

BUENA VISTA CREEK 2021 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 of all our volunteers: the BVC field team (Kathy Parker, Dan Keddy, Michelle Colvin) and lab workers (Karen Merrill, Janell Cannon, Scott Engel, Ellen Bartlett, Brennon Flahive and Karen Wytmans). Our technical advisors are Erick Burres (CA Waterboard), Chad Loftin (San Diego Regional Water Quality Control Board, and Brennon Flahive (retired Environmental Compliance Director at South Orange County Waterwater Authority). Data is posted at www.preservecalavera.org and on the CEDEN website and shared with SDRWCB and the city of Carlsbad, Oceanside and Vista. The program began testing in July 2019.



Figure 1 – Buena Vista Creek Watershed¹

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, May, July, September and November of 2020 with COVID precautions in place.

¹<https://scwrp.org/projects/buena-vista-icreek-watershed-plan/>

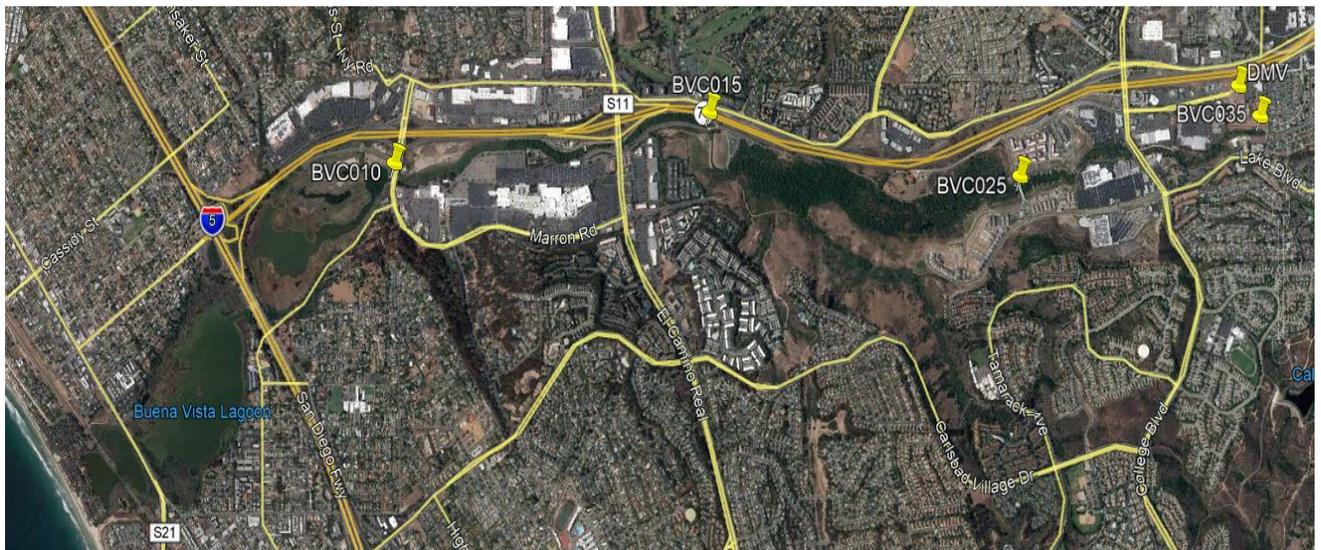
²<https://bvaudubon.org/bv-lagoon-enhancement/>

Sampling Sites

The Buena Vista Creek team sampled the 4 sites along the creek (BVC010, BVC015, BVC025 and BVC035). The site identifications in the map below are the same as those used by SDCK at various times between 2009-2018. Site BVC025 within the Preserve housing development (formerly Quarry Creek) was added to our sampling regimen midyear only for bacteria as we were concerned about periodic spikes in *E. coli* downstream at site BVC015.

There were no high rain events during any of our sampling sessions which might contribute to unusual measurements except some rain during the May session away from the sites but within the watershed. However, there have often been homeless encampments noted near BVC035 and BVC025.

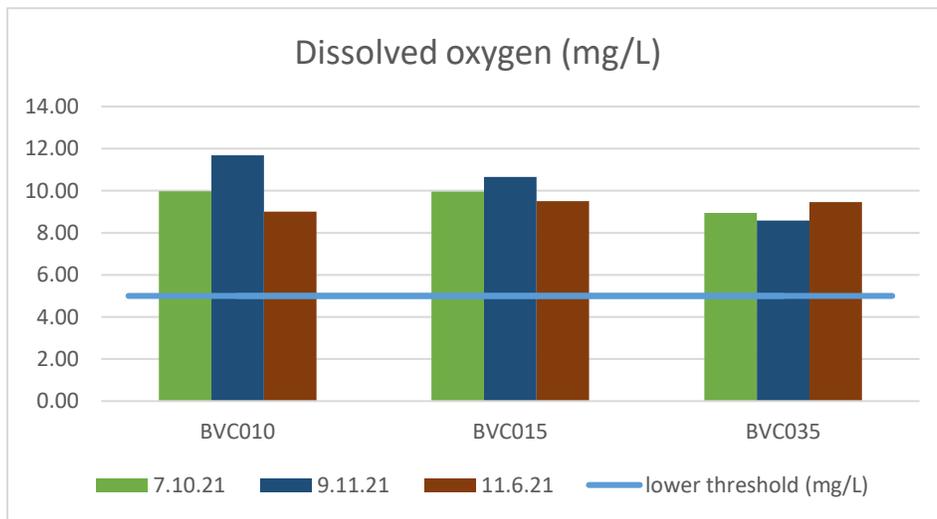
Figure 2 - Buena Vista Creek sampling sites



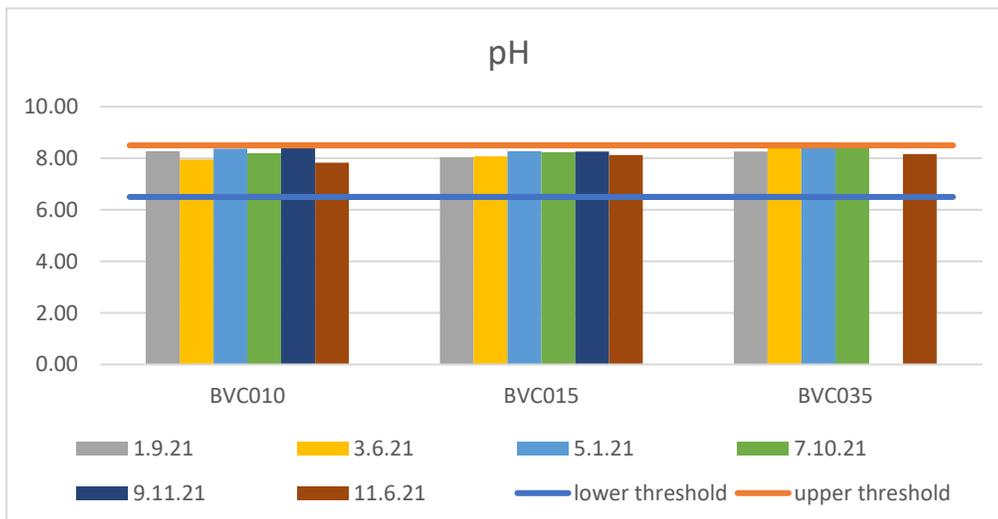
Field Parameters

Our field teams of 2-4 trained volunteers visit our 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 nutrient tests (reactive phosphorus and nitrate) and the other used for bacteria, turbidity, and total phosphorus measurements. Part of the filtered sample is added to a small bottle containing concentrated HCl (to lower the pH to ~2) for the ammonia assay.

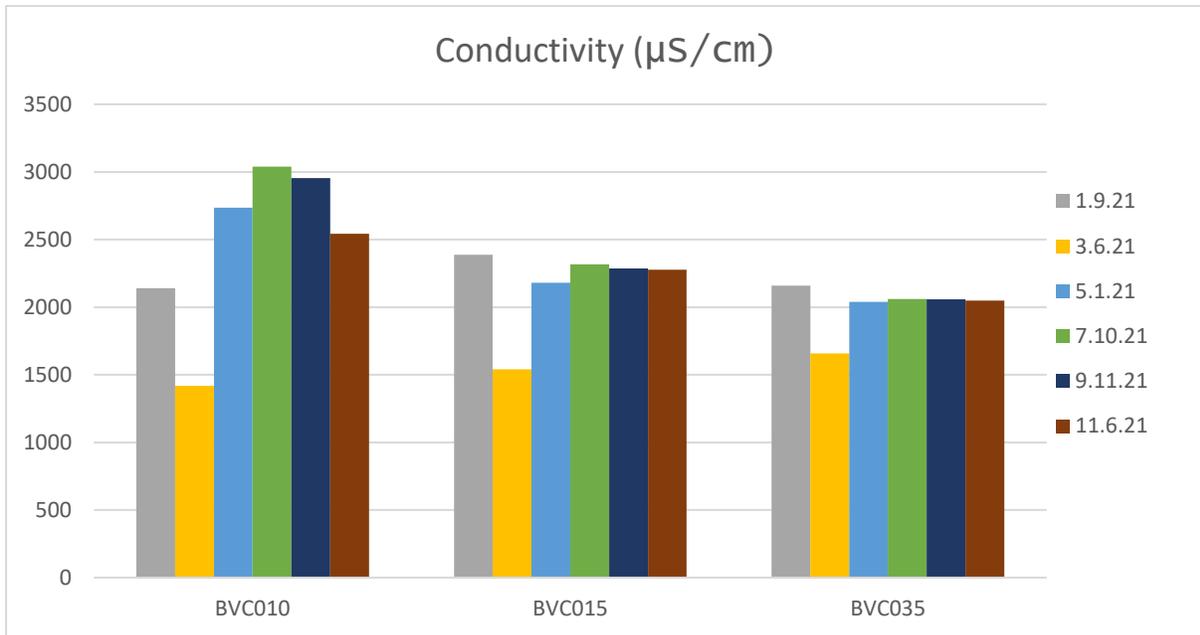
Dissolved oxygen (DO) was consistently above the San Diego Basin Plan[®] threshold of 5.0 mg/L, generally ranging above 6.0 and below 14.0 mg/L at all 3 sites. These levels represent a healthy amount of oxygen in the water for aquatic animals. Because of COVID restrictions rolled over from 2020, dissolved oxygen was not measured until July 2021, hence, the data is only available for the latter half of 2021.



From January through May, the pH was measured in the lab. It continued to be within acceptable limits. Thereafter, with loosened COVID restrictions, we returned to measuring pH in the field. The September measurement for BVC035 was incorrectly recorded and, therefore, not included.



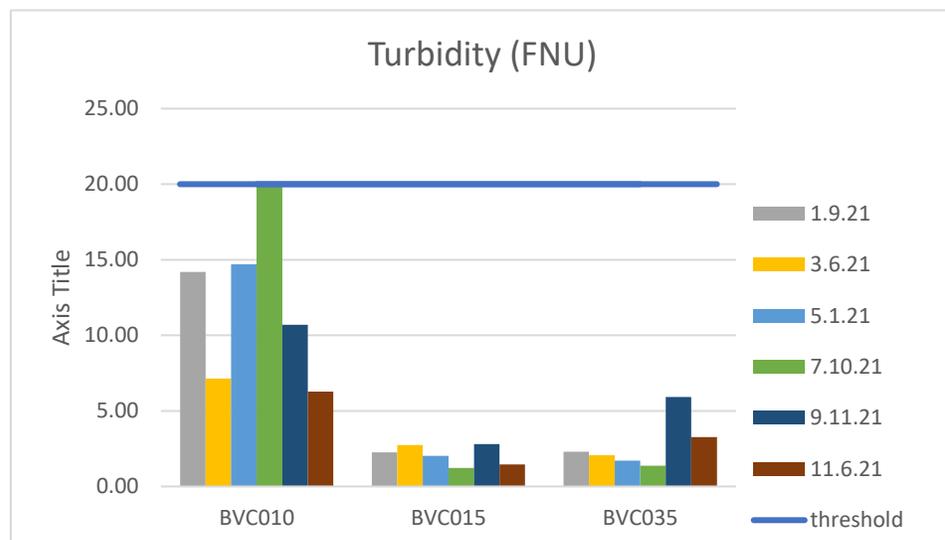
Conductivity fluctuated between about 1500 and 3000 $\mu\text{S}/\text{cm}$. This compares with historic data for this parameter. There is no threshold for conductivity, it merely reflects the amount of dissolved minerals in the water.



Laboratory tests

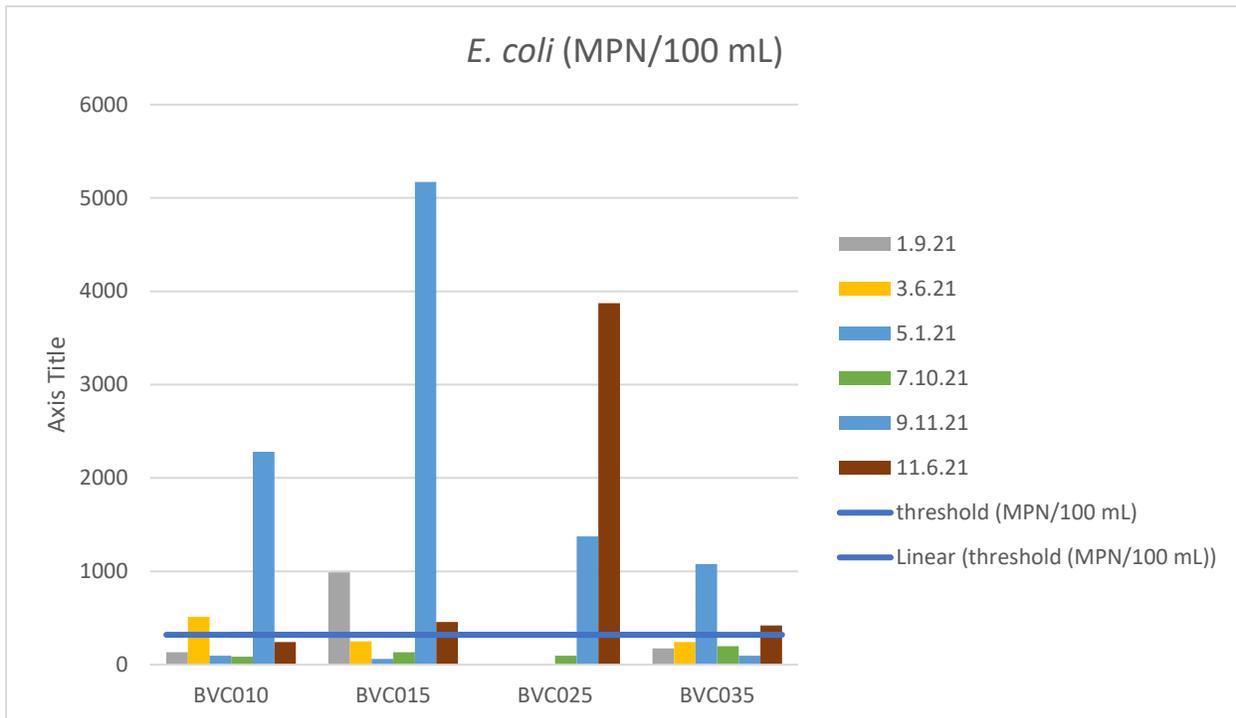
Turbidity (cloudiness), total coliform, *E. coli*, nitrates, total phosphorus, reactive phosphorus and ammonia are measured in the lab using 'grabbed' samples transported from the field. Trained volunteers then process the samples: unfiltered samples are used for total coliform and *E. coli* as well 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 although site BVC010 was consistently higher than the upstream sites..



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 mL³

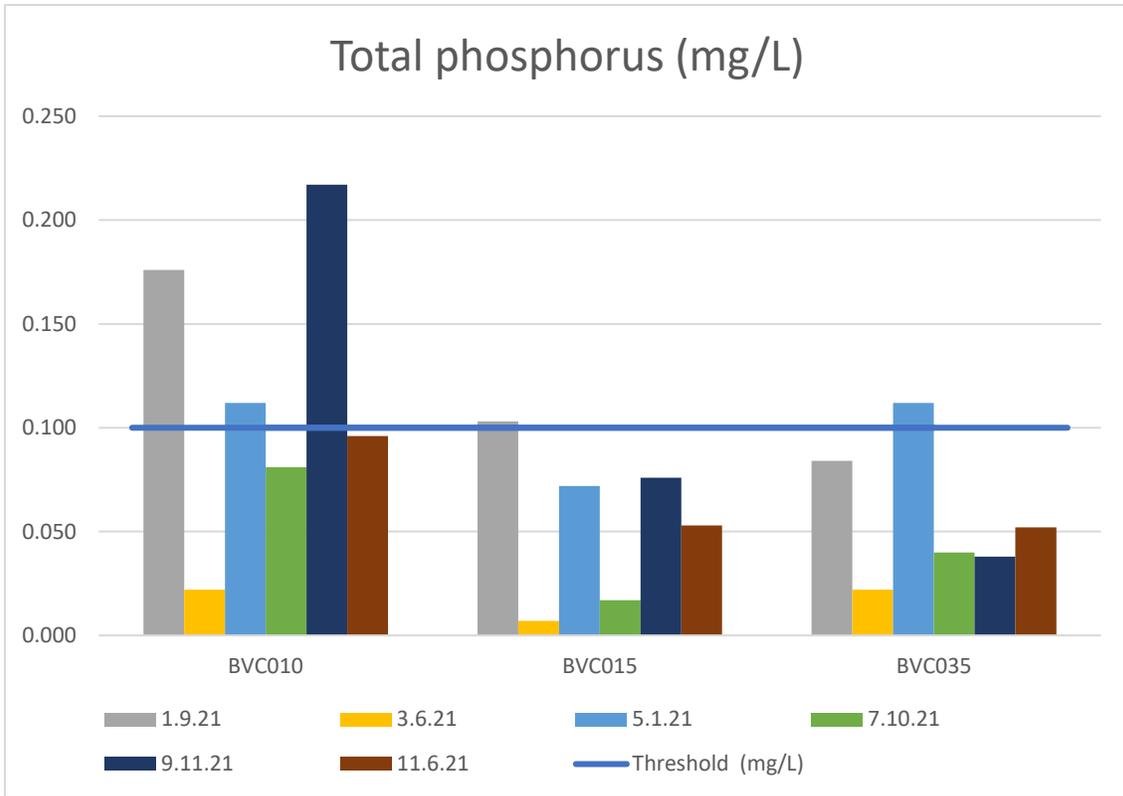
The September event, with light rain in some parts of the watershed, shows high E. coli measurements at 3 of our 4 sites. All sites exhibited an occasional spike above threshold for E. coli even though the other sites remained acceptable. These data were shared with the Carlsbad Stormwater manager and to the best of our knowledge no source was identified although sites BVC035 and BCV025 are within or just downstream of well documented homeless encampments.



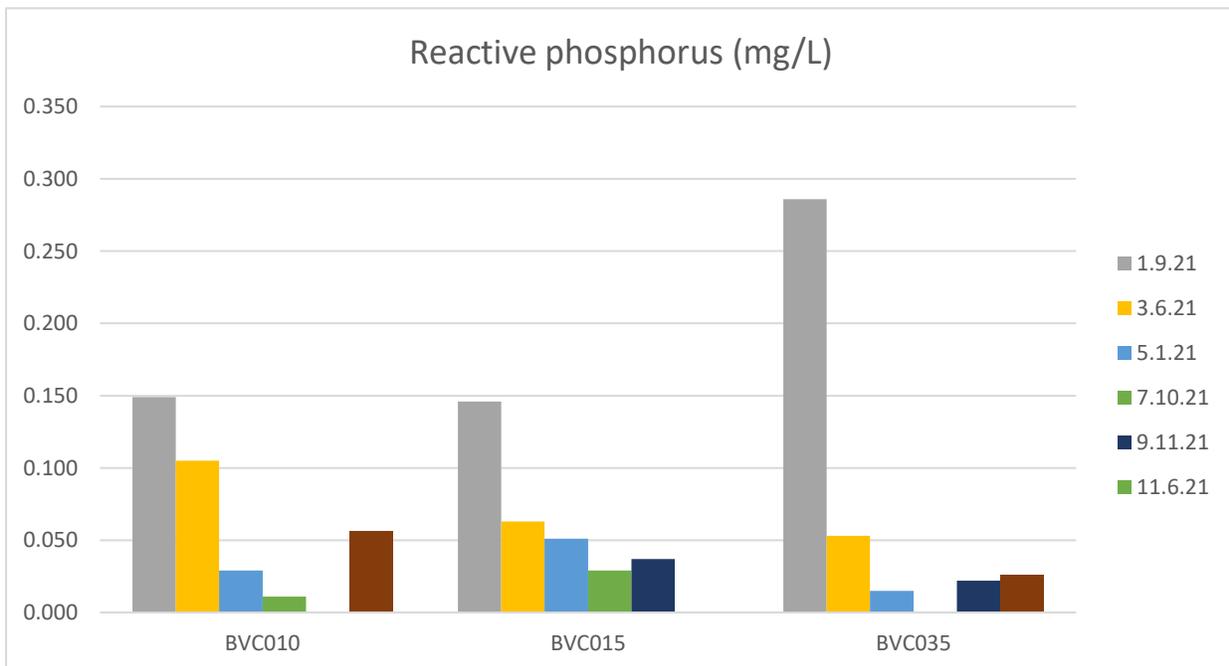
³https://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/docs/R9_Basin_Plan.pdf and discussion with technical advisor, Chad Loftin 4/22/21.

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.

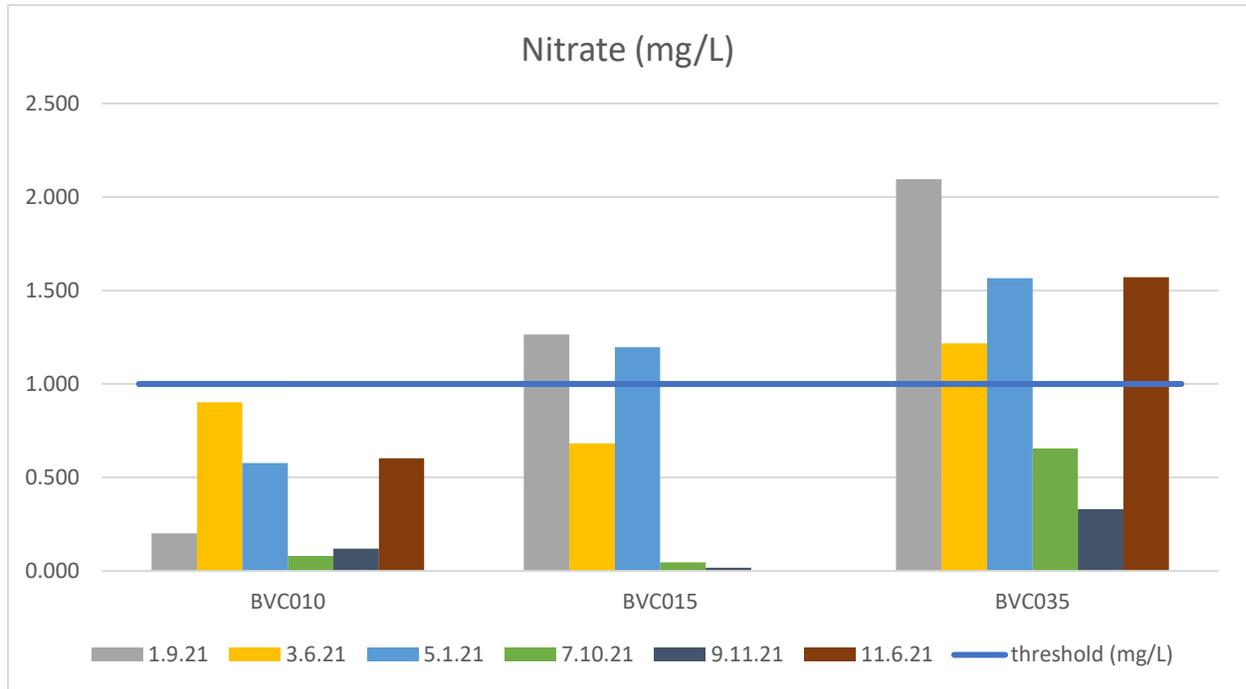
Elevated phosphorus is often the result of fertilizer runoff and can lead to algal blooms. The threshold for San Diego watersheds is 0.1 mg/L³. BVC010 at the east end of the lagoon was frequently over threshold. The other sites were generally acceptable.



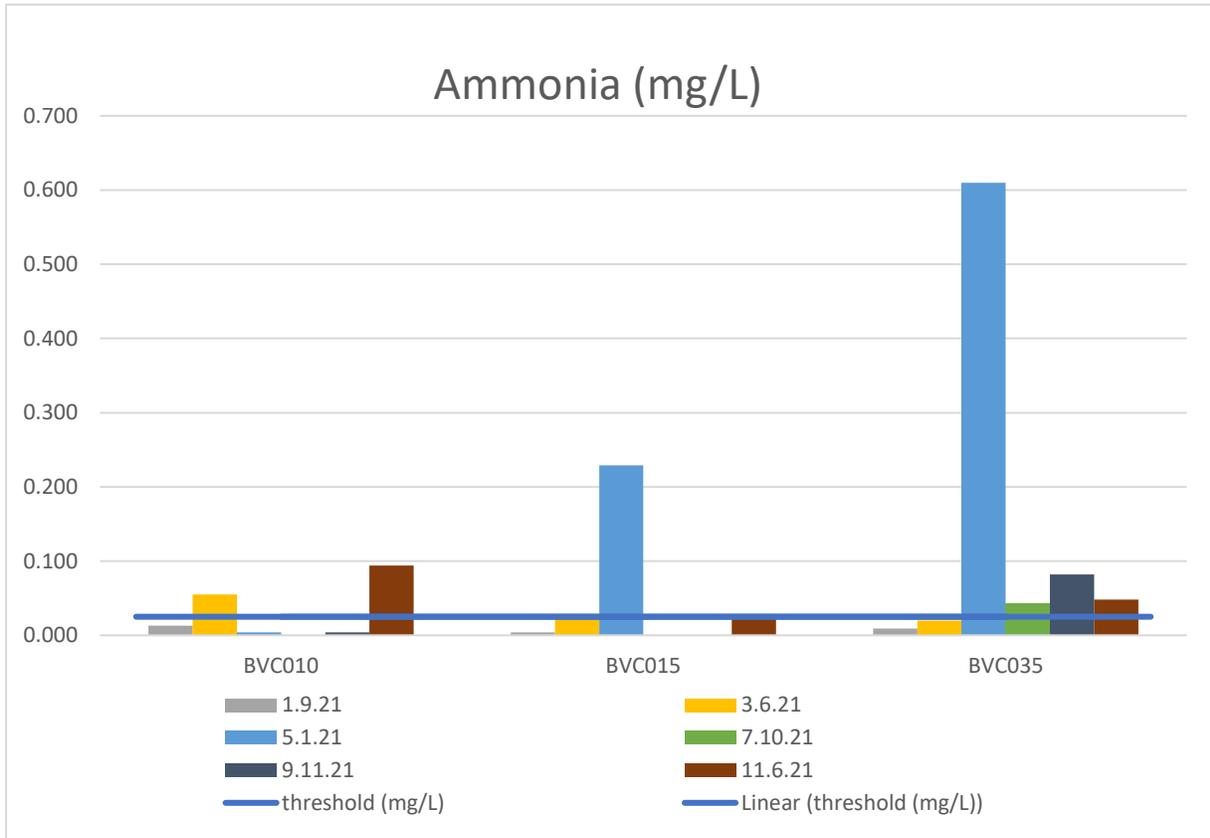
Reactive phosphorus should be less than the total phosphorus but as you can see between these two graphs, that is not always the case. (e.g., BVC025). Our technical advisor suggests that the 'matrix' (the components in the water sample) may be affecting the results, especially when conductivity is greater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



Nitrates, too, generally come from fertilizer runoff. BVC035 was the most likely site to be over threshold with BVC015 being high over the first six months of 2021 and then dropping very low. BVC010, at the head of the lagoon, was consistently below threshold.



Lastly, ammonia⁴, 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. The site, BVC035, furthest upstream was mostly likely to be high. We cannot identify the source of this pollution.



⁴The 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 during March and September (significant). Compared to 2020 the ammonia was looking better (only one above threshold) but total phosphorus continued to be high on half the dates. Nitrates were lower than 2020 with none over threshold.

BVC015, near the driving range on Haymar and close to El Camino Real, also exhibited normal field metrics as well as turbidity. There was some improvement in *E. coli* at this site over 2020 but still a large spike in September, along with two other sites at the same time. Most nutrient readings were acceptable except for the May ammonia levels. Overall nutrient levels were slightly lower than the year before.

BVC025 was only sampled in July-November and then, only for bacteria because of concerns with encampments along that stretch of the creek. Two of the three *E. coli* levels were well above the local threshold but no source was identified.

BVC035 near the Oceanside DMV, was within acceptable range for all field tests. For nutrients, while often above the acceptable levels, were better than 2020. *E. coli* spiked in May as did all the other sites.

Final thoughts

We often can't pinpoint the pollution sources responsible for our data.. The NSDCWMP is strictly a monitoring one but one would like to understand these sources. Some of the high levels of nutrients and bacteria are likely tied to runoff in the rainy season, even with low precipitation (see September). Overall, nutrient measurements showed an improvement over 2020.

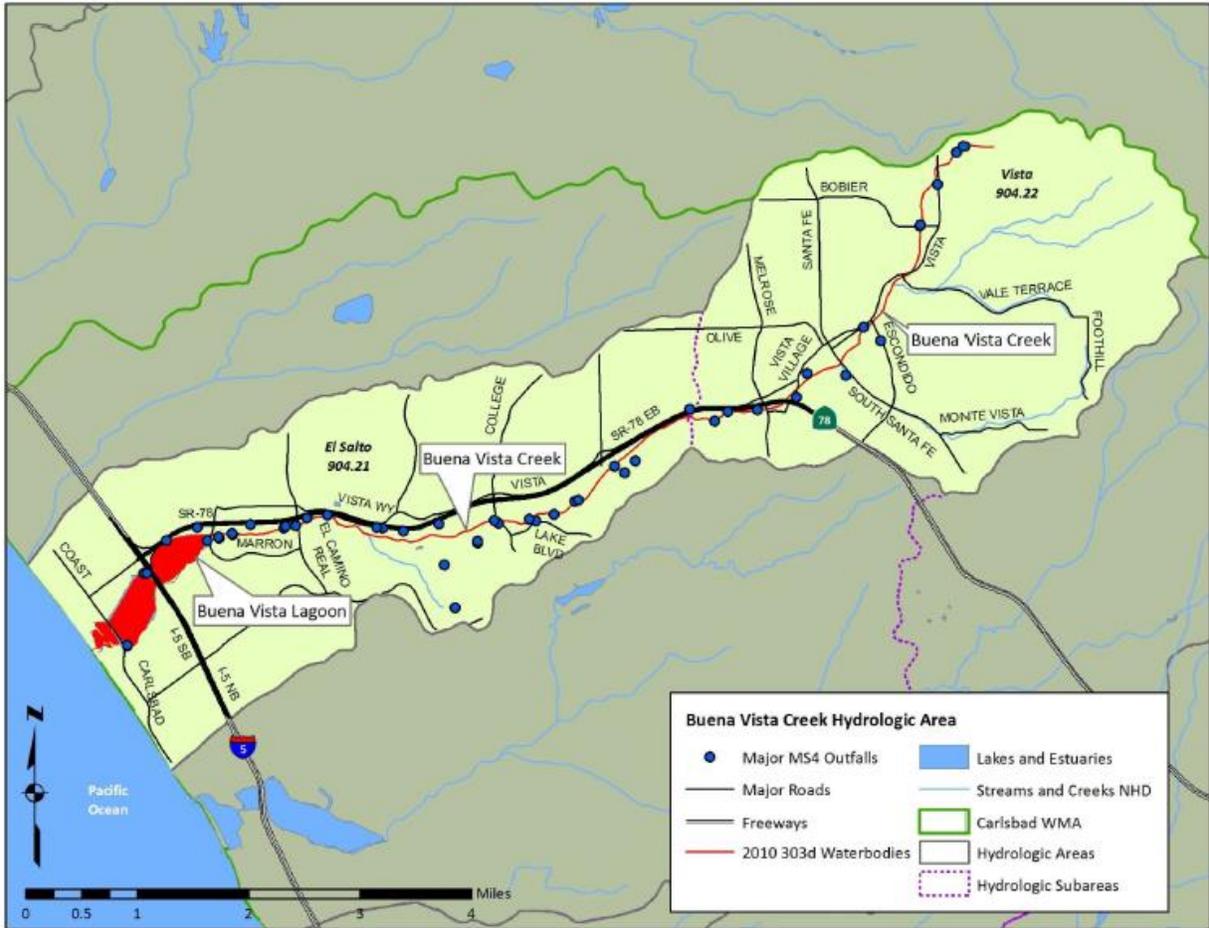
We continue to see spikes in *E. coli* and do contact the stormwater managers as needed. In May, all sites were over threshold for unknown reasons. We will continue to notify stormwater managers and land managers as needed.

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*. We have expanded our cleanup and monitoring efforts at/near El Salto Falls (BVC025) in conjunction with SDHC and hope to receive funding for more monitoring in the near future.

APPENDIX A

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



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

APPENDIX B – Sample site photos

BVC010

Under Jefferson St bridge looking west.



Typical trash at BVC010 site:



Rather tenuous collection site topography:



BVC015 – near Haymar driving range. Very typical photo.



BVC025 – Under El Salto Falls Rd bridge (no photos available)

BVC035 – On Thunder Dr, near Oceanside DMV

