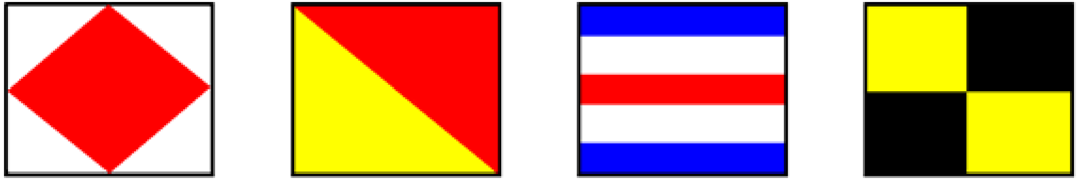
FOCL

Friends of Claytor Lake

Dedicated to conserving and protecting the quality, sustainability and tranquility of the environment of Claytor Lake for all..



www.focl.org

Volunteer Water Quality Monitoring Program for 2020

Environmental Monitoring

Water quality testing is an important part of environmental monitoring. When water quality is poor, it affects not only aquatic life but the surrounding ecosystem as well.

Parameters to be tested can be physical, chemical or biological factors. Physical properties of water quality include temperature and turbidity. Chemical characteristics involve parameters such as pH and dissolved oxygen. Biological indicators of water quality include algae and phytoplankton. These parameters are relevant not only to surface water studies of the ocean, lakes and rivers, but to groundwater and industrial processes as well.

Water quality monitoring can help researchers predict and learn from natural processes in the environment and determine human impacts on an ecosystem. These measurement efforts can also assist in restoration projects or ensure environmental standards are being met.

Sediment Transport and Deposition

Sediment refers to the conglomerate of materials, organic and inorganic, that can be carried away by water, wind or ice. In an aquatic environment, sediment can either be suspended (floating in the water column) or bedded (settled on the bottom of a body of water).

Sediment transport is the movement of organic and inorganic particles by water. In general, the greater the flow, the more sediment that will be conveyed. Water flow can be strong enough to suspend particles in the water column as they move downstream, or simply push them along the bottom of a waterway. Transported sediment may include mineral matter, chemicals and pollutants, and organic material.

Many ecosystems benefit from sediment transport and deposition, whether directly or indirectly. Sediment builds aquatic habitats for spawning and benthic organisms. It is also responsible for providing nutrients to aquatic plants, as well vegetation in nearshore ecosystems such as floodplains and marshes.

Sediment transport relies on water flow to move a load downstream. Water flow is variable, affected not only by the local terrain (e.g. slope), but by water level which, in turn, is influenced by precipitation (or lack thereof).

Ref: Fondriest Environmental, Inc. “Sediment Transport and Deposition.” Fundamentals of Environmental Measurements. 5 Dec. 2014. Web. <
https://www.fondriest.com/environmental-measurements/parameters/hydrology/sediment-transport-deposition/ >

Changes in Water Levels

Most changes in water level are due to weather events such as rainfall. Precipitation causes water levels to initially rise, and then return to previous levels (base flow) over the course of hours or days. Rainfall, whether slight or heavy can affect water flow and sediment transport.

The extent to which a weather event will influence sediment transport is dependent on the amount of sediment available. Heavy rainfall over an area of loose soil and minimal vegetation will create runoff, carrying loose particles into the waterway. Likewise, flooding will also pick up sediment from the local area. In fact, most of a waterway's sediment load occurs during flood events.

Human Influence

Anthropogenic factors, such as dams and altered land use will affect both the sediment load and sediment transport rate. Dams affect the water flow through complete detention or restricted channels. The restricted flow can cause the channel downstream of the dam to become "sediment-starved", while the sediment load behind the dam builds up. A sediment-starved river will not be able to provide habitats for benthic organisms or spawning fish. The highly silted reservoir behind the dam may face issues of too much sediment, including changes in aquatic life and the potential for algal blooms.

On the other side of the spectrum, when a dam release occurs, the flow rate downstream can dramatically increase. If the release is controlled, it can refresh the bed material, building bars and other habitat areas. An uncontrolled release or dam removal can result in flooding, carrying the released sediment further downstream than is needed.

Ref: Fondriest Environmental, Inc. "Sediment Transport and Deposition." Fundamentals of Environmental Measurements. 5 Dec. 2014. Web. <
https://www.fondriest.com/environmental-measurements/parameters/hydrology/sediment-transport-deposition/ >

Consequences of Sediment Transport and Deposition

While sediment is needed to build aquatic habitats and reintroduce nutrients for submerged vegetation, too much or too little sediment can easily cause ecosystem and safety issues. Sediment can easily introduce pollution and other contaminants into a waterway, spreading the pollutants downstream. Too much sediment can cause poor water quality, algal blooms, and deposition build-up. For aquatic life, excessive suspended sediment can disrupt natural aquatic migrations, as well damage gills and other organs.

Diminished water quality occurs with unusually high sediment transport rates. Turbidity can cause water temperatures to rise (sediment absorbs more solar heat than water does). Rising water temperatures will cause dissolved oxygen levels to drop, as warm water cannot hold as much oxygen as cold water. Suspended sediment can block sunlight from reaching submerged plants, decreasing photosynthesis rates and lowering dissolved oxygen levels still further. If the increase in the sediment load is due to agricultural and urban runoff, algal blooms can occur from the increased nutrient load carried into the water body.

Ref: Fondriest Environmental, Inc. “Sediment Transport and Deposition.” Fundamentals of Environmental Measurements. 5 Dec. 2014. Web. < https://www.fondriest.com/environmental-measurements/parameters/hydrology/sediment-transport-deposition/ >

Sediment Deposition

Regular sediment deposition can build bars for aquatic habitats, but increased sedimentation can destroy more habitats than it creates. Siltation, the name for fine sediment deposition, occurs when water flow rates decrease dramatically. This fine sediment can then smother insect larvae, fish eggs and other benthic organisms as it settles out of the water column. Deposition can also alter a waterway’s banks and direction as an unusually high sediment load settles out.

Sediment deposition is responsible for creating alluvial fans and deltas, but excessive accumulation of sediment can build up channel plugs and levees. These deposits then block the river from reaching other stream threads or floodplains. Increased sedimentation is considered one of the primary causes of habitat degradation. Depending on the local geology and terrain, sediment build-up can damage aquatic ecosystems not only in downstream sites, but in upstream headwaters as the deposits grow.

Sediment deposition is considered extreme when it exceeds the recommended or established total maximum daily load (TMDL). A TMDL establishes a limit for measurable pollutants and parameters for a body of water. That means that TMDLs can be created for several different elements of the sediment load, including total suspended solids, nutrient impairment, pathogens and siltation.

Ref: Ref: Fondriest Environmental, Inc. “Sediment Transport and Deposition.” Fundamentals of Environmental Measurements. 5 Dec. 2014. Web. <
https://www.fondriest.com/environmental-measurements/parameters/hydrology/sediment-transport-deposition/ >
/

Parameters Recorded

Seechi Depth Readings (m)

DO Meter Readings

Dissolved Oxygen (mg/L)
Temperature (deg C)
Specific Conductance (uS/Cm)
Total Dissolved Solids (mg/L)

E.coli and Total Coliform (MPN/100 ml)

Total Phosphorus

Total Nitrogen

Chlorophyll-a

NOTE: Not all parameters are reported in graph form.

Dissolved Oxygen

Dissolved oxygen refers to the level of free, non-compound oxygen present in water or other liquids. It is an important parameter in assessing water quality because of its influence on the organisms living within a body of water. In limnology (the study of lakes), dissolved oxygen is an essential factor second only to water itself. A dissolved oxygen level that is too high or too low can harm aquatic life and affect water quality.

Dissolved oxygen is necessary to many forms of life including fish, invertebrates, bacteria and plants. These organisms use oxygen in respiration, similar to organisms on land. Fish and crustaceans obtain oxygen for respiration through their gills, while plant life and phytoplankton require dissolved oxygen for respiration when there is no light for photosynthesis 4. The amount of dissolved oxygen needed varies from creature to creature. Bottom feeders, crabs, oysters and worms need minimal amounts of oxygen (1-6 mg/L), while shallow water fish need higher levels (4-15 mg/L)[5].

Microbes such as bacteria and fungi also require dissolved oxygen. These organisms use DO to decompose organic material at the bottom of a body of water. Microbial decomposition is an important contributor to nutrient recycling. However, if there is an excess of decaying organic material (from dying algae and other organisms), in a body of water with infrequent or no turnover (also known as stratification), the oxygen at lower water levels will get used up quicker.

Ref: Fondriest Environmental, Inc. “Dissolved Oxygen.” Fundamentals of Environmental Measurements. 19 Nov. 2013. Web. < https://www.fondriest.com/environmental-measurements/parameters/water-quality/dissolved-oxygen/ >.

Salinity and Conductivity

The effect of water flow on conductivity and salinity values is fairly basic. If the inflow is a freshwater source, it will decrease salinity and conductivity values. Freshwater sources include springs, snowmelt, clear, clean streams and fresh groundwater. On the other side of the spectrum, highly mineralized groundwater inflows will increase conductivity and salinity. Agricultural runoff, in addition to being high in nutrients, often has a higher concentration of dissolved solids that can influence conductivity. For both freshwater and mineralized water, the higher the flow volume, the more it will affect salinity and conductivity.

Unusual conductivity and salinity levels are usually indicative of pollution. In some cases, such as excessive rainfall or drought, they can be connected to extreme natural causes. Regardless of whether the result was caused by manmade or natural sources, changes in conductivity, salinity and TDS can have an impact on aquatic life and water quality.

Ref: Fondriest Environmental, Inc. “Conductivity, Salinity and Total Dissolved Solids.” Fundamentals of Environmental Measurements. 3 Mar 2014. Web. < https://www.fondriest.com/environmental-measurements/parameters/water-quality/conductivity-salinity-tds/ >.

Nutrient Influence

While phytoplankton rely on photosynthesis to produce sugar for energy, they still need other nutrients to grow and reproduce. These nutrients are typically phosphorus, nitrogen and iron, though some species also require silicon, calcium and other trace metals. The more nutrients (particularly phosphorus) that are present in a body of water, the more algae and phytoplankton that will grow. An increase in the nutrient concentration of a body of water is called eutrophication. Eutrophication is often an indicator of agricultural runoff, which can raise phosphorus and nitrogen concentrations to very high levels. If there are too many nutrients, the algae will form a bloom, which can be very detrimental to water quality and aquatic health.

In temperate fresh waters, growth is limited in winter because light and temperatures are low. A large increase in the spring normally occurs as light conditions improve and water begins to mix. In the summer, phytoplankton flourish until the nutrient supply begins to run low. In tropical lakes, the phytoplankton distribution is fairly constant throughout the year and seasonal population changes are often very small. In temperate and subpolar waters, the seasonal fluctuations are normally fairly large. Fluctuations in population also occur if agricultural runoff brings additional nutrients into a body of water.

Ref: Fondriest Environmental, Inc. “Algae, Phytoplankton and Chlorophyll.” Fundamentals of Environmental Measurements. 22 Oct. 2014. Web. < https://www.fondriest.com/environmental-measurements/parameters/water-quality/algae-phytoplankton-and-chlorophyll>.

Water Clarity

Water clarity is a physical characteristic defined by how clear or transparent water is. Clarity is determined by the depth that sunlight penetrates in water. The further sunlight can reach, the higher the water clarity. The depth sunlight reaches is also known as the photic zone. The clearer the water, the deeper the photic zone and the greater the potential for photosynthetic production. The photic zone (and thus water clarity) has a maximum depth of 200 m based on the light absorption properties of water.

Turbidity is an optical determination of water clarity. Turbid water will appear cloudy, murky, or otherwise colored, affecting the physical look of the water. Suspended solids and dissolved colored material reduce water clarity by creating an opaque, hazy or muddy appearance. Turbidity measurements are often used as an indicator of water quality based on clarity and estimated total suspended solids in water.

Suspended solids in a body of water are often due to natural causes. These natural solids include organic materials such as algae, and inorganic materials such as silt and sediment. Some algae, such as phytoplankton, are regular occurrences, especially in the ocean. Inorganic materials can easily become suspended due to runoff, erosion and resuspension from seasonal water flow. However, when suspended solids exceed expected concentrations, they can negatively impact a body of water. Excess over background amounts are often attributed to human influence, whether directly or indirectly.

Ref: Fondriest Environmental, Inc. “Turbidity, Total Suspended Solids and Water Clarity.” Fundamentals of Environmental Measurements. 13 Jun. 2014. Web. < https://www.fondriest.com/environmental-measurements/parameters/water-quality/turbidity-total-suspended-solids-water-clarity/ >.

Temperature

Water temperature is a physical property expressing how hot or cold water is. As hot and cold are both arbitrary terms, temperature can further be defined as a measurement of the average thermal energy of a substance. Thermal energy is the kinetic energy of atoms and molecules, so temperature in turn measures the average kinetic energy of the atoms and molecules. This energy can be transferred between substances as the flow of heat. Heat transfer, whether from the air, sunlight, another water source or thermal pollution can change the temperature of water.

Temperature is an important factor to consider when assessing water quality. In addition to its own effects, temperature influences several other parameters and can alter the physical and chemical properties of water. In this regard, water temperature should be accounted for when determining:

– Metabolic rates and photosynthesis production
– Compound toxicity
– Dissolved oxygen and other dissolved gas concentrations
– Conductivity and salinity
– Oxidation reduction potential (ORP)
– pH
– Water Density

Ref: Fondriest Environmental, Inc. “Water Temperature.” Fundamentals of Environmental Measurements. 7 Feb. 2014. Web. < https://www.fondriest.com/environmental-measurements/parameters/water-quality/water-temperature/ >.

Sampling Techniques

In the spring of 2014, a YSI Professional Plus (Pro Plus) meter was purchased to measure dissolved oxygen, conductivity, and temperature.

- Included a waterproof cover, backlit display and keypad, four cable monitoring options, USB connectivity to download readings and a rugged case.

Other equipment used to collect water samples include a hand pump, filter assembly, and a hose.

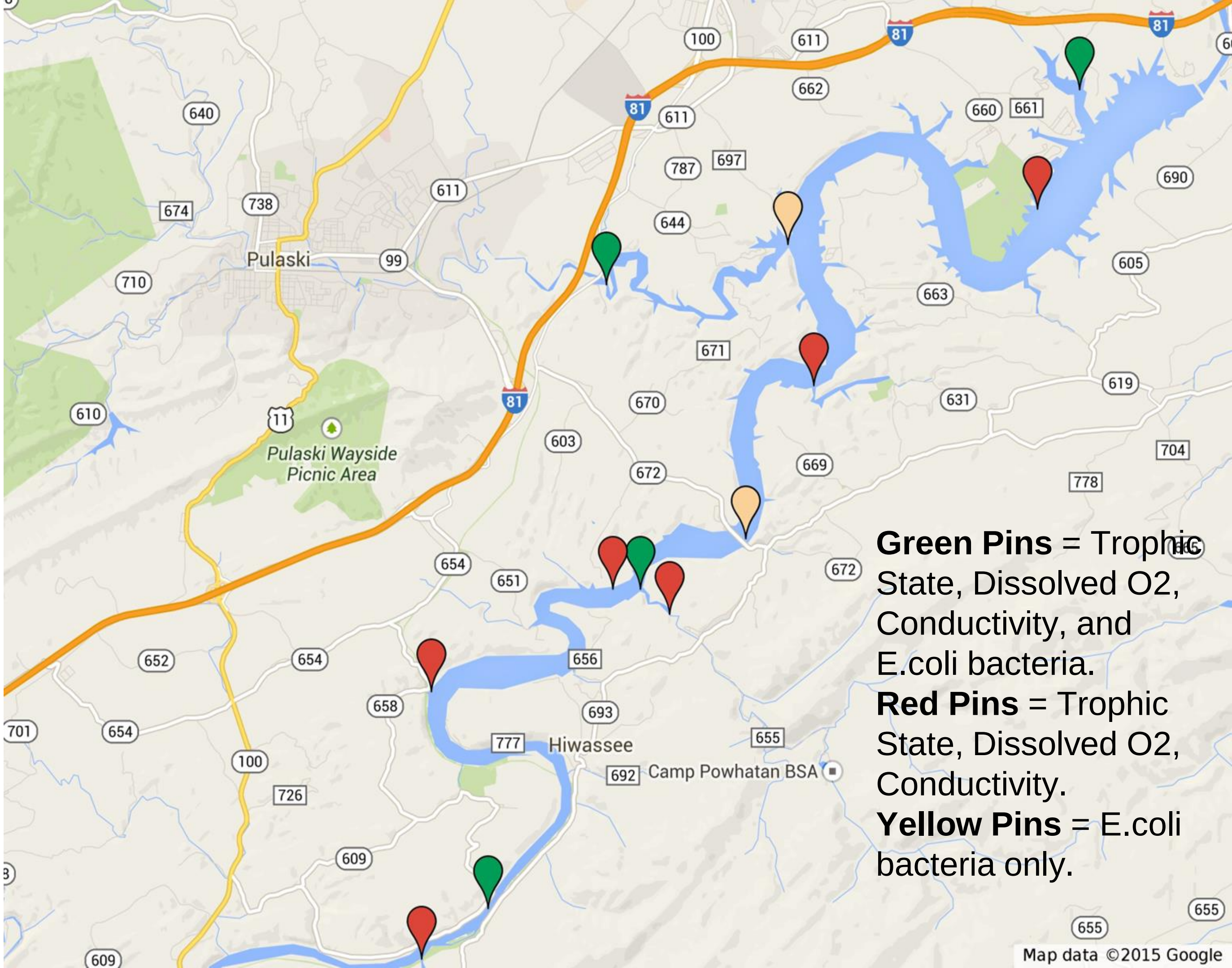
Sample procedures and techniques were updated in 2014, 2015, and 2019 to bring our procedures up to the standards required by the Dept of Environmental Quality.

Schedule for Sampling in 2020

- Sampling was conducted every two weeks through the summer starting on June 6th and ending the week of August 28th. Due to equipment issues, the sample week of July 27th did not happen and the schedule was pushed back by 2 weeks.
- Trophic State samples (total phosphorus, total nitrogen and chlorophyll-a) and Dissolved Oxygen / Conductivity readings were collected every two weeks from 8 sites. Trophic state samples only were collected every two weeks from 2 sites.
- Total of two bacteria samples (total coliform and *E.coli* - TC/EC) were collected per site per month, starting with the week of June 15th, 2020.

Sample Locations

Dublin Hollow CL02
Claytor's dockhouse CL4
Peak Creek - old bridge abutment CL07
Clapboard Hollow CL08
Mack's Creek - CL9A
Mike Spraker's Place CL10
New River Trail RR Trestle CL11
Allisonia Boat Ramp CL12
Mack's Creek (near Lead Mine Rd) CL12A
Big Reed Island bridge CL12B



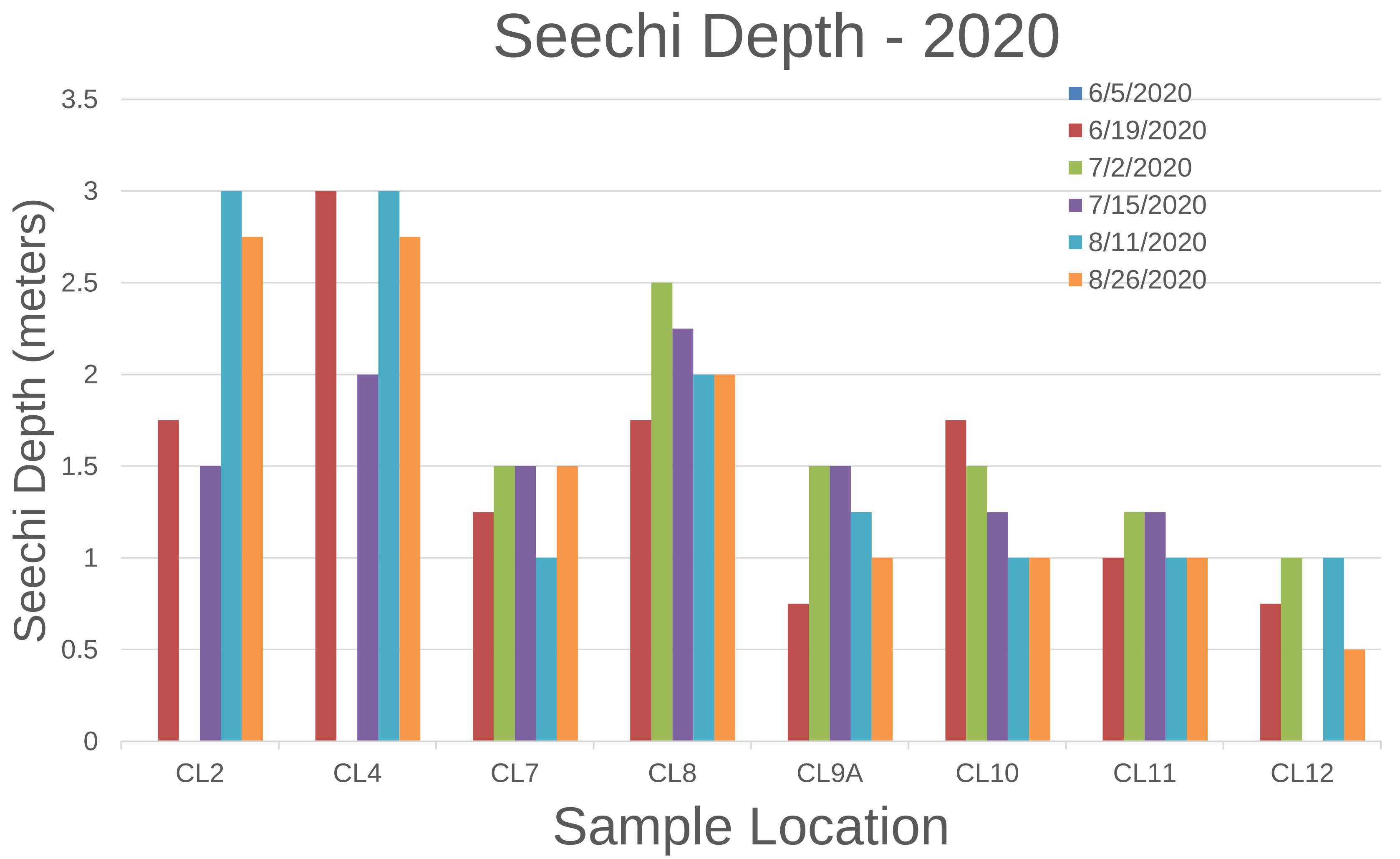
Sample Locations for Trophic State, Dissolved Oxygen & Conductivity

• CL02	Dublin Hollow.
• CL07	Peak Creek – old bridge abutment.
• CL04	Claytor's dockhouse.
• CL08	Clapboard Hollow under power line.
• CL09A	Mack's Creek - mouth.
• CL10	Mike Spraker's place.
• CL11	New River Trail Railroad Trestle.
• CL12	Allisonia's boat ramp – mid channel.
• CL12A	Mack's Creek @ Lead Mines Road – **trophic state samples only**.
• CL12B	Reed Island Creek @ New River Trail Bridge - **trophic state samples only**.

Sample Locations
E.coli and total coliform bacteria

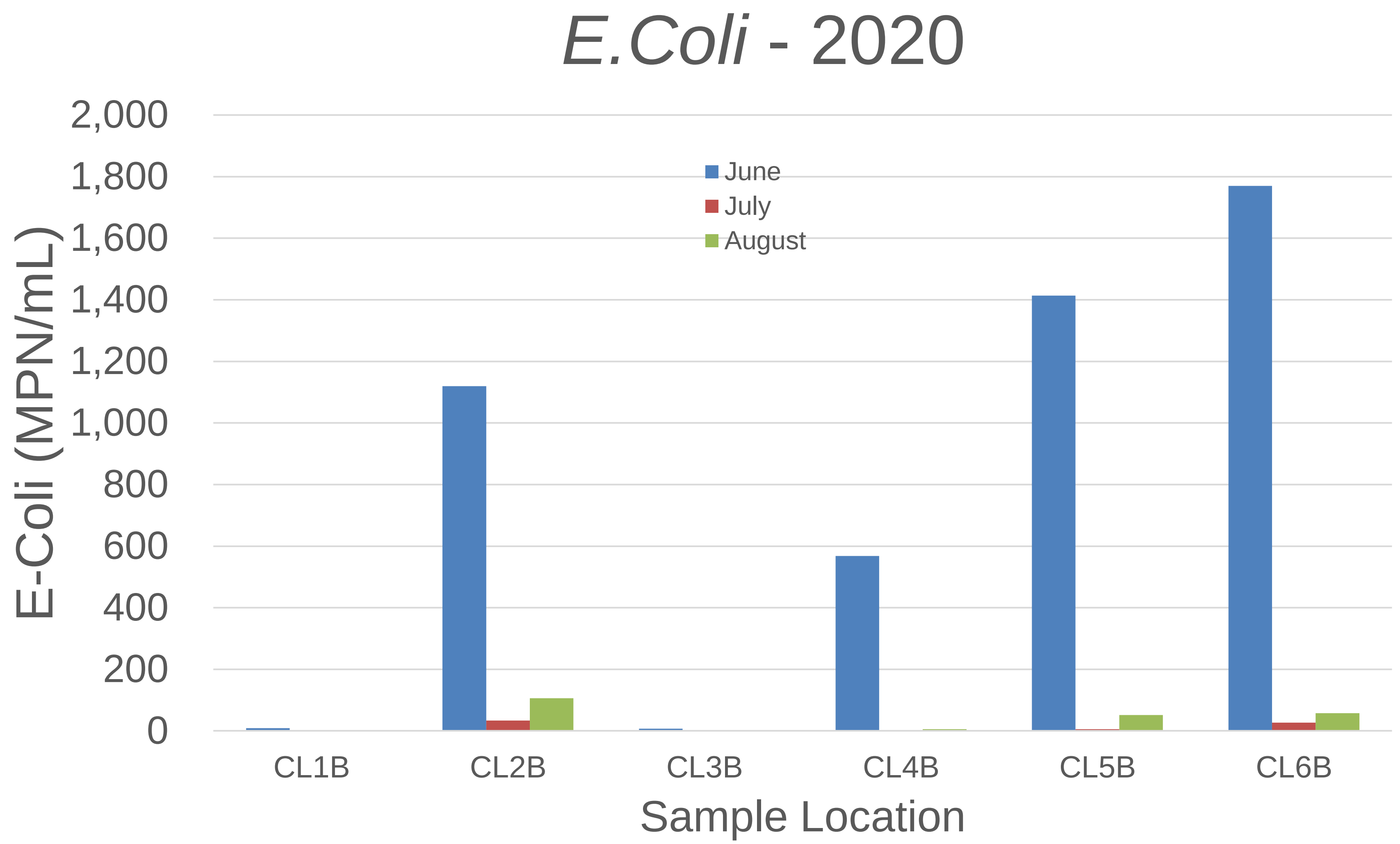
- CL1B Dublin Hollow
- CL2B Peak Creek – old bridge abutment.
- CL3B Peak Creek – mouth.
- CL4B Lighthouse Bridge.
- CL5B Mack's Creek.
- CL6B Allisonia boat ramp – mid channel.

Seechi Depth

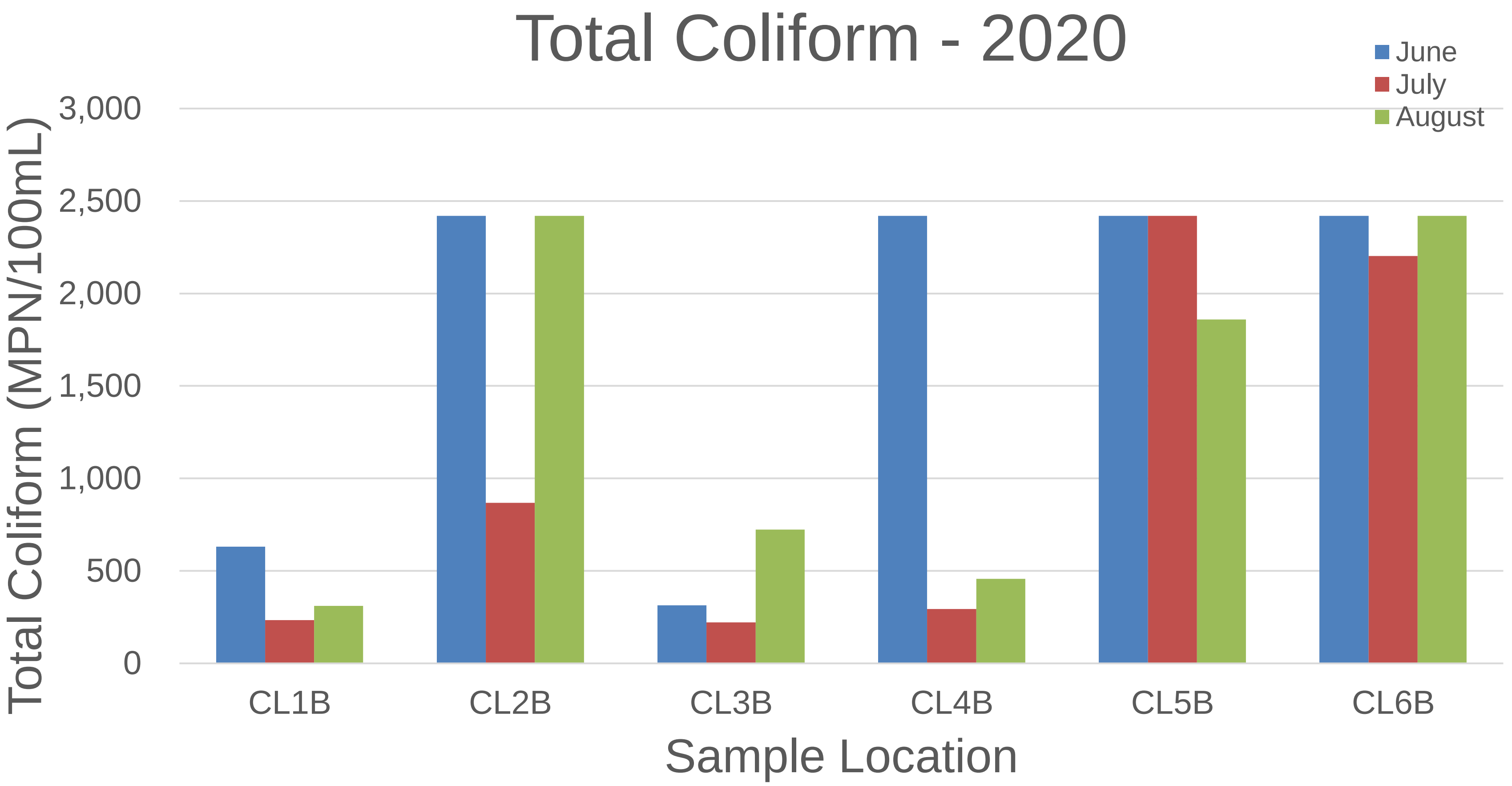


Seechi Depth - 2020
Seechi Depth (meters)
0
0.5
1
1.5
2
2.5
3
3.5
CL2
CL4
CL7
CL8
CL9A
CL10
CL11
CL12
Sample Location
6/5/2020
6/19/2020
7/2/2020
7/15/2020
8/11/2020
8/26/2020

Total Coliform / *E.coli*



E.Coli - 2020
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
June
July
August
E-Coli (MPN/mL)
CL1B
CL2B
CL3B
CL4B
CL5B
CL6B
Sample Location



Total Coliform is not generally used as a measure of water quality. However, it is a measure of total organisms that fall within the coliform family. Of which, *E.coli* is a subfamily. When looking at total water quality issues, this does help to indicate where potential problems are.

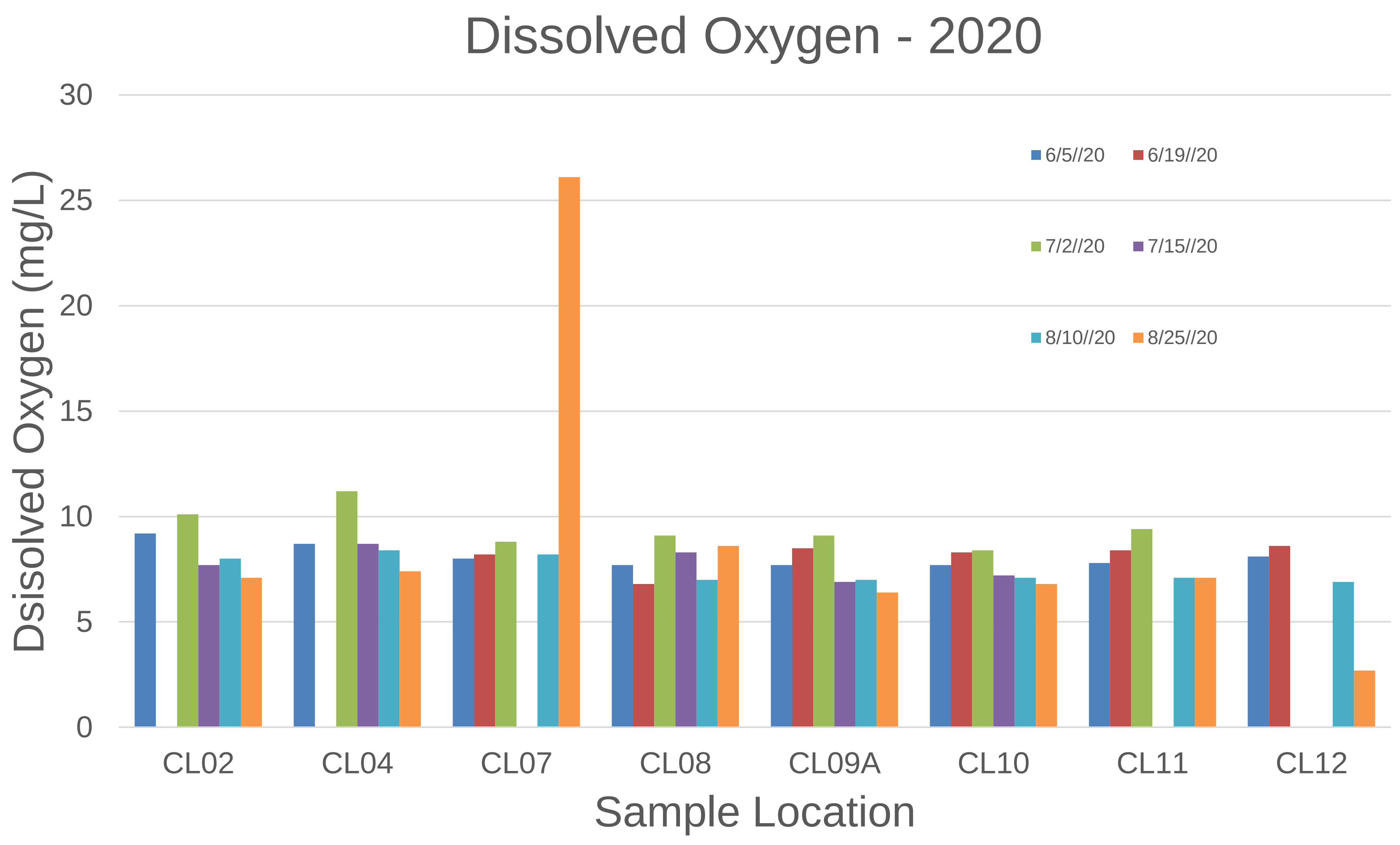
Dissolved Oxygen Meter Readings

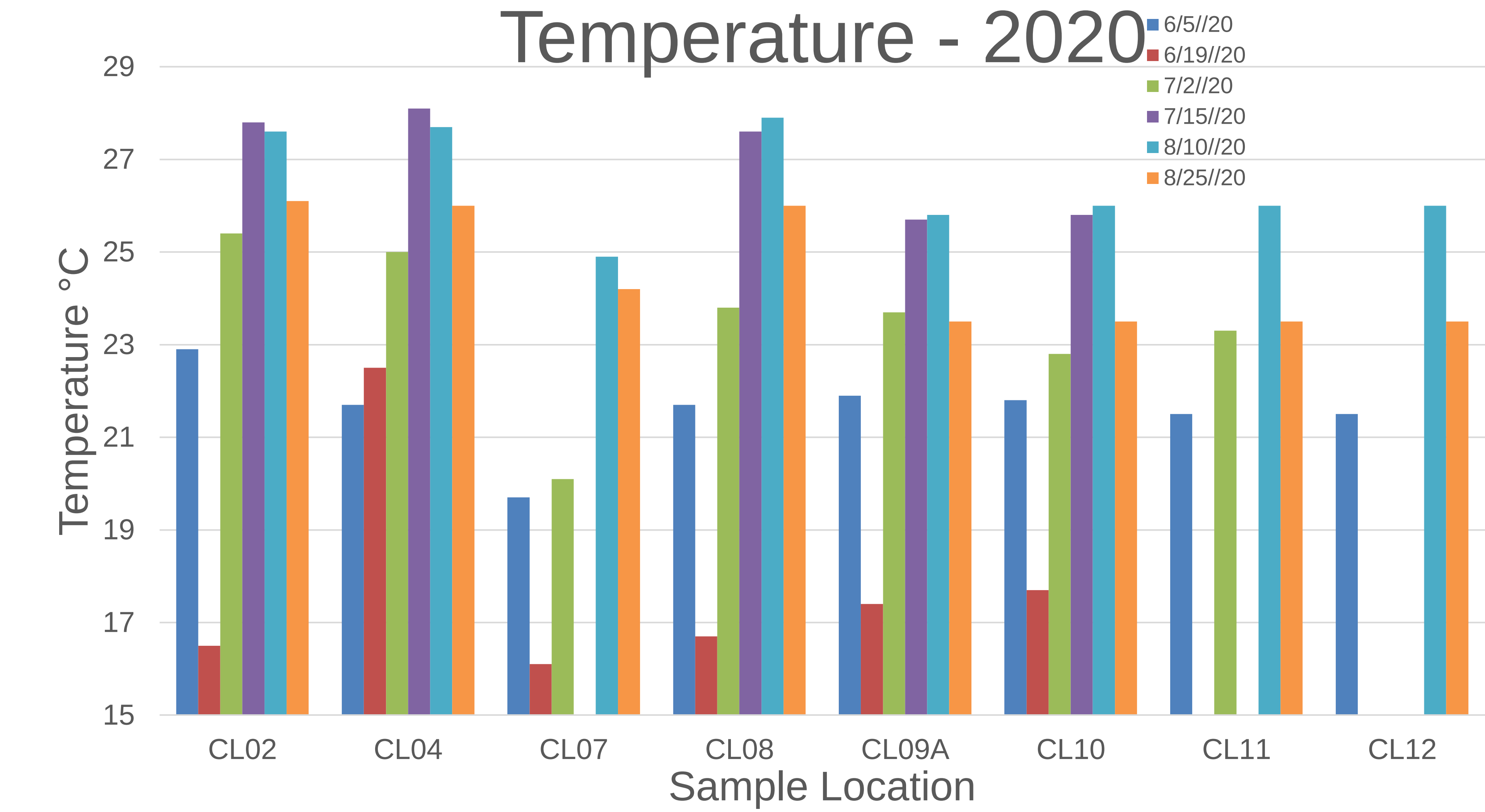
Dissolved Oxygen (mg/L)

Temperature (deg C)

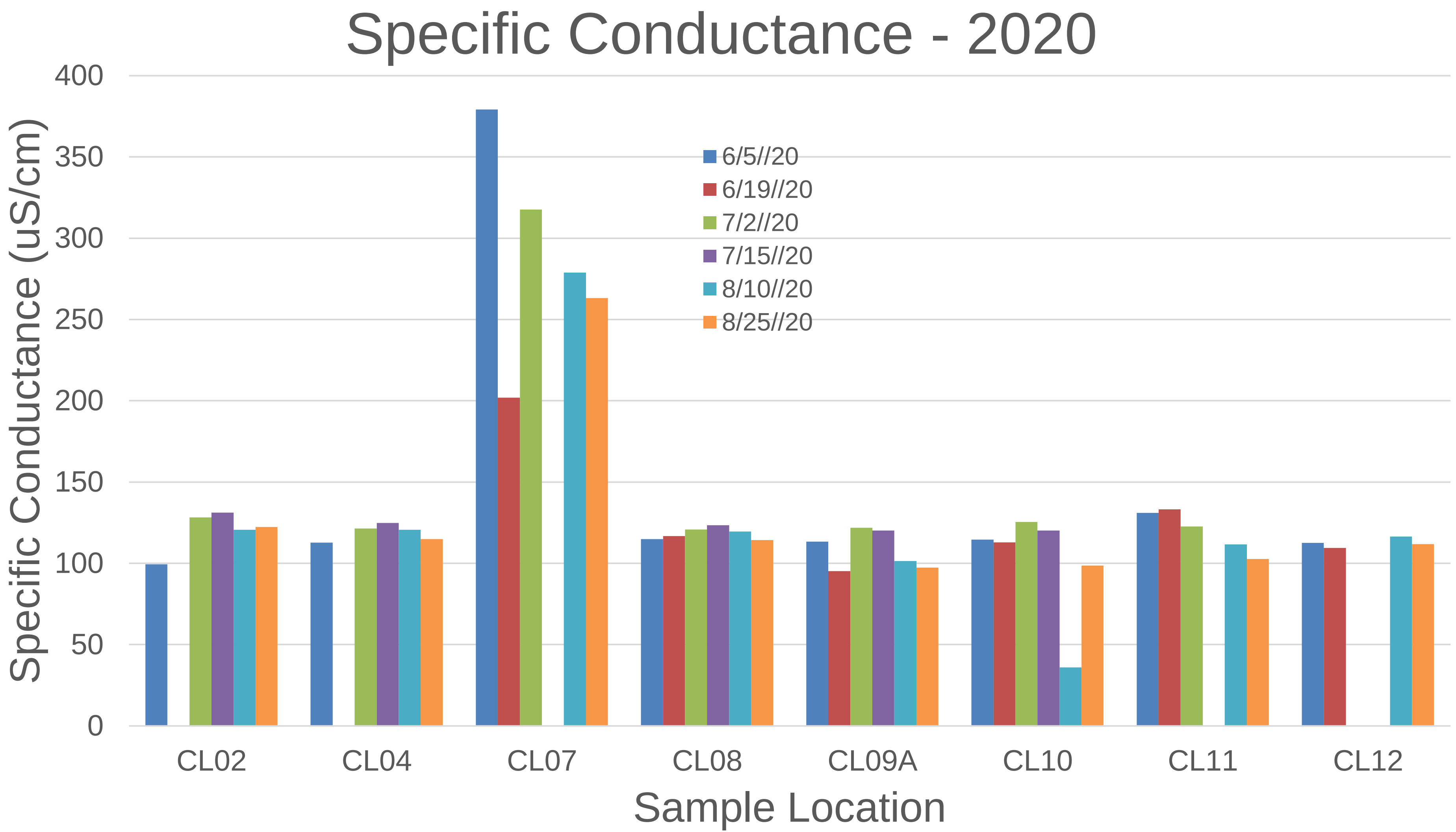
Specific Conductance (uS/Cm)

Total Dissolved Solids (mg/L)

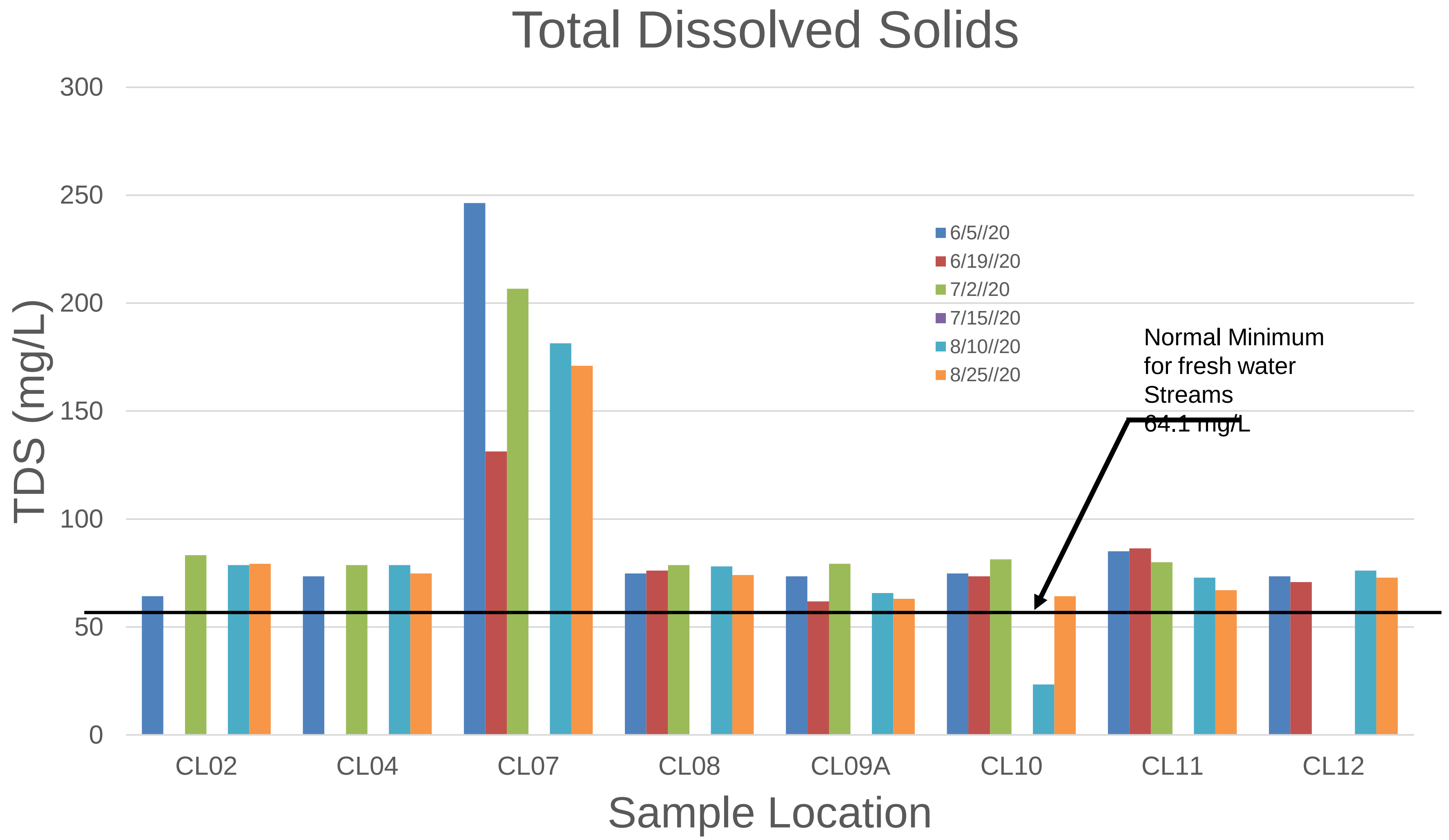

Dissolved Oxygen - 2020
Dsisolved Oxygen (mg/L)
30
25
20
15
10
5
0
6/5//20
6/19//20
7/2//20
7/15//20
8/10//20
8/25//20
CL02
CL04
CL07
CL08
CL09A
CL10
CL11
CL12
Sample Location



Temperature - 2020
6/5//20
6/19//20
7/2//20
7/15//20
8/10//20
8/25//20
29
27
25
23
21
19
17
15
Temperature °C
CL02
CL04
CL07
CL08
CL09A
CL10
CL11
CL12
Sample Location



Specific Conductance - 2020
Specific Conductance (uS/cm)
400
350
300
250
200
150
100
50
0
6/5//20
6/19//20
7/2//20
7/15//20
8/10//20
8/25//20
CL02
CL04
CL07
CL08
CL09A
CL10
CL11
CL12
Sample Location



Total Dissolved Solids
300
250
200
150
100
50
0
TDS (mg/L)
6/5//20
6/19//20
7/2//20
7/15//20
8/10//20
8/25//20
Normal Minimum
for fresh water
Streams
64.1 mg/L
CL02
CL04
CL07
CL08
CL09A
CL10
CL11
CL12
Sample Location

Trophic State Parameters
Total Phosphorus, Total Nitrogen, and Chlorophyll-a

Trophic State parameters [Total Phosphorus (**TP**), Total Nitrogen (**TN**), and Chlorophyll-a (**Chl-a**)] have been tested at Claytor Lake since 2014 with minimal results recorded. Occasional spikes have been observed, but nothing that was sustained.
In fact, the results have been so minor that they were not previously presented.

In 2020, that changed. A sustained increase was observed in the Total Phosphorus records for the entire season. Total Nitrogen and Chlorophyll-a were not affected.

Phosphorus, Nitrogen, and Water Runoff

Phosphorus and Nitrogen are common constituents of agricultural fertilizers, manure, and organic wastes in sewage and industrial effluent. They are an essential element for plant life, but when there is too much it in water, it can speed up eutrophication (a reduction in dissolved oxygen in water bodies caused by an increase of mineral and organic nutrients) of **rivers** and lakes. Soil erosion is a major contributor of phosphorus to streams. Bank erosion occurring during floods can transport a lot of phosphorous from the river banks and adjacent land into a stream, **lake**, or other water body.

Phosphorus gets into water in both urban and agricultural settings. Phosphorus tends to attach to soil particles and, thus, moves into surface-water bodies from runoff.

Ref: https://www.usgs.gov/special-topic/water-science-school/science/phosphorus-and-water?qt-science_center_objects=0#qt-science_center_objects

Phosphorus and Water

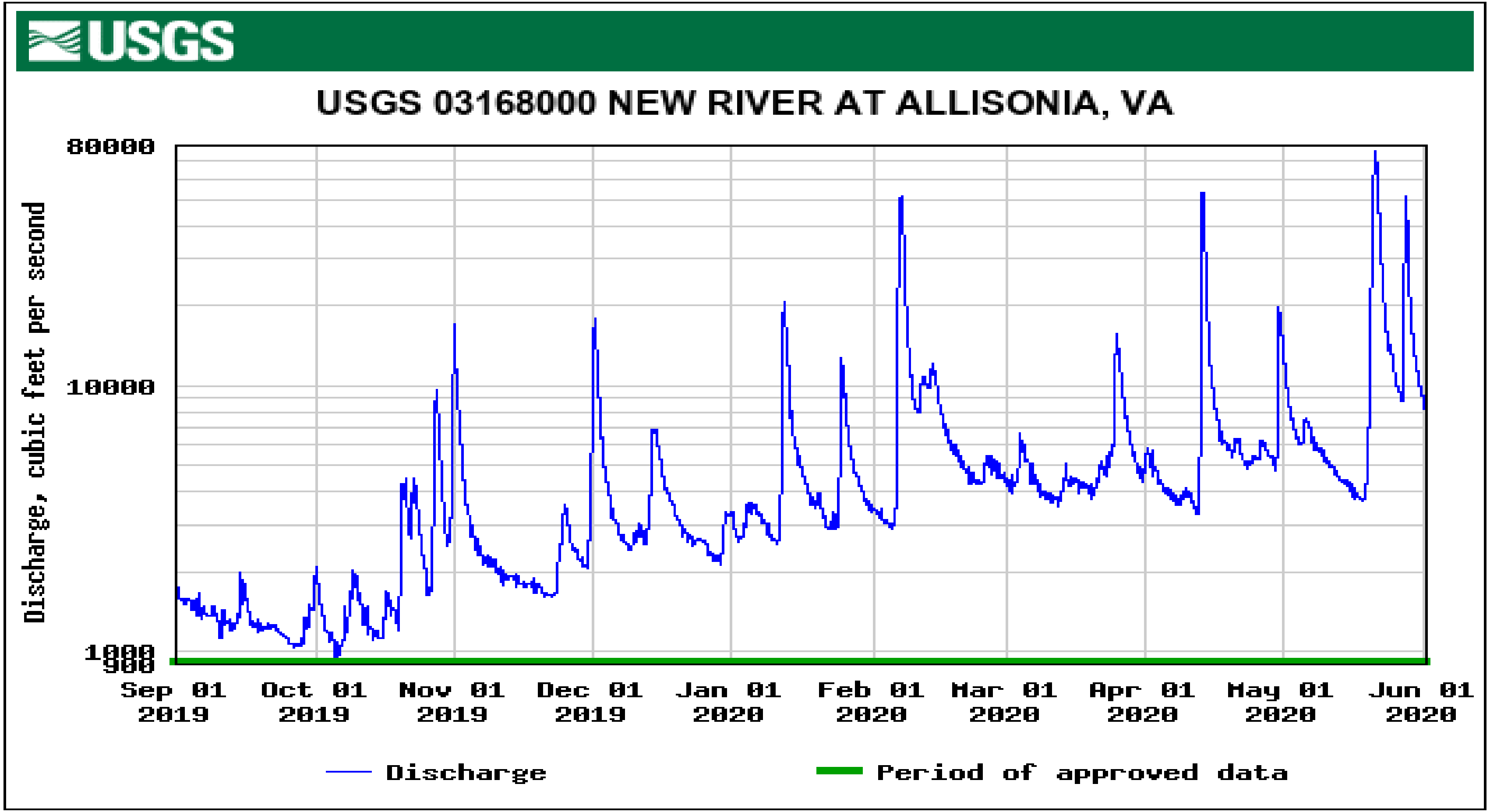
There is a theory that the increased phosphorus is due to increased agricultural runoff from the winter of 2019-2020. The USGS streamflow gauge for Sep-2019 thru May-2020 shows many increased streamflows and several significant spikes in waterflow. **As many lake residents will attest to, it was an extremely wet spring.** If you look at the following slide of the gauge readings throughout the summer, you can see how far above average the summer readings were.

Please observe the graph on the next page from the USGS streamflow website for the New River water levels at the Allisonia gauge. Normal winter levels are between 5,000 and 12,000 cfs (cubic feet per second). Between Jan and June 2020, we had 4 spikes of waterflow that were in excess of 50,000 cfs – one of which was close to 80,000 cfs. It is these spikes in waterflow, due to precipitation events, that cause the most surface water runoff from land that has been fertilized, such as farms and golf courses, as there is not enough time for the water to soak into the groundwater.

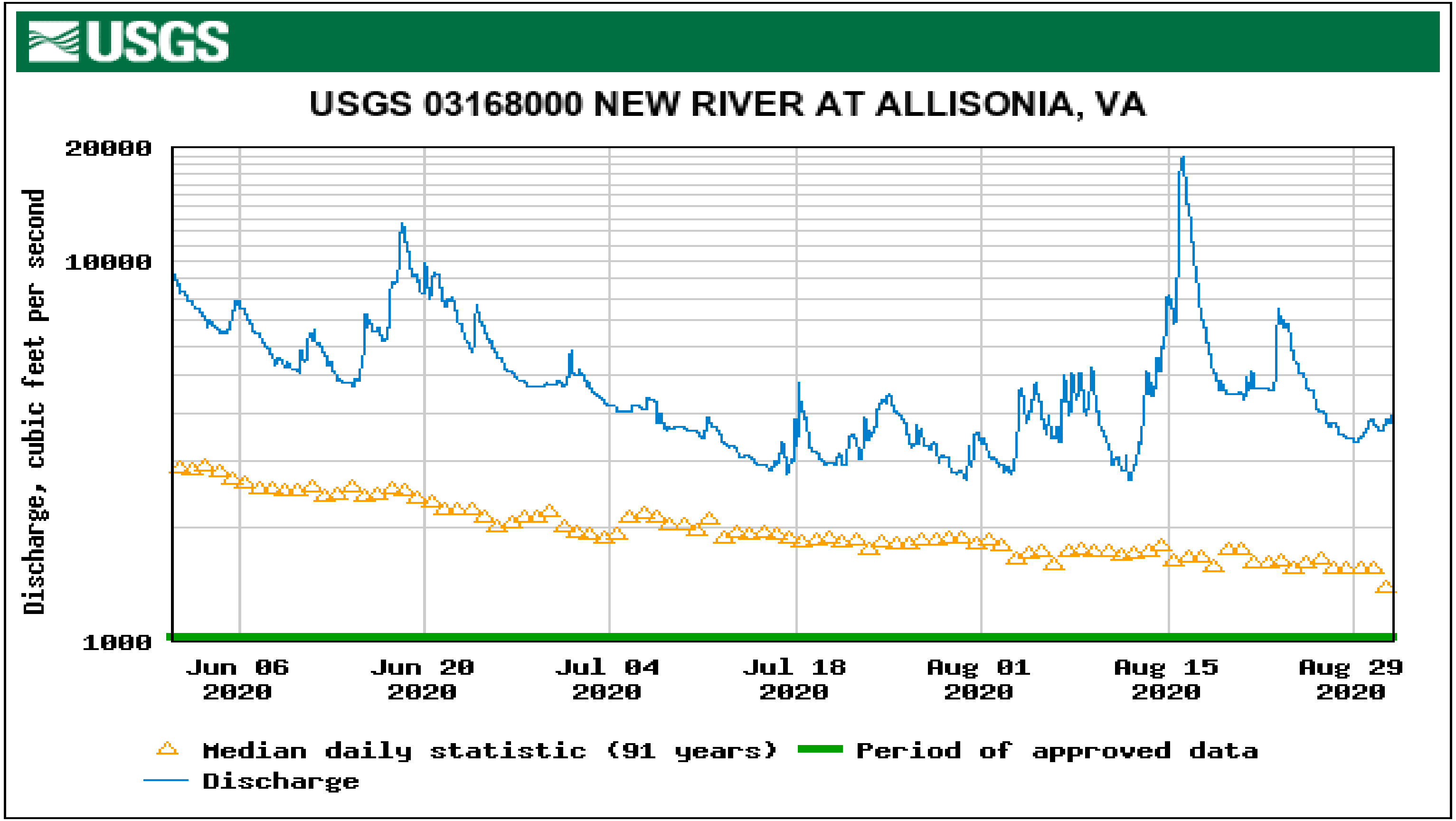
Just as a reference, when the New came up in Feb 2013 and flooded Bisset Park in Radford and the lower parking lot at the Dedmon Center at Radford University, the Allisonia gauge showed about 60,000 cfs. The Radford gauge (that measures the outflow from Claytor Dam) showed about 90,000 cfs. Much of this difference came from the Little River. This same rain event raised the lake level approximately two feet due to necessary management of the discharge at the dam and contaminated several wells that we know of around Claytor Lake.

Ref: https://nwis.waterdata.usgs.gov/va/nwis/uv/?cb_00060=on&cb_00065=on&format=gif_default&site_no=03168000&period=&begin_date=2019-09-01&end_date=2020-06-01

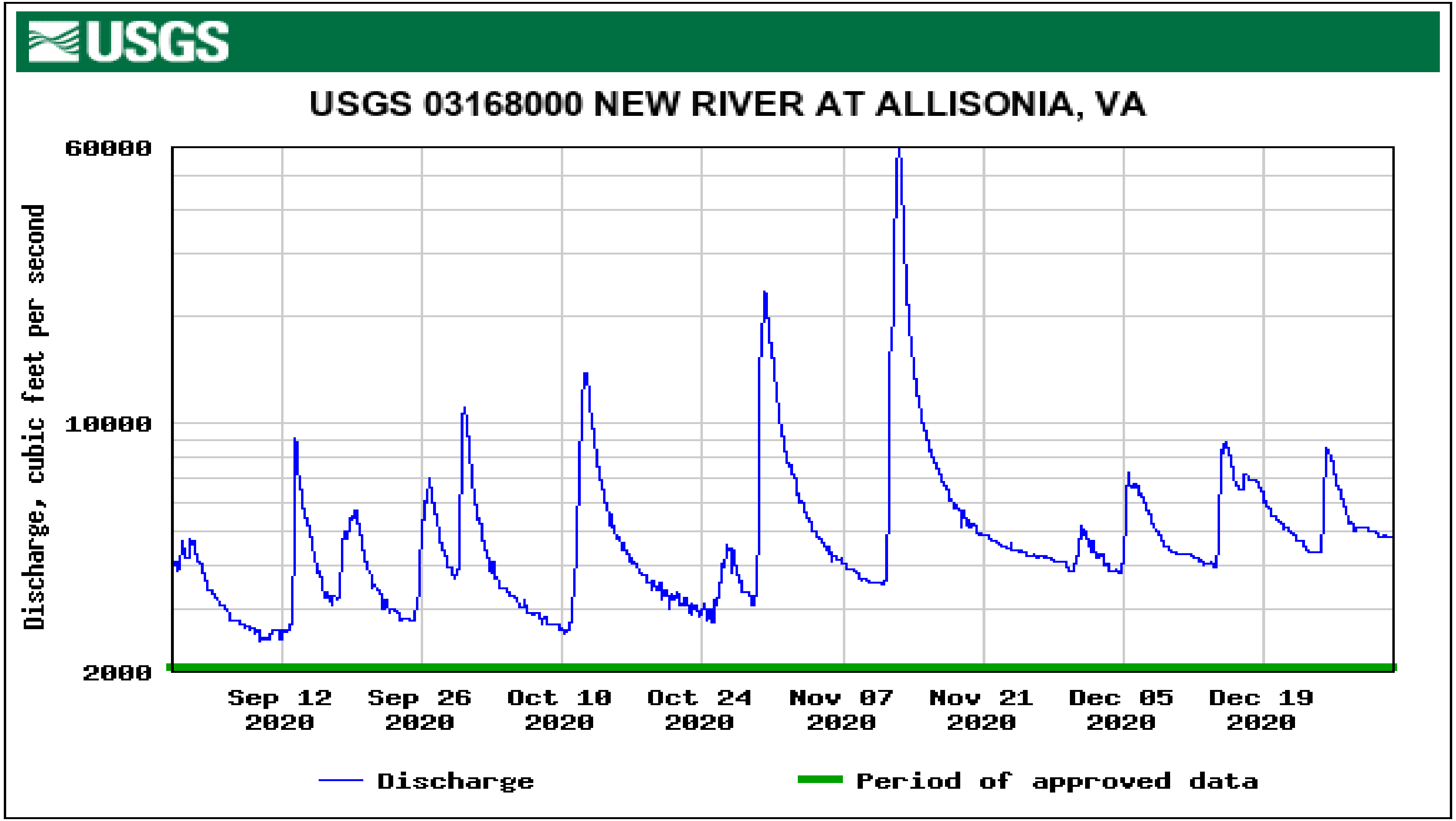
USGS Streamflow Readings – Sept 2019 – May 2020



USGS Streamflow Readings – June 2020 – Aug 2020



USGS Streamflow Readings – Sept 2020 – Dec 2020



Phosphorus and Water

One of the problems that we have is that we don’t know from where the phosphorus is coming. If it is coming from a long distance upstream on the New, there is little that we can do about it without involving the DEQ. However, if some of that runoff is sourced much closer, AEP and FOCL may be able to impact that source directly.

A theory that has been proposed is that some of the phosphorus may be coming out of Reed Island Creek. Due to our current sample sites, we are unable to estimate phosphorus levels from the New, upstream of Reed Island Creek.

We propose to add an additional sample site from a home along Clark’s Ferry Rd to collect total phosphorus, total nitrogen, and chlorophyll-a samples on the same days that the usual samples are collected. This location is not accessible by motorized boat due to the rapids immediately upstream of the Allisonia boat ramp (site CL12) and will require an additional volunteer to collect the sample.

The approximate increase in testing cost is $834 ($139 x 6 sample dates).

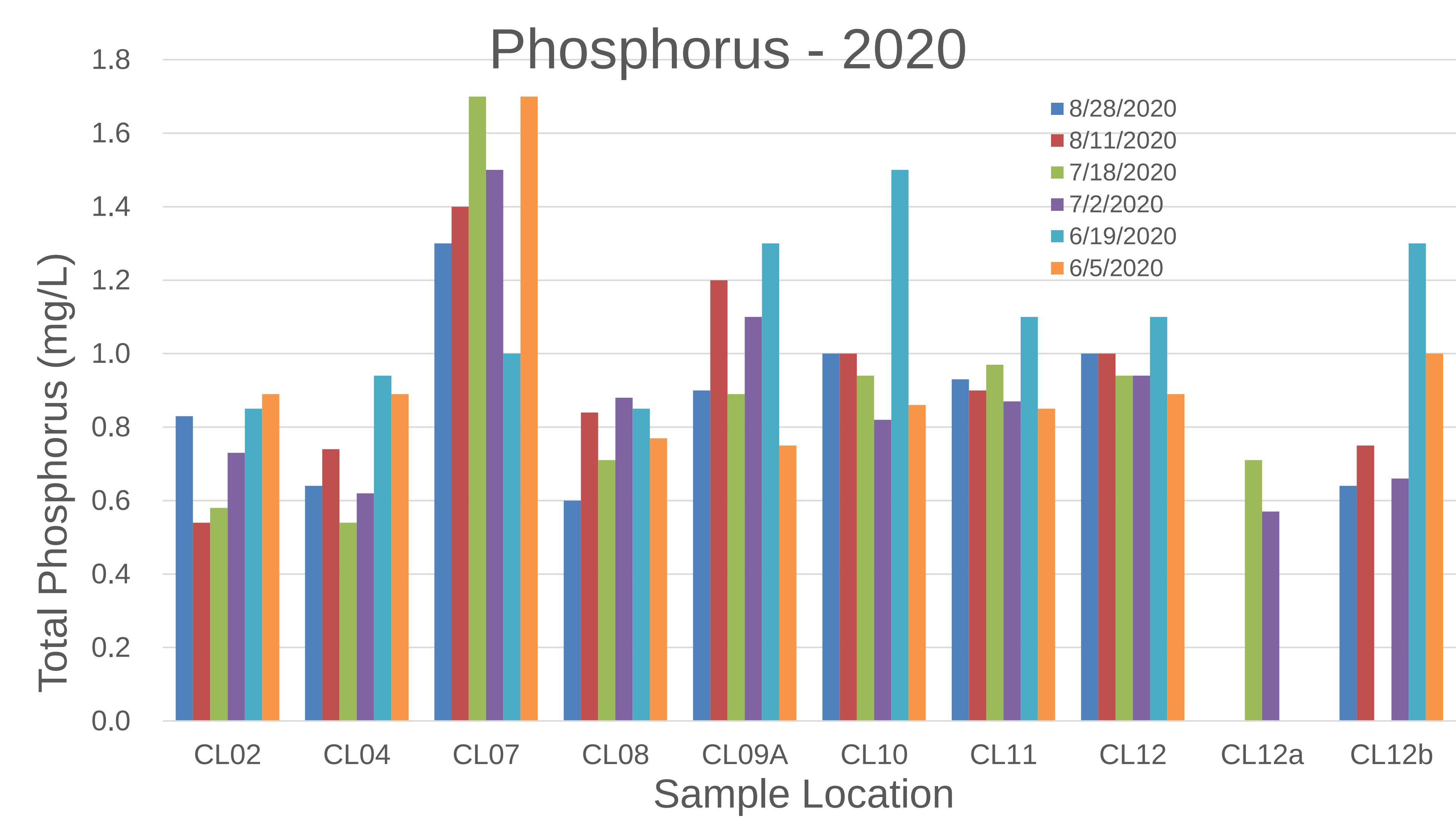
Phosphorus and Water

As illustrated in the picture, there is a significant separation in streamflow from Reed Island Creek and the New River.

Collecting a sample from a home along Clark's Ferry Rd will allow us to have data on the watershed of Claytor Lake, above Reed Island Creek.

Due to the variability of streamflow mixing only a half mile downstream, using a calculation of (CL12 less CL12B) will not work consistently.

Total Phosphorus Records



Phosphorus - 2020
Total Phosphorus (mg/L)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
8/28/2020
8/11/2020
7/18/2020
7/2/2020
6/19/2020
6/5/2020
CL02
CL04
CL07
CL08
CL09A
CL10
CL11
CL12
CL12a
CL12b
Sample Location

Volunteers for 2020

- Cheri Strenz
- Jeff Arnold
- Michael Valash

- To sign up for 2021 Sampling Season (starting week of June 1st), contact Cheri Strenz as soon as possible.

Sampling Coordinated by Andrea D. Jones, Lab Director

Clear Water Testing, LLC

Disclosure: Clear Water Testing LLC is responsible for monitoring sample collection by FOCL volunteers, handling the samples when FOCL volunteers return them, processing the samples that are to be tested by an outside laboratory, managing the data collection process, and presenting the data to Friends of Claytor Lake in a report. We do not make any representation on the analysis of the data or the presentation of additional information collected from outside sources.

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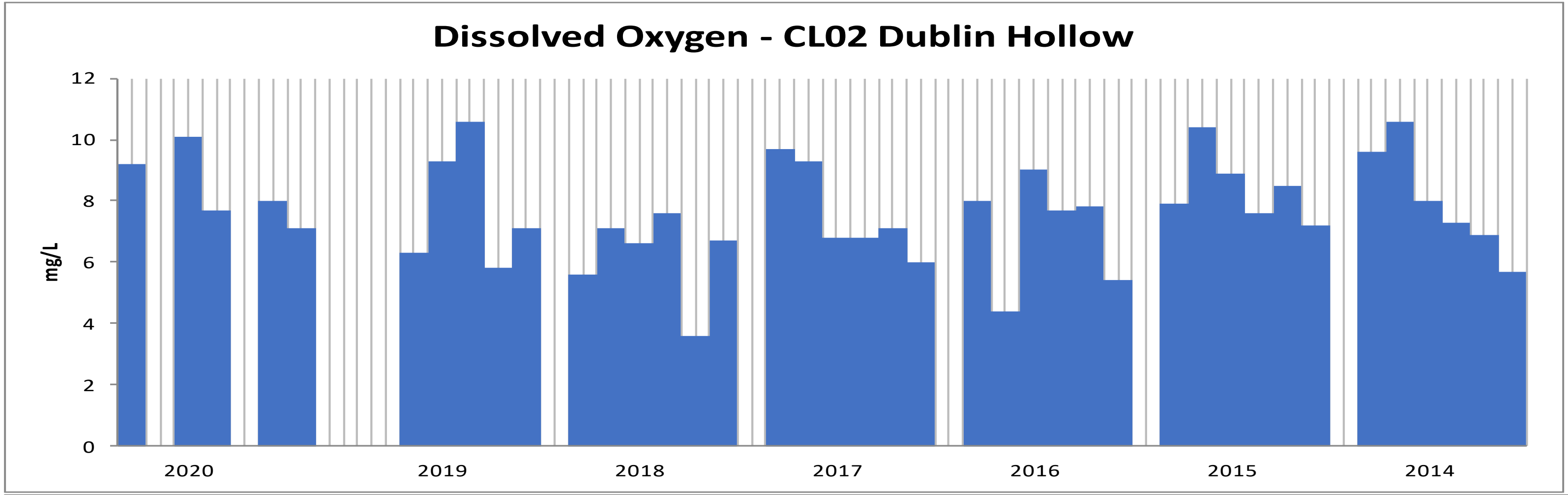
Historical Data by Sampling Site

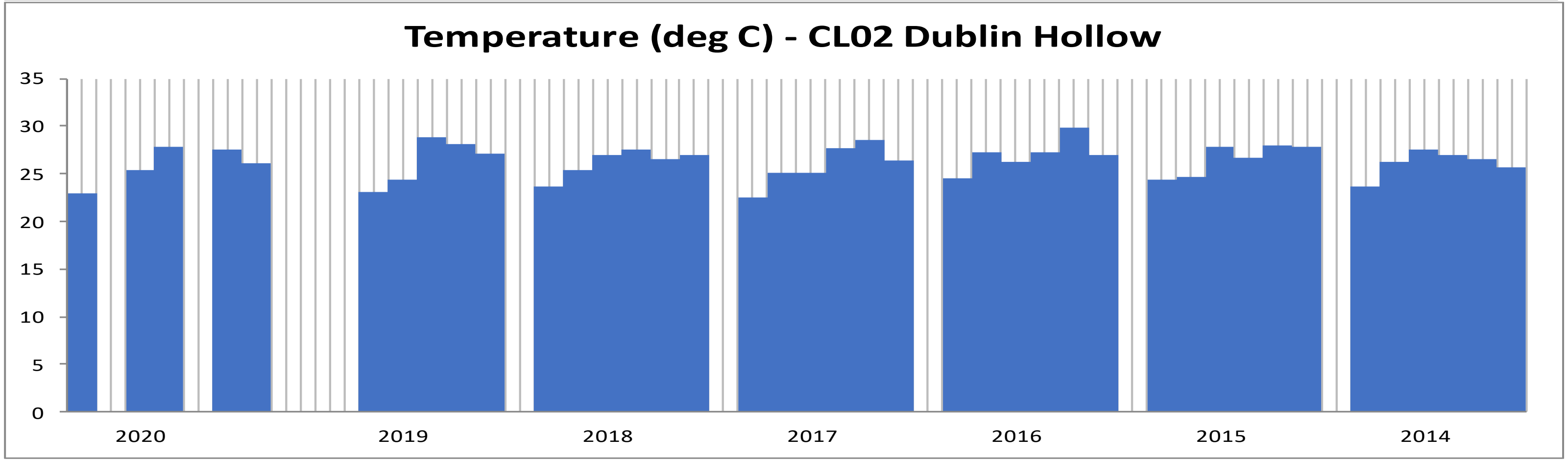
Dissolved Oxygen Meter Readings

Dissolved Oxygen (mg/L)

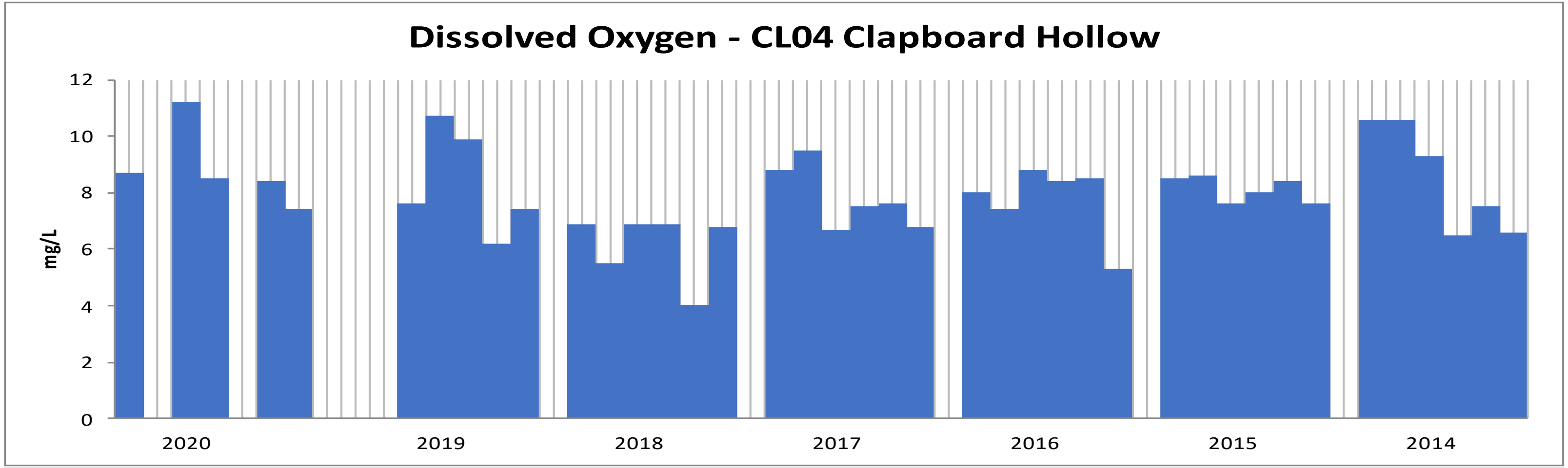
Temperature (deg C)

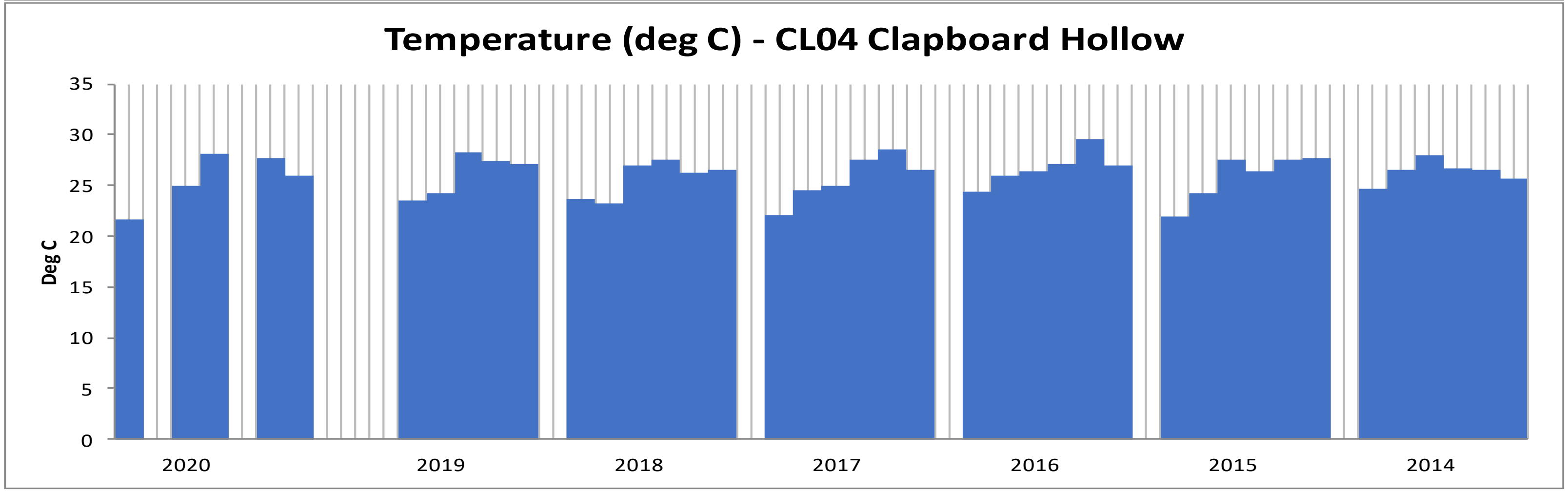


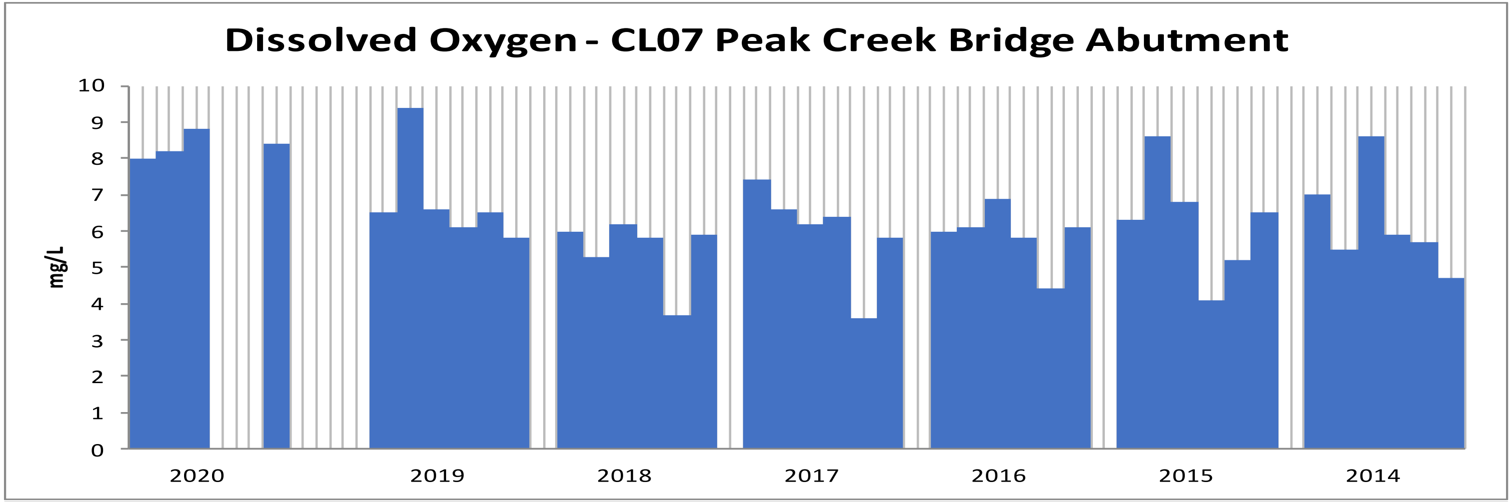
Dissolved Oxygen - CL02 Dublin Hollow
mg/L
0
2
4
6
8
10
12
2020
2019
2018
2017
2016
2015
2014

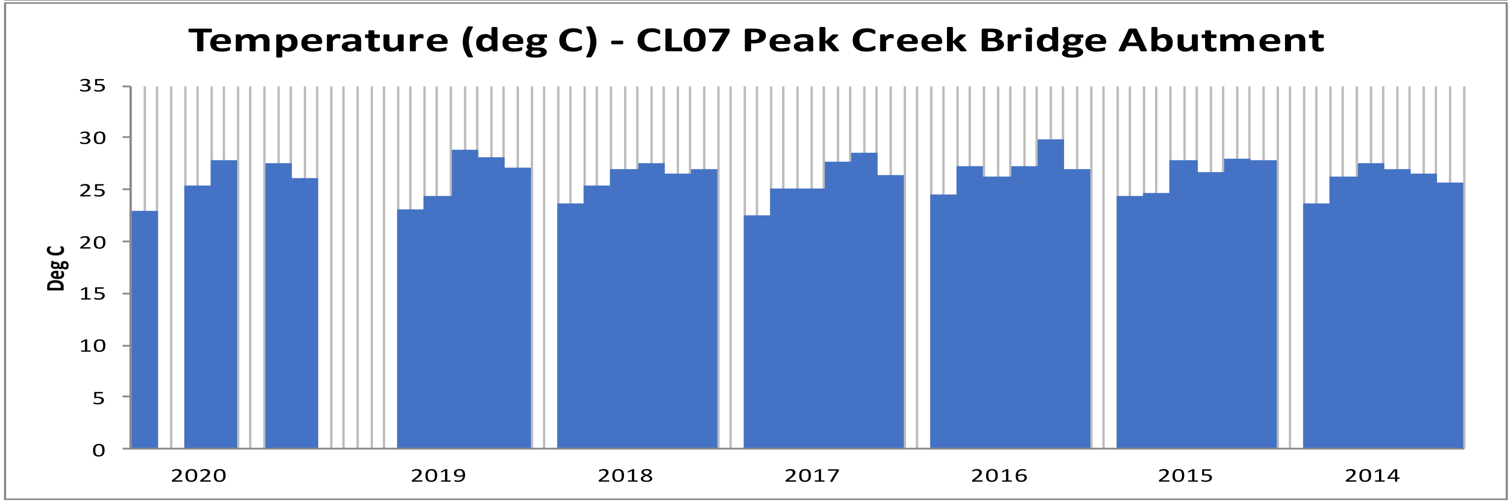


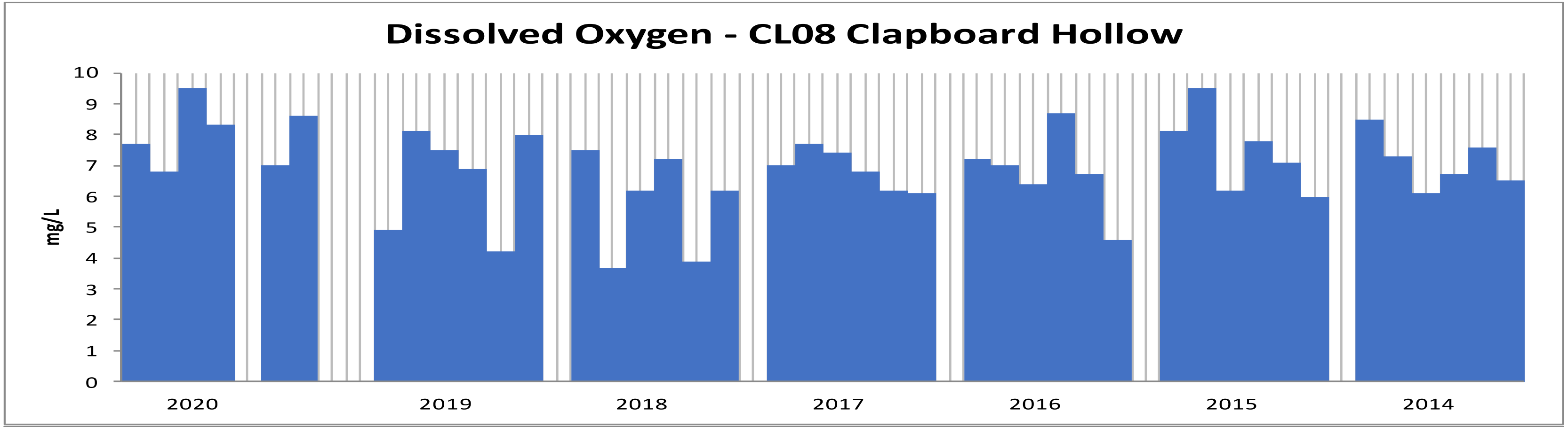
Temperature (deg C) - CL02 Dublin Hollow
0
5
10
15
20
25
30
35
2020
2019
2018
2017
2016
2015
2014

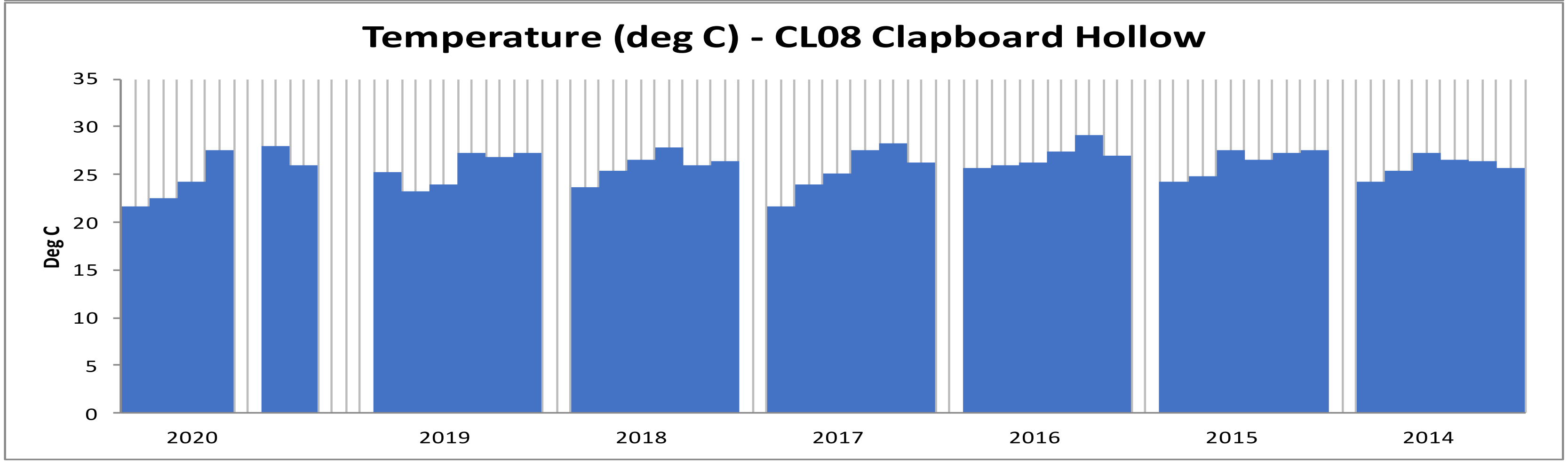

Dissolved Oxygen - CL04 Clapboard Hollow
mg/L
0
2
4
6
8
10
12
2020
2019
2018
2017
2016
2015
2014

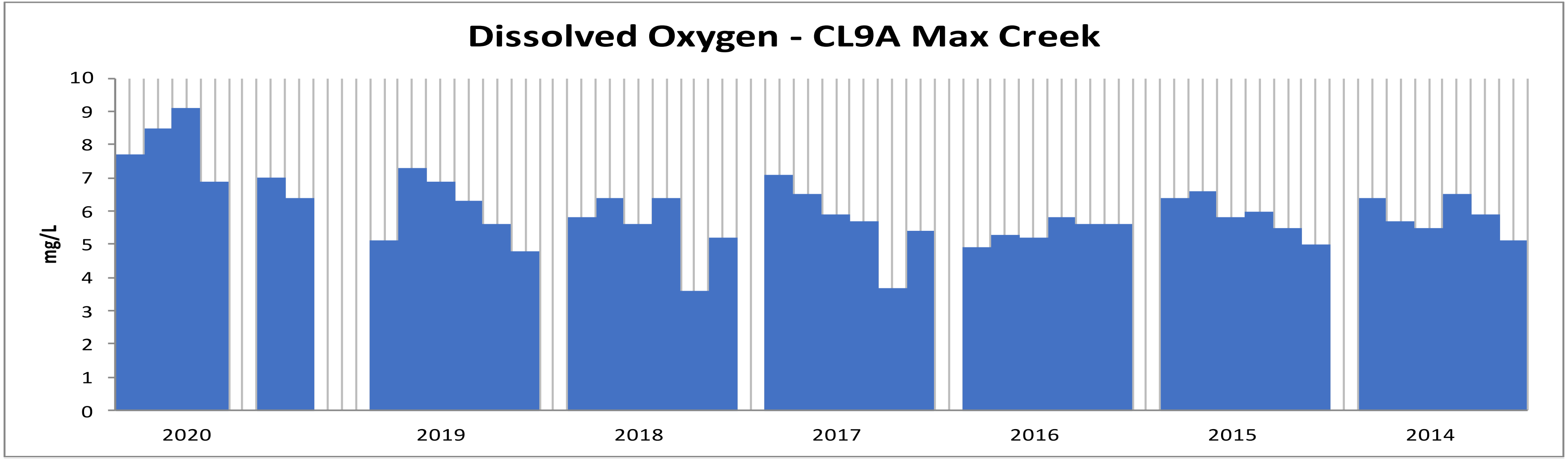

Temperature (deg C) - CL04 Clapboard Hollow
Deg C
0
5
10
15
20
25
30
35
2020
2019
2018
2017
2016
2015
2014


Dissolved Oxygen - CL07 Peak Creek Bridge Abutment
mg/L
10
9
8
7
6
5
4
3
2
1
0
2020
2019
2018
2017
2016
2015
2014

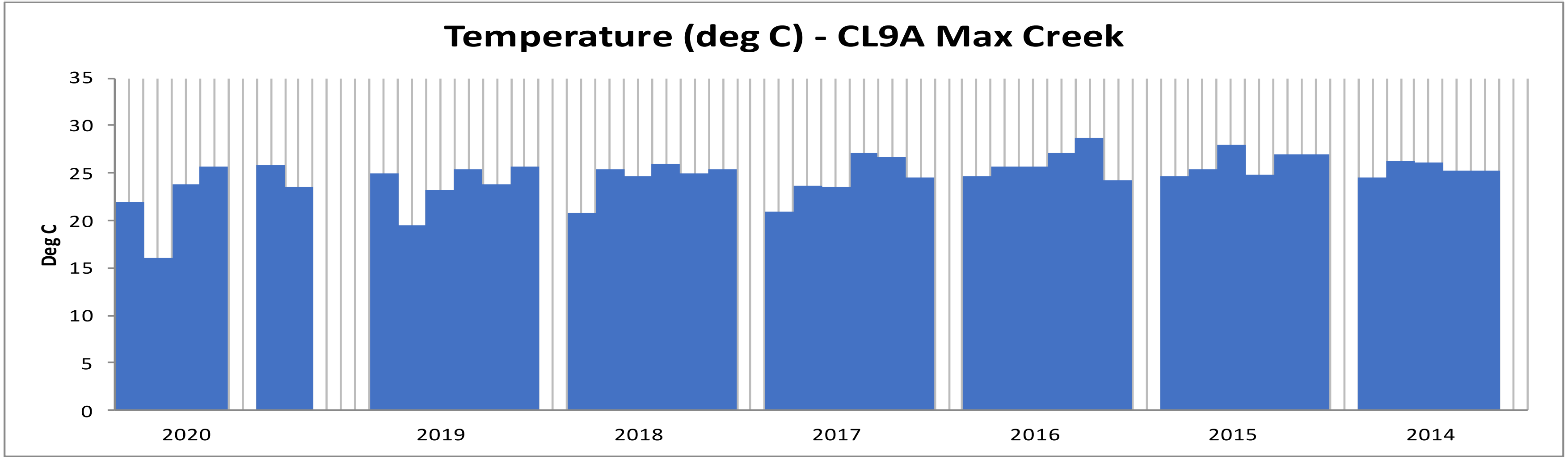

Temperature (deg C) - CL07 Peak Creek Bridge Abutment
Deg C
35
30
25
20
15
10
5
0
2020
2019
2018
2017
2016
2015
2014


Dissolved Oxygen - CL08 Clapboard Hollow
mg/L
0
1
2
3
4
5
6
7
8
9
10
2020
2019
2018
2017
2016
2015
2014

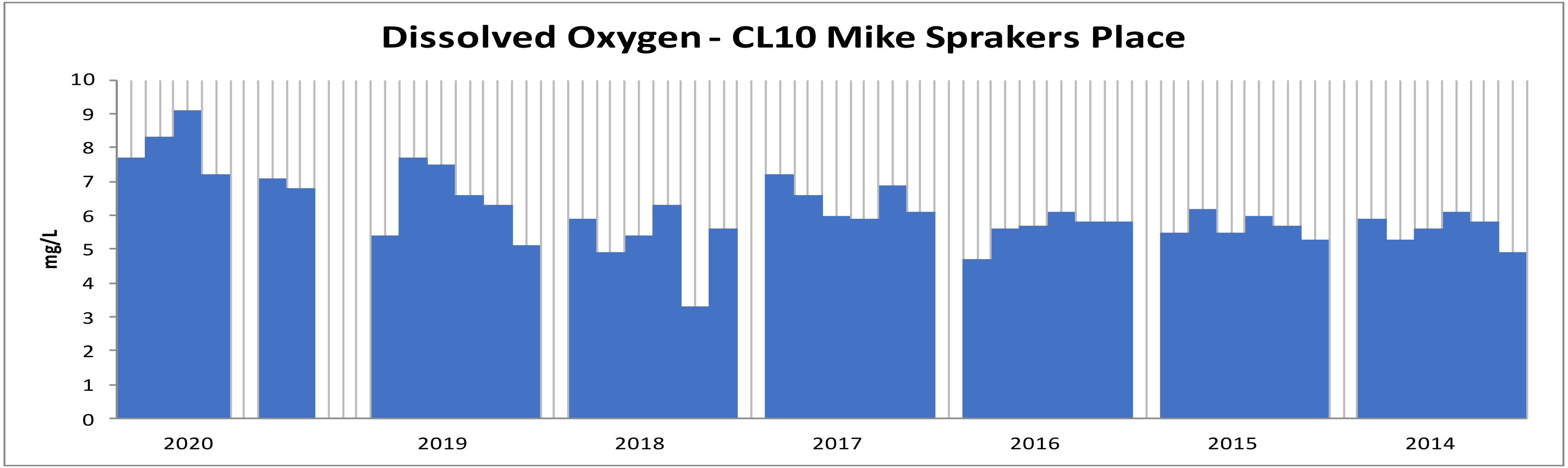

Temperature (deg C) - CL08 Clapboard Hollow
Deg C
0
5
10
15
20
25
30
35
2020
2019
2018
2017
2016
2015
2014

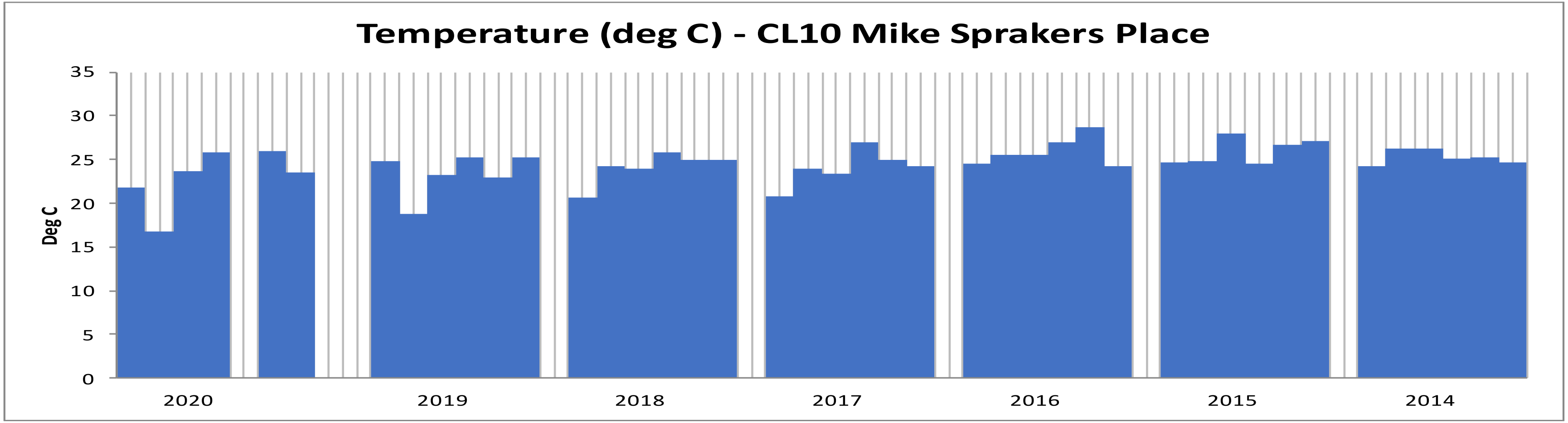


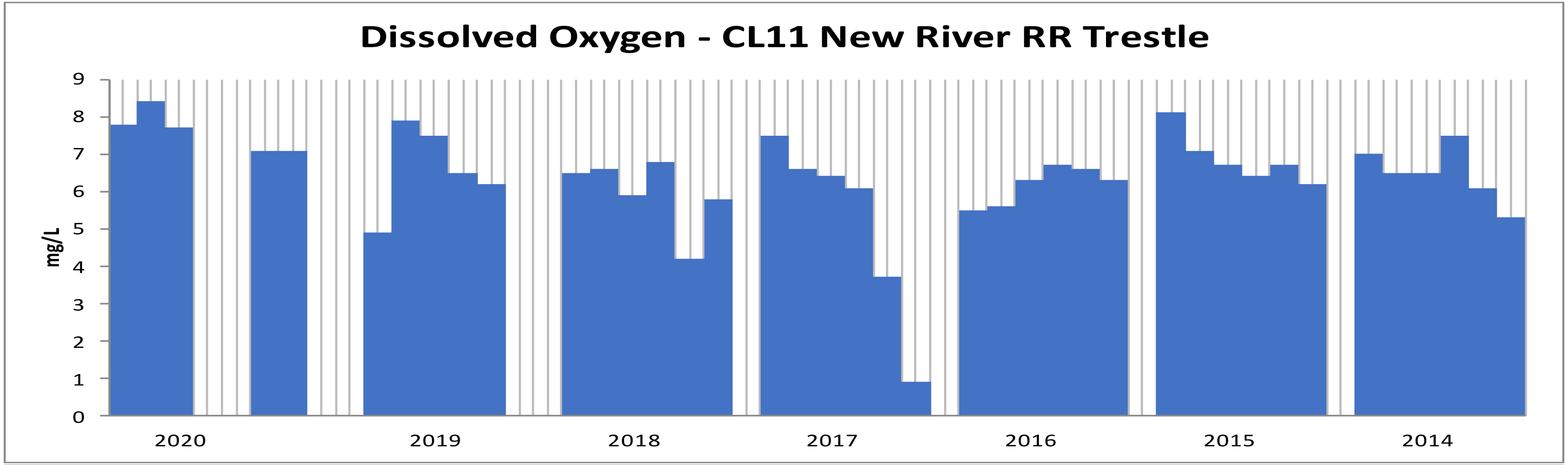
Dissolved Oxygen - CL9A Max Creek
mg/L
0
1
2
3
4
5
6
7
8
9
10
2020
2019
2018
2017
2016
2015
2014



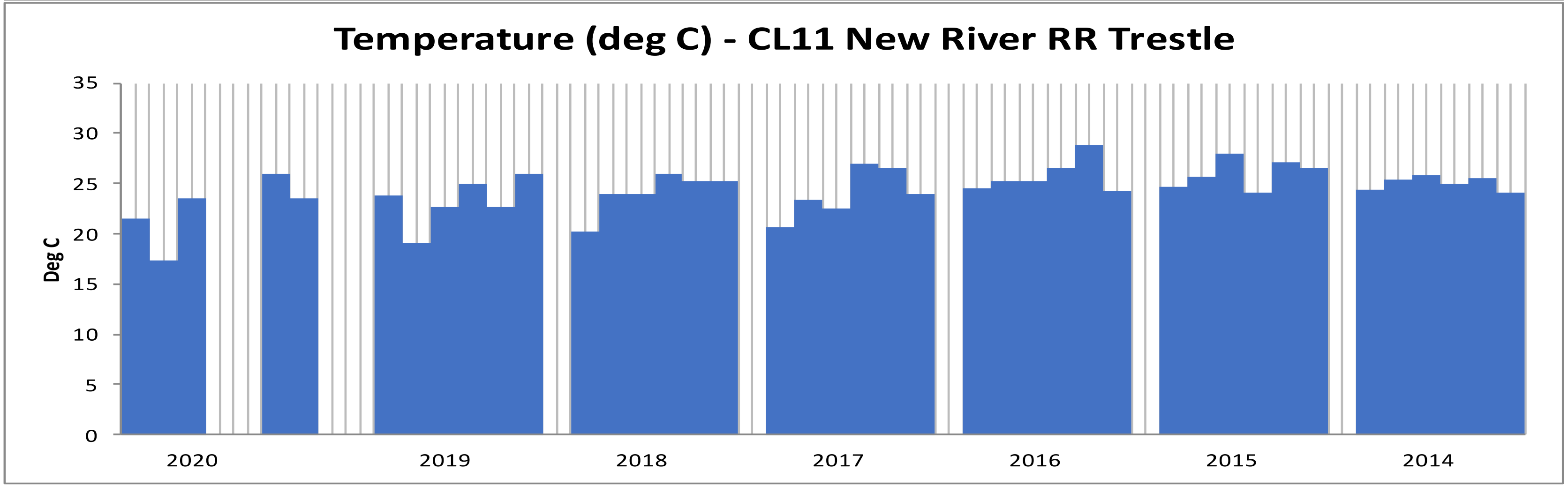
Temperature (deg C) - CL9A Max Creek
Deg C
0
5
10
15
20
25
30
35
2020
2019
2018
2017
2016
2015
2014


Dissolved Oxygen - CL10 Mike Sprakers Place
mg/L
0
1
2
3
4
5
6
7
8
9
10
2020
2019
2018
2017
2016
2015
2014

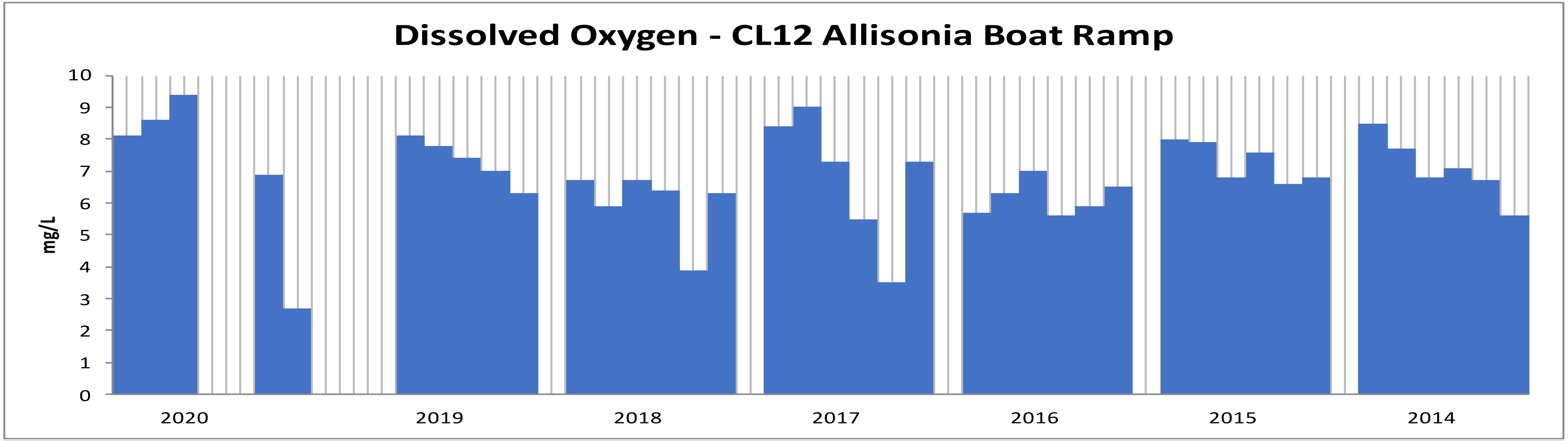

Temperature (deg C) - CL10 Mike Sprakers Place
Deg C
0
5
10
15
20
25
30
35
2020
2019
2018
2017
2016
2015
2014



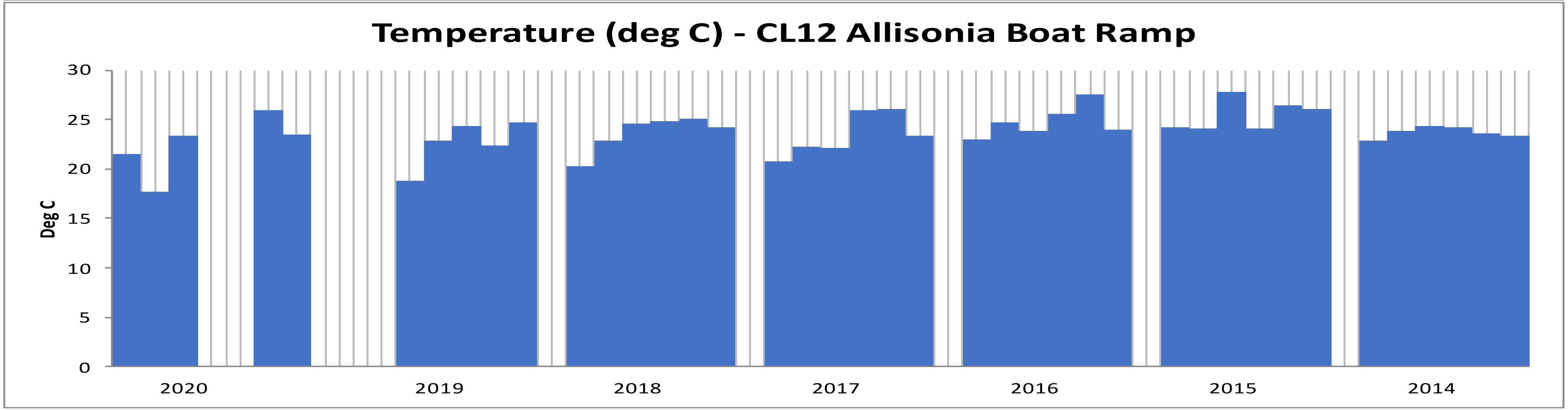
Dissolved Oxygen - CL11 New River RR Trestle
mg/L
0
1
2
3
4
5
6
7
8
9
2020
2019
2018
2017
2016
2015
2014



Temperature (deg C) - CL11 New River RR Trestle
Deg C
0
5
10
15
20
25
30
35
2020
2019
2018
2017
2016
2015
2014



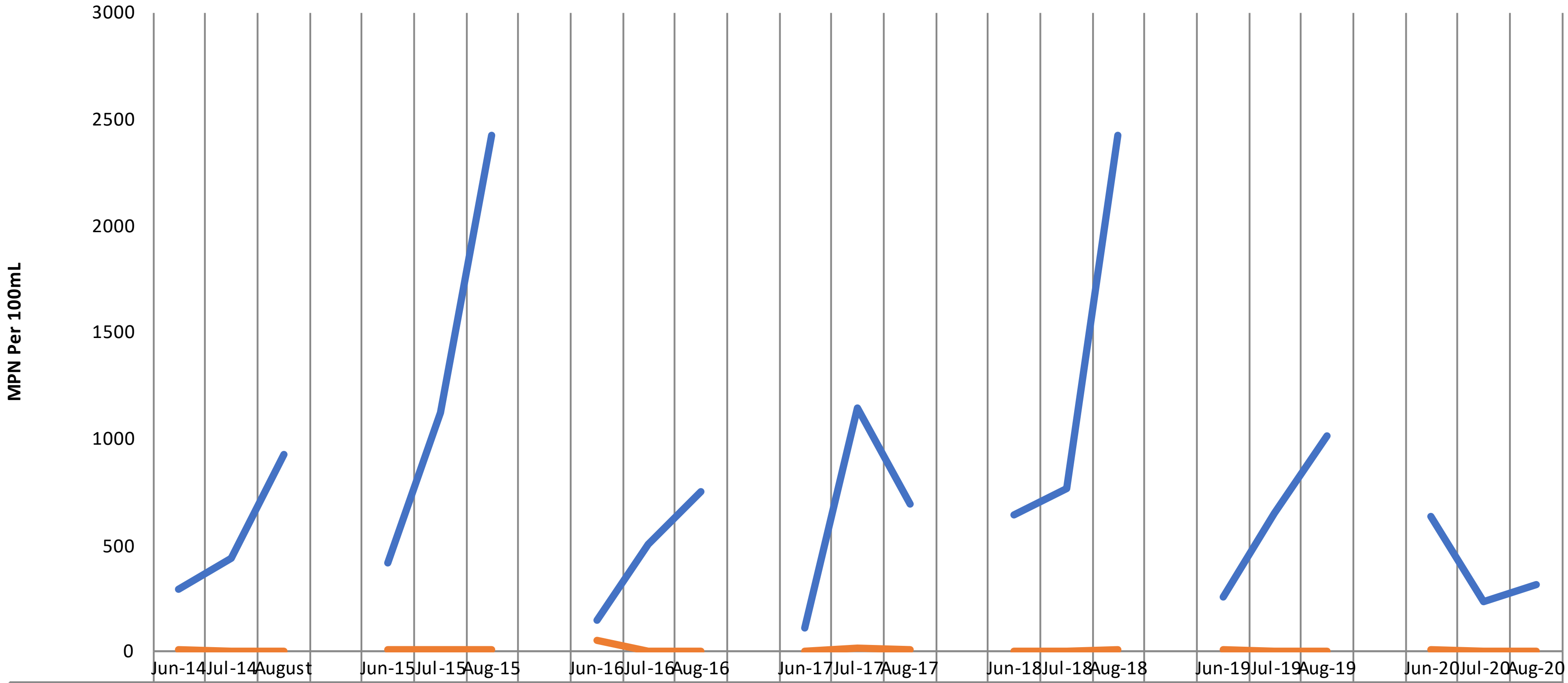
Dissolved Oxygen - CL12 Allisonia Boat Ramp
mg/L
0
1
2
3
4
5
6
7
8
9
10
2020
2019
2018
2017
2016
2015
2014



Temperature (deg C) - CL12 Allisonia Boat Ramp
Deg C
0
5
10
15
20
25
30
2020
2019
2018
2017
2016
2015
2014

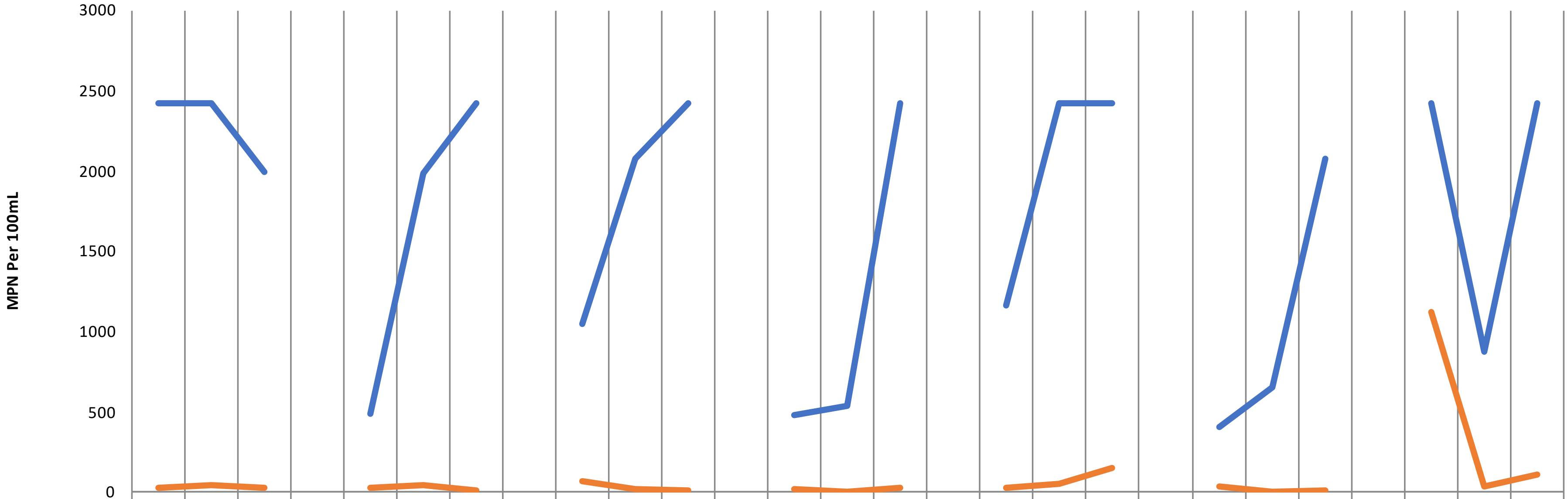
Total Coliform / *E.coli*

Total Coliform & *E.Coli* / CL01B - Dublin Hollow



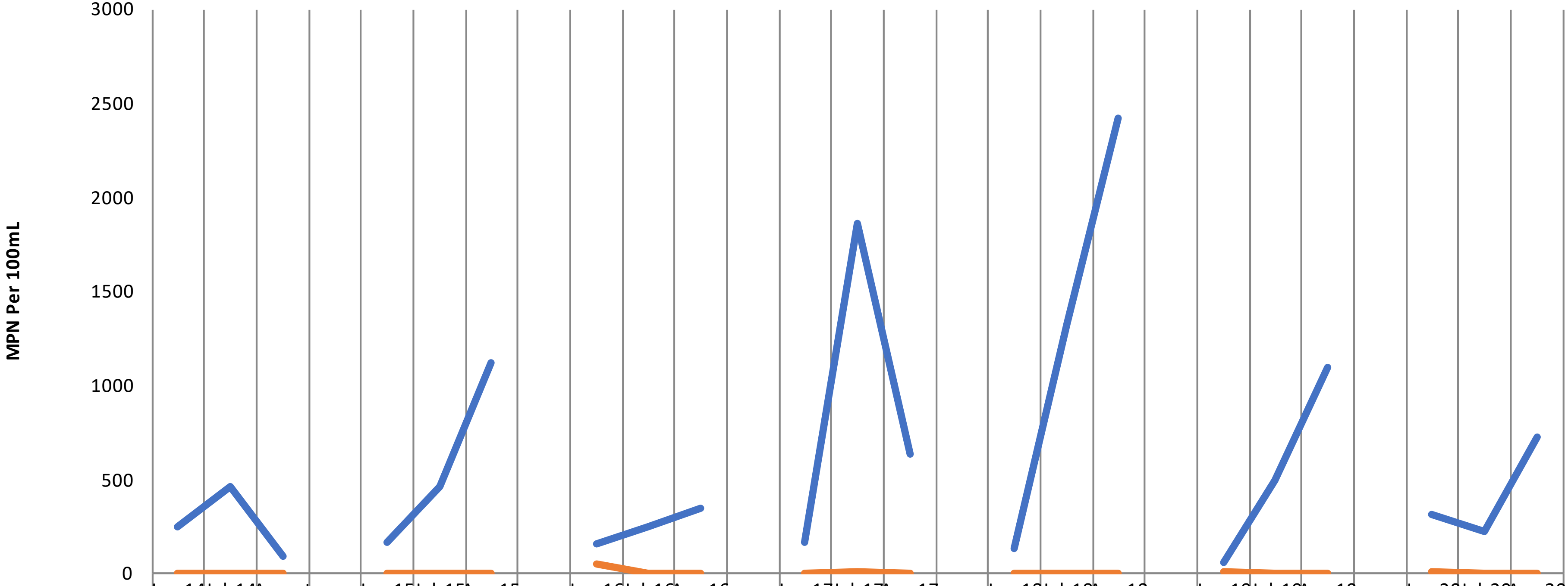
	Jun-14	Jul-14	August		Jun-15	Jul-15	Aug-15		Jun-16	Jul-16	Aug-16		Jun-17	Jul-17	Aug-17		Jun-18	Jul-18	Aug-18		Jun-19	Jul-19	Aug-19		Jun-20	Jul-20	Aug-20
Sample TC	291	435	921		411	1120	2420		141	502.8	751.6		110.6	1140	686.7		637.5	764	2419		252.6	648.8	1013		631.0	232.9	310.2
Sample EC	3	0	2		3	5.2	5.2		49.5	1.5	0		0	13	2.1		0.5	0	4.5		3.6	1	1		8.65	1.0	1

Total Coliform & *E.Coli* / CL02B - Peak Creek Bridge Abutment



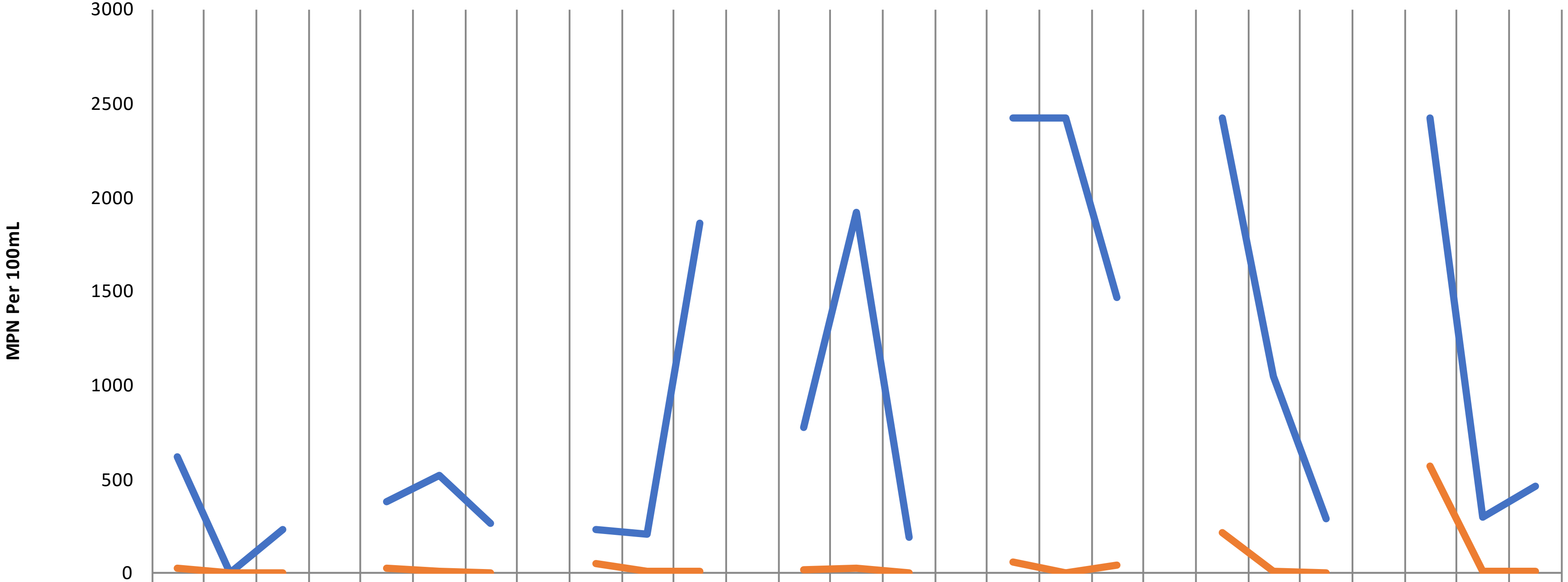
	Jun-14	Jul-14	August		Jun-15	Jul-15	Aug-15		Jun-16	Jul-16	Aug-16		Jun-17	Jul-17	Aug-17		Jun-18	Jul-18	Aug-18		Jun-19	Jul-19	Aug-19		Jun-20	Jul-20	Aug-20
Sample TC	2419.6	2419.6	1990		488	1986.3	2419.6		1046.2	2076.3	2419.6		474.3	533.3	2419.6		1160	2419.5	2419.5		404.4	649.9	2076.3		2419.6	868.6	2419.6
Sample EC	21	37	20		20	42	6.2		66.95	12.8	6.8		16.2	0.5	26.1		25	51.5	148.5		28.2	2	8.6		1119.9	33.4	106

Total Coliform & *E.Coli* / CL03B - Mouth of Peak Creek



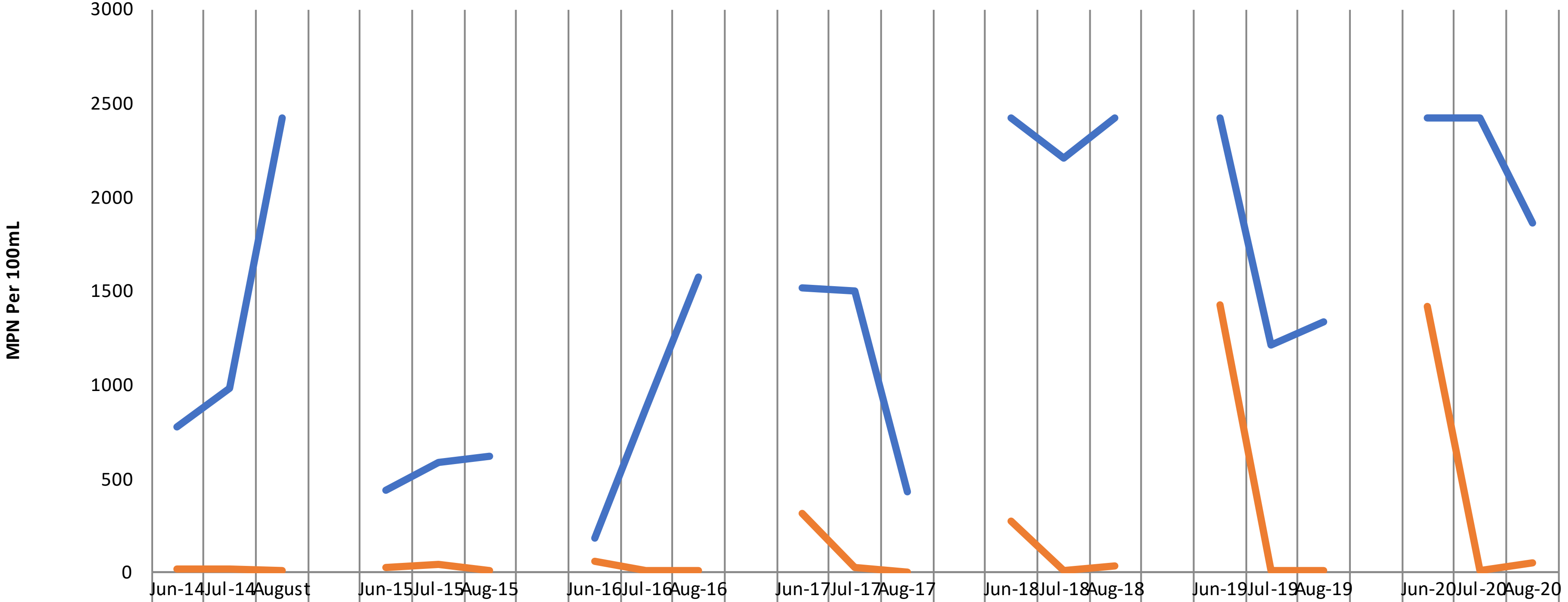
	Jun-14	Jul-14	August	Jun-15	Jul-15	Aug-15	Jun-16	Jul-16	Aug-16	Jun-17	Jul-17	Aug-17	Jun-18	Jul-18	Aug-18	Jun-19	Jul-19	Aug-19	Jun-20	Jul-20	Aug-20
Sample TC	248	461	86	162	461.1	1120	152.5	242.7	346.8	162	1860	630.1	133	1322	2420	55.2	488.4	1092	313.4	221.7	723.8
Sample EC	1	2	0	1	2	2.2	50.35	1	0	1.6	9	0	0.5	0	0	2.6	1	0.5	7.55	1.0	1

Total Coliform & *E.Coli* / CL04B - Lighthouse Bridge



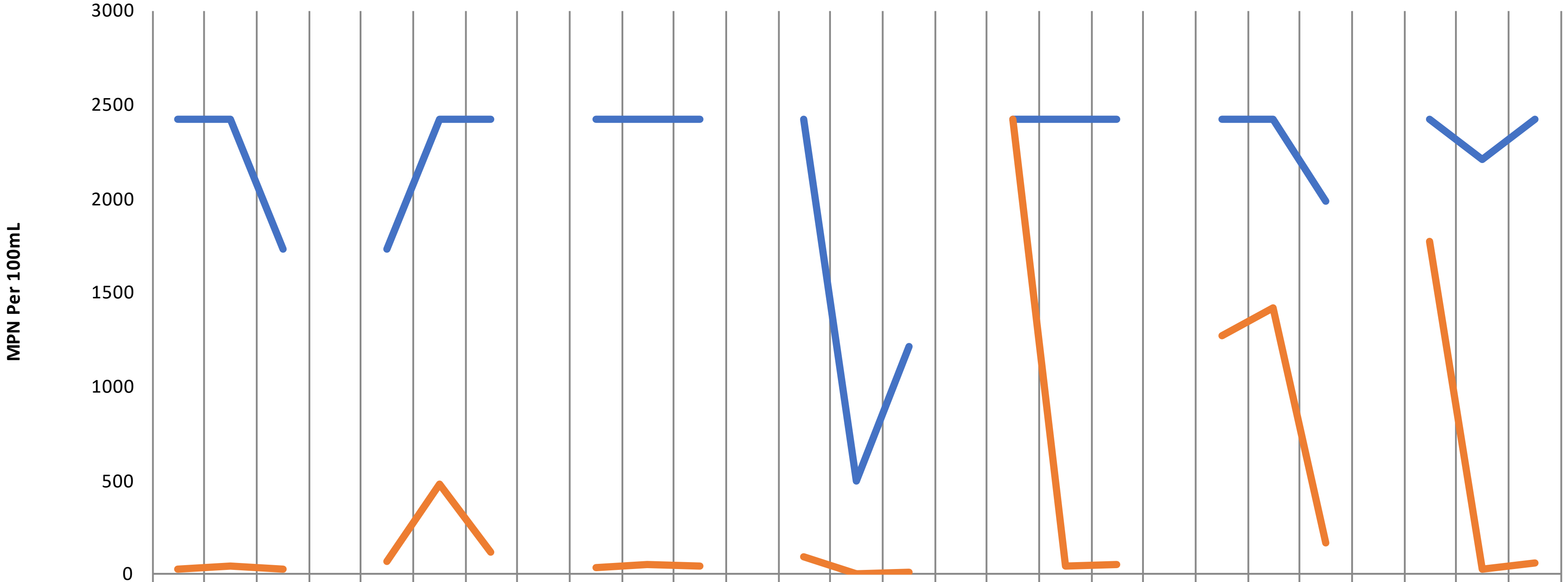
	Jun-14	Jul-14	August		Jun-15	Jul-15	Aug-15		Jun-16	Jul-16	Aug-16		Jun-17	Jul-17	Aug-17		Jun-18	Jul-18	Aug-18		Jun-19	Jul-19	Aug-19		Jun-20	Jul-20	Aug-20
Sample TC	613	0	225		379	517.2	261.3		231.2	207.8	1860		771.7	1917	190.2		2419	2419	1465		2420	1046	283.2		2420	293.4	456.5
Sample EC	24	0	2		23	7.4	2		50.35	3.05	7.95		13.3	21.7	2.1		53.5	0	39		213.5	3.1	1		567.8	2.6	5.75

Total Coliform & *E.Coli* / CL05B - Mouth of Max Creek



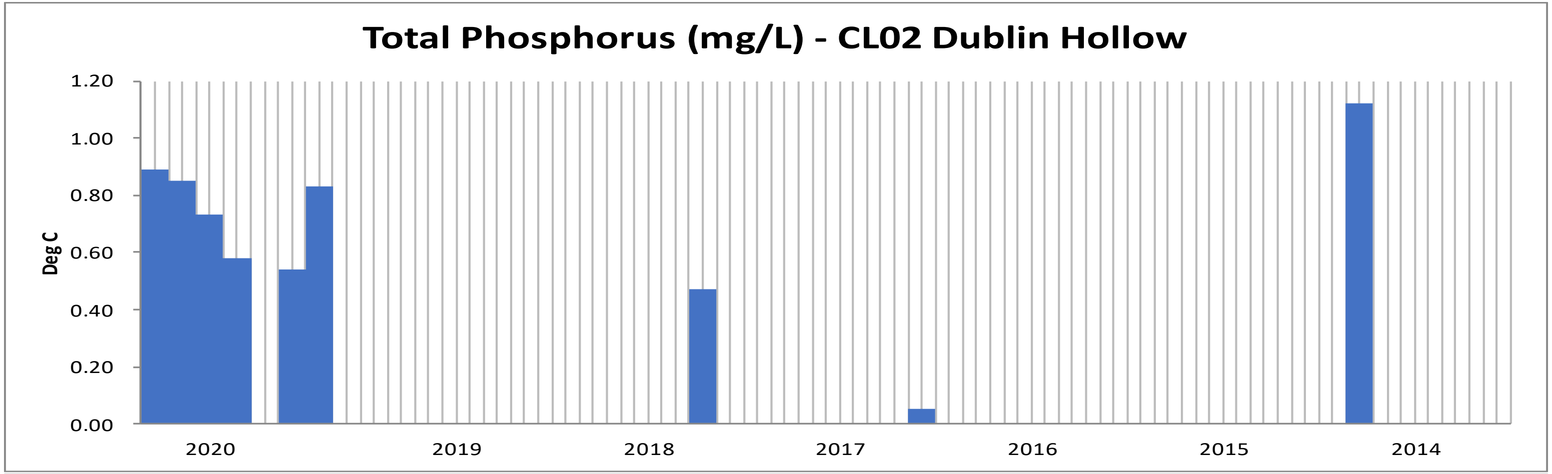
	Jun-14	Jul-14	August	Jun-15	Jul-15	Aug-15	Jun-16	Jul-16	Aug-16	Jun-17	Jul-17	Aug-17	Jun-18	Jul-18	Aug-18	Jun-19	Jul-19	Aug-19	Jun-20	Jul-20	Aug-20
Sample TC	770	980	2420	435	579.4	613.3	175.7	875.3	1573	1516	1500	424.2	2420	2205	2419	2420	1210	1335	2420	2420	1860
Sample EC	15	18	3	20	38.3	7.5	52	7.95	5.3	312.8	26.9	1	269	3.5	29	1426	5.5	5.2	1414	5.8	51.1

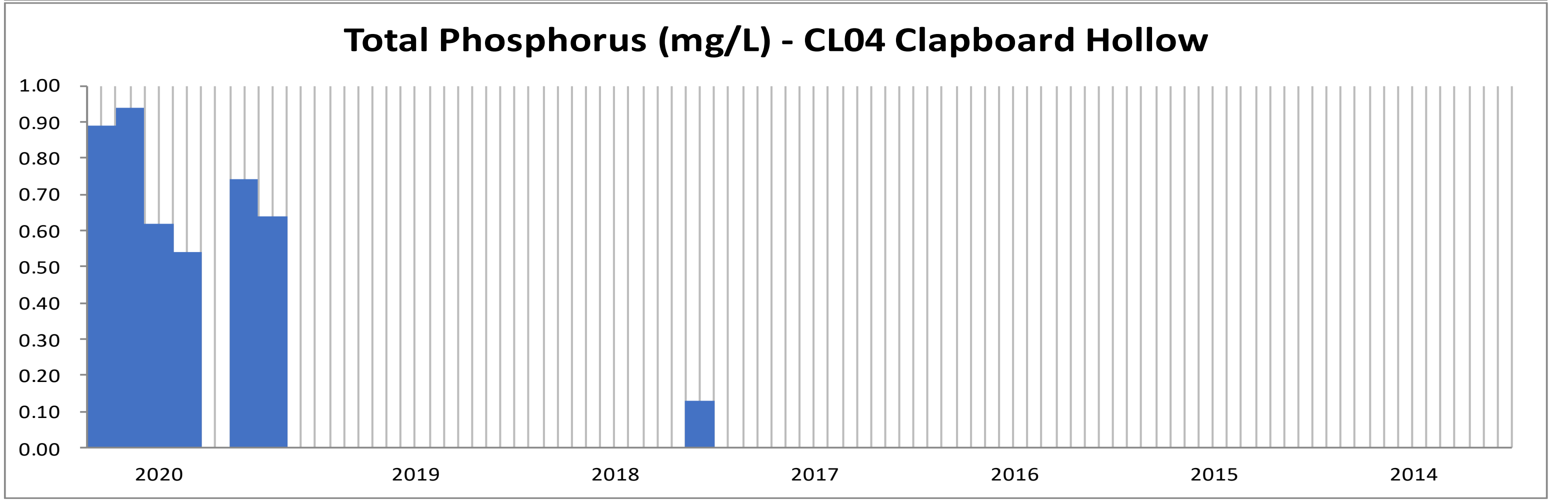
Total Coliform & *E.Coli* / CL06B - Alisonia Boat Ramp

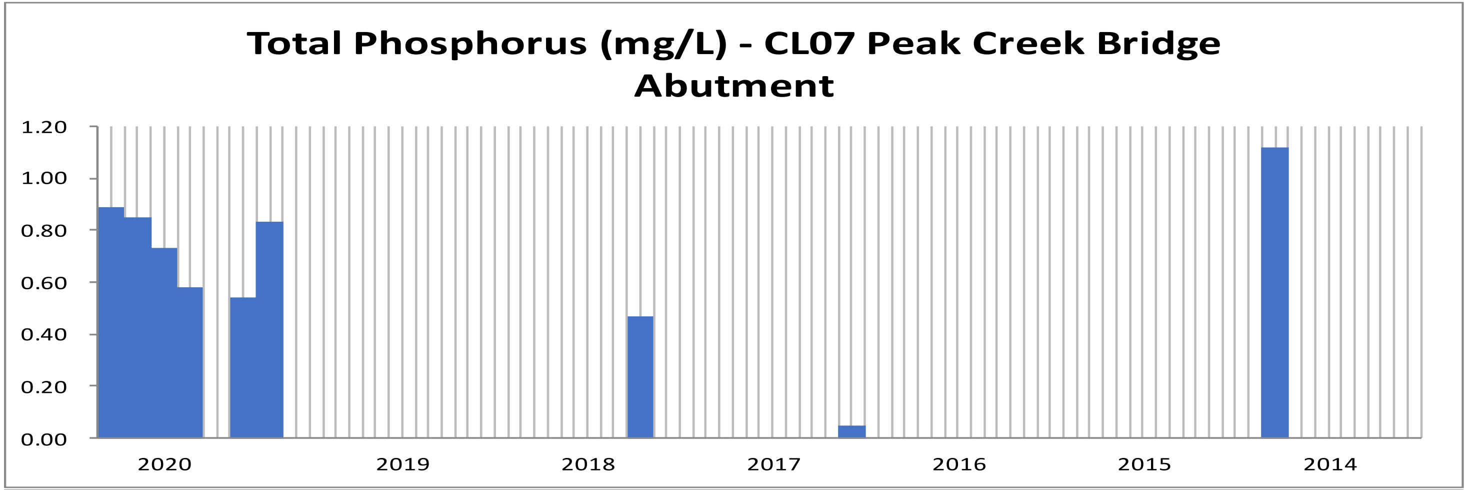


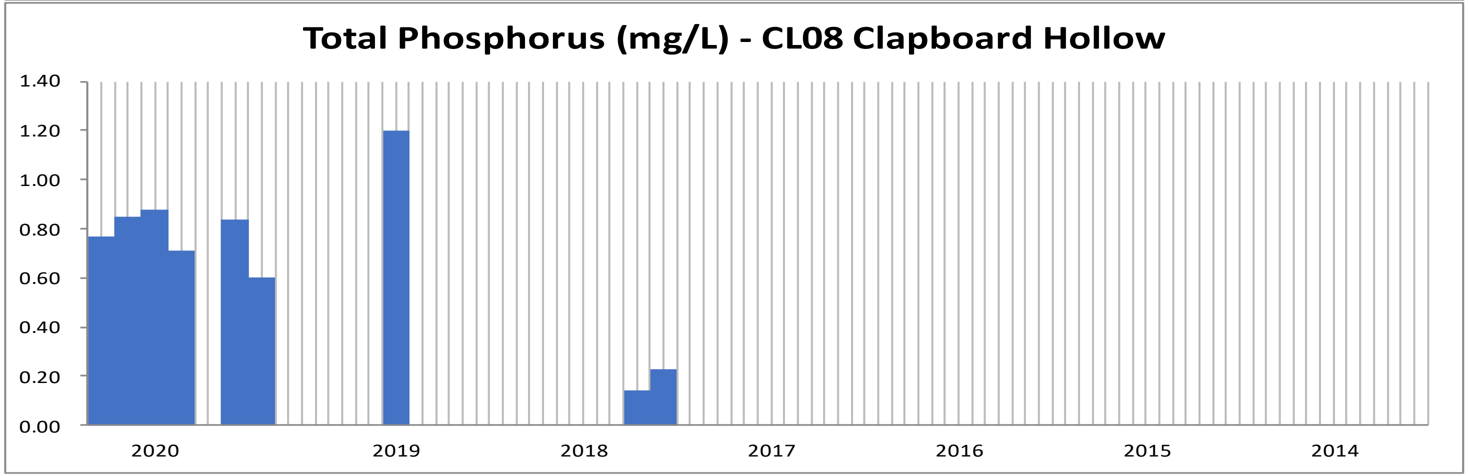
	Jun-14	Jul-14	August	Jun-15	Jul-15	Aug-15	Jun-16	Jul-16	Aug-16	Jun-17	Jul-17	Aug-17	Jun-18	Jul-18	Aug-18	Jun-19	Jul-19	Aug-19	Jun-20	Jul-20	Aug-20
Sample TC	2420	2420	1730	1730	2420	2420	2420	2420	2420	2420	488.4	1210	2419	2420	2419	2420	2420	1986	2420	2,203	2420
Sample EC	20	42	20	62	472.1	111.2	32	49.55	38.15	92.2	0	9.1	2420	37.5	45	1267	1413	162.8	1770	26.5	57.65

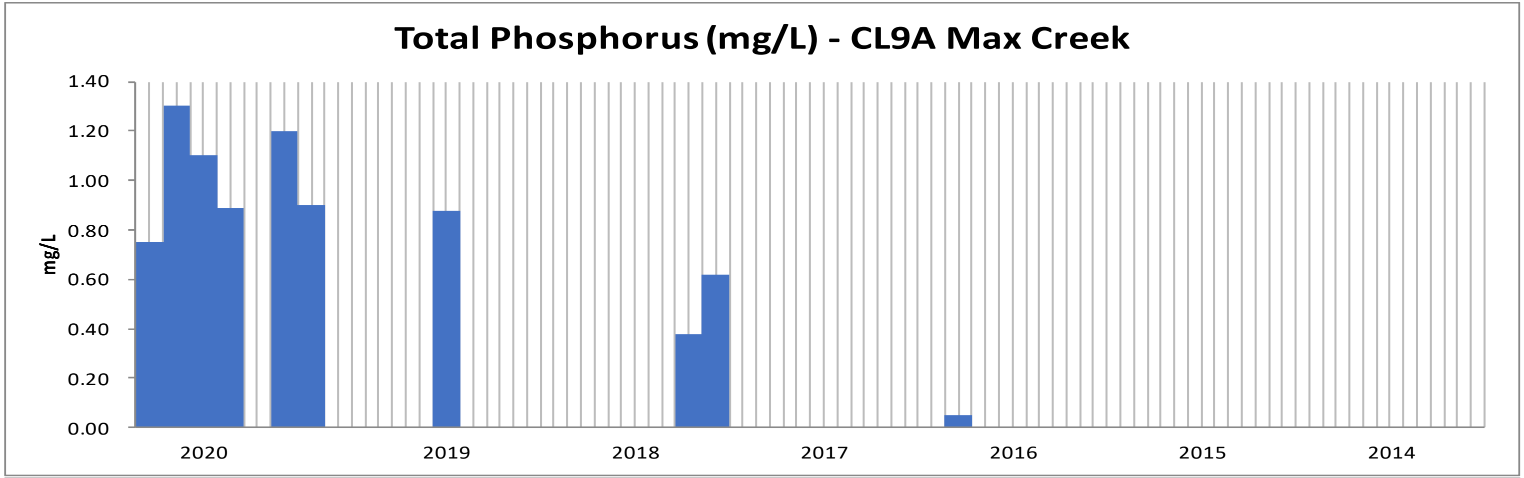
Total Phosphorus Records

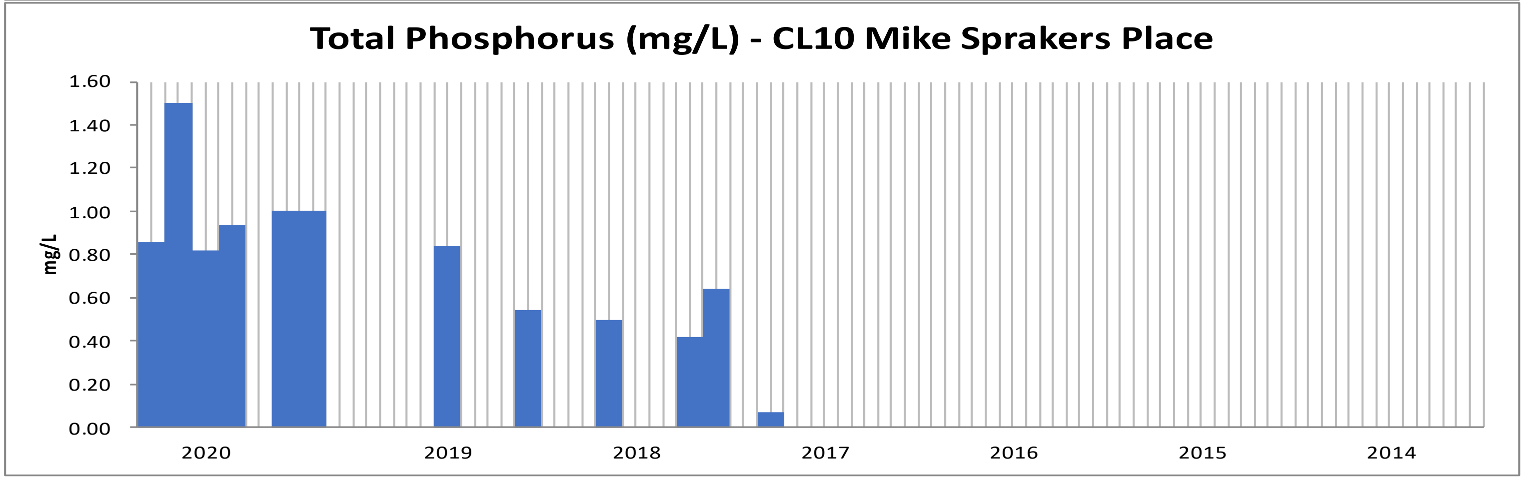

Total Phosphorus (mg/L) - CL02 Dublin Hollow
Deg C
1.20
1.00
0.80
0.60
0.40
0.20
0.00
2020
2019
2018
2017
2016
2015
2014

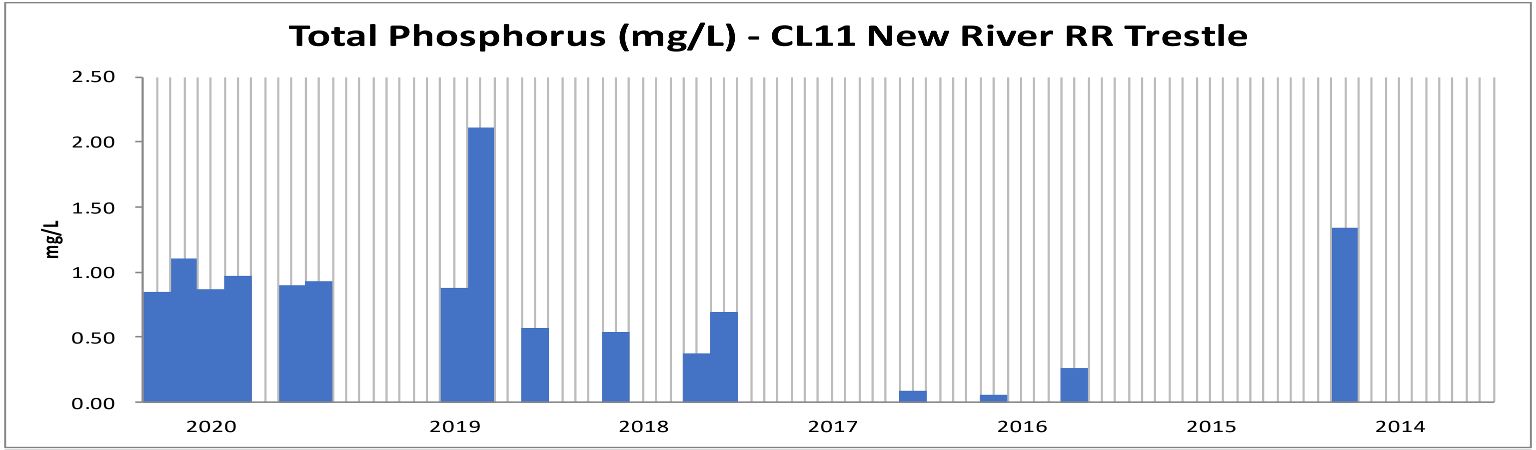

Total Phosphorus (mg/L) - CL04 Clapboard Hollow
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
2020
2019
2018
2017
2016
2015
2014

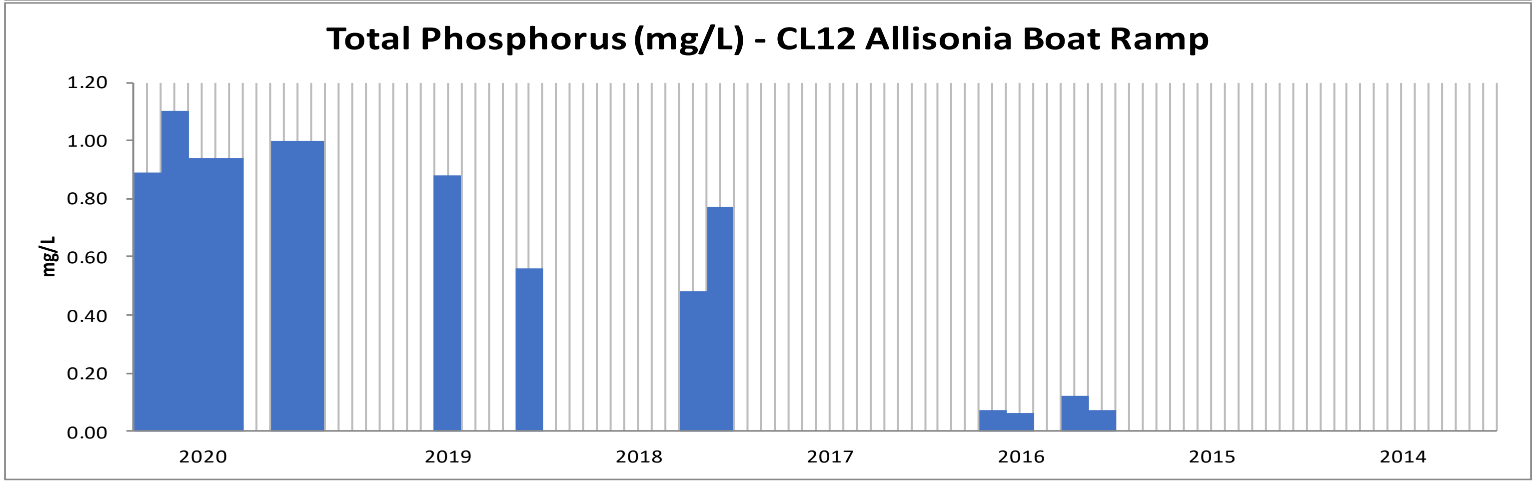

Total Phosphorus (mg/L) - CL07 Peak Creek Bridge Abutment
1.20
1.00
0.80
0.60
0.40
0.20
0.00
2020
2019
2018
2017
2016
2015
2014


Total Phosphorus (mg/L) - CL08 Clapboard Hollow
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
2020
2019
2018
2017
2016
2015
2014


Total Phosphorus (mg/L) - CL9A Max Creek
mg/L
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
2020
2019
2018
2017
2016
2015
2014


Total Phosphorus (mg/L) - CL10 Mike Sprakers Place
mg/L
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
2020
2019
2018
2017
2016
2015
2014


Total Phosphorus (mg/L) - CL11 New River RR Trestle
mg/L
2.50
2.00
1.50
1.00
0.50
0.00
2020
2019
2018
2017
2016
2015
2014


Total Phosphorus (mg/L) - CL12 Allisonia Boat Ramp
mg/L
1.20
1.00
0.80
0.60
0.40
0.20
0.00
2020
2019
2018
2017
2016
2015
2014

<End>