIDS

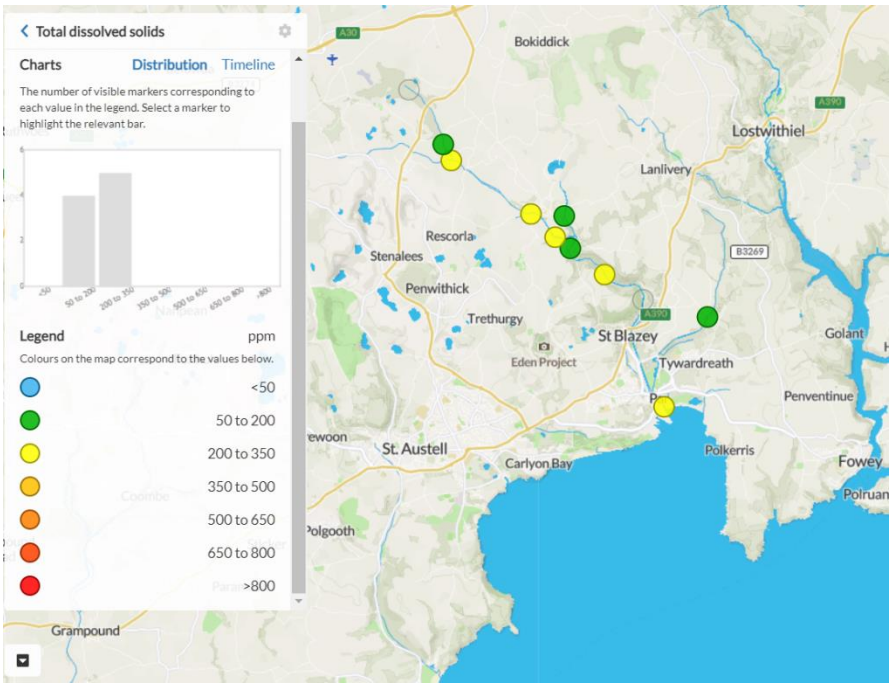
1. We measure these in ppm (parts per million). This is the WRT's explanation:

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.



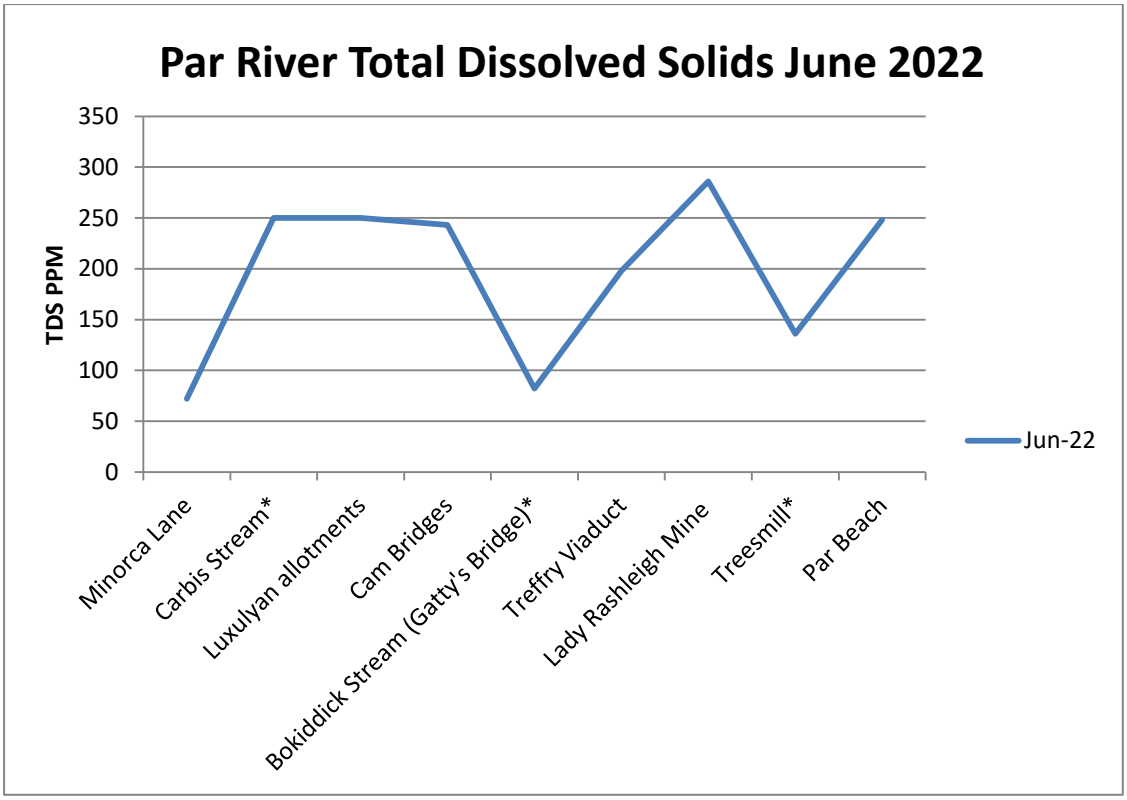
WRT TDS results across the region



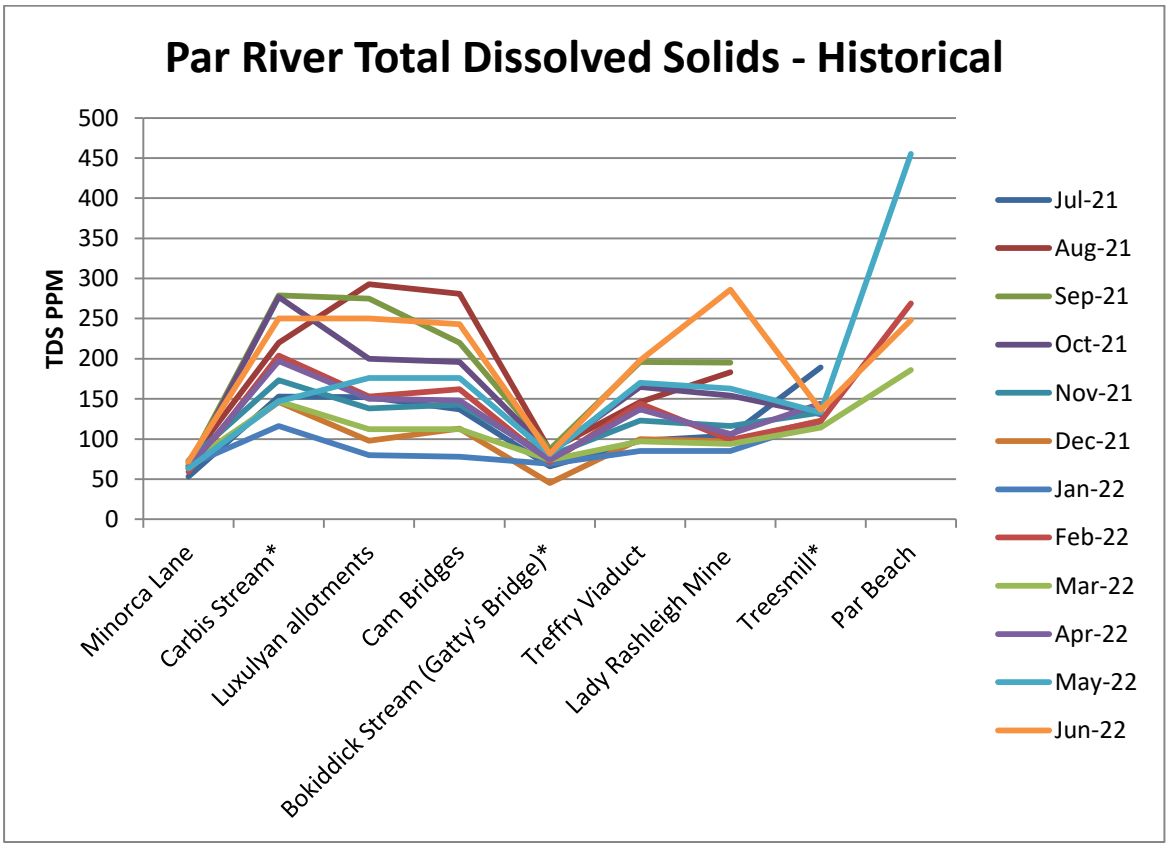
Par catchment results

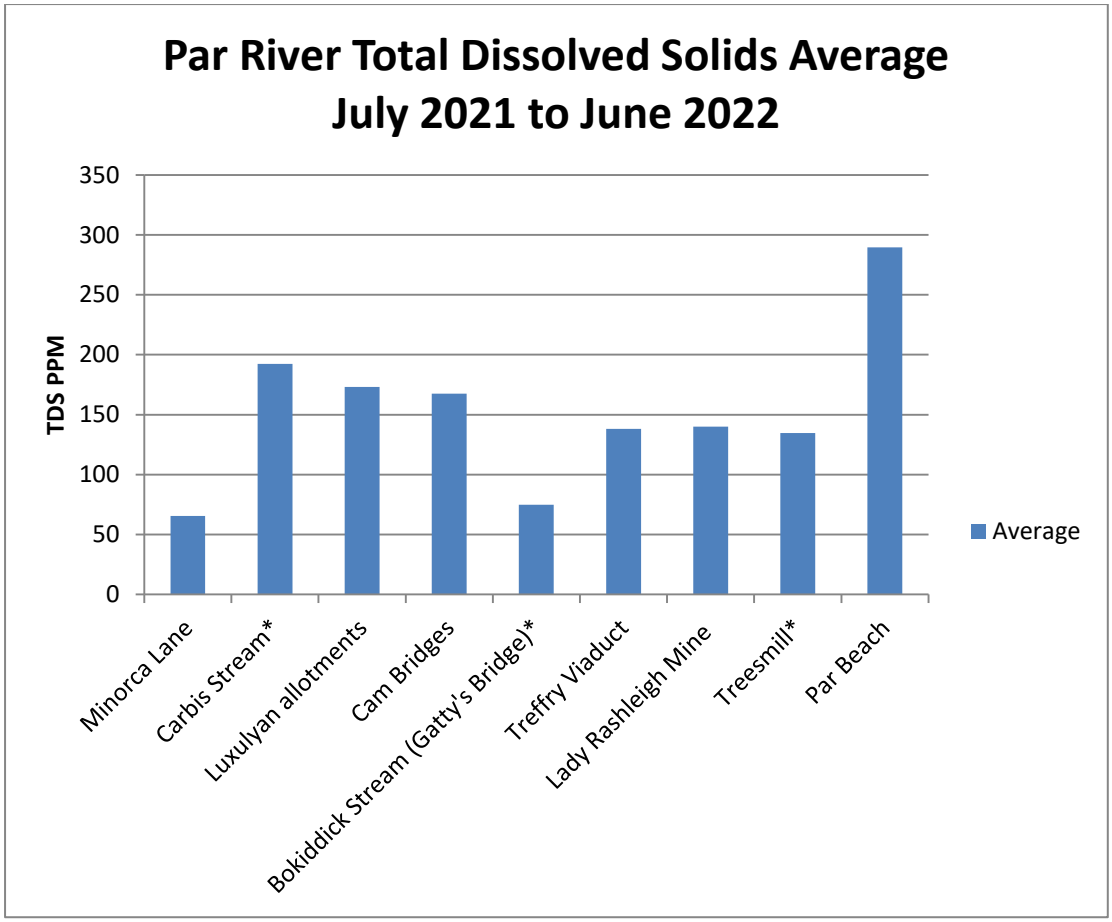
3. Results June 2022

PAR RIVER/TRIBUTARY	LOCATION	Total Dissolved Solids ppm
Par	South of Minorca Lane, Par River, SX 02657 59788	72
Tributary	Carbis Stream SX 02834 59401	250
Par	Luxulyan allotments, Par River, SX 04732 58045	250
Par	Cam Bridges, Par River, SX 05292 57454	243
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	82
Par	Treffry Viaduct, Par River, SX 05650 57179	198
Par	Lady Rashleigh Mine, Par River, SX 06451 56509	286
Tributary	Treesmill, Tywardreath Stream, SX 08873 55385	136
Par	Par Beach slipway, SX 0776 53261	248



3. **Historical data** on total dissolved solids:



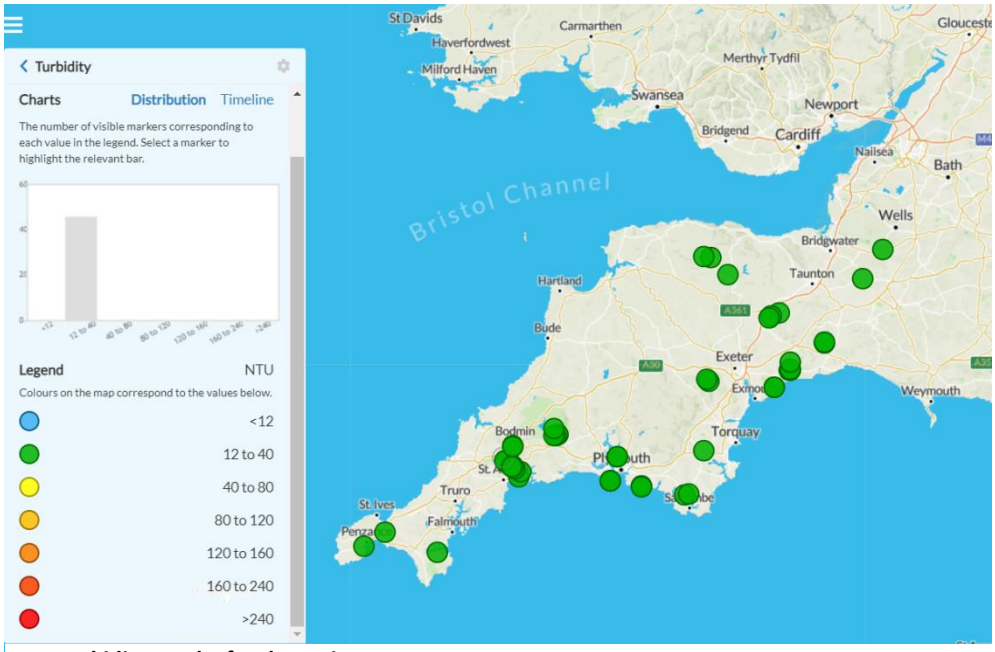


E. TURBIDITY

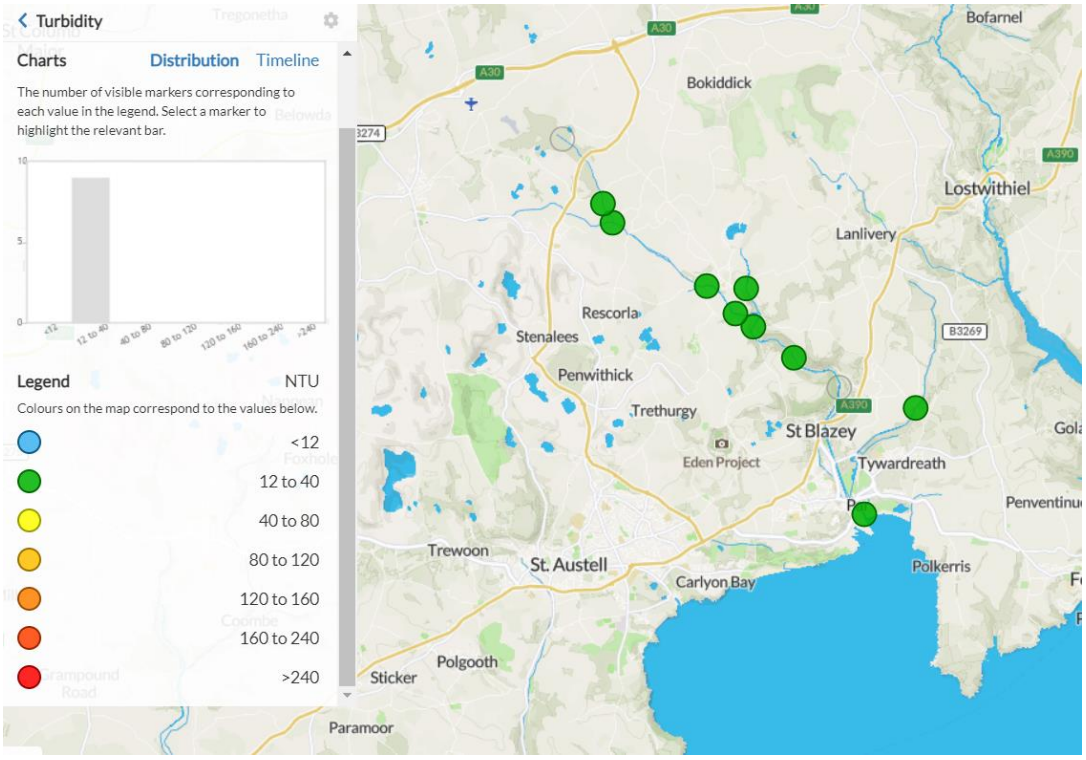
1. This is the WRT explanation of this measure:

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.



WRT Turbidity results for the region

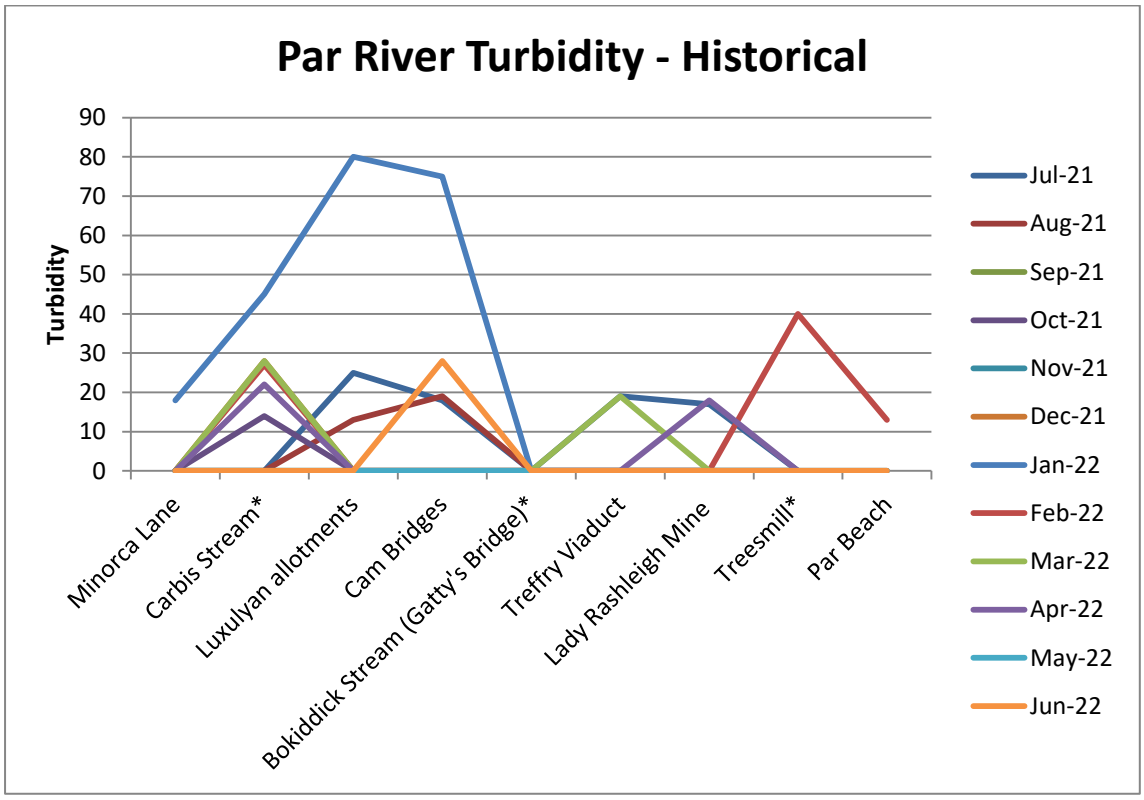


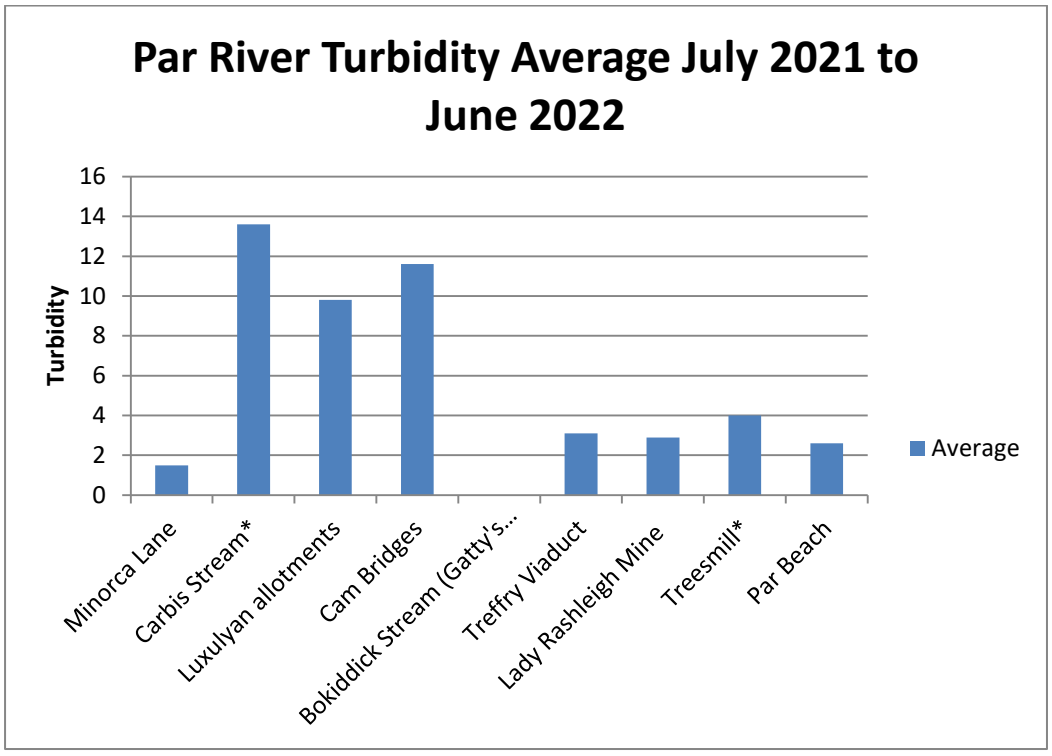
Par catchment results

3 Results June 2022

PAR RIVER/TRIBUTARY	LOCATION	Turbidity
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	Cam Bridges, Par River, SX 05292 57454	28
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

4. Historical data on turbidity:





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:

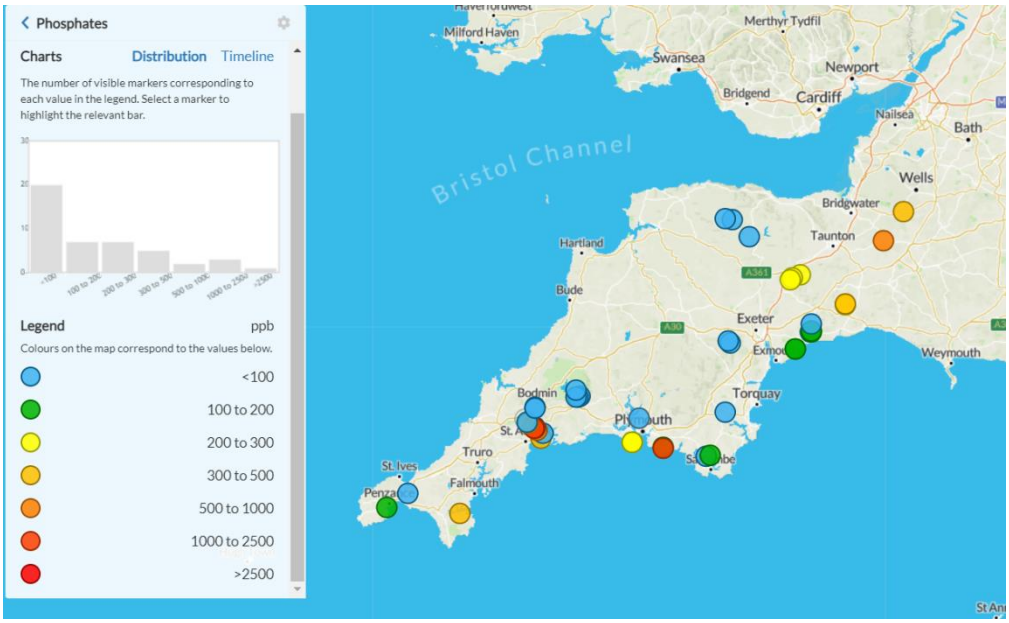
0 – 100 OK

200 – 300 HIGH

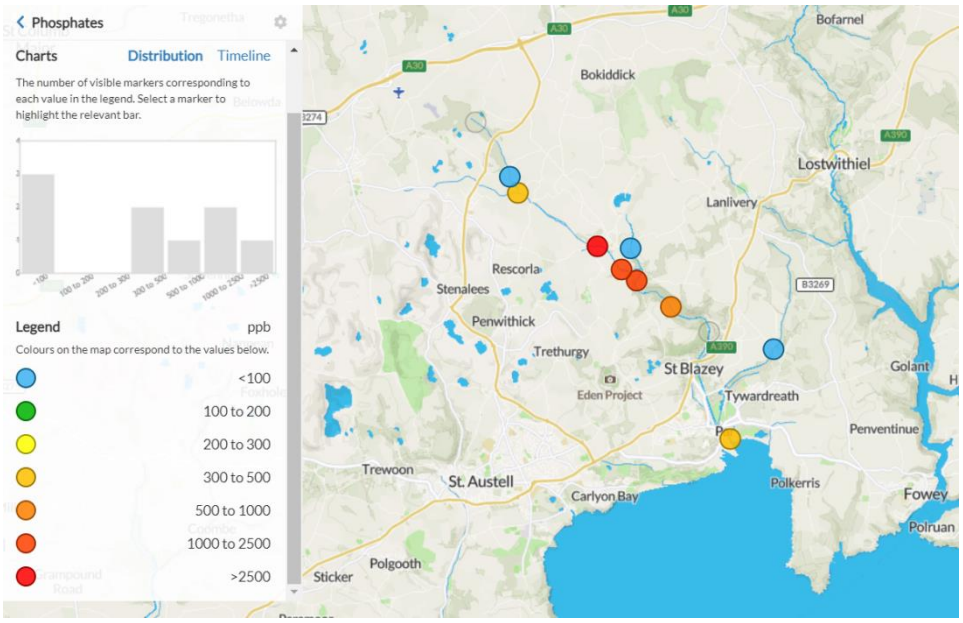
500 – 2500 – TOO HIGH

Phosphate levels were relatively low for the second month running. Levels at all sites monitored were OK according to the WRT guidance. Maximum scores of 2500 PPB have been recorded at some sites but these precede the date range in the historical graphs. They have been recorded on Cartographer.

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

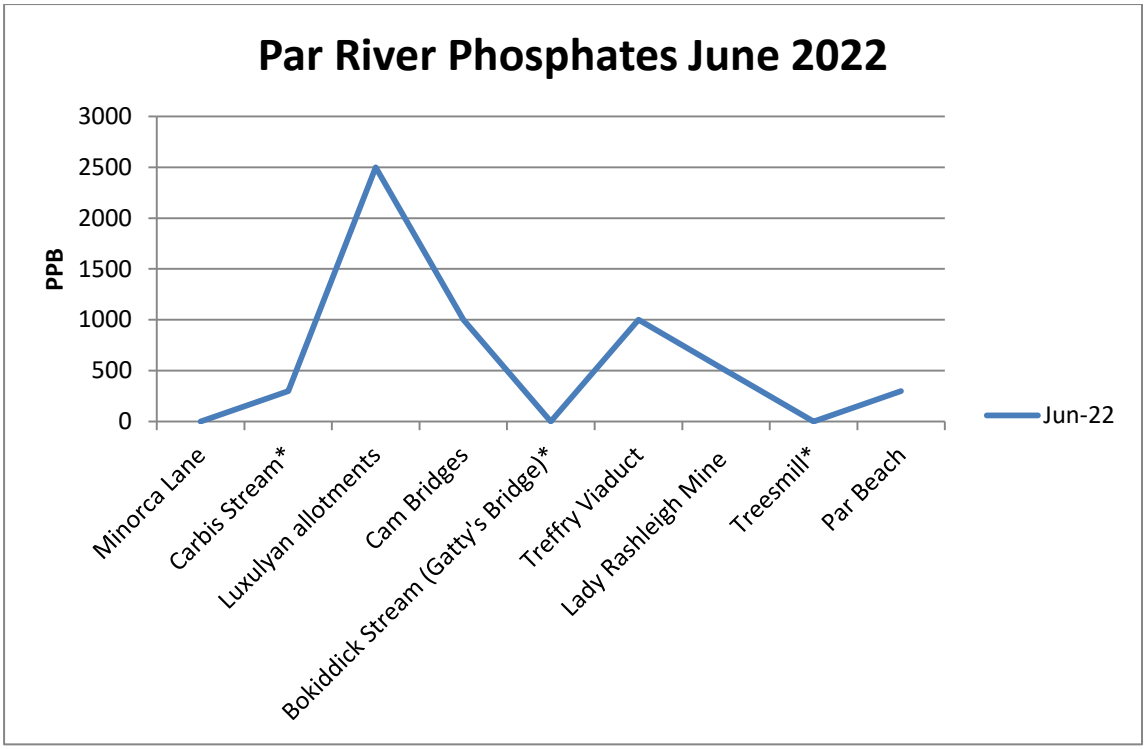


WRT Phosphate results for the region



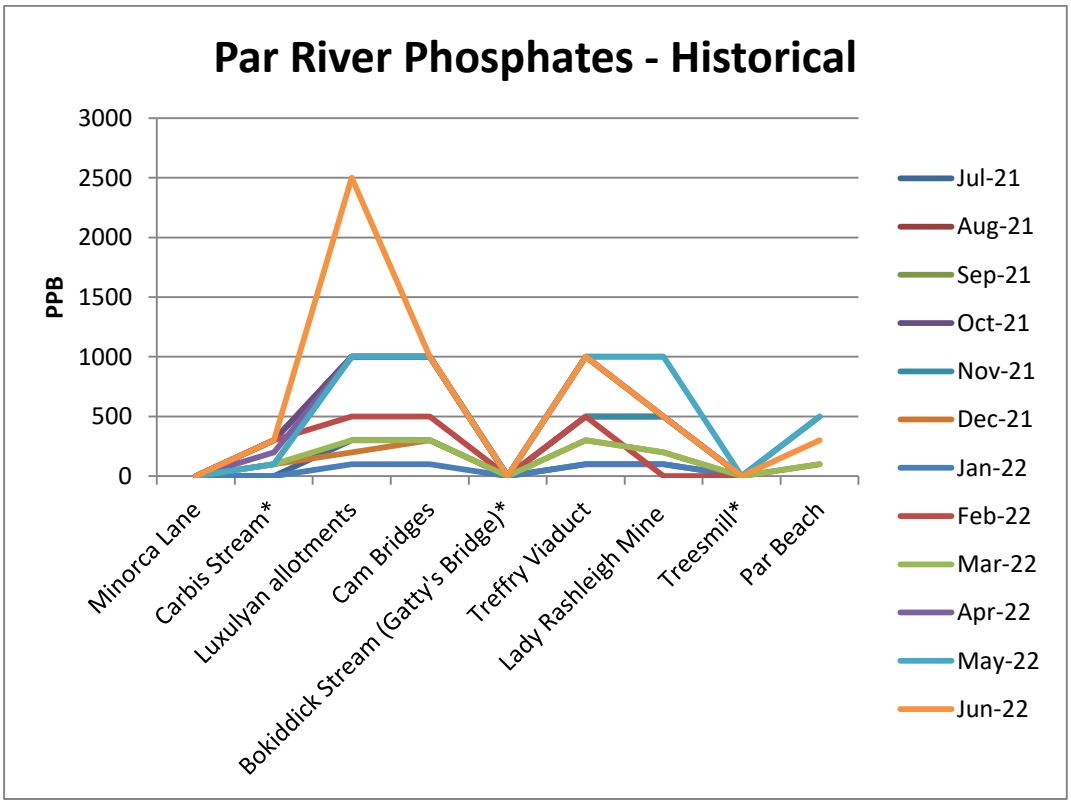
Par River Phosphate levels

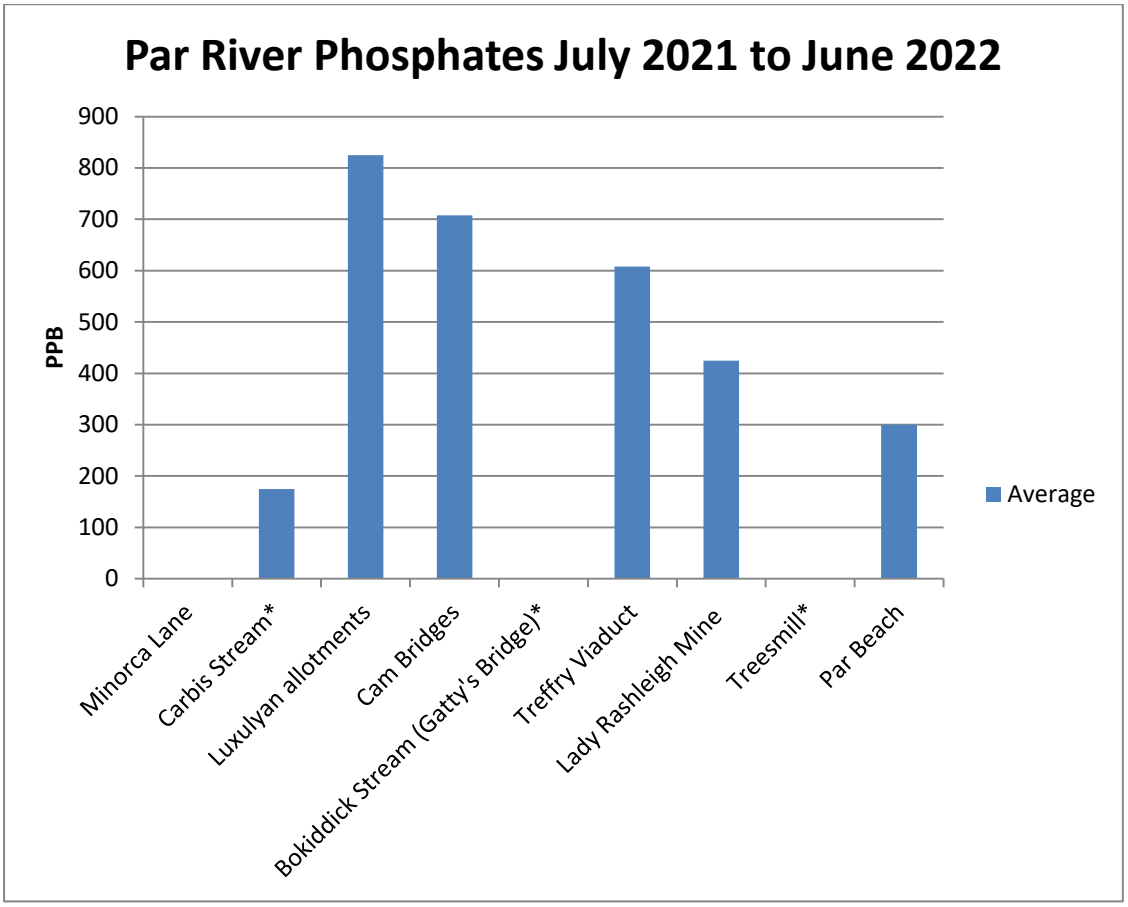
PAR RIVER/TRIBUTARY	LOCATION	Phosphates ppb
Par	South of Minorca Lane, Par River, SX 02657 59788	0
Tributary	Carbis Stream SX 02834 59401	300
Par	Luxulyan allotments, Par River, SX 04732 58045	2500
Par	Cam Bridges, Par River, SX 05292 57454	1000
Tributary	Gatty's Bridge, Bokiddick Stream SX 05531 57953	0
Par	Treffry Viaduct, Par River, SX 05650 57179	1000
Par	Lady Rashleigh Mine, Par River, SX 06451 56509	500
Tributary	Treesmill, Tywardreath Stream, SX 08873 55385	0
Par	Par Beach slipway, SX 0776 53261	300



*indicates a tributary of the Par River.

5. **Historical data on phosphates:**

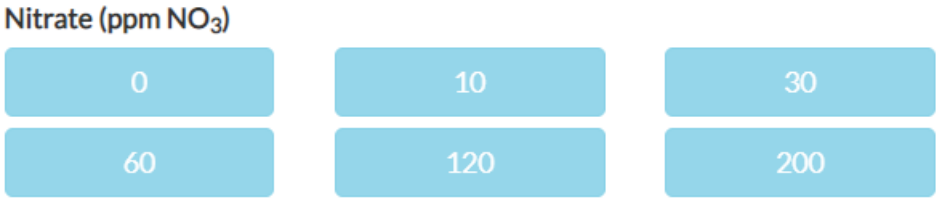




N.B. Guidance from WRT states that Phosphates Parts Per Billion should not exceed 100.

G. NITRATES

1. The WRT kit has these ranges for nitrates:



2. We have concerns about the sensitivity of the testing strips so did not carry out any tests this month.

H. OTHER OBSERVATIONS

1. **E.coli (EC) and Total Coliform(TC)**

(a) On 27th June 2022 testing took place on the Par River south of Minorca Lane, (SX 02657 59788) and on 9th May at Lady Rashleigh Mine (SX 06451 56509) using the

Aquagenx CBT EC+TC MPN Kit which 'simultaneously detects and quantifies E. coli (EC) and Total Coliform (TC) bacteria in a 100 mL sample'.

(b) Key information:

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

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 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 Minimum Probable Number 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**

(d) Historical results compiled by Joan Farmer:

Aquagenx CBT EC=TC (Compartment Bag Test)

Surface and Recreational Waters

Par River near Lady Rashleigh Mine SX 06451 56509

Results are shown in MPN/100ml (Most Probable Number)

>1000 is the highest reading on the 32 row chart. 483 is the second highest number.

Sample Date	Rain? Notes	Result Date	Results E coli	Health Risk		Results Coliforms	Health Risk
21/02/22	Rain prev. 24hrs.	23/02/22 24/02/22	483 [1] >1000 See text message attached* 483	Very High Unsafe Very Unsafe Very High Risk /Unsafe		>1000 >1000	V Unsafe V Unsafe
21/03/22	dry	24/03/22	136	High risk Prob. Unsafe		>1000 [2]	V.Unsafe
16/04/22	Dry and sunny. Rain previous day	18/04/22 Temp over 30 C	326	Very High Risk/ Unsafe		>1000 Def. blue In comp 4 and 5	V. unsafe
09/05/22	Dry	11/05/22	136	High Risk. Probably Unsafe		>1000 Def. blue	V.unsafe
27/06/22	Rain in previous 24 hrs	29/06/22	483	Very High Risk /Unsafe		>1000 Def. blue	V Unsafe

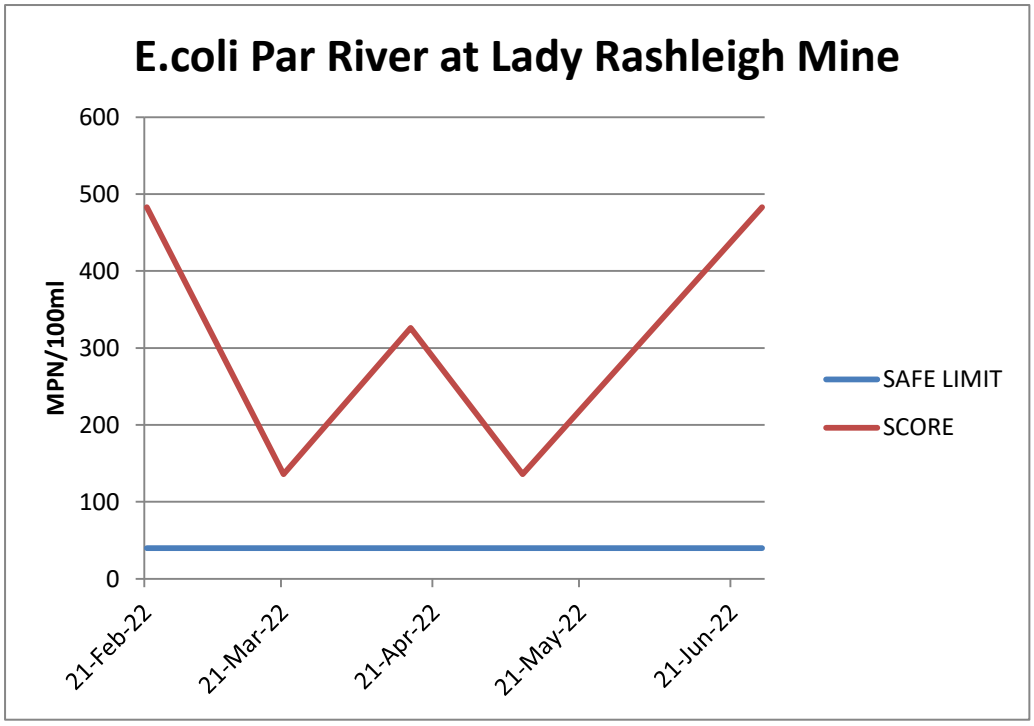
*I now believe this reading should be 483 and the traces of blue in compartment 5 had leaked out of one of the other compartments as the clip was not positioned exactly along the maximum fill line.

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

[2] 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.

(d) Par River at Lady Rashleigh Mine (SX 06451 56509)

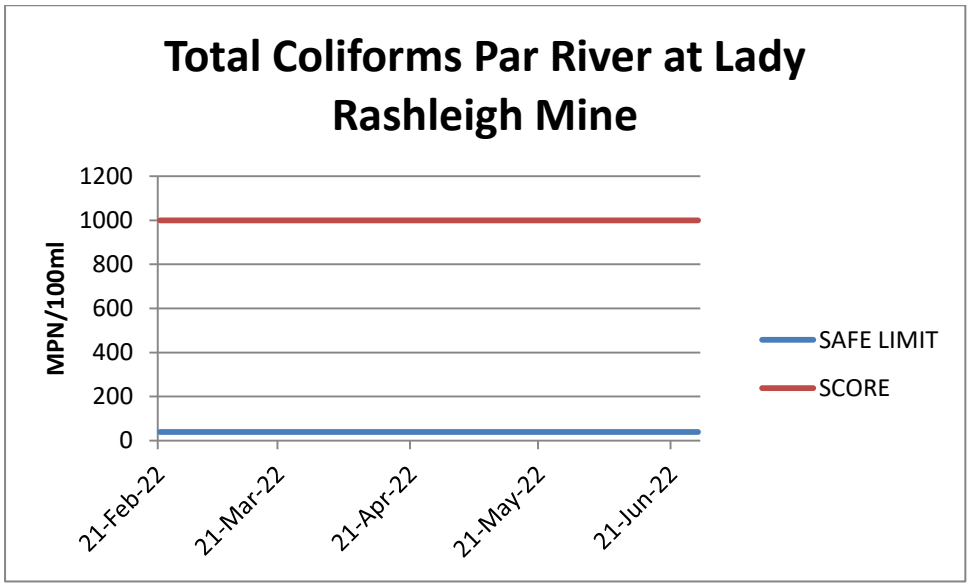
(i) E.coli was 483 MPN/100 ml, which is considered to be **High Risk/Probably Unsafe**.



N.B. The May survey date was 9th May but Excel was not being very cooperative.

(ii) Total Coliforms

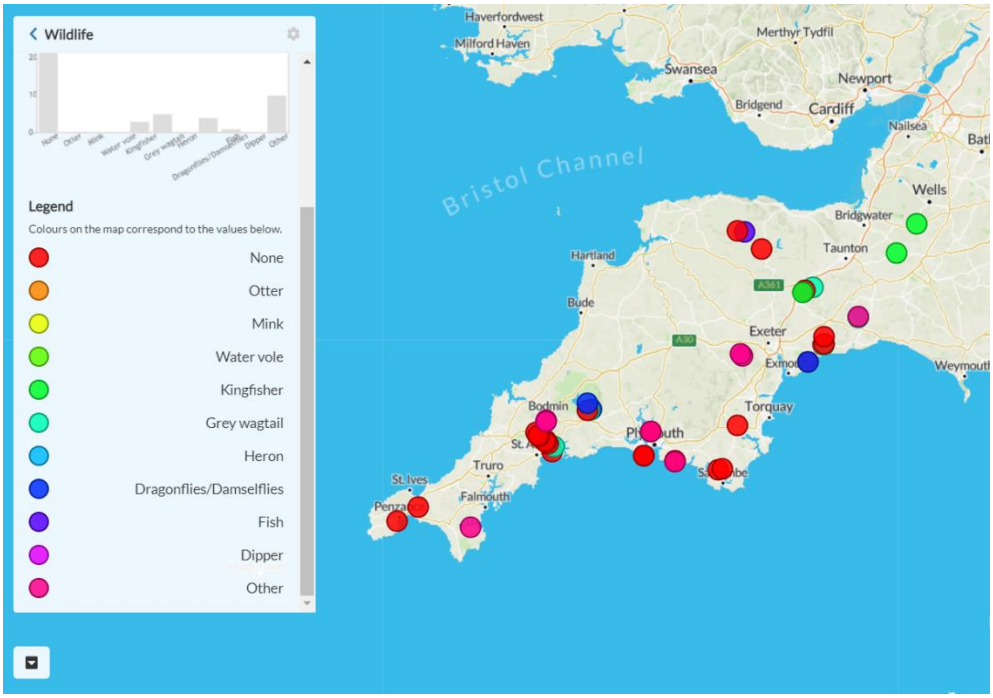
The reading was >1000/Very Unsafe.



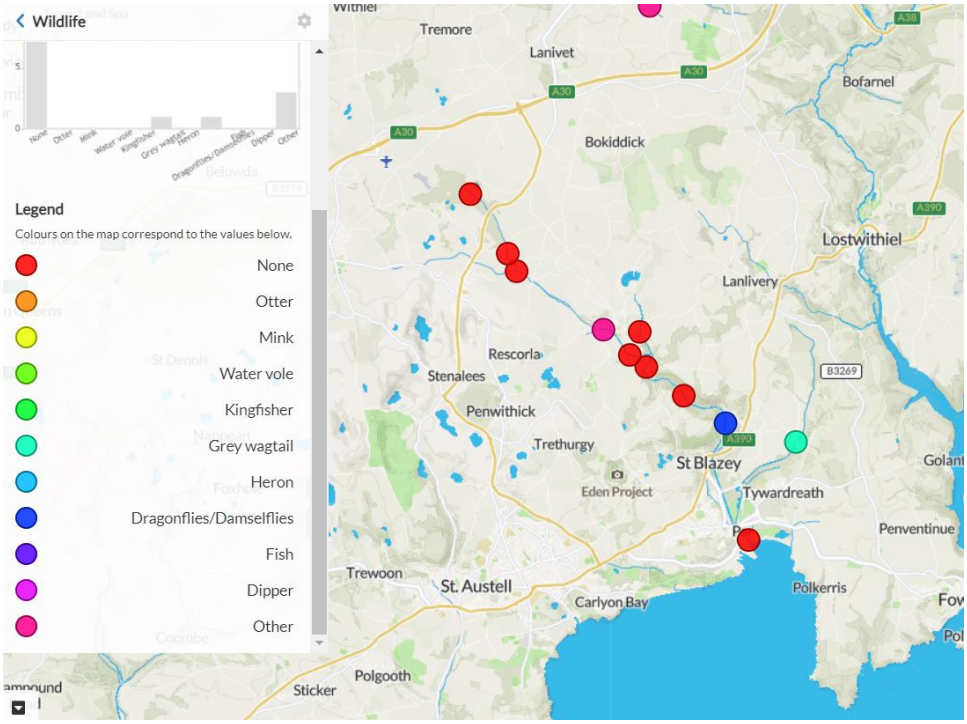
N.B. The last survey date was 9th May but Excel was not being very cooperative. Also: The Aquagenx interpretation table has a category of >1000 MPN/100ml. This has been shown on the graph as 1000.

2. Wildlife

Source: Cartographer.



WRT Wildlife results for the region



Par River Wildlife results

Otter spraint is included, as usual, under ‘Other’ but not in all the places where it was found.

3. Otter survey:

A. SURVEY CONDITIONS

Date & time	26/5/2022, 27/5/2022
Surveyors	Roger Smith, Joan Farmer, Veronica Jones, Chloe Lake
Areas surveyed	Par River from STW to Cam Bridges; Par River from Treffry Viaduct to Ponts Mill; Upper Par (Criggan Moors and Minorca Lane)
Weather	Recent light rain
River level	Low
River flow	Steady
Water quality	Too High phosphate levels at Luxulyan allotments (2500 ppb). Also Too High downstream. There are also concerns about levels of E.coli and Total Coliforms.
Other wildlife	Dippers and Grey Wagtails seen in Luxulyan Valley on 8/5/2022. Fish seen in the river near Ponts Mill on 27/6/2022.

B. EVIDENCE FOR OTTERS ✓

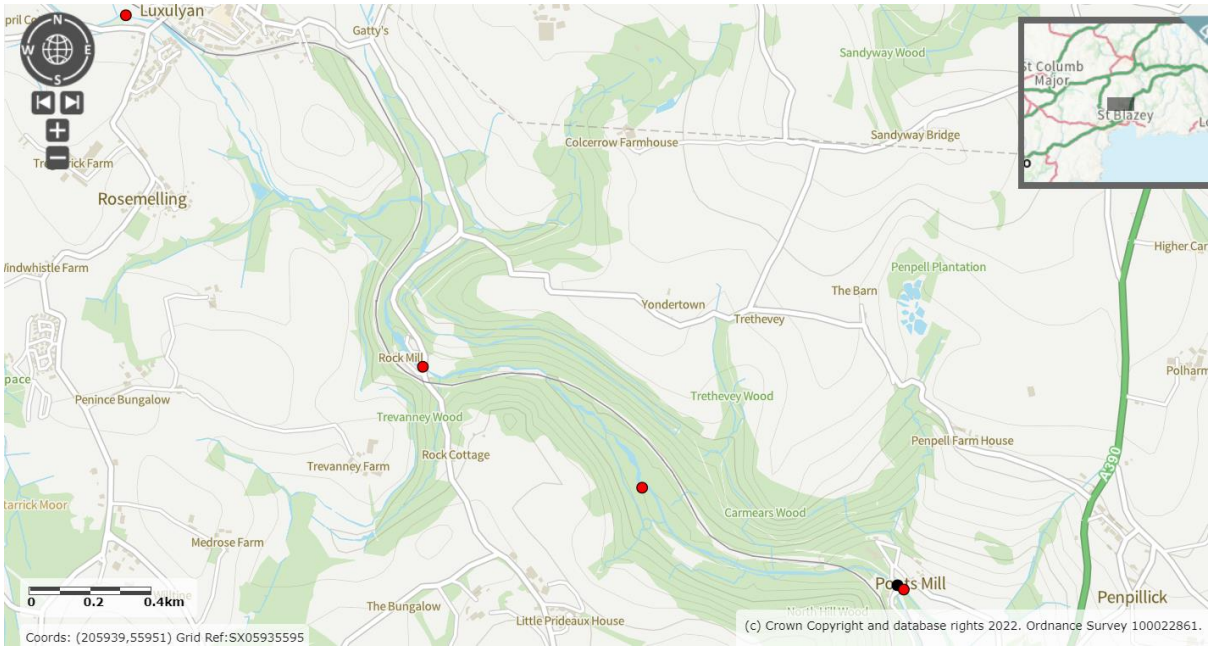
EVIDENCE	SEEN/ ORKS*	LOCATION	NOTES
Spraint - fresh			
Spraint – recent	✓*	SX 04747 58056 Luxulyan allotments boulder in river	
	✓*	SX 05725689 Under Rock Mill road bridge	On boulder beneath bridge.
	✓*	SX 07312 56164 Under canal bridge Ponts Mill	
Spraint - old	✓*	SX 06456 56498 Lady Rashleigh Mine – boulder in river	Three spraints.
Anal jelly			
Sign heap			
Staining			
Tracks	?	SX 07312 56164 Under canal bridge Ponts Mill	
Path			
Slide			
Holt			
Hover			
Couch			
Live sighting			
Corpse			

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

C. 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.



D. PHOTOGRAPHS

1. Recent spraint under canal bridge at Ponts Mill (SX 07312 56164). Possible tracks were seen but these lacked definition.

2. Old spraint on the boulder at Lady Rashleigh Mine (SX 06456 56498). It is thought to have been deposited since the last survey in May.

3. A boulder under the road bridge at Rock Mill (SX 05725689) was exposed because of the low water level. This has often had spraint in the past. On this occasion there were two deposits: one

smelt and looked like otter spraint (second photo); the other had no clear smell and seemed to have bits of fur or hair (first photo).

4. Recent spraint at Luxulyan allotments (SX 04747 58056).

I. DISCUSSION

1. Positive observations.

(a) All water temperatures were below 18˚ Celsius. The graph for average river temperature since July 2021, on page 6, confirms this is the general situation. (Problems with the thermometer meant that results for Treesmill and Par Beach in previous months were not used in calculating averages.) It seems that fish spawning, travel and overall health are adversely affected if temperatures exceed 18˚.
More information can be found here:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/291742/scho1008boue-e-e.pdf

(b) Once again, otter spraint was found. The spraint provides indirect evidence for fish. A fish was seen at Ponts Mill.

(c) Subjective observations carry little, if any weight, but, particularly in Luxulyan Valley, the water looked clear and clean. The Carbis Stream was clear and not polluted with china clay.

(d) The work of Matt Healey and the WRT (with support from the G7 Legacy Project for Nature Recovery) to improve riverside habitat in the Molinnis area is very exciting. It may lead to similar work downstream. The difficulty of raising the health and biodiversity of the Par River to an acceptable standard, given the historical and current problems, is enormous, but the task has begun. The efforts need to be more widely known and greater support given by those in authority.

(e) The recent reform of the Luxulyan Valley Partnership may bode well for at least some sections of the river, particularly since it will include a Watercourses and Carbon Reduction Working Group.

2. Points of concern.

(a) Total Dissolved Solids results at the following points exceeded 200 Parts per Million: Carbis Stream; Luxulyan allotments; Cam Bridges; Lady Rashleigh Mine; Par Beach. We don't know if this is significant. It may just reflect low river levels. But if we assume that higher levels of TDS are not good, this is a point of concern.

(b) Phosphates remain alarmingly high. Although low river levels may be relevant, it does not excuse the situation. WRT classifies any reading below 100 Parts per Billion as OK; therefore anything above that is not. A score of 300 PPB on the Carbis Stream was High according to WRT guidelines. This may be connected to china clay pollution, although the water was clear this time. It seems that Imerys has permission to discharge into this stream. However, the really excessive levels of Phosphates were noted first at Luxulyan allotments. Indeed the score of 2500 PPB was the maximum that our testing kit could register. In the past, a score of 2500 at Luxulyan allotments has prompted us to contact the Environment Agency hotline. At the monitoring sites downstream the scores were: 1000, 1000, 500 and 300 PPB – either High or Too High. The graph for average scores since July 2021 on page 17 demonstrates that the Lower Par River (from Luxulyan downstream) has a serious problem with Phosphate pollution. Previous investigations from the Environment Agency lead us to believe that the source is the St Austell North Sewage Treatment Works at Luxulyan. We need an independent enquiry into the source of this pollutant and the impact on the health of the river. If the SWW plant is having a negative impact on the river this ought to be made public and moves undertaken to get a resolution.

(c) Bacteria. The G7 Legacy Project for Nature Recovery has enabled WRT to undertake pilot studies of bacteria levels. Incubating the samples is unpleasant and Joan Farmer's dedication to the task is highly laudable.

The only sample this time was taken from the river at Lady Rashleigh Mine in Luxulyan Valley. This is a much visited location, very popular with walkers and their children and dogs, especially since the recent installation of rather lovely picnic benches.

The Par River at Lady Rashleigh Mine

The testing kit comes from the USA and the judgements reflect US standards: it is not known what, if any, standards are applied to British rivers. E.coli readings for June would be classified as *Very High Risk/Unsafe*. The Coliform score is judged *Very Unsafe*. That said, we are not aware of any person or animal being adversely affected by the water in the river here or at other locations, so it would be wrong to be alarmist.

We have a suspicion, based only one set of readings in a previous month, that St Austell North STW is a source (there were also concerns about the situation near Minorca Lane). However, this is an inadequate basis on which to make a judgement. Our group has been told that some water treatment works use ultra-violet treatment to kill bacteria. But this uses a lot of energy, so with commercial pressures there may be an incentive not to use it.

Simon Browning of WRT has provided this information which helps to put the problem in context: 'E. coli and faecal coliforms are just a very small subset of the bacterial populations found in rivers, and there is some evidence that more natural river channels and ecology are better at removing them that heavily modified ones'. One of the problems of the river is that it is heavily modified. For much of its course it is artificially straight, lacking the meanders and course complexity of a natural watercourse.

3. Areas of doubt

(a) As citizen scientists there is only a limited amount of testing that we can do. Furthermore, we lack specialist knowledge. Therefore, we do not know the impact on the river and its biodiversity of the high Phosphate and bacteria levels. We do not know if the readings for Total Dissolved Solids are good or bad.

(b) Wildlife. We actively seek otter spraint and other signs at certain locations. Otherwise our wildlife sightings are based on chance while carrying out other tests. None of us would claim expertise. Therefore our observations may miss a great deal of wildlife. But even so, we don't see much. For example, to see a fish is a rare occurrence. Despite the historical degradation of the river (straightening mineral pollution) and current pollution it does flow through SSSIs and a well-managed Council-owned country park, so greater abundance might be expected.
Unfortunately, human error meant there was no riverfly survey this month.

Par River Monitoring Group, 7th July 2022