BUENA VISTA CREEK 2019 ANNUAL REPORT

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Background

In the spring of 2019 Preserve Calavera created a program, the North San Diego County Watershed Monitoring Program (NSDCWMP) to carry on the decade-long work of San Diego Coastkeeper (SDCK) to assess the health of local surface waters. The three watersheds of Carlsbad's lagoons, all of which are part of the Carlsbad Hydrologic Unit, are evaluated for a number of parameters, physical, chemical and biological on a bimonthly basis.

NSDCWMP is an all-volunteer citizen science effort with a leadership management team comprised of two Preserve Calavera board members (also leaders of the Buena Vista Creek (BVC) and Agua Hedionda Lagoon monitoring teams) and a representative from and leader of the Batiquitos Lagoon team. This effort wouldn't be possible without the dedication to the leaders Mary Anne Viney and Karen Wytmans, the BVC field team (Kathy Parker, Dan Keddy, Michelle Colvin) and lab volunteers (Karen Merrill, Janell Cannon, Scott Engel and Ellen Bartlett). Our technical advisors are from the CA Waterboard (Erick Burres) and the San Diego Regional Water Quality Control Board (SDRWCB, Chad Loften). Data is posted at www.preservecalavera.org and on the CEDEN website and shared with SDRWCB and the city of Carlsbad. The program began testing in July 2019.

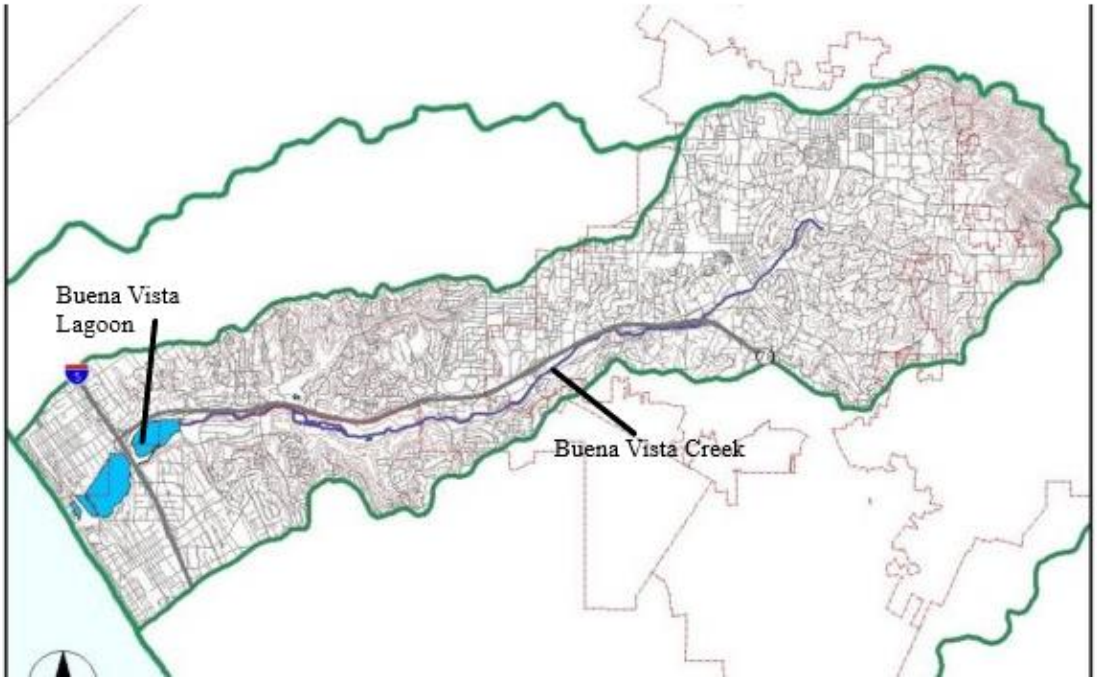


Figure 1 – Buena Vista Creek Watershed[1]

Buena Vista Lagoon which is part of both Oceanside and Carlsbad is fed by Buena Vista Creek whose headwaters are on the western slopes of the San Marcos Mountains, Buena Vista Creek is the only creek feeding Buena Vista Lagoon which opens to the Pacific Ocean. Currently, due to a weir put in place in the 1940s near the mouth of the lagoon, it is freshwater and in a steady state of decline. In May 2020, the Final Environmental Impact Report prepared by The San

Diego Association of Governments (SANDAG) was adopted by their Board of Directors. The consequence is that the lagoon will be returned to its historic saltwater state when funding becomes available.[2]

For 10 years SDCK monitored this watershed bimonthly, ending in December, 2018. Data for 2009-2016 is posted on the California Environmental Data Exchange Network (CEDEN). For calendar years 2017 and 2018 data has been provided to our program by SDCK. During the last year that SDCK produced annual reports for their watersheds, 2016, Buena Vista Creek's water quality was rated as 'fair'. NSDCWMP has not yet created a similar scorecard to assess the overall health of the watershed.

The purpose of this annual report is to 1) interpret the health of Buena Vista Creek for the testing period in 2020 and 2) look at historic trends (2009-present). Each parameter will be evaluated for anomalies and trends and the overall state of the watershed will be summarized based upon these results. Monitoring was carried out in January, March, July, September and November of 2020. Because of COVID-19 restrictions, no testing was carried out in May and subsequent to that, reduced field testing was done as indicated in the analysis of each parameter.

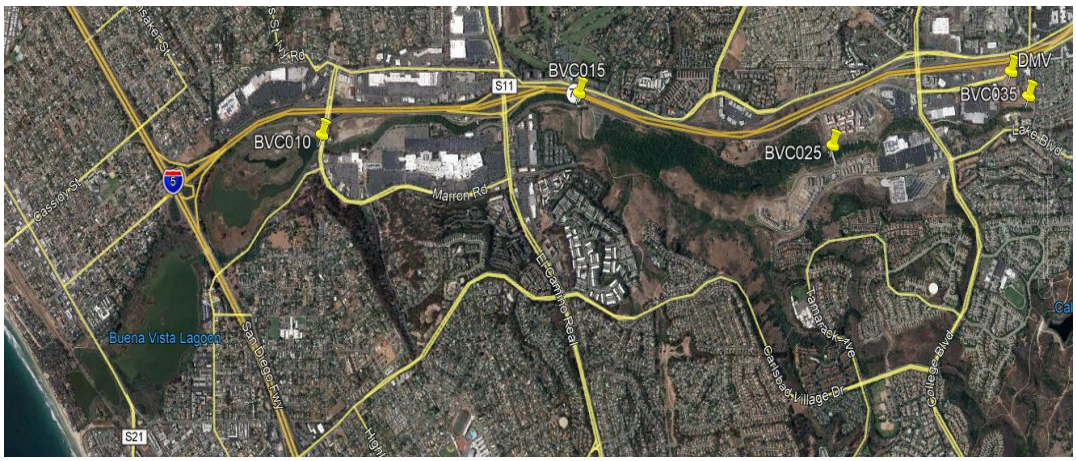
[1]https://scwrp.org/projects/buena-vista- icreek-watershed-plan/
[2]https://bvaudubon.org/bv-lagoon-enhancement/

Sampling Sites

The Buena Vista Creek team sampled the 4 sites along the creek (BVC010, BVC015, BVC025 and BVC035) in January, adding BVC010 at the mouth of the lagoon as known sewage spills have occurred near that site in the past. The site identifications in the map below are the same as those used by SDCK at various times between 2009-2018. Starting in March we dropped the BVC025 site to allow ongoing monitoring of BVC010 (for a total of 3 sites).

As the data is reviewed, please keep in mind that our November, 2019 sampling was during a rain event. You will see that many of our metrics are high which is typical due to high runoff.

Figure 2 - Buena Vista Creek sampling sites

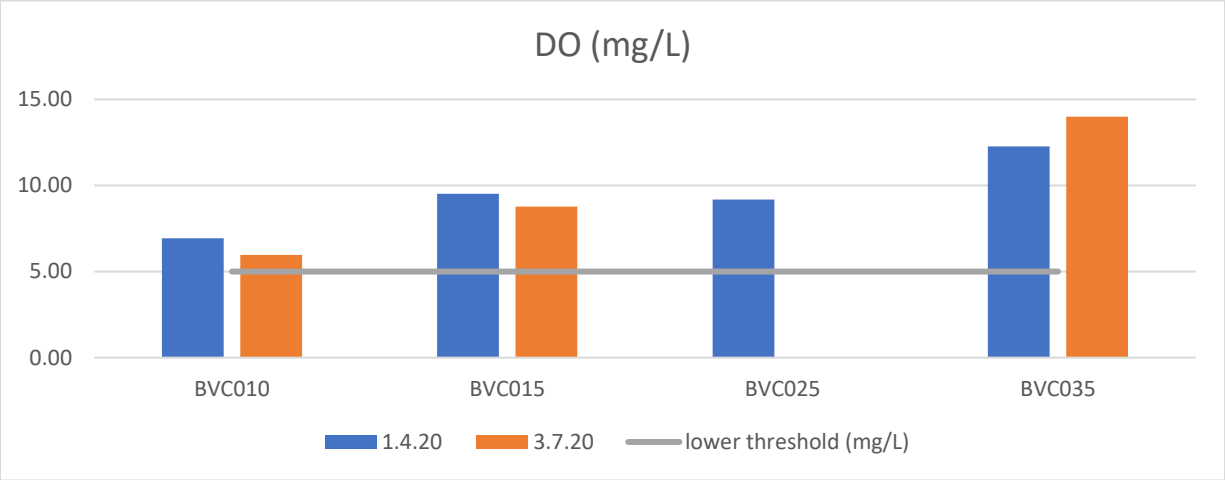


Field Parameters

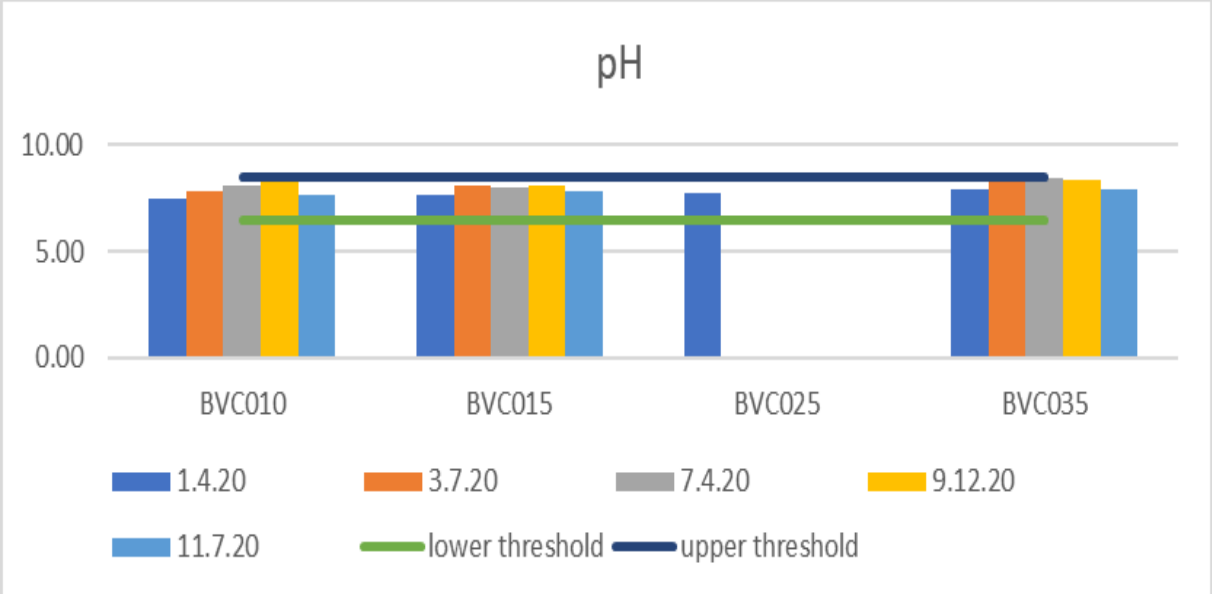
Our field teams of 2-4 trained volunteers visit 3 sites within each watershed where water samples are collected for laboratory analysis and *in situ* measurements made for dissolved oxygen, conductivity and pH. One field sample is filtered for some of the nutrient tests and the other used for bacteria, turbidity, and total phosphorus measurements.

Dissolved oxygen (DO) was consistently above the San Diego Basin Plan[3] threshold of 5.0 mg/L, generally ranging above 6.0 and below 14.0 mg/L at all 3 sites. These levels represent a healthy amount of oxygen in the water for aquatic animals. Because we limited our time in the field due to COVID restrictions, no DO measurements were taken after March. Also, note that the BVC025 site was dropped from testing after January as noted above.

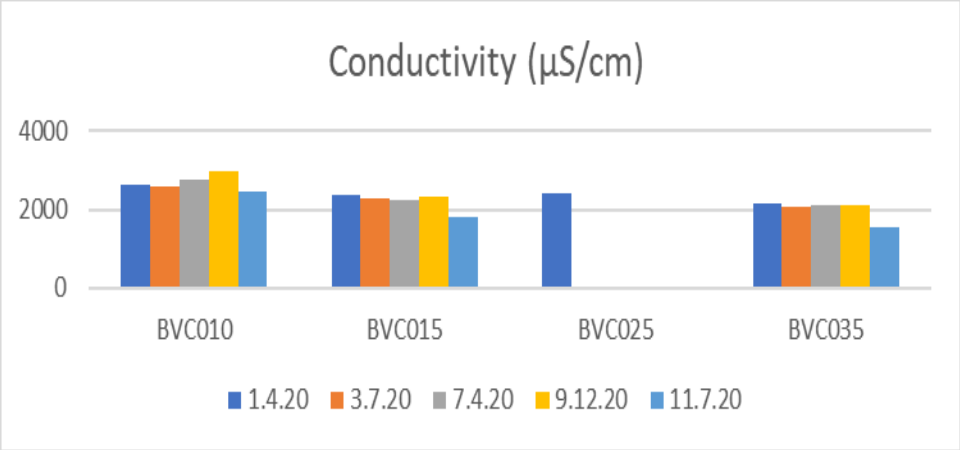
Although sample water was returned to the lab, we chose not to measure dissolved oxygen because it is dependent upon aeration of the water *in situ* as well as photosynthesis.



After January, the pH was measured in the lab. It continued to be within acceptable limits.



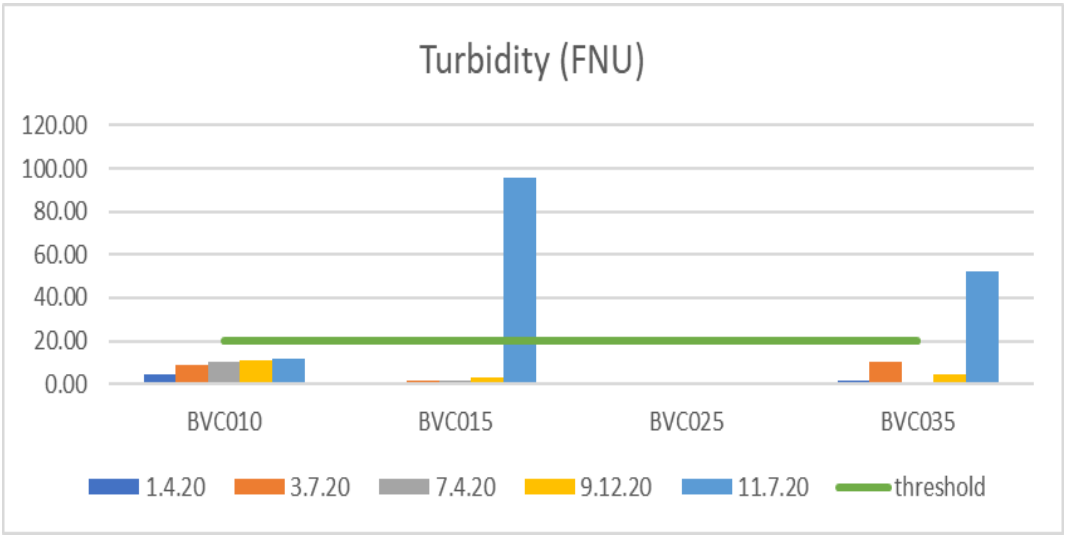
Conductivity fluctuated between 1500 and 3000 µS/cm. This compares with historic data for this parameter. There is no threshold for conductivity, it merely reflects the amount of dissolved minerals in the water.



Laboratory tests

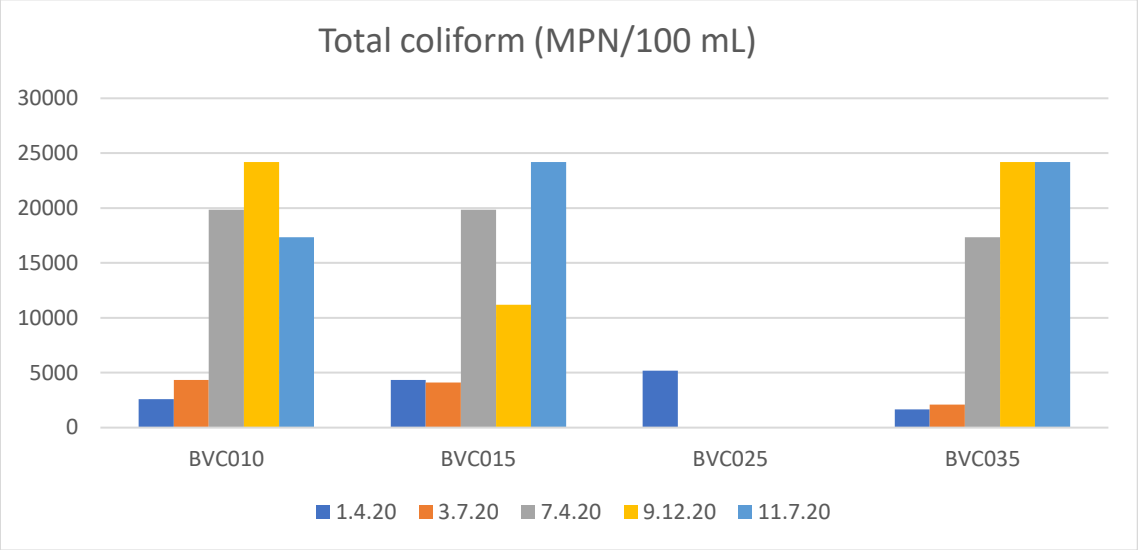
Turbidity (cloudiness), total coliform, *E. coli*, nitrates, total phosphorus, reactive phosphorus and ammonia are measured in the lab using 'grabbed' samples transported from the field. Trained volunteers then process the samples: unfiltered samples are used for total coliform and *E. coli* as well as turbidity and total phosphorus. The remaining filtered sample is used for reactive phosphorus, nitrate, and ammonia.

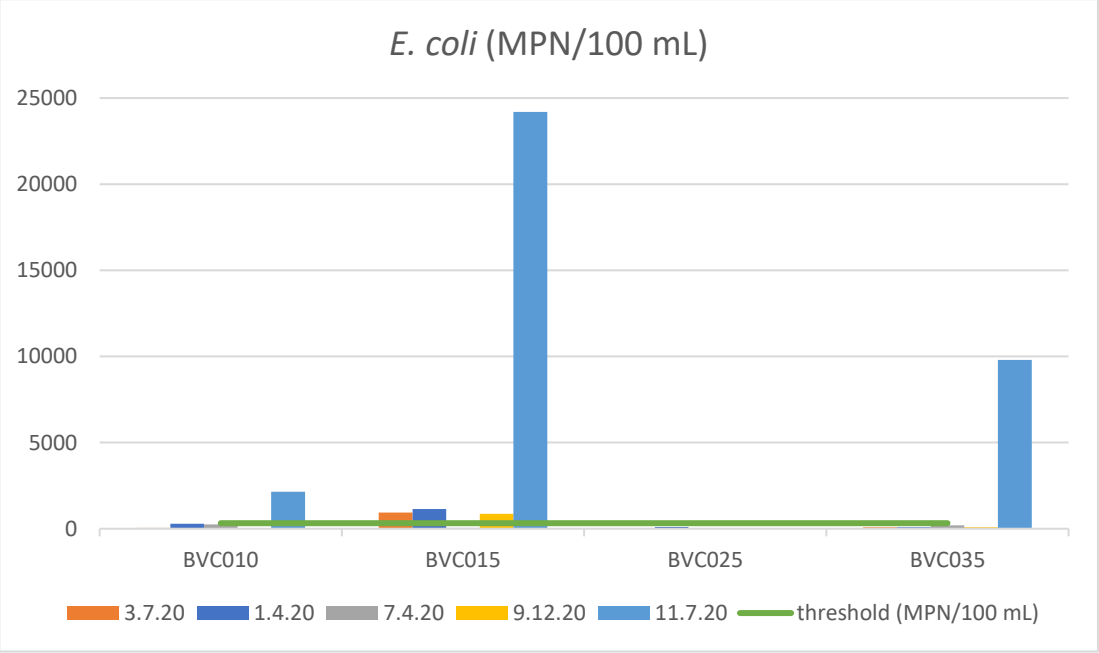
High turbidity can hinder light penetrating water which may affect photosynthesis. The threshold is 20 FNU. For our sites, the turbidity was within an acceptable range except for November which was a rain event and many of our measurements were high. Excess runoff often carries with it additional sediment which will make the water more cloudy.



Coliforms are a group of bacteria found in the digestive tracts of animals, including humans and their wastes. They are also found in plant and soil material. They may or may not indicate

pathogenic bacteria. There is no threshold for these bacteria due to the wide types of sources. *E. coli*, however, is much more indicative of potential concern as many strains are pathogenic. The test we run, using IDEXX Quanti-tray/Colilert, measures all *E. coli*, pathogenic or not. The threshold for this bacterium is 320 MPN/100 mL[3]. During the November rain event you can see that all sites were well above threshold, some alarmingly so. Sites BVC010 (lagoon input) and the furthest upstream site, BVC035, are otherwise fairly clean. Near the driving range at BVC015, however, we saw consistently high *E. coli* levels except July when runoff is typically at its lowest. The city of Carlsbad has been notified of this anomaly and has not yet found any source for the contamination. The good news is that *E. coli* levels have dropped significantly at the head of the lagoon.

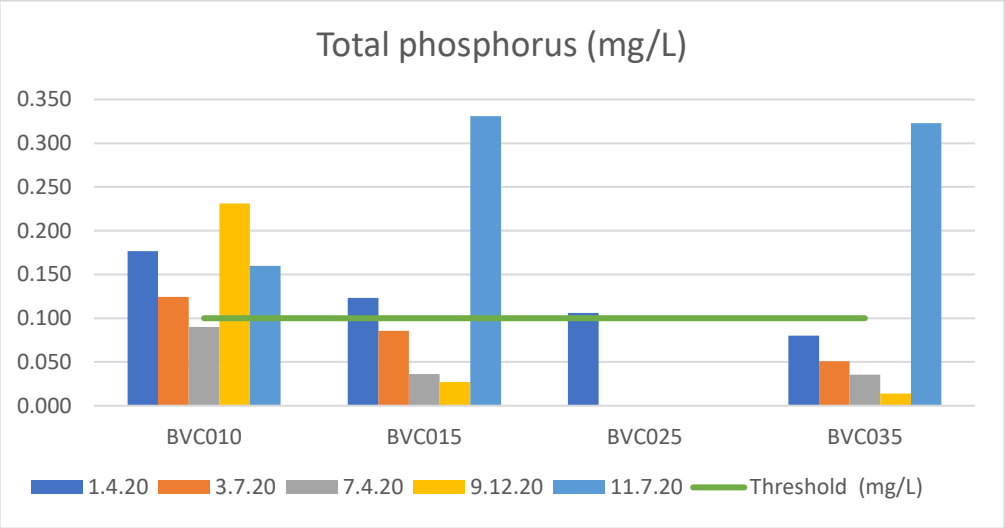




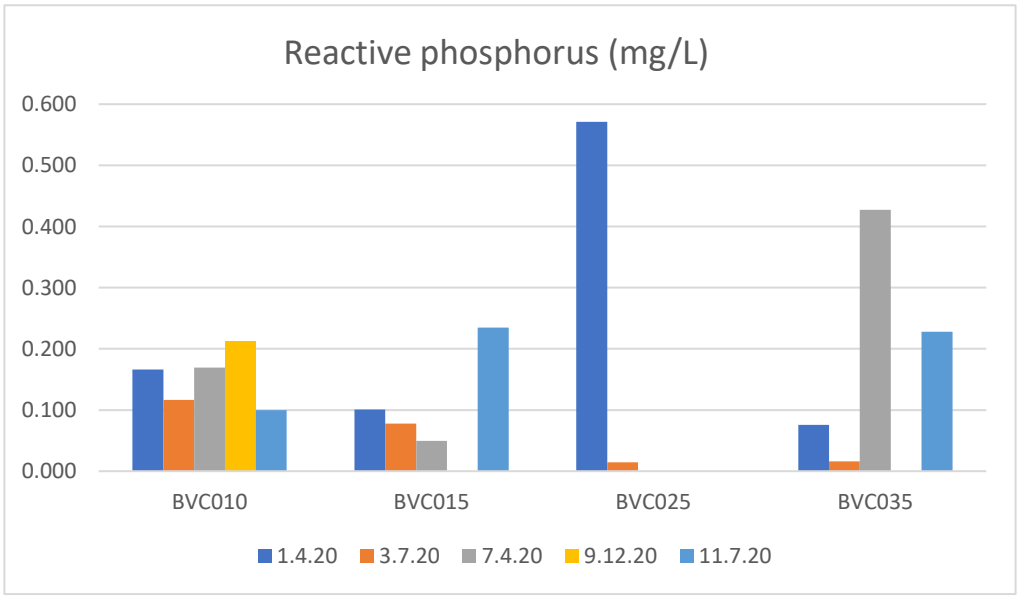
[3]https://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/docs/R9_Basin_Plan.pdf and discussion with technical advisor, Chad Loften 4/22/21.

Phosphorus measurements are two-fold. We measure total phosphorus which includes the reactive phosphorus – that compound available to organisms to use. The total phosphorus also includes any other forms of phosphorus which is tied up and not readily available for organisms.

Elevated phosphorus is often the result of fertilizer runoff and can lead to algal blooms. The threshold for San Diego watersheds is 0.1 mg/L[3]. BVC010 at the east end of the lagoon and not tested in 2019 was usually over threshold. You can see the highest levels at BVC015 and BVC035 during the November rain event. BVC025 was not measured for phosphorus after January.



Reactive phosphorus should be less than the total phosphorus but as you can see between these two graphs, that is not always the case. (e.g., BVC025). Our technical advisor suggests that the 'matrix' (the components in the water sample) may be affecting the results, especially when conductivity is greater than 2000 µS/cm. During 2021, we will be addressing this anomaly. For further reading see this link.



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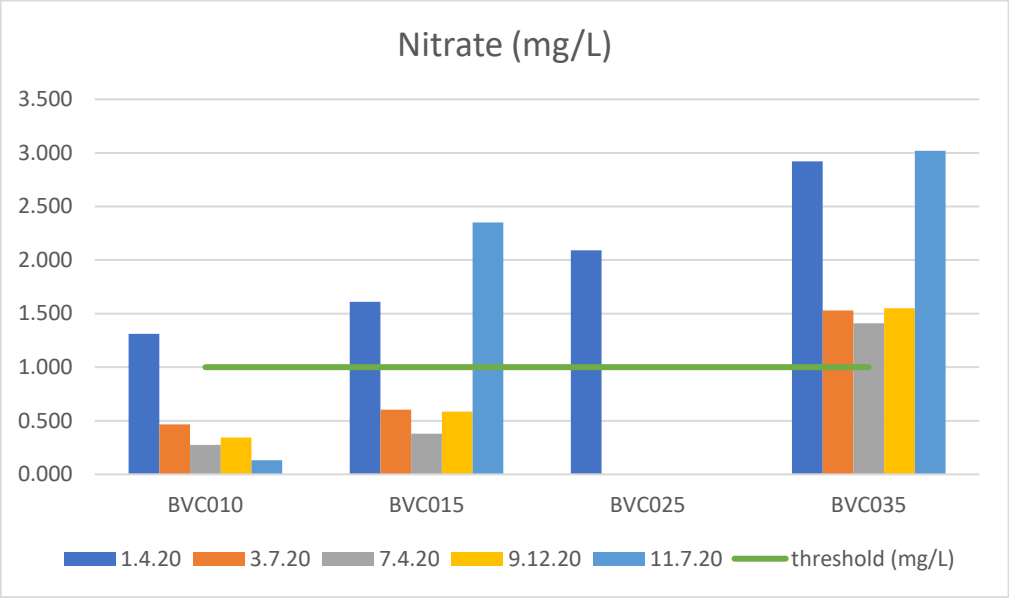
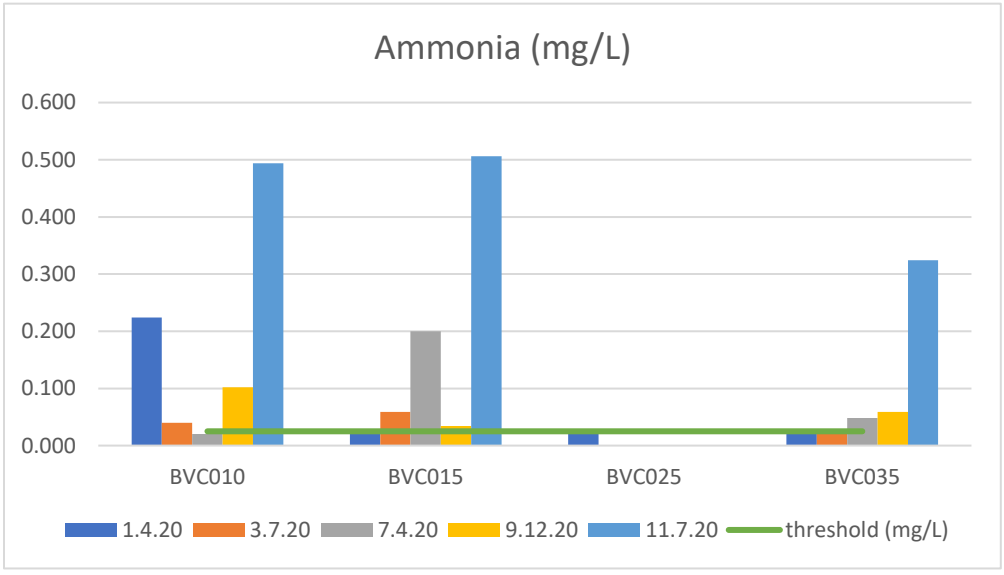
Nitrates, too, generally come from fertilizer runoff. January showed consistently high results for all sites and the most upstream site (BVC035) was always above threshold. BVC025 was not measured for nitrates after January



Lastly, ammonia[4], whose threshold was 0.025 mg/L was often above (significantly) this level. Natural sources of ammonia come from the breakdown of organic wastes, forest fires, animal from runoff and human waste, exchange with the atmosphere and nitrogen fixation. While variable over time and space, the levels of ammonia are of concern with levels sometimes 20 times above threshold.



[4]The Hach methodology for measuring ammonia with their TNT830 kit requires the pH be adjusted in the field to ensure accuracy of the results. To the best of our knowledge SDCK did not follow this step nor have we to date. In 2021 pH will be adjusted in the field for the ammonia test procedures. See https://www.hach.com/asset-get.download-en.jsa?id=7639983749 for detailed procedures.

Analysis by Site

BVC010, closest to Buena Vista Lagoon and sampled from the edge of the cement sides, had reasonable field measurements. The *E. coli* was over threshold only during the single rain event (November). This site had consistently high ammonia and total phosphorus except for July. Nitrates were high only in January when all other nutrients were also over threshold.

BVC015, near the driving range on Haymar and close to El Camino Real, also exhibited normal field metrics. Turbidity was high only during the rainy November event. All nutrients spiked with the rain but were pretty variable during all other sessions. *E. coli* was alarmingly high during the rain event in November and above threshold all other months except for July. Local land managers (Center for Lands Management and San Diego Habitat Conservancy) as well as the city of Carlsbad stormwater manager were notified of these results but could not find homeless encampments nearby nor any other potential sources (T. Murphy, City of Carlsbad via email). That said, it was not uncommon to find evidence of encampments upstream around BVC035.

BVC025 was only sampled in January. During this time all measurements (field and lab) were below or just barely above threshold except for January when nitrates were twice the acceptable level.

BVC035 near the Oceanside DMV, as with the others was within acceptable range for all field tests except for turbidity during the November rain session during which time *E. coli* was exceedingly high. For nutrients, nitrates were consistently above threshold which the other nutrients were more variable. Total phosphorus was only high in November and while slightly high in July and September, this site was >12 times threshold for November.

Final thoughts

It's difficult to explain some of the differences at our testing sites. The NSDCWMP is strictly a monitoring one but one would like to understand the sources of the pollutants we see. Some of the high levels of nutrients and bacteria are likely tied to runoff in the rainy season (see November data).

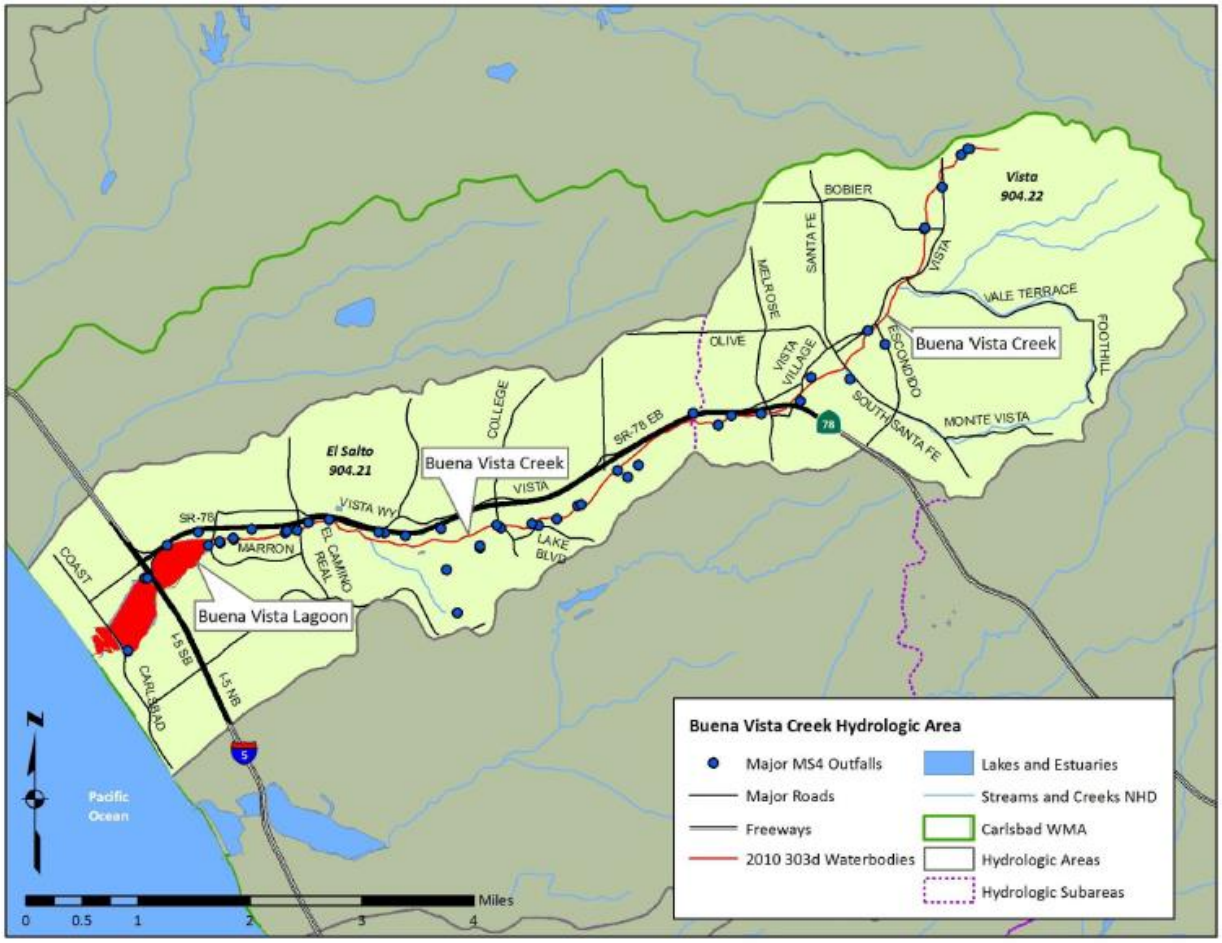
Most of the over-threshold *E. coli* readings were during the sampling session in November and due to the rain and accompanying runoff. BVC015 usually was high and without an obvious source of pollution (see above). Appendix A shows storm drain outfalls along Buena Vista Creek which could possibly be contributing to the *E. coli.* As you may be aware, there is also an aging sewer line that runs near the creek.

As you can see from the MS4 outfall map, the creek and lagoon are on the 303(d) list which indicates impairment from one or more pollutants (e.g., bacteria, sediment, nutrients).

Preserve Calavera will continue to work with SDHC and CNLM as well as city stormwater managers to alert them of metrics of concern, especially *E. coli.*

APPENDIX A

Figure A-2: Buena Vista Creek HA – Major Outfall Information



From WQIP (2018) of Carlsbad Watershed Area, Appendix A, MS4 Outfalls.