Morro Bay Watershed Creek Health
For Water Year 2020

Date Range: October 1, 2019 to September 30, 2020
Analytes: Water temperature, nitrates as nitrogen, orthophosphates as phosphorus

Background

The Morro Bay National Estuary Program's Monitoring Program conducts monitoring in the Morro Bay estuary and watershed to track ambient water quality trends and to assess the impacts of specific implementation projects.

Monitoring data is collected by Estuary Program staff and volunteers, under the guidance of a Quality Assurance Project Plan (QAPP) which is reviewed and approved by EPA and the State Water Resources Control Board. This QAPP document contains the monitoring locations, protocols, equipment specifications, and other details that allow users to assess the quality of the collected data. The full QAPP document is available upon request.

Water Temperature

The Estuary Program wanted to be able to assess how often local creeks had water quality conditions that were supportive of sensitive wildlife such as steelhead during water year 2020 (WY2020).

Equipment Specification: The Estuary Program deploys HOBO TidbiT MX 2203 Temperature 400' Data Loggers at monitoring sites throughout the watershed. These units monitor the daily fluctuations and seasonal trends of water temperature in Morro Bay watershed creeks. The loggers were deployed in streams from spring through summer with readings collected every 30 minutes. Some units remained deployed year round, while some were retrieved prior to large winter storm events and then redeployed in the spring when flows subsided.

Equipment Specifications:

Specifications for the TidbiT temperature loggers are as follows:

Specification	Value
Measurement/Operating Range	-20° to 70°C in air -20° to 50°C in water
Accuracy	±0.25°C from -20° to 0°C ±0.2°C from 0° to 70°C
Resolution	0.01°C

While the TidbiT temperature loggers do not require calibration, an independent measurement was collected from a second meter at time of deployment for comparison. Periodically throughout the deployment, temperature was measured with a second meter to compare with the TidbiT temperature for quality assurance.

Due to equipment malfunctions, the Estuary Program was not able to deploy continuous dissolved oxygen loggers during WY2020. Research is underway to replace the equipment.

Water Temperature Monitoring Locations:

The Estuary Program collected continuous temperature data at six sites throughout the Morro Bay watershed during WY2020, all within the Chorro Creek subwatershed (Figure 1).

Three of the six monitoring sites were chosen along the mainstem of Chorro Creek since it is known to support steelhead trout, a sensitive species of concern. Historic data has also shown elevated temperatures along Chorro Creek. The remaining sites were chosen along tributaries to Chorro Creek: Pennington Creek, San Luisito Creek, and Dairy Creek. These tributaries have historically provided spawning ground for steelhead.

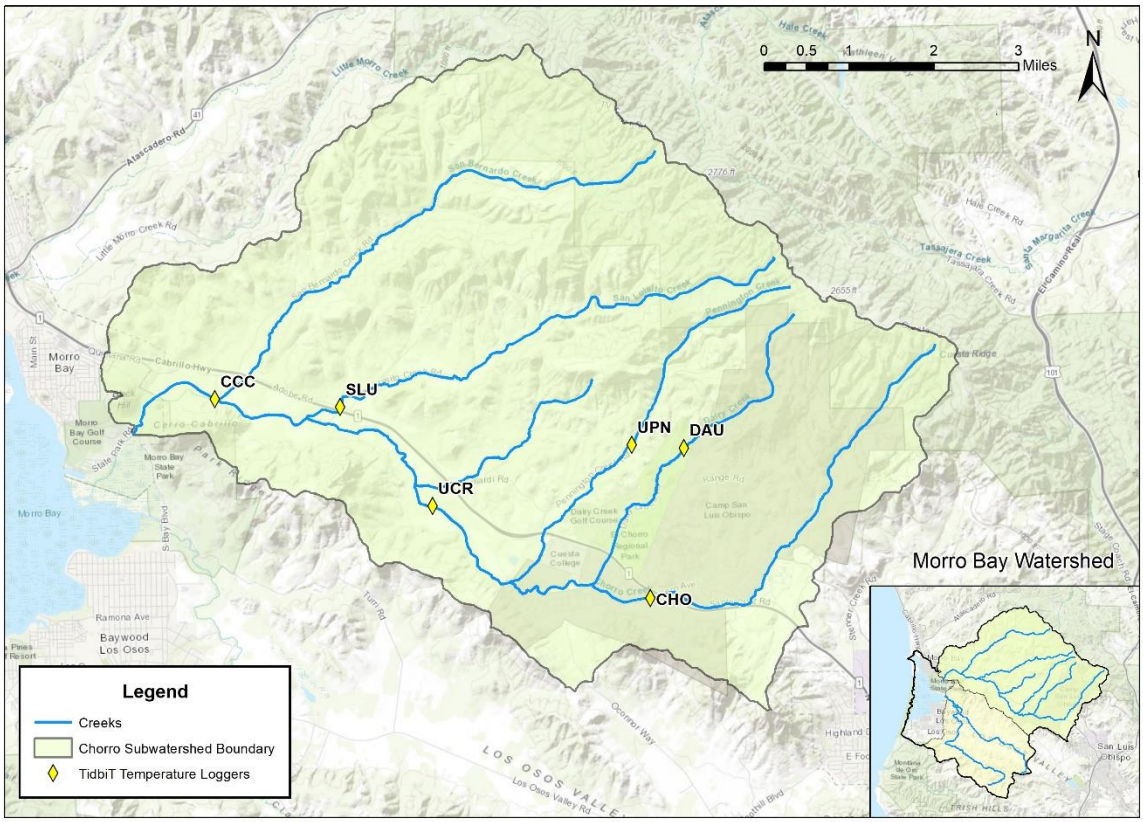

Figure 1: Continuous temperature monitoring sites in the Chorro Creek subwatershed during WY2020.

Results:

Continuous temperature data is of value because it shows the time of day and duration of elevated temperatures. Temperature values from continuous loggers were compared to an 18°C threshold, a level selected to be protective of sensitive aquatic species, including Central California Coast Steelhead. The optimal temperature range for steelhead is between 13 and 21°C (Moyle 2002).

The following datasets show water temperature data collected at 30-minute intervals throughout WY2020, compared to this 18°C threshold. Note that data could not always be collected throughout the entire water year, and the actual deployment dates of the loggers vary by site. Most loggers were deployed at the beginning of WY2020, retrieved before the large winter flows, and re-deployed in the spring (Appendix A provides deployment dates). Temperatures are analyzed throughout the water year and on a seasonal basis. Dates used to define the WY2020 seasons can be found in Appendix B.

Chorro Creek

Water temperature data was collected at three sites along Chorro Creek:

- The uppermost monitoring site is located at Camp San Luis Obispo (site code CHO) at the Highway 1 bridge.
- The middle Chorro Creek site is downstream of the California Men's Colony Wastewater Treatment Plant (CMC WWTP) and just upstream of the Chorro Creek Ecological Reserve. The site is referred to as Upper Chorro Reserve (site code UCR).
- The furthest downstream monitoring site is at Chorro Creek Road (site code CCC) near the bottom of Chorro Creek, just upstream of Chorro Flats. It is above the zone of tidal influence from the bay.

The following graphs show water temperatures at CHO, UCR, and CCC mainstem sites. The first graph for each site illustrates water temperatures for the entire water year and the following graphs show seasonal water temperatures for each site. The blue line indicates water temperature in degrees Celsius (°C) recorded at 30-minute intervals, and the red line indicates the 18°C threshold protective of steelhead and other sensitive species.

Camp San Luis Obispo (CHO)

The following graphs (Figures 2 to 5) show water temperatures at Chorro Creek near Camp San Luis Obispo (CHO). The temperature logger at CHO was deployed from the start of WY2020 (October 1, 2019) until December 5, 2019. Due to equipment failure, winter seasonal data is not available. The following datasets include readings from May 3, 2020 until the end of WY2020 (September 30, 2020).

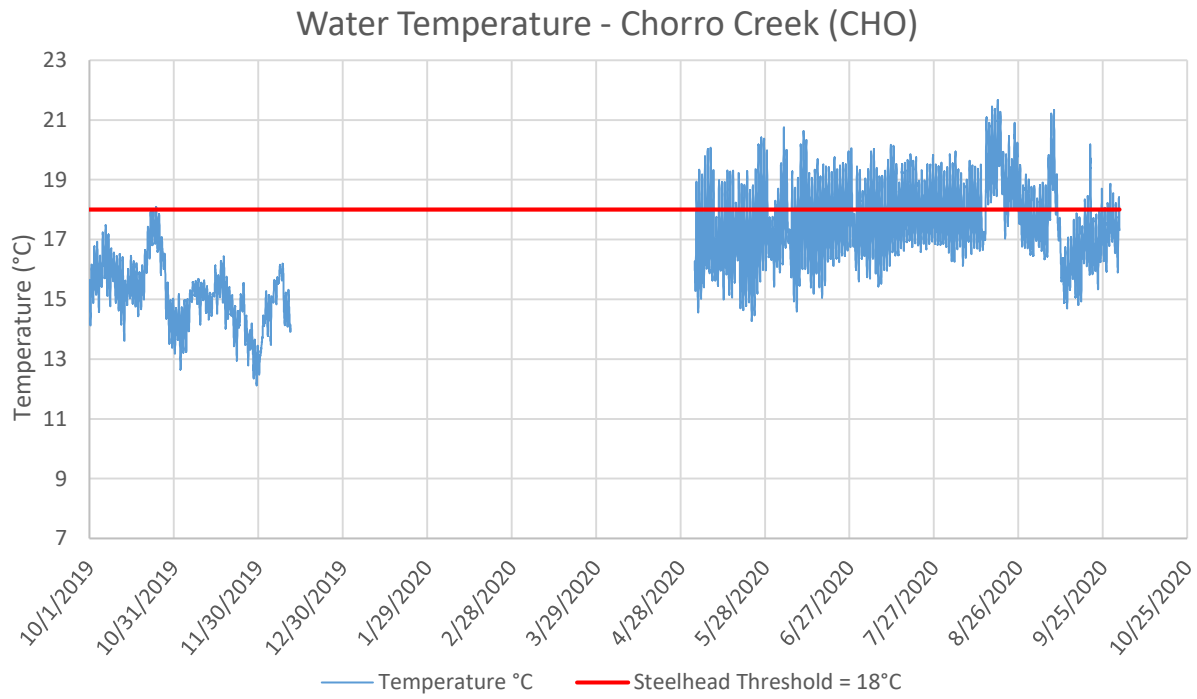

Figure 2. Water temperature at Chorro Creek (CHO) during WY2020. Data was not available from December 5, 2019 to May 3, 2020.

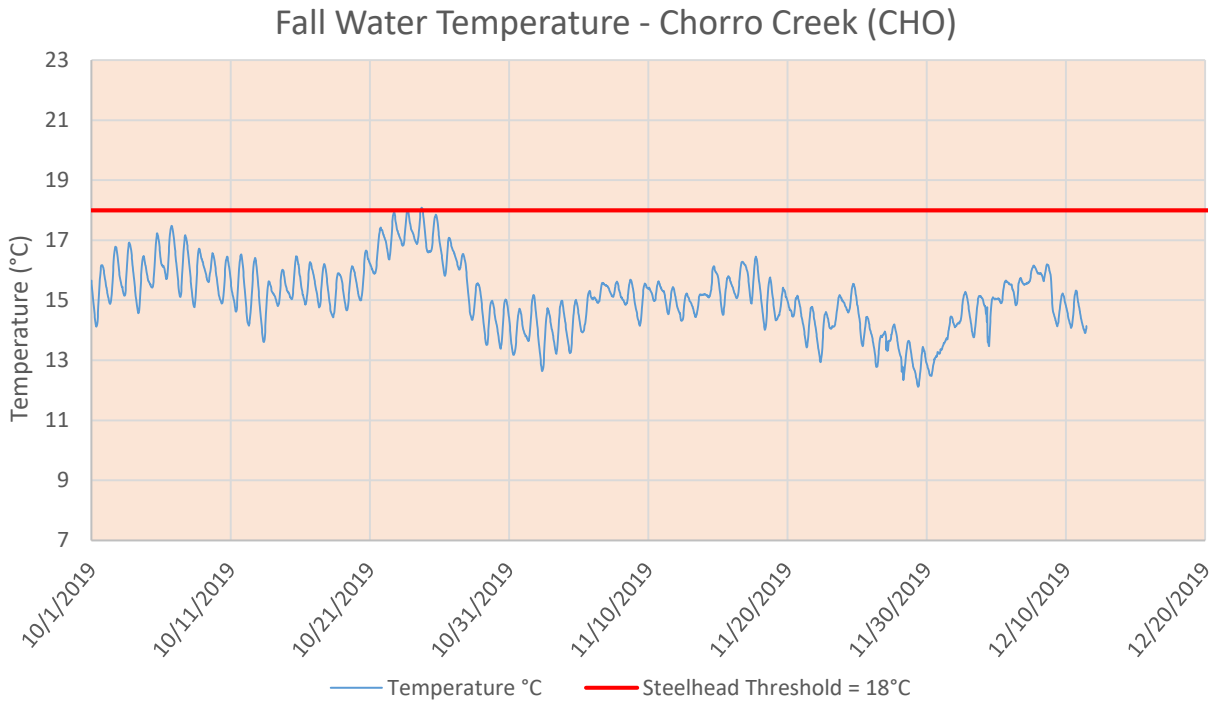

Figure 3. Water temperature at Chorro Creek (CHO) during Fall of WY2020.

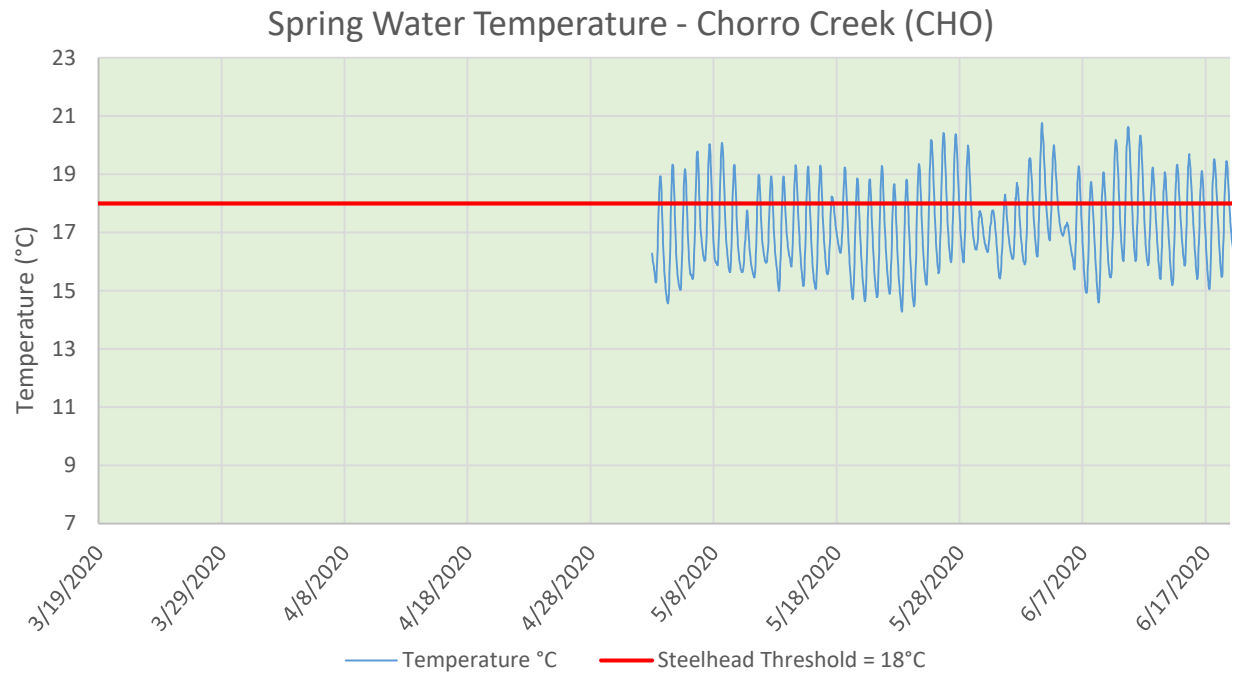

Figure 4. Water temperature at Chorro Creek (CHO) during Spring of WY2020. This dataset began May 3, 2020.

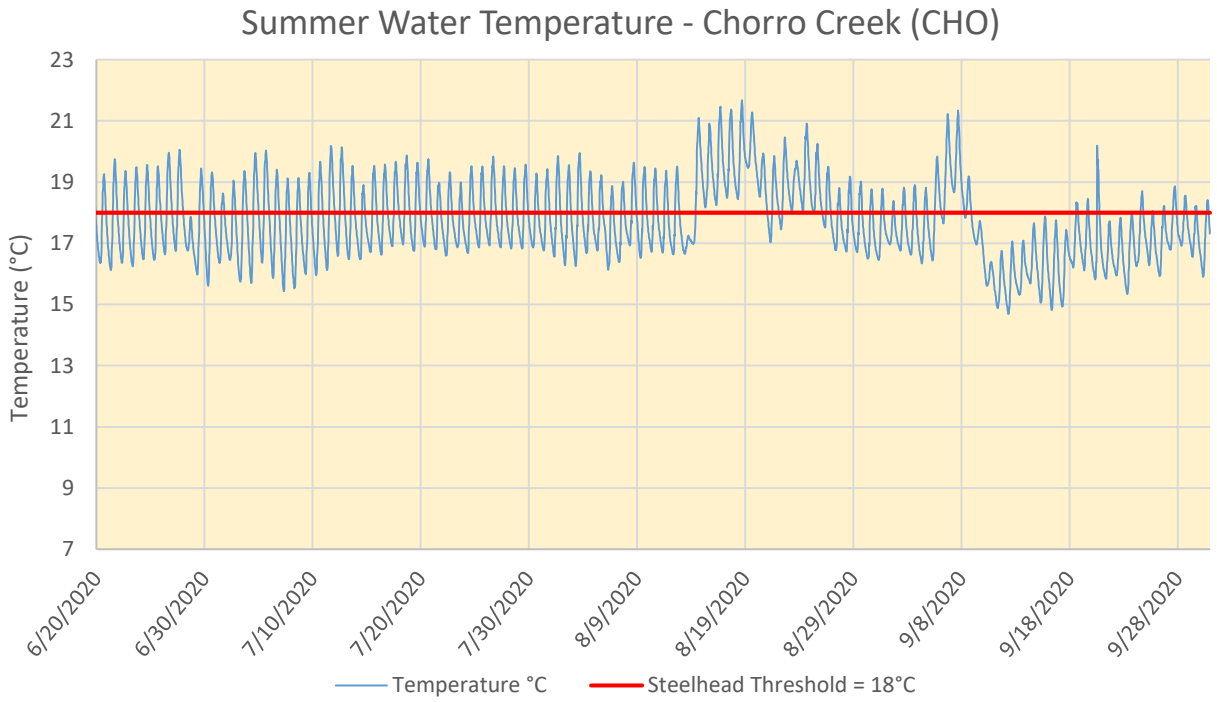

Figure 5. Water temperature at Chorro Creek (CHO) during Summer of WY2020.

Upper Chorro Reserve (UCR)

The following graphs (Figures 6 to 9) show water temperatures at Chorro Creek upstream of the Chorro Creek Ecological Reserve (UCR). The temperature logger at UCR was deployed from the start of WY2020 until December 11, 2019 then redeployed from March 25, 2020 until the end of WY2020. Winter seasonal data is not available.

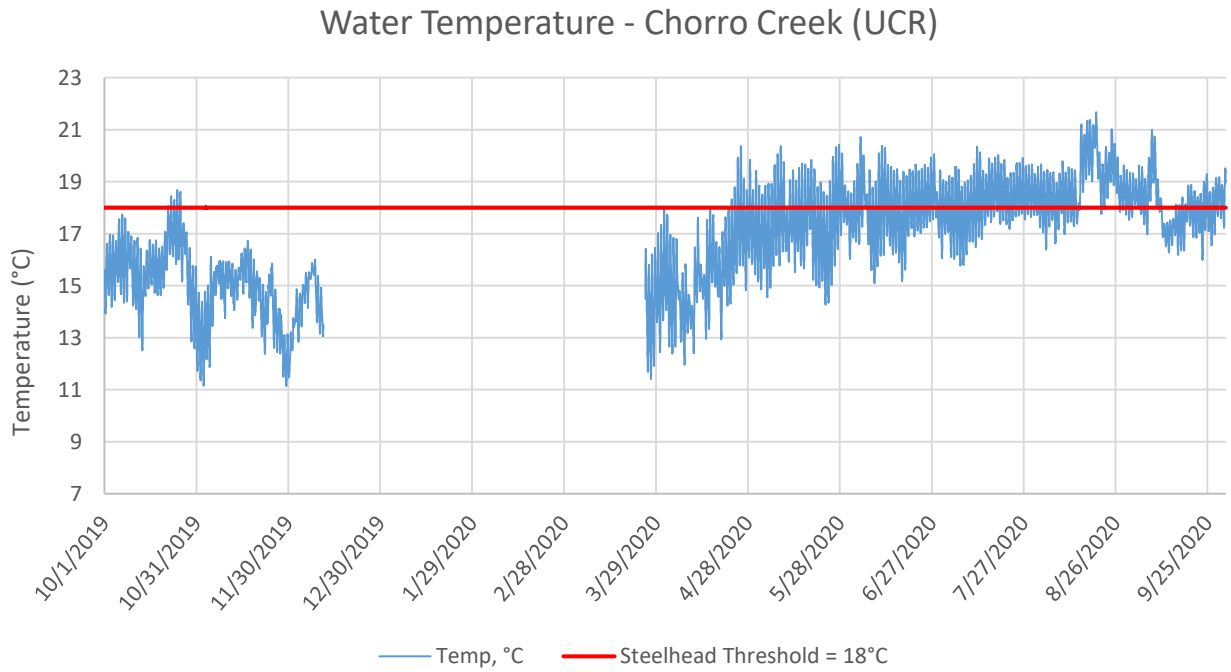

Figure 6. Water temperature at Chorro Creek (UCR) during WY2020. Data was not available from December 11, 2019 to March 25, 2020.

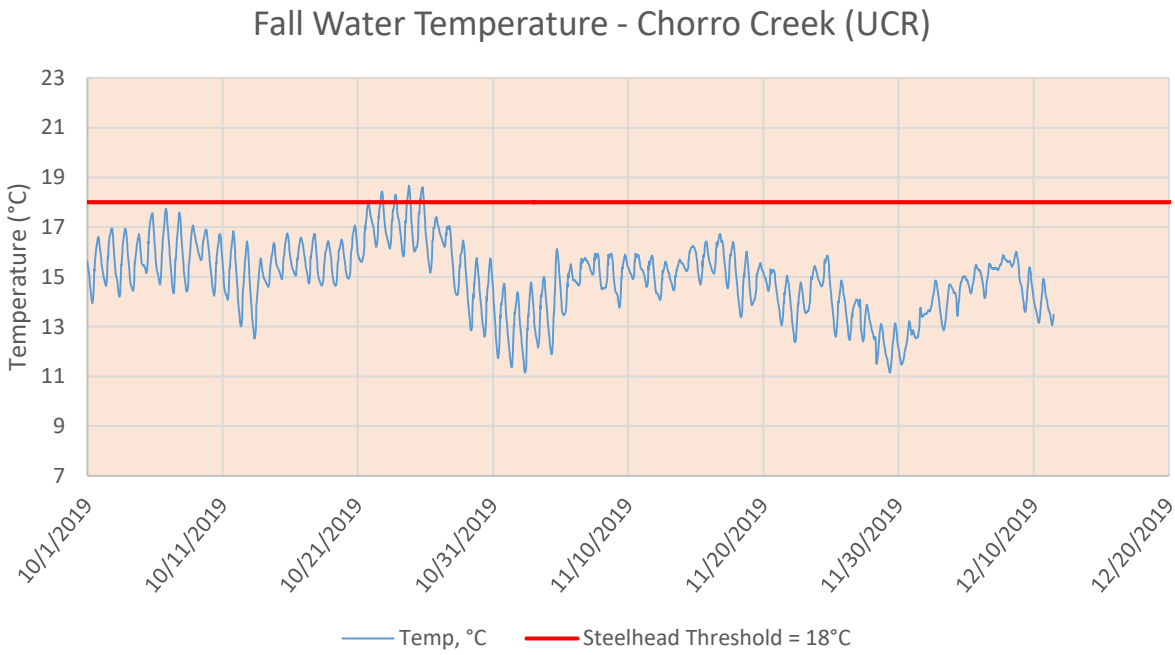

Figure 7. Water temperature at Chorro Creek (UCR) during Fall of WY2020. This dataset ended December 11, 2019.

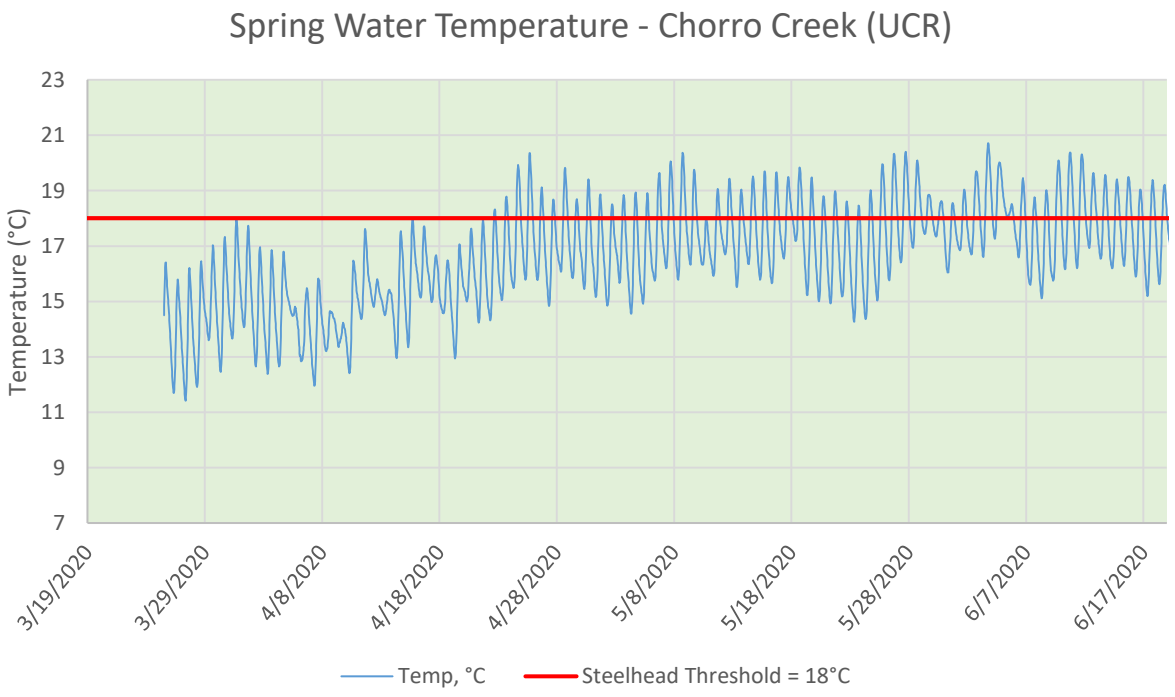

Figure 8. Water temperature at Chorro Creek (UCR) during Spring of WY2020. This dataset began March 25, 2020.

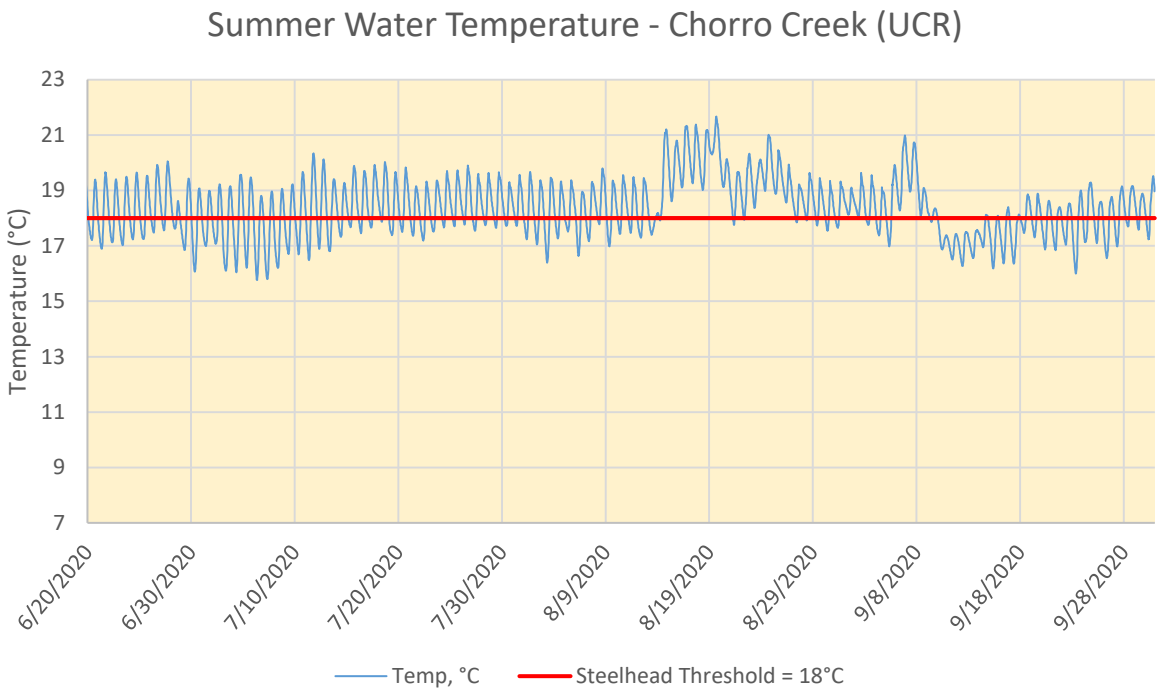

Figure 9. Water temperature at Chorro Creek (UCR) during Summer of WY2020.

Chorro Creek Road (CCC)

The following graphs (Figures 10 to 13) show water temperatures at Chorro Creek near Chorro Creek Road (CCC). The temperature logger at CCC was deployed from the beginning of WY2020, then retrieved December 5, 2019. The logger was redeployed on March 25, 2020 until the end of WY2020. Winter seasonal data is not available.

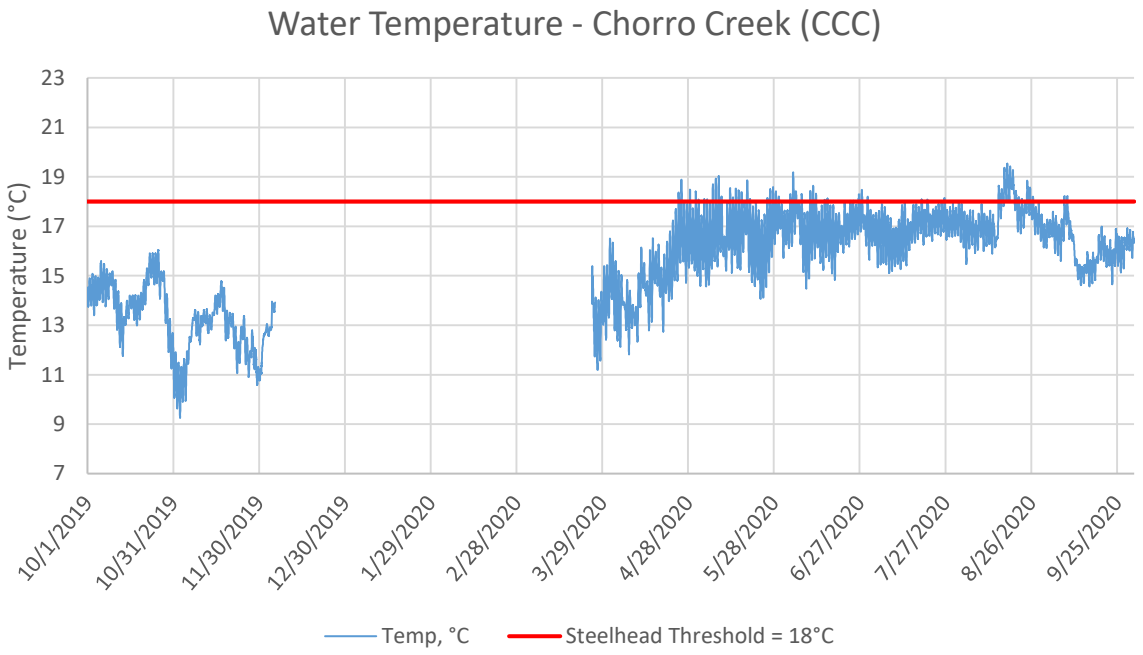

Figure 10. Water temperature at Chorro Creek (CCC) during WY2020. Data was not available from December 5, 2019 to March 25, 2020.

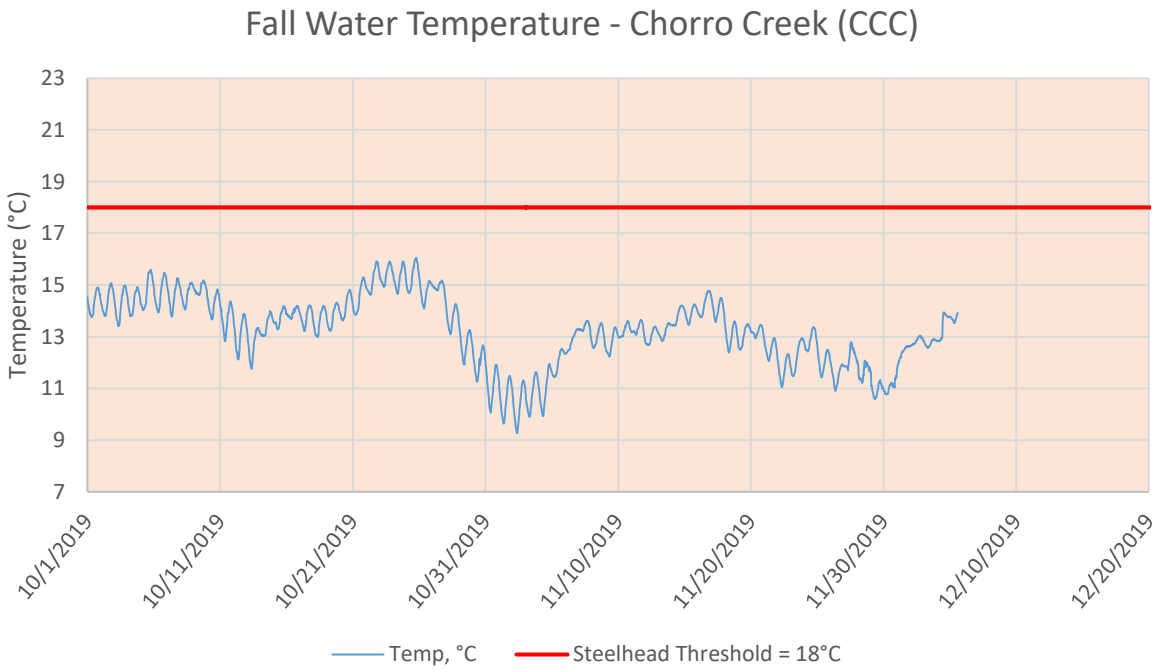

Figure 11. Water temperature at Chorro Creek (CCC) during Fall of WY2020. This dataset ended December 5, 2019.

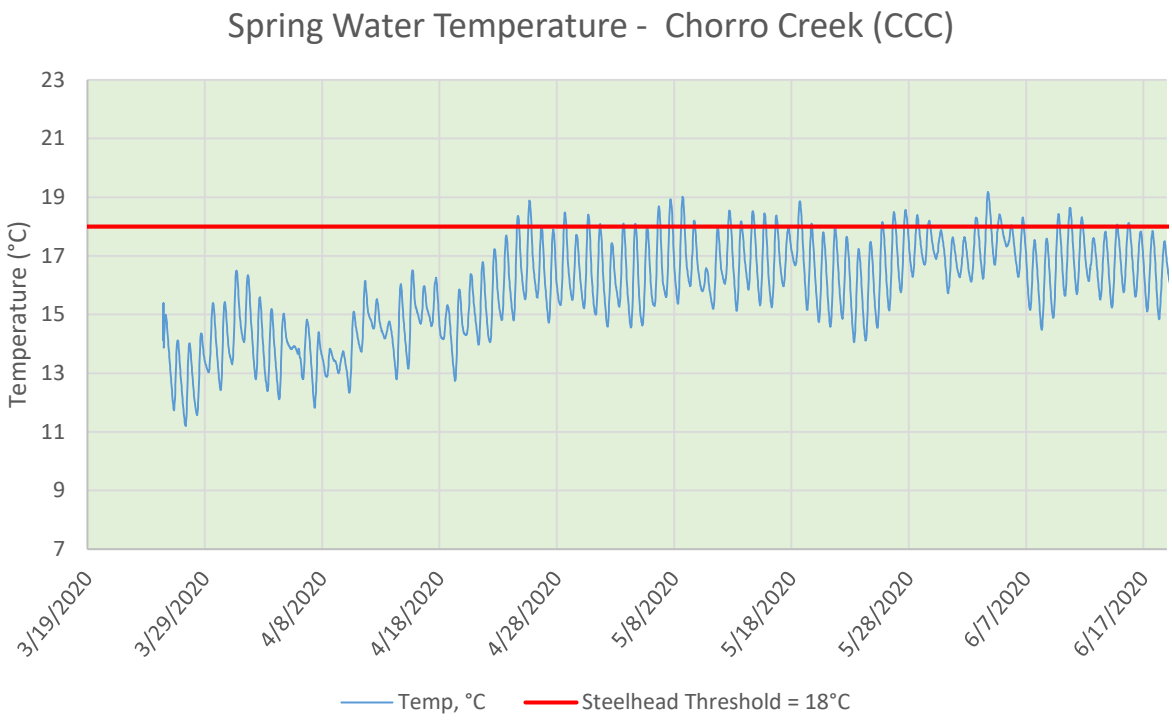

Figure 12. Water temperature at Chorro Creek during Spring of WY2020. This dataset began March 25, 2020.

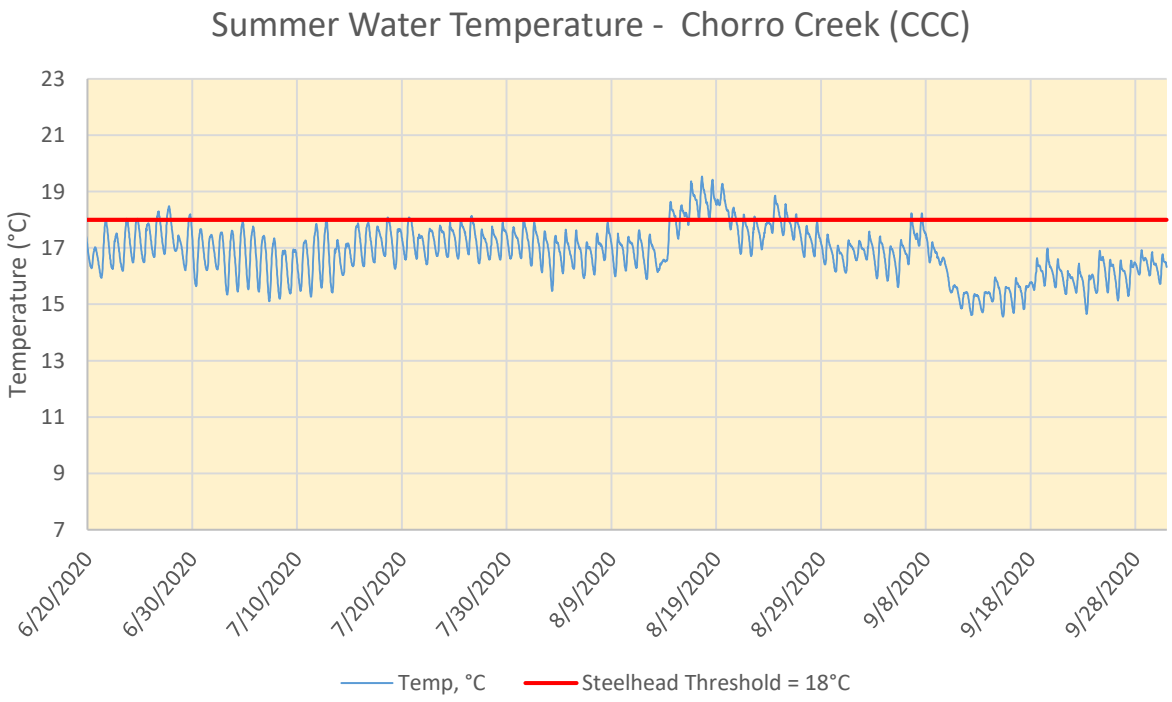

Figure 13. Water temperature at Chorro Creek (CCC) during Summer of WY2020.

Chorro Creek Tributaries

Water temperature data was collected along three tributaries to Chorro Creek:

- San Luisito Creek: this site is located on Adobe Road, about 0.5 miles upstream of confluence with Chorro Creek (site code SLU).
- Dairy Creek: located within El Chorro Regional Park, approximately 2 miles upstream of the confluence of Dairy and Chorro Creek (site code DAU).
- Pennington Creek: located about 2.5 miles upstream of the confluence with Chorro Creek, upstream of the Rancho El Chorro Outdoor School and near the Cal Poly Beef Center at Escuela Ranch (site code UPN).

The following graphs show water temperatures at San Luisito, Pennington, and Dairy Creek tributary sites. The first graph for each site illustrates water temperatures for the entire water year and the following graphs show seasonal water temperatures for each site. In each graph, the blue line indicates water temperature in °C, recorded at 30-minute intervals, and the red line indicates the 18°C threshold protective of steelhead and other sensitive species.

San Luisito Creek (SLU)

The following graphs (Figures 14 to 17) show water temperatures at San Luisito Creek at Adobe Road (SLU) during WY2020. The temperature logger at SLU was deployed from the beginning of WY2020 until December 11, 2019, then redeployed March 25, 2020 until end of WY2020. Winter seasonal data is not available.

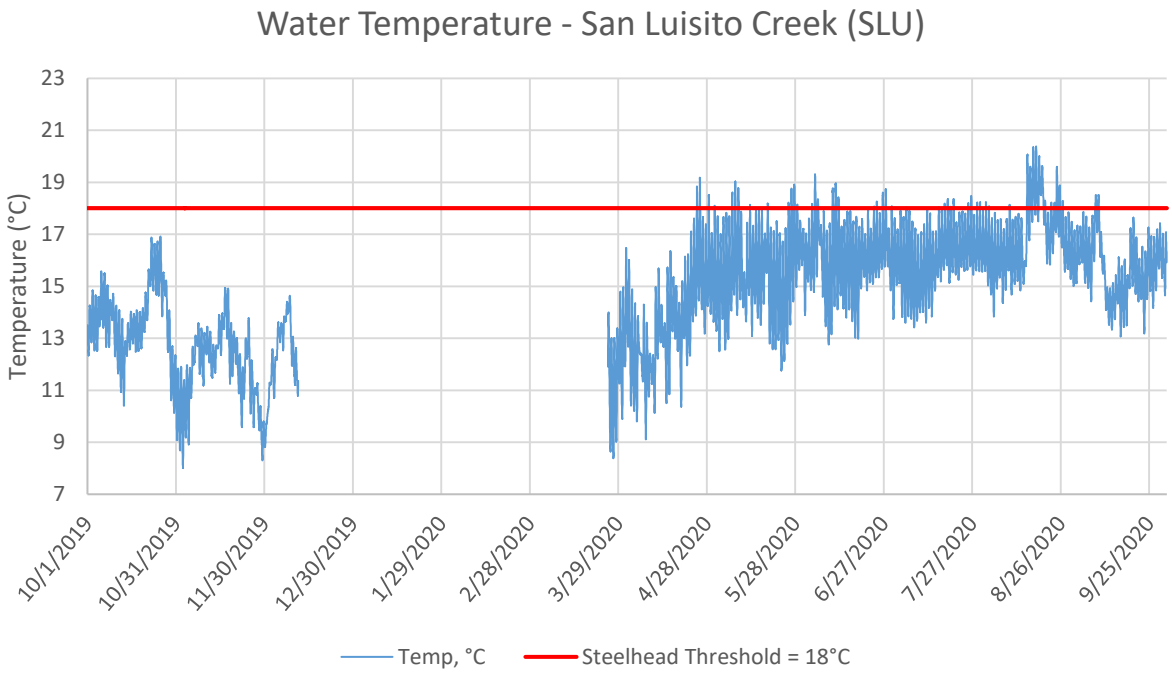

Figure 14. Water temperature at San Luisito Creek (SLU) during WY2020. Data was not available December 11, 2019 to March 25, 2020.

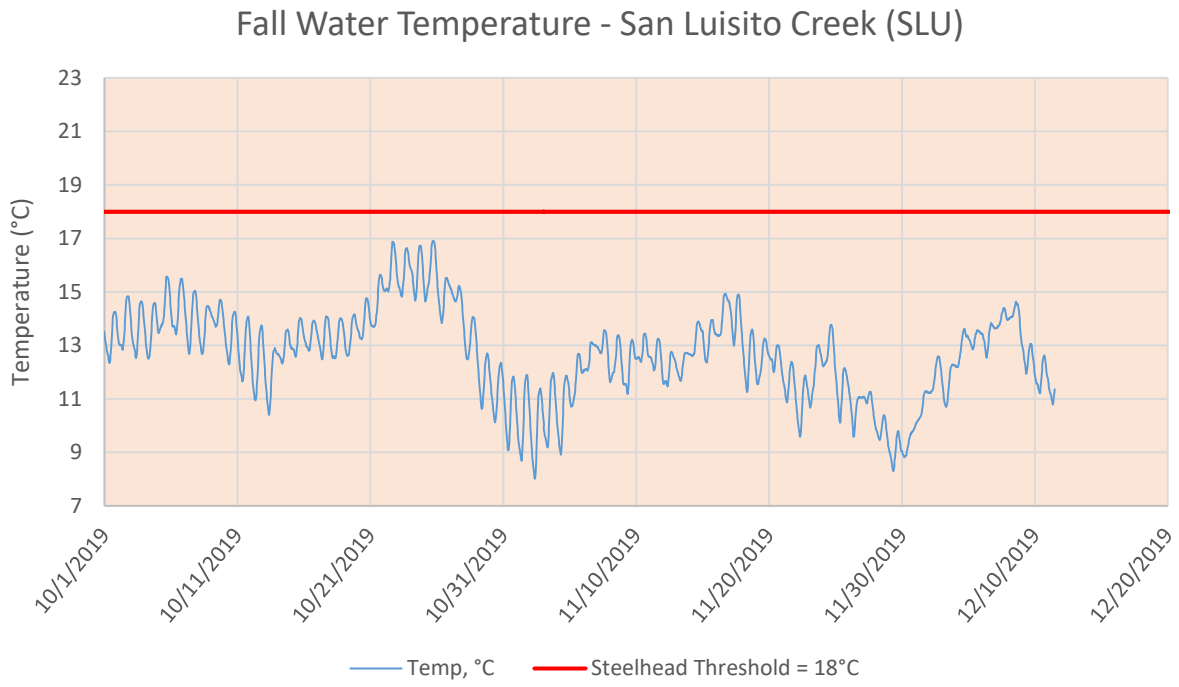

Figure 15. Water temperature at San Luisito Creek (SLU) during Fall of WY2020. This dataset ended December 11, 2019.

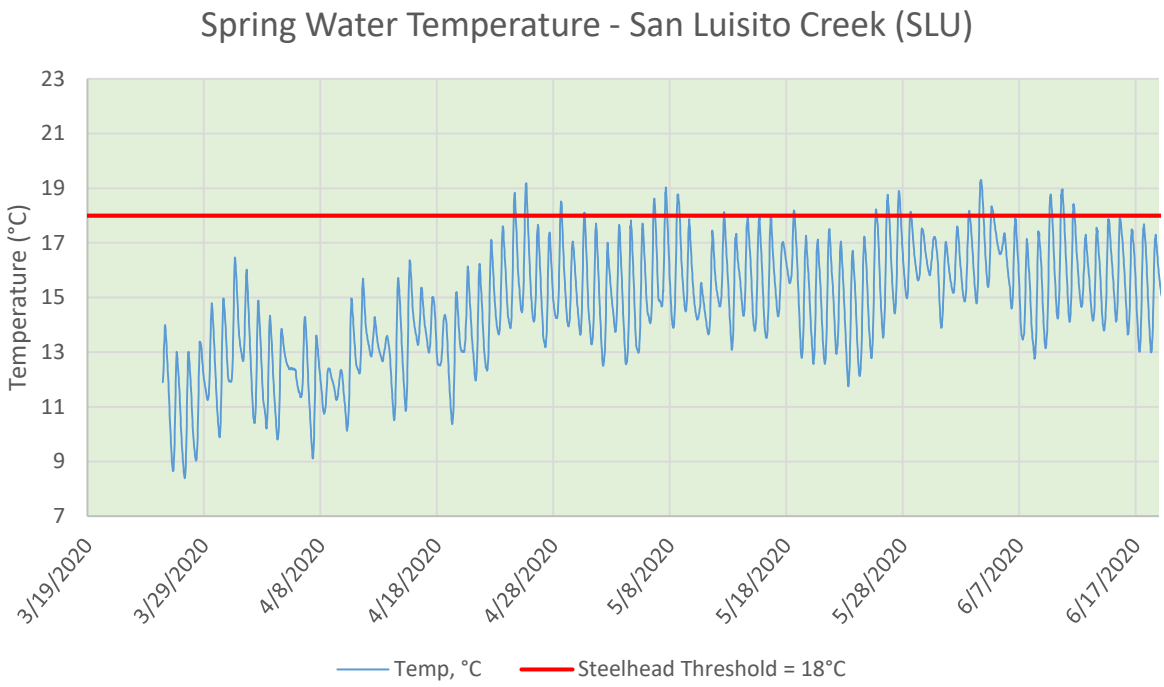

Figure 16. Water temperature at San Luisito Creek (SLU) during Spring of WY2020. This dataset began March 25, 2020.

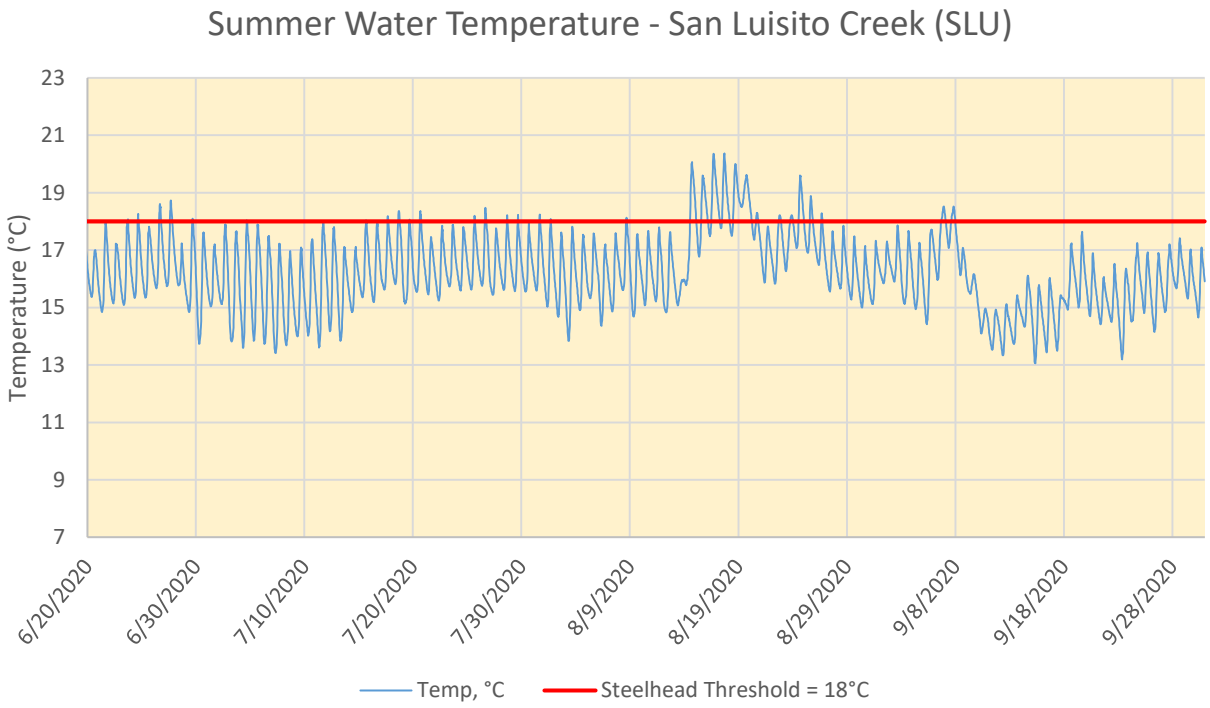

Figure 17. Water temperature at San Luisito Creek (SLU) during Summer of WY2020.

Pennington Creek

The following graphs (Figures 18 to 22) show water temperatures at Pennington Creek near the Cal Poly Beef Center (UPN) during WY2020. The temperature logger at UPN was deployed for the entire water year: October 1, 2019 to September 30, 2020.

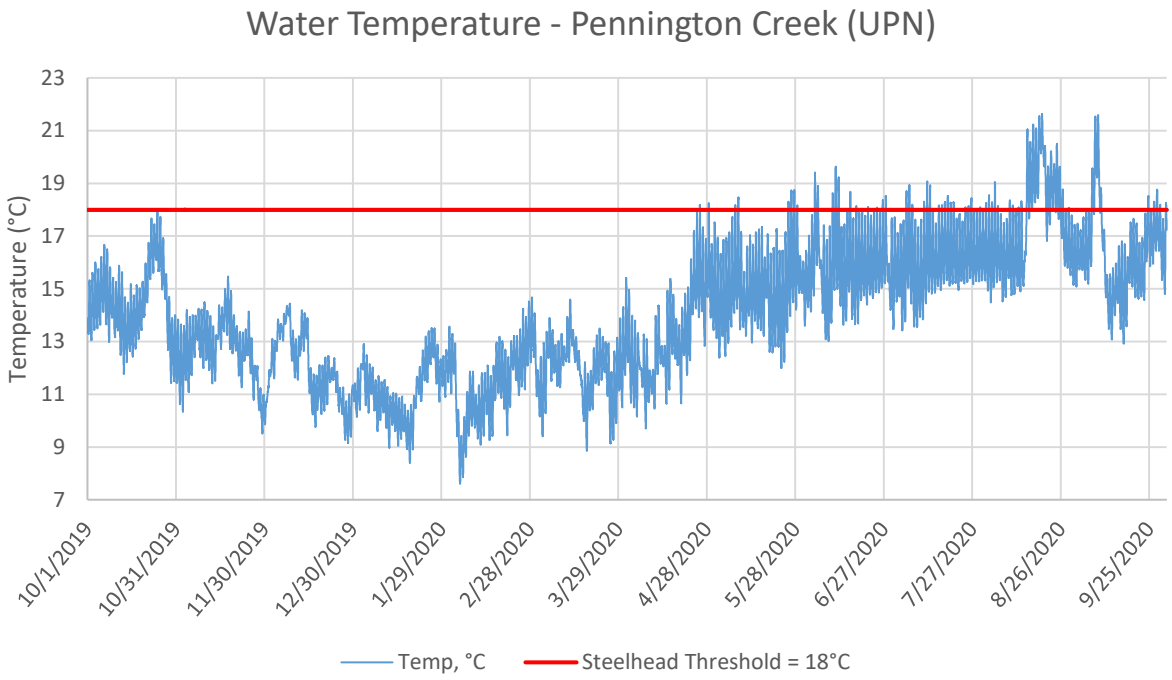

Figure 18. Water temperatures at Pennington Creek (UPN) during WY2020.

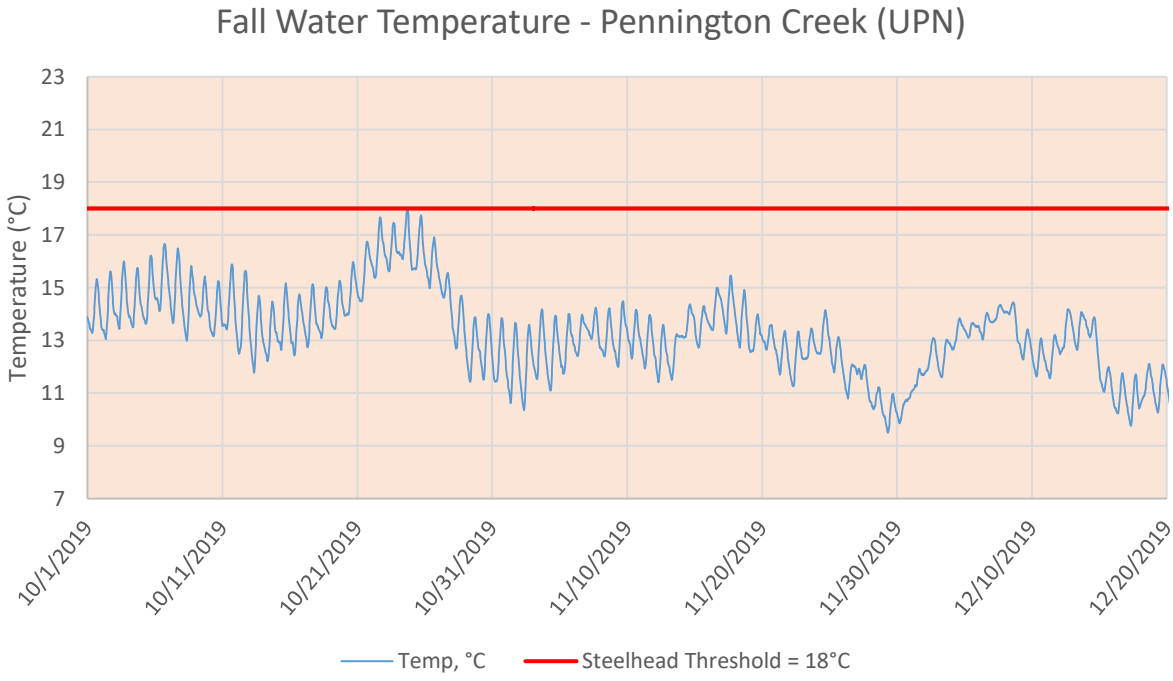

Figure 19. Water temperatures at Pennington Creek (UPN) during Fall of WY2020.

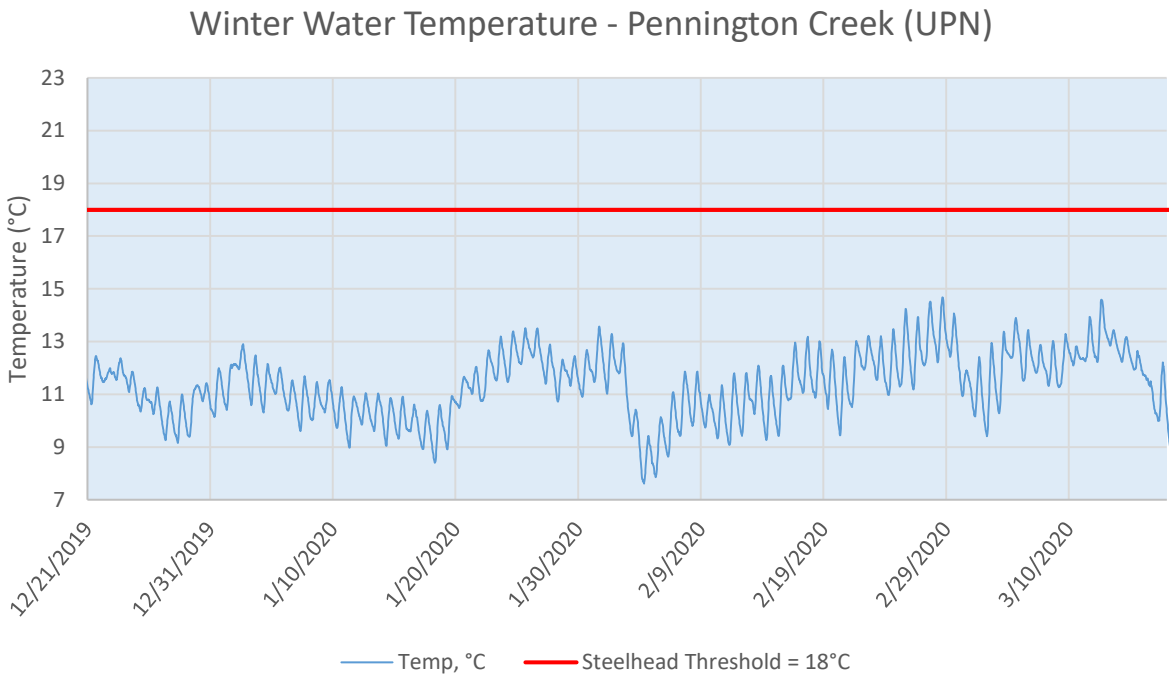

Figure 20. Water temperatures at Pennington Creek (UPN) during Winter of WY2020.

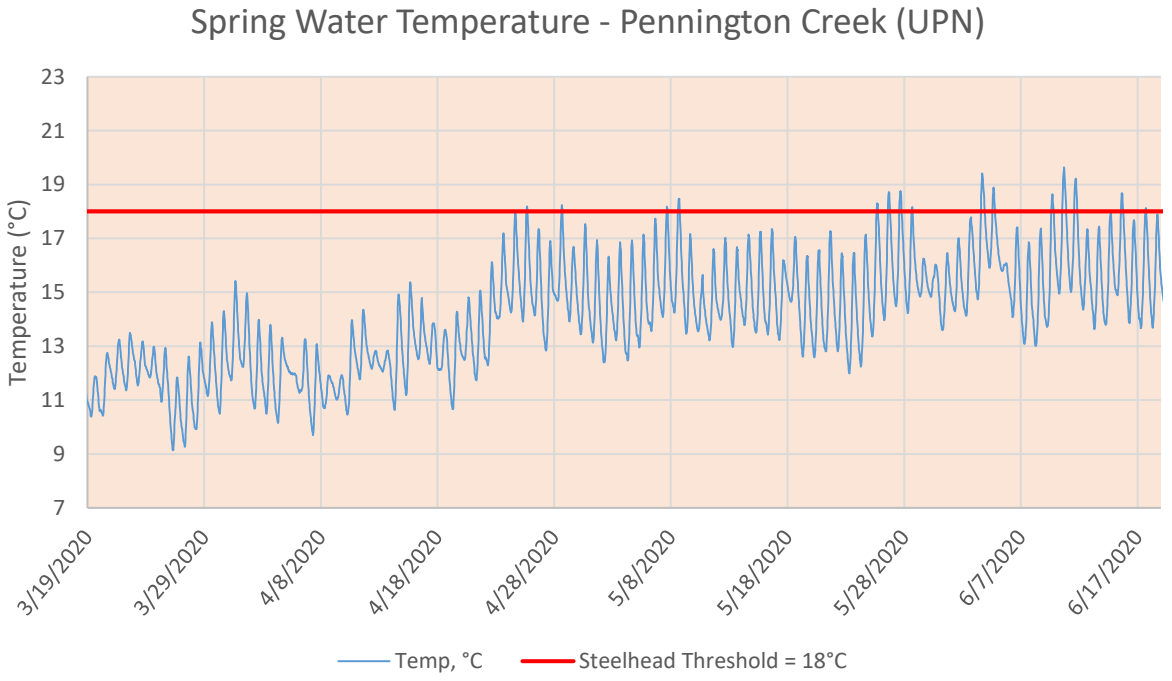

Figure 21. Water temperatures at Pennington Creek (UPN) during Spring of WY2020.

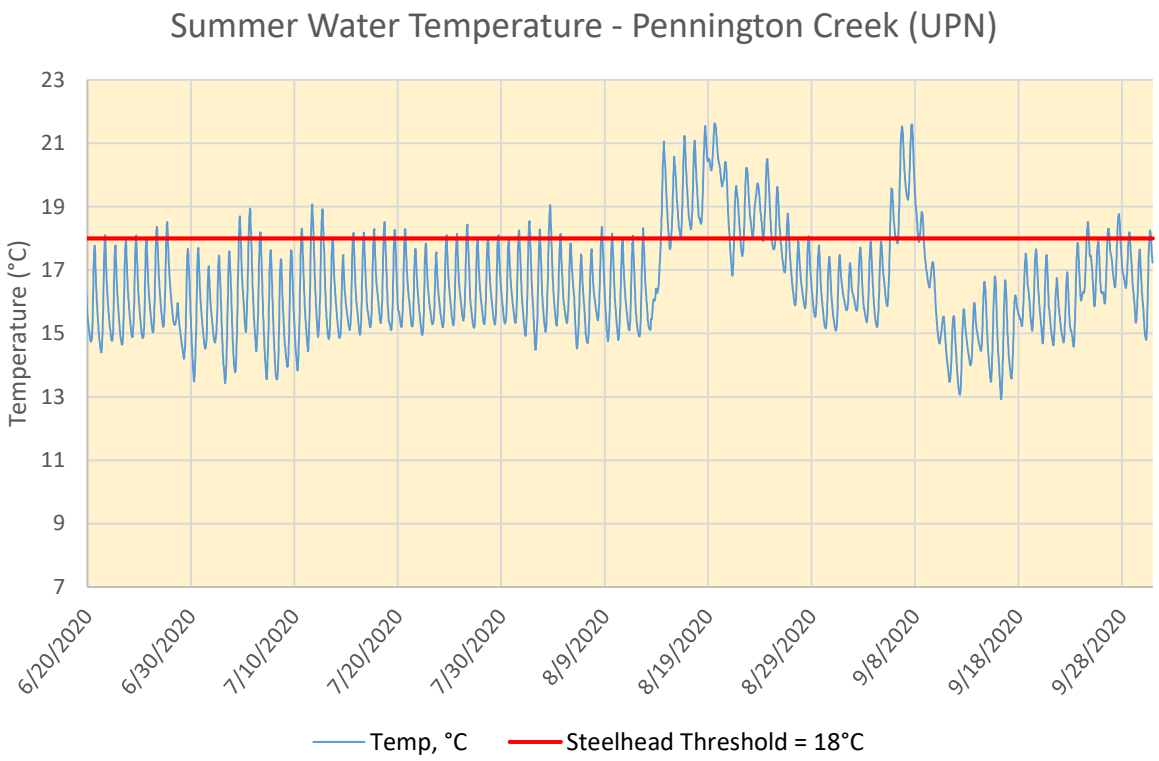

Figure 22. Water temperatures at Pennington Creek (UPN) during Summer of WY2020.

Dairy Creek

The following graphs (Figures 23 to 26) show water temperatures at upper Dairy Creek above El Chorro Regional Park (DAU) during WY2020. The temperature logger at DAU was deployed at the beginning of WY2020 and was retrieved on December 5, 2019. The logger was redeployed March 25, 2020. Winter data is not available, and summer seasonal data is not available after August 12, 2020.

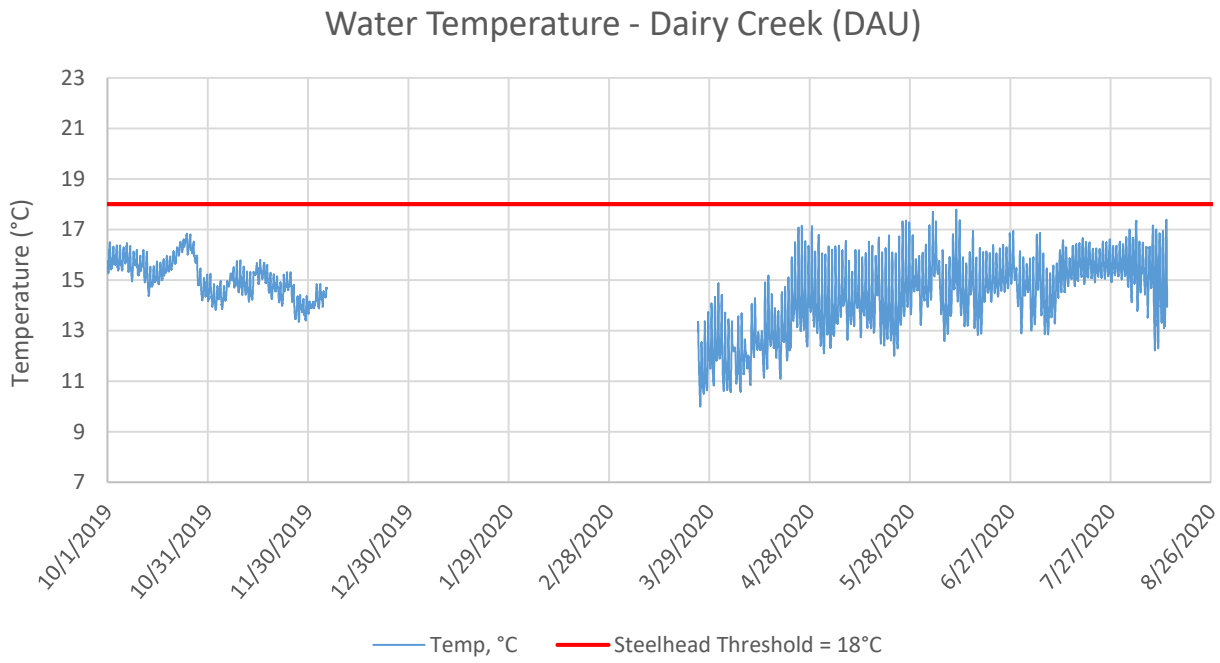

Figure 23. Water temperatures at Dairy Creek (DAU) during WY2020. Data was not available from December 5, 2019 to March 25, 2020.

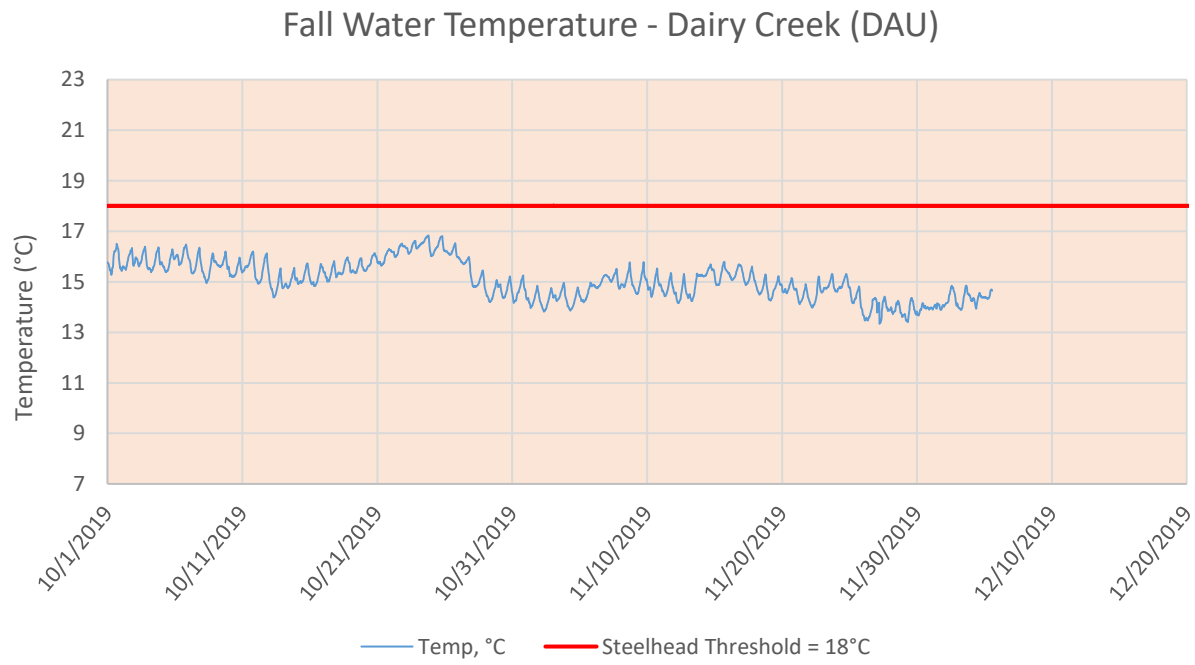

Figure 24. Water temperatures at Dairy Creek (DAU) during Fall of WY2020. This dataset ended December 5, 2019.

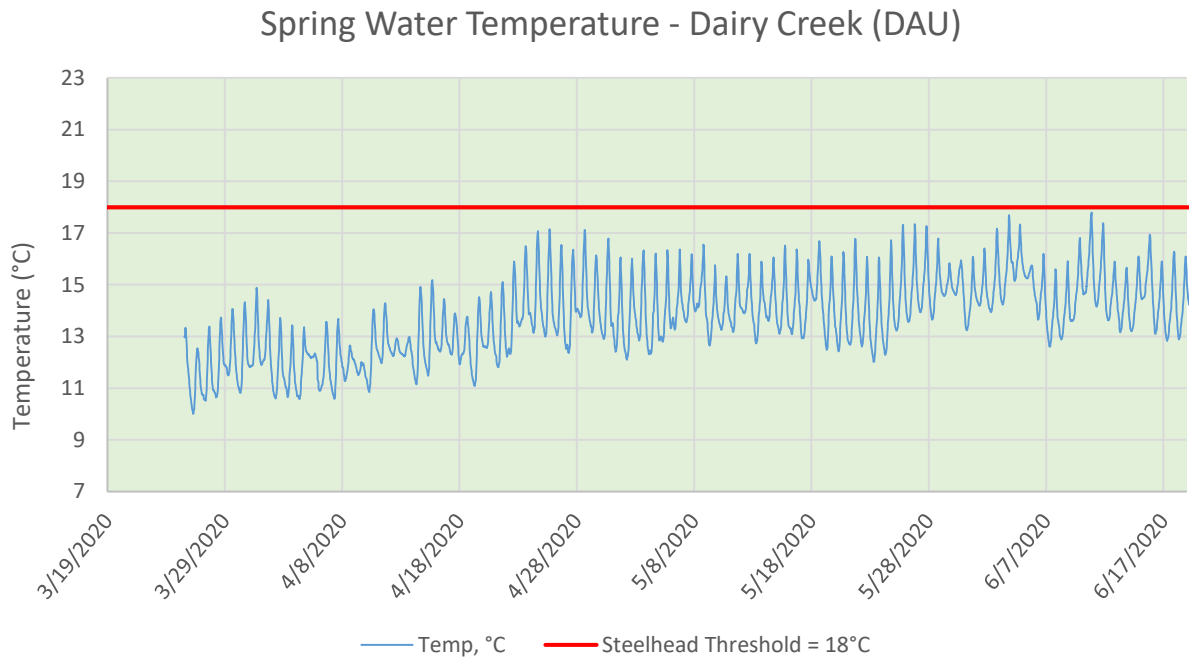

Figure 25. Water temperatures at Dairy Creek (DAU) during Spring of WY2020. This dataset began March 25, 2020.

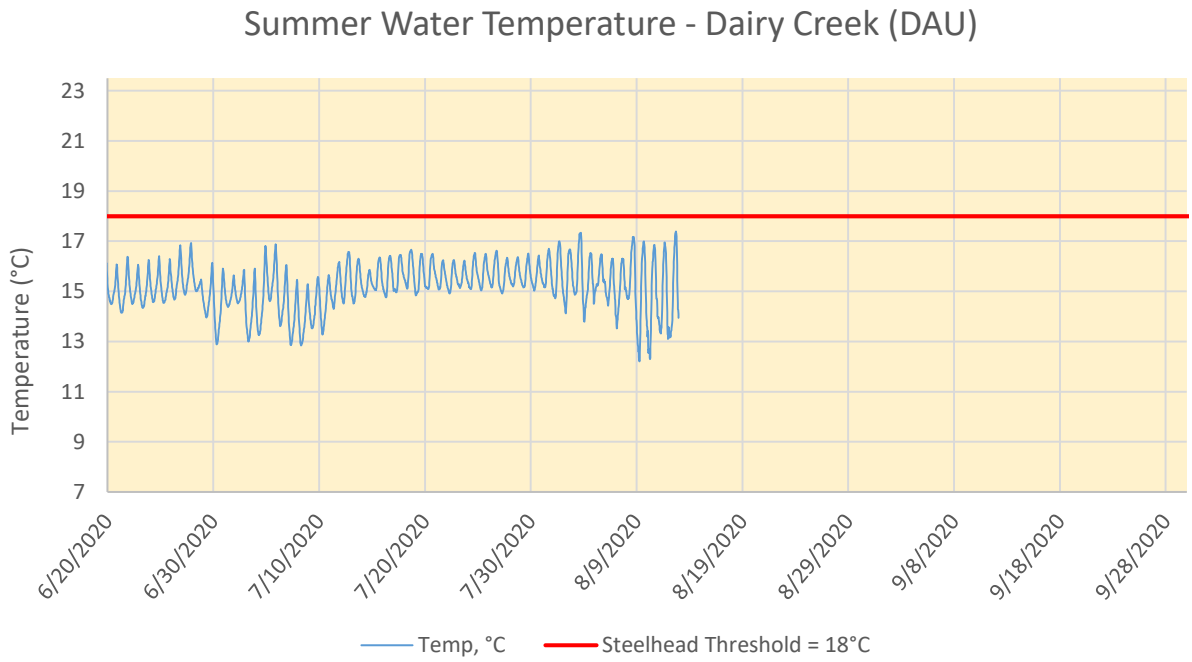

Figure 26. Water temperatures at Dairy Creek (DAU) during Summer of WY2020. The data set ended August 12, 2020.

Discussion

Water temperatures during WY2020 were analyzed using a variety of metrics. First, percent exceedance was calculated to see how frequently sites had water temperatures higher than 18°C. Exceedance was calculated for the entire deployment period of the logger, which varied on a site-by-site basis and on a seasonal basis (Table 1). Because deployment periods for each logger varied, percent exceedance for each site cannot be directly compared between sites. Deployment periods for each temperature logger are outlined in Appendix A.

Percent of Readings above the 18°C Threshold

Timeframe	Site					
	CHO	UCR	CCC	UPN	DAU	SLU
Full Deployment Period	24.7%	33.3%	6.2%	5.6%	0.0%	4.5%
Fall Season	0.2%	1.3%	0.0%	0.0%	0.0%	0.0%
Winter Season	-	-	-	0.0%	-	-
Spring Season	31.1%	26.0%	8.0%	2.9%	0.0%	3.9%
Summer Season	38.7%	61.6%	8.6%	17.4%	0.0%	8.1%

Table 1. Percent exceedance of the 18°C threshold for sensitive species at each monitoring site for WY2020. The deployment periods vary based on site locations. See Appendix A for more details.

The U.S. Environmental Protection Agency (EPA) sets forth water temperature criteria in the 1986 Quality Criteria for Water (also known as the "Gold Book"), where it recommends the use of a maximum weekly average temperature (MWAT) as an index for assigning protective temperature standards for fisheries. The MWAT is described as the highest single value of the seven-day moving average temperature. This index is used in reference to an upper limit, such as the 18°C threshold mentioned previously.

Despite being a standard outlined by the EPA, several case studies have found the MWAT to be inadequately protective (McCullough, 2010). Because high daily maximum temperatures are often accompanied by low daily minimums, averages may remain relatively constant even if the daily maxima are much higher (Beschta et al. 1987). For a more protective metric, the maximum weekly maximum temperature (MWMT), also known as the seven-day average of the daily maximum temperatures (7-DADM), has more recently been adopted for assessing temperature regimes. The MWMT is defined as the maximum seasonal or yearly value of the daily maximum temperatures over a running seven-day consecutive period (Welsh et al., 2001).

In addition to percent exceedance of the 18°C threshold, both MWAT and MWMT were calculated on a monthly basis to further assess thermal suitability for sensitive species. These values were compared to thermal thresholds for salmon and trout life stages, as designated by the EPA (Table 2).

Maximum Weekly Average Temperature (MWAT) - WY 2020												
Site	Oct '19	Nov '19	Dec '19	Jan '20	Feb '20	Mar '20	Apr '20	May '20	Jun '20	Jul '20	Aug '20	Sep '20
CHO	16.9	15.3	-	-	-	-	-	17.4	17.9	18.0	19.5	18.2
UCR	16.9	15.4	-	-	-	-	17.3	17.9	18.3	18.6	20.0	18.8
CCC	15.1	13.7	-	-	-	-	16.6	17.0	17.3	17.3	18.3	17.1
UPN	16.1	13.7	13.4	12.3	12.7	12.7	15.4	15.7	16.1	16.4	19.5	17.9
DAU	16.2	15.3	-	-	-	-	14.4	14.8	15.3	15.7	-	-
SLU	15.3	13.2	-	-	-	-	15.7	16.1	16.5	16.6	18.4	16.7

Maximum Weekly Maximum Temperature (MWMT) - WY 2020												
Site	Oct '19	Nov '19	Dec '19	Jan '20	Feb '20	Mar '20	Apr '20	May '20	Jun '20	Jul '20	Aug '20	Sep '20
CHO	17.6	15.9	-	-	-	-	-	19.7	19.8	19.6	21.1	19.7
UCR	18.1	16.2	-	-	-	-	19.4	19.6	19.8	19.8	21.2	20.0
CCC	15.7	14.1	-	-	-	-	18.3	18.4	18.2	18.0	19.0	17.6
UPN	17.2	14.7	13.8	13.1	14.0	13.9	17.6	17.7	18.4	18.3	21.1	19.4
DAU	16.5	15.5	-	-	-	-	16.7	16.8	16.7	16.5	-	-
SLU	16.2	13.9	-	-	-	-	18.1	18.2	18.1	18.2	19.8	17.9

	> 20°C, Exceeds EPA Threshold for Salmon/Trout Migration
	> 18°C, Exceeds EPA Threshold for Salmon/Trout Migration plus Non-Core Juvenile Rearing
	> 16°C, Exceeds EPA Threshold for Salmon/Trout "Core" Juvenile Rearing
	> 14°C, Exceeds EPA Threshold for Steelhead Smoltification
	> 13°C, Exceeds EPA Threshold of Salmon/Trout Spawning and Egg Incubation
	< 13°C, EPA Optimal Range for Salmon/Trout Egg Incubation
-	= insufficient data

Table 2. Maximum weekly average temperatures (MWAT) and maximum weekly maximum temperatures (MWMT) for monitoring sites during WY2020. Salmon and trout life stage thresholds adapted from EPA, 2003.

Tables 1 and 2 illustrate elevated temperatures at all sites during their respective deployment periods, but especially high temperatures during summer months. Mainstem site UCR had the most frequent exceedances of 18°C, with elevated temperatures for over 60% of the summer season. CHO, just upstream of UCR, also exceeded 18°C for nearly 40% of the summer.

UCR has had the most frequent and sustained issues with elevated temperature on Chorro Creek. This site is immediately downstream from a discharge point source, the California Men's Colony Wastewater Treatment Plant. Their treated discharge goes into the creek and could potentially be contributing to the elevated water temperatures. Elevated temperatures are less frequent downstream, possibly due to cooler water coming in from tributaries (as evidenced by the temperature data from UPN and SLU) and increased canopy cover.

Each year, temperature loggers were retrieved in the winter and re-deployed in the spring to avoid the potential loss of equipment in large storms. This results in large gaps in monitoring. Future efforts aim to capture year-round temperatures, leaving no winter data gaps. In particular during drought years, this would better capture when water temperatures begin to rise and whether winter temperatures support spawning salmonids.

Bimonthly Nutrient Monitoring

The Estuary Program wanted to be able to assess ambient nutrient levels at sites throughout the watershed. The information provides long-term trend data and assists in targeting efforts such as restoration and conservation.

Estuary Program staff visit nine sites to collect samples for laboratory analysis for nitrate as nitrogen (NO_3-N, mg/L) and for orthophosphate as phosphorus (PO_4-P, mg/L). Initially, sites were visited on a quarterly basis, or four times each year. As of June 2019, sites are now visited on a bi-monthly basis, or six times each year. As such, this effort was previously referred to as Quarterly Nutrient Monitoring (QNM) and is now referred to as Bimonthly Nutrient Monitoring (BNM).

Analytical Specifications:

The Estuary Program collects samples using standard techniques. The samples are stored in the dark on ice and then delivered by a courier to a certified laboratory for analysis within the specified hold time. The analysis specifications are as follows:

Nitrate as Nitrogen (mg/L):

Specification	Value
Method Number	EPA 300.0
Minimum Detection Limit (MDL)	0.025 mg/L
Project Quantitation Limit (PQL)	0.10 mg/L
Hold Time	48 hours
Sample storage conditions	4°C in the dark

Orthophosphate as Phosphorus (mg/L):

Specification	Value
Method Number	EPA 365.1
Minimum Detection Limit (MDL)	0.017 mg/L
Project Quantitation Limit (PQL)	0.050 mg/L
Hold Time	48 hours
Sample storage conditions	4°C in the dark

The laboratory occasionally dilutes the sample prior to analysis if the nutrient concentrations are elevated, which impacts the minimum detection limit and project quantitation limit for the results.

For each nitrate and phosphate result that was less than the Project Quantitation Limit (PQL), a random number between 0 and the PQL was generated in R and used for analyses in this report. This is the same method utilized by the Central Coast Regional Water Quality Control Board (CCRWQCB) to manage non-detects in their own analysis.

Monitoring Locations:

The sites were selected to represent Chorro and Los Osos Creeks, as well as their tributaries. The sites include Dairy Creek middle (site code DAM), Pennington Creek upper (UPN), Chorro Creek upper (CHO),

Chorro Creek middle (UCR), Chorro Creek lower (TWB), San Luisito Creek lower (SLU), San Bernardo Creek lower (SBE), Warden Creek middle (TUR), and Los Osos Creek upper (CLV). See the map below (Figure 27) for site locations.

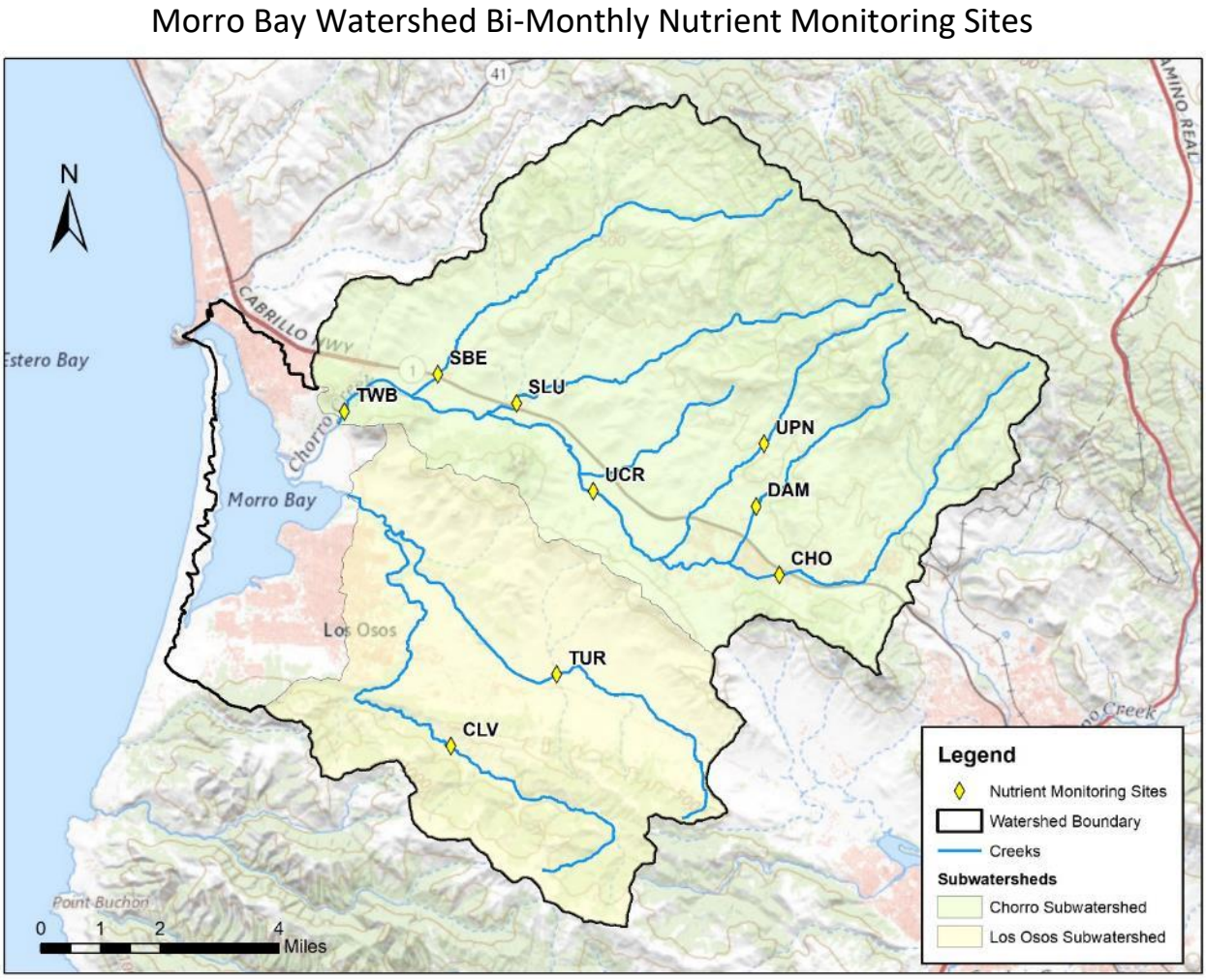

Figure 27. Bi-monthly nutrient monitoring locations.

Nitrate as Nitrogen

Nitrate results are compared to two standards. In freshwater systems, the CCRWQCB considers a water body to be impaired by nitrates if nitrate as nitrogen (NO_3-N) concentrations are greater than or equal to 1 mg/L as N and if the site shows other signs of impact such as widespread algal growth and low dissolved oxygen (DO) concentrations. There is also a drinking water standard for nitrate to be protective of human health, which is less than or equal to 10 mg/L as N. The Estuary Program assessment utilized the following scores:

- Good (green) for nitrate as nitrogen concentrations < 1 mg/L (protective of aquatic and human health)
- Fair (yellow) for nitrate as nitrogen concentrations $\geq$ 1 mg/L and < 10 mg/L

- Poor (red) for nitrate as nitrogen concentrations ≥ 10 mg/L (exceeds level protective of human health)

The following map (Figure 28) indicates the monitoring locations and the average nitrate as nitrogen concentration at each site for WY2020. For sites with year-round flow, this represents six readings. The number of samples varies by sites, as some sites go dry during the summer.

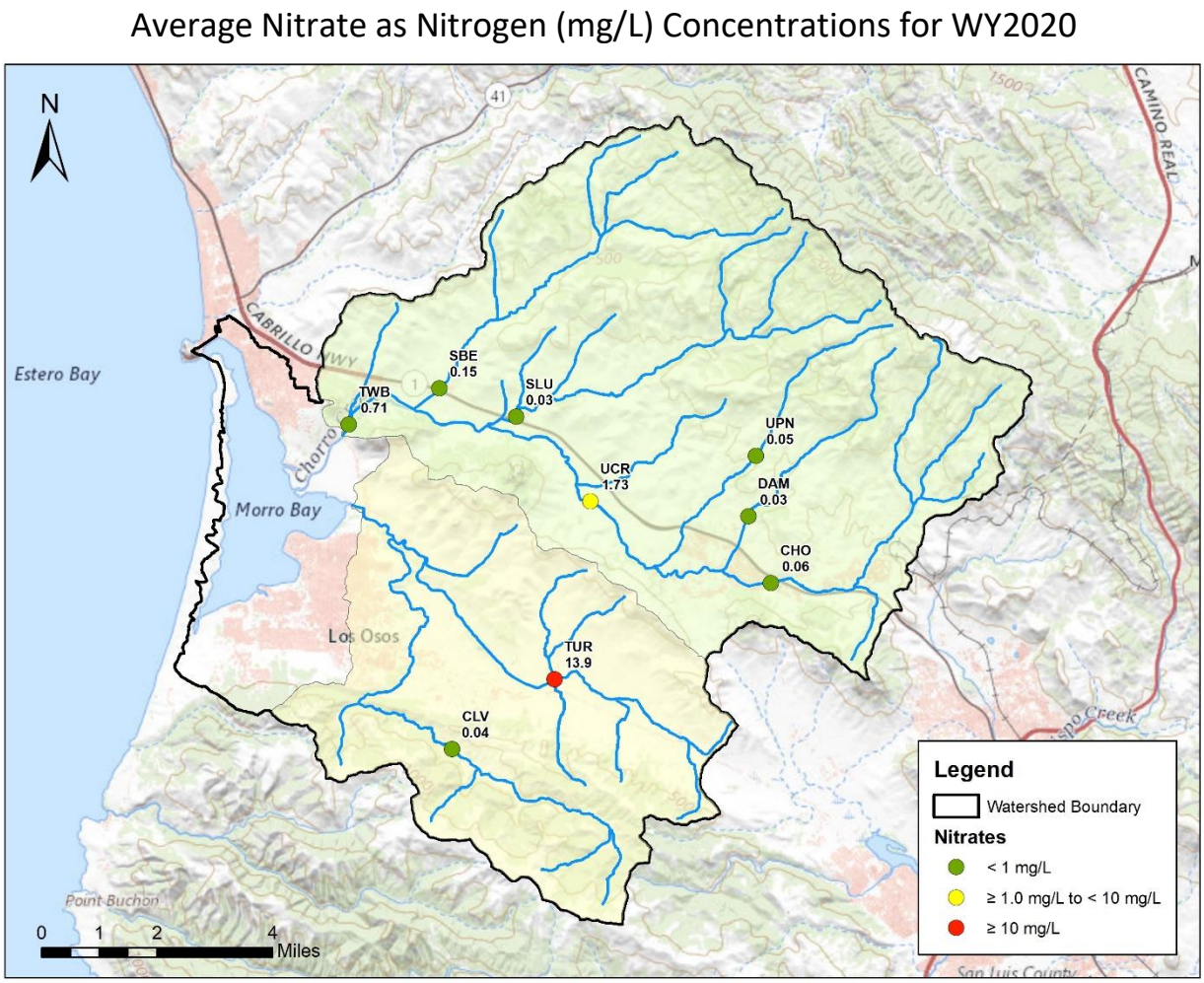

Figure 28. Average Nitrate as Nitrogen (mg/L) concentrations for WY2020 at ten representative monitoring locations.

Changes from the historical nitrate average are compared to results from WY2020 and summarized in Table 3 below.

Nitrates as Nitrogen (mg/L)

Site Code	CHO	UCR	TWB	DAM	UPN	SLU	SBE	TUR	CLV
Historical Average, NO_3-N mg/L	0.13	2.22	0.76	0.06	0.07	0.10	0.39	13.32	0.09
WY2020 Average, NO_3-N mg/L	0.06	1.73	0.71	0.03	0.05	0.03	0.15	13.90	0.04
Relative Percent Difference (%)	78.6	25.2	7.4	70.5	40.6	104.5	91.3	4.3	78.3

Table 3. Historical nitrate averages compared to WY2020 averages. Historical data includes nutrient monitoring from WY2016 through WY2020. The Relative Percent Difference compares the WY2020 data to the historic data. Values highlighted in green had an average nitrate concentrations considered Good (<1mg/L) for WY2020. Values highlighted yellow had an average nitrate concentration considered Fair (≥ 1 mg/L and < 10 mg/L), and values highlighted red were considered Poor (≥ 10 mg/L).

Orthophosphate as Phosphorus

Data is compared to the targets in the Pajaro River nutrient objectives guidance document, as referenced on the CCAMP website. An orthophosphate as phosphorus (PO_4-P) value of 0.12 mg/L is used for comparison to Morro Bay watershed data. There is no standard protective of human health for orthophosphates. The Estuary Program assessment utilized the following scores:

- Good (green) for orthophosphate as phosphorus concentrations < 0.12 mg/L
- Fair (yellow) for orthophosphate as phosphorus concentrations ≥ 0.12 mg/L

The following map (Figure 29) indicates the monitoring locations and the average orthophosphate as phosphorus concentrations at each site for WY2020. For sites with year-round flow, this represents six readings. The number of samples varies by sites, as some sites go dry during the summer.

Average Orthophosphate as Phosphorus (mg/L) Concentrations for WY2020

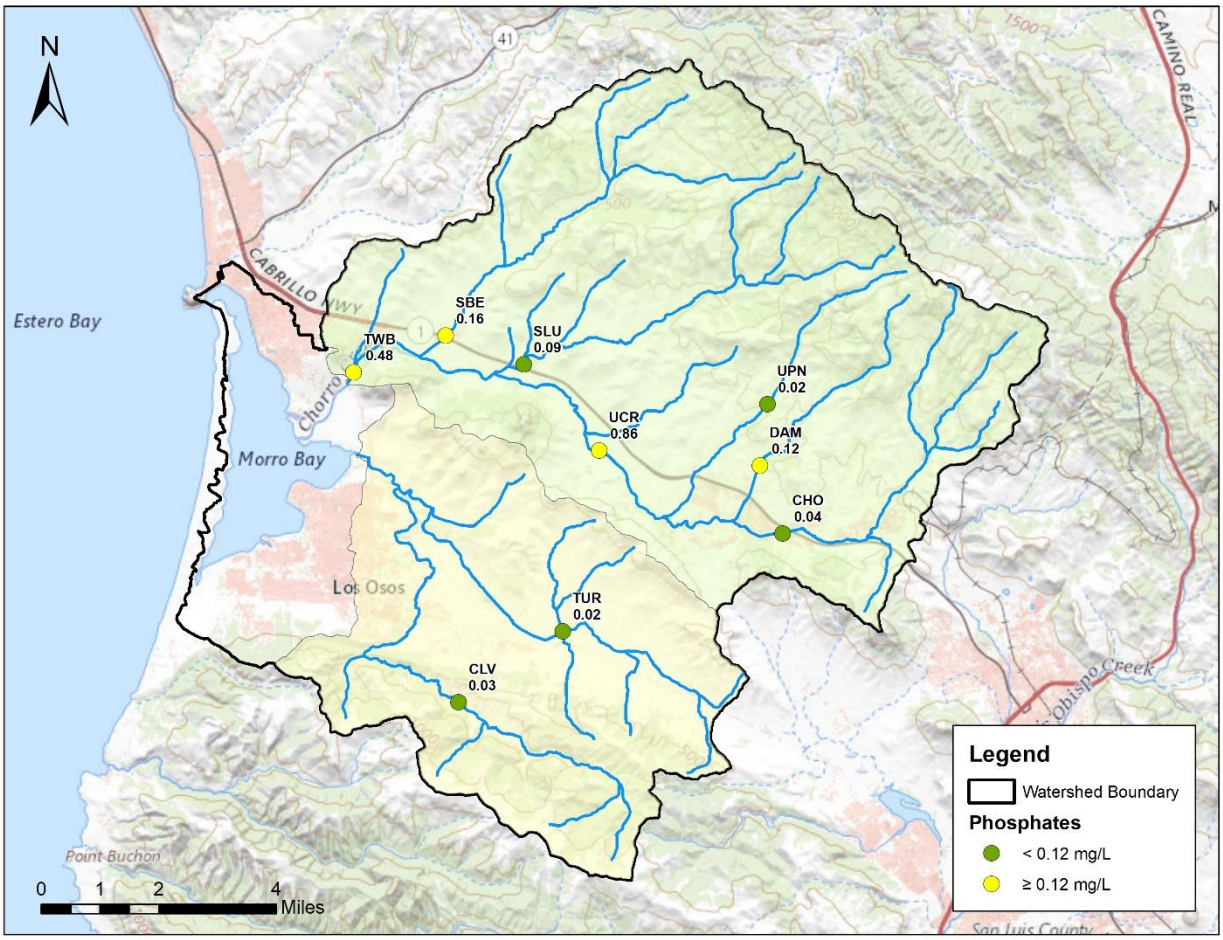

Figure 29. Average Orthophosphate as Phosphorus (mg/L) concentrations for WY2020 at ten representative monitoring locations.

Changes from the historical average phosphate are compared to results from WY2020 below in Table 4.

Orthophosphate as Phosphorus (mg/L)

Site Code	CHO	UCR	TWB	DAM	UPN	SLU	SBE	TUR	CLV
Historical Average, PO4-P mg/L	0.03	0.85	0.44	0.08	0.04	0.10	0.14	0.03	0.04
WY2020 Average, PO4-P mg/L	0.04	0.86	0.48	0.12	0.02	0.09	0.16	0.02	0.03
Relative Percent Difference (%)	27.0	0.7	8.3	39.8	36.9	1.0	8.1	43.0	41.9

Table 4. Historical phosphate averages compared to WY2020 averages. Historical data includes quarterly monitoring from WY2016 through WY2020. The Relative Percent Difference compares the WY2020 data to the historic data. Values highlighted in green are < 0.12 mg/L. Values highlighted yellow are above ≥ 0.12mgL.

Discussion

The highest nitrate values in the watershed have continually been measured on Warden Creek (TUR). Chorro Creek immediately downstream of the CMC WWTP outfall (UCR) also had elevated nitrate concentrations relative to upstream and downstream levels. Orthophosphate concentrations are typically higher in the Chorro Creek subwatershed than in Los Osos Creek, with UCR, SBE, and TWB above the screening level target.

Nutrient impairment often tracks with large DO fluctuations and excess algae. As continuous DO data is not available for WY2020, temperature can be used as a proxy to estimate when DO levels were likely low. For example, UCR experienced elevated temperature for over 60% of the summer season. Thus, it is likely that less-than-ideal DO conditions occurred during the summer of WY2020, and nutrient enrichment could have played a role.

The presence of algae is also an indicator of nutrient impairment. Although the Estuary Program collects observational data when conducting quarterly nutrient monitoring, data collected to date is too limited to report. The Estuary Program hopes to share this algae presence/absence information in the future.

Data Availability

The data is available from the California Environmental Data Exchange Network (CEDEN), a State Water Resources Control Board managed data portal. To retrieve Nutrient data,

- Visit www.CEDEN.org
- Click on Find Data
- For Program, choose Morro Bay National Estuary Program
- For Bimonthly Nutrient Monitoring: For Stations, choose Dairy Creek within cattle enclosure (site code DAM), Pennington Creek upstream from horse corral (UPN), Chorro Creek at Camp SLO (CHO), Chorro Creek at upper Chorro Creek Ecological Reserve (UCR), Chorro Creek at South Bay Boulevard (TWB), San Luisito Creek @ Adobe Rd (SLU), San Bernardo Creek at Adobe Rd (SBE), Warden Creek at Turri Road (TUR), and Los Osos Creek Clark Valley Road (CLV)
- Click on Retrieve Data

For continuous monitoring temperature data, contact the Estuary Program.

For additional details, contact the Estuary Program at 805-772-3834 or staff@mbnep.org.

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Appendix A: WY2020 Deployment Timelines

Site	Full Deployment Period	
	Initial	Re-deployment
CHO	10/1/2019 - 12/11/2019	5/3/2020 - 9/30/2020
UCR	10/1/2019 - 12/11/2019	3/25/2020 - 9/30/2020
CCC	10/1/2019 - 12/5/2019	3/25/2020 - 9/30/2020
DAU	10/1/2019 - 12/5/2019	3/25/2020 - 8/12/2020
UPN	10/1/2019 - 9/30/2020	
SLU	10/1/2019 - 12/11/2019	3/25/2020 - 9/30/2020

Appendix B: WY2020 Dates for each Seasonal Period

Time Period	Start	End
Water Year 2020	10/1/2019	9/30/2020
Fall Season	10/1/2019	12/20/2019
Winter Season	12/21/2019	3/18/2020
Spring Season	3/19/2020	6/19/2020
Summer Season	6/20/2020	9/30/2020