Central Coast Cooperative Monitoring Program 2023 Annual Water Quality Report

Original: July 1, 2024

PRESENTED TO

Central Coast Regional Water Quality Control Board
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401-7906
805-549-3147

PRESENTED BY

Central Coast Water Quality Preservation, Inc.
Sarah Lopez, Executive Director
P.O. Box 2227
Watsonville, CA 95077
831-331-9051
sarah@ccwqp.org

PREPARED BY

CSUMB Watershed Institute
Skylar Wolfe
Lucas Raymond
Dr. John R. Olson, Assistant Professor
100 Campus Center
Seaside, CA 93955
831-582-3873
joolson@csumb.edu

Tetra Tech
Tim Tringali, Vice President
3201 Airpark Drive, Suite 108
Santa Maria, CA 93455
805-739-2659
tim.tringali@tetratech.com

EXECUTIVE SUMMARY

This report describes the results of monitoring conducted by Central Coast Water Quality Preservation, Inc. (CCWQP) in 2023 pursuant to the Central Coast Regional Water Quality Control Board's (CCRWQCB's) Agricultural Order (Order No. R3-2021-0040). CCWQP implements the Central Coast Cooperative Monitoring Program (CMP) under the cooperative surface water monitoring option provided in the Agricultural Order, and initiated monitoring in January 2005.

The objectives of the CMP, described in Order No. R3-2021-0040, Monitoring and Reporting Program, (CCRWQCB 2021), are to:

- Assess the impacts of waste discharges from irrigated lands to receiving water;
- Assess compliance with the numeric limits described in the Order;
- Assess the status of receiving water quality and Beneficial Use protection in impaired waterbodies dominated by agricultural activity;
- Evaluate short-term patterns and long-term trends (five to 10 years or more) in receiving water quality;
- Evaluate water quality impacts resulting from agricultural discharges (including, but not limited to, tile drain discharges);
- Evaluate water quality impacts resulting from stormwater discharges from agricultural operations;
- Evaluate condition of existing perennial, intermittent, or ephemeral streams or riparian or wetland area habitat, including degradation resulting from erosion or agricultural discharges of waste; and
- Assist in the identification of specific sources of water quality problems.

An additional objective of the program is to provide feedback to growers in areas of concern in order to facilitate water quality improvements.

The CMP has traditionally included approximately 50 regularly monitored sites located in six hydrologic units (HUs) throughout the Central Coast Region. Monitoring was first performed in 2005 at 25 sites in the Santa Maria Region in Santa Barbara County and a small area of southern San Luis Obispo County and the Lower Salinas River Region in Monterey County. In 2006, monitoring was initiated at an additional 25 sites. In 2012, the CMP was modified to include a total of seven additional sites (five in the northern monitoring area and two in the southern monitoring area), with one northern site removed.

The CMP includes chemical, physical, toxicological, and biological monitoring elements. Samples are collected in a manner appropriate for the specific analytical methods used. Water samples are typically collected as mid-depth, mid-channel grab samples. Standard operating procedures for collection and analysis of surface water, sediment, and bioassessment samples are provided in the CMP's Quality Assurance Project Plan, or QAPP (CCWQP 2013, 2018a, 2018b). The QAPP documents the sampling and analytical methods, procedures, and requirements, data management procedures, Quality Assurance sample requirements and frequency, the data quality objectives for the CMP, and corrective actions for quality assurance problems.

All 12 CMP events planned for 2023 were successfully conducted. Required field observations were made during 552 of 654 planned site visits. Water samples were not collected during 102 site visits, because 50 site visits observed a dry channel, 45 site visits observed disconnected pools and/or discontinuous flows, and seven were inaccessible due to storm damage. All the collected samples were analyzed. The monitoring results were evaluated in accordance with the CMP QAPP (CCWQP 2013, 2018a, 2018b) and determined overall to be of high quality with few qualifications that would limit use.

The 2023 CMP monitoring results displayed some broad spatial patterns and statistically significant temporal trends:

- The two regions with sites located in the most intensively cropped drainages (Santa Maria Region and the Salinas Region) had the highest median for turbidity, nitrate, and unionized ammonia.

- Dissolved oxygen exceedances were most frequent in the Pajaro and El Estero HUs. Trends in dissolved oxygen were primarily increasing in the Salinas, Santa Maria, and Santa Ynez HUs and declining in the Pajaro River HU.
- Trends in flow have been decreasing across the Central Coast Region, especially in southern HUs. There were 30 trends in flow, which were primarily decreasing (seven exceptions). Five of the seven increasing trends were observed in northern HUs.
- The majority of decreasing trends in pH have occurred in northern HUs (Pajaro River and Salinas), while the majority of increasing trends have occurred in southern HUs (Santa Maria and Santa Ynez). The Pajaro River HU had the highest rate of pH exceedances relative to the number of samples collected, followed by the Salinas and Santa Ynez HUs.
- Trends in salinity-related parameters were mostly increasing in the Pajaro River and South Coast HUs. Trends in the Santa Ynez HU were entirely decreasing and trends in the Salinas HU were mostly decreasing. Santa Maria HU showed mostly increasing trends.
- Trends for unionized ammonia across the Central Coast Region were mostly decreasing. The majority of decreasing trends were found in the southern HUs. The Pajaro River HU had the most increasing trends. The Salinas HU had the highest percentage of Basin Plan Water Quality Objective exceedances in the Region for unionized ammonia. All samples collected from the Estero Bay and South Coast HUs achieved all unionized ammonia TMDL limits.
- Trends in orthophosphate were primarily decreasing in 2023 (87%, 27 of 31 trends), similar to last year's trends (82%, 24 of 29 trends).
- Twenty-seven trends in nitrate were observed across the Central Coast Region, of which 18 were decreasing. Of the increasing trends, most were observed in the Salinas River HU. One increasing trend in nitrate loading had a corresponding decreasing trend in nitrate concentration. The Santa Maria HU had the highest percentage of Basin Plan Water Quality Objective exceedances for nitrate in the Region. All samples collected from sites in the San Antonio and Santa Ynez HUs achieved the non-TMDL Area Limit for nitrate.
- Six significant increasing trends (i.e., improving, reduced toxicity) for algae growth were observed throughout the Region, most frequently in the Pajaro River and Salinas River HUs. No significantly decreasing trends were observed.
- Nine significant increasing trends (i.e., improving, reduced toxicity) and one significant decreasing trend (i.e., worsening) for toxicity to *Ceriodaphnia dubia* survival in water were observed throughout the region. Significant trends in toxicity to *C. dilutus* survival in water was only observed in samples collected from the South Coast HU.
- Toxicity to invertebrate survival and growth in sediment occurred most frequently in samples collected in the Santa Maria HU, followed by the Salinas HU.
- Throughout the monitoring area, most *C. dubia* bioassays showing significant toxicity in water had only sub-lethal effects with no significant effect to mortality.
- 39% of possible site/parameter combinations for conventional parameters showed statistically significant trends in water quality from 2005 through 2023. Most of the trends noted through 2023 were similar to those observed since 2017, with 12% of statistically significant trends reversing direction.

The CMP results from 2023 continue to support the conclusion that low dissolved oxygen, elevated pH, elevated nitrate and ammonia, and water and sediment toxicity are parameters of concern in many waterbodies in the Central Coast Region. However, the presence of statistically significant trends indicates that some conditions may be changing.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

This page intentionally left blank.

ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
%	percent
BV	Sample received after holding time expired
°C	degrees Celsius
CalDUCS	California Data Upload and Checking System
CCAMP	Central Coast Ambient Monitoring Program
CCRWQCB	Central Coast Regional Water Quality Control Board
CCWQP	Central Coast Water Quality Preservation, Inc.
CDC	(California) Department of Conservation
CDWR	California Department of Water Resources
CEDEN	California Environmental Data Exchange Network
CFS	cubic feet per second
CIMS	California Irrigation Management Information System
CJ	Analyte concentration is in excess of the instrument calibration; considered estimated
cm	centimeter(s)
CMP	Cooperative Monitoring Program
CT	QC criteria not met due to high level of analyte concentration
CVP	Central Valley Project
D	EPA Flag - Analytes analyzed at a secondary dilution
DF	Reporting limits elevated due to matrix interferences
DO	dissolved oxygen
DQO	data quality objective
d/s	downstream
EDD	Electronic Data Deliverable
°F	degrees Fahrenheit
FIA	Location was inaccessible to obtain a measurement
FTD	Location was too deep to obtain a measurement
FTT	Water too turbid to measure
HL	Analyte recovery above established limit
HT	Analytical value calculated using results from associated tests
HU	hydrologic unit
HUC	hydrologic unit code
mg/L	milligrams per liter
MRP	Monitoring and Reporting Program
µS/cm	microsiemens per centimeter
MS/MSD	matrix spike/matrix spike duplicate
NCL	North Coast Laboratories
NTU	nephelometric turbidity unit
NCL	North Coast Laboratory
P	Phosphorus
PER	Pacific EcoRisk

Acronyms/Abbreviations	Definition
Physis	Physis Environmental Laboratories
ppt	parts per thousand
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RPD	relative percent difference
SCRWA	South County Regional Wastewater Authority
SVWP	Salinas Valley Water Project
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
TIE	Toxicity Identification Evaluation
TKN	Total Kjeldahl nitrogen
TMDL	Total Maximum Daily Load
TSS	total suspended solid
u/s	upstream
USGS	United States Geological Survey
UCSC	University of California Santa Cruz
VBY	Sample received at improper temperature
VBZ	Sample preserved improperly, flagged by Quality Assurance Officer
VCJ	Analyte concentration is in excess of the instrument calibration; considered estimated
VFDP	Elevated field duplicate relative percent difference
VFIF	Instrument/Probe Failure, flagged by Quality Assurance Officer
VGB	Matrix spike/matrix spike duplicate percent recovery outside control limits
VGN	Surrogate recovery not within control limits
VH	Holding time violation occurred
VIL	Matrix spike/matrix spike duplicate relative percent differenced outside control limits
VIP	Analyte detected in field or lab generated blank
VJ	Estimated value – Environmental Protection Agency Flag, flagged by Quality Assurance Officer
VR	Data rejected
VEUM	Laboratory control sample is outside of control limits
WQO	Water Quality Objective
WWTP	Wastewater treatment plant

1.0 INTRODUCTION

1.1 BACKGROUND

In 1999, Senate Bill 923 amended the California Water Code §13269 to require all waivers of waste discharge requirements existing on January 1, 2000, to expire on January 1, 2003. Irrigated agriculture was covered by a broad waiver that expired in 2003. As amended, California WC §13269 allowed waivers for specific types of discharges if the waiver met five conditions and did not exceed five years in length.

In July 2004, the Central Coast Regional Water Quality Control Board (CCRWQCB) adopted an order for irrigated agriculture requiring irrigated agricultural operations to enroll under the *Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Order No. R3-2004-0117)* (hereinafter referred to as the 2004 Ag Order) or be regulated under other CCRWQCB discharge requirements. In March 2012, March 2017, and April 2021, the CCRWQCB adopted new Ag Orders, Order Numbers R3-2012-0011, R3-2017-0002, and R3-2021-0040, respectively. Prior to 2012, the 2004 Ag Order was renewed for one year each in 2009, 2010, and 2011.

The 2004 Ag Order required that farm operators with irrigated agricultural operations meet the following requirements to participate: 1) enroll with the CCRWQCB, 2) attend a minimum of 15 hours of approved farm water quality education, 3) complete a farm water quality management plan, 4) implement management practices to improve water quality in tailwater, stormwater runoff, and discharges to groundwater, and 5) perform individual surface water quality monitoring or participate in cooperative water quality monitoring. To provide guidance to facilitate meeting these requirements, the CCRWQCB developed a Monitoring and Reporting Program (MRP) that described the monitoring and reporting requirements for all farm operators. In response to the requirements, CCWQP, a non-profit corporation, was formed by the agriculture industry to implement and manage the Cooperative Monitoring Program (CMP). The CMP, operated by CCWQP from 2005 through the present, fulfilled the cooperative monitoring option provided in the 2004 Ag Order and initiated monitoring in January 2005.

For the purposes of the 2004 Ag Order, the CMP initially conducted water quality monitoring at 25 sites within two HUs: the Santa Maria HU (including Oso Flaco Creek) in Santa Barbara and San Luis Obispo Counties and the Salinas HU in Monterey County. This was expanded with an additional 25 sites in a second phase (beginning in 2006) to include four additional Central Coast HUs; Pajaro River, Estero Bay, Santa Ynez, and South Coast. In 2012, the CMP was updated to include reporting on several additional monitoring sites via collaboration with other programs, as well as several additional water quality parameters related to nutrients and toxicity to aquatic organisms. Pursuant to the 2017 Ag Order, the CMP was modified in 2017, 2021, and 2022 to repeat previous special studies related to supplemental toxicants and toxicity testing (CCRWQCB 2017).

The overall goals of monitoring are to characterize the water quality conditions in agricultural watersheds, to understand long-term water quality trends in agricultural areas, and to meet the requirements specified in the MRP. Though the overall goals of monitoring have not changed, adoption of Order No. R3-2021-0040 in 2021 (also known as Agricultural Order) marked a significant change relative to prior Orders. The Agricultural Order included, for the first time, Total Maximum Daily Loads (TMDLs). A TMDL is the maximum amount of a pollutant a waterbody can assimilate and still attain water quality standards. The Central Coast Water Board adopts TMDLs and an associated implementation plan that identifies actions, regulatory (e.g., waste discharge requirements, conditional waivers, etc.) and/or non-regulatory (e.g., voluntary actions and grant funded restoration and treatment projects), that should be taken to attain water quality standards within a reasonable time schedule. It is presumed that when the TMDL is implemented effectively, the waterbody will attain water quality standards and no longer be deemed impaired (CCRWQCB 2021). The practical effect of TMDLs being included in Agricultural Order is the need for CCWQP to annually compare water quality data for sites monitored by the CMP to relevant TMDL criteria (which are now numeric Limits in the Ag Order) and report the results within the required annual reports.

Prior to 2006, funding for CMP was provided in part by a combination of the Non-Point Source Pollution Monitoring Fund for North Monterey County (PGE-SEP) and Guadalupe Oil Field Settlement funds. Funding for CMP water quality and bioassessment monitoring during 2006-2008 was provided in part by two Proposition 50 Agriculture

Water Quality Grant Program Grants administered by the Central Coast Regional Water Quality Control Board. Since its inception, the CMP has also been supported by participation fees from Central Coast irrigated growers and landowners enrolled in the Ag Order. Since 2010, grower participation fees have been the sole source of funding for the program. In-kind services have also been provided by many partner organizations and through the active and generous participation of numerous industry representatives on the CCWQP board of directors and CMP committees.

1.2 PROJECT OBJECTIVES

The objectives of the CMP, described in the Agricultural Order Monitoring and Reporting Program (CCRWQCB 2021), are to:

- Assess the impacts of waste discharges from irrigated lands to receiving water;
- Assess compliance with the numeric limits described in the Order;
- Assess the status of receiving water quality and Beneficial Use protection in impaired waterbodies dominated by agricultural activity;
- Evaluate short-term patterns and long-term trends (5 to 10 years or more) in receiving water quality;
- Evaluate water quality impacts resulting from agricultural discharges (including, but not limited to, tile drain discharges);
- Evaluate water quality impacts resulting from stormwater discharges from agricultural operations;
- Evaluate condition of existing perennial, intermittent, or ephemeral streams or riparian or wetland area habitat, including degradation resulting from erosion or agricultural discharges of waste; and
- Assist in the identification of specific sources of water quality problems.

An additional objective of the original program was, and still is, to provide feedback to growers in areas of concern in order to facilitate water quality improvements.

1.3 PROJECT AREA

The Central Coast Hydrologic Region extends from southern San Mateo County in the north to Santa Barbara County in the south (**Figure 1-1**). The Region includes all of Santa Cruz, Monterey, San Benito, San Luis Obispo, and Santa Barbara Counties and parts of San Mateo, Santa Clara, and Ventura Counties. Most of the Central Coast Region is within the Coast Range. The Region's interior boundary runs northeast to southwest along the hills bordering the San Andreas Fault Zone to the Kern County border. A few square miles of Kern County are included in the Region, and a few square miles of San Luis Obispo and Santa Barbara Counties are excluded. To the south, a small portion of Ventura County is also included in the Region.

Most of the Central Coast Region is drained by four large watersheds: the Pajaro River, the Salinas River and its tributaries, the Santa Maria River, and the Santa Ynez River. The mid-coastal portion (the Estero Bay Region) and extreme southern coastal portion of the Region are characterized by many short, steep, and relatively small watersheds.

The climate of the Central Coast Region is relatively temperate all year due to its location adjacent to the Pacific Ocean. The Central Coast has a Mediterranean climate characterized by mild, wet winters and warm, dry summers. Annual average precipitation in the Region ranges from 14 to 45 inches throughout most of the Region, but southern interior basins typically receive 5 to 10 inches per year, with the mountain areas receiving more rainfall than the valley floors. Most precipitation occurs between late November and mid-April. The average annual precipitation near Salinas is about 15 inches.

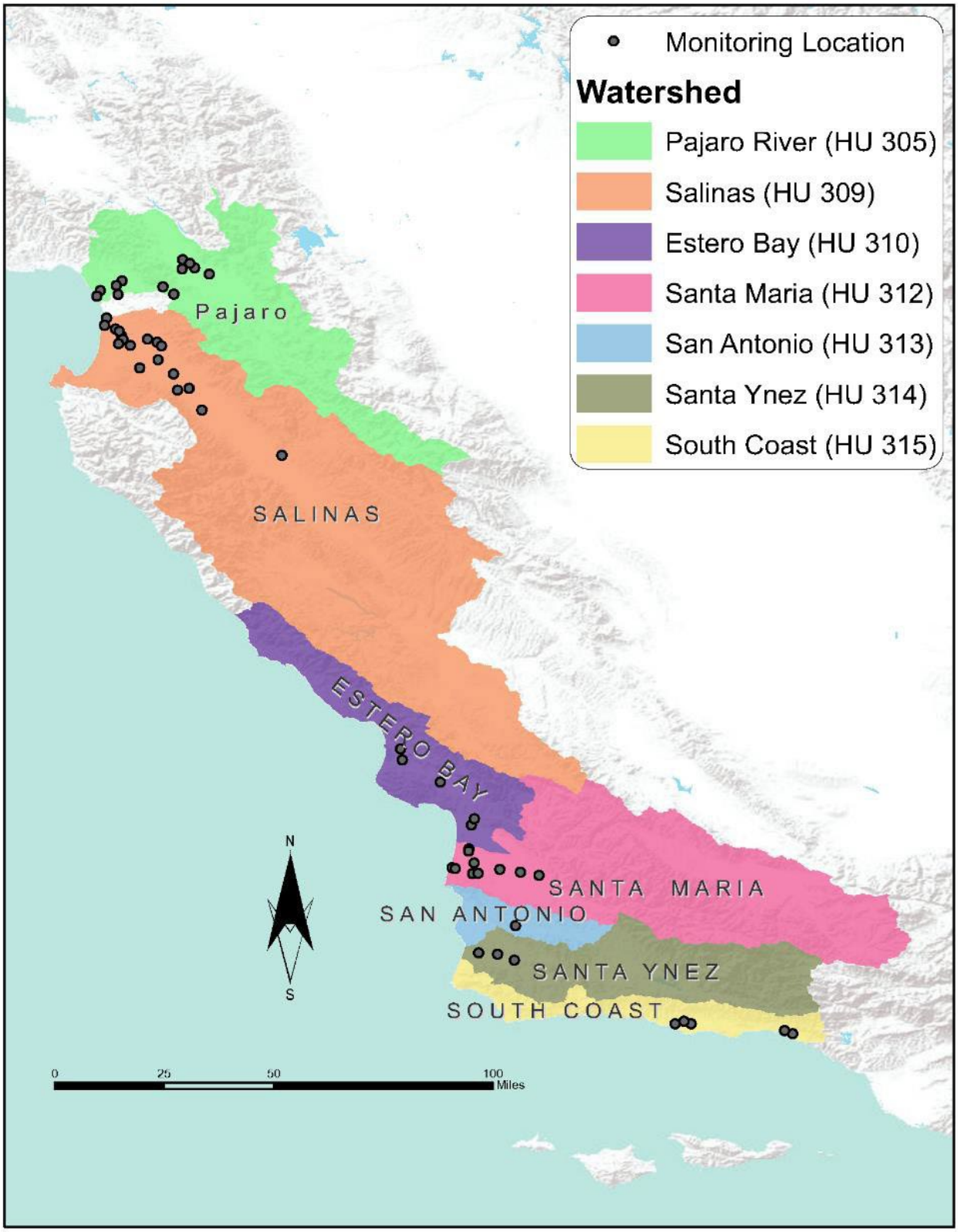


Figure 1-1. Cooperative Monitoring Program Project Area and Core Monitoring Sites

The Central Coast of California comprises six counties that run along the Pacific Ocean, and it is traditionally known for its beaches, agriculture and viticulture industries, and tourism. About 2.3 million people live in the six Central Coast counties, roughly 9% of California's total area and about 6% of its population. The Central Coast comprises Monterey, San Benito, San Luis Obispo, Santa Barbara, Santa Cruz, and Ventura counties (California 100 2023). About 65 percent of the Central Coast population lives in incorporated cities with populations greater than 20,000, including Salinas, Santa Barbara, Santa Maria, Santa Cruz, San Luis Obispo, Lompoc, Watsonville, Hollister, Seaside, Monterey, Atascadero, and Paso Robles. There are many additional small communities in the Region with populations fewer than 20,000. The topography of the Central Coast Region and its distance from California's major population centers results in a landscape that is largely pastoral and agricultural. Major economic activities include tourism, education, agriculture, and agriculture-related processing, and government and service-sector employment. Agriculture is the predominant land use in the Salinas Valley, Pajaro watershed, and San Luis Obispo County. There are over 600,000 acres of prime farmland, farmland of statewide importance, unique farmland, and farmland of local importance within the Region. Additionally, there are over 1.2 million acres of grazing land (CDC 2016).

Additional details are provided in Section 3 for the individual Hydrologic Units within the Central Coast Region.

2.0 METHODS

2.1 MONITORING SITES

The CMP has traditionally included approximately 50 regularly monitored sites located in six HUs throughout the Central Coast Region (with one more recently added site from a separate seventh unit). The CMP initially included 25 sites in the Santa Maria Region in Santa Barbara County (including a small area of southern San Luis Obispo County) and the lower Salinas River Region in Monterey County. In 2006, the CMP was expanded to include an additional 25 sites, including 10 sites in the Pajaro River Watershed monitored by University of California Santa Cruz (UCSC). Monitoring by UCSC was part of the Pajaro River Monitoring Project, which ran from 2005 through 2008 with funding from the CCRWQCB (Grant ID #05-102-553-0: *Long-Term High-Resolution Nutrient & Sediment Monitoring*).

In 2012, the CMP was modified to include a total of seven additional sites (five in the northern monitoring area and two in the southern monitoring area), with two sites removed (one in the north and one in the south). These were added to the CMP to provide information about additional impaired waterbodies in watersheds with agricultural land use. The removed sites either did not convey sufficient amounts of water and/or did not reflect sufficient agricultural land use to merit continued monitoring efforts by the program.

Cooperative monitoring sites for 2023, 56 in total, are listed with brief descriptions in **Table 2-1**. Additional details for each HU and region are provided in Section 3 (Water Quality Monitoring Results).

Table 2-1. Monitoring Site Locations, 2023

Region	Site ID[1]	Site Description	Longitude	Latitude
Lower Pajaro	305SAL	Salsipuedes Creek downstream of Corralitos Creek upstream from Highway 129	121.73183	36.92028
Lower Pajaro	305PJP	Pajaro River at Main St.	-121.75105	36.90533
Lower Pajaro	305WSA	Watsonville Slough at San Andreas Rd.	-121.80430	36.88793
Lower Pajaro	305BRS	Beach Road Ditch at Shell Rd.	-121.81516	36.86978
Lower Pajaro	305WCS	Watsonville Creek at Elkhorn Road/Hudson Landing	-121.74521	36.87385
Upper Pajaro	305CAN	Carnadero Creek upstream of Pajaro River	-121.53444	36.96002
Upper Pajaro	305CHI	Pajaro River at Chittenden	-121.59770	36.90033
Upper Pajaro	305FRA	Millers Canal at Frazier Lake Rd.	-121.49207	36.96344
Upper Pajaro	305LCS	Llagas Creek at Southside	-121.53213	36.99053
Upper Pajaro	305SJA	San Juan Creek at Anzar Rd.	-121.56144	36.87548
Upper Pajaro	305TSR	Tequisquita Slough u/s Pajaro River at Shore Rd.	-121.44437	36.94279
Upper Pajaro	305FUF	Furlong Creek at Frazier Lake Rd.	-121.50800	36.97900
Castroville & Blanco	309ASB	Alisal Slough at White Barn	-121.72968	36.72482
Castroville & Blanco	309BLA	Blanco Drain below Pump	-121.74393	36.71060
Castroville & Blanco	309ESP	Espinosa Slough upstream of Alisal Slough	-121.73372	36.73675

Region	Site ID[1]	Site Description	Longitude	Latitude
Castroville & Blanco	309GAB	Gabilan Creek at Boronda Rd.	-121.61641	36.71548
Castroville & Blanco	309JON	Salinas Reclamation Canal at San Jon Rd.	-121.70496	36.70493
Castroville & Blanco	309MER	Merritt Ditch upstream from Highway 183	-121.74208	36.75184
Castroville & Blanco	309MOR	Moro Cojo Slough at Highway 1	-121.78328	36.79646
Castroville & Blanco	309NAD	Natividad Creek u/s from Salinas Reclamation Canal	-121.60197	36.70254
Castroville & Blanco	309OLD	Old Salinas River at Monterey Dunes Wy.	-121.79008	36.77166
Castroville & Blanco	309TEH	Tembladero Slough at Haro St.	-121.75445	36.75952
Lower Salinas	309ALG	Salinas Reclamation Canal at La Guardia St.	-121.61297	36.65697
Lower Salinas	309CRR	Chualar Creek North Branch East of Highway 101	-121.50995	36.56142
Lower Salinas	309CCD	Chualar Creek West of Highway 101 on River Rd.	-121.51116	36.56130
Lower Salinas	309GRN	Salinas River at Elm Rd. in Greenfield	-121.20429	36.33797
Lower Salinas	309QUI	Quail Creek at Highway 101	-121.56211	36.60943
Lower Salinas	309RTA	Santa Rita Creek at Santa Rita Creek Park	-121.64800	36.72600
Lower Salinas	309SAC[2]	Salinas River at Chualar Bridge on River Rd.	-121.54951	36.55598
Lower Salinas	309SAG[2]	Salinas River at Gonzales River Rd. Bridge	-121.46854	36.48815
Lower Salinas	309SSP	Salinas River at Spreckels Gage	-121.67339	36.62967
Arroyo Grande	310LBC	Los Berros Creek at Century	-120.57837	35.10287
Arroyo Grande	310USG	Arroyo Grande Creek at old USGS Gage	-120.56907	35.12442
San Luis Obispo	310CCC	Chorro Creek upstream from Chorro Flats	-120.8124	35.35767
San Luis Obispo	310PRE	Prefumo Creek at Calle Joaquin	-120.68168	35.24732
San Luis Obispo	310SLD	Davenport Creek at Broad Street	-120.61824	35.21874
San Luis Obispo	310WRP	Warden Creek at Wetlands Restoration Preserve	-120.80647	35.32067
Santa Maria	312BCC	Bradley Canyon Creek	-120.35594	34.93526
Santa Maria	312BCJ	Bradley Channel at Jones Street	-120.41711	34.94561
Santa Maria	312GVS	Green Valley at Simas	-120.556457	34.942280
Santa Maria	312MSD	Main St. Canal u/s from Ray Road at Highway 166	-120.486578	34.955227
Santa Maria	312OFC	Oso Flaco Creek at Oso Flaco Lake Rd.	-120.586259	35.016388
Santa Maria	312OFN	Little Oso Flaco Creek	-120.586157	35.022795
Santa Maria	312ORC	Orcutt Solomon Creek u/s of Santa Maria River	-120.631454	34.957554

Region	Site ID[1]	Site Description	Longitude	Latitude
Santa Maria	312ORI	Orcutt Solomon Creek at Highway 1	-120.572882	34.941374
Santa Maria	312SMI	Santa Maria River at Highway 1	-120.569832	34.977207
Santa Maria	312SMA	Santa Maria River at Estuary	-120.641796	34.963774
San Antonio	313SAE	San Antonio Creek at San Antonio Road East	-120.43200	34.76700
Lompoc	314SYF[2]	Santa Ynez River at Floradale Ave.	-120.49266	34.67192
Lompoc	314SYR	Santa Ynez River at River Park	-120.43698	34.65180
Lompoc	314SYN	Santa Ynez River at 13th St.	-120.55442	34.67677
Santa Barbara	315APF	Arroyo Paredon at Foothill Rd.	-119.54445	34.41676
Santa Barbara	315BEF	Bell Creek at Winchester Canyon Park	-119.90579	34.43926
Santa Barbara	315FMV	Franklin Creek at Mountain View Ln.	-119.51766	34.40678
Santa Barbara	315GAN	Glen Annie Creek upstream Cathedral Oaks	-119.87635	34.44772
Santa Barbara	315LCC	Los Carneros Creek at Calle Real	-119.85358	34.43949

Notes: 1 The first three digits of the Site ID correspond to the Hydrologic Unit Code (HUC) for each region.
HUC Key: 305=Pajaro; 309=Salinas; 310=Estero Bay; 312=Santa Maria; 313= San Antonio; 314=Santa Ynez; 315=South Coast
u/s upstream
2 This is a status site (i.e., non-trend) and is monitored at 50% frequency for all parameters due to their siting being either redundant with trend sites that meet the requirements of the MRP within the same impaired reach (i.e., 309SAC, 309SAG, and 314SYF), or the lack of contributing agricultural discharges (i.e., 314SYF).

2.2 ROUTINE MONITORING PARAMETERS AND SCHEDULE

The CMP includes routine chemical, physical, toxicological, and biological monitoring elements. Samples are collected in a manner appropriate for the specific analytical methods used. Water samples were typically collected as grab samples and collected in the middle of the channel, just below the surface. Standard operating procedures for collection and analysis of surface water, sediment, and bioassessment samples are described briefly in Sections 2.3 through 2.7 of this report, and in more detail in the CMP's Quality Assurance Project Plan (QAPP) and associated amendments (CCWQP 2013, 2018a, 2018b). The standard operating procedures implemented in 2023 were consistent with the QAPP (2018b) and Agricultural Order. The QAPP was updated in 2023 to reflect all requirements specified in the 2021 MRP to the Agricultural Order.

The core CMP monitoring components and schedule consist of the following:

- Chemical and physical constituents measured monthly:
  - Nitrate+nitrite (as nitrogen [N])[1]
  - Total ammonia (as N)
  - Unionized ammonia
  - Total nitrogen (added in 2012)
  - Total Kjeldahl nitrogen
  - Soluble orthophosphate
  - Total phosphorus (as phosphorus [P]) (added in 2012)
  - Water column chlorophyll-*a*
  - Dissolved oxygen
  - Temperature
  - Total dissolved solids
  - Total suspended solids (added in 2012)

[1] Samples were collected for nitrate+nitrite analysis. This report discusses nitrate results as nitrite levels are assumed to be negligible.

  - Electrical conductivity
  - Salinity
  - pH
  - Turbidity
  - Flow
- Chemical constituents monitored quarterly:
  - Total alkalinity (as $CaCO_3$) (added in 2022)
  - Calcium (added in 2022)
  - Magnesium (added in 2022)
  - Sodium (added in 2022)
  - Potassium (added in 2022)
  - Sulfate (SO_4) (added in 2022)
  - Chloride (added in 2022)
- Chronic toxicity of ambient waters was historically assessed with three species (invertebrates, fish, and algae), four times a year (twice during the dry season and twice during the wet season). In 2017, the fish test species was removed, and an additional invertebrate species (*Chironomus dilutus*) was added.
- Sediment toxicity testing was historically conducted once each year in spring, but in 2017 the frequency of testing was increased to twice each year, once from April-June and once in from August-October. The 2021 MRP to the Agricultural Order maintained this frequency and timing through the end of 2021, after which it adjusted to once per year from April-June.
- Benthic macroinvertebrate assessments were conducted in 2023 and will continue on a 5-year cycle.
- Assessments of aquatic habitat (filamentous algae and periphyton coverage, dominant substrate, bank vegetation and shading) are conducted monthly as part of the regularly scheduled monitoring, and in more detail for the macroinvertebrate bioassessment monitoring mentioned above.
- Supplemental analyses of potential toxicants (i.e., pesticides, herbicides, metals) were conducted initially (2006-2011) as focused "follow-up" projects to address exceedances of narrative objectives related to aquatic toxicity, which were observed during core CMP monitoring. In the 2012-2016 Waiver period, supplemental analyses were conducted on a more comprehensive basis, at all sites during either the 2013 or 2014 monitoring year. Supplemental toxicant sampling was also conducted at all sites during the 2017 and 2018 monitoring years. Supplemental analyses for 2021 and 2022 are summarized in the context of concurrent toxicity testing results in the *Central Coast Cooperative Monitoring Program Supplemental Monitoring Report, 2021 and 2022 Aquatic Toxicity & Potential Toxicants* (CCWQP 2023).

2.2.1 Water Quality Criteria

The parameters presented above were selected to evaluate whether water and habitat quality in agricultural regions support the Beneficial Uses designated for Central Coast waterbodies in the *Water Quality Control Plan for the Central Coast Basin* (Basin Plan) (CCRWQCB 2019). This evaluation requires a careful comparison of results to Basin Plan water quality objectives that are deemed protective of relevant Beneficial Uses. However, where a waterbody has been previously deemed impaired and a TMDL established, results must be compared to TMDL related numeric limits, as described in Agricultural Order. Additionally, the Agricultural Order identifies non-TMDL area limits associated with nutrients, pesticide toxicity, and sediment for waterbodies without an associated TMDL limit. Additional discussion regarding the water quality criteria referenced in this report and used for comparison to sampling results is summarized in the following subsections. **Figure 2-1** describes the hierarchical approach used to determine applicable water quality criteria for a given site.

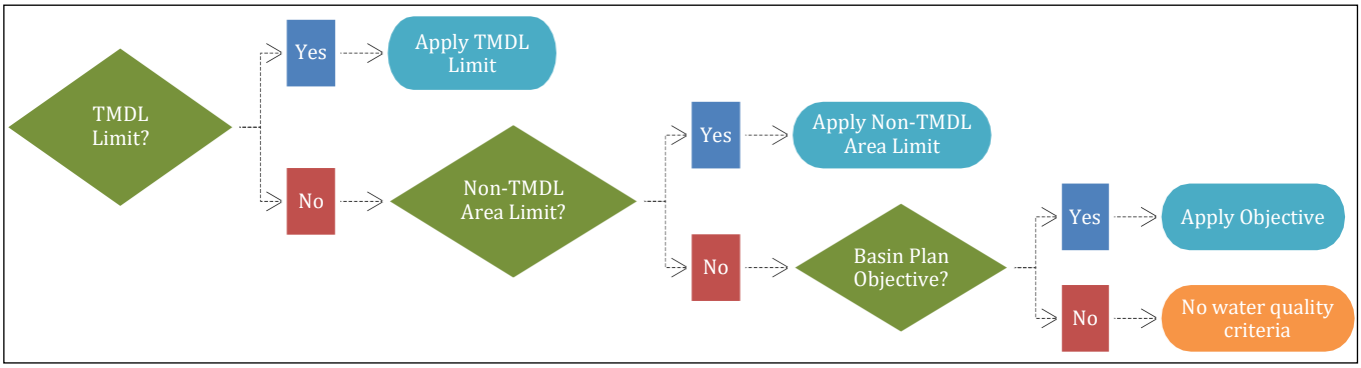


Figure 2-1. Hierarchical Approach Used to Determine Applicable Water Quality Criteria

2.2.1.1 Basin Plan Beneficial Uses and Water Quality Objectives

Table 2-1 of the Basin Plan contains a list of designated Beneficial Uses for many of the Central Coast Region's waterbodies (CCRWQCB 2019). For surface waterbodies within the Central Coast Region that do not have Beneficial Uses designated for them in Table 2-1 of the Basin Plan, the following designations are assigned: municipal and domestic supply, and protection of both recreation and aquatic life uses. The CCRWQCB staff interprets this to include, at a minimum, the following specific Beneficial Uses: Municipal and Domestic Supply (MUN), Water Contact Recreation (REC-1), Non-contact Recreation (REC-2), Cold Freshwater Habitat (COLD), and Warm Freshwater Habitat (WARM). The Basin Plan also assigns numeric Water Quality Objectives for dissolved oxygen, oxygen saturation, pH, and unionized ammonia to all waterbodies unless other water quality objectives for these parameters are applicable based on the Beneficial Uses assigned in Table 2-1. These indicators of water quality and their relationship to Beneficial Uses defined in the Basin Plan have been used previously by the CCRWQCB to assess Central Coast waterbodies. **Table 2-2** presents a summary of the Beneficial Uses pertinent to CMP monitoring sites. Inland Saline Water Habitat (SAL) and Aquaculture (AQUA) beneficial uses are not included in **Table 2-2** since none of the core CMP monitoring locations have SAL or AQUA beneficial uses according to Table 2-1 in the Basin Plan. Water quality objectives for specific monitoring parameters and their related Beneficial Uses are summarized in **Table 2-3** (CCRWQCB 2019).

The Basin Plan includes ranges of numeric objectives for ammonia, nitrate, and conductivity to protect Agricultural Beneficial Uses (AGR). However, the method to implement and interpret the different ranges is not specified in the Basin Plan. For the purpose of this report, concentrations are compared conservatively to the low ends of these ranges but concentrations in excess of these numbers should not necessarily be interpreted as exceedances or violations.

In this report, dissolved oxygen is assessed relative to numeric Water Quality Objectives defined in the Basin Plan. However, due to daytime photosynthesis and evening respiration of algae, aquatic plants, aquatic animals and microbes, the diurnal variation of dissolved oxygen within the water column can be significant and the measured concentration highly dependent on the time of day. In light of this natural cycle, a meaningful way to interpret dissolved oxygen results is based on its departure from a defined acceptable range. For certain water quality assessment purposes, the Central Coast Ambient Monitoring Program (CCAMP) measures the departure of dissolved oxygen results outside an acceptable range, which CCAMP defines as 7.0 to 13.0 milligrams per liter (mg/L), by its distance from the center point (10 mg/L) (CCAMP 2016).

A summary of numeric Water Quality Objectives applicable to individual CMP sites is presented in **Table 2-4** of this report.

Table 2-2. Designated Beneficial Uses[1] for Core CMP Monitoring Locations

CMP Site ID	CMP Site Description	Corresponding Basin Plan "Waterbody Names"	GENERAL OBJECTIVES	MUN	AGR	PROC	IND	GWR	REC1	REC2	WILD	COLD	WARM	MIGR	SPWN	BIOL	RARE	EST	FRSH	COMM	SHELL
305PJP	Pajaro River at Main St.	Pajaro River	X	X	X		X	X	X	X	X	X	X	X	X				X	X	
305CHI	Pajaro River at Chittenden	Pajaro River	X	X	X		X	X	X	X	X	X	X	X	X				X	X	
305FRA	Millers Canal at Frazier Lake Rd.[2]	Not Applicable	X	X					X	X		X	X								
305SJA	San Juan Creek at Anzar Rd.[2]	Not Applicable	X	X					X	X		X	X								
305TSR	Tequisquita Slough u/s Pajaro River at Shore Rd.	Tequisquita Slough	X					X	X	X	X		X		X					X	
305LCS	Llagas Creek at Southside	Llagas Creek (below Chesbro Res.)	X	X	X		X	X	X	X	X	X	X	X	X		X			X	
305CAN	Carnadero Creek upstream of Pajaro River	Carnadero Creek	X	X				X	X	X	X	X	X	X			X			X	
305SAL	Salsipuedes Creek downstream of Corralitos Creek upstream from Highway 129	Salsipuedes Creek	X	X	X			X	X	X	X	X		X	X					X	
305WSA	Watsonville Slough at San Andreas Rd.	Watsonville Slough	X						X	X	X		X		X	X	X	X		X	
305BRS	Beach Road Ditch at Shell Rd.[2]	Not Applicable	X	X					X	X		X	X								

CMP Site ID	CMP Site Description	Corresponding Basin Plan "Waterbody Names"	General Objectives	MUN	AGR	PROC	IND	GWR	REC1	REC2	WILD	COLD	WARM	MIGR	SPWN	BIOL	RARE	EST	FRSH	COMM	SHELL
305WCS	Watsonville Creek at Salinas Road/Hudson Landing[2]	Not Applicable	X	X					X	X		X	X								
305FUF	Furlong Creek at Frazier Lake Rd.[2]	Not Applicable	X	X					X	X		X	X								
309MOR	Moro Cojo Slough at Highway 1	Moro Cojo Slough	X					X	X	X	X	X	X		X	X	X	X		X	X
309OLD	Old Salinas River at Monterey Dunes Wy.	Old Salinas River	X						X	X	X	X	X	X	X	X	X	X		X	
309TEH	Tembladero Slough at Haro St.	Tembladero Slough	X						X	X	X		X	X	X		X	X		X	X
309MER	Merritt Ditch upstream from Highway 183[2]	Not Applicable	X	X					X	X		X	X								
309ESP	Espinosa Slough upstream of Alisal Slough	Espinosa Slough	X						X	X	X		X							X	
309JON	Salinas Reclamation Canal at San Jon Rd.	Salinas Reclamation Canal	X						X	X	X		X	X						X	
309ALG	Salinas Reclamation Canal at La Guardia St.	Salinas Reclamation Canal	X						X	X	X		X	X						X	
309NAD	Natividad Creek upstream from Salinas Reclamation Canal[2]	Not Applicable	X	X					X	X		X	X								

CMP Site ID	CMP Site Description	Corresponding Basin Plan "Waterbody Names"	General Objectives	MUN	AGR	PROC	IND	GWR	REC1	REC2	WILD	COLD	WARM	MIGR	SPWN	BIOL	RARE	EST	FRSH	COMM	SHELL
309GAB	Gabilan Creek at Boronda Rd.	Gabilan Creek	X	X	X			X	X	X	X	X	X	X	X		X			X	
309ASB	Alisal Slough at White Barn[2]	Not Applicable	X	X					X	X		X	X								
309BLA	Blanco Drain below Pump	Blanco Drain	X						X	X	X		X							X	
309SSP	Salinas River at Spreckels Gage	Salinas River, downstream of Spreckels Gage	X	X	X				X	X	X	X	X	X					X	X	
309SAC	Salinas River at Chualar Bridge on River Rd.	Salinas River, Spreckels Gage-Chualar	X	X	X	X	X	X	X	X	X	X	X	X						X	
309QUI	Quail Creek at Highway 101[2]	Not Applicable	X	X					X	X		X	X								
309GRN	Salinas River at Elm Rd. in Greenfield	Salinas Riv, Chualar-Nacimiento Riv	X	X	X	X	X	X	X	X	X	X	X	X	X		X			X	
309SAG	Salinas River at Gonzales River Rd. Bridge	Salinas Riv, Chualar-Nacimiento Riv	X	X	X	X	X	X	X	X	X	X	X	X	X		X			X	
309CCD	Chualar Creek West of Highway 1 on River Rd.[2]	Not Applicable	X	X					X	X		X	X								
309CRR	Chualar Creek North Branch East of Hwy 1[2]	Not Applicable	X	X					X	X		X	X								
309RTA	Santa Rita Creek at Santa Rita Creek Park[2]	Not Applicable	X	X					X	X		X	X								

CMP Site ID	CMP Site Description	Corresponding Basin Plan "Waterbody Names"	General Objectives	MUN	AGR	PROC	IND	GWR	REC1	REC2	WILD	COLD	WARM	MIGR	SPWN	BIOL	RARE	EST	FRSH	COMM	SHELL
310CCC	Chorro Creek upstream from Chorro Flats	Chorro Creek	X	X	X			X	X	X	X	X	X	X	X	X	X		X	X	
310WRP	Warden Creek at Wetlands Restoration Preserve[2]	Not Applicable	X	X					X	X		X	X								
310PRE	Prefumo Creek at Calle Joaquin	Prefumo Creek	X	X	X			X	X	X	X	X		X	X		X		X	X	
310SLD	Davenport Creek at Broad Street	Davenport Creek	X	X	X			X	X	X	X	X					X			X	
310USG	Arroyo Grande Creek at old USGS Gage	Arroyo Grande Creek, downstream from Lopez Re.	X	X	X		X	X	X	X	X	X	X	X			X		X	X	
310LBC	Los Berros Creek at Century	Los Berros Creek	X	X	X			X	X	X	X	X		X			X			X	
312OFC	Oso Flaco Creek at Oso Flaco Lake Rd.	Oso Flaco Creek	X	X	X			X	X	X	X		X			X	X		X	X	
312OFN	Little Oso Flaco Creek[2]	Not Applicable	X	X					X	X		X	X								
312SMA	Santa Maria River at Estuary	Santa Maria River	X	X	X		X	X	X	X	X	X	X	X			X		X	X	
312SMI	Santa Maria River at Highway 1	Santa Maria River	X	X	X		X	X	X	X	X	X	X	X			X		X	X	
312BCC	Bradley Canyon Creek[2]	Not Applicable	X	X					X	X		X	X								

CMP Site ID	CMP Site Description	Corresponding Basin Plan "Waterbody Names"	GENERAL OBJECTIVES	MUN	AGR	PROC	IND	GWR	REC1	REC2	WILD	COLD	WARM	MIGR	SPWN	BIOL	RARE	EST	FRSH	COMM	SHELL
312BCJ	Bradley Channel at Jones Street[2]	Not Applicable	X	X					X	X		X	X								
312GVS	Green Valley at Simas[2]	Not Applicable	X	X					X	X		X	X								
312MSD	Main Street Canal u/s Ray Road at Highway 166[2]	Not Applicable	X	X					X	X		X	X								
312ORC	Orcutt Solomon Creek u/s of Santa Maria River	Orcutt Creek	X	X	X			X	X	X	X	X	X				X	X	X	X	
312ORI	Orcutt Solomon Creek at Highway 1	Orcutt Creek	X	X	X			X	X	X	X	X	X				X	X	X	X	
313SAE	San Antonio Creek at San Antonio Road East	San Antonio Creek	X	X	X			X	X	X	X	X	X	X	X		X		X	X	
314SYR	Santa Ynez River at River Park	Santa Ynez River, downstream Cachuma Res.	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	
314SYF	Santa Ynez River at Floradale Ave.	Santa Ynez River, downstream Cachuma Res.	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	
314SYN	Santa Ynez River at 13th St.	Santa Ynez River, downstream Cachuma Res.	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	
315GAN	Glen Annie Creek upstream Cathedral Oaks	Glenn Annie Creek	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	
315APF	Arroyo Paredon at Foothill Rd.	Arroyo Paredon	X	X	X			X	X	X	X	X	X	X	X		X	X	X	X	

CMP Site ID	CMP Site Description	Corresponding Basin Plan "Waterbody Names"	General Objectives	MUN	AGR	PROC	IND	GWR	REC1	REC2	WILD	COLD	WARM	MIGR	SPWN	BIOL	RARE	EST	FRSH	COMM	SHELL
315FMV	Franklin Creek at Mountain View Ln.	Franklin Creek	X	X	X			X	X	X	X	X	X	X	X		X		X	X	
315BEF	Bell Creek at Winchester Canyon Park[2]	Not Applicable	X	X					X	X		X	X								
315LCC	Los Carneros Creek at Calle Real	Carneros Creek	X	X	X			X	X	X	X	X	X						X	X	

Notes: 1 Key to Beneficial Use Codes:

Code	Beneficial Use	Code	Beneficial Use
MUN	Municipal and Domestic Supply	WARM	Warm Fresh Water Habitat
AGR	Agricultural Supply	MIGR	Migration of Aquatic Organisms
PROC	Industrial Process Supply	SPWN	Spawning, Reproduction, and/or Early Development
IND	Industrial Service Supply	BIOL	Preservation of Biological Habitats of Special Significance
GWR	Groundwater Recharge	RARE	Rare, Threatened, or Endangered Species
REC1	Water Contact Recreation	EST	Estuarine Habitat
REC2	Non-Contact Water Recreation	FRSH	Fresh Water Replenishment
WILD	Wildlife Habitat	COMM	Commercial and Sport Fishing
COLD	Cold Fresh Water Habitat	SHELL	Shellfish Harvesting

2 Table 2-1 of the Basin Plan does not designate Beneficial Uses for the water body, so the following have been assigned: Municipal and Domestic Supply (MUN), Water Contact Recreation (REC-1), Non-contact Recreation (REC-2), Cold Freshwater Habitat (COLD), and Warm Freshwater Habitat (WARM).

Table 2-3. Basin Plan General Objectives and Objectives for Specific Beneficial Uses Applicable to CMP Parameters

Parameters Monitored	General Objectives[1]	Municipal and Domestic Water Supply	Agricultural Water Supply	Water Contact Recreation	Non-Contact Water Recreation	Cold Fresh Water Habitat	Warm Fresh Water Habitat	Fish Spawning	Shellfish Harvesting
Nitrate, mg/L as N	—	< 10	Var	—	—	—	—	—	—
Ammonia (NH_4^+), mg/L as N	—	—	Var	—	—	—	—	—	—
Unionized ammonia (NH_3), mg/L as N	<0.025	—	—	—	—	—	—	—	—
Orthophosphate, mg/L as P	—	—	—	—	—	—	—	—	—
Total Dissolved Solids, mg/L[2]	—	—	—	—	—	—	—	—	—
Conductivity, µS/cm	—	—	Var	—	—	—	—	—	—
Turbidity, NTU	NatB	—	—	—	—	—	—	—	—
Temperature, Fahrenheit	NatB	—	—	—	—	NatB	NatB	—	—
Dissolved Oxygen, mg/L	≥5	—	≥2	—	—	≥7	≥5	≥7	—
Dissolved Oxygen Saturation (median), %	≥85%	—	—	—	—	—	—	—	—
pH, -log[H^+]	7-8.5	6.5-8.3	6.5-8.3	6.5-8.3	6.5-8.3	7-8.5	7-8.5	—	—
Chlorophyll-a, µg/L	—	—	—	—	—	—	—	—	—
Flow, CFS	—	—	—	—	—	—	—	—	—
Aquatic Toxicity, Invertebrate species (Mortality and Reproduction)	Narr	—	—	—	—	—	—	—	—
Algae species (Cell Density)	Narr	—	—	—	—	—	—	—	—
Sediment Toxicity, Invertebrate species (Mortality and Growth)	Narr	—	—	—	—	—	—	—	—

Notes:

— The Basin Plan does not state a Water Quality Objective for this parameter.
1 General Objectives apply to all sites. Where more protective Beneficial Use Objectives are designated, those are used for the purpose of this report.
2 Objectives for TDS exist for specific CMP sites pursuant to Table 3-6 of the Basin Plan.
Var Varies since the numeric Water Quality Objectives for AGR are cited in Basin Plan as concentrations corresponding to “no problems”, “increasing problems” and “severe problems”.
Narr. Indicates Basin Plan objective is narrative.
NatB Indicates Basin Plan objective is based upon natural background conditions. The objective is defined as an acceptable increase in temperature/turbidity and the value of the objective varies based on the natural temperature/turbidity of the waterbody.

Table 2-4. Site-specific Basin Plan Objectives[1] for CMP Monitoring Sites

CMP Site ID	CMP Site Description	pH[2]	DO, mg/L[3]	DO Saturation, %[3]	TDS, mg/L	Ammonia as N, mg/L (NH_4^+)[4]	Unionized Ammonia as N, mg/L (NH_3)[5]	EC, µS/cm[4]	Nitrate as N, mg/L[4]
305PJP	Pajaro River at Main St.	7-8.3	≥7	none	none	*Var*	<0.025	*Var*	*Var*, <10
305CHI	Pajaro River at Chittenden	7-8.3	≥7	none	1000	*Var*	<0.025	*Var*	*Var*, <10
305FRA	Millers Canal at Frazier Lake Rd.[6]	7-8.3	≥5	≥85%	none	none	<0.025	none	<10
305SJA	San Juan Creek at Anzar Rd.[6]	7-8.3	≥5	≥85%	none	none	<0.025	none	<10
305TSR	Tequisquita Slough u/s Pajaro River at Shore Rd.	7-8.3	≥7	none	none	none	<0.025	none	None
305LCS	Llagas Creek at Southside	7-8.3	≥7	none	200	*Var*	<0.025	*Var*	*Var*, <10
305CAN	Carnadero Creek upstream of Pajaro River	7-8.3	≥7	none	none	none	<0.025	none	<10
305SAL	Salsipuedes Creek downstream of Corralitos Creek upstream from Highway 129	7-8.3	≥7	none	none	*Var*	<0.025	*Var*	*Var*, <10
305WSA	Watsonville Slough at San Andreas Rd.	7-8.3	≥7	none	none	none	<0.025	none	none
305BRS	Beach Road Ditch at Shell Rd.[6]	7-8.3	≥5	≥85%	none	none	<0.025	none	<10
305WCS	Watsonville Creek at Salinas Road/Hudson Landing[6]	7-8.3	≥5	≥85%	none	none	<0.025	none	<10
305FUF	Furlong Creek at Frazier Lake Rd.[6]	7-8.3	≥5	≥85%	none	none	<0.025	none	<10
309MOR	Moro Cojo Slough at Highway 1	7-8.3	≥7	none	none	none	<0.025	none	none
309OLD	Old Salinas River at Monterey Dunes Wy.	7-8.3	≥7	none	none	none	<0.025	none	none
309TEH	Tembladero Slough at Haro St.	7-8.3	≥7	none	none	none	<0.025	none	none

CMP Site ID	CMP Site Description	pH[2]	DO, mg/L[3]	DO Saturation, %[3]	TDS, mg/L	Ammonia as N, mg/L (NH_4^+)[4]	Unionized Ammonia as N, mg/L (NH_3)[5]	EC, µS/cm[4]	Nitrate as N, mg/L[4]
309MER	Merritt Ditch upstream from Highway 183[6]	7-8.3	≥5	≥85%	none	none	<0.025	none	<10
309ESP	Espinosa Slough upstream of Alisal Slough	7-8.3	≥5	none	none	none	<0.025	none	none
309JON	Salinas Reclamation Canal at San Jon Rd.	7-8.3	≥5	none	none	none	<0.025	none	none
309ALG	Salinas Reclamation Canal at La Guardia St.	7-8.3	≥5	none	none	none	<0.025	none	none
309NAD	Natividad Creek upstream from Salinas Reclamation Canal[6]	7-8.3	≥5	≥85%	none	none	<0.025	none	<10
309GAB	Gabilan Creek at Boronda Rd.	7-8.3	≥7	none	300	*Var*	<0.025	*Var*	*Var*, <10
309ASB	Alisal Slough at White Barn[6]	7-8.3	≥5	≥85%	none	none	<0.025	*Var*	<10
309BLA	Blanco Drain below Pump	7-8.3	≥5	none	none	none	<0.025	none	none
309SSP	Salinas River at Spreckels Gage	7-8.3	≥7	none	none	*Var*	<0.025	*Var*	*Var*, <10
309SAC	Salinas River at Chualar Bridge on River Rd.	7-8.3	≥7	none	600	*Var*	<0.025	*Var*	*Var*, <10
309QUI	Quail Creek at Highway 101[6]	7-8.3	≥5	≥85%	none	none	<0.025	none	<10
309GRN	Salinas River at Elm Rd. in Greenfield	7-8.3	≥7	none	600	*Var*	<0.025	*Var*	*Var*, <10
309SAG	Salinas River at Gonzales River Rd. Bridge	7-8.3	≥7	none	600	*Var*	<0.025	*Var*	*Var*, <10
309CRR	Chualar Creek West of Highway 1 on River Rd.[6]	7-8.3	≥5	≥85%	none	none	<0.025	none	<10
309CCD	Chualar Creek North Branch East of Hwy 1[6]	7-8.3	≥5	≥85%	none	none	<0.025	none	<10

CMP Site ID	CMP Site Description	pH[2]	DO, mg/L[3]	DO Saturation, %[3]	TDS, mg/L	Ammonia as N, mg/L (NH_4^+)[4]	Unionized Ammonia as N, mg/L (NH_3)[5]	EC, µS/cm[4]	Nitrate as N, mg/L[4]
309RTA	Santa Rita Creek at Santa Rita Creek Park[6]	7-8.3	≥5	≥85%	none	none	<0.025	none	<10
310CCC	Chorro Creek upstream from Chorro Flats	7-8.3	≥7	none	500	*Var*	<0.025	*Var*	*Var*, <10
310WRP	Warden Creek at Wetlands Restoration Preserve[6]	7-8.3	≥5	≥85%	none	none	<0.025	none	<10
310PRE	Prefumo Creek at Calle Joaquin	7-8.3	≥7	none	none	*Var*	<0.025	*Var*	*Var*, <10
310SLD	Davenport Creek at Broad Street	7-8.3	≥7	none	none	*Var*	<0.025	Var	Var, <10
310USG	Arroyo Grande Creek at old USGS Gage	7-8.3	≥7	none	800	*Var*	<0.025	*Var*	*Var*, <10
310LBC	Los Berros Creek at Century	7-8.3	≥7	none	none	*Var*	<0.025	*Var*	*Var*, <10
312OFC	Oso Flaco Creek at Oso Flaco Lake Rd.	7-8.3	≥5	none	none	*Var*	<0.025	*Var*	*Var*, <10
312OFN	Little Oso Flaco Creek[6]	7-8.3	≥5	≥85%	none	none	<0.025	none	<10
312SMA	Santa Maria River at Estuary	7-8.3	≥7	none	none	*Var*	<0.025	*Var*	*Var*, <10
312SMI	Santa Maria River at Highway 1	7-8.3	≥7	none	none	*Var*	<0.025	*Var*	*Var*, <10
312BCC	Bradley Canyon Creek[6]	7-8.3	≥5	≥85%	none	none	<0.025	none	<10
312BCJ	Bradley Channel at Jones Street[6]	7-8.3	≥5	≥85%	none	none	<0.025	none	<10
312GVS	Green Valley at Simas[6]	7-8.3	≥5	≥85%	none	none	<0.025	none	<10
312MSD	Main Street Canal u/s Ray Road at Highway 166[6]	7-8.3	≥5	≥85%	none	none	<0.025	none	<10
312ORC	Orcutt Solomon Creek u/s of Santa Maria River	7-8.3	≥7	none	none	*Var*	<0.025	*Var*	*Var*, <10

CMP Site ID	CMP Site Description	pH[2]	DO, mg/L[3]	DO Saturation, %[3]	TDS, mg/L	Ammonia as N, mg/L (NH_4^+)[4]	Unionized Ammonia as N, mg/L (NH_3)[5]	EC, µS/cm[4]	Nitrate as N, mg/L[4]
312ORI	Orcutt Solomon Creek at Highway 1	7-8.3	≥7	none	none	*Var*	<0.025	*Var*	*Var*, <10
313SAE	San Antonio Creek at San	7-8.3	≥7	none	none	*Var*	<0.025	*Var*	*Var*, <10
314SYR	Santa Ynez River at River Park	7-8.3	≥7	none	1000	*Var*	<0.025	*Var*	*Var*, <10
314SYF	Santa Ynez River at Floradale Ave.	7-8.3	≥7	none	1000	*Var*	<0.025	*Var*	*Var*, <10
314SYN	Santa Ynez River at 13th St.	7-8.3	≥7	none	1000	*Var*	<0.025	*Var*	*Var*, <10
315GAN	Glen Annie Creek upstream Cathedral Oaks	7-8.3	≥7	none	none	*Var*	<0.025	*Var*	*Var*, <10
315APF	Arroyo Paredon at Foothill Rd.	7-8.3	≥7	none	none	*Var*	<0.025	*Var*	*Var*, <10
315FMV	Franklin Creek at Mountain View Ln.	7-8.3	≥7	none	none	*Var*	<0.025	*Var*	*Var*, <10
315BEF	Bell Creek at Winchester Canyon Park[6]	7-8.3	≥5	≥85%	none	none	<0.025	none	<10
315LCC	Los Carneros Creek at Calle Real	7-8.3	≥7	none	none	*Var*	<0.025	*Var*	*Var*, <10

Notes:

1 Water Quality Objectives presented in this table were derived from the Basin Plan, Sections 3.3.2 and 3.3.3 (CCRWQCB 2019).

2 pH objectives for sites with Beneficial Uses specified in Table 2-1 (of Basin Plan) are based on MUN, AGR, REC1, REC2, COLD, and/or WARM Beneficial Uses. pH objectives for sites without Beneficial Uses specified in Table 2-1 of the Basin Plan are based on the designation of the following Beneficial Uses and their associated objectives: MUN, REC1, REC2, COLD, and WARM. For these sites, the most conservative pH range is used (i.e., 7-8.3).

3 DO objectives for sites with Beneficial Uses specified in Table 2-1 (of Basin Plan) are based on COLD, WARM, and/or SPWN Beneficial Uses. DO objectives for sites without Beneficial Uses specified in Table 2-1 (of Basin Plan) are based on Basin Plan General Objectives. The General Objectives for DO is ≥5 mg/L and the General Objectives for median DO saturation is ≥85%, which is based on "*controllable water quality conditions*."

4 *Var* indicates that objective is variable and does not provide a definitive numeric exceedance threshold. Interpretations of objectives for EC, Nitrate-N and Ammonia-N are based on possible effects of constituents on crops and/or soils. Guidelines are flexible and should be modified when warranted by local experience or special conditions of crop, soil, and method of irrigation. Conductivity (EC) objective of 750 µS/cm is the most restrictive objective for AGR (<750, no problems; 750-3000, increasing problems; >3000, severe). Ammonia-N objective of 5 mg/L is most restrictive objective for AGR (5, no problems 5-30, increasing problems; >30, severe). NO3-N objective of 5 mg/L is the most restrictive objective for AGR (5, no problems 5-30, increasing problems; >30, severe). MUN objective for NO3-N is 10 mg/L.

5 Unionized ammonia WQO based on the Basin Plan General Objective for Toxicity which states that "*discharge of wastes shall not cause concentrations of unionized ammonia (NH3) to exceed 0.025 mg/l (as N) in receiving waters*".

6 CMP site is not represented in the Basin Plan.

2.2.1.2 TMDL and Non-TMDL Area Limits

Surface waterbodies within the Central Coast Region are assessed regularly by the CCRWQCB and identified as "impaired" if they do not meet water quality standards. To address these impairments, the CCRWQCB has adopted TMDLs (or Total Maximum Daily Load allocations, with associated implementation plans) for many of these waterbodies. TMDLs that specify irrigated agriculture as a source have associated numeric limits included in Agricultural Order. Tables C.3-2 and C.3-4 of Agricultural Order present the TMDL numeric limits and compliance schedules for parameters monitored by the CMP (i.e., nutrients, pesticides, and toxicity). For the purposes of this report, discussion is focused on TMDL numeric limits from Agricultural Order that directly correspond to routine CMP parameters. In addition to TMDL numeric limits, the 2021 Ag Order also includes numeric limits for waterbodies in non-TMDL areas. The Order also includes compliance dates for nutrients, pesticides and toxicity, and turbidity in non-TMDL areas, located in Tables C.3-3, C.3-5, and C.3-7 of the 2021 Ag Order, respectively. Refer to **Table 2-5** for a summary of hydrologic units monitored by the CMP and associated TMDL and non-TMDL area limits. See **Appendix A** for a detailed summary of annual, dry season (May 1 through September 30), and wet season (October 1 through April 30) TMDL limits and non-TMDL area limits applicable to routine CMP parameters. **Figure 2-1** describes the hierarchical approach used to determine applicable water quality criteria for a given site.

Table 2-5. Summary of Applicable TMDL(s) and Water Quality Limits for Non-TMDL Areas

Hydrologic Unit	Applicable TMDL(s) and Non-TMDL Area Water Quality Limits
305	• Pajaro River Watershed Nutrient TMDL • Pajaro River Watershed Chlorpyrifos and Diazinon TMDL[1] • Pajaro River Watershed Sediment TMDL[2] • Non-TMDL Area Turbidity Limits • Non-TMDL Area Nutrient Limits • Non-TMDL Area Toxicity Limits[1]
309	• Lower Salinas River Watershed Nutrient TMDL • Lower Salinas River Watershed Sediment Toxicity and Pyrethroids in Sediment TMDL • Lower Salinas River Watershed Chlorpyrifos and Diazinon TMDL[1] • Non-TMDL Area Turbidity Limits • Non-TMDL Area Nutrient Limits • Non-TMDL Area Toxicity Limits[1]
310	• Los Berros Creek Nitrate TMDL • Los Osos Creek, Warden Creek, and Warden Lake Wetland Nutrient TMDL • San Luis Obispo Creek Nitrate TMDL • Morro Bay Sediment TMDL[2] • Non-TMDL Area Turbidity Limits • Non-TMDL Area Nutrient Limits • Non-TMDL Area Toxicity Limits[1]
312	• Santa Maria River Watershed Nutrients TMDL • Santa Maria River Watershed Toxicity and Pesticide TMDL • Non-TMDL Area Turbidity Limits • Non-TMDL Area Toxicity Limits[1]
313 and 314	• Non-TMDL Area Turbidity Limits • Non-TMDL Area Nutrient Limits • Non-TMDL Area Toxicity Limits[1]
315	• Arroyo Paredon Nitrate TMDL • Bell Creek Nitrate TMDL • Franklin Creek Nutrients TMDL • Glen Annie Creek, Tecolotito Creek, and Carneros Creek Nitrate TMDL • Non-TMDL Area Turbidity Limits

Hydrologic Unit	Applicable TMDL(s) and Non-TMDL Area Water Quality Limits
	• Arroyo Paredon Diazinon TMDL[1] • Non-TMDL Area Toxicity Limits[1]

Notes:

1 Pesticide concentration and toxic unit related TMDL and Non-TMDL area limit criteria are summarized in the report titled *Central Coast Cooperative Monitoring Program Supplemental Monitoring Report, 2021 and 2022 Aquatic Toxicity and Potential Toxicants* (2023).

2 The limits and units identified in Table C.3-6 of Agricultural Order are not applicable to the parameters monitored for the CMP and are not assessed in this annual report.

2.3 FIELD DATA COLLECTION

Water temperature, dissolved oxygen, oxygen saturation, pH, specific conductivity, salinity, and total dissolved solids (TDS) were measured in the field using a Hydrolab DS5 data sonde or similar field meter. Field meters were calibrated before and after each day of sampling. Field meters were most typically placed in the thalweg upstream of the field crew collecting samples. If a waterbody was not wadeable, the field meter was placed in the water near the stream bank/edge, in an area where the water was well mixed and flowing or placed in a bucket containing a recently collected and well-mixed water sample from the waterbody.

2.4 WATER AND SEDIMENT SAMPLE COLLECTION AND HANDLING

Water quality samples were collected using sanitary techniques that minimize sample contamination. Grab samples were generally collected by wading to mid-stream and filling bottles by direct submersion of the sample bottle or from a secondary clean container. Sample water collected with a secondary container (e.g., sample bucket) was continually mixed to prevent the settling of suspended material and ensure a homogenous sample was collected within the sample container. Sediment samples consisted of composite samples of the top 2 centimeters (cm) of fine-grained sediments, which is intended to ensure collection of relatively recent deposition (though not necessarily recent erosion from the surrounding watershed, as re-deposition of sediments already within the stream can also occur).

All water and sediment samples were immediately placed in an ice chest and preserved with ice. Samples were delivered to their respective labs the day following sample collection, so that method hold times were met. Additionally, all sample shipments were accompanied by a chain-of-custody form that identified the contents of the ice chest and met other QAPP chain-of-custody requirements.

Water column samples were analyzed for conventional and physical measures of water quality, nitrogen and phosphorus compounds, and aquatic toxicity (bioassay). These analyses were performed on filtered (dissolved) or unfiltered (total) samples, as appropriate for the analyte of concern. Analysis of sediment samples included toxicity (bioassay) testing with a single invertebrate species.

Chemical analyses were performed by Physis Environmental Laboratories (Physis) (Anaheim, California) and Silver State Analytical Laboratories (Reno, Nevada). Bioassays were performed by Pacific EcoRisk (PER) (Fairfield, California) and Enthalpy Analytical (San Diego, California).

Additional details of procedures for collecting water and sediment samples for chemical analyses and toxicity testing are provided in the QAPP (CCWQP 2013, 2018a, 2018b). Laboratory SOPs for chemical analyses are also included as appendices to the QAPP.

2.5 TOXICITY TESTING

Water quality samples were analyzed for toxicity to sensitive invertebrate species (*Ceriodaphnia dubia* [water flea] and *Chironomus dilutus* [midge fly larva]), and to aquatic algae (*Selenastrum capricornutum*). Determination of chronic toxicity was performed using *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, 4th Edition* (USEPA 2002). Determination of acute toxicity was performed following guidance in *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to*

Freshwater and Marine Organisms, 5th Edition – Appendix B Supplemental List of Acute Toxicity Test Species (USEPA 2002). Toxicity tests with *C. dubia* were conducted as 7-day static renewal tests (i.e., chronic bioassay) with sample renewals every 24 hours after test initiation; test endpoints included lethal (mortality) and sub-lethal (reproduction) endpoints. Toxicity tests with *C. dilutus* were conducted as 96-hour static renewal tests (i.e., chronic bioassay) with sample renewal occurring 48 hours after test initiation; the test endpoint was mortality. For ambient water samples with conductivities >3000 µS/cm but <15ppt, the 10-day survival test with the amphipod *Hyalella azteca* was performed in place of the *C. dubia* and *C. dilutus* tests (SWAMP protocol modified) (USEPA 2000). Toxicity tests with *S. capricornutum* were conducted as a 96-hour static non-renewal test (i.e., acute bioassay); the test endpoint was growth. For ambient water samples with a conductivity >3000 µS/cm, the 96-hr algal growth test with the diatom *Thalassiosira pseudonana* was performed in place of the *S. capricornutum* test (ASTM E1218-100a). Sediment samples were analyzed for toxicity to the amphipod *H. azteca*. Determination of toxicity was performed as described in *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Organisms, 2nd Edition* (USEPA 2000). Toxicity tests with *H. azteca* were conducted as 10-day tests (i.e., static renewal chronic bioassay) with two daily intermittent volume additions of overlying water. The *H. azteca* sediment toxicity tests included lethal (mortality) and sub-lethal endpoints (growth). For sediment samples with overlying water salinities >15ppt, the static 10-day survival test with the amphipod *Eohaustorius estuarius* was performed in place of the *H. azteca* test (USEPA 1994).

All toxicity testing was performed by PER (Fairfield, California) and Enthalpy Analytical (San Diego, California). Statistical analyses were performed using the CETIS® statistical package (Version 1.9.2.6, TidePool Scientific, McKinleyville, CA).

The salinity of the ambient waters sometimes exceeded the tolerance of the standard freshwater test species. In these cases, alternate salinity-tolerant test species were used for toxicity tests with invertebrate species (*H. azteca, E. estuarius,* or *Americamysis bahia*), and algae species (*T. pseudonana*):

- The *T. pseudonana* algal growth test was performed in place of the *S. capricornutum* test for water samples with conductivity greater than 3000 microsiemens per centimeter (µS/cm).
- The 10-day *H. azteca* test was performed in place of the *C. dubia* test for water samples with a conductivity greater than 3000 µS/cm but less than 15 parts per thousand (ppt) salinity. The chronic *A. bahia* test was performed in place of the *C. dubia* test for water samples with salinity more than 15 ppt.
- The *E. estuarius* sediment test was performed in place of the *H. azteca* test for sediment samples with interstitial water salinity greater than 15 ppt.
- The *C. dilutus* test was not performed for water samples with conductivity greater than 3000 µS/cm; in these cases, the same alternative test species apply as for the *C. dubia* tests.

Details of toxicity testing methods and procedures are provided in Appendix B of the QAPP (CCWQP 2013, 2018a, 2018b).

2.6 QUALITY ASSURANCE

Implementation of the CMP is conducted according to the approved QAPP (CCWQP 2013, 2018a, 2018b). The QAPP was initially approved in 2005 and has been revised or amended several times since, most recently in 2023 and 2024. The QAPP documents the CMP's project management, assessment, and oversight structure, as well as the standard operating procedures and methods for sample collection and analysis, data quality objectives, and data validation and reporting requirements.

2.7 DATA ANALYSIS

A variety of data analysis was performed to assess water quality at CMP monitoring stations. Each analysis is described in the following subsections.

2.7.1 Water Quality Status

A primary objective of the CMP is to assess the status of water quality in waterbodies located in agricultural watersheds of the Central Coast. To this end, monitoring results are tabulated by HU (and by site within each HU) and parameter, and summarized according to basic statistics such as minimum, maximum, mean, and median values. Results are displayed and evaluated relative to numeric Water Quality Objectives, TMDL area limits, and non-TMDL area limits, so that exceedances can be identified. **Figure 2-1** is used to determine the hierarchy for applicable water quality criteria for a given site. Results are also compared between sites and HUs, relative to each other to assess spatial patterns throughout the study area.

Loading, or the mass of a substance that passes a particular point in a waterbody over time, was calculated for nitrate and total suspended solids by multiplying the instantaneous flow result measured in the field with the corresponding parameter concentration measured by a laboratory. All loading results were calculated as pounds per hour. Constant conversion factors were applied to express the instantaneous loading results in units of "mass per unit time" (pounds per hour). Since both flow and water chemistry are sampled by the CMP on an instantaneous, or grab sample basis, it was decided that temporal extrapolation beyond "hours" would not be appropriate for the CMP dataset. Instances of negative flows were omitted from these calculations and subsequent trend analyses. During instances of no flow (i.e., the site was dry), loading was presumed to be zero and included in subsequent trend analyses.

2.7.2 Water Quality Trends

Another main objective of the CMP is to detect trends in water quality over time, should changes occur. The seasonal Mann-Kendall test (Hirsch and Slack 1984) is the primary statistical test used for the CMP and discussed within this annual report. Briefly, the seasonal Mann-Kendall test is a non-parametric test that both identifies and quantifies monotonic trends (i.e., increasing or decreasing). Kendall's tau is a non-parametric measure of correlation that ranges between -1 and 1, where positive values denote an increasing trend. The test computes the slope between each pair of points in the dataset; the median of these slopes is the estimate of the monotonic trend (i.e., tau). The number of positive or negative slopes are compared to a normal distribution based on the size of the dataset to form the test statistic. This test statistic provides for a hypothesis test with a two-tailed p-value for presence of a monotonic trend. A non-seasonal Mann-Kendall test (Mann 1945) was performed on site-by-parameter combinations with insufficient intra-annual data to account for seasonal patterns. Some important considerations related to the trend analyses reported herein, include:

- Historically, sediment sampling was performed once annually, early in the year. Recently, sampling efforts have increased to twice annually (early and late). For consistency in the sampling timeframe, only the first sample each year was used to calculate the Mann-Kendall results.
- Due to the varying measurement range of turbidity field equipment used since the inception of the CMP and the occasional employment of field dilutions, turbidity results were capped at 3,000 NTU to prevent erroneous turbidity trends. This upper limit turbidity threshold was also applied to flow-weighted turbidity calculations.

Due to the computational intensity of the seasonal and non-seasonal Mann-Kendall tests, the statistical computing software R version 3.6.1 (R Core Team 2020) with the "rkt" package (Marchetto 2017), was used on all site-by-parameter combinations with sufficient records in the CMP dataset from 2005 through 2023.

2.7.3 Wet and Dry Weather Comparison

To compare results for differing runoff conditions (i.e., wet weather and dry weather), a two-sample, unpaired t-test assuming unequal variance was used within individual hydrologic units. A t-test compares the means of two groups to determine whether any differences are significant (two-sided test). Skewed data were log transformed.

3.0 WATER QUALITY MONITORING RESULTS

The results of 2023 CMP water quality monitoring discussed in this report include the following:

- Summary of field and laboratory quality assurance, including overall data quality, completeness, and qualified data.
- Standard summary statistics are provided for each site and parameter in **Appendix B**. For each water quality parameter evaluated, the following statistics were calculated: total number of measurements (*n*); minimum detected value (*min detected*); maximum detected value (*max detected*); arithmetic average (*mean*); median value (*median*); standard deviation (*Std Dev*).
- Box plots (also referred to as box and whisker diagrams) are provided for each site and parameter in **Appendix C**. These plots illustrate the distribution of results for a given parameter and site, and specifically depict the minimum detected value, first quartile of results, median, third quartile of results, and maximum detected value. Additional details are summarized in **Appendix C**.
- A two-sample, unpaired t-test used to compare the mean of individual parameters under different weather conditions (i.e., *dry* and *wet* events) is provided in **Appendix D**.
- Spatial patterns are assessed for each water quality parameter by HU. Temporal trends are quantified for each parameter at all sites. Results of the Mann-Kendall tests identifying monotonic trends are provided in **Appendix E**.
- Time series plots used to supplement statistical analysis of the data in order to evaluate temporal trends are provided in **Appendix F**.
- Compliance frequencies with relevant Water Quality Objectives (**Table 2-4**) and TMDL and non-TMDL area numeric limits (**Appendix A**) were calculated wherever possible. These are discussed by HU, and are provided for individual sites with the summary statistics in **Appendix B**.

Results are organized by surface water HUs, and significant spatial trends and comparisons to Water Quality Objectives are discussed. Concentrations of monitored parameters were compared between sites and applicable Water Quality Objectives. Additionally, for sites without designated Beneficial Uses and parameters without relevant Water Quality Objectives, results are also discussed relative to other CMP sites within the HU. Statistically significant changes over time (“trends”), based on monitoring results from 2005 through 2023, are discussed for each parameter group within the results section for each HU. Broad seasonal trends and regional spatial comparisons are discussed for all hydrologic regions in Section 4, Discussion.

Field logs and photos for all monitoring events, laboratory analytical reports, and raw tabulated results can be found in **Appendices G**, **H**, **I**, and **J,** respectively.

3.1 QUALITY ASSURANCE SUMMARY

This summary describes how well the 2023 CMP met the data quality objectives DQOs as presented in the *Quality Assurance Project Plan for the Region 3 Conditional Waiver Cooperative Monitoring Program*, dated April 1, 2015 (revised April 12, 2018). To achieve analytical completeness, chemical, habitat, and field data were assessed monthly during 2023. Additionally, aquatic toxicological tests were assessed once a quarter during the year during Events 218, 219, 222, 225 and 229 (collection of toxicity samples was spread across two months in Quarter 1 to capture runoff from storm events). Sediment toxicological tests were assessed once in May (Event 222), with make-up samples collected at three Pajaro sites during Event 223.

Data collected for the CMP were evaluated for precision, accuracy, and completeness as required by the QAPP. The precision and accuracy for the majority of the results met the CMP DQOs. For those results that did fall outside the DQOs, the primary issues were related to sample matrix effects (i.e., matrix spike/matrix spike duplicate [MS/MSD] percent recoveries and relative percent differences [RPDs]) as well as field duplicate RPDs and toxicity

test holding times. The primary field and habitat qualifiers were related to analyte concentrations exceeding instrument calibration and elevated stream turbidity which made observations of percent algal cover impossible. No data were rejected as unusable during 2023.

Physis used non-project samples to satisfy some of the laboratory Quality Assurance/Quality Control (QA/QC) requirements during analysis of samples collected during the first and second quarters of 2023. While this practice is generally acceptable, the QAPP requirements for this project require that CMP samples be used for all QA/QC tests. The lab was contacted and reminded of this QAPP requirement. Physis reported that the issue was a result of the CMP QAPP requirements not being carried over when they updated their laboratory information management system as well as new staff not being informed of our DQOs. Physis has resolved the issue.

The following summarizes the primary analytical issues that were addressed in 2023:

First Quarter:

1. **Event 218:**
    a. Physis used some non-project samples to satisfy some of the QA/QC requirements. While this practice is generally acceptable, the QAPP requirements for this project require that CMP samples be used for all QA/QC tests. The lab was contacted and reminded of this QAPP requirement.
2. **Event 219:**
    a. Samples were collected from the Salinas HU on Saturday, February 25, 2023, and were delivered to FedEx after the Saturday shipment cut-off time; therefore, these samples did not arrive at Physis until Tuesday, February 28, 2023. All samples arrived having acceptable temperatures, but the dissolved orthophosphate arrived outside of the 48-hour holding time. All samples were analyzed and the orthophosphate data qualified, as appropriate. The field sampling teams were reminded of the importance of meeting FedEx shipping times, especially when the samples are dropped off on the weekend.
    b. Physis used some non-project samples to satisfy some of the QA/QC requirements. While this practice is generally acceptable, the QAPP requirements for this project require that CMP samples be used for all QA/QC tests. The lab was contacted and reminded of this QAPP requirement.
3. **Event 220:**
    a. Sites 312SMA and 312ORC could not be accessed due to a road closure associated with the large storms that preceded the monitoring event.
    b. Access to 309GRN in the Salinas River watershed was unsafe. An alternate, safer route could not be located, so this station was not sampled.
    c. Samples were collected from the Salinas HU on Thursday, March 30, 2023, and could not be shipped before the daily shipping cut-off time, so they were scheduled for a Saturday delivery via FedEx. Arrangements were made with Physis to receive the samples on Saturday and process them within holding time; however, due to a shipping error by FedEx, the samples were not delivered on Saturday and ultimately did not arrive until Monday, April 3, 2023. All samples arrived having acceptable temperatures, but the dissolved orthophosphate arrived outside of the 48-hour holding time. All samples were analyzed and the orthophosphate data qualified, as appropriate.

Second Quarter:

1. **Event 221:**
    a. Sites 312SMA and 312ORC could not be accessed due to a continued road closure associated with the large storms that preceded the monitoring event.
2. **Event 222:**
    a. Site 309SAG was not accessible due to soft terrain and excessive vegetation. Site 312SMA was not sampled, because the river channel was dramatically altered due to prior storm activity and the new river channel was not readily apparent to samplers in the field. This site was labeled as not sampled due to disconnected; however, upon regaining access to the site in June, the new river channel was found approximately 200 meters to the northeast and was travelling toward the Pacific

Ocean in a northwesterly direction. The current latitude and longitude for the most accessible site is 34.9616944, -120.6411726.

3. **Event 223:**
    a. Physis used some non-project samples to satisfy some of the QA/QC requirements. While this practice is generally acceptable, the QAPP requirements for this project require that CMP samples be used for all QA/QC tests. The lab was contacted and reminded of this QAPP requirement.

Third Quarter:

1. **Events 224, 225 and 226:**
    a. For all events during this quarter, all sites were accessible and visited per the field logs; however, the current sampling location for 312SMA is notably different than the historic monitoring location. The site was assessed thoroughly during August's monitoring event and confirmed to be representative of the targeted upstream operations.

Fourth Quarter:

1. **Event 227:**
    a. No issues were identified during this event.
2. **Event 228:**
    a. No issues were identified during this event.
3. **Event 229:**
    a. The lab control associated with the C. dilutus tests for 312OFN, 312MSD, and 312BCJ failed to meet test acceptability requirements for survival (>90%). The re-tests performed on these samples were initiated more than 48-hours after sample collection.
    b. An unequal number of test organisms in the 312OFC *H. azteca* toxicity bioassay test was loaded at test initiation. These tests were qualified (TOQ). The laboratory was contacted and have performed additional training to staff.

3.1.1 Chemistry Data

3.1.1.1 Water

Of the aqueous chemistry results, 7.4% (424 out of 5,722) required qualification of some type. Of the qualified results, 401 were greater than the method reporting limit. Of the 401 qualified chemistry results:

- 188 (47%) of the results were qualified "VFDP" due to field duplicate RPDs exceeding project DQOs. Field crews were required to review duplicate collection procedures.
- 137 (34%) of the results were qualified "VGB" due to MS/MSD % recoveries exceeding established laboratory limits. The laboratory was contacted and asked to recheck values. Any subsequent revisions resulted in the laboratory reissuing a corrected laboratory EDD and report.
- 171 (43%) of the results were qualified "VIL" due to the RPD exceeding established laboratory control limits. The laboratory was contacted and asked to re-check values. Any subsequent revisions resulted in the laboratory reissuing a corrected laboratory EDD and report.
- 5 (1%) of the results were qualified "VH" due to sample holding time exceedances. The primary reason for the number of holding time exceedances is due to shipping issues. Field teams were reminded of the importance of checking with FedEx to confirm their next-day shipping cut-off times.
- 3 (0.7%) of the results were qualified "IZM" due to broken sample bottles being reported by the laboratory. Field teams were reminded to properly package all breakable sample bottles.

- 8 (2%) of the results were qualified “CT” due to the QC criteria (MS/MSD and laboratory duplicate) samples not being met due to the high level of analyte in the sample. Physis was contacted to confirm and asked to re-run these analytes at a greater dilution in the future.
- 2 (0.5%) of the results were qualified “VBZ” due to ammonia samples being improperly preserved during the Third Quarter. Field teams were reminded to check all preserved sample bottles to confirm that they have the correct preservative.
- 4 (1%) of the results were qualified “QAX” due to Physis using non-project samples to complete the QA/QC tests. Physis was reminded that the project QAPP requires that all QA/QC tests be performed using project samples. Physis confirmed that they would correct this for future samples.

Only one of the chemistry results received multiple qualifications:

- 400 (99.8%) of the data received a single qualifier;
- 1 (0.2%) of the data received two qualifiers.

These statistics exclude the informational qualifiers of “D” due to sample dilution and “HT” indicating that the result is calculated (i.e., unionized ammonia and total nitrogen). The single double-pairing of qualifiers was due to a broken bottle and a field duplicate RPD value exceeding compliance limits.

No aqueous chemistry data were rejected as unusable during 2023.

Overall percent completeness for the data was 100%.

3.1.1.2 Sediment

Sediment was collected for sediment toxicity tests only. No sediment samples were collected or analyzed for chemical constituents.

3.1.2 Toxicity Bioassay Data

Aquatic and sediment toxicity data were evaluated for precision, accuracy, and completeness as required in the CMP QAPP. The toxicity data generated are adequate for the purposes of the CMP. Of the 701 aqueous and 94 sediment toxicity tests, 112 of the aqueous data and 88 of the sediment data received qualifiers.

Of the 112 qualified aqueous toxicity bioassay data:

- 88 (79%) of the results were qualified “VFDP” due to field duplicate RPD values exceeding project DQO limits.
- 27 (24%) of the results were qualified “VH” due to control test failure and subsequent re-testing beyond sample holding times.
- 1 (0.9%) of the results were qualified “TOQ” due to an unequal number of test organisms being used at test initiation.

The following aqueous toxicity samples received double qualifiers:

- 4 (3.7%) of the results were qualified “VFDP” and “VH”.

Of the 88 qualified sediment toxicity bioassay data:

- 88 (100%) of the results were qualified “VFDP” due to field duplicate RPD exceedances.

No sediment toxicity bioassay results were assigned multiple qualifiers.

No aqueous or sediment toxicity test data were rejected as unusable, and overall percent completeness for the toxicity tests was 100%.

3.1.3 Habitat Data

Habitat data collected for the CMP were evaluated for completeness as required by the QAPP. Of the possible 7,929 habitat data records, there were 42 results (0.5%) that were qualified (excluding sites that were not sampled because they were either determined to be dry, had a lack of connectivity or were inaccessible). Of the 42 results:

- 38 (90%) were qualified “FTT” due to the water being too turbid to measure algal coverage. No Corrective Action was taken.
- 2 (5%) of the results were qualified “FTD” due to the location being too deep to measure algal coverage. No Corrective Action was taken.
- 2 (5%) of the results were qualified “NR” due to discharge not being able to quantify because of either low-flow/no-flow conditions or this parameter not being required at the site.

No habitat results received multiple data qualifiers.

No habitat data were rejected as unusable and overall percent completeness was determined to be 100%.

3.1.4 Field Data

Field data were evaluated for accuracy and completeness as required by the QAPP. Of the possible 5,802 field data records, 22 results (0.4%) were qualified. Of the 22 results:

- 21 (0.4%) were qualified “CJ” or “VCJ” due to the analyte concentration being greater than instrument calibration. No Corrective Action was taken.
- 1 (0.02%) was qualified “NR” due to this site being collected for toxicity bioassays and air temperature not being required since this was a re-sample event. No Corrective Action was taken.

No field data were rejected as unusable and overall percent completeness was determined to be 100%.

3.1.5 Monitoring Events

All 12 planned monitoring events were successfully fulfilled. 552 of the 654 planned site visits resulted in sample collection, translating to an 84.4% sampling success rate.

Samples were not collected for 102 site visits because:

- 50 (49%) of the site visits observed a dry channel;
- 45 (44%) of the site visits observed disconnected pools and/or discontinuous flows; and
- 7 (7%) of the site visits were inaccessible due to storm damage.

All collected samples were analyzed by a laboratory for an overall analytical completion rate of 100%.

3.2 PAJARO RIVER HYDROLOGIC UNIT (HU 305)

Descriptions of the Pajaro River HU are summarized from the CCRWQCB's *Pajaro River Watershed Characterization Report* (CCRWQCB 2003). The Pajaro River Watershed encompasses over 1,300 square miles in parts of four counties of central coastal California: San Benito, Santa Clara, Santa Cruz, and Monterey Counties. There are five incorporated cities within the watershed: Watsonville, Gilroy, Morgan Hill, Hollister, and San Juan Bautista. Major tributaries to the Pajaro River include San Benito River, Tequisquita Slough, Pacheco Creek, San Juan Creek, Watsonville Slough, Llagas Creek, Uvas Creek, Millers Canal, and Corralitos Creek. Pajaro River Watershed flow patterns are generally characteristic of a Mediterranean climate, with higher flows during the wetter, cooler winter months and low flows during the warmer, drier summer months. Principal water sources for the Pajaro River and its tributaries are surface runoff, springs, subsurface flow into the channels, and reclaimed wastewater entering the watershed through percolation from water discharged by South County Regional Wastewater Authority (SCRWA). The first three water sources are subject to large flow variations due to climatic influences, while the discharge from the SCRWA tends to influence flow year-round. In past years, the Pajaro Watershed has also received water from the San Felipe Division of the Central Valley Project (CVP), which delivered CVP water to the San Justo Reservoir and directly to agricultural and rural users in San Benito County and to the Hollister and San Juan Bautista areas for municipal use. This water also makes its way indirectly into the Pajaro River and its tributaries as agricultural return flows and sub-surface drainage. The Pajaro River Watershed contains a wide variety of land uses, including row crop agriculture, livestock grazing, forestry, industrial, and rural/urban residential. The watershed also contains significant amounts of undeveloped natural vegetative cover, which provides habitat to numerous native bird and wildlife species.

There were originally 10 core CMP sites in the Pajaro River HU. These included the mainstem Pajaro River at Main St. in Watsonville (305PJP) and at Chittenden (305CHI), with the rest of the sites located on tributary waterbodies: Millers Canal (305FRA), San Juan Creek (305SJA), Tequisquita Slough (305TSR), Llagas Creek (305LCS), Carnadero Creek (305CAN), Salsipuedes Creek (305SAL), Watsonville Slough (305WSA), and Struve Slough (305STL). In 2012, the Struve Slough (305STL) site was removed from the program due to lack of impairment and agricultural influence, and three additional sites were added: Watsonville Creek (305WCS), the Beach Road Ditch (305BRS), and Furlong Creek (305FUF). As depicted in **Figure 3-1**, Pajaro Watershed sites are grouped near the Watsonville area in the lower portion of the watershed (305WSA, 305WCS, 305BRS, 305PJP, and 305SAL, and southeast of Gilroy in the upper watershed (305LCS, 305CAN, 305FRA, 305TSR, 305CHI, and 305FUF).

The Beneficial Uses designated by the Basin Plan for waterbodies monitored by the CMP in the Pajaro River Region include nearly every Beneficial Use, with the exceptions being industrial process supply and shellfish harvesting (**Table 2-2**). Three waterbodies monitored by the CMP do not have Beneficial Uses designated in Table 2-1 of the Basin Plan—Beach Road Ditch, Millers Canal, and San Juan Creek (305BRS, 305FRA, and 305SJA)—and are thus assigned the following designations: Municipal and Domestic Supply (MUN), Water Contact Recreation (REC-1), Non-contact Recreation (REC-2), Cold Freshwater Habitat (COLD), and Warm Freshwater Habitat (WARM).

Applicable TMDLs for sites within the Pajaro River HU include the Pajaro River Watershed Nutrient TMDL, Pajaro River Watershed Chlorpyrifos and Diazinon TMDL, and Pajaro River Sediment TMDL. Non-TMDL area limits applicable to sites within the Pajaro River HU include non-TMDL area turbidity limits, non-TMDL area nutrient limits, and non-TMDL area toxicity limits. See **Appendix A** for a summary of applicable routine parameter TMDL limits and non-TMDL area limits for sites in the Pajaro HU.

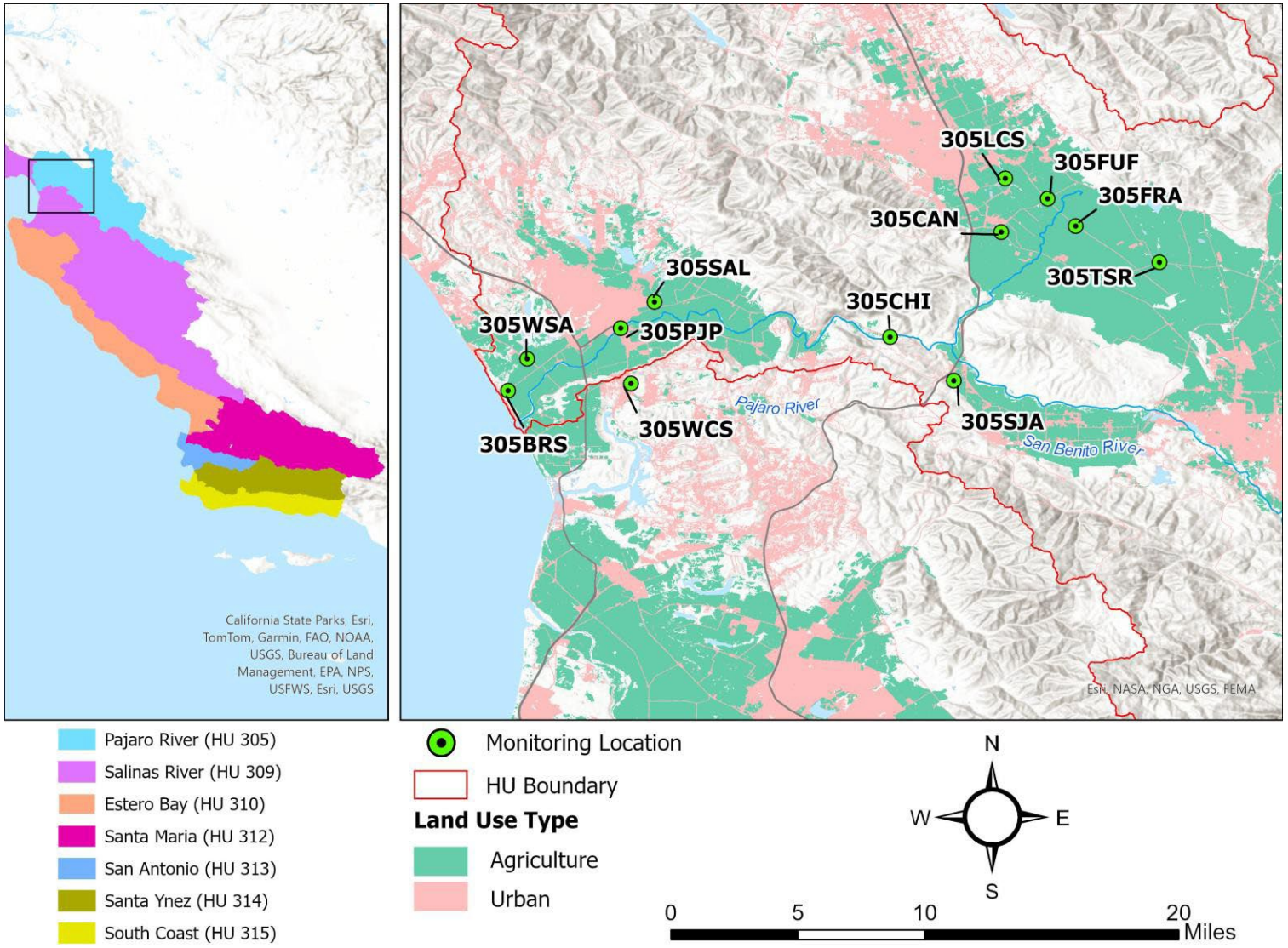


Figure 3-1. CMP Core Monitoring Sites and Distribution of Major Land Uses in the Pajaro River Hydrologic Unit

3.2.1 Flow Results

The flow regime in the Pajaro River Watershed is characterized by seasonal precipitation that occurs primarily from November through April. In 2023, there were multiple occurrences of significant rainfall, sporadic events occurred thorough January while one large precipitation event took place in late November. Flows typically decrease rapidly in March through May. Historic average flows at Chittenden are less than 40 cubic feet per second (CFS) from June through November (United States Geological Survey [USGS] 2008). During the 2023 monitoring year, the annual average flow (591.58 CFS) at the *Pajaro River at Chittenden* stream gage was well above the historic annual average (156.70 CFS, 1940-2022) and ranged from 7.1 CFS (September 4, 2023) to 12,759 CFS (March 31, 2023) (USGS 2023)[1]. The 2023 cumulative annual rainfall (29.64”) at the *Pajaro* rain gauge was higher than the historic average (17.2”, 2006-2022) (**Figure 3-2**) (CDWR 2023). Above average flow and rain were likely caused by several atmospheric rivers early in the year, which maintained wetter annual stream conditions.

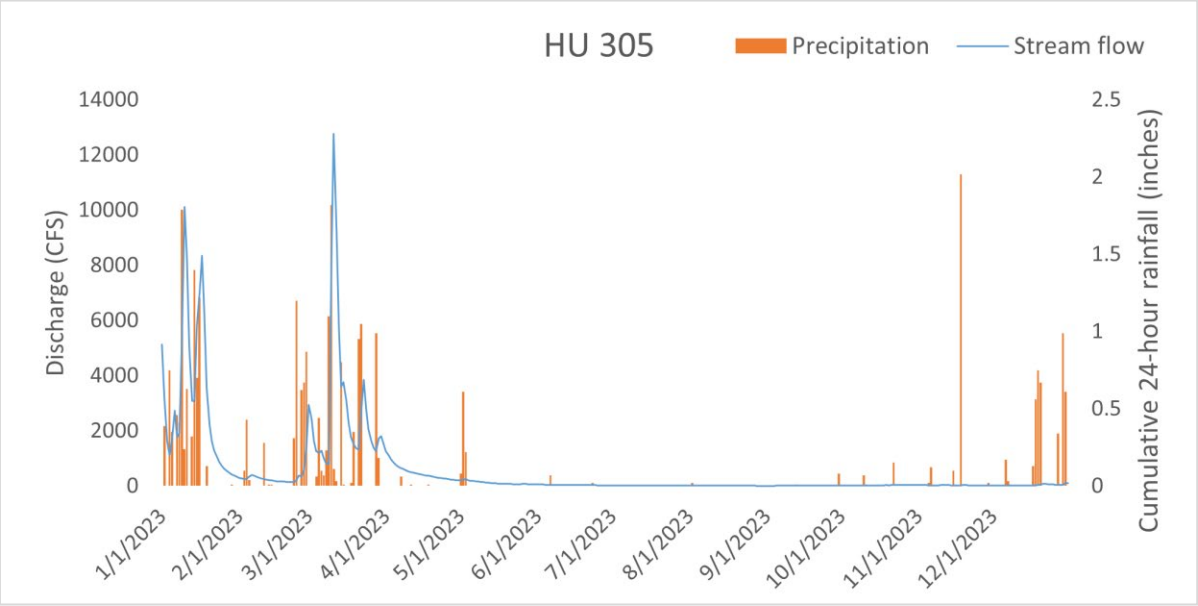


Figure 3-2. 2023 Hydrograph and Total Daily Precipitation Record for Pajaro River at Chittenden[1]

[1] USGS data contains provisional values, subject to revision; flow values may have been updated since the publishing of this report.

In 2023, flows measured at the 12 Pajaro River HU monitoring sites were generally influenced by wet season precipitation, with elevated flows occurring in mid to late December. During the dry season, surface water flows declined with many sites reaching dry conditions at least once. **Figure 3-3** depicts annual median flows for sites within the Pajaro River HU and **Table 3-1** presents descriptive statistics.

- Measured flows during 2023 ranged from -0.69 CFS due to tidal influences (Tequisquita Slough [305TSR]) to 1830.00 CFS (Pajaro River at Main St. [305PJP]).
- Median flows in 2023 ranged from 0.01 CFS at Watsonville Slough (305WSA) to 56.75 CFS (Pajaro River at Main St. [305PJP]).
- For the period of 2005-2023, four sites showed statistically significant decreasing trends in flow (Pajaro River at Chittenden [305CHI], Millers Canal [305FRA], Llagas Creek [305LCS], and San Juan Creek [305SJA]). Four sites showed statistically significant increasing trends (Furlong Creek [305FUF], Salsipuedes Creek [305SAL], Tequisquita Slough [305TSR], and Watsonville Slough [305WSA]).

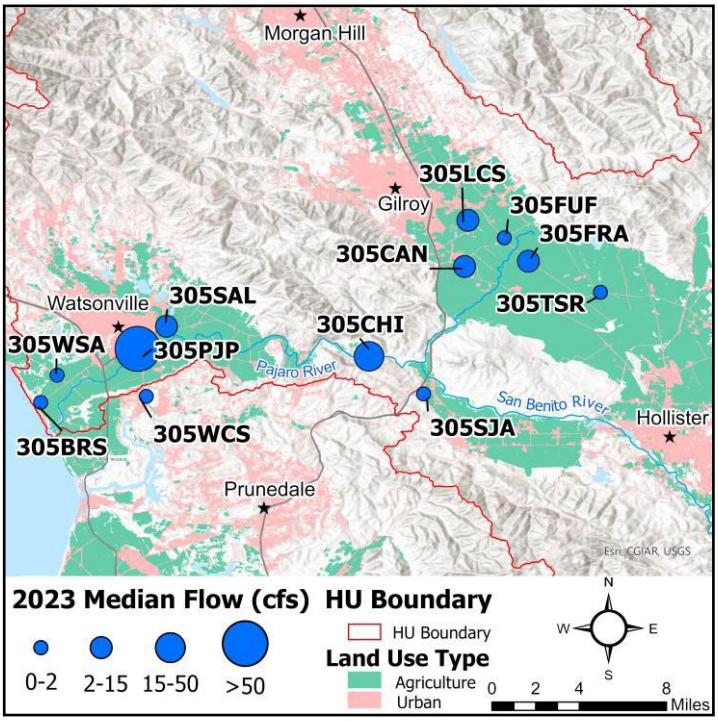


Figure 3-3. 2023 Median Flows for Sites in HU 305

Table 3-1. Descriptive Statistics for Flow in Hydrologic Unit 305 (CFS)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
305BRS	12	0.15	8.13	1.65	0.34	Increasing
305CAN	12	0.00	1152.00	161.90	9.33	Increasing
305CHI	12	12.56	1140.00	205.85	45.74	**Decreasing**
305FRA	12	0.00	480.00	93.50	9.64	**Decreasing**
305FUF	12	0.30	12.33	2.78	1.26	**Increasing**
305LCS	12	1.13	116.40	22.59	9.88	**Decreasing**
305PJP	12	7.20	1830.00	349.30	56.75	Decreasing
305SAL	12	0.53	270.00	56.11	14.96	**Increasing**
305SJA	12	0.58	12.09	2.93	1.56	**Decreasing**
305TSR	12	-0.69	28.14	3.98	0.45	**Increasing**
305WCS	12	0.00	9.96	2.45	0.64	Decreasing
305WSA	12	-0.36	66.48	11.70	0.01	**Increasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.2.2 Water Temperature

The Basin Plan contains a general Water Quality Objective for temperature: natural receiving water temperature of intrastate waters shall not be altered. The Basin Plan also has specific objectives for cold and warm water habitats: At no time or place shall the temperature be increased by more than 5°F above natural receiving water temperature. Water temperature can influence the results of other field measurements including dissolved oxygen, pH, and conductivity and therefore is an important factor to consider when interpreting results. The temperature of certain water bodies can also fluctuate greatly over a 24-hour period. This fluctuation means that results and trends should be interpreted with discretion as they can be affected by the time of day at which the sample is collected.

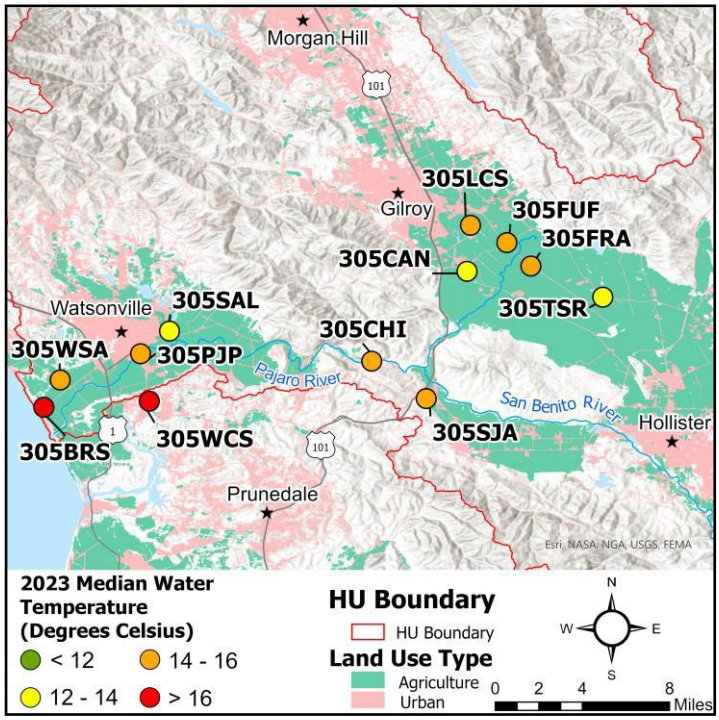


Figure 3-4. 2023 Median Water Temperature for Sites in HU 305

Temperature of natural receiving waters has not been defined for waterbodies within the Pajaro River HU; therefore, the focus of this report is descriptive statistics. In 2023, water temperatures peaked at most sites in the Pajaro River HU during the months of May, July, and August and minimum temperatures at most sites were recorded during January and February, with the exception of Millers Canal [305FRA] which had a minimum temperature recorded in October. **Figure 3-4** depicts annual median temperatures for sites in the Pajaro River HU for 2023, and **Table 3-2** presents descriptive statistics.

- Median water temperatures in the Pajaro River HU ranged from 13.4°C at Carnadero Creek (305CAN) and Tequisquita Slough (305TSR) to 17.2°C at Watsonville Creek (305WCS) in 2023.
- The lowest water temperature (6.8°C) was observed in Tequisquita Slough (305TSR). The highest water temperature (25.1°C) was observed at Millers Canal (305FRA).
- For the period of 2005-2023, no sites showed statistically significant trends in water temperature.

Table 3-2. Descriptive Statistics for Water Temperature in Hydrologic Unit 305 (°C)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
305BRS	12	8.5	22.9	16.5	16.2	Increasing
305CAN	10	8.9	17.9	13.4	13.4	Increasing
305CHI	12	8.7	19.8	14.4	15.0	Increasing
305FRA	12	8.0	25.1	16.2	15.9	Increasing
305FUF	12	8.1	21.7	13.7	14.3	Increasing
305LCS	12	10.0	20.4	15.1	15.7	Increasing
305PJP	12	8.9	19.0	14.9	15.8	Increasing
305SAL	12	8.0	19.6	14.5	13.8	Increasing
305SJA	12	8.6	19.2	14.2	14.2	Increasing
305TSR	12	6.8	19.8	13.0	13.4	Increasing
305WCS	11	9.1	19.7	15.2	17.2	Increasing
305WSA	7	8.4	18.9	14.1	14.7	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.2.3 Turbidity and TSS Results

All sites within the Pajaro River HU have a non-TMDL area turbidity limit. Specifically, 10 sites have a cold water Beneficial Use, so a non-TMDL area turbidity limit of 25 NTU. The remaining two sites have a warm water Beneficial Use, with a non-TMDL area turbidity limit of 40 NTU. See **Table 2-5** and **Appendix A** for a summary of applicable non-TMDL area limits for turbidity in the Pajaro HU. Additionally, all but one site [Watsonville Creek (305WCS)] has a TMDL limit for sediment that is associated with the Pajaro River Watershed Sediment TMDL; however, the sediment limits and units identified in Table C.3-6 of Agricultural Order Agricultural Order are not applicable to the parameters monitored for the CMP and are not assessed in this annual report. **Figure 3-5** depicts annual median turbidity results and total suspended sediment (TSS) loading for sites within the Pajaro River HU, and **Table 3-3** and **Appendix B** present descriptive statistics and turbidity limit exceedances.

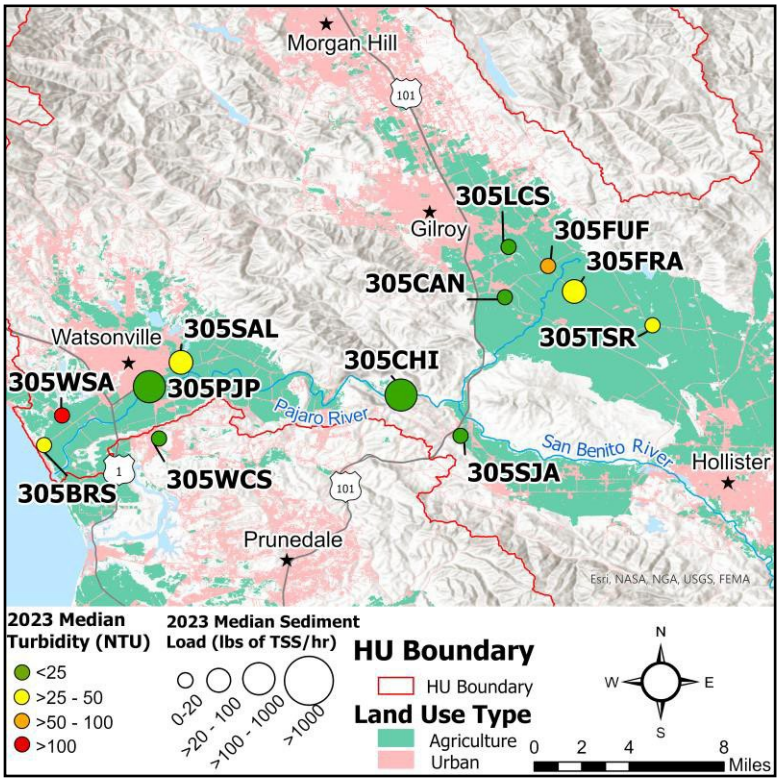


Figure 3-5. 2023 Median Turbidity and TSS Loading for Sites in HU 305

- Median turbidities in the Pajaro River HU ranged from 11 NTU (Llagas Creek [305LCS]) to 125 NTU (Watsonville Slough [305WSA]) in 2023.
- Higher relative TSS loading (218.4lbs. of TSS/hr and 527.6lbs. of TSS/hr, respectively) at Pajaro River at Chittenden (305CHI) and Pajaro River at Main St. (305PJP) was due to higher median flows (45.74 CFS and 56.75 CFS, respectively).
- All 10 sites with a turbidity non-TMDL area limit of 25 NTU (cold water) exceeded the limit in at least one sample. Both sites with a warm water turbidity non-TMDL area limit of 40 NTU (Tequisquita Slough [305TSR] and Watsonville Slough [305WSA]) exceeded the limit in 50% of samples or more.
- For the period of 2005-2023, three sites showed statistically significant decreasing trends in turbidity (Pajaro River at Chittenden [305CHI], Millers Canal [305FRA], and Tequisquita Slough [305TSR]. Three sites showed statistically significant increasing trends in turbidity (Llagas Creek [305LCS], San Juan Creek [305SJA], and Watsonville Creek [305WCS]).
- For the period of 2012-2023, nine out of the 12 sites within the Pajaro River HU showed statistically significant increasing trends in TSS loading. TSS was not monitored by the CMP prior to 2012, so the period of record for TSS trend analysis is shorter than that for turbidity and flow.

Table 3-3. Descriptive Statistics for Turbidity in Hydrologic Unit 305 (NTU)

Site ID[1]	N[3]	Min	Max	Mean	Median	Non-TMDL Area Limit Percent Exceedance	Turbidity Trend[2,4]	TSS Loading Trend[2,4]
305BRS	12	7	432	95	39	67%[5]	Increasing	Increasing
305CAN	10	3	545	72	13	40%[5]	Decreasing	**Increasing**
305CHI	12	5	402	69	22	42%[5]	**Decreasing**	**Increasing**
305FRA	12	24	521	82	37	58%[5]	**Decreasing**	**Increasing**
305FUF	12	20	884	146	82	92%[5]	Increasing	**Increasing**
305LCS	12	2	44	15	11	83%[5]	**Increasing**	**Increasing**
305PJP	12	5	865	145	22	25%[5]	Decreasing	Increasing
305SAL	12	5	999	174	34	42%[5]	Decreasing	**Increasing**
305SJA	12	3	45	16	14	8%[5]	**Increasing**	**Increasing**
305TSR	12	12	126	53	48	50%[6]	**Decreasing**	**Increasing**
305WCS	11	6	609	93	18	36%[5]	**Increasing**	Increasing
305WSA	7	12	999	239	125	86%[6]	Decreasing	**Increasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.
4 Turbidity was monitored from 2005-2023 and TSS was monitored from 2012-2023.
5 The relevant numeric criterion is 25.0 NTU [COLD].
6 The relevant numeric criterion is 40.0 NTU [WARM].

3.2.4 Unionized and Total Ammonia

All but one site within the Pajaro River HU has a TMDL limit for unionized ammonia. All TMDL limits for unionized ammonia are associated with the Pajaro River Watershed Nutrient TMDL. Watsonville Creek (305WCS) is located outside of the Pajaro River Watershed Nutrient TMDL area and therefore has a non-TMDL area limit for unionized ammonia. See **Table 2-5** and **Appendix A** for a summary of applicable TMDL limits and non-TMDL area limits for unionized ammonia in the Pajaro HU. **Figure 3-6** depicts annual median unionized ammonia concentrations for sites in the Pajaro River HU, **Table 3-4** presents descriptive statistics, and **Table 3-5** and **Appendix B** present TMDL and non-TMDL area limit exceedances.

Samples were also collected and analyzed for total ammonia. There is currently no TMDL limit, non-TMDL area limit, or Basin Plan numeric Water Quality Objective for total ammonia applicable to CMP sites in the Pajaro River HU. Therefore, the focus of this report is descriptive statistics, which are presented in **Table 3-6.**

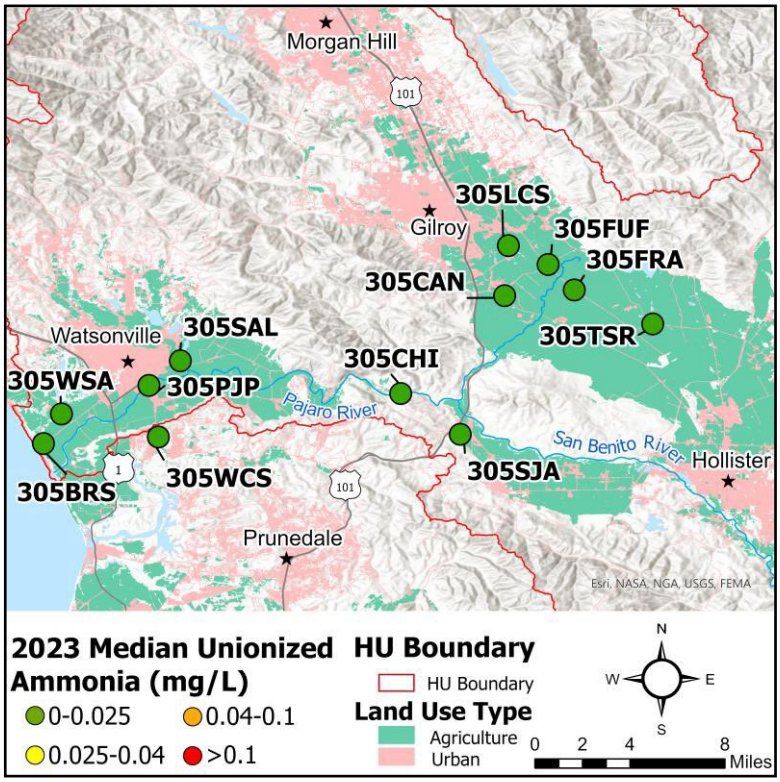


Figure 3-6. 2023 Median Unionized Ammonia for Sites in HU 305

- The highest median unionized ammonia concentration was 0.0079 mg/L, measured in San Juan Creek (305SJA).
- For the period of 2005-2023, two sites (Llagas Creek [305LCS] and Tequisquita Slough [305TSR]) showed statistically significant decreasing trends in unionized ammonia concentrations. Four sites showed a statistically significant increasing trend in unionized ammonia concentration (Pajaro River at Chittenden [305CHI], Salsipuedes Creek [305SAL], Pajaro River at Main St. [305PJP], and San Juan Creek [305SJA]).

Table 3-4. Descriptive Statistics for Unionized Ammonia in Hydrologic Unit 305 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
305BRS	12	0.0001	0.0153	0.0035	0.0017	Increasing
305CAN	10	0.0000	0.0009	0.0003	0.0002	Decreasing
305CHI	12	0.0002	0.0094	0.0023	0.0013	**Increasing**
305FRA	12	0.0009	0.2226	0.0231	0.0061	Increasing
305FUF	12	0.0004	0.0903	0.0095	0.0017	Increasing
305LCS	12	0.0000	0.0003	0.0001	0.0001	**Decreasing**
305PJP	12	0.0002	0.0230	0.0036	0.0020	**Increasing**
305SAL	12	0.0001	0.0053	0.0017	0.0016	**Increasing**
305SJA	12	0.0007	0.2712	0.0492	0.0079	**Increasing**
305TSR	12	0.0001	0.0167	0.0027	0.0015	**Decreasing**

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
305WCS	11	0.0001	0.1394	0.0217	0.0041	Increasing
305WSA	7	0.0003	0.0169	0.0029	0.0005	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant (α = 0.05).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Three sites (Millers Canal [305FRA], Furlong Creek [305FUF], and San Juan Creek [305SJA]) exceeded the unionized ammonia TMDL limit of 0.025 mg/L in at least one sample.
- Watsonville Creek (305WCS) exceeded its 0.025 mg/L non-TMDL area limit for unionized ammonia in 27% of the samples in 2023.
- The other eight sites in the Pajaro River Watershed had no TMDL limit exceedances for unionized ammonia.

Table 3-5. Summary of Pajaro River Watershed Nutrient TMDL and Non-TMDL Nutrient Limit Exceedances for Unionized Ammonia in Hydrologic Unit 305

Site ID[1]	TMDL Annual Percent Exceedance[2]	Non-TMDL Area Limit Percent Exceedance[2]
305BRS	0%	N/A
305CAN	0%	N/A
305CHI	0%	N/A
305FRA	0%	N/A
305FUF	8%	N/A
305LCS	8%	N/A
305PJP	0%	N/A
305SAL	0%	N/A
305SJA	42%	N/A
305TSR	0%	N/A
305WCS	N/A	27%
305WSA	0%	N/A

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations, 2023*, for detailed site descriptions.

2 The relevant numeric criterion is 0.025 mg/L.

N/A There is no applicable Pajaro River Watershed Nutrient TMDL limit or non-TMDL area limit criterion for unionized ammonia at this site.

- The spatial distribution and relative magnitudes of total ammonia concentrations were similar to unionized ammonia concentrations.
- The highest total ammonia concentration (2.740 mg/L) was measured in San Juan Creek (305SJA).
- For the period of 2005-2023, eight sites showed statistically significant increasing trends in total ammonia.

Table 3-6. Descriptive Statistics for Total Ammonia in Hydrologic Unit 305 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
305BRS	12	0.031	0.325	0.100	0.077	Increasing
305CAN	10	0.011	0.062	0.032	0.027	Increasing
305CHI	12	0.015	0.209	0.072	0.059	**Increasing**
305FRA	12	0.012	0.308	0.081	0.060	**Increasing**
305FUF	12	0.017	0.477	0.101	0.048	Increasing
305LCS	12	0.004	0.155	0.046	0.034	**Increasing**
305PJP	12	0.004	0.277	0.088	0.069	**Increasing**
305SAL	12	0.004	0.224	0.089	0.049	**Increasing**
305SJA	12	0.021	2.740	0.976	0.707	**Increasing**
305TSR	12	0.017	0.230	0.089	0.059	Increasing
305WCS	11	0.013	0.880	0.202	0.141	**Increasing**
305WSA	7	0.089	0.443	0.244	0.290	**Increasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.2.5 Nitrate and Total Nitrogen

Samples were collected and analyzed for "nitrate + nitrite"; however, this report primarily refers to "nitrate" as nitrite levels are assumed to be very low. All but one site within the Pajaro River HU have a TMDL limit for nitrate. All TMDL limits for nitrate are associated with the Pajaro River Watershed Nutrient TMDL. Watsonville Creek (305WCS) is located outside of the Pajaro River Watershed Nutrient TMDL area and therefore has a non-TMDL area limit for nitrate. See **Table 2-5** and **Appendix A** for a summary of applicable annual, dry season, and wet season TMDL limits and non-TMDL area limits for nitrate in the Pajaro HU. **Figure 3-7** depicts annual median nitrate concentrations and loading for sites in the Pajaro River HU for 2023, **Table 3-7** presents descriptive statistics, and **Table 3-8** and **Appendix B** present TMDL and non-TMDL area limit exceedances.

Samples were also collected and analyzed for total nitrogen. Millers Canal (305FRA) has a total nitrogen TMDL limit for the wet and dry season, and Watsonville Slough (305WSA) has a TMDL limit for the dry season only. See **Table 2-5** and **Appendix A** for a summary of applicable dry season and wet season total nitrogen TMDL limits in the Pajaro River HU. There is currently no non-TMDL area limits or numeric Water Quality Objective for total nitrogen in the Basin Plan applicable to the other ten CMP sites in the Pajaro River HU. Descriptive statistics for total nitrogen are presented in **Table 3-9** and TMDL and non-TMDL area exceedances are presented in **Table 3-10** and **Appendix B**.

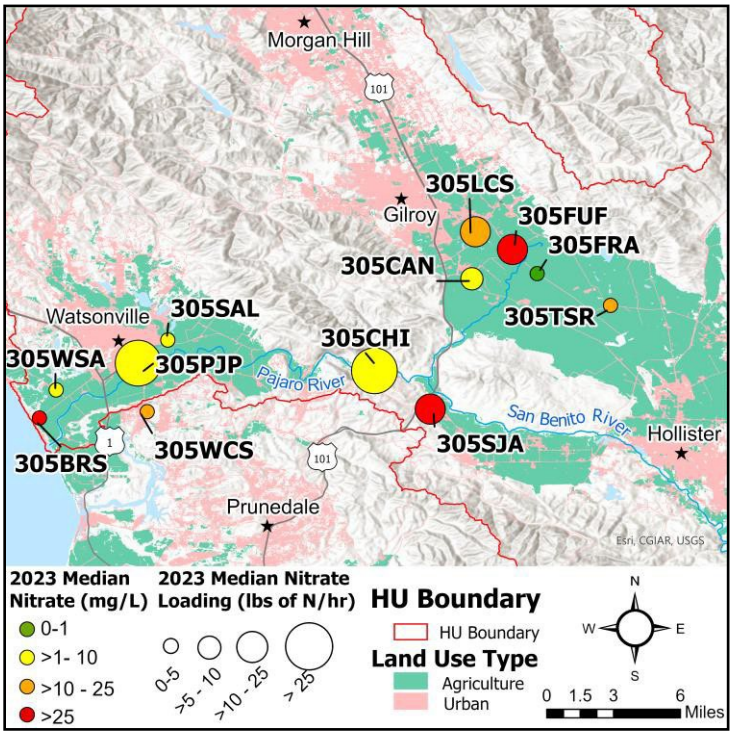


Figure 3-7. 2023 Median Nitrate for Sites in HU 305

- In 2023, Furlong Creek (305FUF) had the highest median concentration of Nitrate (39.90 mg/L).
- Moderate nitrate loading in San Juan Creek (305SJA) resulted from high nitrate concentrations, as flow was modest. Relatively high loading in Pajaro River at Main St. (305PJP) and Pajaro River at Chittenden (305CHI) was due to high flows and moderate nitrate concentrations.
- For the period of 2005-2023, two sites showed statistically significant increasing trends in nitrate concentration (Furlong Creek [305FUF] and Tequisquita Slough [305TSR]), and three sites showed statistically significant decreasing trends in nitrate concentrations (Pajaro River at Main St. [305PJP], Watsonville Creek [305WCS], and Watsonville Slough [305WSA]).
- For the period of 2005-2023, five sites showed statistically significant increasing trends in nitrate loading (Beach Road Ditch [305BRS], Salsipuedes Creek [305SAL], Furlong Creek [305FUF], Tequisquita Slough [305TSR], and Watsonville Slough [305WSA]).

Table 3-7. Descriptive Statistics for Nitrate in Hydrologic Unit 305 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Nitrate Trend[2]	Nitrate Loading Trend[2]
305BRS	12	2.37	35.40	22.69	25.50	Increasing	**Increasing**
305CAN	10	0.46	45.00	13.08	3.67	Decreasing	Increasing
305CHI	12	0.96	18.60	6.48	4.31	Increasing	Decreasing
305FRA	12	0.01	1.27	0.24	0.01	Increasing	Decreasing
305FUF	12	20.10	48.50	37.69	39.90	**Increasing**	**Increasing**
305LCS	12	2.81	20.50	13.15	16.05	Decreasing	Decreasing
305PJP	12	1.19	10.10	4.37	3.41	**Decreasing**	Decreasing
305SAL	12	0.44	9.21	3.57	1.29	Decreasing	**Increasing**
305SJA	12	11.00	49.00	32.72	34.40	Increasing	Decreasing
305TSR	12	0.98	40.90	15.31	13.10	**Increasing**	**Increasing**
305WCS	11	1.08	18.00	10.23	10.40	**Decreasing**	Decreasing
305WSA	7	0.27	1.56	0.99	1.34	**Decreasing**	**Increasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Three sites (Millers Canal [305FRA], Furlong Creek [305FUF], Watsonville Slough [305WSA]) showed no exceedance of the 10 mg/L nitrate TMDL. Six sites exceeded the nitrate TMDL limit in at least 40% of samples sites (Beach Road Ditch [305BRS], Carnadero Creek [305CAN], Furlong Creek [305FUF], Llagas Creek [305LCS], San Juan Creek [309SJA], and Tequisquita Slough [305TSR]). Of those sites, Furlong Creek (305FUF) and San Juan Creek (305SJA) exceeded the nitrate TMDL limit in 100% of the samples.
- All nine sites with a dry season TMDL limit for nitrate exceeded the limit in at least 60% of samples. Five sites (Beach Road Ditch [305BRS], Pajaro River at Chittenden [305CHI], Furlong Creek [305FUF], Llagas Creek [305LCS], and San Juan Creek [305SJA]) exceeded the dry season TMDL limit in all samples.
- Three of 10 sites with a wet season TMDL limit for nitrate (8.0 mg/L) showed no exceedance (Pajaro River at Chittenden [305CHI], Pajaro River at Main St. [305PJP], and Watsonville Slough [305WSA]). Two sites, Furlong Creek (305FUF) and San Juan Creek (305SJA), exceeded the wet season TMDL limit in at least 60% of samples.
- Watsonville Creek [305WCS] exceeded the nitrate non-TMDL area limit in 55% of the samples.

Table 3-8. Summary of Pajaro River Watershed Nutrient TMDL and Non-TMDL Area Nutrient Limit Exceedances for Nitrate in Hydrologic Unit 305

Site ID[1]	TMDL Annual Percent Exceedance[2]	TMDL Dry Season Percent Exceedance	TMDL Wet Season Percent Exceedance[3]	Non-TMDL Area Limit Percent Exceedance[2]
305BRS	92%	100%[4]	86%	N/A
305CAN	40%	67%[5]	29%	N/A
305CHI	17%	100%[6]	0%	N/A
305FRA	0%	N/A	14%	N/A
305FUF	0%	100%[5]	N/A	N/A
305LCS	100%	100%[5]	100%	N/A
305PJP	67%	80%[6]	43%	N/A
305SAL	17%	60%[5]	0%	N/A
305SJA	100%	100%[4]	100%	N/A
305TSR	67%	80%[7]	71%	N/A
305WCS	N/A	N/A	N/A	55%
305WSA	0%	N/A	0%	N/A

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations,* 2023, for detailed site descriptions.
2 The TMDL and Non-TMDL Areas numeric criterion is 10.0 mg/L.
3 The relevant wet season numeric criterion is 8.0 mg/L.
4 The relevant dry season numeric criterion is 3.3 mg/L.
5 The relevant dry season numeric criterion is 1.8 mg/L.
6 The relevant dry season numeric criterion is 3.9 mg/L.
7 The relevant dry season numeric criterion is 2.2 mg/L.
N/A There is no applicable Pajaro River Watershed Nutrient TMDL or non-TMDL area limit criterion for nitrate at this site.

- Median values for total nitrogen ranged from 2.0 mg/L (Millers Canal [305FRA]) to 40.1 mg/L (Furlong Creek [305FUF]).
- The highest total nitrogen concentration (58.9 mg/L) was observed at San Juan Creek (305SJA).
- For the period of 2005-2023, three sites showed a statistically significant increasing trend in total nitrogen (Millers Canal [305FRA], Salsipuedes Creek [305SAL], and Tequisquita Slough [305TSR]). Two sites (Pajaro River at Chittenden [305CHI] and Watsonville Creek [305WCS]) showed statistically significant decreasing trends in total nitrogen.

Table 3-9. Descriptive Statistics for Total Nitrogen in Hydrologic Unit 305 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
305BRS	12	3.4	35.8	23.8	26.3	Increasing
305CAN	10	0.9	45.0	13.4	4.3	Decreasing
305CHI	12	1.8	18.9	7.3	5.0	**Decreasing**
305FRA	12	1.1	6.2	2.4	2.0	**Increasing**
305FUF	12	23.2	48.5	38.0	40.1	Increasing
305LCS	12	3.3	20.7	13.4	16.2	Increasing
305PJP	12	2.1	10.5	5.2	4.3	Decreasing
305SAL	12	0.9	9.6	4.5	4.1	**Increasing**
305SJA	12	19.6	58.9	38.3	39.6	Decreasing
305TSR	12	1.8	41.7	16.2	14.1	**Increasing**
305WCS	11	2.5	18.2	11.3	11.6	**Decreasing**
305WSA	7	1.5	13.1	4.4	3.2	Decreasing

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Millers Canal (305FRA) and Watsonville Slough (305WSA) exceeded total nitrogen dry season TMDL limits of 1.1 mg/L and 2.1 mg/L, respectively, in all samples.
- Millers Canal [305FRA], the only site with a wet season TMDL limit had no exceedances of the 8.0 mg/L limit.

Table 3-10. Summary of Pajaro River Watershed Nutrient TMDL and Non-TMDL Area Nutrient Limit Exceedances for Total Nitrogen in Hydrologic Unit 305

Site ID[1]	TMDL Dry Season Percent Exceedance	TMDL Wet Season Percent Exceedance	Non-TMDL Area Limit Percent Exceedance
305BRS	N/A	N/A	N/A
305CAN	N/A	N/A	N/A
305CHI	N/A	N/A	N/A
305FRA	100%[2]	0%[3]	N/A
305FUF	N/A	N/A	N/A
305LCS	N/A	N/A	N/A
305PJP	N/A	N/A	N/A
305SAL	N/A	N/A	N/A
305SJA	N/A	N/A	N/A
305TSR	N/A	N/A	N/A
305WCS	N/A	N/A	N/A
305WSA	100%[4]	N/A	N/A

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations,* 2023, for detailed site descriptions.
2 The relevant dry season numeric criterion is 1.1 mg/L.
3 The relevant wet season numeric criterion is 8.0 mg/L.

4 The relevant dry season numeric criterion is 2.1 mg/L.
N/A There is no applicable Pajaro River Watershed Nutrient TMDL or non-TMDL area limit criterion for total nitrogen at this site.

3.2.6 Orthophosphate and Total Phosphorus

All sites in the Pajaro River HU, except for Watsonville Creek (305WCS), have a dry season and wet season TMDL limit for orthophosphate. All TMDL limits for orthophosphate are associated with the Pajaro River Watershed Nutrient TMDL. See **Table 2-5** and **Appendix A** for a summary of applicable dry season and wet season TMDL limits for orthophosphate in the Pajaro HU. **Figure 3-8** depicts annual median orthophosphate concentrations for sites in the Pajaro River HU for 2023. **Table 3-11** presents descriptive statistics for orthophosphate, **Table 3-12** and **Appendix B** present TMDL and non-TMDL area limit exceedances for orthophosphate, and **Table 3-13** presents descriptive statistics for total phosphorus.

- Median concentrations for orthophosphate in the Pajaro River HU ranged from 0.014 mg/L at Carnadero Creek (305CAN) to 0.565 mg/L at San Juan Creek (305SJA) in 2023.

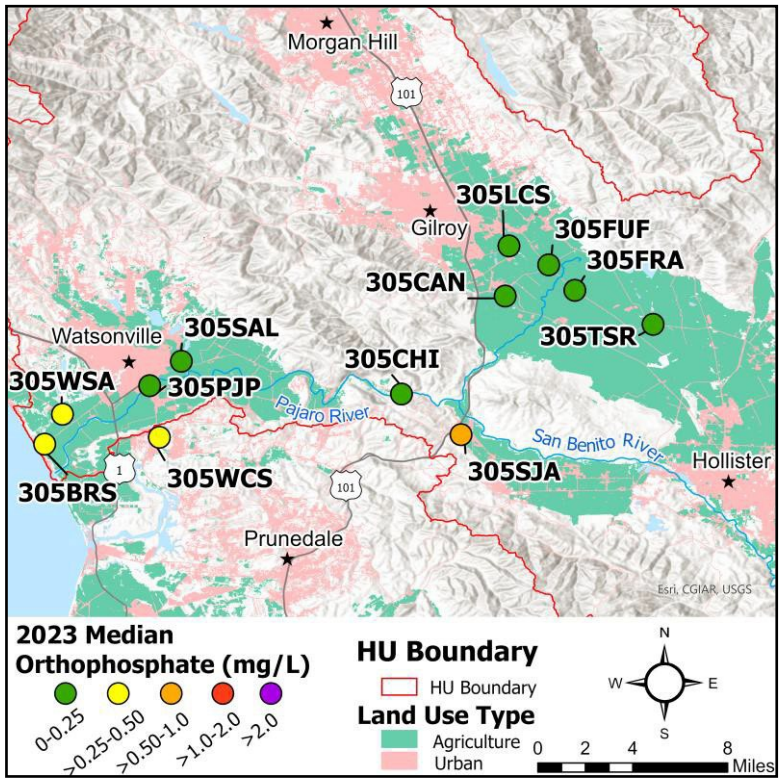


Figure 3-8. 2023 Median Orthophosphate as P for Sites in HU 305

- The highest concentration of orthophosphate observed at any Pajaro HU site in 2023 was in San Juan Creek (305SJA) (5.310 mg/L).
- For the period of 2005-2023, one site (San Juan Creek [305SJA]), showed statistically significant increasing trends in orthophosphate concentrations and three sites (Millers Canal [305FRA], Furlong Creek [305FUF], and Llagas Creek [305LCS]) showed a statistically significant decreasing trend.

Table 3-11. Descriptive Statistics for Orthophosphate as P in Hydrologic Unit 305 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
305BRS	12	0.104	0.873	0.308	0.277	Increasing
305CAN	10	0.004	0.047	0.016	0.014	Decreasing
305CHI	12	0.037	0.345	0.127	0.094	Decreasing
305FRA	12	0.004	0.196	0.054	0.021	**Decreasing**
305FUF	12	0.004	0.439	0.118	0.084	**Decreasing**
305LCS	12	0.004	0.045	0.025	0.024	**Decreasing**
305PJP	12	0.040	0.192	0.113	0.110	Decreasing
305SAL	12	0.073	0.366	0.187	0.194	Increasing
305SJA	12	0.067	5.310	1.239	0.565	**Increasing**
305TSR	12	0.072	0.306	0.149	0.127	Decreasing
305WCS	11	0.048	0.622	0.258	0.277	Increasing

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
305WSA	7	0.060	0.448	0.294	0.288	Decreasing

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- In 2023, seven of 11 sites with an applicable dry season TMDL limit for orthophosphate exceeded the limit in at least 20% of samples. Two sites showed no exceedance of the orthophosphate dry season TMDL limit (Carnadero Creek [305CAN] and Llagas Creek [305LCS]).
- Five sites of the 11 sites with an applicable wet season TMDL limit for orthophosphate (Carnadero Creek [305CAN], Pajaro River at Chittenden [305CHI], Millers Canal [305FRA], Llagas Creek [305LCS], and Pajaro River at Main St. [305PJP]) did not exceed the 0.3 mg/L limit. The six remaining sites exceeded the limit in 14% or more of wet season samples.

Table 3-12. Summary of Pajaro River Watershed Nutrient TMDL and Non-TMDL Area Nutrient Limit Exceedances for Orthophosphate as P in Hydrologic Unit 305

Site ID[1]	TMDL Dry Season Percent Exceedance	TMDL Wet Season Percent Exceedance[2]	Non-TMDL Area Limit Percent Exceedance
305BRS	100%[3]	43%	N/A
305CAN	0%[4]	0%	N/A
305CHI	60%[3]	0%	N/A
305FRA	40%[5]	0%	N/A
305FUF	100%[4]	14%	N/A
305LCS	0%[4]	0%	N/A
305PJP	20%[3]	0%	N/A
305SAL	60%[3]	14%	N/A
305SJA	80%[6]	57%	N/A
305TSR	60%[6]	14%	N/A
305WCS	N/A	N/A	N/A
305WSA	50%[3]	20%	N/A

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations,* 2023, for detailed site descriptions.
2 The relevant wet season numeric criterion is 0.3 mg/L.
3 The relevant dry season numeric criterion is 0.14 mg/L.
4 The relevant dry season numeric criterion is 0.05 mg/L.
5 The relevant dry season numeric criterion is 0.04 mg/L.
6 The relevant dry season numeric criterion is 0.12 mg/L.
N/A There is no applicable Pajaro River Watershed Nutrient TMDL or non-TMDL area limit criterion for orthophosphate as P at this site.

- The spatial distribution and relative magnitudes of total phosphorus concentrations were similar to orthophosphate concentrations.
- Median concentrations for total phosphorus in the Pajaro River HU ranged from 0.096 at Carnadero Creek (305CAN) to 1.012 mg/L at San Juan Creek (305SJA) in 2023.
- The highest concentration for total phosphorus was observed at San Juan Creek (305SJA) (5.060 mg/L).
- For the period of 2005-2023, six sites showed a statistically significant increasing trend in total phosphorus (Beach Road Ditch [305BRS], Pajaro River at Main St. [305PJP], Pajaro River at Chittenden [305CHI], Salsipuedes Creek [305SAL], San Juan Creek [305SJA], and Watsonville Creek [305WCS]).

Table 3-13. Descriptive Statistics for Total Phosphorus in Hydrologic Unit 305 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
305BRS	12	0.289	1.230	0.559	0.433	**Increasing**
305CAN	10	0.004	0.277	0.097	0.096	Increasing
305CHI	12	0.073	0.542	0.283	0.274	**Increasing**
305FRA	12	0.100	0.915	0.420	0.378	Increasing
305FUF	12	0.093	0.901	0.339	0.306	Decreasing
305LCS	12	0.036	0.297	0.117	0.104	Decreasing
305PJP	12	0.144	0.630	0.315	0.277	**Increasing**
305SAL	12	0.157	2.490	0.497	0.341	**Increasing**
305SJA	12	0.143	5.060	1.516	1.012	**Increasing**
305TSR	12	0.220	0.552	0.360	0.342	Increasing
305WCS	11	0.134	0.848	0.469	0.497	**Increasing**
305WSA	7	0.440	2.080	0.990	0.738	Decreasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.2.7 Specific Conductivity

A Water Quality Objective for specific conductivity to protect agricultural uses applies to four Pajaro HU sites - Llagas Creek (305LCS), Salsipuedes Creek (305SAL), and the Pajaro River at Main St. (305PJP) and Chittenden (305CHI). This agricultural objective does not define a numeric value to evaluate exceedance frequencies, but provides ranges:

- <750 µS/cm, "No Problem";
- 750-3,000 µS/cm, "Increasing Problems" and
- >3,000 µS/cm, "Severe".

Figure 3-9 depicts annual median conductivity for sites in the Pajaro River HU for 2023 and **Table 3-14** presents descriptive statistics.

- Median conductivity ranged from 317 µS/cm at Watsonville Slough (305WSA) to 3,999 µS/cm at Millers Canal (305FRA).
- Eight sites had median concentrations between 750 and 3,000 µS/cm indicating increasing problems. One site (Millers Canal [305FRA]) had a median concentration above the high end of the listed ranges (3,000 µS/cm) indicating severe problems.
- The two highest maximum conductivities were recorded at Beach Road Ditch (305BRS) (36,777 µS/cm) where there is tidal influence, and Millers Canal (305FRA) (18,022 µS/cm).
- For the period of 2005-2023, two sites showed statistically significant increasing trends in conductivity (Pajaro River at Chittenden [305CHI] and Watsonville Creek [305WCS]). Four sites (Beach Road Ditch [305BRS], Pajaro River at Main St. [305PJP], Salsipuedes Creek [305SAL], and San Juan Creek [305SJA]) showed statistically decreasing trends in specific conductivity.

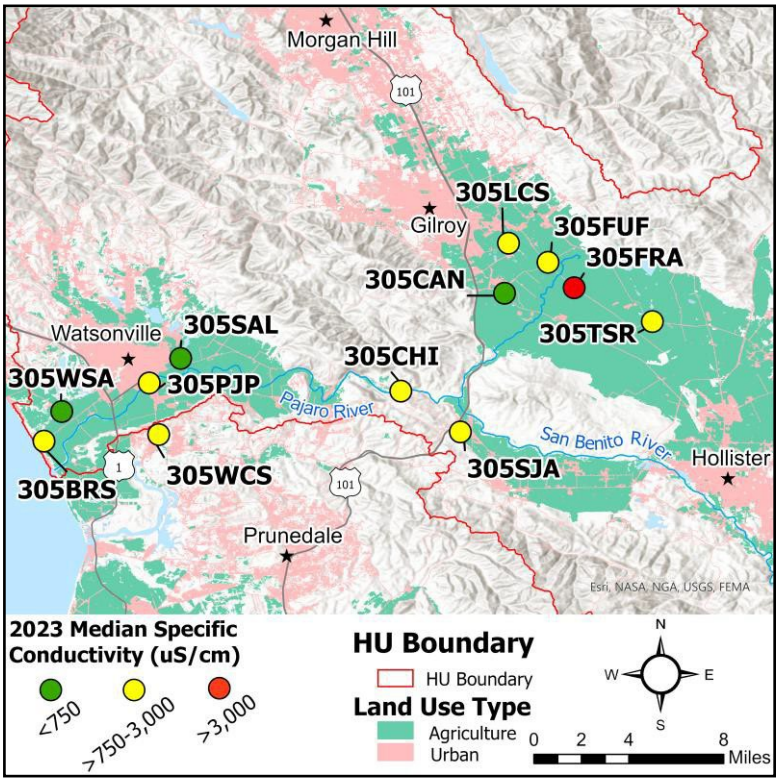


Figure 3-9. 2023 Median Conductivity for Sites in HU 305

Table 3-14. Descriptive Statistics for Specific Conductivity in Hydrologic Unit 305 (µS/cm)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
305BRS	12	1,039	36,777	7,266	2,028	**Decreasing**
305CAN	10	308	2,108	931	469	Increasing
305CHI	12	617	3,226	1,507	1,441	**Increasing**
305FRA	12	516	18,022	5,448	3,999	Increasing
305FUF	12	849	1,492	1,315	1,391	Decreasing
305LCS	12	309	1,262	914	1,063	Increasing
305PJP	12	399	1,685	1,091	971	**Decreasing**
305SAL	12	215	884	580	593	**Decreasing**
305SJA	12	1,649	3,070	2,579	2,706	**Decreasing**
305TSR	12	958	3,069	2,447	2,522	Increasing
305WCS	11	100	1,603	1,203	1,448	**Increasing**
305WSA	7	133	992	415	317	Increasing

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.2.8 Total Dissolved Solids and Salinity

The Basin Plan contains TDS objectives for two sites in the Pajaro River HU: Pajaro River at Chittenden (305CHI) (1,000 mg/L) and Llagas Creek (305LCS) (200 mg/L). The objectives are applied as an annual average. The Basin Plan contains no numeric Water Quality Objectives for the following analytes for CMP sites in the Pajaro River HU: salinity, alkalinity, calcium, magnesium, sodium, potassium, sulfate, and chloride. No trend analyses were performed on the latter six analytes due to limited historical data associated with them. **Figure 3-10** depicts annual median TDSconcentrations for sites in the Pajaro River HU for 2023. **Table 3-15**, **Table 3-16**, **Table 3-17**, **Table 3-18**, **Table 3-19**, **Table 3-20**, **Table 3-21**, **Table 3-22**, and **Table 3-23** present descriptive statistics for TDS, salinity, alkalinity, calcium, magnesium, sodium, potassium, sulfate, and chloride, respectively.

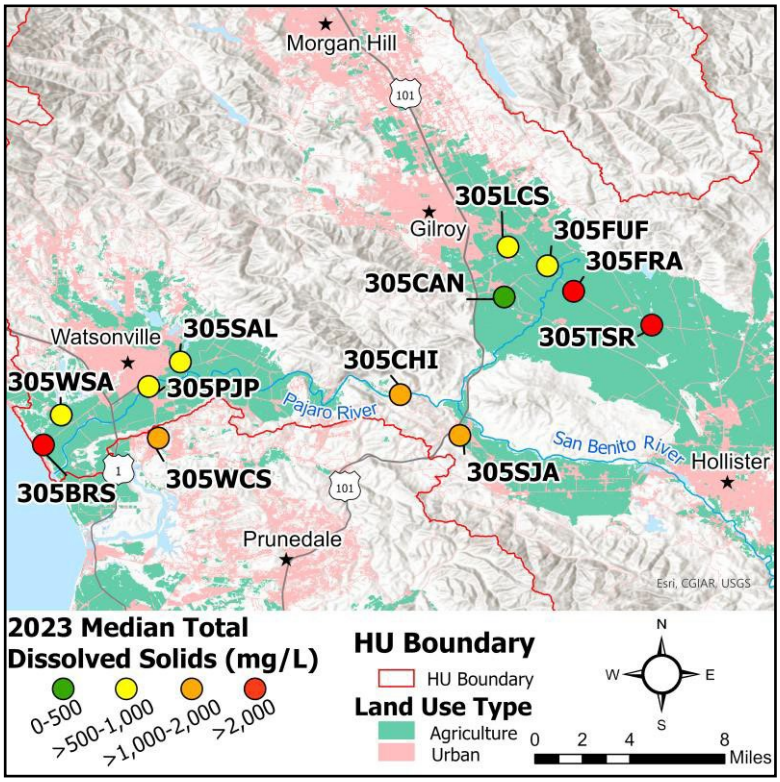


Figure 3-10. 2023 Median Total Dissolved Solids for Sites in HU 305

- Median TDS concentrations ranged from 206 mg/L at Carnadero Creek (305CAN) to 2,559 mg/L at Millers Canal (305FRA).
- TDS concentrations were highest in Beach Road Ditch (305BRS) (23,920 mg/L) and Millers Canal (305FRA) (11,723 mg/L).
- The annual mean for TDS at Llagas Creek (305LCS) (588 mg/L) exceeded the Water Quality Objective.
- For the period of 2005-2023, three sites showed statistically significant increasing trends in TDS concentrations (Beach Road Ditch [305BRS], Pajaro River at Chittenden [305CHI], Millers Canal [305FRA], Tequisquita Slough [305TSR], and Watsonville Creek [305WCS]). One site (San Juan Creek [305SJA]) had a statistically significant decreasing trend.

Table 3-15. Descriptive Statistics for Total Dissolved Solids in Hydrologic Unit 305 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	WQO Exceedance?	Trend[2]
305BRS	12	674	23,920	4,700	1,318	N/A	Increasing
305CAN	10	156	1,370	601	305	N/A	Increasing
305CHI	12	313	2,097	972	936	No[4]	**Increasing**
305FRA	12	262	11,723	3,536	2,599	N/A	**Increasing**
305FUF	12	552	978	838	893	N/A	Decreasing
305LCS	12	202	820	588	691	Yes[5]	Decreasing
305PJP	12	260	1,096	702	631	N/A	Decreasing
305SAL	12	140	575	373	386	N/A	Decreasing
305SJA	12	1,072	1,996	1,647	1,759	N/A	**Decreasing**
305TSR	12	486	1,995	1,579	1,639	N/A	**Increasing**

Site ID[1]	N[3]	Min	Max	Mean	Median	WQO Exceedance?	Trend[2]
305WCS	11	65	1,042	768	941	N/A	Increasing
305WSA	7	91	645	265	206	N/A	Decreasing

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.
N/A There is no applicable Water Quality Objective for this site.
4 Water quality objective is <100mg/L.
5 Water quality objective is <200mg/L.

- The spatial distribution and relative magnitudes of salinity were similar to TDS concentrations.
- For the period of 2005-2023, three sites showed statistically significant increasing trends in salinity (Pajaro River at Chittenden [305CHI], Millers Canal [305FRA], Tequisquita Slough [305TSR]). One site (San Juan Creek [305SJA]) showed a statistically significant decreasing trend in salinity.

Table 3-16. Descriptive Statistics for Salinity in Hydrologic Unit 305 (ppt)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
305BRS	12	0.52	23.30	4.39	1.04	Decreasing
305CAN	10	0.15	1.08	0.47	0.23	Increasing
305CHI	12	0.30	1.70	0.77	0.73	**Increasing**
305FRA	12	0.25	10.63	3.06	2.13	**Increasing**
305FUF	12	0.42	0.76	0.66	0.70	Decreasing
305LCS	12	0.15	0.63	0.46	0.53	Increasing
305PJP	12	0.19	0.86	0.55	0.48	Decreasing
305SAL	12	0.10	0.44	0.28	0.29	Decreasing
305SJA	12	0.84	1.61	1.34	1.41	**Decreasing**
305TSR	12	0.48	1.61	1.27	1.31	**Increasing**
305WCS	11	0.05	0.81	0.60	0.73	Increasing
305WSA	7	0.07	7.04	1.14	0.15	Increasing

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$)
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median alkalinity concentrations ranged from 115 mg/L at Watsonville Slough (305WSA) to 440 mg/L at Tequisquita Slough (305TSR).

Table 3-17. Descriptive Statistics for Alkalinity in Hydrologic Unit 305 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
305BRS	4	85	434	284	308
305CAN	3	118	323	196	147
305CHI	4	165	420	310	327
305SAL	4	48	220	126	118
305FRA	4	169	434	306	311
305FUF	4	234	374	330	356
305LCS	4	95	325	207	204
305PJP	4	82	387	220	206
305SJA	4	272	464	394	419
305TSR	4	361	517	440	440
305WCS	4	35	462	277	305
305WSA	3	98	171	128	115

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- The lowest concentration of calcium (15 mg/L) was measured at Watsonville Creek (305WCS) and the highest concentration (180 mg/L) was measured at Millers Canal (305FRA).

Table 3-18. Descriptive Statistics for Calcium in Hydrologic Unit 305 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
305BRS	4	60	97	79	79
305CAN	3	31	112	60	36
305CHI	4	46	106	80	85
305SAL	4	24	79	46	41
305FRA	4	51	180	98	81
305FUF	4	68	116	101	110
305LCS	4	23	88	55	55
305PJP	4	25	94	57	54
305SJA	4	96	129	113	114
305TSR	4	73	139	115	125
305WCS	4	15	78	52	58
305WSA	3	24	53	37	35

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median magnesium concentrations in the Pajaro River HU ranged from 16 mg/L at Salsipuedes Creek (305SAL) to 141 mg/L at Tequisquita Slough (305TSR). The highest concentration of magnesium (538 mg/L) was recorded in Millers Canal (305FRA).

Table 3-19. Descriptive Statistics for Magnesium in Hydrologic Unit 305 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
305BRS	4	36	97	68	70
305CAN	3	17	64	34	22
305CHI	4	36	105	72	74
305SAL	4	8	29	17	16
305FRA	4	48	538	207	122
305FUF	4	42	74	65	72
305LCS	4	15	61	38	38
305PJP	4	18	85	44	37
305SJA	4	69	151	109	108
305TSR	4	80	185	137	141
305WCS	4	8	124	71	76
305WSA	3	16	29	23	24

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median sodium concentrations ranged from 18 mg/L at Salsipuedes Creek (305SAL) to 332 mg/L at Millers Canal (305FRA). Millers Canal (305FRA) also had the highest recorded concentration of sodium (1,640 mg/L).

Table 3-20. Descriptive Statistics for Sodium in Hydrologic Unit 305 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
305BRS	4	90	252	169	166
305CAN	3	14	69	34	20
305CHI	4	61	207	134	134
305SAL	4	10	42	22	18
305FRA	4	125	1,640	607	332
305FUF	4	49	95	80	88
305LCS	4	11	71	34	27
305PJP	4	31	117	67	60
305SJA	4	164	342	265	277
305TSR	4	217	315	267	268
305WCS	4	6	86	50	55
305WSA	3	22	30	27	29

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Potassium concentrations ranged from 2.5 mg/L at nine sites to 11.4 mg/L at Tequisquita Slough (305TSR).
- Tequisquita Slough (305TSR) had the highest median potassium concentration (5.8 mg/L).

Table 3-21. Descriptive Statistics for Potassium in Hydrologic Unit 305 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
305BRS	4	2.5	5.8	3.3	2.5
305CAN	3	2.5	2.5	2.5	2.5
305CHI	4	2.5	2.5	2.5	2.5
305SAL	4	2.5	5.5	3.9	3.8
305FRA	4	2.5	6.5	4.4	4.3
305FUF	4	2.5	10.2	4.4	2.5
305LCS	4	2.5	2.5	2.5	2.5
305PJP	4	2.5	2.5	2.5	2.5
305SJA	4	2.5	8.0	3.9	2.5
305TSR	4	2.5	11.4	6.4	5.8
305WCS	4	2.5	2.5	2.5	2.5
305WSA	3	2.5	10.9	5.3	2.5

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median sulfate concentrations ranged from 37 mg/L at Carnadero Creek (305CAN) to 748 mg/L at Millers Canal (305FRA). Millers Canal (305FRA) also had the highest recorded concentration of sulfate (3,960 mg/L).

Table 3-22. Descriptive Statistics for Sulfate in Hydrologic Unit 305 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
305BRS	4	126	337	228	225
305CAN	3	31	149	72	37
305CHI	4	127	451	284	278
305SAL	4	25	118	57	43
305FRA	4	292	3,960	1,437	748
305FUF	4	85	166	138	150
305LCS	4	27	100	62	60
305PJP	4	72	332	164	127
305SJA	4	348	747	524	500
305TSR	4	510	696	598	593
305WCS	4	23	275	171	194
305WSA	3	30	67	46	42

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- The lowest concentration of chloride (9 mg/L) was measured at Watsonville Creek (305WCS) and the highest concentration (1,550 mg/L) was measured at Millers Canal (305FRA).

Table 3-23. Descriptive Statistics for Chloride in Hydrologic Unit 305 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
305BRS	4	105	263	198	212
305CAN	3	12	147	60	20
305CHI	4	47	224	145	155
305SAL	4	10	50	24	18
305FRA	4	101	1,550	565	304
305FUF	4	54	112	90	96
305LCS	4	19	129	58	42
305PJP	4	34	149	74	57
305SJA	4	175	333	254	255
305TSR	4	209	330	279	289
305WCS	4	9	92	54	58
305WSA	3	26	41	35	37

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.2.9 Dissolved Oxygen

The minimum dissolved oxygen (DO) Water Quality Objective for protection of cold water or spawning aquatic life Beneficial Uses (7 mg/L) applies to seven of the 12 Pajaro River HU sites. For sites that do not have specifically assigned Beneficial Uses, the Basin Plan specifies the following general numeric objectives: 5 mg/L and 85% saturation. The 85% saturation objective is applied on a median basis. General water quality objectives apply to all waterbodies unless a more protective Beneficial Use and water quality objective are designated. **Figure 3-11** depicts annual median dissolved oxygen concentrations for sites in the Pajaro River HU for 2023. **Table 3-24** and **Table 3-25** present descriptive statistics for dissolved oxygen and oxygen saturation, respectively.

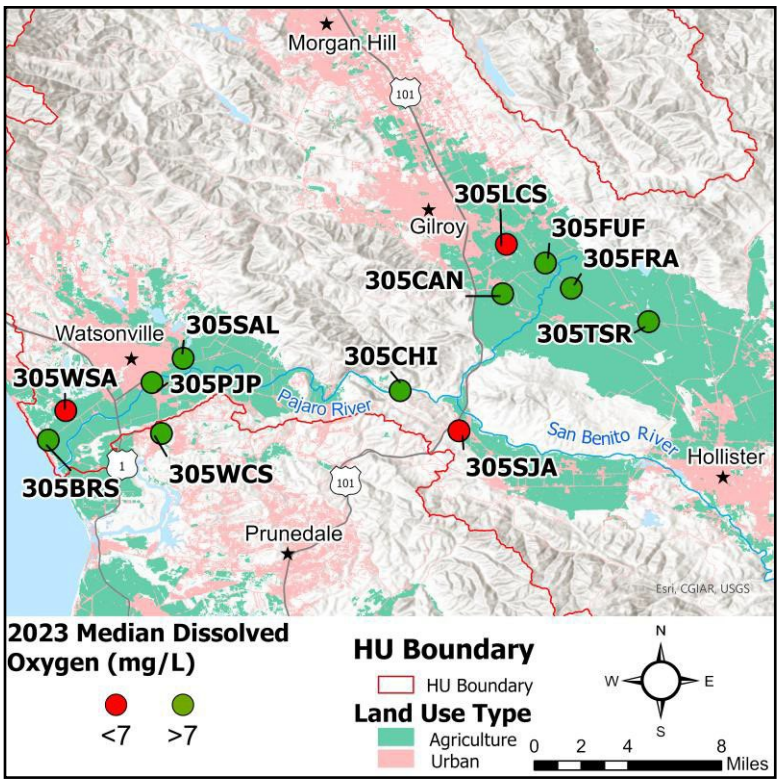


Figure 3-11. 2023 Median Dissolved Oxygen Concentrations for Sites in HU 305

- Median DO concentrations in the Pajaro HU ranged from 5.34 mg/L at Watsonville Slough (305WSA) to 10.04 mg/L at Watsonville Creek (305WCS).
- Four sites in the Pajaro River HU met the 5 mg/L or 7 mg/L minimum Water Quality Objective in all samples.
- For the period of 2005-2023, four sites displayed statistically significant decreasing trends in dissolved oxygen concentrations (Carnadero Creek [305CAN], Pajaro River at Chittenden [305CHI], Llagas Creek [305LCS], and Watsonville Creek [305WCS]). Trends in DO must be interpreted with caution, as diel patterns in DO can be influenced by temperature and biological activity depending on the time of day at which sampling occurs, and changes in DO can manifest as either depressed or very high concentrations.

Table 3-24. Descriptive Statistics for Dissolved Oxygen in Hydrologic Unit 305 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Percent Exceedance	Trend[2]
305BRS	12	1.72	21.92	11.05	9.12	17%[3]	Increasing
305CAN	10	4.01	11.34	7.90	9.08	40%	**Decreasing**
305CHI	12	6.05	10.81	8.33	8.21	17%	**Decreasing**
305FRA	12	4.95	14.66	9.95	9.11	8%[3]	Decreasing
305FUF	12	7.88	11.18	9.40	9.24	0%[3]	Increasing
305LCS	12	1.61	9.67	5.47	5.44	58%	**Decreasing**
305PJP	12	7.34	11.01	9.06	8.84	0%	Decreasing
305SAL	12	8.92	12.85	10.12	9.86	0%	Increasing
305SJA	12	3.35	12.72	7.58	6.85	17%[3]	Decreasing
305TSR	12	4.76	12.02	8.03	8.36	33%	Decreasing
305WCS	11	5.98	21.72	10.96	10.04	0%[3]	**Decreasing**
305WSA	7	2.53	9.32	5.18	5.34	71%	Decreasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 Water quality objective is >5 mg/L; all other sites have a Water Quality Objective of >7 mg/L.

- In 2023, two out of five sites with a Water Quality Objective of 85% saturation exceeded the objective on a median basis (Beach Road Ditch [305BRS] and San Juan Creek [305SJA]).
- For the period of 2005-2023, six sites exhibited statistically significant decreasing trends in oxygen saturation (Carnadero Creek [305CAN], Pajaro River at Chittenden [305CHI], Llagas Creek [305LCS], San Juan Creek [304SJA], Tequisquita Slough [305TSR], and Watsonville Creek [305WCS]).

Table 3-25. Descriptive Statistics for Oxygen Saturation in Hydrologic Unit 305 (%)

Site ID[1]	N[3]	Min	Max	Mean	Median	WQO Exceedance?[4]	Trend[2]
30	12	21	24	11	85	Yes	Increasing
30	10	39	10	75	88	N/A	**Decreasing**
30	12	67	94	81	80	N/A	**Decreasing**
30	12	46	17	10	89	No	Decreasing
30	12	69	11	91	92	No	Increasing
30	12	16	10	54	56	N/A	**Decreasing**
30	12	79	11	89	89	N/A	Decreasing
30	12	83	12	99	98	N/A	Increasing
30	12	35	11	73	67	Yes	**Decreasing**
30	12	50	11	76	76	N/A	**Decreasing**
30	11	54	23	11	88	No	**Decreasing**
30	7	27	92	49	46	N/A	Decreasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 Water quality objective is >85%.

N/A There is no applicable Water Quality Objective for this site.

3.2.10 pH

The Water Quality Objective for all Pajaro River HU sites is 7-8.3 pH standard units. For sites with MUN or REC1/REC2 and WARM/COLD Beneficial Uses, the acceptable pH range is 7-8.3 standard pH units. For sites that are not included in Table 2-1 of the Basin Plan, the acceptable pH range is also 7-8.3 standard pH units, which includes the Basin Plan general and REC1/REC2 Water Quality Objectives. **Figure 3-12** depicts annual median pH for sites in the Pajaro River HU for 2023 and **Table 3-26** presents descriptive statistics.

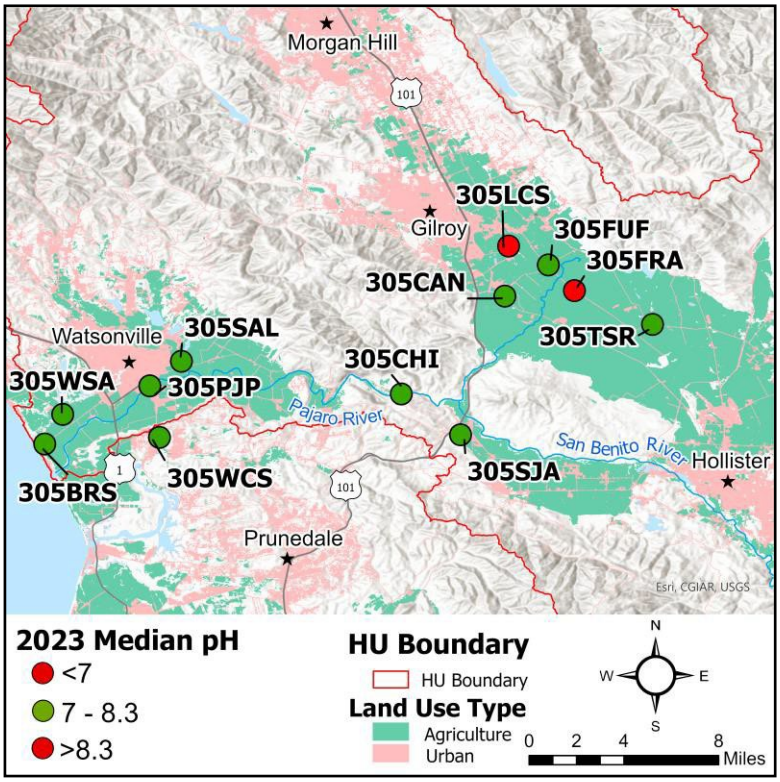


Figure 3-12. 2023 Median pH for Sites in HU 305

- No sites met the applicable pH Water Quality Objective in all samples in 2023.
- Only one site had pH levels below the minimum criterion of 7.0 standard pH units (Llagas Creek [305LCS]). All other exceedances pertained to the 8.3 standard pH units Water Quality Objective.
- Llagas Creek (305LCS) and Millers Canal (305FRA) exceeded the pH Water Quality Objective in 75% and 83% of samples collected, respectively.
- The highest pH in 2023 was recorded in Furlong Creek (305FUF) (9.98 pH units) and the lowest was recorded in Llagas Creek (305LCS) (6.17 pH units).
- For the period of 2005-2023, three sites showed statistically significant decreasing trends in pH (Carnadero Creek [305CAN], Llagas Creek [305LCS], and Tequisquita Slough [305TSR]).

Table 3-26. Descriptive Statistics for pH in Hydrologic Unit 305 (pH units)

Site ID[1]	N[3]	Min	Max	Mean	Median	Percent Exceedance[2]	Trend[4]
305BRS	12	6.91	8.78	7.95	7.83	42%	Increasing
305CAN	10	6.85	8.17	7.48	7.35	10%	**Decreasing**
305CHI	12	7.83	8.55	8.08	8.00	17%	Increasing
305FRA	12	7.92	9.73	8.67	8.72	83%	Decreasing
305FUF	12	7.35	9.98	8.22	8.15	25%	Increasing
305LCS	12	6.17	8.23	6.88	6.77	75%	**Decreasing**
305PJP	12	7.52	9.06	8.10	8.10	25%	Increasing
305SAL	12	7.41	8.70	7.94	7.85	8%	Decreasing
305SJA	12	7.58	8.59	8.05	8.00	25%	Decreasing
305TSR	12	7.41	8.88	7.99	7.95	8%	**Decreasing**
305WCS	11	7.06	9.64	8.19	8.06	45%	Decreasing
305WSA	7	6.76	8.31	7.28	7.20	43%	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Water quality objective is 7-8.3

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3.2.11 Aquatic Toxicity Results

The potential for toxic effects to aquatic and sediment-dwelling organisms is assessed by the CMP via bioassays for sensitive algal species in water (*S. capricornutum* growth), and for sensitive invertebrate species in water (*C. dubia* reproduction and *C. dubia and C. dilutus* survival) and sediment (*H. azteca* growth and survival). Test organism survival and reproduction or growth is measured in environmental samples as well as in non-toxic control samples. A statistical test is then applied to determine significant differences in organism performance between environmental and control samples. When test organism performance is significantly lower in the environmental sample than in the control, *and* the difference exceeds a 20% effect threshold, a sample is determined to be "toxic" and in exceedance of the narrative Basin Plan objective for "no toxic substances in toxic amounts."

Three sites within the Pajaro HU (Pajaro River at Chittenden [305CHI], Llagas Creek [305LCS], and Pajaro River at Main St. [305PJP]) have a significant toxic effect (*C. dubia* survival/reproduction in water and *H. azteca* survival/reproduction in sediment) TMDL limit associated with the Pajaro River Watershed Chlorpyrifos and Diazinon TMDL. Additionally, a significant toxic effect non-TMDL area limit for survival, growth, and reproduction in water and sediment apply to sites without a TMDL limit. *H. azteca* reproduction in sediment is not tested for by the CMP so is not included in the TMDL and non-TMDL area limit exceedance discussion below. See **Table 2-5** and **Appendix A** for a summary of applicable toxic effect TMDL and non-TMDL area limits in the Pajaro River HU. Results from aquatic and sediment bioassays conducted on samples from the Pajaro River HU in 2023 are illustrated in **Figure 3-13** and tabulated in **Table 3-27**.

- Toxicity to algal growth in water was observed in one of four bioassays in water samples collected from five sites: Beach Road Ditch (305BRS), Furlong Creek (305FUF), San Juan Creek (305SJA), Tequisquita Slough (305TSR), and Watsonville Creek (305WCS) (**Figure 3-13 a**). Toxicity to algal growth in water was observed in one of three bioassays in water samples collected from Carnadero Creek (305CAN). (**Figure 3-13 a**).
- Significant mortality to *C. dilutus* in water was observed in seven samples collected from seven sites (Carnadero Creek [305CAN], Millers Canal [305FRA], Furlong Creek [305FUF], Llagas Creek [305LCS], San Juan Creek [305SJA), Watsonville Creek [305WCS], and Watsonville Slough [305WSA]) (**Figure 3-13 b**).
- No significant mortality to *C. dubia* was observed in any water samples collected from the Pajaro HU (**Figure 3-13 b, d**). Of the three sites with a TMDL area limit for *C. dubia* survival in water, all showed no toxic effect (**Figure 3-13 d**).
- Toxicity to invertebrate reproduction in water was observed in ten samples collected from seven sites (**Figure 3-13 c**). Of three sites with an applicable significant toxic effect TMDL limit for C. dubia reproduction in water, one site (Llagas Creek [305LCS]) achieved the TMDL limit (Figure 3-13 c). Of the 9 sites with an applicable significant toxic effect non-TMDL limit for invertebrate reproduction in water, four sites achieved this limit (Carnadero Creek [305CAN], Millers Canal [305FRA], Llagas Creek [305LCS], Tequisquita Slough [305TSR]) (**Figure 3-13 c**).
- One sediment sample per site was collected in 2023 and analyzed for sediment toxicity. Toxicity to invertebrate growth in sediment was observed in four of the twelve sites (Beach Road Ditch [305BSR], Furlong Creek [305FUF], Tequisquita Slough [305TSR], and Watsonville Slough [305WSA] (**Figure 3-13 e**). Of the nine sites with a significant toxic effect non-TMDL area limit for growth in sediment, five sites achieved this limit (Carnadero Creek [305CAN], Salsipuedes Creek [305SAL], Millers Canal [305FRA], San Juan Creek [305SJA], Watsonville Creek [305WCS])(**Figure 3-13 e**).
- One sediment sample per site was collected in 2023 and analyzed for sediment toxicity. Toxicity to invertebrate survival in sediment was observed in one site (Furlong Creek [305FUF]) (**Figure 3-13 f**). Of the nine sites with a significant toxic effect non-TMDL area limit for growth in sediment, eight sites showed no toxic effect. All three sites with a significant toxic effect TMDL limit for *H. azteca* survival in sediment achieved the TMDL limit (Pajaro River at Chittenden [305CHI], Llagas Creek [305LCS], and Pajaro River at Main St. [305PJP]) (**Figure 3-13 f**).

- For the period of 2005-2023, seven statistically significant toxicity trends were observed in the Pajaro River HU.

Detailed trend analysis results, including trend directions and statistical significance, can be found in **Appendix E**. A summary of these results is presented in **Table 3-27**.

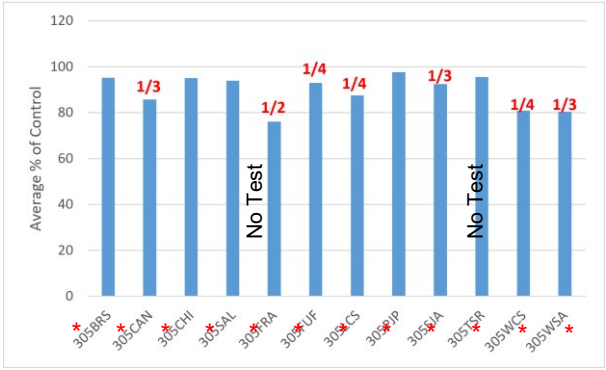
Table 3-27. Summary of Toxicity and Trends in Hydrologic Unit 305

Site ID[1]	Algal Growth		*C. dilutus* - Survival		*C. dubia* - Reproduction		*C. dubia* - Survival		*H. azteca* - Growth		*H. azteca* - Survival	
	# of Toxic	Trend[1]	# of Toxic Samples	Trend[1]	# of Toxic Samples	Trend[1]	# of Toxic Samples	Trend[1]	# of Toxic Samples	Trend[1]	# of Toxic Samples	Trend[1]
305BRS	1/4	Increasing	0/4	Decreasing	1/4	Decreasing	0/4	**Decreasing**	1/1	Decreasing	0/1	Decreasing
305CAN	1/3	Decreasing	1/3	Decreasing	0/3	Increasing	0/3	Increasing	0/1	**Decreasing**	0/1	**Decreasing**
305CHI	0/4	Increasing	0/4	Increasing	1/4	Decreasing	0/4	None[2]	0/1	Decreasing	0/1	Increasing
305FRA	0/4	Decreasing	1/2	Decreasing	0/2	Decreasing	0/4	Decreasing	0/1	Increasing	0/1	Decreasing
305FUF	1/4	Decreasing	1/4	Increasing	2/4	Decreasing	0/4	Decreasing	1/1	Increasing	1/1	Increasing
305LCS	0/4	Increasing	1/4	Increasing	0/4	Increasing	0/4	Increasing	0/1	**Decreasing**	0/1	Increasing
305PJP	0/4	**Increasing**	0/4	Increasing	1/4	Decreasing	0/4	Increasing	0/1	Decreasing	0/1	Decreasing
305SAL	0/4	Increasing	0/4	Decreasing	2/4	Decreasing	0/4	Decreasing	0/1	Decreasing	0/1	Increasing
305SJA	1/4	Decreasing	1/3	Decreasing	0/3	Increasing	0/4	Decreasing	0/1	Increasing	0/1	Increasing
305TSR	1/4	**Increasing**	0/3	Increasing	0/3	Decreasing	0/4	Increasing	1/1	**Decreasing**	0/1	Increasing
305WCS	1/4	Decreasing	1/4	Decreasing	2/4	Increasing	0/4	Increasing	0/1	Decreasing	0/1	Decreasing
305WSA	0/3	Decreasing	1/3	Decreasing	1/3	Decreasing	0/3	Increasing	1/1	Decreasing	0/1	Increasing

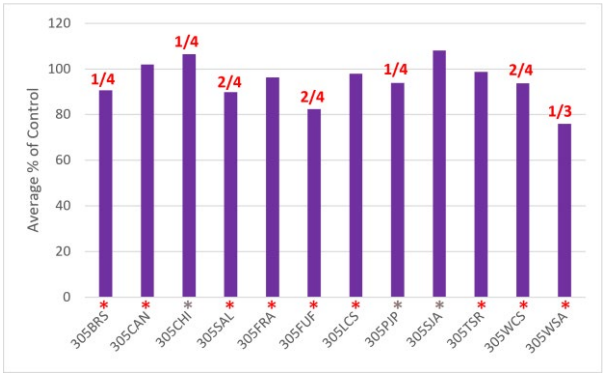
Notes:

1 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
2 None = No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.
3 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

a) Algal Toxicity in Water – Growth

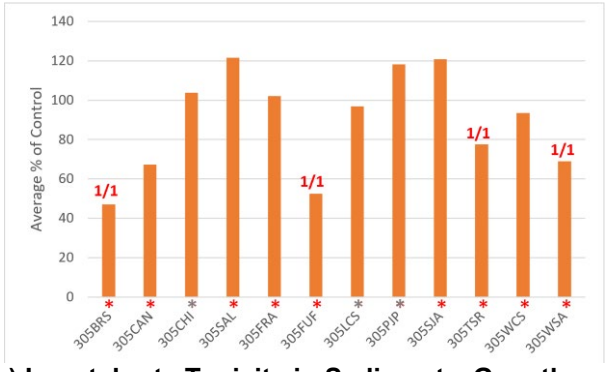


b) *C. dilutus* Toxicity in Water – Survival

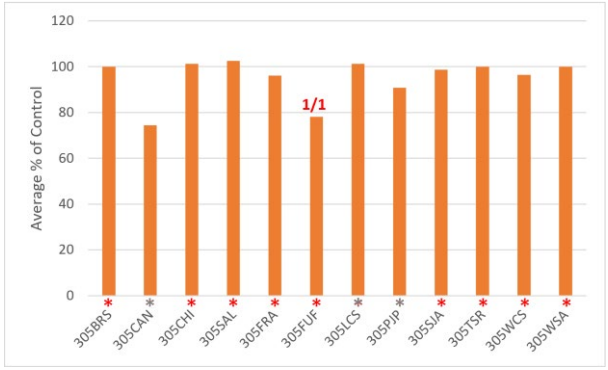


c) Invertebrate Toxicity in Water – Reproduction

d) Invertebrate Toxicity in Water – Survival



e) Invertebrate Toxicity in Sediment – Growth



f) Invertebrate Toxicity in Sediment – Survival

Figure 3-13. Results for Aquatic Toxicity (water and sediment) Monitoring in the Pajaro Region

Notes:

1. Bars represent the mean survival, reproduction, or growth rate for all 2023 samples at each site, relative to laboratory controls.
2. There are generally four water toxicity sampling events for algae and invertebrates and two sediment toxicity events scheduled for each site, each year.
3. "No Test" indicates sites where no toxicity samples were collected due to dry channel or ponded conditions.
4. Results >100% indicate growth rates greater than the control.
5. If a site experienced "significant toxicity" red fractions indicate the number of significantly toxic samples relative to the total number of toxicity samples collected (e.g., 1/2 indicates the site had two samples collected, one of which was significantly toxic.)
6. *C. dubia* reproduction graphs generally reflect *C. dubia* tests but in some cases reflect a salinity-tolerant alternate test species, which in some cases test for "growth" instead of "reproduction" as the sub-lethal endpoint.

* Site with an applicable TMDL limit for a given test species and endpoint.

* Site with an applicable non-TMDL area limit for a given test species and endpoint.

3.3 SALINAS HYDROLOGIC UNIT (HU 309)

Descriptions of the Salinas HU hydrology are summarized from the CCRWQCB's *Salinas River Watershed Characterization Report* (CCRWQCB 2000). The watershed of the Salinas River and its tributaries covers approximately 4,600 square miles (nearly 3 million acres) and lies within San Luis Obispo and Monterey Counties. The Salinas River, which originates in San Luis Obispo County, flows northwestward into Monterey County, through the entire length of the Salinas Valley and empties into the Monterey Bay.

The Salinas River drains a large area with many distinct tributaries, and although it is considered a single HU, geographic, political, land use and groundwater divisions facilitate discussion of the Salinas River Watershed in terms of an upper and a lower watershed. The upper watershed begins at the headwaters of the Salinas River in the La Panza Range southeast of Santa Margarita Lake in San Luis Obispo County and flows to the narrows area near Bradley, just inside Monterey County. The upper watershed includes drainages of the Estrella, Nacimiento, and San Antonio Rivers; overlies the Paso Robles Ground Water Basin; and lies mainly in San Luis Obispo County. The lower watershed extends from the Bradley narrows area to Monterey Bay and includes the drainage of the Arroyo Seco River, overlies the Salinas Ground Water Basin, and is entirely within Monterey County.

The Salinas Reclamation Canal parallels the Salinas River in the lower watershed, also ultimately draining to Monterey Bay. The Reclamation Canal incorporates drainage from the city of Salinas and surrounding agricultural areas, including several small tributaries which drain the Gabilan foothills to the east. Near Castroville, the Reclamation Canal meets Tembladero Slough and incorporates drainage from the city of Castroville and more western agricultural areas, ultimately flowing to Monterey Bay and the Elkhorn Slough via Moss Landing Harbor.

In addition to agriculture and urban development, other land uses in the Salinas River Watershed include two military facilities (Fort Hunter Liggett and Camp Roberts), exploitation of mineral and oil reserves in the San Ardo area and a few other locations throughout the watershed, and public land and open space.

Historically, there have been 18 core CMP sites in the Salinas HU. All the CMP sites are in the lower watershed below the Bradley Narrows of the Salinas River (**Figure 3-14**) and are within the Lower Salinas Valley Hydrologic Area. There are four sites on the mainstem Salinas River upstream from Salinas at Spreckels, Chualar, Gonzales, and Greenfield (309SSP, 309SAC, 309SAG, and 309GRN) and three sites on tributaries to the river upstream from the city of Salinas: Quail Creek (309QUI), Chualar Creek West of Highway 1 on River Road (309CCD), and Chualar Creek, North Branch (309CRR). There are seven sites on tributaries, creeks, and sloughs downstream of Salinas: Moro Cojo Slough (309MOR), Old Salinas River Estuary (309OLD), Tembladero Slough (309TEH), Merritt Ditch (309MER), Espinosa Slough (309ESP), Alisal Slough (309ASB), and Blanco Drain (309BLA). There are two sites on the Salinas Reclamation Canal, at San Jon Road (309JON) downstream of the city, and at La Guardia Road (309ALG) upstream of the city. There are also two sites east of Salinas on direct tributaries to the Reclamation Canal: Gabilan Creek (309GAB) and Natividad Creek (309NAD). Alisal Slough (309ASB) has a connection to the lower end of the Reclamation Canal but is not a tributary. In 2012, a 19th site, Santa Rita Creek (309RTA), was added.

The Beneficial Uses designated by the Basin Plan for waterbodies monitored by the CMP in the Salinas HU include all Beneficial Uses (Table 2-2).

Applicable TMDLs for sites within the Salinas HU include the Lower Salinas River Watershed Nutrient TMDL, Lower Salinas River Watershed Sediment Toxicity and Pyrethroids in Sediment TMDL, and Lower Salinas River Watershed Chlorpyrifos and Diazinon TMDL. Non-TMDL area limits applicable to sites in the Salinas HU include non-TMDL area turbidity limits, non-TMDL area nutrient limits, and non-TMDL area toxicity limits. See **Appendix A** for a summary of applicable routine parameter TMDL limits and non-TMDL area limits for sites in the Salinas HU.

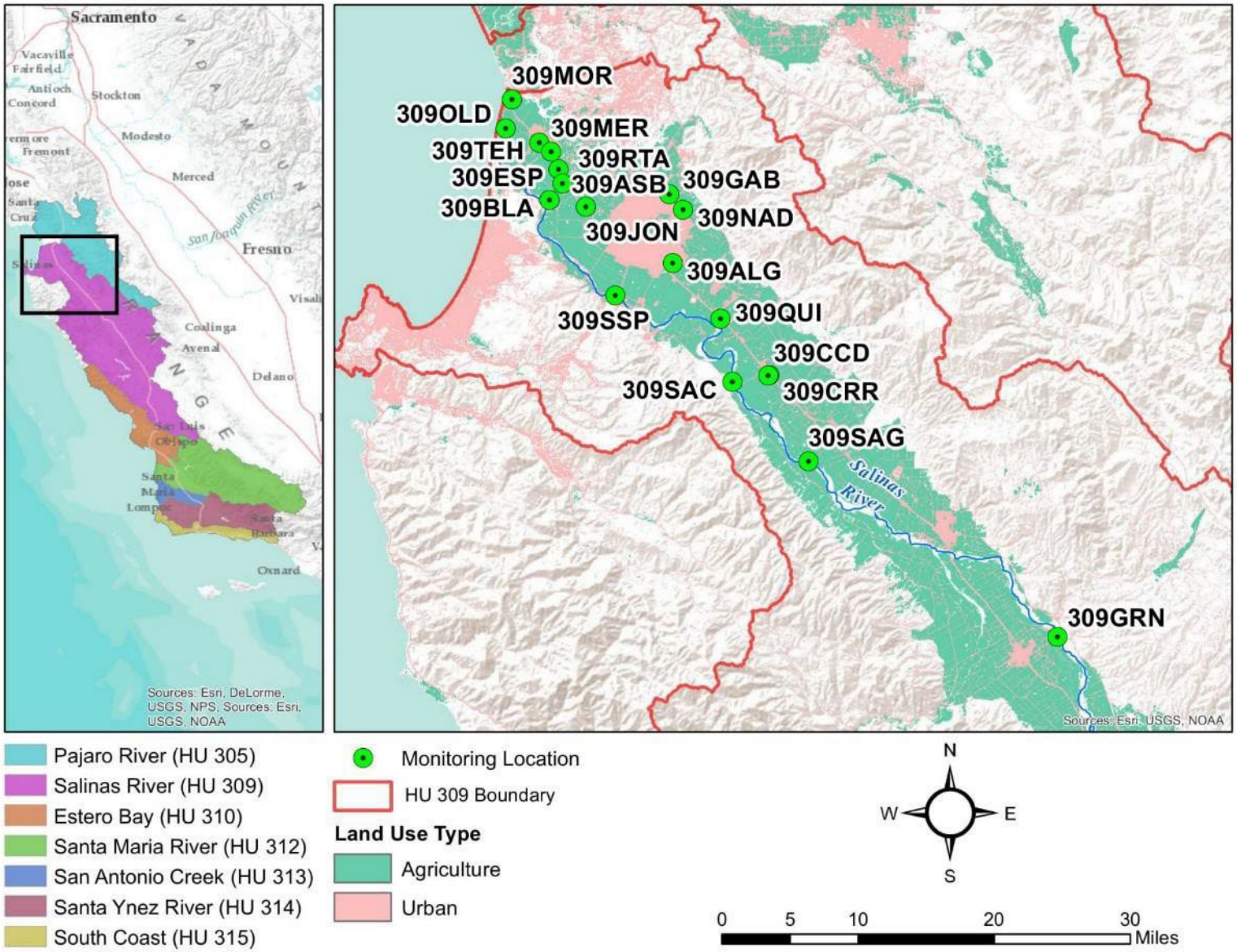
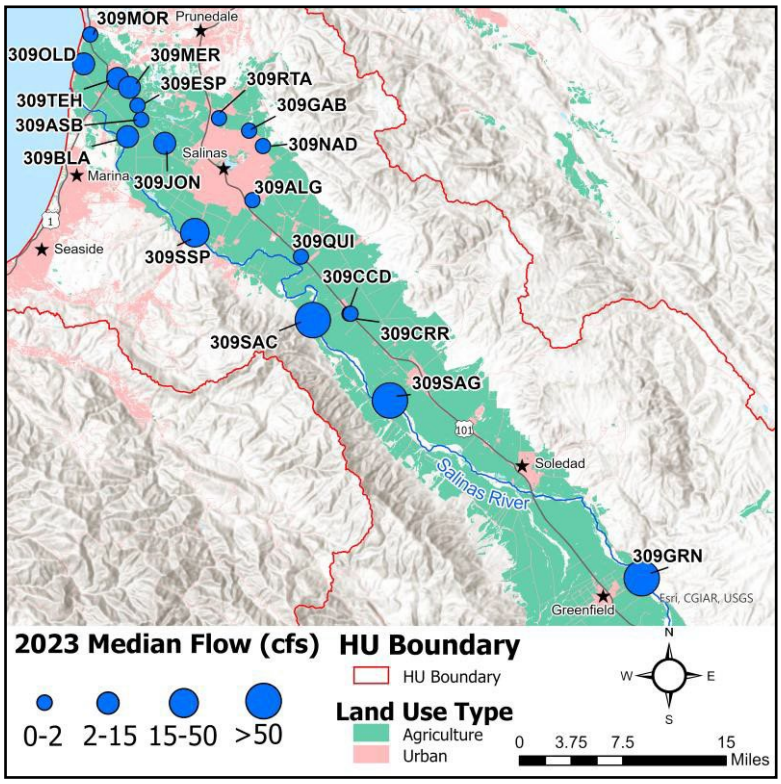


Figure 3-14. CMP Core Monitoring Sites and Distribution of Major Land Uses in the Salinas Hydrologic Unit

3.3.1 Flow Results

The flow regime in the Salinas River Watershed is characterized by seasonal precipitation that occurs primarily from November through March. In 2023, there was significant precipitation in January and March that tapered into mid-April. There was also significant rainfall occurring throughout December. In the dry season, dam releases regulate instream flow for groundwater recharge and Salinas Valley Water Project (SVWP) operations. Near Bradley, flows are maintained near 450 CFS by releases from Nacimiento and San Antonio Reservoirs. During the 2023 monitoring year, the annual average flow (1340.65 CFS) at the *Salinas River at Bradley* USGS stream gage was above the historic annual average (476.59 CFS, 1958-2022) and ranged from 78.56 CFS (December 14, 2023) to 38381.05 CFS (January 10, 2023) (USGS 2023)[1]. The 2023 cumulative annual rainfall (17.96") at the *Salinas North* rain gauge was higher than the historic average (16.68", 1993-2022) **(Figure 3-15**) (CDWR 2023).



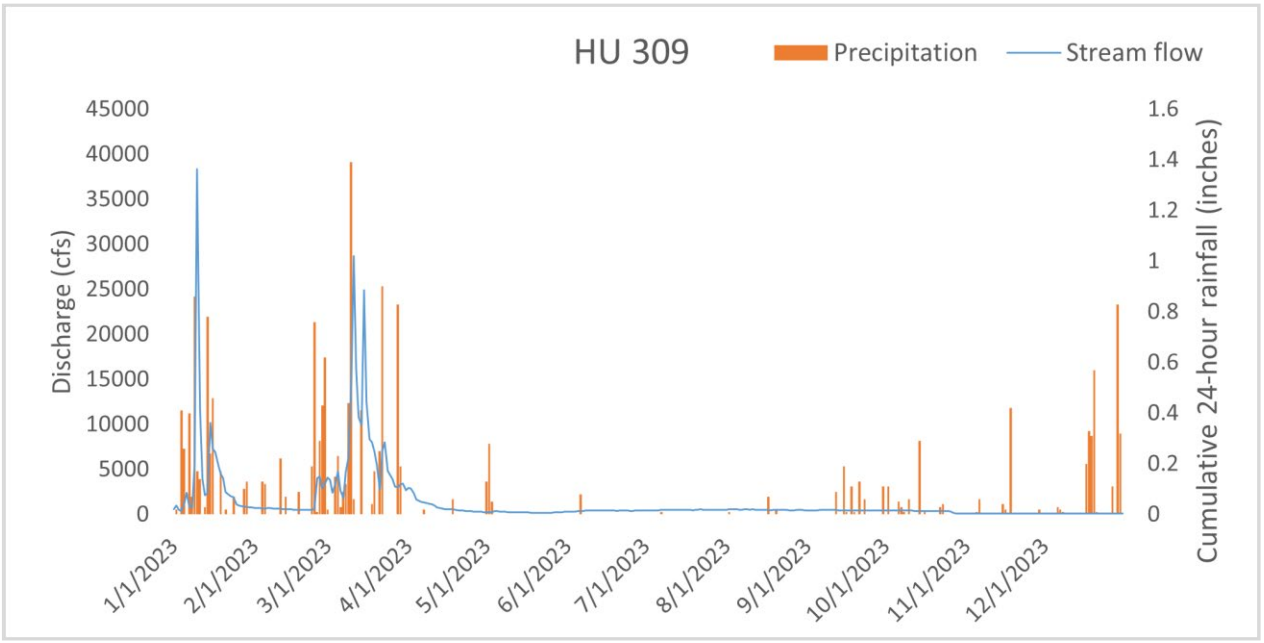


Figure 3-15. 2023 Salinas River at Bradley Hydrograph and Salinas North Precipitation Totals

In 2023, flows measured at the 19 Salinas HU monitoring sites were generally influenced by heavy wet season precipitation with elevated flows observed in late January and March. During the dry season, much of the surface

[1] USGS data contains provisional values, subject to revision; flow values may have been updated since the publishing of this report.

water flows were influenced by base flows, dam releases, and irrigation. **Figure 3-16** depicts annual median flow values for sites within the Salinas HU for 2023 and **Table 3-28** presents descriptive statistics.

- Measured flows ranged from negative flow due to tidal influences (Merritt Ditch [309MER], Moro Cojo Slough [309MOR], Old Salinas River [309OLD], Espinosa Slough upstream of Alisal Slough [309ESP]) to 7,875.00 CFS (Salinas River at Spreckels Gage [309SSP]).
- Median flows ranged from 0 CFS (Natividad Creek u/s from Salinas Reclamation Canal [309NAD], Quail Creek at Highway 101 [309QUI]) to 348.75 CFS (Salinas River at Chualar Bridge on River Rd. [309SAC]).
- For the period of 2005-2023, three sites show statistically significant decreasing trends in flow: Salinas Reclamation Canal at San Jon Rd. (309JON), Natividad Creek (309NAD), and Quail Creek (309QUI). One site (Merritt Ditch [309MER]) showed a statistically significant increasing trend in flow.

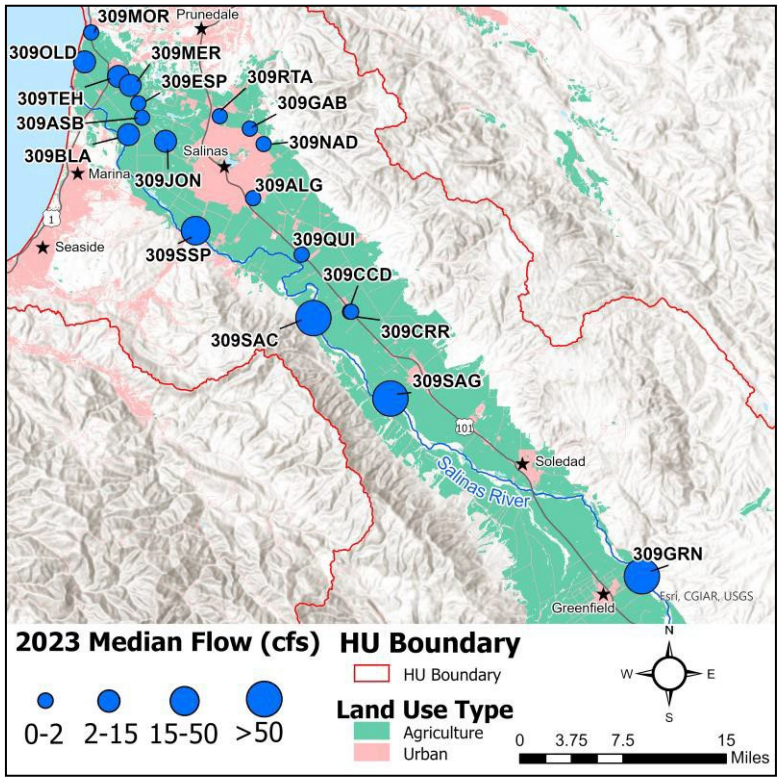


Figure 3-16. 2023 Median Flows for Sites in HU 309

Table 3-28. Descriptive Statistics for flow in Hydrologic Unit 309 (CFS)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
309ALG	12	0.00	75.00	13.61	1.25	Increasing
309ASB	12	0.22	53.55	6.12	1.21	Decreasing
309BLA	12	0.12	45.00	18.41	11.63	**Decreasing**
309CCD	12	0.00	2.60	0.40	0.10	**Decreasing**
309CRR	12	0.00	4.08	0.50	0.07	**Increasing**
309ESP	12	-2.40	15.00	3.36	1.93	**Increasing**
309GAB	12	0.00	270.00	35.72	0.03	Increasing
309GRN	12	0.00	1433.48	446.84	334.64	**Decreasing**
309JON	12	0.26	228.28	35.86	2.52	**Decreasing**
309MER	12	-12.00	53.82	6.85	2.63	**Increasing**
309MOR	12	-22.43	75.45	7.63	0.76	Increasing
309NAD	12	0.00	45.00	5.17	0.00	Decreasing
309OLD	12	-15.07	37.08	8.13	3.96	**Increasing**
309QUI	12	0.00	15.39	1.76	0.00	**Decreasing**
309RTA	12	0.00	72.00	6.68	0.01	**Decreasing**
309SAC	6	112.50	1012.50	402.08	348.75	**Decreasing**
309SAG	6	121.50	640.00	351.92	345.00	Decreasing
309SSP	12	0.00	7875.00	789.31	20.50	**Decreasing**
309TEH	12	3.03	292.96	39.39	11.89	**Increasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. Bold trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.3.2 Water Temperature

The Basin Plan contains a general Water Quality Objective for temperature: natural receiving water temperature of intrastate waters shall not be altered. The Basin Plan also has specific objectives for cold and warm water habitats: At no time or place shall the temperature be increased by more than 5°F above natural receiving water temperature. Water temperature can influence the results of other field measurements including dissolved oxygen, pH, and conductivity and therefore is an important factor to consider when interpreting results. The temperature of certain water bodies can also fluctuate greatly over a 24-hour period. This fluctuation means that results and trends should be interpreted with discretion as they can be affected by the time of day at which the sample is collected.

Temperature of natural receiving waters has not been defined for waterbodies within the Salinas HU; therefore, the focus of this report is descriptive statistics. In 2023, water temperatures peaked at most sites in the Salinas HU during the months of August and September; minimum temperatures at most sites were recorded during the months of January and February. **Figure 3-17** depicts annual median temperatures for sites in the Salinas HU for 2023, and **Table 3-29** presents descriptive statistics.

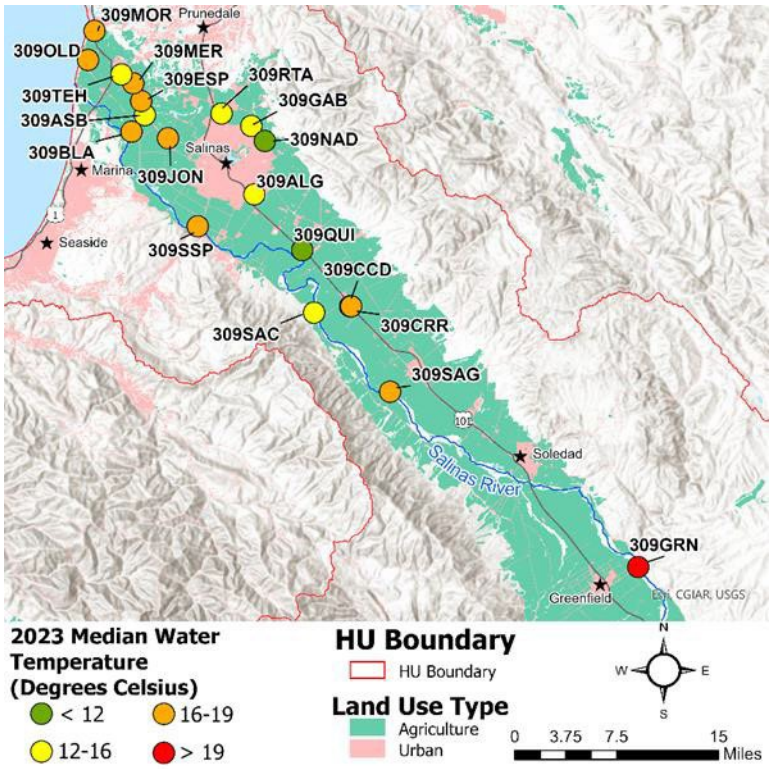


Figure 3-17. 2023 Median Water Temperature for Sites in HU 309

- Median water temperatures in the Salinas HU ranged from 10.9°C (Quail Creek at Highway 101 [309QUI]) to 21.0°C (Salinas River at Elm Rd. in Greenfield [309GRN]) in 2023.
- The lowest water temperature (7.1°C) was observed in Tembladero Slough (309TEH); the highest water temperature (26.7°C) was observed in Salinas Rec Canal, u/s Salinas (309ALG).
- From 2005-2023, no site displayed a statistically significant trend in water temperature, however all sites did display an increasing trend.

Table 3-29. Descriptive Statistics for Water Temperature in Hydrologic Unit 309 (°C)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
309ALG	11	8.7	26.7	18.6	14.5	Increasing
309ASB	12	10.5	24.7	16.2	15.5	Increasing
309BLA	12	9.8	24.6	17.0	17.5	Increasing
309CCD	9	12.3	24.7	17.7	15.9	Increasing
309CRR	8	11.7	24.1	17.1	17.5	Increasing
309ESP	12	11.6	24.4	16.9	17.4	Increasing
309GAB	6	7.3	25.0	14.8	13.5	Increasing
309GRN	11	12.7	24.3	18.9	21.0	Increasing
309JON	12	8.2	23.3	16.0	16.5	Increasing
309MER	12	8.4	21.9	16.4	18.3	Increasing
309MOR	12	9.4	21.1	15.2	16.2	Increasing
309NAD	4	7.2	26.4	14.0	11.2	Increasing
309OLD	12	7.7	21.8	15.3	17.0	Increasing
309QUI	3	9.8	15.3	12.0	10.9	N/A[4]
309RTA	6	7.3	25.9	14.8	13.1	Increasing
309SAC	6	10.5	22.6	15.6	15.8	Increasing
309SAG	5	12.1	22.0	16.3	16.1	Increasing
309SSP	11	8.3	23.9	16.7	17.2	Increasing
309TEH	12	7.1	20.5	14.0	14.3	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. Bold trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.

3.3.3 Turbidity and TSS Results

All sites within the Salinas HU have a non-TMDL area turbidity limit. Five sites have a warm water Beneficial Use, with a turbidity limit of 40 NTU. The remaining 14 sites have a cold water Beneficial Use, with a turbidity limit of 25 NTU. See **Table 2-5** and **Appendix A** for a summary of applicable non-TMDL area limits for turbidity in the Salinas HU. **Figure 3-18** depicts annual median turbidity concentrations and TSS loading for sites in the Salinas HU for 2023, and **Table 3-30** and **Appendix B** present descriptive statistics and turbidity limit exceedances.

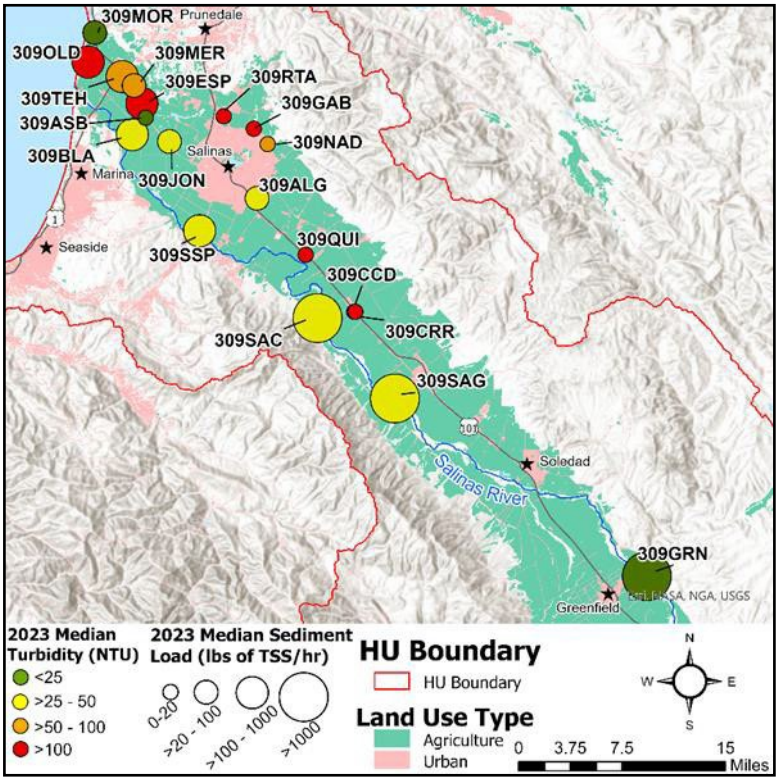


Figure 3-18. 2023 Median Turbidity and TSS Loading for Sites in HU 309

- Median turbidities during 2023 ranged from 11 NTU in Moro Cojo Slough (309MOR) to 1,039 NTU in Chualar Creek, North Branch (309CRR).
- Nine sites in the Salinas HU had a maximum turbidity greater than 1,000 NTU: Chualar Creek West of Highway 1 on River Road (309CCD), Chualar Creek, North Branch (309CRR), Espinosa Slough upstream of Alisal Slough (309ESP), Gabilan Creek at Boronda Rd. (309GAB), Salinas Reclamation Canal at San Jon Rd. (309JON), Merritt Ditch upstream from Highway 183 (309MER), Quail Creek at Highway 101 (309QUI), Santa Rita Creek (309RTA), and Tembladero Slough (309TEH).
- All five sites with a warm water 40 NTU non-TMDL turbidity limit exceeded the limit in at least 42% of samples.
- All 14 sites with a cold water 25 NTU non-TMDL turbidity limit exceeded the limit in at least 25% of samples. Three sites (Chualar Creek West of Highway 1 [309CCD], Quail Creek [309QUI], and Santa Rita Creek [309RTA]) exceeded the limit in 100% of samples.
- Chualar Creek, North Branch (309CRR), Chualar Creek West of Highway 1 on River Road (309CCD), Gabilan Creek (309GAB), Santa Rita Creek at Santa Rita Creek Park (309RTA), and Quail Creek (309QUI) had relatively high median turbidity but lower TSS loading due to smaller flow conditions. High TSS loading observed at Salinas River at Spreckels Gage (309SSP) (442,458 lbs. of TSS/hr) was due to higher-than-average levels of flow and turbidity (**Appendix B**).
- For the period of 2005-2023, 14 sites showed statistically significant decreasing trends in turbidity, and one site (Salinas River at Spreckels Gage [309SSP]) showed a statistically significant increasing trend.
- For the period of 2012-2023, 12 sites showed statistically significant increasing trends in TSS loading. No sites depicted statistically significant decreasing trends. TSS was not monitored by CMP prior to 2012, so the period of record for TSS trend analysis is shorter than that for turbidity and flow.

Table 3-30. Descriptive Statistics for Turbidity in Hydrologic Unit 309 (NTU)

Site ID[1]	N[3]	Min	Max	Mean	Median	Non-TDML Area Limit Percent Exceedance	Turbidity Trend[2,4]	TSS Loading Trend[2,4]
309ALG	11	0	784	234	49	55%[5]	**Decreasing**	**Increasing**
309ASB	12	10	81	26	15	33%[6]	**Decreasing**	**Increasing**
309BLA	12	7	176	52	36	42%[5]	**Decreasing**	Decreasing
309CCD	9	56	3,000	1,211	722	100%[6]	Increasing	Increasing
309CRR	8	16	3,000	1,252	1,039	88%[6]	**Decreasing**	N/A[7]
309ESP	12	20	1,410	246	153	83%[5]	**Decreasing**	**Increasing**
309GAB	6	11	2,407	782	624	83%[6]	**Decreasing**	**Increasing**
309GRN	11	1	169	34	16	45%[6]	**Decreasing**	**Increasing**
309JON	12	4	1,993	312	47	58%[5]	**Decreasing**	Increasing
309MER	12	9	1,670	288	52	67%[6]	**Decreasing**	**Increasing**
309MOR	12	0	118	28	11	25%[6]	**Decreasing**	**Increasing**
309NAD	4	9	879	256	68	50%[6]	**Decreasing**	Increasing
309OLD	12	18	344	138	109	92%[6]	**Decreasing**	**Increasing**
309QUI	3	328	3,000	1,446	1,010	100%[6]	**Decreasing**	Increasing
309RTA	6	51	3,000	976	658	100%[6]	Decreasing	Decreasing
309SAC	6	24	772	162	43	83%[6]	Increasing	**Increasing**
309SAG	5	20	784	184	46	60%[6]	Decreasing	**Increasing**
309SSP	11	22	569	95	42	82%[6]	**Increasing**	**Increasing**
309TEH	12	16	2,190	294	69	75%[5]	**Decreasing**	**Increasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.
4 Turbidity was monitored from 2005-2023 and TSS was monitored from 2012-2023.
5 The relevant numeric criterion is 40.0 NTU [WARM].
6 The relevant numeric criterion is 25.0 NTU [COLD].
7 No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.

3.3.4 Unionized and Total Ammonia

All but one site (Salinas River in Greenfield [309GRN]) within the Salinas HU have a TMDL limit for unionized ammonia. All TMDL limits for unionized ammonia are associated with the Lower Salinas River Watershed Nutrient TMDL. Salinas River in Greenfield (309GRN) is located outside of the Lower Salinas River Watershed Nutrient TMDL and therefore has a non-TMDL area limit for unionized ammonia. See **Table 2-5** and **Appendix A** for a summary of applicable annual TMDL and non-TMDL area limits for unionized ammonia in the Salinas HU. **Figure 3-19** depicts annual median unionized ammonia concentrations for sites in the Salinas HU for 2023. **Table 3-31** presents descriptive statistics, and **Table 3-32** and **Appendix B** present TMDL and non-TMDL area limit exceedances.

Samples were also collected and analyzed for total ammonia. There is currently no TMDL, non-TMDL area limit, or Basin Plan numeric Water Quality Objective for total ammonia applicable to CMP sites in the Salinas HU. Therefore, the focus of this report is descriptive statistics, which are presented in **Table 3-33**.

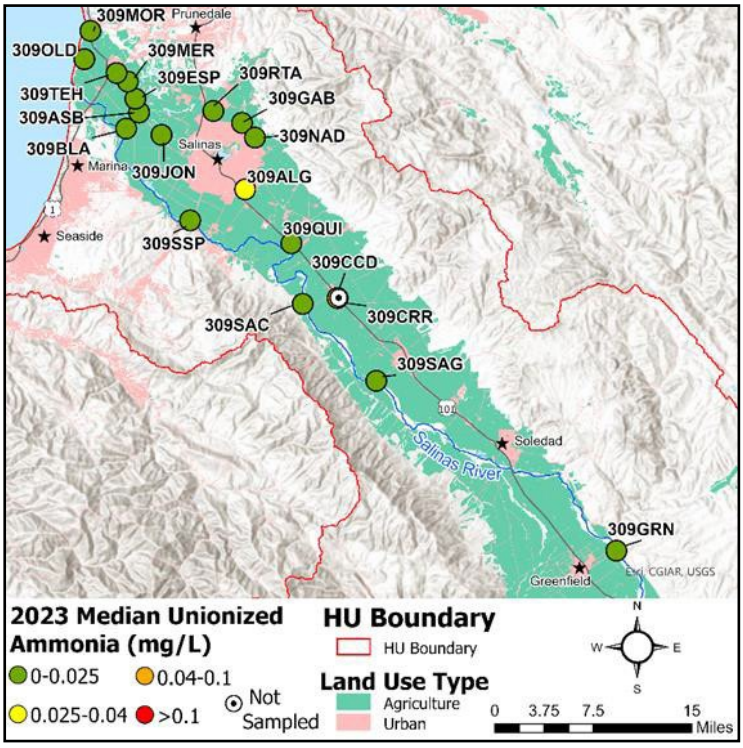


Figure 3-19. 2023 Median Unionized Ammonia for Sites in HU 309

- The lowest concentration of unionized ammonia (0.0003 mg/L) was measured at the following sites: Tembladero Slough at Haro St. (309TEH), Salinas River at Spreckels Gage (309SSP), Moro Cojo Slough at Highway 1 (309MOR), Gabilan Creek at Boronda Rd. (309GAB), and Salinas River at Elm Rd. in Greenfield (309GRN). The highest concentration of unionized ammonia (0.48138 mg/L) was measured at Salinas Reclamation Canal at La Guardia St. (309ALG).
- For the period of 2005-2023, one site, Chualar Creek West of Highway 1 on River Road (309CCD), displayed a statistically significant increasing trend in unionized ammonia concentrations. 11 sites (Alisal Slough at White Barn [309ASB], Blanco Drain below Pump [309BLA], Espinosa Slough upstream of Alisal Slough [309ESP], Salinas River at Elm Rd. in Greenfield [309GRN], Salinas Reclamation Canal at San Jon Rd.[309JON], Merritt Ditch upstream from Highway 183 [309MER], Moro Cojo Slough [309MOR], Salinas River at Chualar Bridge on River [309SAC], Salinas River at Gonzales River Rd. Bridge [309SAG], Salinas River at Spreckels Gage [309SSP], and Tembladero Slough at Haro St. [309TEH]) displayed a statistically significant decreasing trend in unionized ammonia concentrations.

Table 3-31. Descriptive Statistics for Unionized Ammonia in Hydrologic Unit 309 (mg/L as N)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
309ALG	11	0.0029	0.4814	0.1048	0.0388	Decreasing
309ASB	12	0.0012	0.2338	0.0261	0.0044	**Decreasing**
309BLA	12	0.0004	0.0257	0.0058	0.0044	**Decreasing**
309CCD	9	0.0013	0.3199	0.1225	0.0746	**Increasing**
309CRR	0	NS	NS	NS	NS	Decreasing
309ESP	12	0.0019	0.1081	0.0188	0.0063	**Decreasing**
309GAB	6	0.0003	0.1395	0.0253	0.0033	Decreasing
309GRN	11	0.0003	0.0266	0.0061	0.0027	**Decreasing**
309JON	12	0.0006	0.0303	0.0073	0.0049	**Decreasing**
309MER	12	0.0005	0.0161	0.0065	0.0059	**Decreasing**
309MOR	12	0.0003	0.1848	0.0247	0.0024	**Decreasing**
309NAD	4	0.0007	0.0150	0.0053	0.0028	Increasing
309OLD	12	0.0011	0.1034	0.0197	0.0065	Increasing
309QUI	3	0.0142	0.0619	0.0319	0.0195	Increasing
309RTA	6	0.0015	0.2103	0.0421	0.0043	Increasing
309SAC	6	0.0005	0.0038	0.0016	0.0012	**Decreasing**
309SAG	5	0.0010	0.0092	0.0035	0.0020	**Decreasing**
309SSP	11	0.0003	0.0063	0.0021	0.0016	**Decreasing**
309TEH	12	0.0003	0.0129	0.0049	0.0027	**Decreasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant (α =0.05).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

NS Not sampled for unionized ammonia.

- Eleven of 17 sites with a TMDL limit for unionized ammonia exceeded the TMDL limit of 0.025 mg/L in at least one sample. Six sites (Merritt Ditch [309MER], Natividad Creek [309NAD], Salinas River at Chualar Bridge on River Rd. [309SAC], Salinas River at Gonzales River Rd. Bridge [309SAG], Salinas River at Spreckels Gage [309SSP}, and Tembladero Slough [309TEH]), had zero exceedances of the TMDL limit in 2023.
- Salinas River in Greenfield (309GRN) exceeded its unionized ammonia non-TMDL area limit of 0.025 mg/L in 9% of samples.

Table 3-32. Lower Salinas River Watershed Nutrient TMDL and Nutrient Limit Exceedances for Unionized Ammonia in Hydrologic Unit 309

Site ID[1]	TMDL Annual Percent Exceedance[2]	Non-TMDL Area Limit Percent Exceedance[2]
309ALG	55%	N/A
309ASB	17%	N/A
309BLA	8%	N/A
309CCD	67%	N/A
309CRR	N/A	N/A
309ESP	17%	N/A
309GAB	17%	N/A
309GRN	N/A	9%
309JON	8%	N/A
309MER	0%	N/A
309MOR	17%	N/A
309NAD	0%	N/A
309OLD	25%	N/A
309QUI	33%	N/A
309RTA	33%	N/A
309SAC	0%	N/A
309SAG	0%	N/A
309SSP	0%	N/A
309TEH	0%	N/A

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations, 2023*, for detailed site descriptions.

2 The relevant numeric criterion is 0.025 mg/L.

N/A There is no applicable Lower Salinas River Watershed Nutrient TMDL or non-TMDL area limit criterion for unionized ammonia at this site.

- The spatial distribution and relative magnitudes of total ammonia concentrations were similar to unionized ammonia concentrations, with the exception of Salinas Reclamation Canal at La Guardia St. (309ALG) having a lower total ammonia concentration.
- For the period of 2005-2023, five sites (Blanco Drain [309BLA], Chualar Creek West of Highway 1 on River Road [309CCD], Natividad Creek [309NAD], Old Salinas River [309OLD], and Salinas River at Spreckels Gage [309SSP]) showed statistically significant increasing trends in total ammonia. No sites exhibited decreasing trends.

Table 3-33. Descriptive Statistics for Total Ammonia in Hydrologic Unit 309 (mg/L as N)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
309ALG	11	0.076	3.110	0.642	0.131	Increasing
309ASB	12	0.056	11.900	1.181	0.159	Increasing
309BLA	12	0.004	0.720	0.148	0.083	**Increasing**
309CCD	9	0.070	11.700	3.214	1.930	**Increasing**
309CRR	0	NS	NS	NS	NS	Decreasing
309ESP	12	0.029	1.470	0.236	0.112	Increasing
309GAB	6	0.030	1.940	0.446	0.156	Increasing
309GRN	11	0.009	0.596	0.113	0.035	Increasing
309JON	12	0.052	0.845	0.202	0.082	Increasing
309MER	12	0.044	1.470	0.366	0.147	Increasing
309MOR	12	0.010	1.320	0.308	0.105	Decreasing
309NAD	4	0.071	0.281	0.141	0.105	**Increasing**
309OLD	12	0.082	3.980	0.613	0.285	**Increasing**
309QUI	3	0.747	4.920	2.326	1.310	Increasing
309RTA	6	0.146	5.980	1.180	0.194	Increasing
309SAC	6	0.012	0.145	0.043	0.021	Decreasing
309SAG	5	0.024	0.351	0.100	0.047	Decreasing
309SSP	11	0.004	0.180	0.058	0.041	**Increasing**
309TEH	12	0.041	0.984	0.331	0.121	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

NS Not sampled for total ammonia.

3.3.5 Nitrate and Total Nitrogen

Samples were collected and analyzed for "nitrate + nitrite"; however, this report primarily refers to "nitrate" as nitrite levels are assumed to be very low. All but two sites (Salinas River in Greenfield [309GRN] and Moro Cojo Slough [309MOR]) within the Salinas HU have a TMDL limit for nitrate. All TMDL limits for nitrate are associated with the Lower Salinas River Watershed Nutrient TMDL. Salinas River in Greenfield (309GRN) is located outside of the Lower Salinas River Watershed Nutrient TMDL area, and Moro Cojo Slough (309MOR) does not have an applicable TMDL nitrate limit. Therefore, Salinas River in Greenfield (309GRN) and Moro Cojo Slough (309MOR) have a non-TMDL area limit for nitrate. See **Table 2-5** and **Appendix A** for a summary of applicable annual, dry season, and wet season TMDL and non-TMDL area limits for nitrate in the Salinas HU. **Figure 3-20** depicts annual median nitrate concentrations and loading for sites in the Salinas HU for 2023, **Table 3-34** presents descriptive statistics, and **Table 3-35** and **Appendix B** present the TMDL and non-TMDL area limit exceedances.

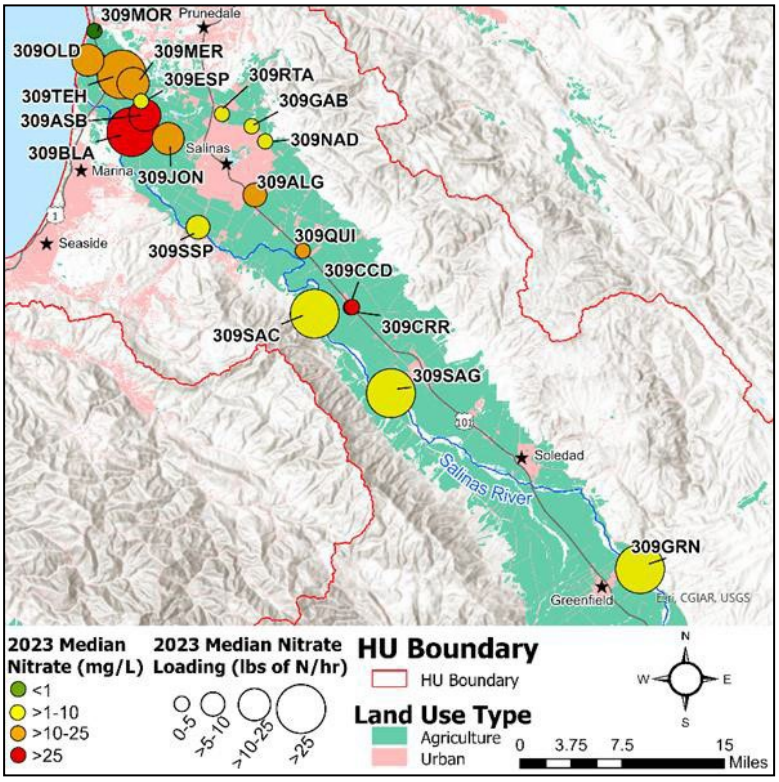


Figure 3-20. 2023 Median Nitrate as N for Sites in HU 309

Samples were also collected and analyzed for total nitrogen. One site (Moro Cojo Slough [309MOR]) has an applicable wet and dry season TMDL limit for total nitrogen. No other site in the Salinas HU has a TMDL or non-TMDL area limit applicable to it, nor is there a numeric Water Quality Objective for total nitrogen in the Basin Plan. See **Table 2-5** and **Appendix A** for a summary of applicable dry season and wet season total nitrogen TMDL limits in the Salinas HU. The focus of this report for the remaining 18 sites is descriptive statistics, which are presented in **Table 3-36**. See **Table 3-37** for a summary for TMDL and non-TMDL area limit exceedances.

- Blanco Drain (309BLA) showed the highest median nitrate concentration (65.60 mg/L).
- High nitrate loading at Blanco Drain (309BLA) and Salinas River at Spreckels Gage (309SSP) was due primarily to elevated nitrate concentrations. Salinas River at Spreckels Gage (309SSP) had high discharge which contributed to the elevated nitrate loading, as well (**Appendix B**).
- For the period of 2005-2023, five sites (Salinas Reclamation Canal at La Guardia St. [309ALG], Chualar Creek West of Highway 1 [309CCD], Salinas River in Greenfield [309GRN], Moro Cojo Slough [309MOR], and Old Salinas River at Monterey Dunes [3090OLD]) showed statistically significant increasing trends in nitrate concentrations, and three sites showed a statistically significant decreasing trend (Espinosa Slough upstream of Alisal Slough [309ESP], Natividad Creek u/s from Salinas [309NAD], and Quail Creek [309QUI]).
- For the period of 2005-2023, three sites (Salinas Reclamation Canal at La Guardia St. [309ALG], Merritt Ditch upstream from Highway 183 [309MER], and Moro Cojo Slough [309MOR]) showed a statistically significant increasing trend in nitrate loading, and two sites showed a statistically significant decreasing trend (Natividad Creek u/s from Salinas [309NAD] and Quail Creek [309QUI]).

Table 3-34. Descriptive Statistics for Nitrate in Hydrologic Unit 309 (mg/L as N)

Site ID[1]	N[3]	Min	Max	Mean	Median	Nitrate Trend[2]	Nitrate Loading Trend[2]
309ALG	11	2	44	19	15	**Increasing**	**Increasing**
309ASB	12	27	77	48	47	Increasing	Decreasing
309BLA	12	13	87	63	66	Decreasing	Increasing
309CCD	9	14	80	42	41	**Increasing**	Decreasing
309CRR	8	6	81	39	36	Increasing	Decreasing
309ESP	12	1	35	9	3	**Decreasing**	Increasing
309GAB	6	1	29	11	8	Decreasing	Increasing
309GRN	11	0	7	2	1	**Increasing**	Decreasing
309JON	12	2	37	16	11	Increasing	Decreasing
309MER	12	3	30	18	17	Decreasing	**Increasing**
309MOR	12	0	4	1	1	**Increasing**	**Increasing**
309NAD	4	2	13	6	5	**Decreasing**	**Decreasing**
309OLD	12	2	42	22	25	**Increasing**	Increasing
309QUI	3	7	59	29	21	**Decreasing**	**Decreasing**
309RTA	6	2	14	7	6	Decreasing	Decreasing
309SAC	6	0	2	1	1	Increasing	Decreasing
309SAG	5	1	2	1	1	Increasing	Decreasing
309SSP	11	0	3	1	1	Increasing	Decreasing
309TEH	12	5	44	23	22	Decreasing	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- The three sites with an annual TMDL limit of 10 mg/L for nitrate (both Chualar Creek sites [309CCD] and [309CRR], and Quail Creek [309QUI]) all exceeded the limit in at least 67% of samples.
- The two sites (Salinas River in Greenfield [309GRN] and Moro Cojo Slough [309MOR]) with a non-TMDL limit of 10 mg/L for nitrate did not exceed the limit in any samples in 2023.
- Of the 13 sites sampled, with an applicable dry season TMDL limit for nitrate, all exceeded the limit in 40% or more of the samples. Seven sites exceeded the dry season limit in all samples collected. Of the fourteen sites sampled with an applicable wet season TMDL limit for nitrate, half exceeded the limit. Three Salinas River sites (309SAC, 309SAG, and 309SSP) met the wet season TMDL limit in all samples.

Table 3-35. Summary of Lower Salinas River Watershed Nutrient TMDL and Non-TMDL Area Nutrient Limit Exceedances for Nitrate in Hydrologic Unit 309

Site ID[1]	TMDL Annual Percent Exceedance[2]	TMDL Dry Season Percent Exceedance	TMDL Wet Season Percent Exceedance[3]	Non-TMDL Area Limit Percent Exceedance[2]
309ALG	N/A	80%[4]	67%	N/A
309ASB	N/A	100%[4]	100%	N/A
309BLA	N/A	100%[4]	100%	N/A
309CCD	100%	N/A	N/A	N/A
309CRR	88%	N/A	N/A	N/A
309ESP	N/A	40%[4]	29%	N/A
309GAB	N/A	100%[5]	25%	N/A
309GRN	N/A	N/A	N/A	0%
309JON	N/A	100%[4]	43%	N/A
309MER	N/A	100%[4]	71%	N/A
309MOR	N/A	N/A	N/A	0%
309NAD	N/A	NS[5]	25%	N/A
309OLD	N/A	80%[6]	57%	N/A
309QUI	67%	N/A	N/A	N/A
309RTA	N/A	100%[4]	40%	N/A
309SAC	N/A	67%[7]	0%	N/A
309SAG	N/A	50%[7]	0%	N/A
309SSP	N/A	40%[7]	0%	N/A
309TEH	N/A	100%[4]	86%	N/A

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations,* 2023, for detailed site descriptions.
2 The TMDL and Non-TMDL Areas numeric criterion is 10.0 mg/L.
3 The relevant wet season numeric criterion is 8.0 mg/L.
4 The relevant dry season numeric criterion is 6.4 mg/L.
5 The relevant dry season numeric criterion is 2.0 mg/L.
6 The relevant dry season numeric criterion is 3.1 mg/L.
7 The relevant dry season numeric criterion is 1.4 mg/L.
N/A There is no applicable Lower Salinas River Watershed Nutrient TMDL or non-TMDL area limit criterion for nitrate at this site.

- Median total nitrogen concentrations ranged from 1.973 mg/L (Salinas River in Greenfield [309GRN]) to 67.705 mg/L (Blanco Drain [309BLA]).
- For the period of 2012-2023, seven sites showed a statistically significant increasing trend in total nitrogen concentrations: Salinas Reclamation Canal at La Guardia St. (309ALG), Chualar Creek West of Highway 1 on River Road (309CCD), Salinas River in Greenfield (309GRN), Salinas Reclamation Canal at San Jon Rd. [309JON], Old Salinas River (309OLD), Salinas River at Chualar Bridge (309SAC), and Salinas River at Spreckels Gage (309SSP). One site showed a statistically significant decreasing trend (Tembladero Slough [309TEH]).

Table 3-36. Descriptive Statistics for Total Nitrogen in Hydrologic Unit 309 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
309ALG	11	3.70	43.70	21.96	17.48	**Increasing**
309ASB	12	30.12	77.99	50.66	48.51	Decreasing
309BLA	12	13.71	87.30	64.37	67.71	Decreasing
309CCD	9	15.69	90.40	51.96	45.82	**Increasing**
309CRR	0	NS	NS	NS	NS	NA
309ESP	12	3.02	38.96	14.01	9.39	Decreasing
309GAB	6	3.26	28.50	14.99	16.06	Increasing
309GRN	11	0.74	7.30	2.59	1.97	**Increasing**
309JON	12	3.23	37.89	18.58	13.07	**Increasing**
309MER	12	8.66	32.59	20.13	19.06	Decreasing
309MOR	12	1.37	9.75	3.74	3.47	Increasing
309NAD	4	4.04	13.76	8.53	8.16	Decreasing
309OLD	12	3.12	44.14	24.68	27.10	**Increasing**
309QUI	3	11.09	64.94	39.84	43.50	Decreasing
309RTA	6	3.44	26.20	12.12	10.03	Increasing
309SAC	6	1.12	2.82	1.96	2.06	**Increasing**
309SAG	5	1.06	3.28	2.02	2.02	Increasing
309SSP	11	0.57	3.32	1.91	2.04	**Increasing**
309TEH	12	11.38	46.38	25.19	24.75	**Decreasing**

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

NS Not sampled for total nitrogen.
NA No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.

- Moro Cojo Slough (309MOR) exceeded its total nitrogen dry season TMDL limit of 1.7 mg/L in 80% of samples and its wet season TMDL limit of 8.0 mg/L in 14% of samples.

Table 3-37. Summary of Lower Salinas River Watershed Nutrient TMDL and Non-TMDL Area Nutrient Limit Exceedances for Total Nitrogen in Hydrologic Unit 309

Site ID	TMDL Dry Season Percent Exceedance	TMDL Wet Season Percent Exceedance	Non-TMDL Area Limit Percent Exceedance
309MOR	80%	14%	N/A

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations,* 2023, for detailed site descriptions.
2 The total nitrogen TMDL and non-TMDL area limits are not appliable to any other site.
3 The relevant dry season numeric criterion is 1.7 mg/L.
4 The relevant wet season numeric criterion is 8.0 mg/L.
N/A There is no applicable Lower Salinas River Watershed Nutrient TMDL or non-TMDL area limit criterion for total nitrogen at this site.

3.3.6 Orthophosphate and Total Phosphorus

All but four sites (Chualar Creek West of Highway 1 on River Road [309CCD], Chualar Creek, North Branch [309CRR], Salinas River in Greenfield [309GRN], and Quail Creek [309QUI]) within the Salinas HU have a dry season and wet season TMDL limit for orthophosphate. See **Table 2-5** and **Appendix A** for a summary of applicable dry season and wet season TMDL limits for orthophosphate in the Salinas HU. **Figure 3-21** depicts annual median orthophosphate concentrations for sites in the Salinas HU for 2023. **Table 3-38** presents descriptive statistics for orthophosphate, **Table 3-39** and **Appendix B** present nutrient TMDL and non-TMDL area limit exceedances for orthophosphate, and **Table 3-40** presents descriptive statistics for total phosphorus.

- Median orthophosphate concentrations ranged from 0.059 mg/L in the Salinas River at Elm Rd. in Greenfield (309GRN) to 0.727 mg/L in Chualar Creek West of Highway 1 (309CCD).

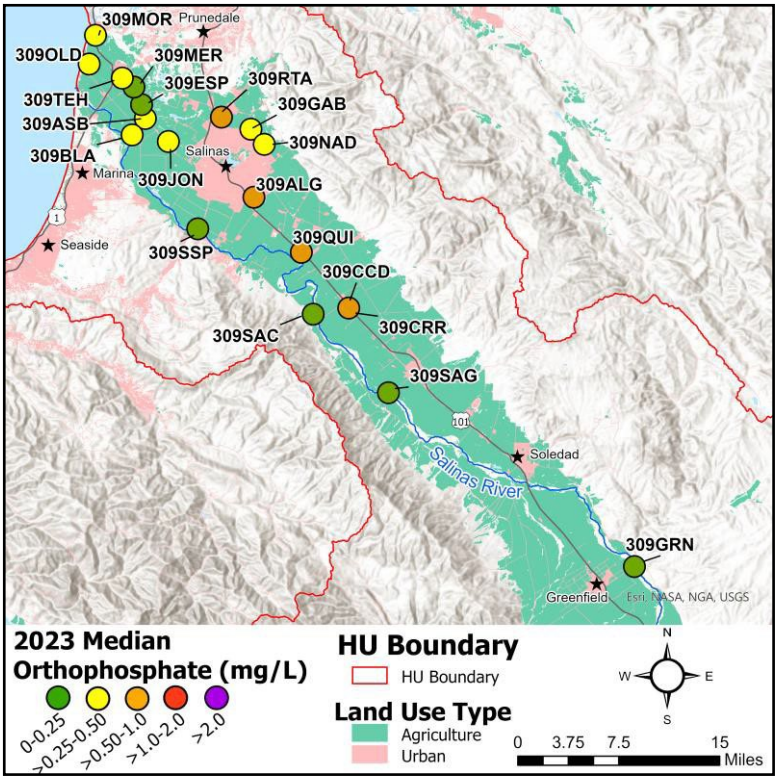


Figure 3-21. 2023 Median Orthophosphate as P for Sites in HU 309

- The maximum orthophosphate concentration observed at any Salinas HU site in 2023 occurred in Moro Cojo Slough (309MOR) (2.070mg/L).
- During the period of 2005-2023, 13 sites showed statistically significant decreasing trends in orthophosphate concentrations, whereas there were no statistically significant increasing trends.

Table 3-38. Descriptive Statistics for Orthophosphate as P in Hydrologic Unit 309 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
309ALG	11	0.17	1.36	0.60	0.58	Decreasing
309ASB	12	0.12	0.84	0.37	0.30	**Decreasing**
309BLA	12	0.06	0.58	0.29	0.26	**Decreasing**
309CCD	9	0.47	1.65	0.78	0.73	**Decreasing**
309CRR	0	NS	NS	NS	NS	Decreasing
309ESP	12	0.00	0.86	0.27	0.08	**Decreasing**
309GAB	6	0.12	1.39	0.55	0.45	Decreasing
309GRN	11	0.00	0.09	0.06	0.06	**Decreasing**
309JON	12	0.08	0.58	0.30	0.31	**Decreasing**
309MER	12	0.09	0.44	0.22	0.19	**Decreasing**
309MOR	12	0.06	2.07	0.55	0.41	**Decreasing**
309NAD	4	0.15	0.50	0.32	0.31	**Decreasing**
309OLD	12	0.08	0.90	0.47	0.49	Decreasing
309QUI	3	0.40	1.40	0.80	0.59	Decreasing
309RTA	6	0.31	1.16	0.62	0.55	Increasing
309SAC	6	0.04	0.12	0.07	0.07	**Decreasing**
309SAG	5	0.04	0.12	0.07	0.07	**Decreasing**
309SSP	11	0.02	0.11	0.07	0.07	**Decreasing**
309TEH	12	0.05	0.77	0.40	0.32	**Decreasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

NS Not sampled for orthophosphate as P.

- Five of the 15 sites with applicable criteria exceeded the dry season TMDL limit for orthophosphate in 100% of samples. Only one site, Salinas River at Gonzales River Rd. Bridge (309SAG), didn't exceed the dry season TMDL limit in 2023.
- Eight of 15 sites with applicable criteria exceeded the wet season TMDL limit for orthophosphate in more than 50% of samples, two of which exceeded in 100% of samples. Three Salinas River sites (309SAC, 309SAG, and 309SSP) had zero exceedances of the wet season TMDL limit in 2023.

Table 3-39. Summary of Lower Salinas River Watershed Nutrient TMDL and Non-TMDL Area Nutrient Limit Exceedances for Orthophosphate as P in Hydrologic Unit 309

Site ID[1]	TMDL Dry Season Percent Exceedance	TMDL Wet Season Percent Exceedance[2]	Non-TMDL Area Limit Percent Exceedance
309ALG	100%[3]	100%	N/A
309ASB	80%[3]	43%	N/A
309BLA	100%[3]	43%	N/A
309CCD	N/A	N/A	N/A
309CRR	N/A	N/A	N/A
309ESP	20%[3]	43%	N/A
309GAB	100%	50%	N/A
309GRN	N/A	N/A	N/A
309JON	80%[3]	86%	N/A
309MER	80%[3]	29%	N/A
309MOR	40%[3]	71%	N/A
309NAD	NS	50%	N/A
309OLD	100%[4]	71%	N/A
309QUI	N/A	N/A	N/A
309RTA	100%[3]	100%	N/A
309SAC	33%[4]	0%	N/A
309SAG	0%[4]	0%	N/A
309SSP	20%[4]	0%	N/A
309TEH	80%[3]	71%	N/A

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations,* 2023, for detailed site descriptions.
2 The relevant wet season numeric criterion is 0.3 mg/L.
3 The relevant dry season numeric criterion is 0.13 mg/L.
4 The relevant dry season numeric criterion is 0.07 mg/L.
N/A There is no applicable Lower Salinas River Watershed Nutrient TMDL or non-TMDL area limit criterion for orthophosphate as P at this site.

- The spatial distribution and relative magnitudes of total phosphorus concentrations were similar to orthophosphate concentrations.
- Median total phosphorus concentrations ranged from 0.233 mg/L at Salinas River at Elm Rd. in Greenfield (309GRN) to 2.190 mg/L at Quail Creek (309QUI).
- The maximum total phosphorus concentration observed at any Salinas HU site in 2023 was observed at Chualar Creek West of Highway 1 on River Road (309CCD) (28.200 mg/L).
- For the period of 2012-2023, three sites (Moro Cojo Slough [309MOR], Old Salinas River at Monterey Dunes [309OLD], and Salinas River at Spreckels Gage [309SSP]) showed a statistically significant increasing trend in total phosphorus, and two sites (Blanco Drain [309BLA] and Salinas Reclamation Canal at San Jon Rd. [309JON]) showed a statistically significant decreasing trend in total phosphorus.

Table 3-40. Descriptive Statistics for Total Phosphorus in Hydrologic Unit 309 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
309ALG	11	0.48	2.84	1.16	0.92	Increasing
309ASB	12	0.47	1.33	0.75	0.74	Increasing
309BLA	12	0.19	2.37	0.77	0.68	**Decreasing**
309CCD	9	1.10	28.20	5.32	1.71	Increasing
309CRR	0	NS	NS	NS	NS	NA[4]
309ESP	12	0.34	2.40	1.13	1.13	Increasing
309GAB	6	0.40	3.54	1.26	0.85	Decreasing
309GRN	11	0.09	0.69	0.27	0.23	Increasing
309JON	12	0.28	2.58	0.86	0.68	**Decreasing**
309MER	12	0.19	1.76	0.63	0.52	Increasing
309MOR	12	0.20	1.94	0.88	0.81	**Increasing**
309NAD	4	0.23	1.69	0.77	0.58	Increasing
309OLD	12	0.56	1.43	0.97	0.98	**Increasing**
309QUI	3	1.35	6.51	3.35	2.19	Increasing
309RTA	6	0.53	4.76	1.81	1.07	Decreasing
309SAC	6	0.17	1.50	0.50	0.30	Increasing
309SAG	5	0.06	3.35	0.84	0.24	Increasing
309SSP	11	0.20	1.13	0.43	0.32	**Increasing**
309TEH	12	0.46	1.87	0.93	0.82	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.

NS Not sampled for total phosphorus.

NA No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.

3.3.7 Specific Conductivity

A conductivity Water Quality Objective to protect agricultural uses applies to six sites (four mainstem Salinas River sites, Gabilan Creek [309GAB], and Alisal Slough [309ASB]) in the Salinas HU. This agricultural objective does not define a numeric value to evaluate exceedance frequencies, but provides ranges:

- <750 µS/cm, "No Problem";
- 750-3,000 µS/cm, "Increasing Problems" and
- >3,000 µS/cm, "Severe".

Figure 3-22 depicts annual median 2023 conductivity for sites in the Salinas HU and **Table 3-41** presents descriptive statistics.

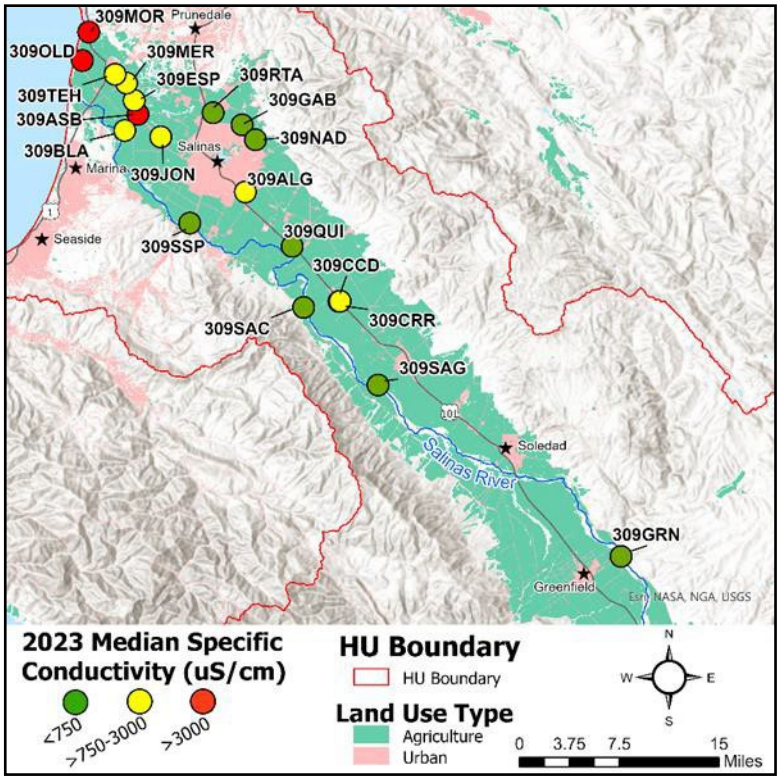


Figure 3-22. 2023 Median Conductivity for Sites in HU 309

- In 2023, median conductivities ranged from 411 µS/cm in the Salinas River at Elm Rd. in Greenfield (309GRN) to 29,562 µS/cm in Moro Cojo Slough (309MOR).
- Median conductivities at 11 out of 19 sites sampled were above the low end of the listed ranges (750 µS/cm) in 2023 indicating increasing or severe problems.
- For the period of 2005-2023, no sites depicted a statistically significant increasing trend in conductivity concentrations, while six sites showed statistically significant decreasing trends in conductivity concentrations (Blanco Drain [309BLA], Merritt Ditch upstream from Highway 183 [309MER], Moro Cojo Slough [309MOR], Salinas River at Chualar Bridge [309SAC], Salinas River at Gonzales River Rd. Bridge [309SAG], and Salinas River at Spreckels Gage [309SSP]).

Table 3-41. Descriptive Statistics for Conductivity in Hydrologic Unit 309 (µS/cm)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
309ALG	11	300	1,598	921	1,024	Decreasing
309ASB	12	2,149	3,430	3,035	3,130	Increasing
309BLA	12	2,484	3,121	2,792	2,791	**Decreasing**
309CCD	9	996	3,066	1,774	1,740	Increasing
309CRR	8	468	3,122	1,697	1,671	Decreasing
309ESP	12	388	2,964	1,699	1,754	Decreasing
309GAB	6	219	980	632	675	Increasing
309GRN	11	293	812	510	411	Decreasing
309JON	12	140	2,219	1,272	1,424	Increasing
309MER	12	436	2,305	1,656	1,922	**Decreasing**
309MOR	12	1,775	52,632	29,071	29,562	**Decreasing**
309NAD	4	348	987	589	511	Decreasing
309OLD	12	569	17,737	9,070	9,240	Increasing
309QUI	3	495	1,178	728	510	Increasing
309RTA	6	191	848	561	607	Decreasing
309SAC	6	298	657	451	456	**Decreasing**
309SAG	5	332	487	420	441	**Decreasing**
309SSP	11	367	712	496	420	**Decreasing**
309TEH	12	370	2,589	1,615	1,613	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.3.8 Total Dissolved Solids and Salinity

The Basin Plan contains TDS Water Quality Objectives for four sites in the Salinas HU: Gabilan Creek (309GAB) (300 mg/L), and mainstem Salinas River sites except for the Salinas River at Spreckels site (309SSP) (600 mg/L). The objectives are applied as an annual average. The Basin Plan contains no numeric Water Quality Objectives for the following analytes for CMP sites in the Salinas HU: salinity, alkalinity, calcium, magnesium, sodium, potassium, sulfate, and chloride. No trend analyses were performed on the latter six analytes due to limited historical data associated with them. **Figure 3-23** depicts annual median TDS concentrations for sites in the Salinas HU for 2023. **Table 3-42**, **Table 3-43**, **Table 3-44**, **Table 3-45**, **Table 3-46**, **Table 3-47** , **Table 3-48**, **Table 3-49**, and **Table 3-50** present descriptive statistics for TDS, salinity, alkalinity, calcium, magnesium, sodium, potassium, sulfate, and chloride, respectively.

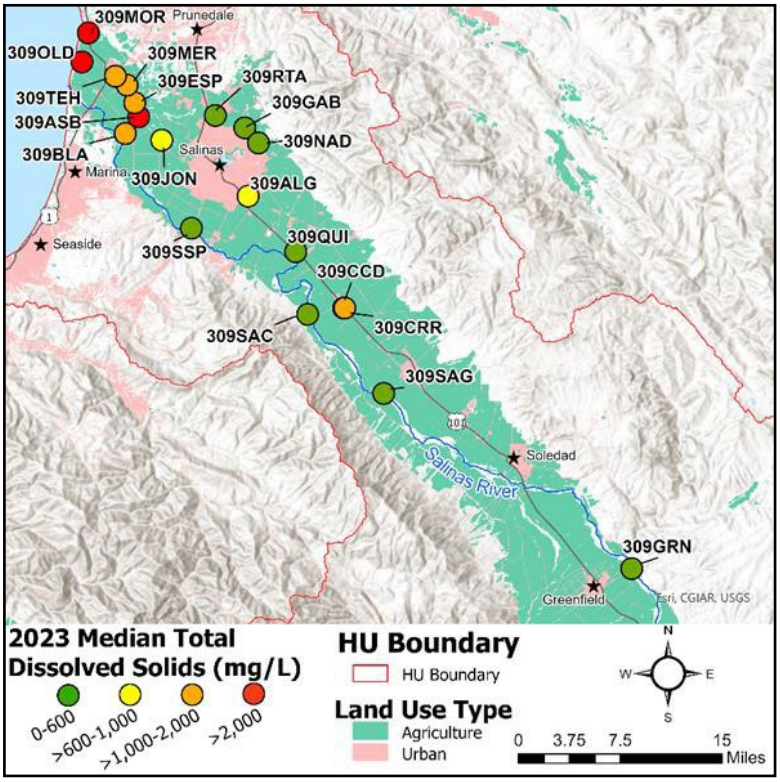


Figure 3-23. 2023 Median Total Dissolved Solids for Sites in HU 309

- Median TDS concentrations for 2023 ranged from 265 mg/L at Salinas River in Greenfield (309GRN) to 18,915 mg/L (tidal influence) in the Moro Cojo Slough (309MOR).
- Only one applicable site met the respective TDS Water Quality Objectives on an average annual basis (Gabilan Creek [309GAB]) while the rest did not (Salinas River in Greenfield (309GRN), Salinas River at Chualar Bridge [309SAC], and Salinas River at Gonzales River Rd. Bridge [309SAG]).
- For the period of 2005-2023, three sites (Alisal Slough [309ASB], Salinas Reclamation Canal at San Jon Rd. [309JON], and Old Salinas River at Monterey Dunes Wy. [309OLD]) showed a statistically significant increasing trend in TDS concentrations, while three sites showed statistically significant decreasing trends in TDS concentrations (Blanco Drain [309BLA], Moro Cojo Slough [309MOR], and Salinas River at Spreckels Gage [309SSP]).

Table 3-42. Descriptive Statistics for Total Dissolved Solids in Hydrologic Unit 309 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	WQO Exceedance?	Trend[2]
309ALG	11	192	1,023	589	655	N/A	Increasing
309ASB	12	1,377	2,195	1,942	2,003	N/A	**Increasing**
309BLA	12	1,590	1,998	1,786	1,786	N/A	**Decreasing**
309CCD	9	638	1,962	1,135	1,113	N/A	Increasing
309CRR	8	299	1,998	1,086	1,070	N/A	Decreasing
309ESP	12	249	1,897	1,087	1,124	N/A	Increasing
309GAB	6	140	627	404	433	Yes[4]	Increasing
309GRN	11	188	520	327	265	No[5]	Increasing
309JON	12	89	1,421	815	911	N/A	**Increasing**
309MER	12	1	1,475	974	1,230	N/A	Decreasing
309MOR	12	1,137	33,670	18,531	18,915	N/A	**Decreasing**
309NAD	4	223	632	377	327	N/A	Decreasing
309OLD	12	364	11,360	5,819	5,914	N/A	**Increasing**
309QUI	3	317	754	466	327	N/A	Increasing
309RTA	6	122	543	354	381	N/A	Decreasing
309SAC	6	190	421	289	291	No[4]	Decreasing
309SAG	5	213	312	269	282	No[4]	Decreasing
309SSP	11	238	505	322	269	N/A	**Decreasing**
309TEH	12	237	2,247	1,117	1,032	N/A	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 Water quality objective is <300mg/L.
5 Water quality objective is <600mg/L.
N/A There is no applicable Water Quality Objective for this site.

- The spatial distribution and relative magnitudes of salinity were similar to TDS concentrations.
- For the period of 2005-2023, six sites showed statistically significant decreasing trends in salinity (Blanco Drain [309BLA], Merritt Ditch upstream from Highway 183 [309MER], Salinas River at Chualar Bridge, Moro Cojo Slough [309MOR], Salinas River at Chualar Bridge on River [309SAC], Salinas River at Gonzales River Rd. Bridge [309SAG], and Salinas River at Spreckels Gage [309SSP]), while one site (Alisal Slough [309ASB]). showed a statistically significant increasing trend in salinity.

Table 3-43. Descriptive Statistics for Salinity in Hydrologic Unit 309 (ppt)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
309ALG	11	0.20	0.85	0.49	0.50	Decreasing
309ASB	12	1.20	1.90	1.65	1.70	**Increasing**
309BLA	12	1.30	1.70	1.50	1.50	**Decreasing**
309CCD	9	0.50	1.70	0.94	0.90	Increasing
309CRR	8	0.20	1.70	0.90	0.90	Decreasing
309ESP	12	0.19	1.60	0.92	0.95	Decreasing
309GAB	6	0.10	0.50	0.33	0.35	Increasing
309GRN	11	0.14	0.50	0.28	0.20	Decreasing
309JON	12	0.10	1.20	0.69	0.75	Increasing
309MER	12	0.20	1.20	0.89	1.01	**Decreasing**
309MOR	12	1.00	34.74	18.45	18.30	**Decreasing**
309NAD	4	0.20	0.50	0.30	0.25	Decreasing
309OLD	12	0.30	10.40	5.19	5.25	Increasing
309QUI	3	0.30	0.60	0.40	0.30	Increasing
309RTA	6	0.10	0.40	0.28	0.30	Decreasing
309SAC	6	0.10	0.30	0.21	0.20	**Decreasing**
309SAG	5	0.19	0.30	0.22	0.20	**Decreasing**
309SSP	11	0.20	0.40	0.27	0.30	**Decreasing**
309TEH	12	0.20	1.40	0.87	0.85	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median alkalinity concentrations ranged from 65 mg/L at Natividad Creek (309NAD) to 372 mg/L at Merritt Ditch (309MER).

Table 3-44. Descriptive Statistics for Alkalinity in Hydrologic Unit 309 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
309ALG	4	56	176	108	100
309ASB	4	225	362	290	286
309BLA	4	320	416	351	333
309CCD	2	223	329	276	276
309CRR	0	NS	NS	NS	NS
309ESP	4	165	350	281	305
309GAB	2	67	184	126	126
309GRN	4	98	175	144	152
309JON	4	46	266	171	185
309MER	4	94	408	312	372
309MOR	4	184	292	230	223
309NAD	1	65	65	65	65
309OLD	4	172	430	327	353
309QUI	1	76	76	76	76
309RTA	3	42	213	120	106
309SAC	2	133	166	150	150
309SAG	2	102	122	112	112
309SSP	3	113	166	137	133
309TEH	4	149	337	241	239

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- The lowest median concentration of calcium (31 mg/L) was measured at Natividad Creek (309NAD) and the highest median concentration (284 mg/L) was measured at Moro Cojo Slough (309MOR).

Table 3-45. Descriptive Statistics for Calcium in Hydrologic Unit 309 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
309ALG	4	41	78	57	55
309ASB	4	109	183	158	171
309BLA	4	151	170	162	164
309CCD	2	149	274	212	212
309CRR	0	NS	NS	NS	NS
309ESP	4	48	121	87	90
309GAB	2	24	103	63	63
309GRN	4	30	76	55	57
309JON	4	17	152	87	89
309MER	4	36	140	102	117
309MOR	4	88	527	296	284
309NAD	1	31	31	31	31
309OLD	4	89	203	157	169
309QUI	1	55	55	55	55
309RTA	3	14	67	39	36
309SAC	2	50	66	58	58
309SAG	2	49	50	49	49
309SSP	3	40	64	51	50
309TEH	4	70	129	92	85

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median magnesium concentrations in the Salinas HU ranged from 9 mg/L at Santa Rita Creek (309RTA) to 593 mg/L at Moro Cojo Slough (309MOR).

Table 3-46. Descriptive Statistics for Magnesium in Hydrologic Unit 309 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
309ALG	4	10	28	19	20
309ASB	4	96	190	147	151
309BLA	4	128	155	144	147
309CCD	2	46	90	68	68
309CRR	0	NS	NS	NS	NS
309ESP	4	19	89	54	55
309GAB	2	6	25	16	16
309GRN	4	12	33	23	24
309JON	4	5	73	34	30
309MER	4	18	74	60	73
309MOR	4	115	1,250	638	593
309NAD	1	11	11	11	11
309OLD	4	112	379	244	242
309QUI	1	14	14	14	14
309RTA	3	6	21	12	9
309SAC	2	20	30	25	25
309SAG	2	18	20	19	19
309SSP	3	14	29	21	20
309TEH	4	43	111	65	53

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median sodium concentrations ranged from 21 mg/L at Natividad Creek (309NAD) to 5,025 mg/L at Moro Cojo Slough (309MOR). Moro Cojo Slough (309MOR) also had the highest recorded concentration of sodium (10,300 mg/L).

Table 3-47. Descriptive Statistics for Sodium in Hydrologic Unit 309 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
309ALG	4	24	114	68	66
309ASB	4	175	234	199	193
309BLA	4	213	253	236	238
309CCD	2	91	193	142	142
309CRR	0	NS	NS	NS	NS
309ESP	4	50	355	180	159
309GAB	2	15	60	38	38
309GRN	4	11	47	33	37
309JON	4	9	135	77	82
309MER	4	43	200	151	180
309MOR	4	828	10,300	5,295	5,025
309NAD	1	21	21	21	21
309OLD	4	870	2,950	1,898	1,885
309QUI	1	26	26	26	26
309RTA	3	20	71	40	30
309SAC	2	28	42	35	35
309SAG	2	26	29	28	28
309SSP	3	16	40	28	29
309TEH	4	86	214	135	120

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median potassium concentrations ranged from 2.5 mg/L at nine sites to 202.5 mg/L at Moro Cojo Slough (309MOR).

Table 3-48. Descriptive Statistics for Potassium in Hydrologic Unit 309 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
309ALG	4	6.1	10.2	8.4	8.6
309ASB	4	2.5	8.8	4.1	2.5
309BLA	4	2.5	2.5	2.5	2.5
309CCD	2	9.1	16.9	13.0	13.0
309CRR	0	NS	NS	NS	NS
309ESP	4	7.0	15.9	11.3	11.2
309GAB	2	2.5	2.5	2.5	2.5
309GRN	4	2.5	2.5	2.5	2.5
309JON	4	2.5	6.5	3.5	2.5
309MER	4	5.9	10.5	7.9	7.6
309MOR	4	48.9	424.0	219.5	202.5
309NAD	1	2.5	2.5	2.5	2.5
309OLD	4	32.8	112.0	68.7	65.0
309QUI	1	7.4	7.4	7.4	7.4
309RTA	3	2.5	10.3	6.8	7.5
309SAC	2	2.5	2.5	2.5	2.5
309SAG	2	2.5	2.5	2.5	2.5
309SSP	3	2.5	2.5	2.5	2.5
309TEH	4	2.5	8.7	5.1	4.6

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median sulfate concentrations ranged from 39 mg/L at Gabilan Creek (309GAB) to 1,370 mg/L at Moro Cojo Slough (309MOR). Moro Cojo Slough (309MOR) also had the highest recorded concentration of sulfate (2,820 mg/L).

Table 3-49. Descriptive Statistics for Sulfate in Hydrologic Unit 309 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
309ALG	4	48	93	71	72
309ASB	4	294	580	440	444
309BLA	4	421	660	558	576
309CCD	2	312	602	457	457
309CRR	0	NS	NS	NS	NS
309ESP	4	35	171	104	105
309GAB	2	16	61	39	39
309GRN	4	44	149	101	107
309JON	4	11	194	97	91
309MER	4	53	189	149	178
309MOR	4	301	2,820	1,465	1,370
309NAD	1	42	42	42	42
309OLD	4	277	1,090	638	592
309QUI	1	59	59	59	59
309RTA	3	23	49	37	40
309SAC	2	82	127	105	105
309SAG	2	73	83	78	78
309SSP	3	60	124	89	83
309TEH	4	98	352	181	137

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- The lowest median concentration of chloride (23 mg/L) was measured at Gonzales River Rd. Bridge (309SAG) and the highest concentration (8,410 mg/L) was measured at Moro Cojo Slough (309MOR).

Table 3-50. Descriptive Statistics for Chloride in Hydrologic Unit 309 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
309ALG	4	37	164	89	78
309ASB	4	344	533	425	412
309BLA	4	275	300	288	288
309CCD	2	117	192	155	155
309CRR	0	NS	NS	NS	NS
309ESP	4	65	675	319	269
309GAB	2	17	101	59	59
309GRN	4	9	43	29	33
309JON	4	10	402	166	127
309MER	4	56	296	222	268
309MOR	4	1,480	20,000	9,575	8,410
309NAD	1	34	34	34	34
309OLD	4	1,440	5,700	3,425	3,280
309QUI	1	35	35	35	35
309RTA	3	21	85	49	42
309SAC	2	27	34	30	30
309SAG	2	19	27	23	23
309SSP	3	15	32	25	28
309TEH	4	134	410	235	197

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.3.9 Dissolved Oxygen

The minimum DO objective for protection of cold water or spawning aquatic life Beneficial Uses (7 mg/L) applies to eight Salinas HU sites. For sites that do not have specifically assigned Beneficial Uses, the Basin Plan specifies the following general numeric objectives: 5 mg/L and 85% saturation. The 85% saturation objective is applied on a median basis. General Water Quality Objectives apply to all waterbodies unless a more protective Beneficial Use and Water Quality Objective are designated. **Figure 3-24** depicts annual median dissolved oxygen concentrations for sites in the Salinas HU for 2023, **Table 3-51** presents descriptive statistics for dissolved oxygen concentration, and **Table 3-52** presents descriptive statistics for oxygen saturation.

- All eight sites sampled, having a Beneficial Use for protection of cold water or spawning aquatic life, surpassed the minimum 7 mg/L Water Quality Objective.
- Nine of 11 sites with a minimum Water Quality Objective of 5 mg/L met the objective in all samples in 2023.

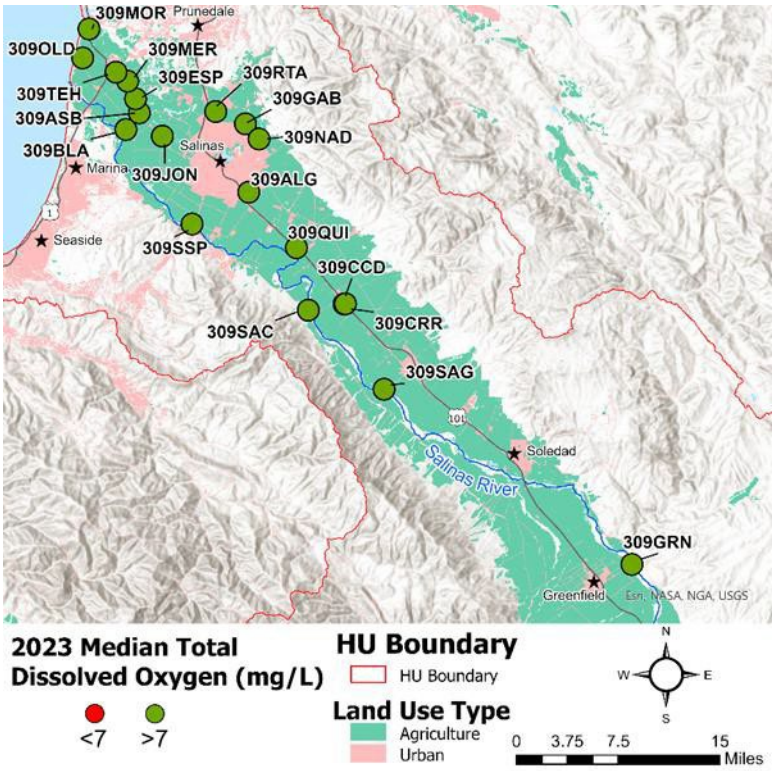


Figure 3-24. 2023 Median Dissolved Oxygen Concentrations for Sites in HU 309

- For the period of 2005-2023, eight sites showed statistically significant increasing trends in DO concentrations: Salinas Reclamation Canal at La Guardia St. (309ALG), Blanco Drain (309BLA), Moro Cojo Slough (309MOR), Natividad Creek (309NAD), Old Salinas River (309OLD), Quail Creek (309QUI), and Santa Rita Creek (309RTA). One site showed a statistically significant decreasing trend in DO concentrations (Alisal Slough [309ASB]). Trends in DO must be interpreted with caution, as diel patterns in DO can be influenced by temperature and biological activity depending on the time of day at which sampling occurs, and changes in DO can manifest as either depressed or very high concentrations.

Table 3-51. Descriptive Statistics for Dissolved Oxygen in Hydrologic Unit 309 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Percent Exceedance	Trend[2]
309ALG	11	5	14	10	11	9%[4]	**Increasing**
309ASB	12	7	12	10	9	0%[4]	**Decreasing**
309BLA	12	7	17	12	11	0%[4]	**Increasing**
309CCD	9	5	10	8	8	0%[4]	Decreasing
309CRR	8	7	11	8	8	0%[4]	Decreasing
309ESP	12	8	19	12	11	0%[4]	Increasing
309GAB	6	8	12	10	10	0%	**Increasing**
309GRN	11	8	10	9	9	0%	Increasing
309JON	12	5	18	10	10	8%[4]	Decreasing
309MER	12	8	13	10	10	0%[4]	Decreasing
309MOR	12	3	15	8	9	33%	**Increasing**
309NAD	4	10	13	11	11	0%[4]	**Increasing**
309OLD	12	5	13	9	9	33%	**Increasing**
309QUI	3	10	11	11	11	0%[4]	**Increasing**
309RTA	6	8	11	10	10	0%[4]	**Increasing**
309SAC	6	8	12	10	10	0%	Increasing
309SAG	5	8	11	9	9	0%	Increasing
309SSP	11	5	12	10	10	9%	Decreasing
309TEH	12	5	12	9	9	25%	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 Water quality objective is >5 mg/L; all other sites have a Water Quality Objective of >7 mg/L.

- In 2023, no sites with a Water Quality Objective of 85% saturation exceeded the objective on a median basis.
- For the period of 2005-2023, nine sites showed statistically significant increasing trends in oxygen saturation (Salinas Reclamation Canal at La Guardia St. [309ALG], Blanco Drain [309BLA], Gabilan Creek [309GAB], Salinas River at Elm Rd. in Greenfield [309GRN], Moro Cojo Slough [309MOR], Natividad Creek [309NAD], Old Salinas River [309OLD], and Quail Creek [309QUI], Tembladero Slough [309TEH]). Two sites showed statistically significant decreasing trends in oxygen saturation (Alisal Slough [309ASB] and Chualar Creek West of Highway 1 on River Road [309CCD]).

Table 3-52. Descriptive Statistics for Oxygen Saturation in Hydrologic Unit 309 (%)

Site ID[1]	N[3]	Min	Max	Mean	Median	WQO Exceedance?[4]	Trend[2]
309ALG	11	49	142	102	99	N/A	**Increasing**
309ASB	12	77	145	100	97	No	**Decreasing**
309BLA	12	67	187	122	114	N/A	**Increasing**
309CCD	9	56	101	87	94	No	**Decreasing**
309CRR	8	64	99	86	92	No	Decreasing
309ESP	12	78	234	124	105	N/A	Decreasing
309GAB	6	95	108	100	100	N/A	**Increasing**
309GRN	11	80	112	100	101	N/A	**Increasing**
309JON	12	44	196	99	94	N/A	Decreasing
309MER	12	81	139	101	93	No	Increasing
309MOR	12	44	139	90	89	N/A	**Increasing**
309NAD	4	93	119	107	109	No	**Increasing**
309OLD	12	52	137	90	81	N/A	**Increasing**
309QUI	3	97	102	98	97	No	**Increasing**
309RTA	6	76	103	95	98	No	Increasing
309SAC	6	90	109	101	100	N/A	Decreasing
309SAG	5	82	111	96	98	N/A	Increasing
309SSP	11	57	119	98	102	N/A	Decreasing
309TEH	12	52	135	84	86	N/A	**Increasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 Water quality objective is >85%

N/A There is no applicable Water Quality Objective for this site.

3.3.10 pH

The Water Quality Objective for all Salinas HU sites is 7-8.3 pH standard units. For sites with MUN or REC1/REC2 and WARM/COLD Beneficial Uses, the acceptable pH range is 7-8.3 standard pH units. For sites that are not included in Table 2-1 of the Basin Plan, the acceptable pH range is also 7-8.3 standard pH units, which includes the Basin Plan general and REC1/REC2 Water Quality Objectives. **Figure 3-25** depicts annual median pH for sites in the Salinas HU for 2023 and **Table 3-53** presents descriptive statistics.

- None of the 19 sites sampled met the applicable pH Water Quality Objective in all samples in 2023.
- No sites had pH levels below the minimum criterion of 7.0 standard pH units. All other exceedances pertained to the 8.3 standard pH units Water Quality Objective.
- For the period of 2005-2023, 10 sites showed statistically significant decreasing trends in pH. No sites showed a statistically significant increasing trend in pH.

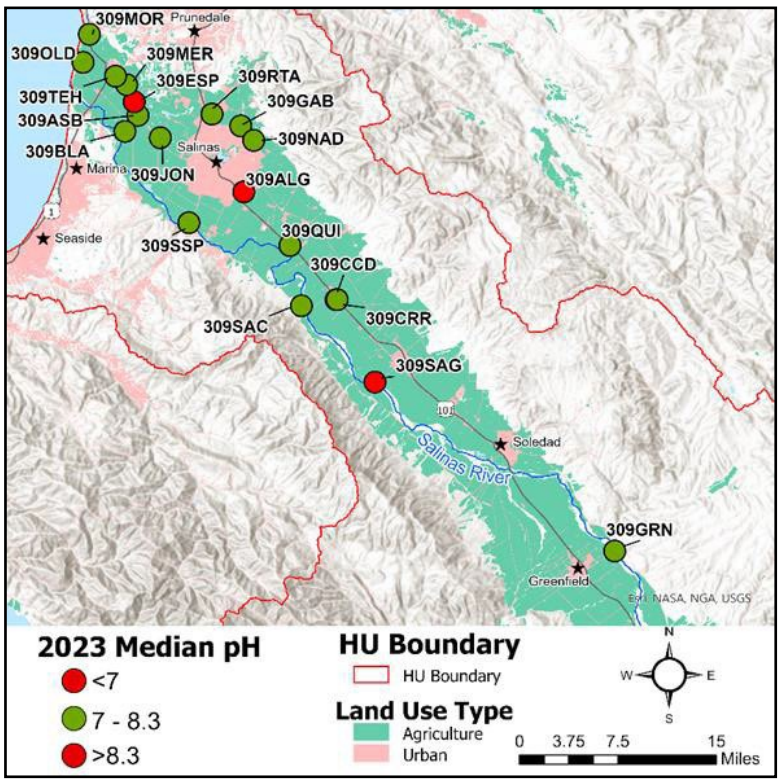


Figure 3-25. 2023 Median pH for Sites in HU 309

Table 3-53. Descriptive Statistics for pH in Hydrologic Unit 309 (pH units)

Site ID[1]	N[3]	Min	Max	Mean	Median	Percent Exceedance[2]	Trend[4]
309ALG	11	7.63	9.68	8.62	8.59	64%	Decreasing
309ASB	12	7.38	8.50	8.03	8.03	25%	**Decreasing**
309BLA	12	7.66	8.73	8.24	8.30	42%	Decreasing
309CCD	9	7.52	8.31	8.04	8.23	11%	Increasing
309CRR	8	7.75	8.36	8.11	8.21	13%	Decreasing
309ESP	12	7.67	9.00	8.45	8.60	67%	**Decreasing**
309GAB	6	7.35	8.19	7.88	7.90	0%	Decreasing
309GRN	11	7.89	8.45	8.28	8.28	46%	**Decreasing**
309JON	12	7.56	9.29	8.15	8.00	25%	**Decreasing**
309MER	12	7.09	8.56	8.02	8.09	25%	**Decreasing**
309MOR	12	7.12	9.44	8.24	8.23	42%	**Decreasing**
309NAD	4	7.78	8.69	8.09	7.94	25%	Increasing
309OLD	12	7.20	9.03	8.10	8.06	33%	Decreasing
309QUI	3	7.72	8.17	7.90	7.82	0%	Increasing
309RTA	6	7.71	8.24	7.98	8.02	0%	Increasing
309SAC	6	8.16	8.43	8.26	8.24	33%	**Decreasing**
309SAG	5	7.95	8.43	8.24	8.32	60%	**Decreasing**
309SSP	11	7.65	8.67	8.13	8.10	18%	**Decreasing**
309TEH	12	7.12	8.57	7.87	7.89	8%	**Decreasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Water quality objective is 7-8.3

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3.3.11 Aquatic Toxicity Results

The potential for toxic effects to aquatic and sediment-dwelling organisms is assessed by the CMP via bioassays for sensitive algal species (*S. capricornutum* growth) in water, and for sensitive invertebrate species in water (*C. dubia* reproduction and *C. dubia and C. dilutus* survival) and sediment (*H. azteca* growth and survival). Test organism survival and reproduction or growth is measured in environmental samples as well as in non-toxic control samples. A statistical test is then applied to determine significant differences in organism performance between environmental and control samples. When test organism performance is significantly lower in the environmental sample than in the control, *and* the difference exceeds a 20% effect threshold, a sample is determined to be "toxic" and in exceedance of the narrative Basin Plan objective for "no toxic substances in toxic amounts."

All but four sites within the Salinas HU (Espinosa Slough [309ESP], Salinas River in Greenfield [309GRN], Moro Cojo Slough [309MOR], and Santa Rita Creek [309RTA]) have a significant toxic effect (*H. azteca* survival in sediment) TMDL limit associated with the Lower Salinas River Watershed Sediment Toxicity and Pyrethroids in Sediment TMDL. Additionally, a significant toxic effect non-TMDL area limit for survival, growth, and reproduction in water and sediment apply to sites without a TMDL limit. *H. azteca* reproduction in sediment is not tested for by the CMP, so is not included in the non-TMDL area limit exceedance discussion. See **Table 2-5** and **Appendix A** for a summary of applicable toxic effect TMDL and non-TMDL area limits in the Salinas HU. Results from aquatic and sediment bioassays conducted on samples from the Salinas HU in 2023 are illustrated in Figure 3-27a-d and tabulated in **Table 3-54**.

- In 2023, toxicity (reduced growth in sample water relative to a non-toxic control) to algae was observed in one of four bioassays collected from Alisal Slough (309ASB), one of four samples collected from Merritt Ditch (309MER), and one of four samples collected from Moro Cojo Slough (309MOR) (**Figure 3- 27 a**)(**Figure 3-27a**).
- Significant mortality to *C. dilutus* in water was observed in 14 samples collected from ten sites (**Figure 3-27 b**).
- Significant mortality to *C. dubia* in water was observed in 14 samples collected from eight sites (**Figure 3-26 d**). Of the 18 sites sampled, 10 sites achieved the significant toxic effect non-TMDL area limit for *C. dubia* survival in water (**Figure 3-27 d**).
- Toxicity to invertebrate reproduction in water was observed in 17 samples collected from 16 sites. All water samples collected from Natividad Creek (309NAD), Quail Creek (309QUI), and Santa Rita Creek (309RTA) resulted in toxicity to invertebrate reproduction (**Figure 3-27 c**). Of the 16 sites sampled in the Salinas HU, three sites (Chualar Creek West of Highway 1 on River [309CCD], Salinas River at Chualar Bridge on River Rd. [309SAC], and Salinas River at Gonzales River Rd. Bridge [309SAG]) achieved the significant toxic effect non-TMDL area limit for reproduction in water (**Figure 3-27 c**).
- One sediment sample per site was collected in 2023 and analyzed for sediment toxicity. Of the 16 sites sampled in the Salinas HU, seven sites achieved the significant toxic effect non-TMDL area limit for growth in sediment (**Figure 3-27 e**). Toxicity to invertebrate growth rates in sediment was observed at nine sites (**Figure 3-27 e**).
- One sediment sample per site was collected in 2023 and analyzed for sediment toxicity. Toxicity to invertebrate survival in sediment was observed in eleven of the sixteen sites (Salinas Reclamation Canal at La Guardia St. [309ALG], Alisal Slough [309ASB], Blanco Drain [309BLA], Espinosa Slough [309ESP], Gabilan Creek [309GAB], Salinas Reclamation Canal at San Jon Rd. [309JON], Moro Cojo Slough [309MOR], Old Salinas River [309OLD], Santa Rita Creek [309RTA], and Tembladero Slough [309TEH] (**Figure 3-27 f**). Three of 15 sites with a significant toxic effect (i.e., *H. azteca* survival in sediment) TMDL limit were not sampled due to dry conditions.
- Three of 15 sites with a significant toxic effect limit for *H. azteca* survival in sediment were not sampled for toxicity in 2023 due to dry conditions. Of the 12 sites that were sampled, four sites (Merritt Ditch [309MER] and three Salinas River sites [309SAC, 309SAG, and 309SSP]) showed no significant toxic effect on *H. azteca* survival in sediment during the reporting year.

- For the period of 2005-2023, the following statistically significant trends were observed:
    - Two sites displayed increasing (improving, reduced toxicity) trends in toxicity to algae (Santa Rita Creek [309RTA] and Tembladero Slough [309TEH]).
    - Two sites displayed increasing (improving, reduced toxicity) trends in invertebrate reproduction in water (Salinas Reclamation Canal at La Guardia St. [309ALG] and Salinas Reclamation Canal at San Jon Rd. [309JON]).
    - Three sites showed significant increasing trends (improving, reduced toxicity) in invertebrate survival in water (Salinas Reclamation Canal at La Guardia St. [309ALG], Salinas Reclamation Canal at San Jon Rd. [309JON], and Tembladero Slough [309TEH]).
    - One site (Espinosa Slough upstream of Alisal Slough [309ESP]) displayed a statistically significant increasing (improving, decreased toxicity) trend in invertebrate growth in sediment.
    - One site (Alisal Slough [309ASB]) displayed a statistically significant decreasing (worsening, increased toxicity) trend in invertebrate survival in sediment.
- Detailed trend analysis results, including trend directions and statistical significance, can be found in **Appendix E**. A summary of these results is presented in **Table 3-39**.

Table 3-54. Summary of Toxicity and Trends in Hydrologic Unit 309

Site [ID1]	Algal Growth		*C. dilutus* - Survival		*C. dubia* - Reproduction		*C. dubia* - Survival		*H. azteca* - Growth		*H. azteca* - Survival	
	# of Toxic Samples[3]	Trend[1]	# of Toxic Samples[3]	Trend[1]	# of Toxic Samples[3]	Trend[1]	# of Toxic Samples[3]	Trend[1]	# of Toxic Samples[3]	Trend[1]	# of Toxic Samples[3]	Trend[1]
309ALG	0/4	Increasing	2/4	Increasing	1/4	**Increasing**	0/4	**Increasing**	1/1	Decreasing	1/1	Increasing
309ASB	1/4	Increasing	2/3	Increasing	1/3	Increasing	1/4	Decreasing	1/1	Decreasing	1/1	**Decreasing**
309BLA	0/4	Increasing	0/4	Increasing	2/4	Decreasing	0/4	Decreasing	0/1	Decreasing	0/1	Increasing
309CCD	0/2	Increasing	0/2	Increasing	0/2	Increasing	0/2	Increasing	1/1	Increasing	1/1	Increasing
309CRR	0/0	Increasing	0/0	None[4]	0/0	Decreasing	0/0	Decreasing	0/0	Increasing	0/0	Increasing
309ESP	0/4	Increasing	1/4	Decreasing	2/4	Increasing	2/4	Increasing	1/1	Increasing	1/1	Increasing
309GAB	0/2	Increasing	1/2	Increasing	1/2	Increasing	0/2	Increasing	0/0	Increasing	0/0	Increasing
309GRN	0/5	Increasing	0/4	Increasing	2/4	Increasing	1/4	Increasing	0/0	Decreasing	0/0	Decreasing
309JON	0/4	Increasing	2/4	Increasing	1/4	**Increasing**	0/4	**Increasing**	1/1	Increasing	1/1	Decreasing
309MER	1/4	Increasing	1/4	Increasing	1/4	Increasing	0/4	Increasing	0/1	Increasing	0/1	Increasing
309MOR	1/4	Increasing	0/0	None[4]	0/0	None[4]	1/4	Decreasing	0/0	Increasing	0/1	**Increasing**
309NAD	0/1	Increasing	1/1	Increasing	1/1	Decreasing	1/1	Decreasing	1/1	Decreasing	1/1	Decreasing
309OLD	0/4	Decreasing	0/0	Increasing	0/0	Increasing	4/4	Decreasing	1/1	None[5]	1/1	Increasing
309QUI	0/1	Increasing	1/1	Decreasing	1/1	Increasing	1/1	Increasing	0/0	Increasing	0/0	Increasing
309RTA	0/3	**Increasing**	2/3	Increasing	3/3	Increasing	3/3	Increasing	0/0	Decreasing	0/0	Decreasing
309SAC	0/3	Increasing	0/2	Increasing	0/2	Increasing	0/2	Increasing	0/0	Decreasing	0/0	Decreasing
309SAG	0/2	Decreasing	0/2	Increasing	0/2	Decreasing	0/2	Decreasing	0/0	Decreasing	0/0	Decreasing
309SSP	0/4	Increasing	0/3	Increasing	1/3	Increasing	0/3	Increasing	0/0	**Decreasin**	0/0	Decreasing
309TEH	0/4	**Increasing**	1/4	Increasing	0/4	Increasing	0/4	**Increasing**	1/1	Increasing	1/1	Increasing

Notes:

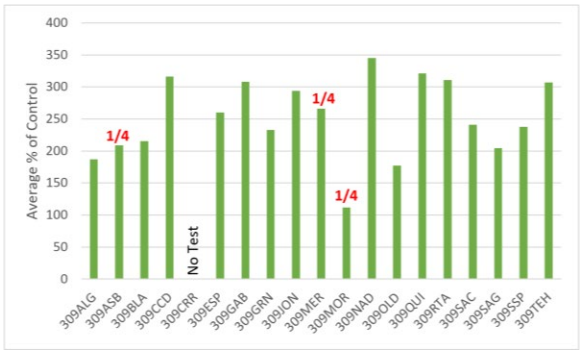
1 Refer to Section 2.1, Table 2-1, Core Monitoring Locations, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

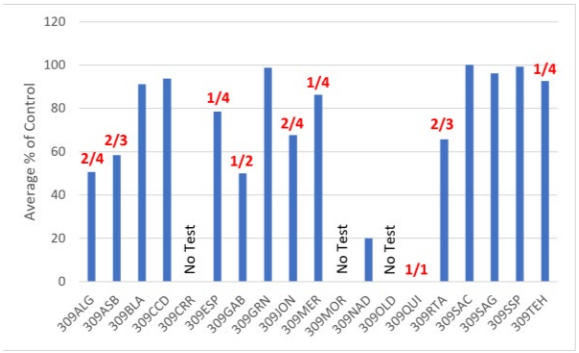
3 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 None = No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.

5 None = No monotonic trend (i.e., increasing or decreasing) was identified.

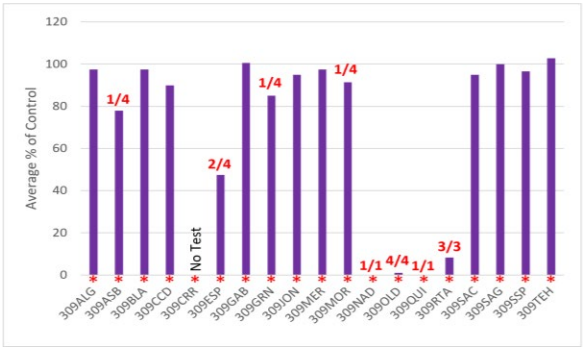


a) Algal Toxicity in Water – Growth

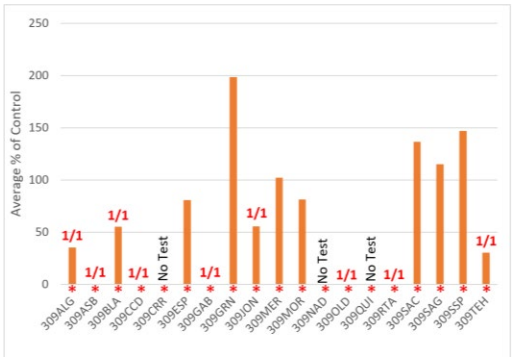


b) *C. dilutus* Toxicity in Water – Survival

c) Invertebrate Toxicity in Water – Reproduction



d) Invertebrate Toxicity in Water – Survival



e) Invertebrate Toxicity in Sediment – Growth

f) Invertebrate Toxicity in Sediment – Survival

Figure 3-26. Results for Aquatic Toxicity (water and sediment) Monitoring in the Salinas HU

Notes:

1. Bars represent the mean survival, reproduction, or growth rate for all 2023 samples at each site, as compared to laboratory controls.
2. There are generally four water toxicity sampling events for algae and invertebrates and two sediment toxicity events scheduled for each site, each year.
3. "No Test" indicates sites where no toxicity samples were collected due to dry channel or ponded conditions.
4. Results >100% indicate organism performance rates in the environmental sample were greater than in the control.
5. If site experienced "significant toxicity" red fractions indicate the number of significantly toxic samples relative to the total number of toxicity samples collected (e.g., 1/2 indicates the site had two samples collected, one of which was significantly toxic.)
6. *C. dubia* reproduction graphs generally reflect *C. dubia* tests but in some cases reflect a salinity-tolerant alternate test species, which in some cases test for "growth" instead of "reproduction" as the sub-lethal endpoint.

* Site with an applicable TMDL limit for a given test species and endpoint.

* Site with an applicable non-TMDL area limit for a given test species and endpoint.

3.4 ESTERO BAY (HU 310)

Descriptions of the Estero Bay HU are summarized from the Central Coast Water Board's Estero Hydrologic Unit Draft Assessment Report (SWRCB 2003). The coastal watersheds of the Estero Bay HU (HU 310) are in western San Luis Obispo County. Sixteen of the larger watersheds in the HU were sampled by CCAMP during the 2002 sampling year.

Several urban areas including San Simeon, Cambria, Cayucos, Morro Bay, Los Osos, San Luis Obispo, Pismo Beach, Arroyo Grande, and Oceano are found in the area. Major land uses in the area include grazing, agriculture and residential. In the watersheds of San Simeon, Santa Rosa, Villa, Cayucos, Old, Toro and Morro Creeks the primary land uses are grazing, vineyards, and avocado and orange orchards on multiple ranch properties. In recent years, an increasing number of ranches are converting to vineyards and avocado orchards. Some areas include intensive agricultural cropping activities, particularly in the lower watersheds of Chorro Creek, Los Osos Creek, San Luis Obispo Creek, Pismo Creek, and Arroyo Grande Creek.

Monitoring for the CMP was initiated in the Estero Bay HU in January 2006. There were originally six core CMP sites in the Estero Bay HU. These sites are located on Chorro Creek (310CCC) and Warden Creek (310WRP) in the north of the watershed; Prefumo Creek (310PRE) and Davenport Creek (310SLD) near San Luis Obispo; and Arroyo Grande Creek (310USG) and Los Berros Creek (310LBC) upstream from Pismo Beach at the southern end of the watershed. The site on Davenport Creek has been sampled only twice by the CMP due to lack of flow at the site or apparent connections to other waterbodies upstream or downstream (**Figure 3-27**).

The Beneficial Uses designated by the Basin Plan for waterbodies monitored by the CMP in the Estero Bay Region include nearly every Beneficial Use, with the exceptions being industrial process supply, estuarine habitat, and shellfish harvesting (Table 2-2).

Applicable TMDLs for sites within the Estero Bay HU include the Los Berros Creek Nitrate TMDL, Los Osos Creek, Warden Creek, and Warden Lake Wetland Nutrient TMDL, San Luis Obispo Creek Nitrate TMDL, and Morro Bay Sediment TMDL. Non-TMDL area limits for sites within the Estero Bay HU include non-TMDL area turbidity limits, non-TMDL area nutrient limits, and non-TMDL Area Toxicity Limits. See **Appendix A** for a summary of applicable routine parameter TMDL limits and non-TMDL area limits for sites in the Estero Bay HU.

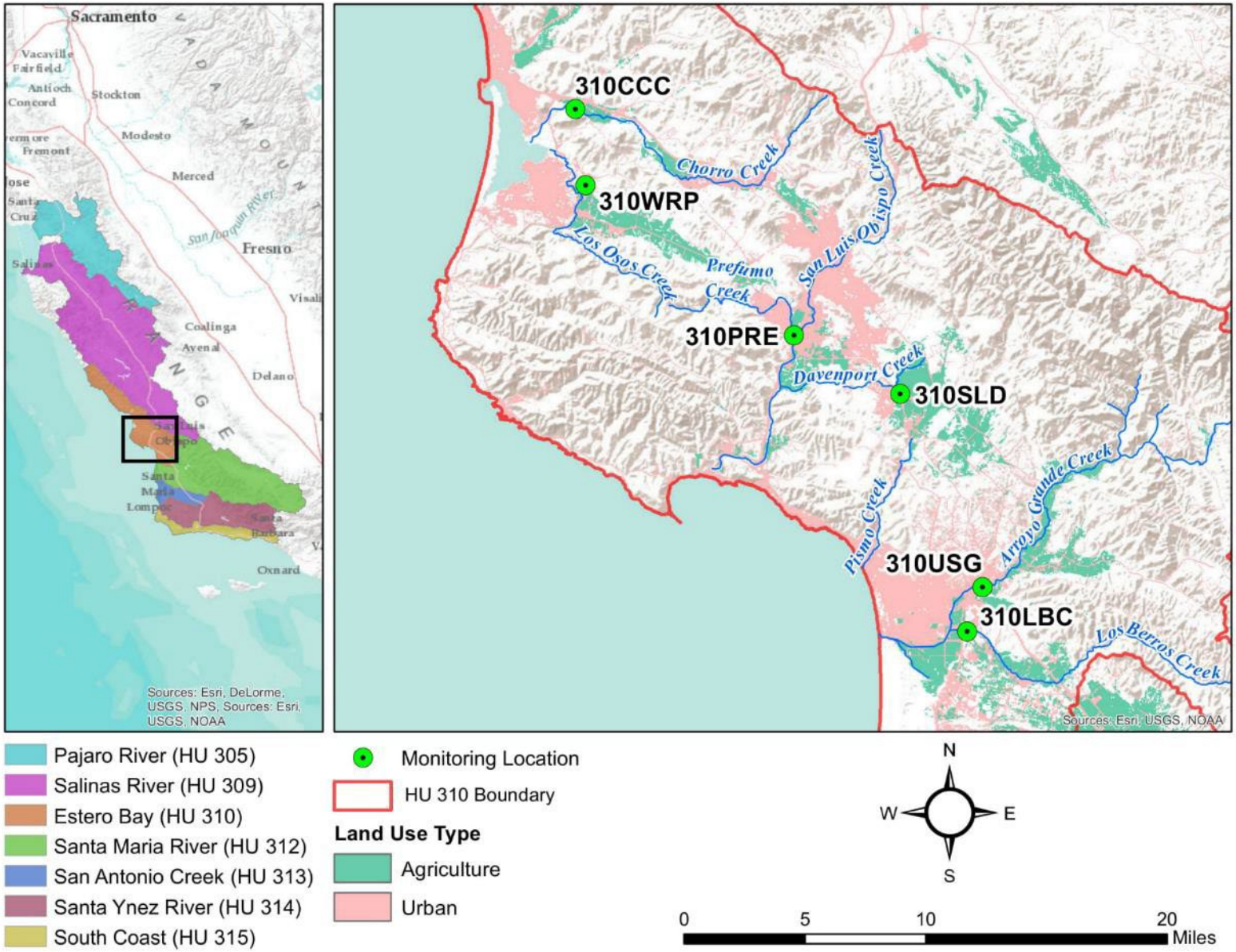


Figure 3-27. CMP Core Monitoring Sites and Distribution of Major Land Uses in the Estero Bay Hydrologic Unit

3.4.1 Flow Results

Seasonal patterns for the Estero Bay Region are typical for the Central Coast and are characterized by precipitation and subsequent flows that occur primarily from November through April. During the 2023 monitoring year, the annual average flow (31.21 CFS) at the *Lopez Canyon near Arroyo Grande* USGS stream gage, was significantly higher than the historic annual average (9.02 CFS, 1968-2022) and ranged from 3.65 (October 25, 2023) to 445.16 CFS (March 10, 2023) (USGS 2023)[1]. Although the *Lopez Canyon near Arroyo Grande* stream gage is above a reservoir, the timing and magnitude of flow are indicative of a wetter year within the Region. The 2023 cumulative annual rainfall (34.85") at the *San Luis Obispo* rain gauge was much higher than the historic average (17.21", 2000-2022) (**Figure 3-28**)(CDWR 2023). Above average flow and rain were likely caused several, relatively large atmospheric rivers early in the year.

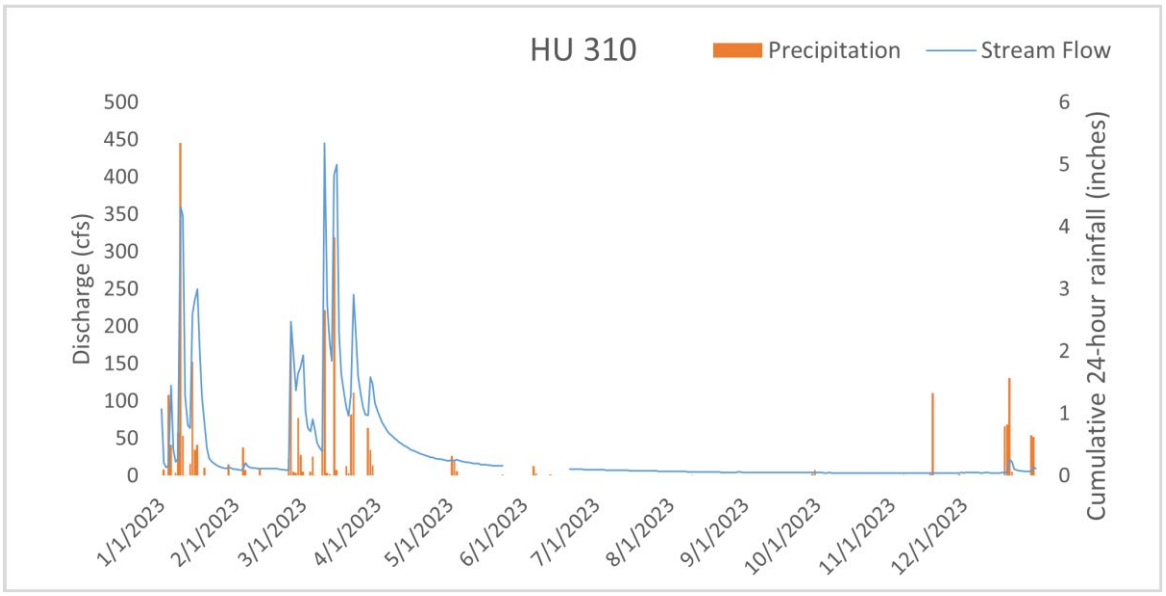


Figure 3-28. 2023 Hydrograph and Total Daily Precipitation Record for Lopez Canyon near Arroyo Grande

[1] USGS data contains provisional values, subject to revision; missing flow values may have been updated since the publishing of this report.

In 2023, flows measured at the five Estero Bay HU sites were primarily influenced by storms occurring throughout March, and irrigation during the dry season. **Figure 3-29** depicts annual median flows for sites within the Estero Bay HU for 2023 and **Table 3-55** presents descriptive statistics.

- Measured flows ranged from no flow at two sites to 1033.17 CFS in Chorro Creek (310CCC).
- Median flows during 2023 ranged from no flow in Davenport Creek (310SLD) to 12.07 CFS in Chorro Creek (310CCC).
- For the period of 2005-2023, two sites showed statistically significant decreasing trends in flows (Los Berros Creek [310LBC] and Arroyo Grande Creek [310USG]).

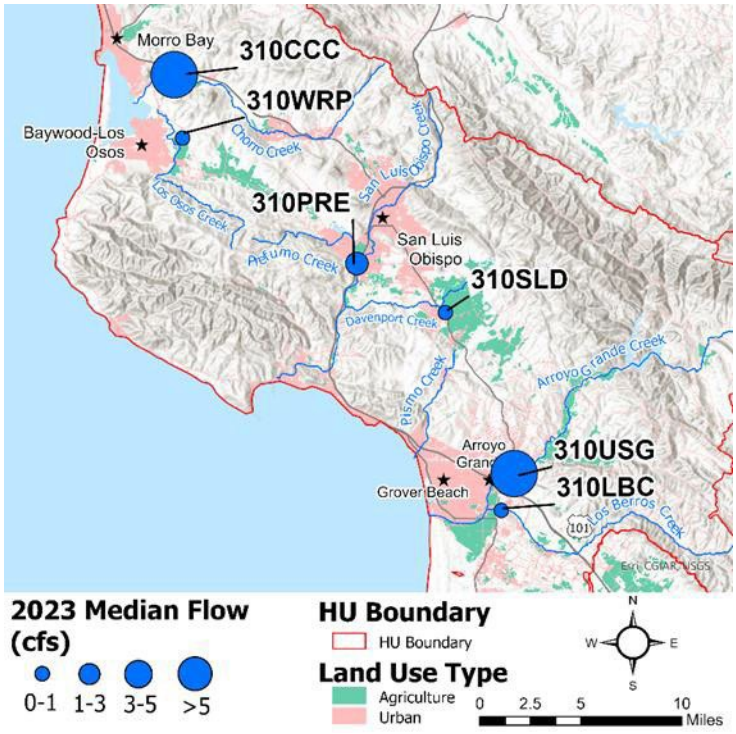


Figure 3-29. 2023 Median Flows for Sites in HU 310

Table 3-55. Descriptive Statistics for Flow in Hydrologic Unit 310 (CFS)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
310CCC	12	3.37	1,033.17	115.68	12.07	Increasing
310LBC	12	0.00	52.64	5.85	0.55	**Decreasing**
310PRE	12	0.66	425.97	55.26	1.31	Decreasing
310SLD	12	0.00	8.06	0.84	0.00	Increasing
310USG	12	1.88	253.55	46.57	6.99	**Decreasing**
310WRP	12	0.13	187.89	24.75	0.64	Decreasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.4.2 Water Temperature

The Basin Plan contains a general Water Quality Objective for temperature: natural receiving water temperature of intrastate waters shall not be altered. The Basin Plan also has specific objectives for cold and warm water habitats: At no time or place shall the temperature be increased by more than 5°F above natural receiving water temperature. Water temperature can influence the results of other field measurements including dissolved oxygen, pH, and conductivity and therefore is an important factor to consider when interpreting results. The temperature of certain water bodies can also fluctuate greatly over a 24-hour period. This fluctuation means that results and trends should be interpreted with discretion as they can be affected by the time of day at which the sample is collected.

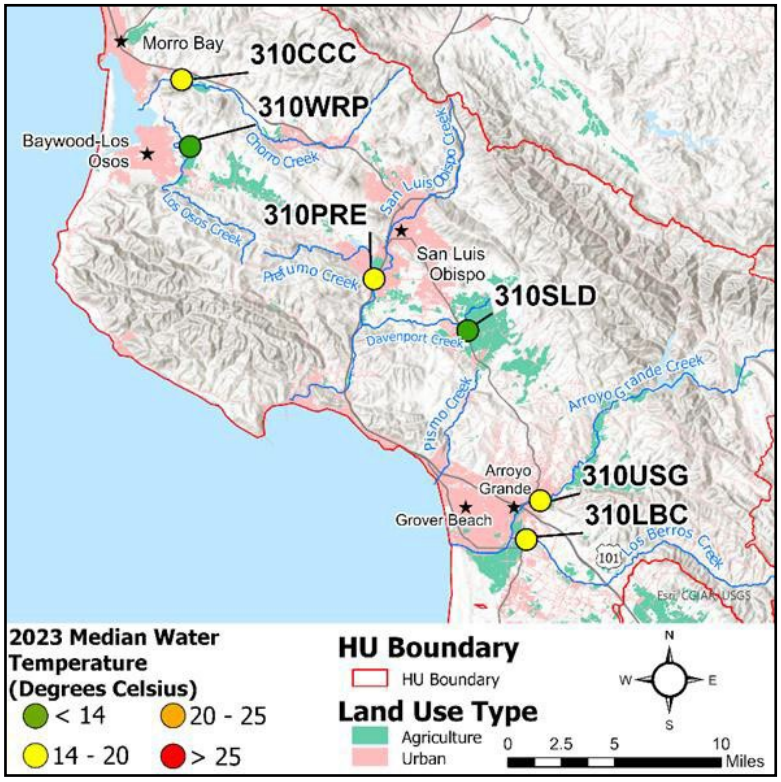


Figure 3-30. 2023 Median Water Temperature for Sites in HU 310

Temperature of natural receiving waters has not been defined for waterbodies within the Estero Bay HU; therefore, the focus of this report is descriptive statistics. In 2023, water temperatures peaked at all sites sampled during the month of August, with the exception of (310LBC) peaking in July, and minimum temperatures at most sites were recorded between January and March. **Figure 3-30** depicts annual median temperatures for sites in the Estero Bay HU for 2023, and **Table 3-56** presents descriptive statistics.

- Median water temperatures in the Estero Bay HU ranged from 13.0°C in Davenport Creek (310SLD) to 17.0°C in Los Berros Creek (310LBC).
- The lowest water temperature (7.5°C) occurred at Warden Creek (310WRP) and highest water temperature (18.5°C) was recorded at Prefumo Creek (310PRE).
- For the period of 2005-2023, no sites in the Estero Bay HU showed significant trends in water temperature.

Table 3-56. Descriptive Statistics for Water Temperature in Hydrologic Unit 310 (°C)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
310CCC	12	9.3	18.0	13.8	14.2	Increasing
310LBC	10	13.2	18.4	16.4	17.0	Increasing
310PRE	12	12.3	18.5	16.0	16.5	Increasing
310SLD	2	11.7	14.3	13.0	13.0	N/A[3]
310USG	12	10.2	18.2	14.5	14.8	Increasing
310WRP	12	7.5	17.6	13.2	13.6	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.

3.4.3 Turbidity and TSS Results

All sites in the Estero Bay HU have a cold water Beneficial Use, with a non-TMDL area turbidity limit of 25 NTU. See **Table 2-5** and **Appendix A** for a summary of applicable non-TMDL area limits for turbidity in the Estero Bay HU. Additionally, two sites [Chorro Creek (310CCC) and Warden Creek (310WRP)] have a TMDL limit for sediment that is associated with the Morro Bay Sediment TMDL; however, the sediment limits and units identified in Table C.3-6 of Agricultural Order are not applicable to the parameters monitored for the CMP and are not assessed in this annual report. **Figure 3-31** depicts annual median turbidity concentrations and TSS loading for sites in the Estero Bay HU for 2023, and **Table 3-57** and **Appendix B** present descriptive statistics and turbidity limit exceedances.

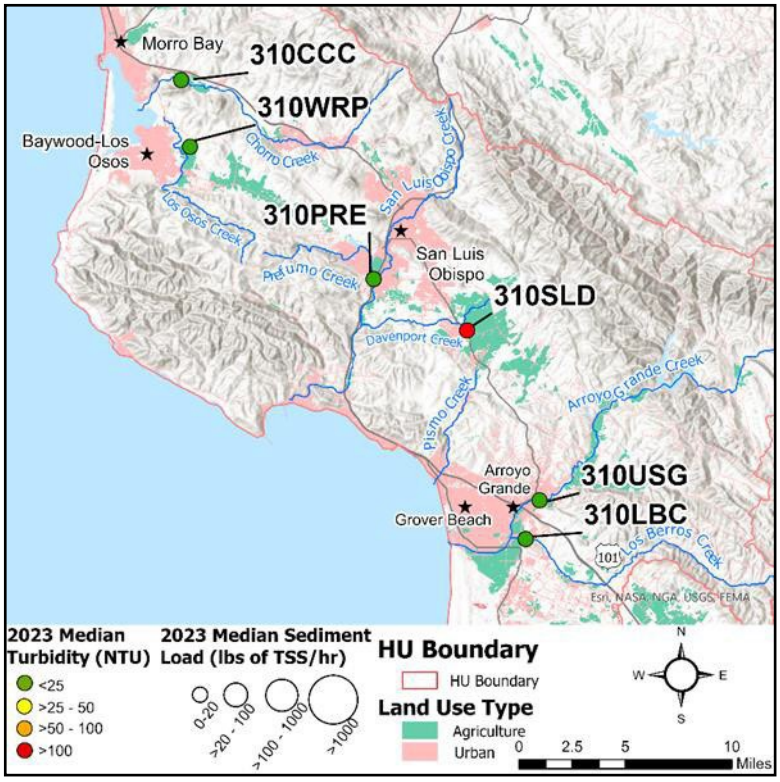


Figure 3-31. 2023 Median Turbidity and TSS Loading for Sites in HU 310

- Median turbidities ranged from 2 NTU in Los Berros Creek (310LBC) to 501 NTU in Davenport Creek (310SLD).
- All six sites in the El Estero HU have a non-TMDL turbidity limit of 25 NTU. All six sites exceeded the limit in at least 17% of samples in 2023. Davenport Creek (310SLD) exceeded the limit in 100% of samples, but this is likely due to only two samples being collected during the wet season.
- Low TSS loads throughout Estero Bay HU were due to low median flows and median TSS concentrations, apart from Davenport Creek (310SLD).
- For the period of 2005-2023, three sites (Chorro Creek [310CCC], Arroyo Grande Creek [310USG], and Warden Creek [310WRP]) showed statistically significant increasing trends in turbidity.
- For the period of 2012-2023, four sites showed statistically significant increasing trends for TSS loading (Chorro Creek [310CCC], Los Berros Creek [310LBC], and Prefumo Creek [310PRE], and Warden Creek [310WRP]). TSS was not monitored prior to 2012, so the period of record for TSS trend analysis is shorter than that for turbidity and flow.

Table 3-57. Descriptive Statistics for Turbidity in Hydrologic Unit 310 (NTU)

Site ID[1]	N[3]	Min	Max	Mean	Median	Non-TDML Area Limit Percent Exceedance[2]	Turbidity Trend[4,5]	TSS Loading Trend[4,5]
310CCC	12	0.89	999	128	4	25%	**Increasing**	**Increasing**
310LBC	10	0.55	576	69	2	20%	Increasing	**Increasing**
310PRE	12	5.45	266	36	10	17%	Increasing	**Increasing**
310SLD	2	206.00	796	501	501	100%	Increasing	Increasing
310USG	12	0.94	999	173	5	25%	**Increasing**	Increasing
310WRP	12	0.86	999	103	3	17%	**Increasing**	**Increasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 The relevant numeric criterion is 25.0 NTU [COLD].

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

5 Turbidity was monitored from 2005-2023 and TSS was monitored from 2012-2023.

3.4.4 Unionized and Total Ammonia

All sites within the Estero Bay HU have a non-TMDL area limit for unionized ammonia of 0.25 mg/L (**Appendix A**). See **Table 2-5** and **Appendix A** for a summary of applicable annual TMDL and non-TMDL area limits for unionized ammonia in the Estero Bay HU. **Figure 3-32** depicts annual median unionized ammonia concentrations for sites in the Estero Bay HU for 2023, **Table 3-58** presents descriptive statistics, and **Table 3-59** and **Appendix B** present non-TMDL area limit exceedances.

Samples were also collected and analyzed for total ammonia. There is currently no TMDL limit, non-TMDL area limit, or Basin Plan numeric Water Quality Objective for total ammonia applicable to CMP sites in the Estero Bay HU. Therefore, the focus of this report is descriptive statistics, which are presented in **Table 3-60**.

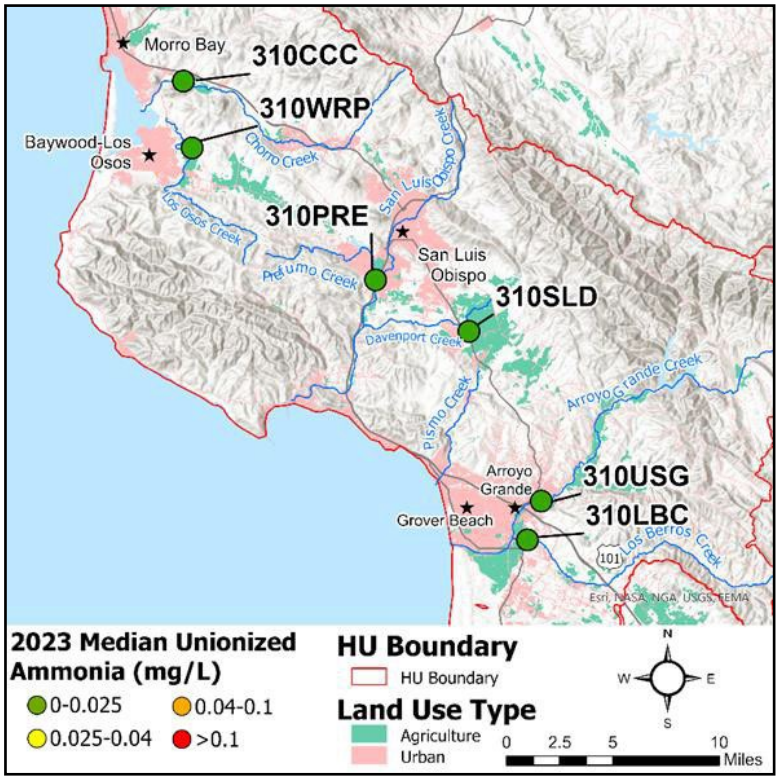


Figure 3-32. 2023 Median Unionized Ammonia for Sites in HU 310

- The lowest median concentration of unionized ammonia (0.0002 mg/L) was measured at Warden Creek (310WRP), and the highest concentration of unionized ammonia (0.008 mg/L) was measured at Arroyo Grande Creek (310USG).
- For the period of 2005-2023, four sites (Chorro Creek [310CCC], Los Berros Creek [310LBC], Prefumo Creek [310PRE], and Arroyo Grande Creek [310USG]) displayed a statistically significant decreasing trend in unionized ammonia concentrations.

Table 3-58. Descriptive Statistics for Unionized Ammonia in Hydrologic Unit 310 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
310CCC	12	0.0001	0.0017	0.0007	0.0006	**Decreasing**
310LBC	10	0.0002	0.0027	0.0010	0.0006	**Decreasing**
310PRE	12	0.0001	0.0028	0.0005	0.0003	**Decreasing**
310SLD	2	0.0004	0.0008	0.0006	0.0006	N/A[4]
310USG	12	0.0001	0.0092	0.0019	0.0008	**Decreasing**
310WRP	12	0.0000	0.0007	0.0003	0.0002	Decreasing

Notes:

1 Refer to Section 2.1, Table 2-1, Core Monitoring Locations, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. Bold trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.
4 No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.

- No exceedances of the non-TMDL area limit (0.025 mg/L) were observed in the Estero Bay HU in 2023. Unionized ammonia was less than 0.010 mg/L in all samples collected.

Table 3-59. Nutrient Limit Exceedances for Unionized Ammonia in Hydrologic Unit 310

Site ID[1]	Non-TMDL Area Limit Percent Exceedance[2]
310CCC	0%
310LBC	N/A
310PRE	N/A
310SLD	0%
310USG	0%
310WRP	N/A

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 The relevant numeric criterion is 0.025 mg/L.
N/A There is no applicable non-TMDL area limit criterion for unionized ammonia at this site.

- The spatial distribution and relative magnitudes of total ammonia concentrations were relatively similar to unionized ammonia concentrations, with the exception of 310SLD which had a median total ammonia concentration double of that observed at the other sites.
- For the period of 2005-2023, three sites showed statistically significant decreasing trends in total ammonia (Chorro Creek [310CCC], Los Berros Creek [310LBC], and Arroyo Grande Creek [310USG]), and one site (Warden Creek [310WRP]) showed a statistically significant increasing trend.

Table 3-60. Descriptive Statistics for Total Ammonia in Hydrologic Unit 310 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
310CCC	12	0.0035	0.0558	0.0247	0.0178	**Decreasing**
310LBC	10	0.0110	0.0890	0.0388	0.0309	**Decreasing**
310PRE	12	0.0070	0.2880	0.0643	0.0365	Decreasing
310SLD	2	0.0596	0.0980	0.0788	0.0788	N/A[4]
310USG	12	0.0035	0.1580	0.0456	0.0336	**Decreasing**
310WRP	12	0.0035	0.0840	0.0386	0.0361	**Increasing**

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.
4 No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.

3.4.5 Nitrate and Total Nitrogen

Samples were collected and analyzed for "nitrate + nitrite"; however, this report primarily refers to "nitrate" as nitrite levels are assumed to be very low. Three of six sites within the Estero Bay HU have a TMDL limit. All TMDL limits for nitrate are associated with the Los Berros Creek Nitrate TMDL; San Luis Obispo Creek Nitrate TMDL; or Los Osos Creek, Warden Creek, and Warden Lake Wetland Nutrient TMDL. The other three sites have a non-TMDL area limit for nitrate. See **Table 2-5** and **Appendix A** for a summary of applicable annual TMDL and non-TMDL area limits for nitrate in the Estero Bay HU. **Figure 3-33** depicts annual median nitrate concentrations and loading for sites in the Estero Bay HU for 2023, **Table 3-61** presents descriptive statistics, and **Table 3-62** and **Appendix B** present TMDL and non-TMDL area limit exceedances.

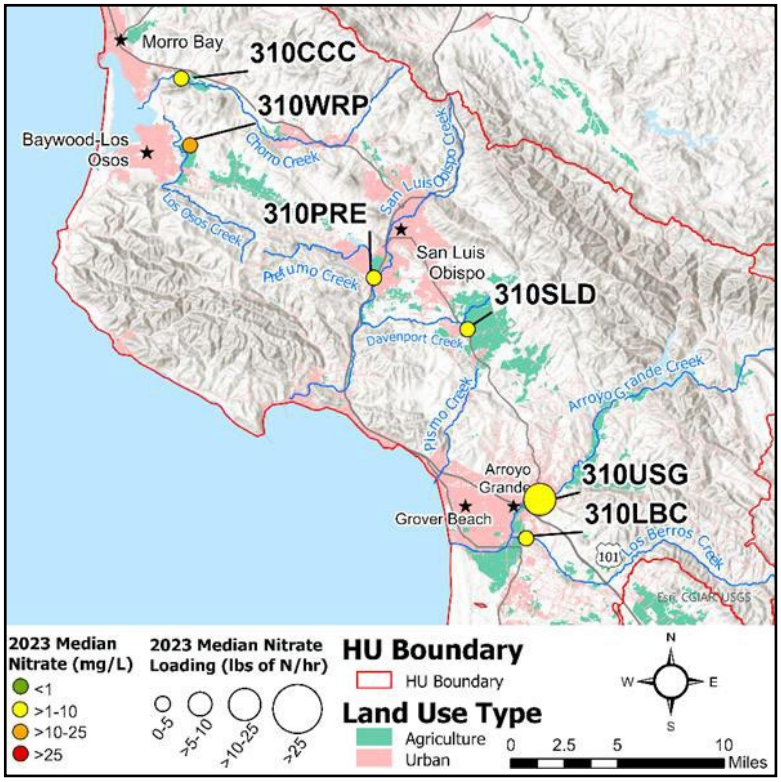


Figure 3-33. 2023 Median Nitrate as N for Sites in HU 310

Samples were also collected and analyzed for total nitrogen. There is currently no TMDL limit, non-TMDL area limit, or Basin Plan numeric Water Quality Objective for total nitrogen applicable to CMP sites in the Estero Bay HU. Therefore, the focus of this report is descriptive statistics, which are presented in **Table 3-63**.

- In 2023, the maximum nitrate concentration (32.00 mg/L) was recorded in Warden Creek (310WRP) in September.
- Low nitrate loads throughout the Estero Bay HU were driven by increased median flows and moderate nitrate concentrations (**Appendix B**).
- For the period of 2005-2023, three sites showed statistically significant decreasing trends in nitrate concentrations (Chorro Creek [310CCC], Los Berros Creek [310LBC], and Prefumo Creek [310PRE]).
- For the period of 2005-2023, five out of six sites showed a statistically significant decreasing trend in nitrate loading.

Table 3-61. Descriptive Statistics for Nitrate in Hydrologic Unit 310 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Nitrate Trend[2]	Nitrate Loading Trend[2]
310CCC	12	0.42	1.81	1.14	1.13	**Decreasing**	**Decreasing**
310LBC	10	1.45	13.70	8.35	8.43	**Decreasing**	**Decreasing**
310PRE	12	0.13	12.40	2.45	1.81	**Decreasing**	**Decreasing**
310SLD	2	1.34	7.66	4.50	4.50	N/A[4]	Increasing
310USG	12	0.47	7.68	5.07	5.80	Increasing	**Decreasing**
310WRP	12	0.88	32.00	17.07	21.70	Decreasing	**Decreasing**

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. Bold trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.
4 No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.

- Three of the six sites (Chorro Creek [310CCC], Davenport Creek at Broad Street [310SLD], and Arroyo Grande Creek [310USG]) met the 10 mg/L non-TMDL area limit for nitrate in all samples collected.
- 40% of samples at Los Berros Creek (310LBC), 8% of samples at Prefumo Creek at Calle Joaquin (310PRE), and 58% of samples in Warden Creek (310WRP) exceeded the applicable TMDL limits.

Table 3-62. Summary of TMDL and Non-TMDL Area Nutrient Limit Exceedances for Nitrate in Hydrologic Unit 310

Site ID[1]	Los Berros Creek Nitrate TMDL Percent Exceedance[2]	San Luis Obispo Nitrate TMDL Percent Exceedance[2]	Los Osos Creek, Warden Creek, and Warden Lake Wetland Nutrient TMDL Percent Exceedance[2]	Non-TMDL Area Limit Percent Exceedance[2]
310CCC	N/A	N/A	N/A	0%
310LBC	40%	N/A	N/A	N/A
310PRE	N/A	8%	N/A	N/A
310SLD	N/A	N/A	N/A	0%
310USG	N/A	N/A	N/A	0%
310WRP	N/A	N/A	58%	N/A

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations,* 2023, for detailed site descriptions.
2 The TMDL and Non-TMDL Areas numeric criterion is 10.0 mg/L.
N/A There is no applicable Nutrient TMDL or non-TMDL area limit criterion for nitrate at this site.

- Median total nitrogen concentrations ranged from 1.58 mg/L in Chorro Creek (310CCC) to 22.16 mg/L in Warden Creek (310WRP).
- For the period of 2005-2023, three sites showed statistically significant decreasing trends in total nitrogen (Chorro Creek [310CCC], Prefumo Creek [310PRE], and Warden Creek [310WRP]), while one site (Arroyo Grande Creek [310USG]) showed a statistically significant increasing trend in total nitrogen.

Table 3-63. Descriptive Statistics for Total Nitrogen in Hydrologic Unit 310 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
310CCC	12	1.08	2.63	1.69	1.58	**Decreasing**
310LBC	10	3.62	14.09	9.43	9.26	Decreasing
310PRE	12	0.99	12.77	3.69	2.18	**Decreasing**
310SLD	2	4.07	9.67	6.87	6.87	N/A[4]
310USG	12	4.12	8.29	6.06	6.15	**Increasing**
310WRP	12	2.49	32.00	17.90	22.16	**Decreasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. Bold trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.

3.4.6 Orthophosphate and Total Phosphorus

There is currently no TMDL limit, non-TMDL Area limit, or numeric Water Quality Objective for orthophosphate as P or total phosphorus in the Basin Plan applicable to CMP sites in the Estero Bay HU. **Figure 3-34** depicts annual median orthophosphate concentrations for sites in the Estero Bay HU for 2023. **Table 3-64** and **Table 3-65** present descriptive statistics for orthophosphate and total phosphorus, respectively.

- The highest median orthophosphate concentration for the Estero Bay HU in 2023 was in Los Berros Creek (310LBC) (0.621 mg/L).
- The orthophosphate concentrations in 2023 ranged from 0.053 mg/L at Creek Warden Creek (WRP) to 0.937 mg/L at Los Berros Creek (310LBC).
- For the period of 2005-2023, four of five sites with sufficient historical data (Chorro Creek [310CCC], Prefumo Creek [310PRE], Arroyo Grande Creek [310USG], and Warden Creek [310WRP]) showed statistically significant decreasing trends in orthophosphate concentrations.

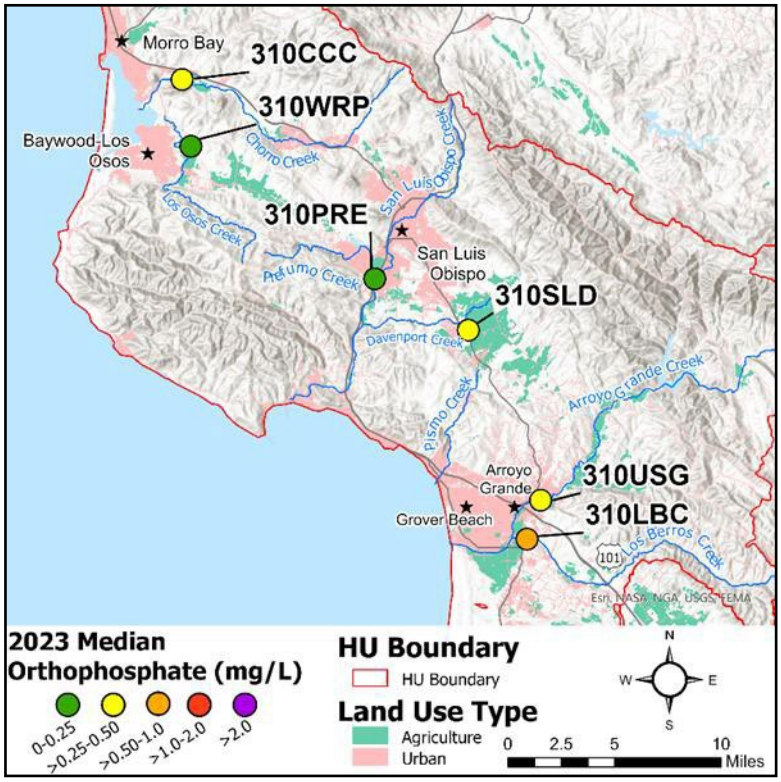


Figure 3-34. 2023 Median Orthophosphate as P for Sites in HU 310

Table 3-64. Descriptive Statistics for Orthophosphate as P in Hydrologic Unit 310 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
310CCC	12	0.168	0.400	0.310	0.332	**Decreasing**
310LBC	10	0.538	0.937	0.653	0.621	Increasing
310PRE	12	0.101	0.269	0.152	0.150	**Decreasing**
310SLD	2	0.249	0.477	0.363	0.363	N/A[4]
310USG	12	0.236	0.765	0.337	0.288	**Decreasing**
310WRP	12	0.053	0.218	0.143	0.150	**Decreasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.

- The spatial distribution and relative magnitudes of total phosphorus concentrations were similar to orthophosphate concentrations.
- Median total phosphorus concentrations ranged from 0.236 mg/L at Prefumo Creek (310PRE) to 0.820 mg/L at Davenport Creek (310SLD).
- The highest total phosphorus concentration at any Estero Bay site in 2023 was observed at Arroyo Grande Creek (310USG) (2.79 mg/L).
- For the period of 2005-2023, two sites showed statistically significant increasing trends in total phosphorus (Prefumo Creek [309PRE] and Arroyo Grande Creek [309USG]).

Table 3-65. Descriptive Statistics for Total Phosphorus in Hydrologic Unit 310 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
310CCC	12	0.201	1.670	0.624	0.477	Decreasing
310LBC	10	0.645	2.050	0.943	0.739	Increasing
310PRE	12	0.169	0.525	0.261	0.236	**Increasing**
310SLD	2	0.721	0.918	0.820	0.820	N/A[4]
310USG	12	0.298	2.790	0.725	0.375	**Increasing**
310WRP	12	0.079	0.850	0.288	0.254	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.

3.4.7 Specific Conductivity

A conductivity objective to protect agricultural uses applies to all Estero Bay HU sites except Warden Creek (310WRP). This agricultural objective does not define a numeric value to evaluate exceedance frequencies, but provides ranges:

- <750 µS/cm, "No Problem";
- 750-3,000 µS/cm, "Increasing Problems" and
- >3,000 µS/cm, "Severe".

Figure 3-35 depicts annual median 2023 conductivity for sites in the Estero Bay HU and **Table 3-66** presents descriptive statistics.

- In 2023, median conductivity concentrations ranged from 589 µS/cm at Davenport Creek (310SLD) to 1,548 µS/cm at Warden Creek (310WRP).
- The maximum conductivity was observed in Los Berros Creek (310LBC) (1,969 µS/cm).

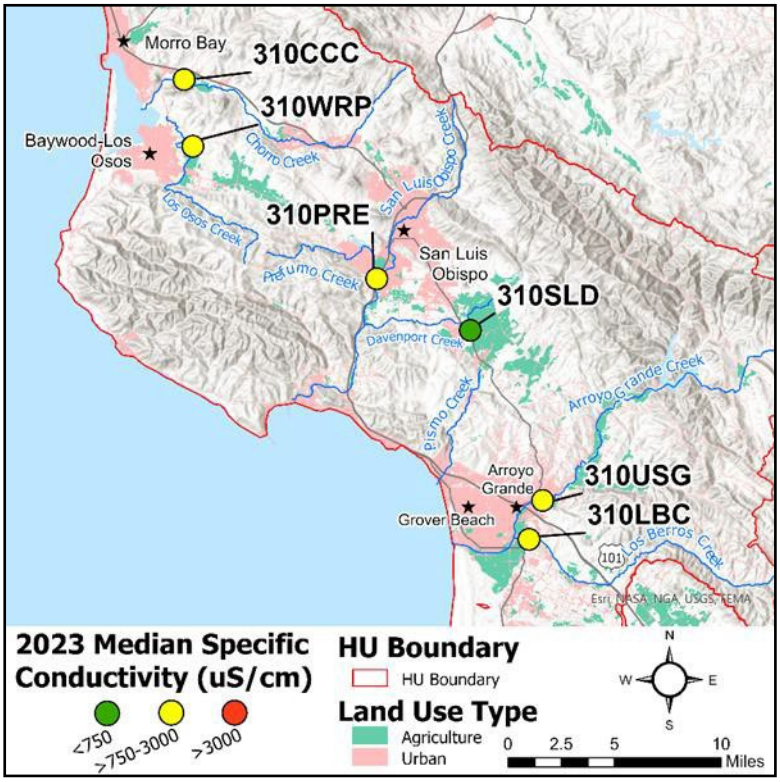


Figure 3-35. 2023 Median Conductivity for Sites in HU 310

- For the period of 2005-2023, onesite showed a statistically significant decreasing trend in conductivity (Chorro Creek [310CCC]). Arroyo Grande Creek [310USG]) showed a statistically significant increasing trend in conductivity.

Table 3-66. Descriptive Statistics for Conductivity in Hydrologic Unit 310 (µS/cm)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
310CCC	12	357	911	746	807	**Decreasing**
310LBC	10	667	1,969	1,395	1,500	Increasing
310PRE	12	230	1,083	818	991	N/A[4]
310SLD	2	476	702	589	589	Increasing
310USG	12	452	1,495	1,130	1,252	**Increasing**
310WRP	12	182	1,726	1,278	1,548	Decreasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.

3.4.8 Total Dissolved Solids and Salinity

The Basin Plan contains TDS Water Quality Objectives for two sites in the Estero Bay unit: Chorro Creek (310CCC) (500 mg/L) and Arroyo Grande Creek (310USG) (800 mg/L). The objectives are applied as an annual average. The Basin Plan contains no numeric Water Quality Objectives for the following analytes for CMP sites in the Estero Bay HU: salinity, alkalinity, calcium, magnesium, sodium, potassium, sulfate, and chloride. No trend analyses were performed on the latter six analytes due to limited historical data associated with them. **Figure 3-36** depicts annual median TDS concentrations for sites in the Estero Bay HU for 2023. **Table 3-67**, **Table 3-68, Table 3-69, Table 3-70, Table 3-71, Table 3-72, Table 3-73, Table 3-74,** and **Table 3-75** present descriptive statistics for TDS, salinity, alkalinity, calcium, magnesium, sodium, potassium, sulfate, and chloride, respectively.

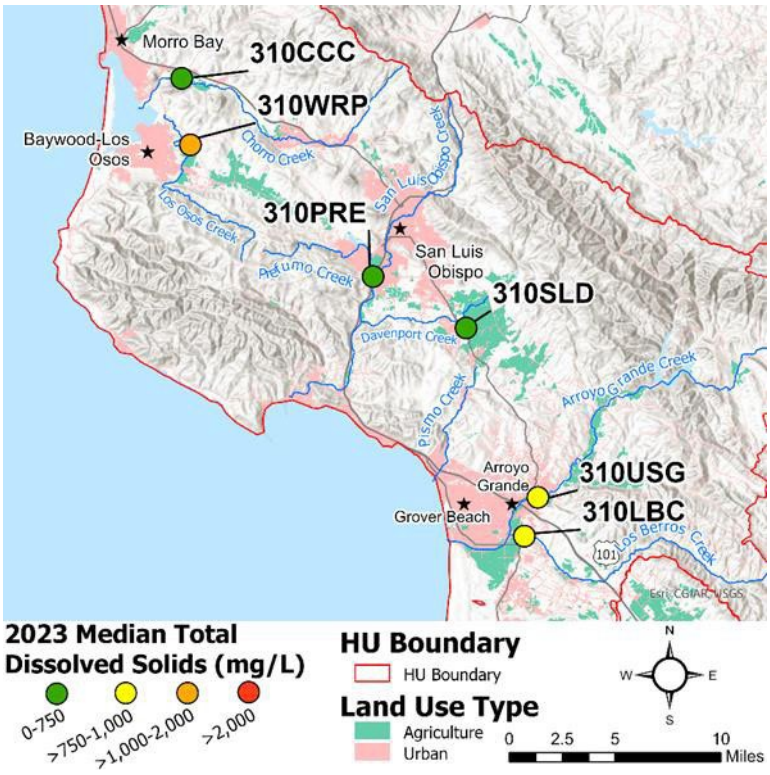


Figure 3-36. 2023 Median Total Dissolved Solids for Sites in HU 310

- In 2023, the mean concentration of TDS in Chorro Creek (310CCC) (525 mg/L) exceeded its Water Quality Objective of 500 mg/L and the mean concentration in Arroyo Grande Creek (310USG)(814 mg/L) exceeded its Water Quality Objective of 800 mg/L.
- For the period of 2005-2023, two sites showed statistically significant increasing trends in TDS concentrations (Prefumo Creek [310PRE] and Arroyo Grande Creek [310USG).

Table 3-67. Descriptive Statistics for Total Dissolved Solids in Hydrologic Unit 310 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	WQO Exceedance?	Trend[2]
310CCC	12	232	592	488	525	No	Increasing
310LBC	10	338	1,280	898	975	N/A	Decreasing
310PRE	12	147	704	528	644	N/A	**Increasing**
310SLD	2	242	456	349	349	N/A	N/A[4]
310USG	12	294	972	728	814	No	**Increasing**
310WRP	12	119	1,125	827	1,007	N/A	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.
N/A There is no applicable Water Quality Objective for this site.

- For the period of 2005-2023, one site (Arroyo Grande Creek [310USG]) displayed a statistically significant increasing trend in salinity and two sites (Chorro Creek [310CCC] and Prefumo Creek [310PRE]) displayed statistically significant decreasing trends in salinity.

Table 3-68. Descriptive Statistics for Salinity in Hydrologic Unit 310 (ppt)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
310CCC	12	0.170	0.450	0.367	0.400	**Decreasing**
310LBC	10	0.200	1.010	0.649	0.750	Decreasing
310PRE	12	0.110	0.540	0.405	0.490	**Decreasing**
310SLD	2	0.230	0.340	0.285	0.285	Increasing
310USG	12	0.220	0.760	0.567	0.625	**Increasing**
310WRP	12	0.090	0.880	0.646	0.785	Decreasing

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median alkalinity concentrations in the Estero Bay HU ranged from 149 mg/L in Davenport Creek (310SLD) to 457 mg/L in Warden Creek (310WRP).

Table 3-69. Descriptive Statistics for Alkalinity in Hydrologic Unit 310 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
310CCC	4	150	373	311	361
310LBC	3	91	233	168	179
310PRE	4	90	430	332	404
310SLD	1	149	149	149	149
310USG	4	132	381	288	319
310WRP	4	72	494	370	457

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Calcium concentrations ranged from 38 mg/L in Chorro Creek (310CCC) to 136 mg/L in Arroyo Grande Creek (310USG).

Table 3-70. Descriptive Statistics for Calcium in Hydrologic Unit 310 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
310CCC	4	23	40	35	38
310LBC	3	50	142	109	134
310PRE	4	15	72	53	63
310SLD	1	53	53	53	53
310USG	4	55	180	127	136
310WRP	4	18	108	78	93

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median magnesium concentrations ranged from 31 mg/L at Davenport Creek (310SLD) to 90 mg/L at Warden Creek (310WRP).

Table 3-71. Descriptive Statistics for Magnesium in Hydrologic Unit 310 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
310CCC	4	31	74	60	67
310LBC	3	27	72	55	65
310PRE	4	17	79	59	71
310SLD	1	31	31	31	31
310USG	4	25	78	54	56
310WRP	4	15	116	78	90

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- The lowest concentration of sodium (14 mg/L) was measured at Prefumo Creek (310PRE), and the highest concentration (85 mg/L) was measured at Warden Creek (310WRP).

Table 3-72. Descriptive Statistics for Sodium in Hydrologic Unit 310 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
310CCC	4	16	40	29	30
310LBC	3	64	80	71	70
310PRE	4	14	38	31	36
310SLD	1	58	58	58	58
310USG	4	27	57	43	44
310WRP	4	15	85	62	74

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Potassium concentrations were low in the Estero Bay HU, ranging from a minimum of 2.5 mg/L at all six sites sampled to a maximum of 7.2 mg/L at Los Berros Creek (310USG).

Table 3-73. Descriptive Statistics for Potassium in Hydrologic Unit 310 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
310CCC	4	2.5	2.5	2.5	2.5
310LBC	3	2.5	7.2	5.6	7.1
310PRE	4	2.5	2.5	2.5	2.5
310SLD	1	2.5	2.5	2.5	2.5
310USG	4	2.5	2.5	2.5	2.5
310WRP	4	2.5	2.5	2.5	2.5

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median sulfate concentrations ranged from 43 mg/L at Chorro Creek (310CCC) to 335 mg/L at Los Berros Creek (310LBC). Los Berros Creek (310LBC) also had the highest recorded concentration of sulfate (412 mg/L).

Table 3-74. Descriptive Statistics for Sulfate in Hydrologic Unit 310 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
310CCC	4	34	57	44	43
310LBC	3	103	412	283	335
310PRE	4	8	91	59	68
310SLD	1	123	123	123	123
310USG	4	75	363	254	290
310WRP	4	8	137	78	85

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- The lowest concentration of chloride (13 mg/L) was measured at Warden Creek (310WRP), and the highest concentration (166 mg/L) was measured at Los Berros Creek (310LBC).

Table 3-75. Descriptive Statistics for Chloride in Hydrologic Unit 310 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
310CCC	4	16	47	36	41
310LBC	3	97	166	140	157
310PRE	4	17	50	39	46
310SLD	1	40	40	40	40
310USG	4	23	65	47	50
310WRP	4	13	163	115	142

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.4.9 Dissolved Oxygen

The minimum dissolved oxygen Water Quality Objective for protection of cold water or spawning aquatic life Beneficial Uses (7 mg/L) applies to five Estero Bay HU sites. Warden Creek (310WRP) does not have specifically assigned Beneficial Uses in the Basin Plan, so the Basin Plan specifies the following general numeric objectives: 5 mg/L and 85% saturation. The 85% saturation objective is applied on a median basis. General Water Quality Objectives apply to all waterbodies unless a more protective Beneficial Use and Water Quality Objective are designated. **Figure 3-37** depicts annual median dissolved oxygen concentrations for sites in the Estero Bay HU for 2023, **Table 3-76** presents descriptive statistics for dissolved oxygen concentration, and **Table 3-77** presents descriptive statistics for oxygen saturation.

- In 2023, four sites (Chorro Creek [310CCC], Los Berros Creek [310LBC], Davenport Creek [310SLD], and Arroyo Grande Creek [310USG]) met the 7 mg/L minimum Water Quality

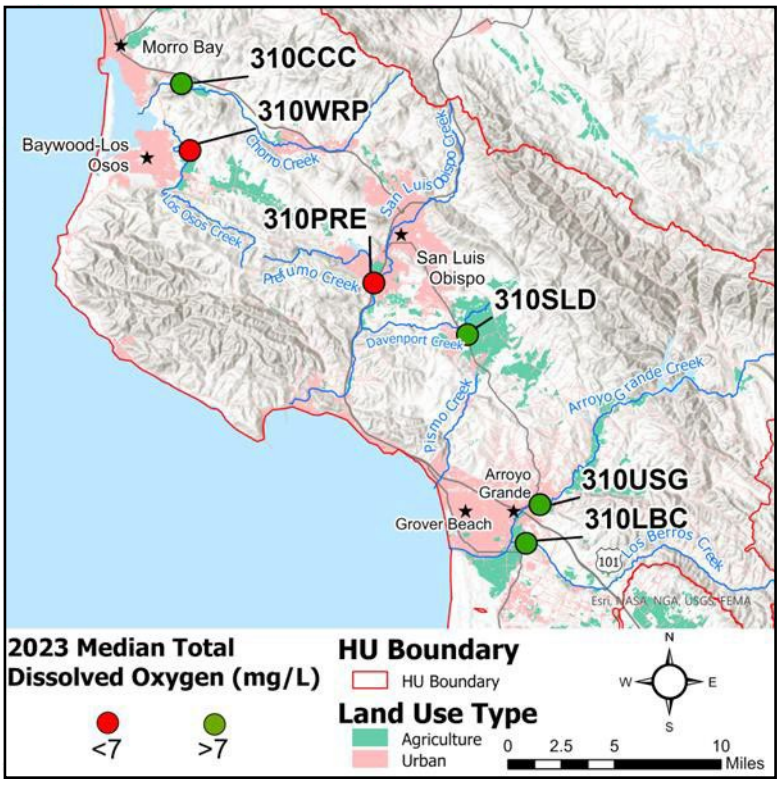


Figure 3-37. 2023 Median Dissolved Oxygen Concentrations for Sites in HU 310

Objective in all samples. Prefumo Creek (310PRE) failed to meet the 7 mg/L Water Quality Objective in 67% of samples.

- Warden Creek (310WRP) failed to meet the 5 mg/L minimum Water Quality Objective in 25% of samples.
- For the period of 2005-2023, two sites (Chorro Creek [310CCC] and Prefumo Creek [310PRE]) showed statistically significant decreasing trends in dissolved oxygen. Chorro Creek (310CCC) showed a decreasing trend in oxygen saturation, as well.. Davenport Creek (310SLD) presented an increasing trend in dissolved oxyen. Trends in DO must be interpreted with caution, as diel patterns in DO can be influenced by temperature and biological activity depending on the time of day at which sampling occurs, and changes in DO can manifest as either depressed or very high concentrations.

Table 3-76. Descriptive Statistics for Dissolved Oxygen in Hydrologic Unit 310 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Percent Exceedance	Trend[2]
310CCC	12	8.12	10.82	9.36	9.29	0%	**Decreasing**
310LBC	10	8.20	15.44	9.93	8.94	0%	Increasing
310PRE	12	5.08	9.62	6.76	6.38	67%	**Decreasing**
310SLD	2	7.91	8.54	8.23	8.23	0%	**Increasing**
310USG	12	9.16	12.78	10.80	10.80	0%	Increasing
310WRP	12	3.40	7.79	5.57	5.17	25%[4]	Decreasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 WQO is >5 mg/L; all other sites have a WQO of >7 mg/L.

- Samples collected from Warden Creek (310WRP) exceeded the 85% saturation Water Quality Objective on a median basis.
- Median dissolved oxygen saturation concentration values ranged from 53% mg/L Warden Creek (310WRP) to 104% mg/L in Arroyo Grande Creek (310USG).

Table 3-77. Descriptive Statistics for Oxygen Saturation in Hydrologic Unit 310 (%)

Site ID[1]	N[3]	Min	Max	Mean	Median	WQO Exceedance? [4]	Trend[2]
310CCC	12	82.8	97.6	90.2	88.5	N/A	**Decreasing**
310LBC	10	82.2	149.9	101.5	93.1	N/A	Increasing
310PRE	12	53.7	92.8	68.2	63.8	N/A	Decreasing
310SLD	2	77.3	79.3	78.3	78.3	N/A	Increasing
310USG	12	84.7	122.8	106.5	104.2	N/A	Increasing
310WRP	12	33.3	73.5	52.8	52.7	Yes	Decreasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 Water quality objective is >85%.

N/A There is no applicable Water Quality Objective for this site.

3.4.10 pH

The Water Quality Objective for all Estero Bay HU sites is 7-8.3 pH standard units. For sites with MUN or REC1/REC2 and WARM/COLD Beneficial Uses, the acceptable pH range is 7-8.3 standard pH units. For sites that are not included in Table 2-1 of the Basin Plan, the acceptable pH range is also 7-8.3 standard pH units, which includes the Basin Plan general and REC1/REC2 Water Quality Objectives. **Figure 3-38** depicts annual median pH for sites in the Estero Bay HU for 2023 and **Table 3-78** presents descriptive statistics.

- In 2023, Arroyo Grande Creek (310USG) exceeded the 7-8.3 standard pH unit Water Quality Objective in 25% of samples and Chorro Creek (310CCC) exceeded the Water Quality Objective in 8% of samples. All exceedances pertained to the 8.3 standard pH units Water Quality Objective.
- For the period of 2005-2023, one site (Prefumo Creek [310PRE]) showed a statistically significant increasing trend in pH and one site (Chorro Creek [310CCC]) showed a statistically significant decreasing trend in pH.

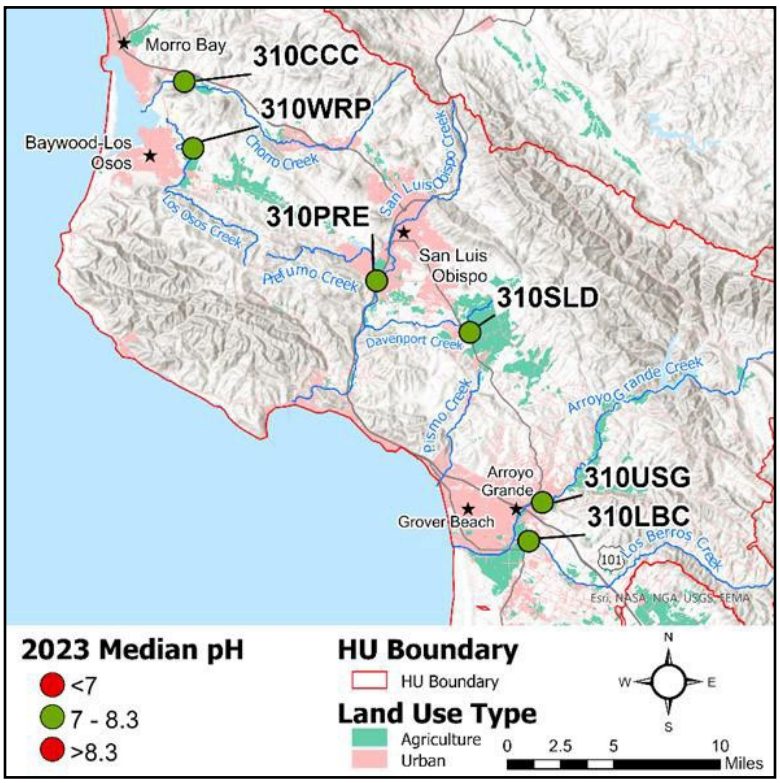


Figure 3-38. 2023 Median pH for Sites in HU 310

Table 3-78. Descriptive Statistics for pH in Hydrologic Unit 310 (pH units)

Site ID[1]	N[3]	Min	Max	Mean	Median	Percent Exceedance[2]	Trend[4]
310CCC	12	7.73	8.45	8.12	8.14	8%	**Decreasing**
310LBC	10	7.43	8.13	7.87	7.84	0%	Increasing
310PRE	12	7.13	7.67	7.44	7.45	0%	**Increasing**
310SLD	2	7.53	7.55	7.54	7.54	0%	Increasing
310USG	12	7.76	8.40	8.17	8.19	25%	Decreasing
310WRP	12	7.05	7.66	7.51	7.59	0%	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Water quality objective is 7-8.3.

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3.4.11 Aquatic Toxicity Results

The potential for toxic effects to aquatic and sediment-dwelling organisms is assessed by the CMP via bioassays for sensitive algal species (*S. capricornutum* growth) in water, and for sensitive invertebrate species in water (*C. dubia* reproduction and *C. dubia and C. dilutus* survival) and sediment (*H. azteca* growth and survival). Test organism survival and reproduction or growth is measured in environmental samples as well as in non-toxic control samples. A statistical test is then applied to determine significant differences in organism performance between environmental and control samples. When test organism performance is significantly lower in the environmental sample than in the control, *and* the difference exceeds a 20% effect threshold, a sample is determined to be "toxic" and in exceedance of the narrative Basin Plan objective for "no toxic substances in toxic amounts." All sites in the Estero Bay HU have a significant toxic effect non-TMDL area limit for survival, growth, and reproduction in water and sediment. *H. azteca* reproduction in sediment is not tested for by the CMP so is not included in the non-TMDL area limit exceedance discussion as follows. See **Table 2-5** and **Appendix A** for a summary of applicable toxic effect non-TMDL area limits in the Estero Bay HU. Results from aquatic and sediment bioassays conducted on samples from the Estero Bay HU in 2023 are illustrated in Figure 3-39a-d and tabulated in **Table 3-79**.

- In 2023, no significant toxicity to algal growth (i.e., reduced growth in sample water relative to a non-toxic control) in water was observed in the Estero Bay HU (**Figure 3-39 a**).
- There was no significant mortality to *C. dilutus* in water in the Estero Bay HU (**Figure 3-39 b**).
- Significant mortality to *C. dubia* in water was observed in one of three bioassays from samples collected at Los Berros Creek (310LBC) (**Figure 3-39 d**). Of the six sites sampled, all but one site (Los Berros Creek [31LBC]) achieved the significant toxic effect non-TMDL area limit for *C. dubia* survival in water (**Figure 3-39 d**).
- Toxicity to invertebrate reproduction in water was observed in all but one site (Davenport Creek [310SLD]) in the Estero Bay HU. (**Figure 3-39 c**). Five sites out of six exceeded the significant toxic effect non-TMDL area limit for reproduction in water by at least 25% (**Figure 3-39 c**).
- In 2023, significant toxicity to invertebrate growth in sediment was observed in one site (Los Berros Creek [310LBC]) within the Estero Bay HU (**Figure 3-39 e**). Four of the five sites sampled achieved the significant toxic effect non-TMDL area limit for growth in sediment (**Figure 3-39 e**).
- In 2023, no significant toxicity to invertebrate survival in sediment was observed within the Estero Bay HU All five sites that were sampled also achieved the significant toxic effect non-TMDL area limit for survival in sediment (**Figure 3-39 f**).
- For the period of 2005-2023, the following statistically significant trends were observed:
    - Two sites showed statistically significant increasing trends (improving, reduced toxicity) in invertebrate survival in water (Chorro Creek [310CCC] and Warden Creek [310WRP]).

Detailed trend analysis results, including trend directions and statistical significance, can be found in **Appendix E**. A summary of these results is presented in **Table 3-79**.

Table 3-79. Summary of Toxicity and Trends in Hydrologic Unit 310

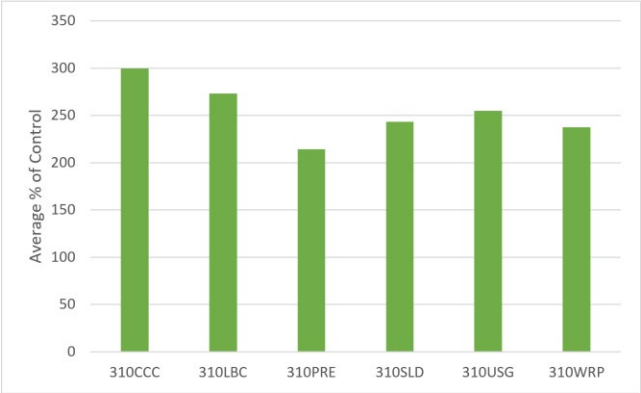
Site ID[1]	Algal Growth		*C. dilutus* - Survival		*C. dubia* - Reproduction		*C. dubia* - Survival		*H. azteca* - Growth		*H. azteca* - Survival	
	# of Toxic Samples[3]	Trend[1]	# of Toxic Samples[3]	Trend[1]	# of Toxic Samples[3]	Trend[1]	# of Toxic Samples[3]	Trend[1]	# of Toxic Samples[3]	Trend[1]	# of Toxic Samples[3]	Trend[1]
310CCC	0/4	Increasing	0/4	Increasing	2/4	Decreasing	0/4	**Increasing**	0/1	Decreasing	0/1	Increasing
310LBC	0/3	Increasing	0/3	Increasing	2/3	Increasing	1/3	Increasing	1/1	Decreasing	0/1	Decreasing
310PRE	0/4	Increasing	0/4	Increasing	2/4	Increasing	0/4	Increasing	0/1	Decreasing	0/1	Decreasing
310SLD	0/1	N/A[2]	0/1	N/A[2]	0/1	N/A[2]	0/1	N/A[2]	0/0	N/A[2]	0/0	N/A[2]
310USG	0/4	Decreasing	0/4	Increasing	1/4	Increasing	0/4	Increasing	0/1	Decreasing	0/1	Increasing
310WRP	0/4	Increasing	0/4	Decreasing	3/4	Decreasing	0/4	**Increasing**	1/1	Decreasing	0/1	Increasing

Notes:

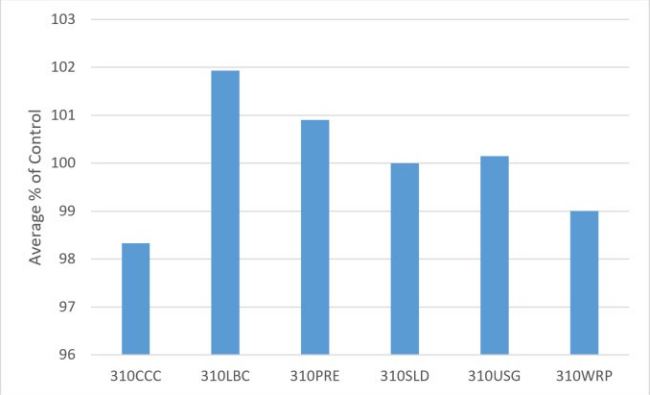
1 Refer to Section 2.1, Table 2-1, Core Monitoring Locations, 2023, for detailed site descriptions.

2 None = No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.

3 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

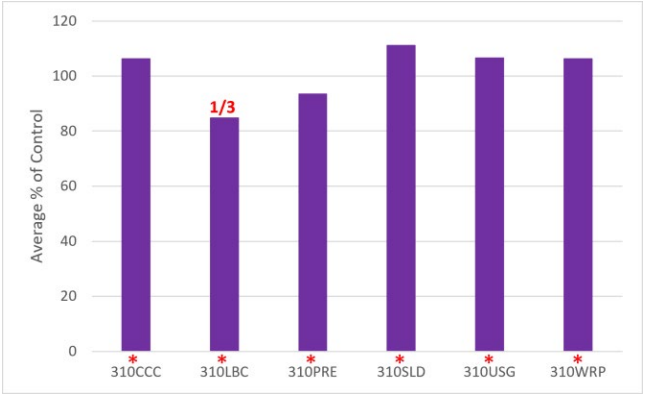


a) Algal Toxicity in Water – Growth

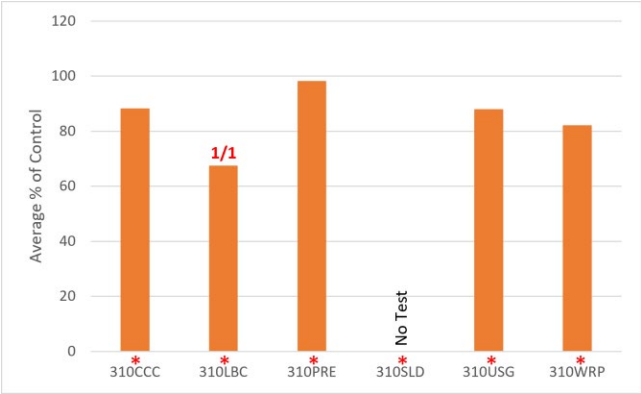


b) *C. dilutus* Toxicity in Water – Survival

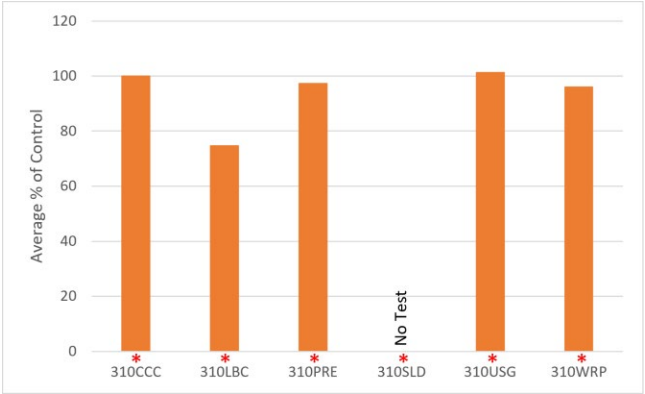
c) Invertebrate Toxicity in Water – Reproduction



d) Invertebrate Toxicity in Water – Survival



e) Invertebrate Toxicity in Sediment – Growth



f) Invertebrate Toxicity in Sediment – Survival

Figure 3-39. Results for Aquatic Toxicity (water and sediment) Monitoring in the Estero Bay HU

Notes:

1. Bars represent the mean survival, reproduction, or growth rate for all 2023 samples at each site, as compared to laboratory controls.
2. There are generally four water toxicity sampling events for algae and invertebrates and two sediment toxicity events scheduled for each site, each year.
3. "No Test" indicates sites where no toxicity samples were collected due to dry channel or ponded conditions.
4. Results >100% indicate organism performance rates in the environmental sample were greater than in the control.
5. If site experienced "significant toxicity" red fractions indicate the number of significantly toxic samples relative to the total number of toxicity samples collected (e.g., 1/2 indicates the site had two samples collected, one of which was significantly toxic.)
6. *C. dubia* reproduction graphs generally reflect *C. dubia* tests but in some cases reflect a salinity-tolerant alternate test species, which in some cases test for "growth" instead of "reproduction" as the sub-lethal endpoint.

* Site with an applicable non-TMDL area limit for a given test species and endpoint.

3.5 SANTA MARIA HYDROLOGIC UNIT (HU 312)

Descriptions of the Santa Maria HU are summarized from the CCRWQCB's *Santa Maria River Hydrologic Unit Assessment Report* (CCRWQCB 2007). The Santa Maria HU (HU 312) includes all areas tributary to the Cuyama River, Sisquoc River, and Santa Maria River. At 1,880 square miles (1.2 million acres), the Santa Maria River watershed is one of the larger coastal drainage basins in California. The Cuyama River and Sisquoc River originate in wilderness areas of the Los Padres National Forest. The Santa Maria River is formed by the confluence of the Cuyama and Sisquoc approximately seven miles southeast of Santa Maria. The Twitchell reservoir (completed in 1958) is located on the Cuyama River six miles above the confluence with the Sisquoc River. The Santa Maria valley is a broad, flat valley protected from flooding by levees and a series of flood control channels and basins. The river is the major source of recharge to the Santa Maria Groundwater Basin. The majority of storm water runoff infiltrates as storms generally do not produce continuous flows along major segments of the Santa Maria River.

Nipomo Creek drains the Nipomo Valley and joins the Santa Maria River just west of U.S. Highway 101. Orcutt-Solomon Creek drains the Orcutt area and joins the Santa Maria River near its outlet to the Pacific Ocean. Oso Flaco Lake and its drainage are within HU 312, but they are not part of the Santa Maria Watershed. Oso Flaco Lake is north of the Santa Maria Estuary. The outlet from Oso Flaco Lake flows directly to the ocean and is not tributary to the mainstem of the Santa Maria River.

Major land use activities in the Santa Maria Watershed include irrigated and dryland agriculture, oil production, and urban development. Nearly 90% of the contributing watershed is undeveloped land, but the Santa Maria Valley is where most of the monitoring sites are located, and its land uses are predominantly agricultural and urban. Twitchell Reservoir, which is located within the northern portion of the watershed, supports important flood control and groundwater recharge functions. Sedimentation of the reservoir is reducing its water storage capacity; however, little agricultural or urban development currently exists within the drainage area contributing to Twitchell Reservoir.

Monitoring for the CMP was initiated in the Santa Maria area in January of 2005. There are 10 core CMP sites in the Santa Maria HU. Most of these sites are located west of Santa Maria: in Oso Flaco and Little Oso Flaco Creeks (312OFC and 312OFN), the mainstem Santa Maria River (312SMA and 312SMI), its major tributary Orcutt-Solomon Creek (312ORC and 312ORI), and sub-tributary Green Valley (312GVS). Three other sites are tributaries of the mainstem of the Santa Maria River. These include Bradley Channel (312BCJ) and Bradley Canyon Creek (312BCC), which are located east of the City of Santa Maria and south of the Santa Maria River, and Main Street Canal (312MSD), which is located west of the City of Santa Maria and south of the Santa Maria River (**Figure 3-40**).

The Beneficial Uses designated by the Basin Plan for waterbodies monitored by the CMP in the Santa Maria Region include nearly every Beneficial Use, with the exceptions being industrial process supply, shellfish harvesting, and spawning, reproduction, and/or early development (**Table 2-2**).

Applicable TMDLs for sites within the Santa Maria HU include the Santa Maria River Watershed Nutrients TMDL and Santa Maria River Watershed Toxicity and Pesticide TMDL. Non-TMDL area limits for sites within the Santa Maria HU include non-TMDL area turbidity limits, and non-TMDL area toxicity limits. See **Appendix A** for a summary of applicable routine parameter TMDL limits and non-TMDL area limits for sites in the Santa Maria HU.

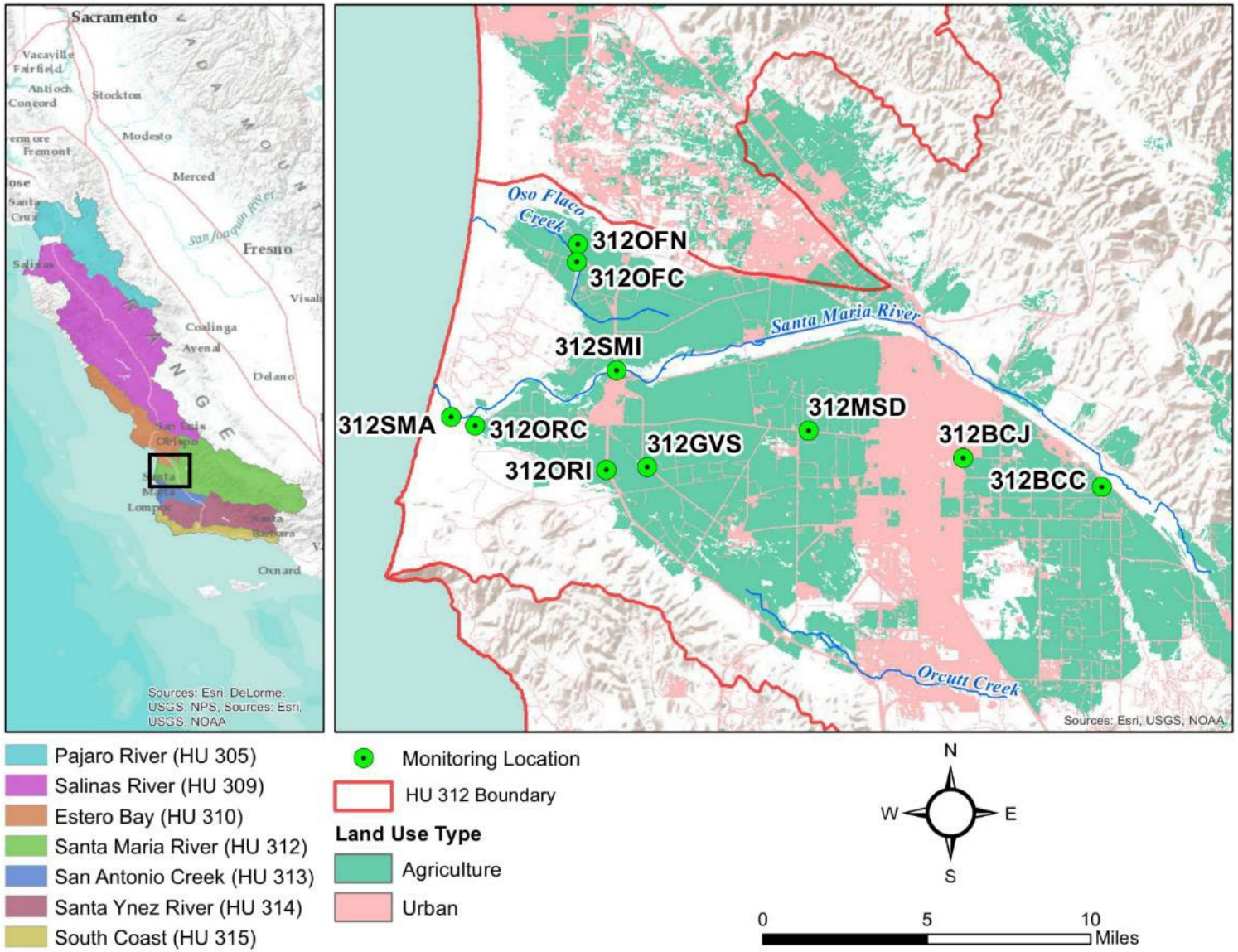


Figure 3-40. CMP Core Monitoring Sites and Distribution of Major Land Uses in the Santa Maria Hydrologic Unit

3.5.1 Flow Results

The flow regime in the Santa Maria HU is characterized by seasonal precipitation that occurs primarily from November through April. During the 2023 monitoring year, the annual average flow (472.88 CFS) at the *Sisquoc River near Garey* USGS gaging station was considerably higher than the historic annual average (47.89 CFS, 1942-2022) and ranged from 0 CFS for most of the Fall to 6294.2 CFS (January 10, 2023) (USGS 2023)[1]. The 2023 cumulative annual rainfall (19.31") at the *Nipomo* rain gauge was higher than the historic average (10.98", 2006-2022) (**Figure 3-41**) (CDWR 2023). Above average flow and rain were likely caused by several, relatively large atmospheric rivers early in the year.

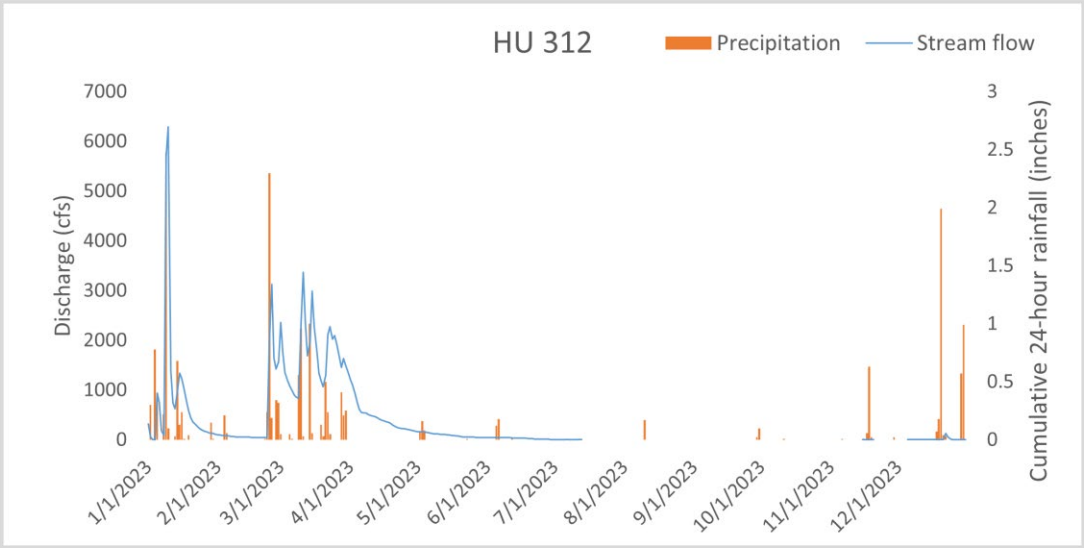


Figure 3-41. 2023 Hydrograph and Total Daily Precipitation Record for Sisquoc River near Garey

[1] USGS data contains provisional values, subject to revision; flow values may have been updated since the publishing of this report.

In 2023, flows measured at the 10 Santa Maria HU monitoring sites were elevated January through March, with lower flows and/or dry channel conditions the rest of the year. **Figure 3-42** depicts annual median flows for sites within the Santa Maria HU during 2023 and **Table 3-80** presents descriptive statistics.

- Measured flows in 2023 ranged from negative flow at two sites, likely due to low flow or stagnant conditions, (Bradley Channel at Jones Street [312BCJ] and Santa Maria River at Estuary [312SMA]) to 12,806 CFS at Santa Maria River at Highway 1 likely due to tidal influence (312SMI).
- Median flows ranged from no flow (four sites) to 4.18 CFS at Santa Maria River at Estuary (312SMA).
- For the period of 2005-2023, all 10 sites showed statistically significant decreasing trends in flow.

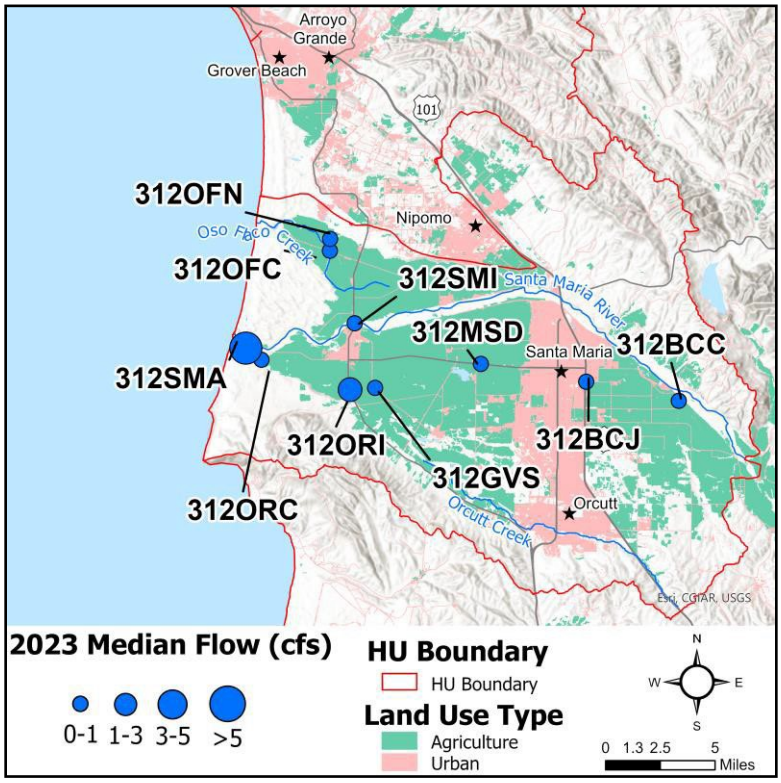


Figure 3-42. 2023 Median Flows for Sites in HU 312

Table 3-80. Descriptive Statistics for Flow in Hydrologic Unit 312 (CFS)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
312BCC	12	0.00	17.04	1.50	0.00	**Decreasing**
312BCJ	12	-0.04	4.17	0.74	0.21	**Decreasing**
312GVS	12	0.00	18.30	2.36	0.00	**Decreasing**
312MSD	12	0.00	41.65	5.69	0.00	**Decreasing**
312OFC	12	0.05	6.63	1.20	0.60	**Decreasing**
312OFN	12	0.31	6.58	1.28	0.67	**Decreasing**
312ORC	10	0.09	58.56	8.34	0.87	**Decreasing**
312ORI	12	0.19	189.54	35.22	1.30	**Decreasing**
312SMA	10	-1.95	130.21	22.09	4.18	**Decreasing**
312SMI	12	0.00	12,806.01	1,119.20	0.00	**Decreasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.5.2 Water Temperature

The Basin Plan contains a general Water Quality Objective for temperature: natural receiving water temperature of intrastate waters shall not be altered. The Basin Plan also has specific objectives for cold and warm water habitats: At no time or place shall the temperature be increased by more than 5°F above natural receiving water temperature. Water temperature can influence the results of other field measurements including dissolved oxygen, pH, and conductivity and therefore is an important factor to consider when interpreting results. The temperature of certain water bodies can also fluctuate greatly over a 24-hour period. This fluctuation means that results and trends should be interpreted with discretion as they can be affected by the time of day at which the sample is collected.

Temperature of natural receiving waters has not been defined for waterbodies within the Santa Maria HU; therefore, the focus of this report is descriptive statistics. In 2023, water temperatures peaked variably from July through August in the Santa Maria HU and minimum temperatures at all sites were recorded between January and March.

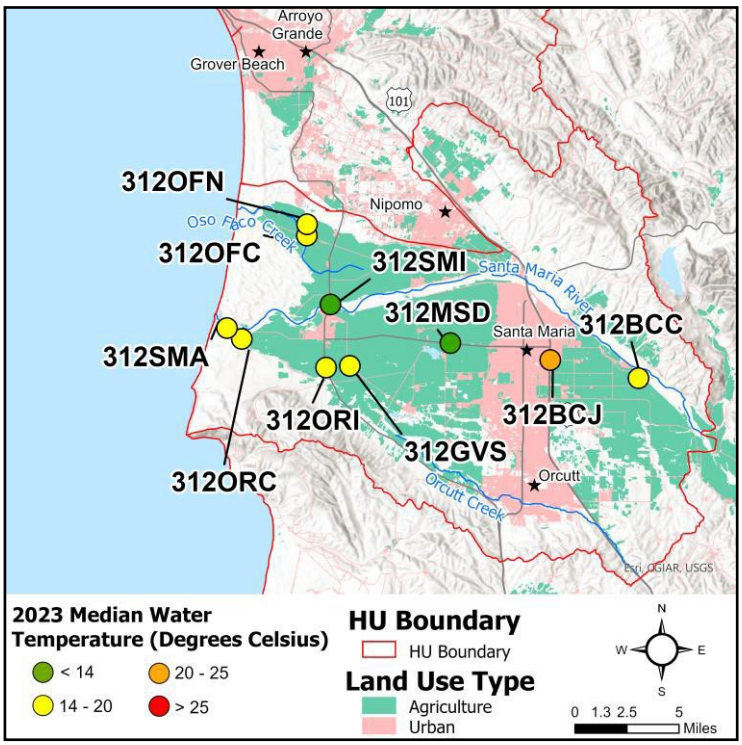


Figure 3-43. 2023 Median Water Temperature for Sites in HU 312

Figure 3-43 depicts annual median temperatures for sites in the Santa Maria HU for 2023, and **Table 3-81** presents descriptive statistics.

- In 2023, median water temperatures in the Santa Maria HU ranged from 13.3°C at Main St. Canal u/s from Ray Road at Highway 166 (312MSD) to 20.4°C at Bradley Channel (312BCJ).
- The lowest water temperature (7.1°C) was observed at Orcutt Solomon Creek u/s of Santa Maria River (312ORC) and the highest water temperature (35.1°C) was observed at Bradley Channel (312BCJ).
- For the period of 2005-2023, no sites showed statistically significant trends in water temperature.

Table 3-81. Descriptive Statistics for Water Temperature in Hydrologic Unit 312 (°C)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
312BCC	2	16.0	16.2	16.1	16.1	None[4]
312BCJ	12	13.5	35.1	21.1	20.4	Increasing
312GVS	3	8.7	19.6	14.6	15.5	None[4]
312MSD	9	9.3	22.7	15.3	13.3	Increasing
312OFC	12	8.2	25.6	16.8	15.6	Increasing
312OFN	12	10.8	21.8	16.3	15.9	Increasing
312ORC	10	7.1	19.4	14.2	16.3	Increasing
312ORI	12	9.2	24.8	15.6	15.7	Increasing
312SMA	9	7.9	23.7	15.8	17.1	Increasing
312SMI	3	9.4	21.5	14.8	13.6	None[4]

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant (α =0.05).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.

3.5.3 Turbidity and TSS Results

All sites within the Santa Maria HU have a non-TMDL turbidity limit. One site in the Santa Maria HU (Oso Flaco Creek [312OFC]) has a warm water Beneficial Use, so has a turbidity limit of 40 NTU. All other sites in the HU have a cold water Beneficial Use, with a turbidity limit of 25 NTU. See **Table 2-5** and **Appendix A** for a summary of applicable non- TMDL area limits for turbidity in the Santa Maria HU. **Figure 3-44** depicts annual median turbidity concentrations and TSS loading for sites in the Santa Maria HU for 2023. **Table 3-82** and **Appendix B** present descriptive statistics and turbidity limit exceedances.

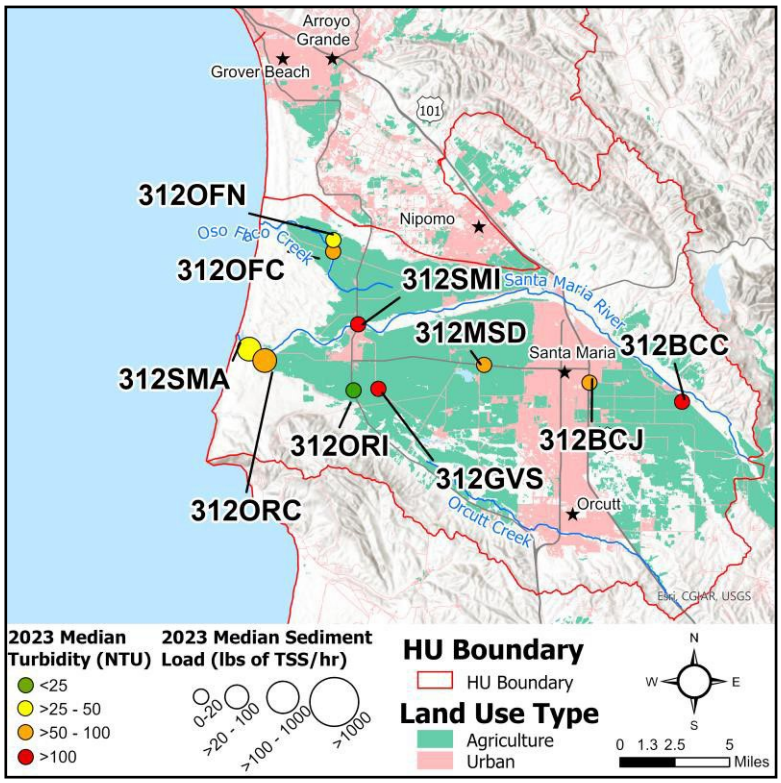


Figure 3-44. 2023 Median Turbidity and TSS Loading for Sites in HU 312

- Median turbidities ranged from 20 NTU (Orcutt Solomon Creek at Highway 1 [312ORI]) to 999 NTU (Bradley Canyon Creek [312BCC], Green Valley Creek [312GVS], and Santa Maria River at Highway 1 [312SMI]) in 2023. The three sites with median turbidities greater than 500 NTU could only be sampled when flow was present after large storm events and were otherwise dry.
- All 10 sites exceeded the non-TMDL area limit for turbidity in at least 42% of samples. All samples collected Bradley Canyon Creek (312BCC) and Santa Maria River at Highway 1 (312SMI) in 2023 exceeded the non-TMDL area limit. This is likely a result of these two locations only having flow to sample during large rain events.
- Low to moderate TSS loads in the Santa Maria HU were due to low median flows and moderate TSS concentrations (**Appendix B**).
- For the period of 2005-2023, three sites showed statistically significant decreasing trends in turbidity concentrations (Bradley Channel [312BCJ], Solomon Creek [312ORC], and Santa Maria River at Estuary [312SMA]).
- For the period of 2012-2023, three sites showed statistically significant decreasing trends in TSS loading and five sites showed statistically significant increasing trends in TSS loading. TSS was not monitored prior to 2012, so the period of record for TSS trend analysis is shorter than that for turbidity and flow.

Table 3-82. Descriptive Statistics for Turbidity in Hydrologic Unit 312 (NTU)

Site ID[1]	N[3]	Min	Max	Mean	Median	Non-TDML Area Limit Percent Exceedance	Turbidity Trend[2,4]	TSS Loading Trend[2,4]
312BCC	2	999.0	999.0	999.0	999.0	100%[5]	Increasing	**Increasing**
312BCJ	12	9.8	999.0	242.9	56.6	92%[5]	**Decreasing**	**Increasing**
312GVS	3	16.5	999.0	671.5	999.0	67%[5]	Increasing	**Decreasing**
312MSD	9	2.9	708.0	177.1	75.9	67%[5]	Increasing	Decreasing
312OFC	12	16.5	999.0	227.0	94.3	75%[6]	Decreasing	**Increasing**
312OFN	12	5.7	674.0	97.0	31.8	58%[5]	Decreasing	**Increasing**
312ORC	10	6.5	999.0	259.3	64.1	70%[5]	**Decreasing**	**Decreasing**
312ORI	12	5.4	999.0	282.0	19.9	42%[5]	Increasing	Increasing
312SMA	9	12.1	999.0	189.7	40.1	78%[5]	**Decreasing**	**Decreasing**
312SMI	3	252.0	999.0	750.0	999.0	100%[5]	Increasing	**Increasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 Turbidity was monitored from 2005-2023 and TSS was monitored from 2012-2023.

5 The relevant numeric criterion is 25.0 NTU [COLD].

6 The relevant numeric criterion is 40.0 NTU [WARM].

3.5.4 Unionized and Total Ammonia

All sites within the Santa Maria HU have a TMDL limit for unionized ammonia. All TMDL limits for unionized ammonia are associated with the Santa Maria River Watershed Nutrients TMDL. See **Table 2-5** and **Appendix A** for a summary of applicable annual TMDL limits for nitrate in the Santa Maria HU. **Figure 3-45** depicts annual median unionized ammonia concentrations for sites in the Santa Maria HU for 2023, **Table 3-83** presents descriptive statistics, and **Table 3-84** and **Appendix B** present TMDL and non-TMDL area limit exceedances for unionized ammonia.

Samples were also collected and analyzed for total ammonia. There is currently no TMDL limit, non-TMDL area limit, or Basin Plan numeric Water Quality Objective for total ammonia applicable to CMP sites in the Santa Maria HU. Therefore, the focus of this report is descriptive statistics, which are presented in **Table 3-85**.

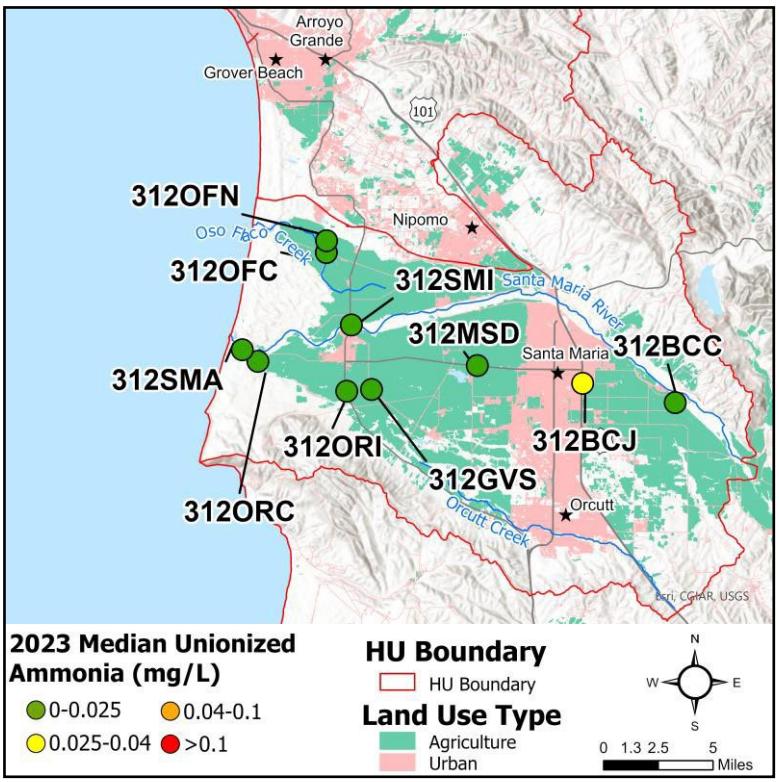


Figure 3-45. 2023 Median Unionized Ammonia for Sites in HU 312

- In 2023, median concentrations of unionized ammonia ranged from 0.0011 mg/L at Main St. Canal u/s from Ray Road at Highway 166 (312MSD) to 0.0334 mg/L at Bradley Channel (312BCJ).
- For the period of 2005-2023, two sites (Santa Maria River at Estuary [312SMA] and Green Valley at Simas [312GVS]) showed a statistically significant decreasing trend in unionized ammonia concentrations.

Table 3-83. Descriptive Statistics for Unionized Ammonia in Hydrologic Unit 312 (mg/L as N)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
312BCC	2	0.0027	0.0028	0.0027	0.0027	Increasing
312BCJ	12	0.0014	4.2776	0.8765	0.0334	Increasing
312GVS	3	0.0014	0.1278	0.0440	0.0028	**Decreasing**
312MSD	9	0.0003	0.0782	0.0110	0.0011	Decreasing
312OFC	12	0.0004	2.1420	0.2007	0.0037	Increasing
312OFN	12	0.0004	0.0067	0.0022	0.0018	Decreasing
312ORC	10	0.0008	0.0469	0.0090	0.0038	Decreasing
312ORI	12	0.0003	0.1162	0.0150	0.0031	Increasing
312SMA	9	0.0004	0.0044	0.0018	0.0013	**Decreasing**
312SMI	3	0.0012	0.0072	0.0036	0.0023	Decreasing

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant (α = 0.05).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- All ten sites in the Santa Maria HU have an unionized ammonia TMDL limit of 0.025 mg/L. Six sites exceeded the objective in at least one sample. Exceedances at these sites ranged from 10% to 58% of samples with the fewest occurrences in Orcutt Solomon Creek upstream of Santa Maria River (312ORC) and the most in Bradley Channel (312BCJ).
- Four sites met the unionized ammonia TMDL limit of 0.025 mg/L in all samples in 2023.

Table 3-84. Summary of Santa Maria River Watershed Nutrients TMDL and Nutrient Limit Exceedances for Unionized Ammonia in Hydrologic Unit 312

Site ID[1]	TMDL Annual Percent Exceedance[2]	Non-TMDL Area Limit Percent Exceedance
312BCC	0%	N/A
312BCJ	58%	N/A
312GVS	33%	N/A
312MSD	11%	N/A
312OFC	33%	N/A
312OFN	0%	N/A
312ORC	10%	N/A
312ORI	17%	N/A
312SMA	0%	N/A
312SMI	0%	N/A

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 The relevant numeric criterion is 0.025 mg/L.
N/A There is no applicable non-TMDL area limit criterion for unionized ammonia at this site.

- The spatial distribution and relative magnitudes of total ammonia concentrations were similar to unionized ammonia concentrations.
- For the period of 2005-2023, there were no statistically significant trends in total ammonia at any sites in the Santa Maria HU.

Table 3-85. Descriptive Statistics for Total Ammonia in Hydrologic Unit 312 (mg/L as N)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
312BCC	2	0.128	0.226	0.177	0.177	Increasing
312BCJ	12	0.064	10.900	2.430	0.150	Increasing
312GVS	3	0.103	4.670	1.745	0.462	Decreasing
312MSD	9	0.042	1.140	0.254	0.111	Decreasing
312OFC	12	0.092	32.100	3.531	0.422	Increasing
312OFN	12	0.042	0.935	0.183	0.093	Increasing
312ORC	10	0.042	1.810	0.515	0.361	Decreasing
312ORI	12	0.064	2.110	0.487	0.233	Increasing
312SMA	9	0.029	0.632	0.208	0.102	Increasing
312SMI	3	0.047	0.318	0.150	0.087	Increasing

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.5.5 Nitrate and Total Nitrogen

Samples were collected and analyzed for "nitrate + nitrite"; however, this report primarily refers to "nitrate" as nitrite levels are assumed to be very low. All sites within the Santa Maria HU have a TMDL limit for nitrate. All TMDL limits for nitrate are associated with the Santa Maria River Watershed Nutrients TMDL. See **Table 2-5** and **Appendix A** for a summary of applicable annual, dry season, and wet season TMDL limits for nitrate in the Santa Maria HU. The 10 mg/L Basin Plan Water Quality Objective for nitrate as N based on the municipal and domestic supply Beneficial Use applies to all 10 Santa Maria HU sites. A nitrate objective to protect agricultural uses also applies to Oso Flaco Creek (312OFC), both Orcutt Solomon Creek sites (312ORC and 312ORI), and both Santa Maria River sites (312SMA and 312SMI). The agricultural objective does not define a single numeric value from which to evaluate exceedance frequencies but does provide ranges defining "increasing problems" and "severe problems". Because the objective to protect municipal and

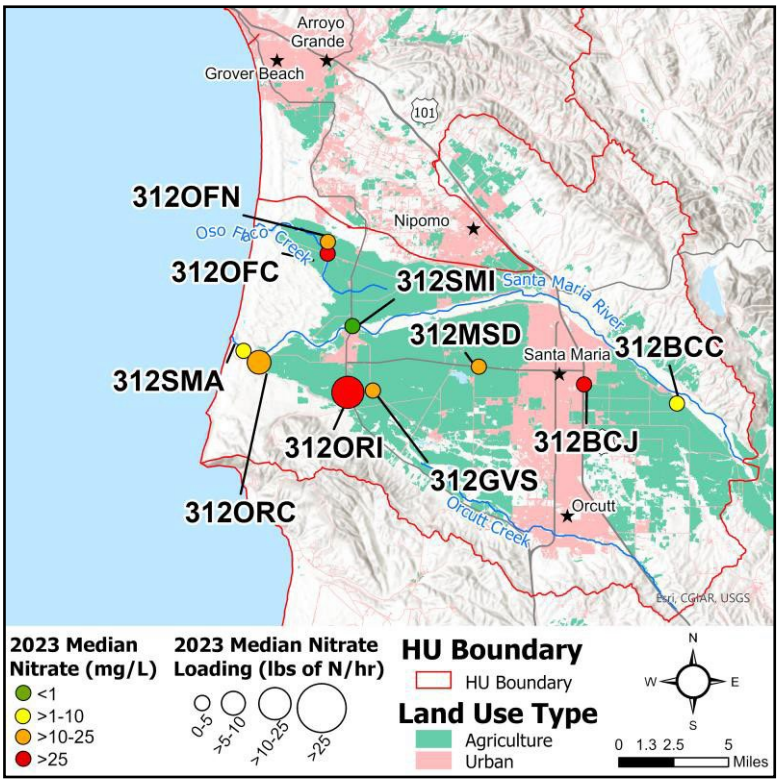


Figure 3-46. 2023 Median Nitrate as N for Sites in HU 312

domestic supply is more specific, it was used to assess exceedances. For the purposes of this report, TMDL and non-TMDL area limits supersede Basin Plan Water Quality Objective criteria when both criteria are applicable to a given monitoring site. **Figure 3-46** depicts annual median nitrate concentrations and median loading for sites in the Santa Maria HU for 2023, **Table 3-86** presents descriptive statistics, and **Table 3-87** and **Appendix B** present TMDL and non-TMDL Area limit exceedances.

Samples were also collected and analyzed for total nitrogen. There is currently no TMDL limit, non-TMDL area limit, or Basin Plan numeric Water Quality Objective for total nitrogen applicable to CMP sites in the Santa Maria HU. Therefore, the focus of this report is descriptive statistics, which are presented in **Table 3-88**.

- Median nitrate concentrations for 2023 ranged from 0.81 mg/L (Santa Maria River at Highway 1 [312SMI]) to 50.95 mg/L (Orcutt Solomon at Highway 1 [312ORI]).
- For the period of 2005-2023, no site showed a statistically significant increasing trend in nitrate concentrations. Five sites showed statistically significant decreasing trends in nitrate concentrations (Bradley Canyon Creek [312BCC], Oso Flaco Creek [312OFC], Little Oso Flaco Creek [312OFN], Orcutt Solomon Creek [312ORC], and Santa Maria River at Estuary [312SMA]).
- For the period of 2005-2023, nine sites showed statistically significant decreasing trends in nitrate loading.

Table 3-86. Descriptive Statistics for Nitrate in Hydrologic Unit 312 (mg/L as N)

Site ID[1]	N[3]	Min	Max	Mean	Median	Basin Plan WQO Percent Exceedance	Nitrate Trend[2]	Nitrate Loading Trend[2]
312BCC	2	0.9	2.8	1.8	1.8	0%	**Decreasing**	**Decreasing**
312BCJ	12	0.7	48.9	27.3	30.7	83%	Increasing	Decreasing
312GVS	3	1.8	63.7	26.3	13.5	67%	Decreasing	**Decreasing**
312MSD	9	0.6	31.5	15.2	15.1	67%	Decreasing	**Decreasing**
312OFC	12	5.4	78.8	29.1	27.6	83%	**Decreasing**	**Decreasing**
312OFN	12	3.0	18.0	10.5	10.3	50%	**Decreasing**	**Decreasing**
312ORC	10	9.6	37.2	22.8	24.0	90%	**Decreasing**	**Decreasing**
312ORI	12	2.8	104.0	45.9	51.0	67%	Increasing	**Decreasing**
312SMA	9	0.4	19.7	8.6	6.3	44%	**Decreasing**	**Decreasing**
312SMI	3	0.6	0.9	0.8	0.8	0%	Decreasing	**Decreasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- All four sites with an annual TMDL limit for nitrate exceeded the limit in 67% or more samples.
- Four of the six sites with a dry season TMDL limit for nitrate exceeded the limit of 4.3 mg/L in 75% or more samples (Orcutt Solomon Creek upstream of Santa Maria River [312ORC], Orcutt Solomon at Highway 1 [312ORI], Green Valley at Simas [312GVS], and Santa Maria River at Estuary [312SMA]). The other two sites with a dry season TMDL limit were not sampled during the 2023 dry season due to dry conditions (Bradley Canyon Creek [312BCC] and Santa Maria River at Highway 1 [312SMI]).
- Four of the six sites (Green Valley at Simas [312 GVS], Orcutt Solomon Creek upstream of Santa Maria River [312ORC], Orcutt Solomon at Highway 1 [312ORI], Santa Maria River at Estuary [312SMA]) with a wet season TMDL limit for nitrate exceeded the limit of 8.0 mg/L in at least 40% of samples. Bradley Canyon Creek (312 BCC) and Santa Maria River at Highway 1 (312SMI) did not exceed the nitrate TMDL for any samples in the wet season.

Table 3-87. Summary of Santa Maria River Watershed Nutrients TMDL and Non-TMDL Area Nutrient Limit Exceedances for Nitrate in Hydrologic Unit 312

Site ID[1]	TMDL Annual Percent Exceedance	TMDL Dry Season Percent Exceedance[2]	TMDL Wet Season Percent Exceedance[3]	Non-TMDL Area Limit Percent Exceedance
312BCC	N/A	NS	0%	N/A
312BCJ	83%[4]	N/A	N/A	N/A
312GVS	N/A	100%	50%	N/A
312MSD	67%[4]	N/A	N/A	N/A
312OFC	92%[5]	N/A	N/A	N/A
312OFN	83%[5]	N/A	N/A	N/A
312ORC	N/A	100%	100%	N/A
312ORI	N/A	100%	71%	N/A
312SMA	N/A	75%	40%	N/A
312SMI	N/A	NS	0%	N/A

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations,* 2023, for detailed site descriptions.
2 The TMDL numeric criterion is 10.0 mg/L.
3 The TMDL numeric criterion is 5.7 mg/L
4 The relevant wet season numeric criterion is 8.0 mg/L.
5 The relevant dry season numeric criterion is 4.3 mg/L.
N/A There is no applicable Santa Maria River Watershed Nutrient TMDL or non-TMDL area limit criterion for nitrate at this site.
NS Not sampled.

- Median total nitrogen concentrations ranged from 6.3 mg/L at Santa Maria River at Highway 1 (312SMI) to 59.0 mg/L at Orcutt Solomon at Highway 1 (312ORI).
- For the period of 2005-2023, one site (Main Street Canal [312MSD]) showed a statistically significant increasing trend in total nitrogen. Four sites showed statistically significant decreasing trends in total nitrogen (Green Valley at Simas [312GVS], Oso Flaco Creek [312OFC], Little Oso Flaco Creek [312OFN], and Santa Maria River at Estuary [312SMA]).

Table 3-88. Descriptive Statistics for Total Nitrogen in Hydrologic Unit 312 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
312BCC	2	7.0	7.1	7.0	7.0	Decreasing
312BCJ	12	4.1	73.6	34.0	33.5	Increasing
312GVS	3	8.2	63.9	31.1	21.3	**Decreasing**
312MSD	9	1.9	32.9	17.0	16.2	**Increasing**
312OFC	12	8.4	140.2	37.1	31.4	**Decreasing**
312OFN	12	5.8	19.1	12.1	12.8	**Decreasing**
312ORC	10	11.1	39.8	26.1	26.6	Decreasing
312ORI	12	7.9	104.0	53.9	59.0	Increasing
312SMA	9	3.4	30.2	12.7	12.7	**Decreasing**
312SMI	3	1.3	7.2	5.0	6.3	Decreasing

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.5.6 Orthophosphate and Total Phosphorus

All but two sites (Main Street Canal [312MSD] and Bradley Channel [312BCJ]) within the Santa Maria HU have a TMDL limit for orthophosphate as P. All TMDL limits for orthophosphate as P are associated with the Santa Maria River Watershed Nutrients TMDL. See **Table 2-5** and **Appendix A** for a summary of applicable annual, dry season, and wet season TMDL limits for orthophosphate as P in the Santa Maria HU. **Figure 3-47** depicts annual median orthophosphate concentrations for sites in the Santa Maria HU for 2023. **Table 3-89** presents descriptive statistics for orthophosphate, **Table 3-90** and **Appendix B** present TMDL and non-TMDL area limit exceedances for orthophosphate, and **Table 3-91** presents descriptive statistics for total phosphorus.

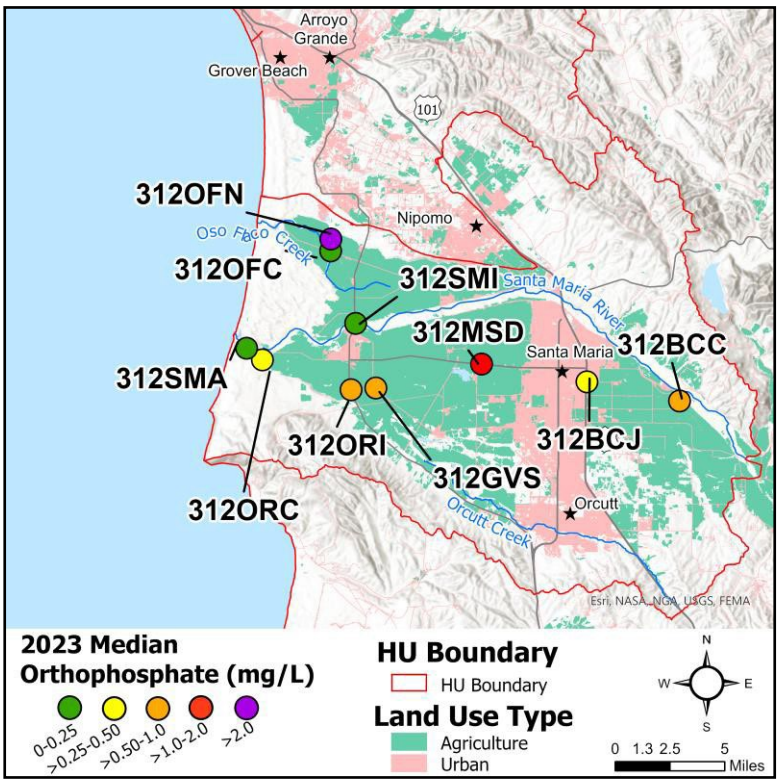


Figure 3-47. 2023 Median Orthophosphate as P for Sites in HU 312

- In 2023, median orthophosphate concentrations ranged from 0.004 mg/L at Santa Maria River at Estuary (312SMA) to 2.600 mg/L at Little Oso Flaco Creek (312OFN).

- For the period of 2005-2023, two sites showed statistically significant increasing trends in orthophosphate concentrations (Green Valley at Simas [312GVS] and Little Oso Flaco Creek [312OFN]). Four sites showed statistically significant decreasing trends in orthophosphate concentrations (Bradley Channel [312BCJ], Oso Flaco Creek [312OFC], Orcutt Solomon Creek upstream of Santa Maria River [312ORC], and Santa Maria River at Estuary [SMA]).

Table 3-89. Descriptive Statistics for Orthophosphate as P in Hydrologic Unit 312 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
312BCC	2	0.437	0.575	0.506	0.506	Increasing
312BCJ	12	0.004	1.070	0.368	0.274	**Decreasing**
312GVS	3	0.017	0.695	0.460	0.668	**Increasing**
312MSD	9	0.100	23.200	5.445	1.280	Increasing
312OFC	12	0.004	0.971	0.255	0.141	**Decreasing**
312OFN	12	0.528	4.440	2.339	2.600	**Increasing**
312ORC	10	0.014	0.832	0.363	0.342	**Decreasing**
312ORI	12	0.082	0.998	0.586	0.641	Decreasing
312SMA	9	0.004	0.621	0.126	0.004	**Decreasing**
312SMI	3	0.097	0.204	0.154	0.162	Decreasing

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- The two sites with an annual TMDL limit of 0.08 mg/L for orthophosphate (Oso Flaco Creek [312OFC] and Little Oso Flaco [312OFN]), exceeded the limit in 75% of samples and 100% of samples, respectively.
- Two of the six sites with a dry season TMDL limit of 0.19 mg/L exceeded the limit in at least 80% of samples (Orcutt Solomon Creek [312ORC] and Orcutt Solomon at Highway 1 [312ORI]). Two sites (Green Valley at Simas [312GVS] and Santa Maria River at Estuary [312SMA]) met the dry season TMDL limit of 0.19 mg/L in all samples. The remaining two sites were not sampled in the dry season due to dry conditions.
- All the six sites with a wet season TMDL limit were sampled. Two sites exceeded the wet season TMDL Limit in 100% of samples collected (Bradley Canyon Creek [312BCC] and Green Valley Creek [312GVS]). Three sites exceeded the wet season TMDL limit in at least 40% of the samples, while Santa Maria River at Highway 1 (312SMI) did not achieve the limit.

Table 3-90. Summary of Santa Maria River Watershed Nutrient TMDL and Non-TMDL Area Nutrient Limit Exceedances for Orthophosphate as P in Hydrologic Unit 312

Site ID[1]	TMDL Annual Percent Exceedance[2]	TMDL Dry Season Percent Exceedance[3]	TMDL Wet Season Percent Exceedance[4]	Non-TMDL Area Limit Percent Exceedance
312BCC	N/A	NS	100%	N/A
312BCJ	N/A	N/A	N/A	N/A
312GVS	N/A	0%	100%	N/A
312MSD	N/A	N/A	N/A	N/A
312OFC	75%	N/A	N/A	N/A
312OFN	100%	N/A	N/A	N/A
312ORC	N/A	80%	40%	N/A
312ORI	N/A	100%	71%	N/A
312SMA	N/A	0%	40%	N/A
312SMI	N/A	NS	0%	N/A

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations,* 2023, for detailed site descriptions.
2 The TMDL numeric criterion is 0.08 mg/L.
3 The relevant dry season numeric criterion is 0.19 mg/L.
4 The relevant wet season numeric criterion is 0.3 mg/L.
N/A There is no applicable Santa Maria River Watershed Nutrients TMDL or non-TMDL area limit criterion for orthophosphate as P at this site.
NS Not sampled.

- Median total phosphorus concentrations ranged from 0.406 mg/L at Santa Maria River at Estuary (312SMA) to 5.440 mg/L at Santa Maria River at Highway 1 (312SMI).
- For the period of 2005-2023, five sites showed a statistically significant increasing trend in total phosphorus (Green Valley at Simas [312GVS], Main Street Canal [312MSD], Oso Flaco Creek [312OFC], Little Oso Flaco Creek [312OFN], and Orcutt Solomon at Highway 1 [312ORI]). Two sites (Orcutt Solomon Creek upstream of Santa Maria [312ORC] and Santa Maria River at Estuary [312SMA]) showed a statistically significant decreasing trend in total phosphorus.

Table 3-91. Descriptive Statistics for Total Phosphorus in Hydrologic Unit 312 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
312BCC	2	2.360	2.640	2.500	2.500	Increasing
312BCJ	12	0.468	3.490	1.282	0.968	Increasing
312GVS	3	0.118	5.860	3.323	3.990	**Increasing**
312MSD	9	0.207	23.600	6.757	1.970	**Increasing**
312OFC	12	0.189	3.130	1.219	0.862	**Increasing**
312OFN	12	1.510	6.820	3.347	3.275	**Increasing**
312ORC	10	0.250	6.290	1.314	0.740	**Decreasing**
312ORI	12	0.333	18.300	2.635	0.991	**Increasing**
312SMA	9	0.228	6.880	1.222	0.406	**Decreasing**
312SMI	3	0.924	5.810	4.058	5.440	Decreasing

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.5.7 Specific Conductivity

A conductivity Water Quality Objective to protect agricultural uses applies to Oso Flaco Creek (312OFC), both Orcutt-Solomon Creek sites (312ORC and 312 ORI), and both Santa Maria River sites (312SMA and 312SMI). This agricultural objective does not define a numeric value to evaluate exceedance frequencies, but provides ranges:

- <750 µS/cm, "No Problem";
- 750–3,000 µS/cm, "Increasing Problems" and
- >3,000 µS/cm, "Severe".

Figure 3-48 depicts annual median conductivities for sites in the Santa Maria HU for 2023 and **Table 3-92** presents descriptive statistics.

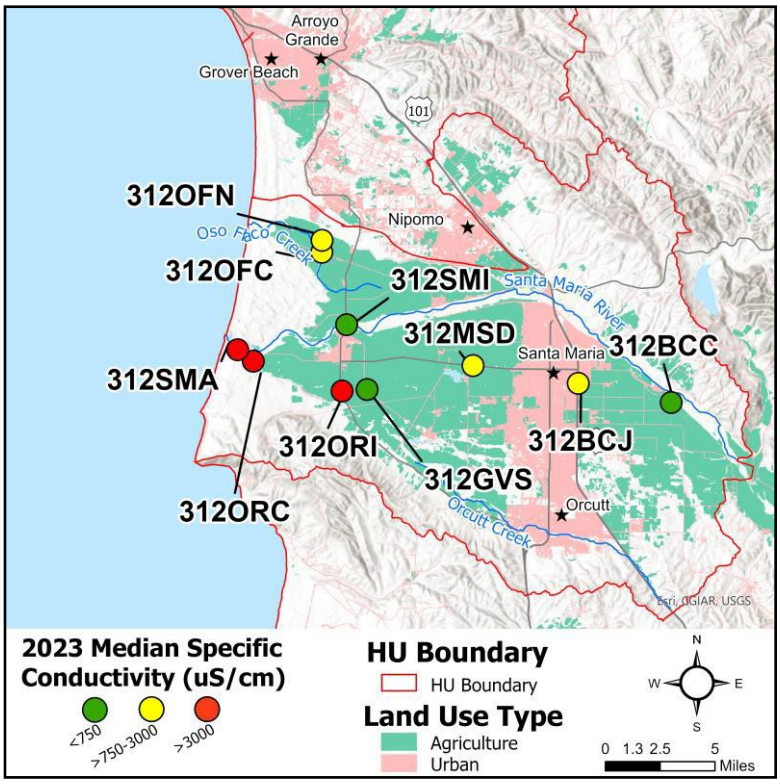


Figure 3-48. 2023 Median Conductivity for Sites in HU 312

- In 2023, all but three sites had median conductivities above the low-end of the listed ranges (750 µS/cm) indicating increasing or severe problems. The three sites (Bradley Canyon Creek [312BCC], Green Valley at Simas [312GVS], and Santa Maria River at Highway 1 [312SMI]) had medians of less than 500 µS/cm.
- Three sites had conductivity measurements exceed 3,000 µS/cm: Orcutt Solomon Creek (312ORC), Orcutt Solomon at Highway 1 (312ORI), and Santa Maria River at Estuary (312SMA).
- For the period of 2005-2023, four sites showed statistically significant increasing trends in conductivity (Bradley Channel [312BCJ], both Orcutt Solomon Creek sites [312ORC and 312 ORI], and Santa Maria River at Estuary [312SMA]). One site showed a statistically significant decreasing trend in conductivity concentrations (Little Oso Flaco Creek [312OFN]).

Table 3-92. Descriptive Statistics for Conductivity in Hydrologic Unit 312 (µS/cm)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
312BCC	2	239	259	249	249	Decreasing
312BCJ	12	200	2,511	1,661	1,849	**Increasing**
312GVS	3	206	2,535	1,071	474	Decreasing
312MSD	9	138	1,922	1,251	1,406	Decreasing
312OFC	12	429	2,900	1,905	1,925	Increasing
312OFN	12	507	2,325	1,476	1,443	**Decreasing**
312ORC	10	590	4,279	3,089	3,581	**Increasing**
312ORI	12	439	4,008	2,432	3,060	**Increasing**
312SMA	9	1,139	29,032	11,907	5,971	**Increasing**
312SMI	3	409	882	573	429	Decreasing

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant (α =0.05).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.5.8 Total Dissolved Solids and Salinity

The Basin Plan contains no numeric Water Quality Objective for TDS or the following analytes applicable to CMP sites in the Santa Maria HU: salinity, alkalinity, calcium, magnesium, sodium, potassium, sulfate, and chloride. No trend analyses were performed on the latter six analytes due to limited historical data associated with them. Therefore, the focus of this report is descriptive statistics. Figure 3-49.
depicts annual median TDS concentrations for sites in the Santa Maria HU for 2023. **Table 3-93**, **Table 3-94**, **Table 3-95**, **Table 3-96**, **Table 3-97**, **Table 3-98**, **Table 3-99**, **Table 3-100**, and **Table 3-101** present descriptive statistics for TDS, salinity, alkalinity, calcium, magnesium, sodium, potassium, sulfate, and chloride, respectively.

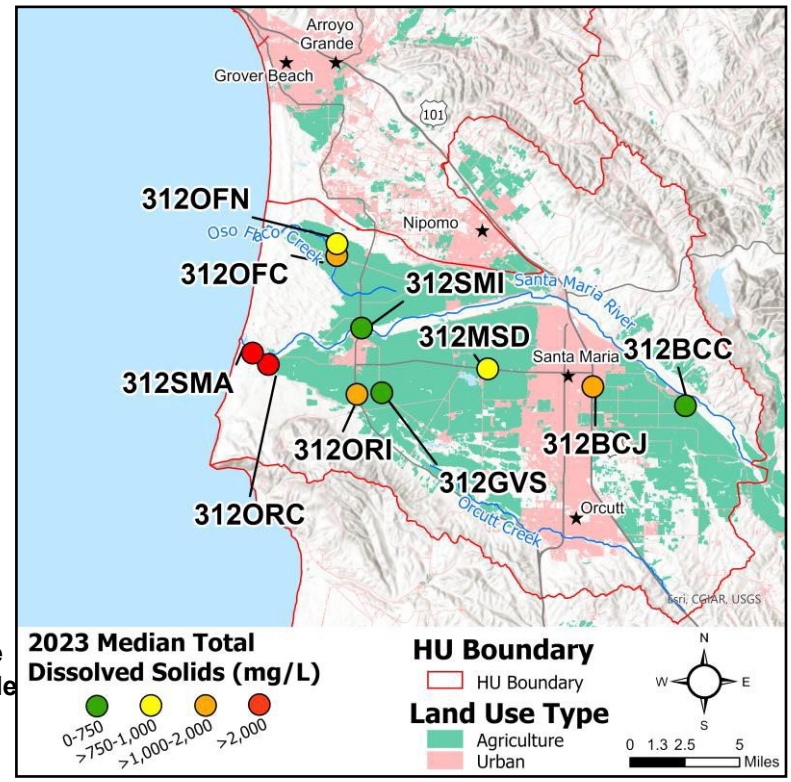


Figure 3-49. 2023 Median Total Dissolved Solids for Sites in HU 312

- Median TDS concentrations for 2023 ranged from 146 mg/L (n=2) at Bradley Canyon Creek (312BCCI) to 3,882 mg/L in Santa Maria River at Estuary (312SMA).
- The highest TDS concentration was measured in Santa Maria River at Estuary (312SMA) (18,567 mg/L), but this was due to tidal influence.
- For the period of 2005-2023, five sites showed statistically significant decreasing trends in TDS concentrations (Green Valley at Simas [312GVS], Santa Maria River at Highway 1 [312SMI], Orcutt Solomon at Highway 1 [312ORI], Oso Flaco Creek [312OFC], and Little Oso Flaco Creek [312OFN]).

Table 3-93. Descriptive Statistics for Total Dissolved Solids in Hydrologic Unit 312 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	WQO Exceedance?	Trend[2]
312BCC	2	137	155	146	146	N/A	Decreasing
312BCJ	12	101	1,632	1,098	1,202	N/A	Decreasing
312GVS	3	104	1,647	686	307	N/A	**Decreasing**
312MSD	9	70	1,250	811	913	N/A	Decreasing
312OFC	12	217	1,885	1,233	1,252	N/A	**Decreasing**
312OFN	12	257	1,511	953	938	N/A	**Decreasing**
312ORC	10	386	2,781	2,008	2,328	N/A	Decreasing
312ORI	12	223	2,606	1,576	1,990	N/A	**Decreasing**
312SMA	9	740	18,567	7,706	3,882	N/A	Decreasing
312SMI	3	217	573	352	266	N/A	**Decreasing**

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant (α = 0.05).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- The spatial distribution and relative magnitudes of salinity were similar to TDS concentrations.
- For the period of 2005-2023, four sites showed statistically significant decreasing trends in salinity (Green Valley at Simas [312GVS], Oso Flaco Creek [312OFC], Little Oso Flaco Creek [312OFN], and Santa Maria River at Highway 1 [312SMI]). One site (Orcutt Solomon Creek at Highway 1 [312ORI]) showed a statistically significant decreasing trend in salinity.

Table 3-94. Descriptive Statistics for Salinity in Hydrologic Unit 312 (ppt)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
312BCC	2	0.11	0.13	0.12	0.12	Increasing
312BCJ	12	0.09	1.37	0.89	0.94	Increasing
312GVS	3	0.10	1.31	0.55	0.23	**Decreasing**
312MSD	9	0.06	0.98	0.63	0.71	Decreasing
312OFC	12	0.21	1.51	0.98	0.99	**Decreasing**
312OFN	12	0.25	1.20	0.75	0.73	**Decreasing**
312ORC	10	0.29	2.29	1.63	1.90	Increasing
312ORI	12	0.21	2.13	1.27	1.61	**Increasing**
312SMA	9	0.57	17.66	7.11	3.26	Increasing
312SMI	3	0.20	0.43	0.28	0.21	**Decreasing**

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median alkalinity concentrations ranged from 82 mg/L at Bradley Canyon Creek (312BCC) to 330 mg/L at Orcutt Solomon Creek (312ORC).

Table 3-95. Descriptive Statistics for Alkalinity in Hydrologic Unit 312 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
312BCC	1	82	82	82	82
312BCJ	4	55	216	140	144
312GVS	2	75	249	162	162
312MSD	4	32	258	184	223
312OFC	4	121	400	251	242
312OFN	4	108	379	228	213
312ORC	4	123	359	285	330
312ORI	4	145	314	254	278
312SMA	3	144	303	245	288
312SMI	1	206	206	206	206

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- The lowest concentration of calcium (15 mg/L) was measured at Main Street Canal (312MSD) and the highest concentration (468 mg/L) was measured at Santa Maria River at Estuary (312SMA).

Table 3-96. Descriptive Statistics for Calcium in Hydrologic Unit 312 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
312BCC	1	55	55	55	55
312BCJ	4	37	228	162	192
312GVS	2	55	283	169	169
312MSD	4	15	192	127	150
312OFC	4	83	341	211	210
312OFN	4	102	282	183	173
312ORC	4	71	425	318	388
312ORI	4	48	394	256	292
312SMA	3	129	468	322	370
312SMI	1	85	85	85	85

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median magnesium concentrations in the Santa Maria HU ranged from 13 mg/L at Bradley Canyon Creek (312BCC) to 245 mg/L at Santa Maria River at Estuary (312SMA).

Table 3-97. Descriptive Statistics for Magnesium in Hydrologic Unit 312 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
312BCC	1	13	13	13	13
312BCJ	4	10	96	68	84
312GVS	2	18	120	69	69
312MSD	4	5	93	58	67
312OFC	4	26	143	77	69
312OFN	4	28	80	52	50
312ORC	4	27	181	134	164
312ORI	4	19	192	111	116
312SMA	3	47	612	301	245
312SMI	1	21	21	21	21

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median sodium concentrations ranged from 10 mg/L at Bradley Canyon Creek (312BCC) to 745 mg/L at Santa Maria River at Estuary (312SMA).

Table 3-98. Descriptive Statistics for Sodium in Hydrologic Unit 312 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
312BCC	1	10	10	10	10
312BCJ	4	8	127	91	114
312GVS	2	29	144	86	86
312MSD	4	7	91	61	74
312OFC	4	30	181	96	87
312OFN	4	52	168	107	103
312ORC	4	46	255	185	219
312ORI	4	34	244	170	201
312SMA	3	71	4,220	1,679	745
312SMI	1	17	17	17	17

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Potassium concentrations ranged from 2.5 mg/L at three sites (Main Street Canal [312MSD], Orcutt Solomon Creek at Highway 1 [312ORI], and Santa Maria River at Highway 1 [312SMI]) to 157.0 mg/L at Santa Maria River at Estuary (312SMA).
- Santa Maria River at Estuary (312SMA) had the highest median potassium concentration (25.4 mg/L).

Table 3-99. Descriptive Statistics for Potassium in Hydrologic Unit 312 (mg/L)

Site ID[1]	N2	Min	Max	Mean	Median
312BCC	1	6.3	6.3	6.3	6.3
312BCJ	4	6.7	12.1	8.4	7.3
312GVS	2	5.5	5.7	5.6	5.6
312MSD	4	2.5	54.2	19.7	11.0
312OFC	4	5.6	57.4	19.2	7.0
312OFN	4	9.2	18.7	14.4	14.9
312ORC	4	6.1	13.7	9.4	8.9
312ORI	4	2.5	33.3	11.6	5.2
312SMA	3	7.7	157.0	63.4	25.4
312SMI	1	2.5	2.5	2.5	2.5

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median sulfate concentrations in the Santa Maria HU ranged from 73 mg/L at Bradley Canyon Creek (312BCC) (n=1) to 1,720 mg/L at Santa Maria River at Estuary (312SMA). Santa Maria River at Estuary (312SMA) also had the highest recorded concentration of sulfate (2,090 mg/L).

Table 3-100. Descriptive Statistics for Sulfate in Hydrologic Unit 312 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
312BCC	1	73	73	73	73
312BCJ	4	57	802	594	758
312GVS	2	115	874	495	495
312MSD	4	24	769	408	419
312OFC	4	156	1,170	616	570
312OFN	4	177	865	508	496
312ORC	4	134	1,550	1,049	1,255
312ORI	4	94	1,080	692	797
312SMA	3	324	2,090	1,378	1,720
312SMI	1	93	93	93	93

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- The lowest concentration of chloride (6 mg/L) was measured at two sites (Bradley Canyon Creek [312BCC] and Main Street Canal [312MSD]) and the highest concentration (7,260 mg/L) was measured at Santa Maria River at Estuary (312SMA).

Table 3-101. Descriptive Statistics for Chloride in Hydrologic Unit 312 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
312BCC	1	6	6	6	6
312BCJ	4	8	88	65	82
312GVS	2	37	228	132	132
312MSD	4	6	76	49	57
312OFC	4	28	148	92	96
312OFN	4	36	131	82	80
312ORC	4	57	410	264	294
312ORI	4	37	573	310	315
312SMA	3	86	7,260	2,905	1,370
312SMI	1	7	7	7	7

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.5.9 Dissolved Oxygen

The minimum dissolved oxygen Water Quality Objective for protection of cold water or spawning aquatic life Beneficial Uses (7 mg/L) applies to four Santa Maria HU sites, including both Orcutt-Solomon Creek sites (312ORC and 312ORI) and both mainstem Santa Maria River sites (312SMA and 312SMI). The DO objective for protection of warm water Beneficial Uses (5 mg/L) applies to one Santa Maria HU site, Oso Flaco Creek (312OFC). For sites that do not have specifically assigned Beneficial Uses, the Basin Plan specifies the following general numeric objectives: 5 mg/L and 85% saturation. The 85% saturation objective is applied on a median basis. General Water Quality Objectives apply to all waterbodies unless a more protective Beneficial Use and Water Quality Objective are designated. The general numeric objectives apply to five sites: Bradley Canyon Creek (312BCC), Bradley Channel (312BCJ), Green Valley Creek (312GVS), Main Street Canal (312MSD) and Little Oso Flaco Creek (312OFN). **Figure 3-50** depicts annual median dissolved oxygen concentrations for sites in the Santa Maria HU for 2023. **Table 3-102** presents descriptive statistics for dissolved oxygen concentration, and **Table 3-103** presents descriptive statistics for oxygen saturation.

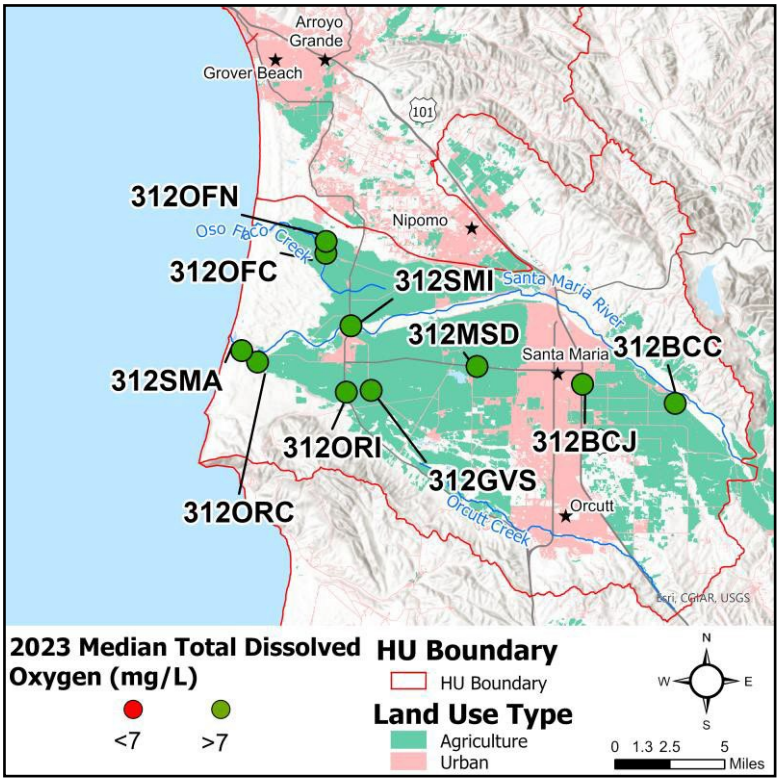


Figure 3-50. 2023 Median Dissolved Oxygen Concentrations for Sites in HU 312

- Two of the four sites sampled (Orcutt Solomon at Highway 1 [312ORI] and Santa Maria River at Highway 1 [312SMI]) with a minimum Water Quality Objective of 7 mg/L met the objective in all samples collected.
- Five of the six sites with a minimum Water Quality Objective of 5 mg/L met the objective in all samples in 2023 (Bradley Canyon Creek [312BCC], Bradley Channel at Jones Street [312BCJ], Green Valley Creek [312GVS], Main Street Canal [312MSD], and Oso Flaco Creek [312OFC]).
- For the period of 2005-2023, six sites showed statistically significant increasing trends in dissolved oxygen concentrations (Bradley Channel at Jones Street [312BCJ], Green Valley Creek [312GVS], Main Street Canal [312MSD], Oso Flaco Creek at Oso Flaco Lake Rd. [312OFC], Orcutt Solomon Creek [312ORC], and Santa Maria River at Estuary [312SMA]. Trends in dissolved oxygen must be interpreted with caution, as diel patterns in dissolved oxygen can be influenced by temperature and biological activity depending on the time of day at which sampling occurs, and changes in dissolved oxygen can manifest as either depressed or very high concentrations.

Table 3-102. Descriptive Statistics for Dissolved Oxygen in Hydrologic Unit 312 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Percent Exceedance	Trend[2]
312BCC	2	9.22	10.08	9.65	9.65	0%[4]	Increasing
312BCJ	12	7.75	27.15	14.77	15.50	0%[4]	**Increasing**
312GVS	3	8.65	11.20	9.99	10.11	0%[4]	**Increasing**
312MSD	9	7.23	15.00	10.18	10.30	0%[4]	**Increasing**
312OFC	12	5.55	224.10	27.44	9.16	0%[4]	**Increasing**
312OFN	12	2.75	12.56	8.38	8.84	17%[4]	Decreasing
312ORC	10	6.67	12.03	9.34	9.43	10%	**Increasing**
312ORI	12	7.36	13.49	10.49	10.00	0%	Increasing
312SMA	9	5.71	12.33	9.14	10.21	33%	**Increasing**
312SMI	3	8.92	11.82	9.96	9.15	0%	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 Water quality objective is >5 mg/L; all other sites have a water quality objective of >7 mg/L.

- All five sites with the 85% saturation Water Quality Objective met the objective in all samples collected.
- For the period of 2005-2023, six sites showed statistically significant increasing trends in oxygen saturation.

Table 3-103. Descriptive Statistics for Oxygen Saturation in Hydrologic Unit 312 (%)

Site ID[1]	N[3]	Min	Max	Mean	Median	WQO Exceedance?	Trend[2]
312BCC	2	94	103	98	98	No	Increasing
312BCJ	12	79	262	168	179	No	**Increasing**
312GVS	3	87	112	98	96	No	**Increasing**
312MSD	9	78	175	102	90	No	**Increasing**
312OFC	12	19	202	93	94	N/A	**Increasing**
312OFN	12	25	141	86	92	No	Decreasing
312ORC	10	8	112	83	89	N/A	**Increasing**
312ORI	12	80	164	107	98	N/A	Increasing
312SMA	9	64	151	97	92	N/A	**Increasing**
312SMI	3	88	103	98	101	N/A	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

N/A There is no applicable Water Quality Objective for this site.

3.5.10 pH

The Water Quality Objective for all Santa Maria HU sites is 7-8.3 standard pH units. For sites with MUN or REC1/REC2 and WARM/COLD Beneficial Uses, the acceptable pH range is 7-8.3 standard pH units. For sites that are not included in Table 2-1 of the Basin Plan, the acceptable pH range is also 7-8.3 standard pH units, which includes the Basin Plan general and REC1/REC2 Water Quality Objectives. **Figure 3-51** depicts annual median pH for sites in the Santa Maria HU for 2023 and **Table 3-104** presents descriptive statistics.

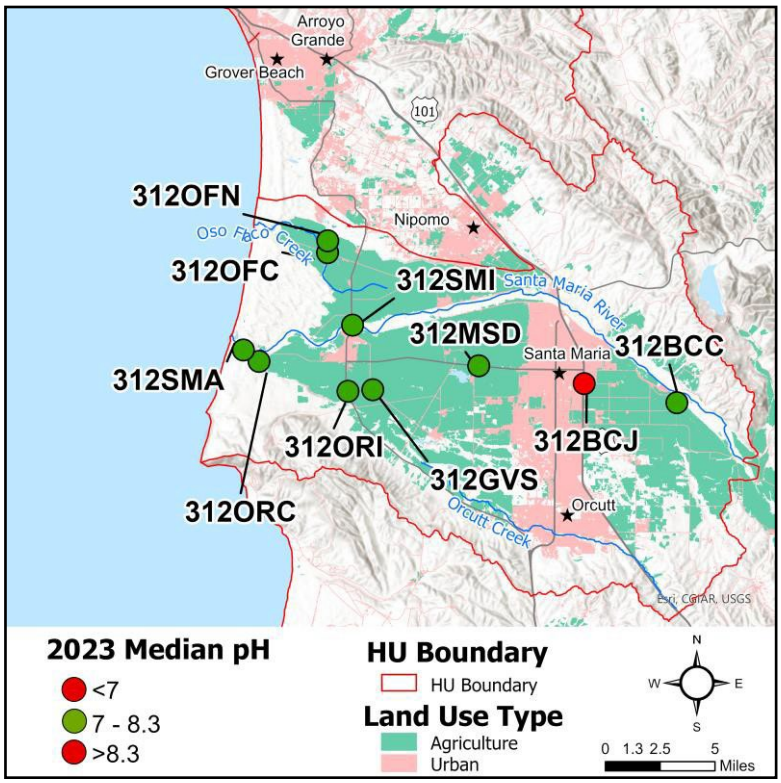


Figure 3-51. 2023 Median pH for Sites in HU 312

- Only three sites did not meet the applicable pH Water Quality Objective in all samples during 2023 (Bradley Channel at Jones St. [312BCJ], Little Oso Flaco Creek [312OFN], and Orcutt Solomon Creek at Highway 1 [312ORI]).
- One sample from one site (Little Oso Flaco Creek [312OFN]) had a pH level below the minimum criterion of 7.0 standard pH units; all other exceedances pertained to the 8.3 standard pH units Water Quality Objective.
- The maximum pH (9.41 pH units) was measured in Bradley Channel at Jones St. (312BCJ) in February.
- For the period of 2005-2023, three sites showed statistically significant increasing trends in pH (Green Valley Creek [312GVS], Oso Flaco Creek [312OFC], and Orcutt Solomon Creek upstream of Santa Maria River [312ORC]).

Table 3-104. Descriptive Statistics for pH in Hydrologic Unit 312 (pH units)

Site ID[1]	N[3]	Min	Max	Mean	Median	Percent Exceedance	Trend[2]
312BCC	2	7.65	7.88	7.77	7.77	0%	Increasing
312BCJ	12	7.50	9.41	8.60	8.79	67%	Increasing
312GVS	3	7.60	7.95	7.75	7.70	0%	**Increasing**
312MSD	9	7.23	8.25	7.83	7.82	0%	Increasing
312OFC	12	7.31	8.24	7.72	7.69	0%	**Increasing**
312OFN	12	6.84	8.22	7.68	7.74	8%	Increasing
312ORC	10	7.38	8.12	7.85	7.90	0%	**Increasing**
312ORI	12	7.36	8.33	7.75	7.73	8%	Increasing
312SMA	9	7.51	8.14	7.78	7.80	0%	Increasing
312SMI	3	7.94	8.13	8.03	8.01	0%	Increasing

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.5.11 Aquatic Toxicity Results

The potential for toxic effects to aquatic and sediment-dwelling organisms is assessed by the CMP via bioassays for sensitive algal species (*S. capricornutum* growth) in water, and for sensitive invertebrate species in water (*C. dubia* reproduction and *C. dubia and C. dilutus* survival) and sediment (*H. azteca* growth and survival). Test organism survival and reproduction or growth is measured in environmental samples as well as in non-toxic control samples. A statistical test is then applied to determine significant differences in organism performance between environmental and control samples. When test organism performance is significantly lower in the environmental sample than in the control, *and* the difference exceeds a 20% effect threshold, a sample is determined to be "toxic" and in exceedance of the narrative Basin Plan objective for "no toxic substances in toxic amounts." All sites within the Santa Maria HU have a significant toxic effect (*C. dubia* survival/reproduction in water and *H. azteca* survival in sediment) TMDL limit associated with the Santa Maria River Watershed Toxicity and Pesticide TMDL. Additionally, a significant toxic effect non-TMDL area limit for survival, growth, and reproduction in water and sediment applies to sites without a TMDL limit. *H. azteca* reproduction in sediment is not tested for by the CMP so is not included in the non-TMDL area limit exceedance discussion below. See **Table 2-5** and **Appendix A** for a summary of applicable toxic effect TMDL and non-TMDL area limits in the Pajaro River HU. Results from aquatic and sediment bioassays conducted on samples from the Santa Maria HU in 2023 are illustrated in Figure 3-52a-d . and tabulated in **Table 3-105**.

- In 2023, toxicity (reduced growth in sample water relative to a non-toxic control) to algae was observed in one or more of the bioassays collected from five sites: Main St. Canal (312MSD), Oso Flaco Creek (312OFC), and both Orcutt Solomon Creek sites (312ORC and 312ORI), and Green Valley at Simas (312GVS) which had observed toxicity in 100% of the samples collected (n=2) (**Figure 3-52 a**).
- Significant mortality to *C. dilutus* in water was observed in 13 samples collected from nine of thet ten sites sampled (**Figure 3-52 b**). Significant mortality to *C. dubia* in water was observed in 7 samples collected from six sites (**Figure 3-52 d**). Four sites (Bradley Canyon Creek [312BCC], Bradley Channel at Jones St. [312BCJ], Orcutt Solomon Creek at Santa Maria [312ORC], and Santa Maria River at Highway 1 [312SMI]) achieved the significant toxic effect TMDL limit for *C. dubia* survival in water (**Figure 3-52 d**).
- Toxicity to invertebrate reproduction in water was observed in 14 samples collected from eight of the ten sites sampled. All bioassays on water samples collected from Green Valley at Simas (312GVS), Oso Flaco Creek (312OFC), Orcutt Solomon Creek upstream of Santa Maria River (312ORC), and Santa Maria River at Estuary (312SMA) resulted in reproductive toxicity (**Figure 3-52 c**). Two sites (Bradley Canyon Creek [312BCC] and Santa Maria River at Highway 1 [312SMI]) achieved the significant toxic effect TMDL limit for *C. dubia* reproduction in water **(Figure 3-52 c)**.
- One sediment sample per site was collected in 2023 and analyzed for sediment toxicity. Toxicity to invertebrate growth in sediment was observed in three of the six sites sampled (Bradley Channel [312BCJ] and both Orcutt Solomon Creek sites [312ORC and 312ORI]) (**Figure 3-52 e**). Toxicity to invertebrate survival in sediment was observed in four of the six sites sampled (Bradley Channel [312BCJ], Main Street Ditch [312MSD], Oso Flaco Creek [312OFC], and Orcutt Solomon at Highway 1 [312ORI]) (**Figure 3-52 f**). Of the six sites sampled, two sites (Little Oso Flaco Creek [312OFN] and Orcutt Solomon Creek at Santa Maria River [312ORC]) achieved the significant toxic effect TMDL limit for survival in sediment (**Figure 3-52 f**).
- For the period of 2005-2023, all statistically significant interannual trends in toxicity were increasing (improving, reduced toxicity). The following trends were observed:
    - Four sites showed statistically significant increasing trends (improving, reduced toxicity) in invertebrate survival in water (both Bradley Creek sites [312BCC and 312BCJ], Orcutt Solomon Creek upstream of Santa Maria River [312ORC] and Santa Maria River at Estuary [312SMA]).
    - Four sites showed statistically significant increasing trends (improving, reduced toxicity) in invertebrate growth in sediment (Bradley Channel at Jones Street [312BCJ], Main St. Canal

upstream from Ray Road at Highway 166 [312MSD], Orcutt Solomon Creek upstream of Santa Maria River [312ORC] and Orcutt Solomon Creek at Highway 1 [312ORI]).

- Four sites showed statistically significant increasing trends (improving, reduced toxicity) in invertebrate survival in sediment (Bradley Channel at Jones Street [312BCJ], Little Oso Flaco Creek [312OFN], Orcutt Solomon Creek upstream of Santa Maria River [312ORC], and Santa Maria River at Estuary [312SMA]).

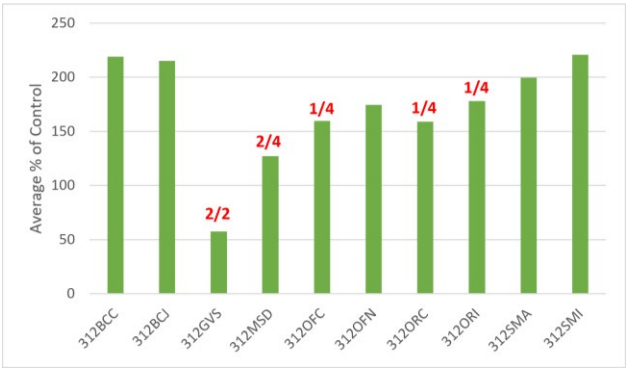
Detailed trend analysis results, including trend directions and statistical significance, can be found in **Appendix E**. A summary of these results is presented in **Table 3-105.**

Table 3-105. Summary of Toxicity and Trends in Hydrologic Unit 312

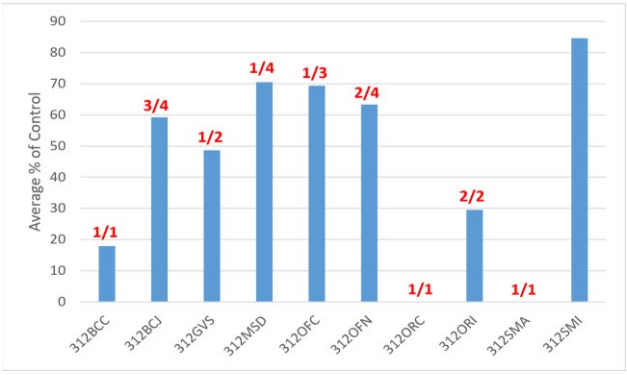
Site ID[1]	Algal Growth		*C. dilutus* - Survival		*C. dubia* - Reproduction		*C. dubia* - Survival		*H. azteca* - Growth		*H. azteca* - Survival	
	# of Toxic Samples[2]	Trend[3]	# of Toxic Samples[2]	Trend[3]	# of Toxic Samples[2]	Trend[3]	# of Toxic Samples[2]	Trend[3]	# of Toxic Samples[2]	Trend[3]	# of Toxic Samples[2]	Trend[3]
312BCC	0/1	Increasing	1/1	Increasing	0/1	Increasing	0/1	**Increasing**	0/0	Decreasing	0/0	Decreasing
312BCJ	0/4	Increasing	3/4	Increasing	1/4	Increasing	0/4	**Increasing**	1/1	**Increasing**	1/1	**Increasing**
312GVS	2/2	Increasing	1/2	Increasing	2/2	Increasing	1/2	Increasing	0/0	Increasing	0/0	Increasing
312MSD	2/4	Increasing	1/4	Increasing	3/4	Increasing	1/4	Increasing	0/1	**Increasing**	1/1	Increasing
312OFC	1/4	Increasing	1/3	Decreasing	3/3	None[4]	1/4	Decreasing	0/1	Increasing	1/1	Increasing
312OFN	0/4	Increasing	2/4	None[4]	2/4	Decreasing	1/4	Decreasing	0/1	Increasing	0/1	**Increasing**
312ORC	1/4	Increasing	1/1	Decreasing	1/1	Increasing	0/4	**Increasing**	1/1	**Increasing**	0/1	**Increasing**
312ORI	1/4	Increasing	2/2	Decreasing	1/2	Increasing	2/4	Decreasing	1/1	**Increasing**	1/1	Increasing
312SMA	0/3	Increasing	1/1	Increasing	1/1	Increasing	1/3	**Increasing**	0/0	Increasing	0/0	**Increasing**
312SMI	0/1	Increasing	0/1	Decreasing	0/1	Increasing	0/1	Increasing	0/0	None[5]	0/0	None[5]

Notes:

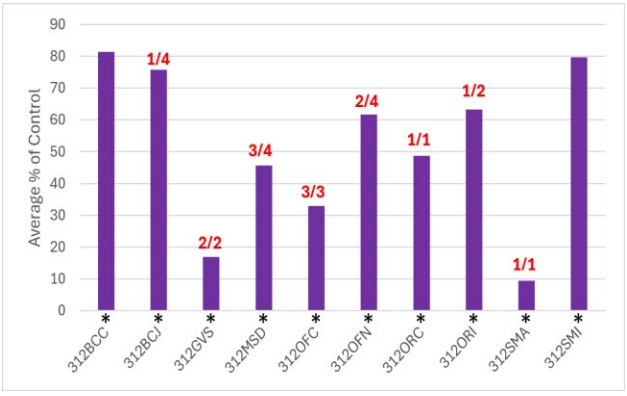
1. Refer to Section 2.1, Table 2-1, Core Monitoring Locations, 2023, for detailed site descriptions.
2. If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.
3. Increasing/decreasing trends pursuant to the results of a Mann Kendall Analysis. **Bold** trends are statistically significant (α =0.05)
4. None = No monotonic trend (i.e., increasing or decreasing) was identified.
5. None = No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.



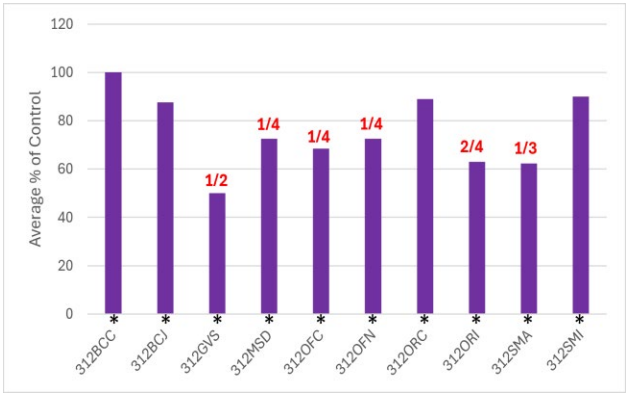
a) Algal Toxicity in Water – Growth



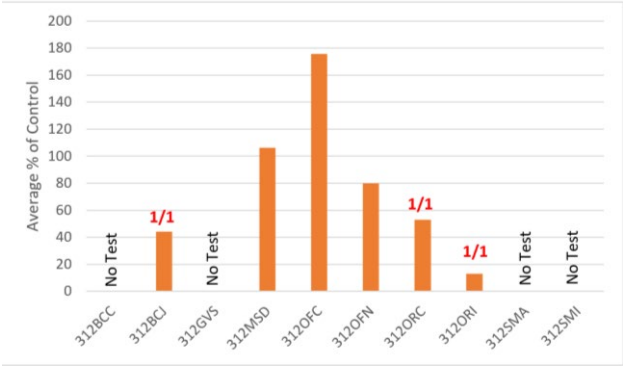
b) *C. dilutus* Toxicity in Water – Survival



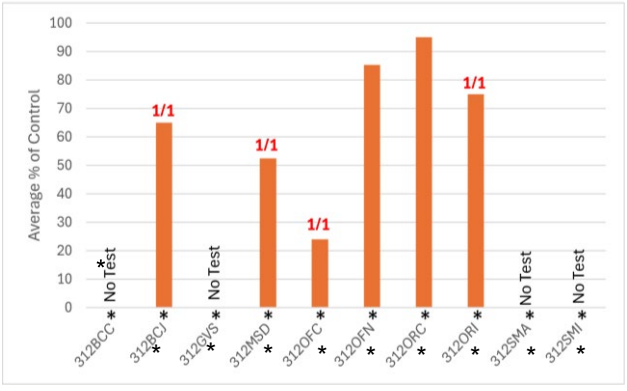
c) Invertebrate Toxicity in Water – Reproduction



d) Invertebrate Toxicity in Water – Survival



e) Invertebrate Toxicity in Sediment – Growth



f) Invertebrate Toxicity in Sediment – Survival

Figure 3-52. Results for Aquatic Toxicity (water and sediment) Monitoring in the Santa Maria Region

Notes:

1. Bars represent the mean survival, reproduction, or growth rate for all 2023 samples at each site, as compared to laboratory controls.
2. There are generally four water toxicity sampling events for algae and invertebrates and two sediment toxicity events scheduled for each site each year.
3. "No Test" indicates sites where no toxicity samples were collected due to dry channel or ponded conditions.
4. Results >100% indicate organism performance rates in the environmental sample were greater than in the control.
5. If a site experienced "significant toxicity" red fractions indicate the number of significantly toxic samples relative to the total number of toxicity samples collected (e.g., 1/2 indicates the site had two samples collected, one of which was significantly toxic.)
6. *C. dubia* reproduction graphs generally reflect *C. dubia* tests but in some cases reflect a salinity-tolerant alternate test species, which in some cases test for "growth" instead of "reproduction" as the sub-lethal endpoint.

* Site with an applicable TMDL limit for a given test species and endpoint.

3.6 SAN ANTONIO (HU 313) AND SANTA YNEZ (HU 314) HYDROLOGIC UNIT

Descriptions of the Santa Ynez HU are summarized from the State Water Resources Control Board's (SWRCB) Surface Water Ambient Monitoring Program (SWAMP) *Assessment Report for the Central Coast Region* (SWRCB 2007a). Descriptions of the San Antonio HU are summarized from the *Santa Barbara County Integrated Regional Water Management Plan* (County of Santa Barbara 2019).

The Santa Ynez River Watershed drains approximately 574,885 acres originating in the Santa Ynez Mountains of Los Padres National Forest and is the only major watershed within the Santa Ynez HU. The Santa Ynez River Watershed is the largest drainage system wholly located in Santa Barbara County, draining about 40 percent of the mainland part of the County. The San Antonio Creek Watershed drains approximately 105,600 acres. The San Antonio Creek Watershed starts at a point approximately 10 miles east of Los Alamos, where it then traverses to the northwest through Los Alamos and Vandenberg Space Force Base to the ocean. The lower reaches of San Antonio Creek on Vandenberg Space Force Base have a perennial flow primarily due to surfacing of an impermeable geologic unit near Barka Slough, which forces groundwater into the creek.

The Santa Ynez River Watershed is the primary source of water for about two-thirds of Santa Barbara County residents. Three reservoirs have been created along the river course. The Jamison and Gibraltar Reservoirs are located within Los Padres National Forest. Major tributaries to the river above these reservoirs include North Fork Juncal Creek, Agua Caliente Canyon Creek, Mono Creek, and Indian Creek. Cachuma Reservoir is located along Highway 154. Major tributaries to the river between Gibraltar and Cachuma dam include Santa Cruz Creek and Cachuma Creek. The lower reaches of the river flow through Vandenberg Space Force Base property to the ocean at Surf Beach. Major tributaries below Cachuma Dam include Santa Aguenda Creek, Alamo Pintado Creek, Zaca Creek, Santa Rosa Creek, and Salsipuedes Creek.

Land uses that may impact water quality in the Santa Ynez River Watershed include recreation (numerous campground and day use areas along the river in the National Forest and at Lake Cachuma), grazing, dry land agriculture, viticulture, and rural residential areas (including many horse facilities). Urban and residential areas in the watershed include Solvang, Buellton, and Lompoc. The City of Lompoc's wastewater treatment plant (WWTP) discharges to the river via San Miguelito Creek. The Santa Ynez River below Lompoc is dominated by the treated wastewater discharge during periods of low natural flow. The primary land uses in the San Antonio Creek Watershed include ranching and agricultural cultivation, with annual or vegetable crops in the flat areas, wine grapes in the transitional uplands, and dry farming. Irrigated crops depend on groundwater supply.

Monitoring for the CMP in the Santa Ynez HU was initiated in January 2006. There are three core CMP sites in the Santa Ynez HU, all of which are located on the Santa Ynez River. The most upstream site (314SYR, previously 314SYL) is located just upstream of Lompoc. This site is influenced by agricultural uses primarily concentrated along approximately 20 miles of river stretching upstream to the town of Santa Ynez. The middle site is located just downstream of Lompoc (314SYF) and the Lompoc WWTP discharge point. The most downstream site (314SYN) is located below an area dominated by approximately nine square miles of intensive agricultural use, downstream and west of Lompoc. Monitoring for the CMP in San Antonio HU was initiated in January 2006. The only core CMP site in the San Antonio HU is located on San Antonio Creek, upstream of Barka Slough and immediately above San Antonio Road East ().

The Beneficial Uses designated by the Basin Plan for the Santa Ynez River and its estuary include nearly every Beneficial Use, with the only exceptions being preservation of biological habitats of special significance, estuarine habitat, and shellfish harvesting. The Beneficial Uses designated by the Basin Plan for San Antonio Creek include nearly every Beneficial Use except for industrial process and service supply, estuarine habitat, preservation of biological habitats of special significance, estuarine habitat, and shellfish harvesting (Table 2-2).

There are no TMDLs applicable to sites within the San Antonio and Santa Ynez HUs. However, non-TMDL area limits for turbidity, nutrients, and toxicity exist for sites within the San Antonio and Santa Ynez HUs. See **Appendix A** for a summary of applicable routine parameter non-TMDL area limits for sites in the San Antonio and Santa Ynez HUs.

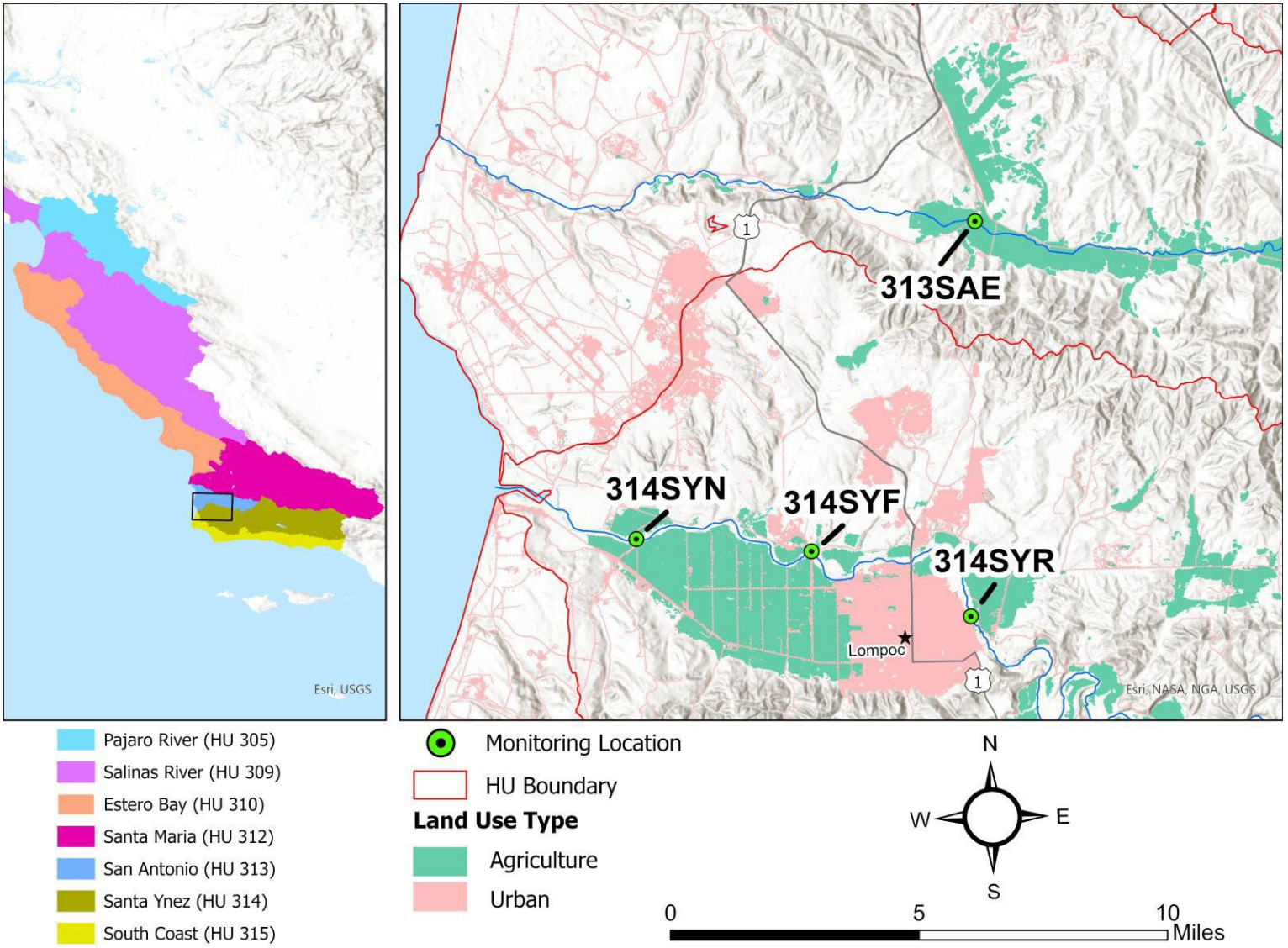


Figure 3-53. CMP Core Monitoring Sites and Distribution of Major Land Uses in the Santa Ynez and San Antonio Hydrologic Units

3.6.1 Flow Results

The flow regime in the Santa Ynez River Watershed is characterized by precipitation that occurs primarily from November through April. Flows typically decrease rapidly in May and the riverbed is often dry between June and November. Dry season flows in the upper Santa Ynez mainstem are due to outflows from Lake Cachuma, which were historically around 40 to 60 CFS. During the 2023 monitoring year, the annual average flow (541.76 CFS) at the *Santa Ynez River near Narrows* USGS stream gage was considerably higher than the historic annual average (110.31 CFS, 1953-2022) and ranged from 6.78 CFS (November 9, 2023) to 16053.44 CFS (February 25, 2023) (USGS 2023)[1]. The 2023 cumulative annual rainfall (19.88") at the *Santa Ynez* rain gauge was higher than the historic average (16.09", 1986-2022) (**Figure 3-54**) (CDWR 2023).
Above average flow and rain were likely caused by several, relatively large atmospheric rivers early in the year. More frequent releases were required in 2023 to maintain the Lake Cachuma storage capacity.

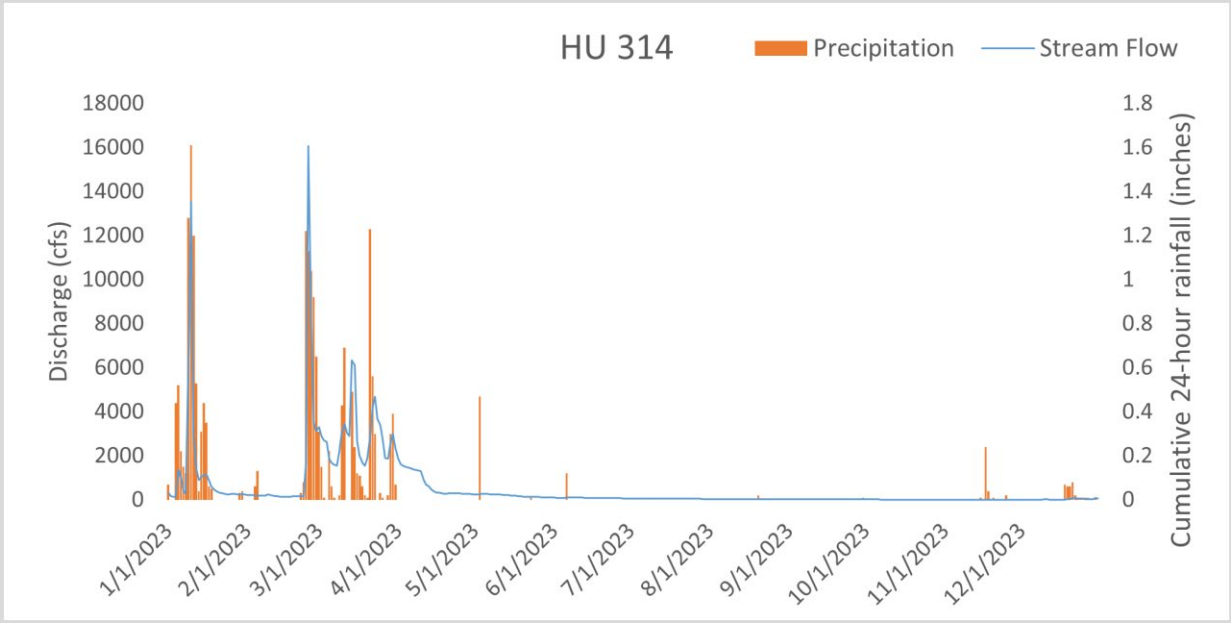


Figure 3-54. 2023 Hydrograph and Total Daily Precipitation Record for Santa Ynez River near Narrows

[1] USGS data contains provisional values, subject to revision; flow values may have been updated since the publishing of this report.

In 2023, flows measured at the four San Antonio and Santa Ynez HU monitoring sites were generally influenced by wet season precipitation with elevated flows occurring in March and April. **Figure 3-55** depicts annual median flow for sites within the San Antonio and Santa Ynez HUs for 2023 and **Table 3-106** presents descriptive statistics.

- During 2023, measured flows ranged from negative flow (-0.29 CFS) due to tidal influence at Santa Ynez River at 13th St. (314SYN), to 5566.38 CFS at Santa Ynez River at River Park (314SYR).
- San Antonio Creek (313SAE) was dry or disconnected for eight months of the monitoring year.
- Median flows during 2023 ranged from no flow at San Antonio Creek (313SAE) to 109.81 CFS at Santa Ynez River at Floradale Ave. (314SYF).
- For the period of 2005-2023, the San Antonio Creek (313SAE) showed increasing trends whereas Santa Ynez River at Floradale Ave (314SYF) showed statistically significant decreasing trends in flow.

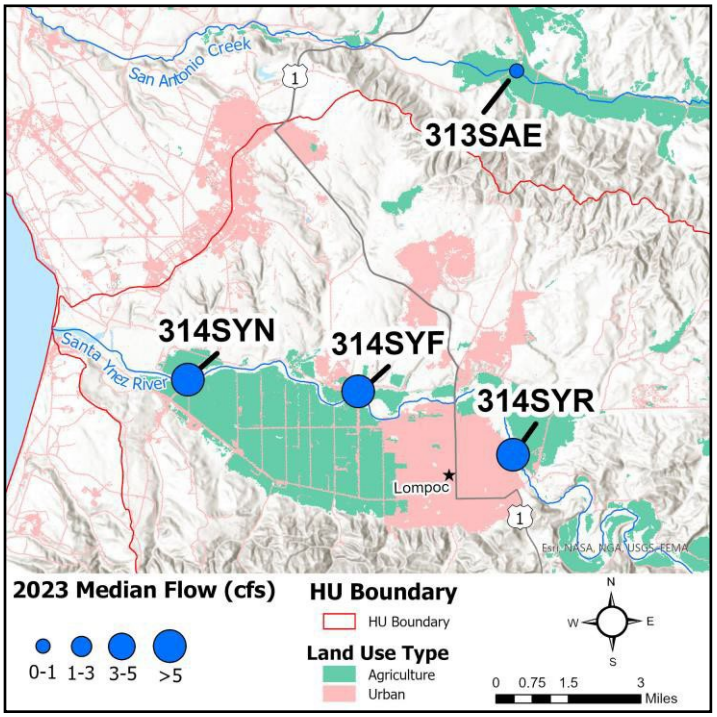


Figure 3-55. 2023 Median Flows for Sites in HUs 313 and 314

Table 3-106. Descriptive Statistics for Flow in Hydrologic Unit 313 and 314 (CFS)

Site ID[1]	N	Min	Max	Mean	Median	Trend[2]
313SAE	12	-0.01	338.53	44.72	0.00	**Increasing**
314SYF	6	3.47	820.52	230.23	109.81	**Decreasing**
314SYN	12	-0.29	4909.59	757.39	69.72	Decreasing
314SYR	12	0.63	5566.38	638.05	41.07	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.6.2 Water Temperature

The Basin Plan contains a general Water Quality Objective for temperature: natural receiving water temperature of intrastate waters shall not be altered. The Basin Plan also has specific objectives for cold and warm water habitats: At no time or place shall the temperature be increased by more than 5°F above natural receiving water temperature. Water temperature can influence the results of other field measurements including dissolved oxygen, pH, and conductivity and therefore is an important factor to consider when interpreting results. The temperature of certain water bodies can also fluctuate greatly over a 24-hour period. This fluctuation means that results and trends should be interpreted with discretion as they can be affected by the time of day at which the sample is collected.

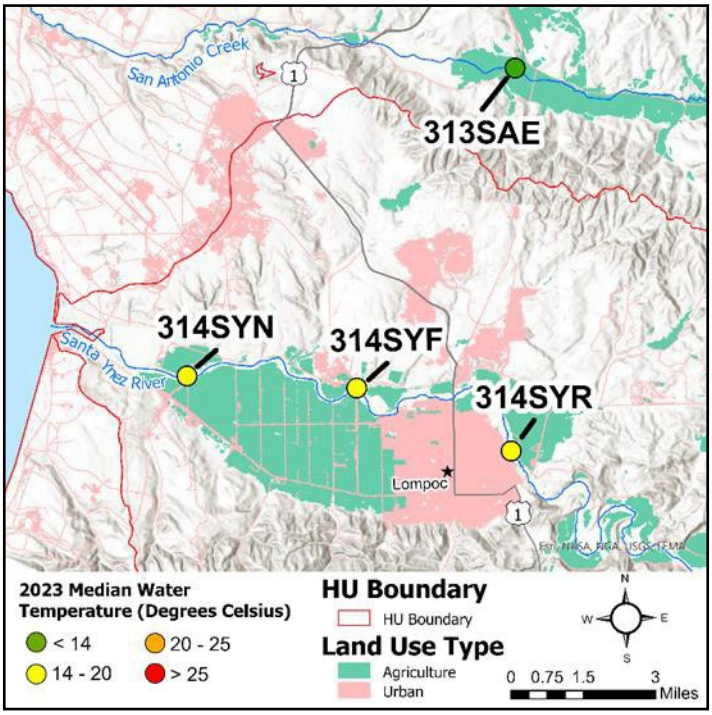


Figure 3-56. 2023 Median Water Temperature for Sites in HUs 313 and 314

Temperature of natural receiving waters has not been defined for waterbodies within the San Antonio and Santa Ynez HUs; therefore, the focus of this report is descriptive statistics. The maximum mean expected summer background temperature is 21.9°C for the San Antonio HU and 23.7°C for the Santa Ynez HU (Hill et al. 2013). **Figure 3-56** depicts annual median temperatures for sites in the San Antonio and Santa Ynez HUs for 2023, and **Table 3-107** presents descriptive statistics.

- Median temperatures in the San Antonio and Santa Ynez HUs ranged from 11.7°C to 19.15°C in 2023.
- The lowest water temperature (9.5°C) was measured at San Antonio Creek (313SAE) and the highest water temperature (27.3°C) was observed at Santa Ynez River at River Park (314SYR).
- For the period of 2005-2023, one site (Santa Ynez River at Floradale [314SYF]) showed a statistically significant increasing trend in water temperature.

Table 3-107. Descriptive Statistics for Water Temperature in Hydrologic Unit 313 and 314 (°C)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
313SAE	4	9.50	20.50	13.35	11.70	Increasing
314SYF	6	10.20	21.40	16.78	19.15	**Increasing**
314SYN	12	9.70	24.10	16.82	16.60	Increasing
314SYR	12	10.20	27.30	17.98	18.25	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.6.3 Turbidity and TSS Results

All sites in the Santa Ynez and San Antonio HUs have a cold water Beneficial Use, with a non-TMDL area turbidity limit of 25 NTU. See **Table 2-5** and **Appendix A** for a summary of applicable non-TMDL area limits for turbidity in the San Antonio and Santa Ynez HUs. **Figure 3-57** depicts annual median turbidity concentrations and TSS loading for sites in the Santa Ynez and San Antonio HUs for 2023, and **Table 3-108** and **Appendix B** present descriptive statistics and turbidity limit exceedances for turbidity.

- The minimum turbidity (1 NTU) was measured in the Santa Ynez River at River Park (314SYR) and the maximum turbidity (9999 NTU) was observed at San Antonio Creek (313SAE).
- In 2023, median turbidity levels in the San Antonio and Santa Ynez HUs ranged from 5 NTU (Santa Ynez River at River Park [314SYR]) to 999 NTU (San Antonio Creek [313SAE]).

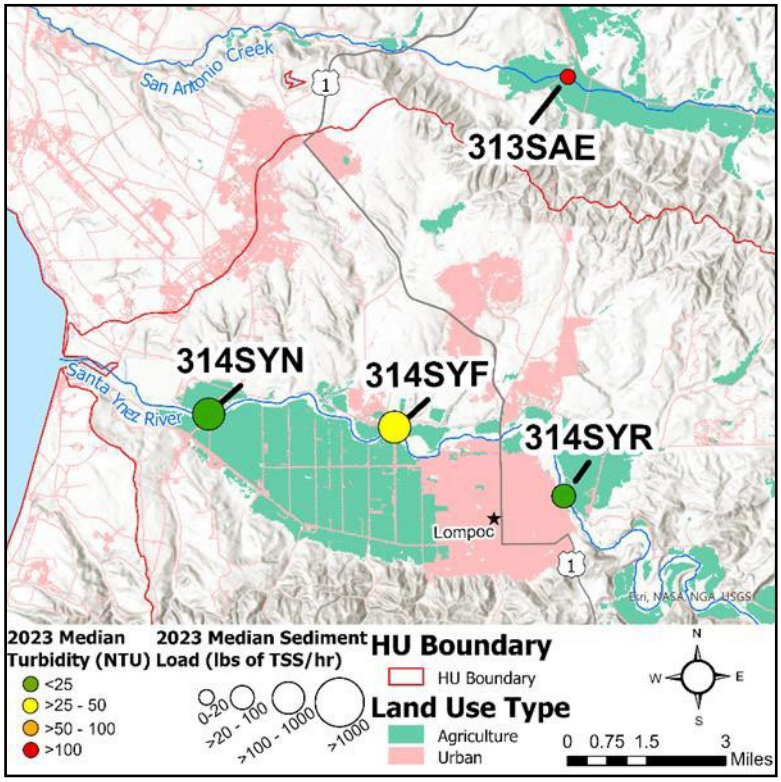


Figure 3-57. 2023 Median Turbidity and TSS Loading for Sites in HUs 313 and 314

- All sites exceeded the turbidity limit in at least 25% of samples with San Antonio Creek (313SAE) exceeding the limit in 100% of samples.
- Moderate median flows and lower TSS concentrations, apart from San Antonio Creek (313SAE), resulted in overall TSS loadings throughout the Santa Ynez HU (**Appendix B**).
- For the period of 2005-2023, all three Santa Ynez River sites showed a statistically significant increasing trends in turbidity.
- For the period of 2012-2023, all four sites showed statistically significant increasing trends in TSS loading. TSS was not monitored prior to 2012, so the period of record for TSS trend analysis is shorter than that for turbidity and flow.

Table 3-108. Descriptive Statistics for Turbidity in Hydrologic Unit 313 and 314 (NTU)

Site ID[1]	N[3]	Min	Max	Mean	Median	Non-TDML Area Limit Percent Exceedance[2]	Turbidity Trend[4,5]	TSS Loading Trend[4,5]
313SAE	4	57	999	763.4	999	100%	Increasing	**Increasing**
314SYF	6	9	999	207	26	50%	**Increasing**	**Increasing**
314SYN	12	4	999	184	19	25%	**Increasing**	**Increasing**
314SYR	12	1	999	154	5	33%	**Increasing**	**Increasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 The relevant numeric criterion is 25.0 NTU [COLD].

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant (α = 0.05).

5 Turbidity was monitored from 2005-2023 and TSS was monitored from 2012-2023.

3.6.4 Unionized Ammonia and Total Ammonia

All sites within the San Antonio and Santa Ynez HUs have a non-TMDL area unionized ammonia limit of 0.025 mg/L (**Appendix A**). See **Table 2-5** and **Appendix A** for a summary of applicable annual TMDL and non-TMDL area limits for unionized ammonia in the San Antonio and Santa Ynez HUs. **Figure 3-58** depicts annual median unionized ammonia concentrations for sites in the Santa Ynez and San Antonio HUs for 2023, **Table 3-109** presents descriptive statistics, and **Table 3-110** and **Appendix B** present non-TMDL area limit exceedances.

Samples were also collected and analyzed for total ammonia. There is currently no TMDL limit, non-TMDL area limit, or Basin Plan numeric Water Quality Objective for total ammonia applicable to CMP sites in the Santa Ynez and San Antonio HU. Therefore, the focus of this report is descriptive statistics, which are presented in **Table 3-111**.

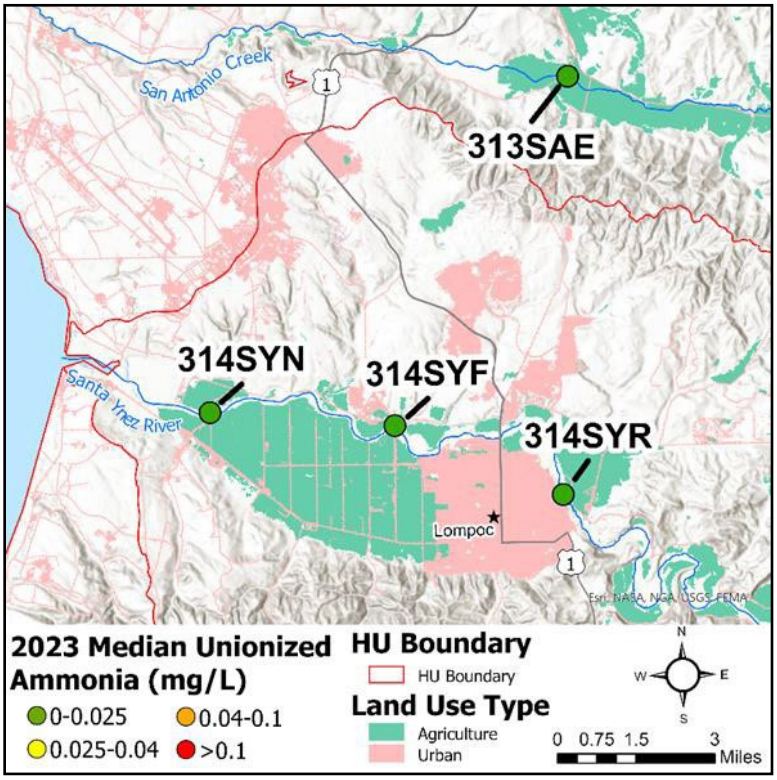


Figure 3-58. 2023 Median Unionized Ammonia for Sites in HUs 313 and 314

- In 2023, unionized ammonia concentrations in the San Antonio and Santa Ynez HUs ranged from 0.0002 mg/L at Santa Ynez River at River Park (314SYR) to 0.0725 mg/L at the San Antonio Creek (313SAE).
- Median unionized ammonia concentrations in 2023 ranged from 0.0011 mg/L at San Antonio Creek (313SAE) and Santa Ynez River at River Park (314SYR) to 0.0017 mg/L at Santa Ynez River at 13th St. (314SYN).
- For the period of 2005-2023, two sites (Santa Ynez River at Floradale Ave. [314SYF] and San Ynez River at River Park [314SYR]) showed a statistically significant decreasing trend in unionized ammonia concentrations.

Table 3-109. Descriptive Statistics for Unionized Ammonia in Hydrologic Unit 314 (mg/L as N)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
313SAE	4	0.0004	0.0725	0.0188	0.0011	Decreasing
314SYF	6	0.0007	0.0055	0.0021	0.0015	**Decreasing**
314SYN	12	0.0004	0.0085	0.0025	0.0017	Increasing
314SYR	12	0.0002	0.0050	0.0015	0.0011	**Decreasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant (α = 0.05).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- All sites except for San Antonio Creek at San Antonio Road East (313SAE) met the unionized ammonia non-TMDL Area limit of 0.025 mg/L for all sampling events. San Antonio Creek at San Antonio Road East (313SAE) exceeded the non-TMDL area limit in 25% of samples.

Table 3-110. Summary of Non-TMDL Area Nutrient Limit Exceedances for Unionized Ammonia in Hydrologic Units 313 and 314

Site ID[1]	Non-TMDL Area Limit Percent Exceedance[2]
313SAE	25%
314SYF	0%
314SYN	0%
314SYR	0%

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations,* 2023, for detailed site descriptions.
2 The relevant numeric criterion is 0.025 mg/L.

- The spatial distribution and relative magnitudes of total ammonia concentrations were similar to unionized ammonia concentrations, except for San Antonio Creek at San Antonio Road East (313SAE) which switched from having a low median concentration of unionized ammonia to having the highest median total ammonia concentration.
- For the period of 2005-2023, two sites (Santa Ynez River at Floradale Ave. [314SYF] and River Park [314SYR]) showed statistically significant decreasing trends in total ammonia concentrations.

Table 3-111. Descriptive Statistics for Total Ammonia in Hydrologic Unit 314 (mg/L as N)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
313SAE	4	0.0256	0.6430	0.2284	0.1225	Increasing
314SYF	6	0.0370	0.0990	0.0613	0.0560	**Decreasing**
314SYN	12	0.0190	0.2960	0.0755	0.0500	Increasing
314SYR	12	0.0035	0.0709	0.0304	0.0234	**Decreasing**

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.6.5 Nitrate and Total Nitrogen

Samples were collected and analyzed for "nitrate + nitrite"; however, this report primarily refers to "nitrate" as nitrite levels are assumed to be very low. All sites within the San Antonio and Santa Ynez HUs are located outside of a nutrient TMDL are and therefore have a non-TMDL area limit for nitrate. See **Table 2-5** and **Appendix A** for a summary of applicable non-TMDL area limits for nitrate in the San Antonio and Santa Ynez HUs. **Figure 3-59** depicts annual median nitrate concentrations and loading for sites in the Santa Ynez and San Antonio HUs for 2023, **Table 3-112** presents descriptive statistics, and **Table 3-113** and **Appendix B** present non-TMDL area limit exceedances for nitrate.

Samples were also collected and analyzed for total nitrogen. There is currently no TMDL limit, non-TMDL area limit, or Basin Plan numeric Water Quality Objective for total nitrogen applicable to CMP sites in the Santa Ynez and San Antonio HUs. Therefore, the focus of this report is descriptive statistics, which are presented in **Table 3-114**.

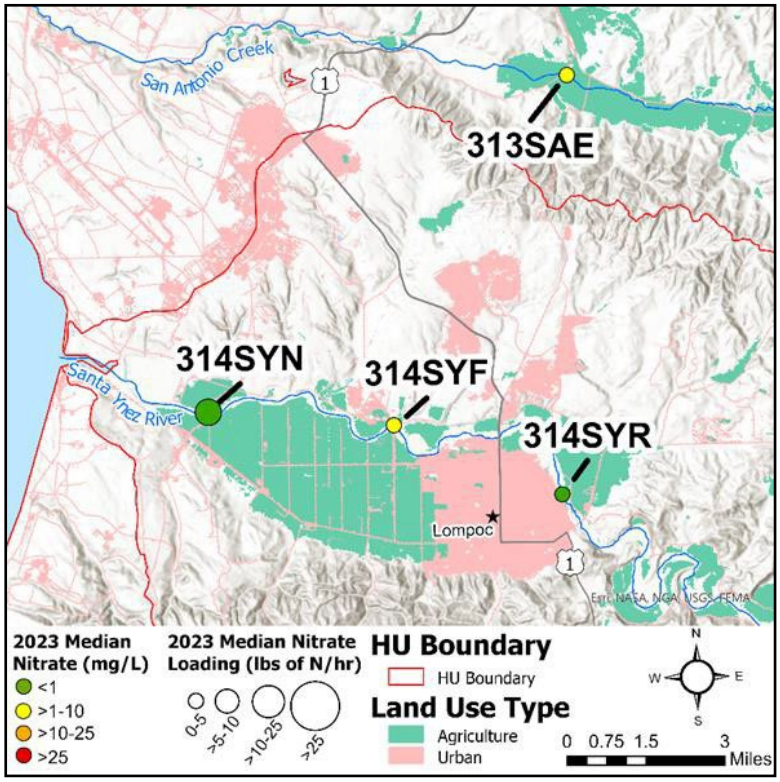


Figure 3-59. 2023 Median Nitrate as N for Sites in HUs 313 and 314

- Nitrate concentrations in the Santa Ynez and San Antonio HUs ranged from 0.01 mg/L at Santa Ynez at Floradale Ave (314SYF) and at River Park (314SYR) to 8.12 mg/L at San Antonio Creek (313SAE).
- Median nitrate concentrations in the Santa Ynez and San Antonio HUs for 2023 ranged from 0.03 mg/L at the Santa Ynez River at River Park (314SYR) to 5.37 mg/L in San Antonio Creek (313SAE).
- Low median flows and nitrate concentrations resulted in low nitrate loading throughout the Santa Ynez HU. (**Appendix B**).
- For the period of 2005-2023, two Santa Ynez River sites (314SYF and 314SYN) showed statistically significant decreasing trends in nitrate concentration. Santa Ynez River at Floradale Ave. (314SYF) also showed a statistically decreasing trend in nitrate loading. Santa Ynez at River Park (314SYR) depicted a statistically increasing trend. San Antonio Creek (313SAE) depicted a significant increasing trend in nitrate loading.

Table 3-112. Descriptive Statistics for Nitrate in Hydrologic Unit 313 and 314 (mg/L as N)

Site ID[1]	N[3]	Min	Max	Mean	Median	Nitrate Trend[2]	Nitrate Loading Trend[2]
313SAE	4	1.57	8.12	5.11	5.37	Decreasing	**Increasing**
314SYF	6	0.01	4.68	1.81	1.05	**Decreasing**	**Decreasing**
314SYN	12	0.17	2.17	0.88	0.64	**Decreasing**	Decreasing
314SYR	12	0.01	1.36	0.34	0.03	**Increasing**	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant (α = 0.05).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- All four sites in the San Antonio and Santa Ynez HUs met the 10 mg/L non-TMDL area limit for nitrate.

Table 3-113. Summary of Non-TMDL Area Nutrient Limit Exceedances for Nitrate in Hydrologic Units 313 and 314

Site ID[1]	Non-TMDL Area Limit Percent Exceedance[2]
313SAE	0%
314SYF	0%
314SYR	0%
314SYN	0%

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations,* 2023, for detailed site descriptions.

2 The relevant numeric criterion is 10.0 mg/L.

- Median total nitrogen concentrations ranged from 0.5 mg/L at Santa Ynez River at River Park (314SYR) to 11.0 mg/L at San Antonio Creek (313SAE).

- For the period of 2005-2023, no sites showed a statistically significant trend in total nitrogen.

Table 3-114. Descriptive Statistics for Total Nitrogen in Hydrologic Unit 313 and 314 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
313SAE	4	9.2	26.3	14.4	11.0	Increasing
314SYF	6	0.6	8.4	3.0	1.5	Increasing
314SYN	12	0.5	9.1	2.6	1.5	Increasing
314SYR	12	0.0	5.5	1.1	0.5	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant (α = 0.05).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.6.6 Orthophosphate and Total Phosphorus

There is currently no applicable TMDL limit, non-TMDL Area limit, or numeric Water Quality Objective for orthophosphate as P or total phosphorus in the Basin Plan applicable to CMP sites in the San Antonio and Santa Ynez HUs. **Figure 3-60** depicts annual median orthophosphate concentrations for sites in the Santa Ynez and San Antonio HUs in 2023. **Table 3-115** and **Table 3-116** present descriptive statistics for orthophosphate and total phosphorus, respectively.

- Orthophosphate concentrations in the Santa Ynez and San Antonio HUs for 2023 ranged from 0.020 mg/L at Santa Ynez River at River Park (314SYR) to 4.570 mg/L at the Floradale Ave. site (314SYF).
- In 2023, the median orthophosphate concentrations ranged from 0.048 mg/L at the Santa Ynez River at River Park site (314SYR) to 1.735 mg/L at the San Antonio Creek site (313SAE).
- For the period of 2005-2023, one site (Santa Ynez River at River Park [314SYR]) showed a statistically significant decreasing trend in orthophosphate concentrations.

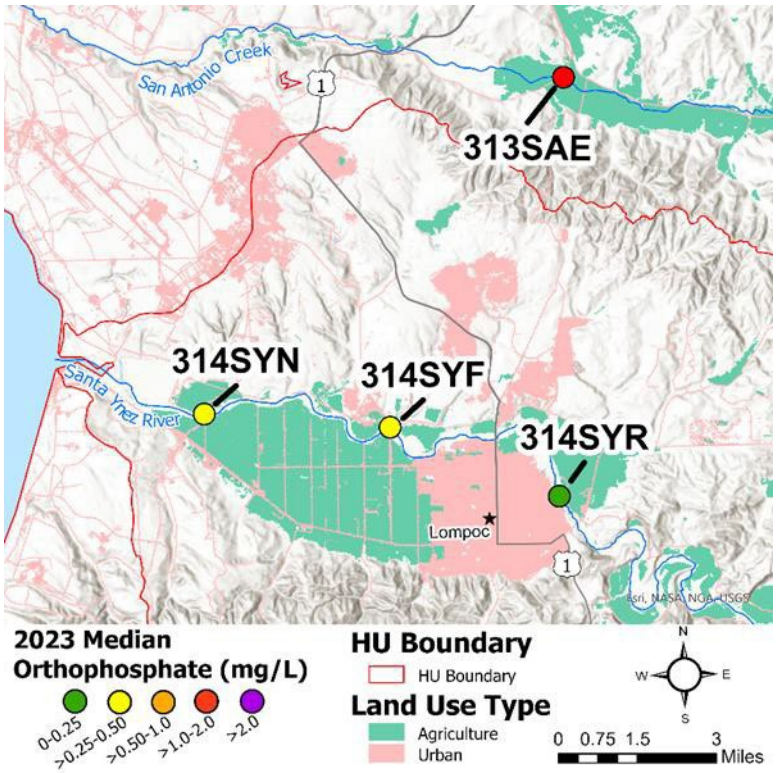


Figure 3-60. 2023 Median Orthophosphate as P for Sites in HUs 313 and 314

Table 3-115. Descriptive Statistics for Orthophosphate as P in Hydrologic Unit 314 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
313SAE	4	1.300	2.020	1.698	1.735	Increasing
314SYF	6	0.178	4.570	1.107	0.325	Increasing
314SYN	12	0.133	2.560	0.746	0.442	Decreasing
314SYR	12	0.020	0.162	0.061	0.048	**Decreasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant (α = 0.05).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- The spatial distribution and relative magnitudes of total phosphorus concentrations were similar to orthophosphate concentrations.
- Median concentrations for total phosphorus ranged from 0.117 mg/L at Santa Ynez River at River Park (314SYR) to 7.060 mg/L at San Antonio Creek (313SAE).
- The maximum total phosphorus concentration at any Santa Ynez or San Antonio HU site was observed at San Antonio Creek (313SAE) (13.300 mg/L).
- For the period of 2005-2023, no sites showed statistically significant trends in total phosphorus concentrations.

Table 3-116. Descriptive Statistics for Total Phosphorus in Hydrologic Unit 314 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
313SAE	4	1.740	13.300	7.290	7.060	Increasing
314SYF	6	0.179	5.240	1.992	0.929	Decreasing
314SYN	12	0.373	5.570	1.554	1.008	N/A[4]
314SYR	12	0.051	4.700	0.626	0.117	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 No monotonic trend (i.e., increasing or decreasing) was identified.

3.6.7 Specific Conductivity

A conductivity objective to protect agricultural uses applies to all CMP monitoring sites in the Santa Ynez and San Antonio HUs. This agricultural objective does not define a numeric value to evaluate exceedance frequencies, but provides ranges:

- <750 µS/cm, "No Problem";
- 750-3,000 µS/cm, "Increasing Problems" and
- >3,000 µS/cm, "Severe".

Figure 3-61 depicts annual median conductivity for sites within the Santa Ynez and San Antonio Creek HUs in 2023 and **Table 3-117** presents descriptive statistics.

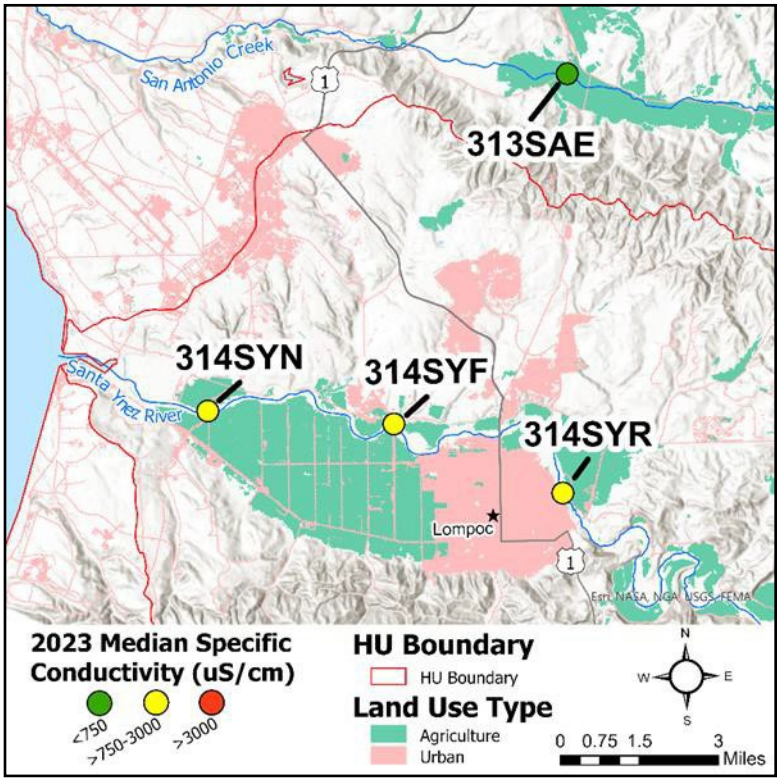


Figure 3-61. 2023 Median Conductivity for Sites in HUs 313 and 314

- The lowest conductivity measurement (357 µS/cm) was recorded at San Antonio Creek (313SAE) and the highest (31,530 µS/cm) was recorded at Santa Ynez River at 13th St. (314SYN).
- Median conductivities in the Santa Ynez and San Antonio HUs for 2023 ranged from 709 µS/cm at San Antonio Creek (313SAE) to 1,304 µS/cm at Santa Ynez River at 13th Street (314SYN).
- All sites within the Santa Ynez HU had median conductivities above the low-end of the listed ranges (750 µS/cm) and below the high-end of the listed ranges (3,000 µS/cm) indicating increasing problems. San Antonio Creek (313SAE) fell below the low-end range (709 µS/cm) indicating no problem.
- For the period of 2005-2023, Santa Ynez River at Floradale Ave. (314SYF) and Santa Ynez River at River Park (314SYR) showed statistically significant decreasing trends in conductivity.

Table 3-117. Descriptive Statistics for Conductivity in Hydrologic Unit 313 and 314 (µS/cm)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
313SAE	4	357	1,360	784	709	Decreasing
314SYF	6	444	1,554	1,107	1,143	**Decreasing**
314SYN	12	389	31,530	6,364	1,304	Increasing
314SYR	12	632	1,524	1,153	1,192	**Decreasing**

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.6.8 Total Dissolved Solids and Salinity

All three sites in the Santa Ynez HU have a TDS Water Quality Objective of 1,000 mg/L. The objective is applied as an annual average. One CMP monitoring site in the San Antonio HU (San Antonio Creek at San Antonio Rd East [313SAE]) does not have an applicable TDS Water Quality Objective. The Basin Plan contains no numeric Water Quality Objectives for the following analytes for CMP sites in Santa Ynez and San Antonio HUs: salinity, alkalinity, calcium, magnesium, sodium, potassium, sulfate, and chloride. No trend analyses were performed on the latter six analytes due to limited historical data associated with them. Therefore, the focus of this report is descriptive statistics. **Figure 3-62** depicts the median TDS concentrations for sites within the Santa Ynez and San Antonio HUs in 2023. **Table 3-118**, **Table 3-119**, **Table 3-120**, **Table 3-121**, **Table 3-122**, **Table 3-123**, **Table 3-124**, **Table 3-125**, and **Table 3-126** present descriptive statistics for TDS, salinity, alkalinity, calcium, magnesium, sodium, potassium, sulfate, and chloride, respectively.

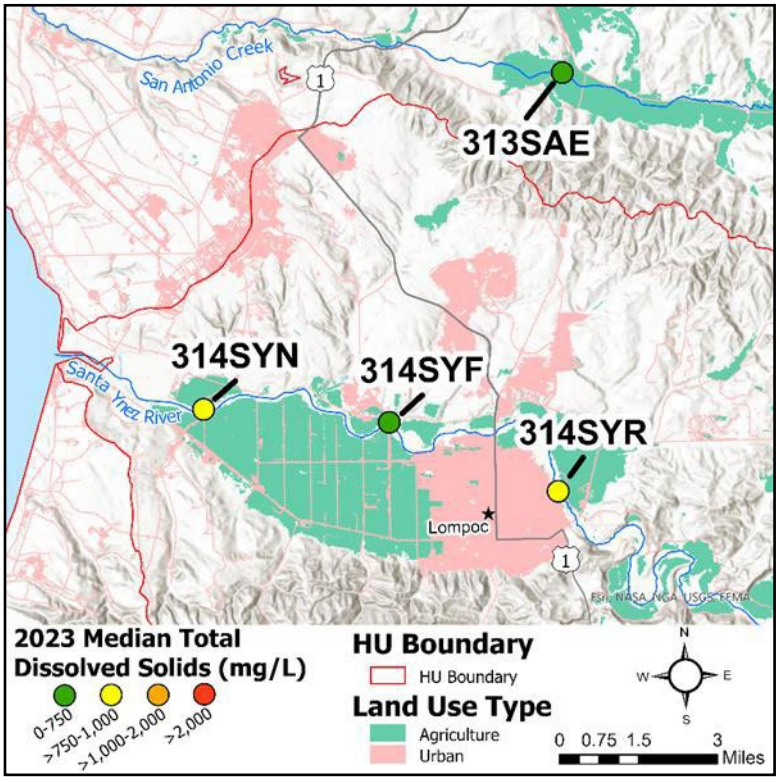


Figure 3-62. 2023 Median TDS for Sites in HUs 313 and 314

- Median TDS concentrations in the Santa Ynez and San Antonio HUs for 2023 ranged from 461 mg/L at Santa Antonio Creek (313SAE) to 848 mg/L at Santa Ynez River at 13th St. (314SYN).
- The maximum TDS measurement in the Santa Ynez and San Antonio HUs for 2023 was 20,509 mg/L at the 13th Street site (314SYN).
- One of the three Santa Ynez River sites (Santa Ynez River at 13th St. [314SYN]) did not meet the Water Quality Objective of 1,000 mg/L on a mean basis (4,132 mg/L).
- For the period of 2005-2023, two Santa Ynez River sites (Floradale Ave. [314SYF] and River Park [314SYR]) showed statistically significant decreasing trends in TDS concentration. The same two sites showed statistically significant decreasing trends in salinity.

Table 3-118. Descriptive Statistics for Total Dissolved Solids in Hydrologic Unit 313 and 314 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	WQO Exceedance?	Trend[2]
313SAE	4	180	885	497	461	N/A	Decreasing
314SYF	6	239	1,010	712	743	No	**Decreasing**
314SYN	12	253	20,509	4,132	848	Yes	Increasing
314SYR	12	320	990	742	775	No	**Decreasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

N/A There is no applicable Water Quality Objective for this site.

- The spatial distribution and relative magnitudes of salinity were similar to TDS concentrations.
- For the period of 2005-2023, two Santa Ynez River sites (Floradale Ave. [314SYF] and River Park [314SYR]) showed statistically significant decreasing trends in salinity.

Table 3-119. Descriptive Statistics for Salinity in Hydrologic Unit 313 and 314 (ppt)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
313SAE	4	0.17	0.69	0.39	0.35	Decreasing
314SYF	6	0.21	0.78	0.55	0.57	**Decreasing**
314SYN	12	0.19	19.70	3.84	0.65	Increasing
314SYR	12	0.31	0.77	0.58	0.59	**Decreasing**

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median alkalinity concentrations in the Santa Ynez HU ranged from 85 mg/L at San Antonio Creek (313SAE) to 261 mg/L at Santa Ynez River at River Park (314SYR).

Table 3-120. Descriptive Statistics for Alkalinity in Hydrologic Unit 313 and 314 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
313SAE	1	85	85	85	85
314SYN	4	188	265	231	235
314SYR	4	188	314	256	261
314SYF	2	115	240	178	178

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- The lowest concentration of calcium (34 mg/L) was measured at San Antonio Creek (313SAE), and the highest concentration (148 mg/L) was measured at Santa Ynez River at River Park (314SYR).
- Santa Ynez River at 13th St. (314SYN) had the highest median concentration (113 mg/L) in the Santa Ynez HU.

Table 3-121. Descriptive Statistics for Calcium in Hydrologic Unit 313 and 314 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
313SAE	1	34	34	34	34
314SYN	4	41	143	102	113
314SYR	4	71	148	108	106
314SYF	2	41	106	73	73

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median magnesium concentrations in the Santa Ynez HU ranged from 12 mg/L at San Antonio Creek (313SAE) to 50 mg/L at both Santa Ynez River at 13th St. (314SYN) and River Park (314SYR).

Table 3-122. Descriptive Statistics for Magnesium in Hydrologic Unit 313 and 314 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
313SAE	1	12	12	12	12
314SYN	4	19	93	53	50
314SYR	4	30	75	51	50
314SYF	2	20	46	33	33

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median sodium concentrations in the Santa Ynez HU ranged from 28 mg/L at San Antonio Creek (313SAE) to 84 mg/L at Santa Ynez River at 13th St. (314SYN).

Table 3-123. Descriptive Statistics for Sodium in Hydrologic Unit 313 and 314 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
313SAE	1	28	28	28	28
314SYN	4	20	561	187	84
314SYR	4	38	85	61	60
314SYF	2	28	62	45	45

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Potassium concentrations ranged from a minimum of 2.5 mg/L at all sites to a maximum of 28.0 mg/L at Santa Ynez River at 13th St. (314SYN).

Table 3-124. Descriptive Statistics for Potassium in Hydrologic Unit 313 and 314 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
313SAE	1	2.5	2.5	2.5	2.5
314SYN	4	2.5	28.0	10.0	4.7
314SYR	4	2.5	2.5	2.5	2.5
314SYF	2	2.5	2.5	2.5	2.5

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median sulfate concentrations ranged from 72 mg/L at San Antonio Creek (313SAE) to 336 mg/L at Santa Ynez River at 13th St. (314SYN). Santa Ynez River at 13th St. (314SYN) had the highest recorded concentration of sulfate (1,210 mg/L).

Table 3-125. Descriptive Statistics for Sulfate in Hydrologic Unit 313 and 314 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
313SAE	1	72	72	72	72
314SYF	2	102	305	204	204
314SYR	4	163	377	299	328
314SYN	4	88	1,210	492	336

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- The lowest and highest concentrations of chloride (11 mg/L and 2,490 mg/L, respectively) were measured at Santa Ynez River at 13th St. (314SYN).

Table 3-126. Descriptive Statistics for Chloride in Hydrologic Unit 313 and 314 (mg/L)

Site ID[1]	N[4]	Min	Max	Mean	Median
313SAE	1	26	26	26	26
314SYF	2	28	51	39	39
314SYR	4	31	90	59	59
314SYN	4	11	2,490	670	90

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.6.9 Dissolved Oxygen

The minimum DO Water Quality Objective for protection of cold water or spawning aquatic life Beneficial Uses (7 mg/L) applies to all CMP sites in the Santa Ynez and San Antonio HUs. **Figure 3-63** depicts annual median dissolved oxygen concentrations for sites within the Santa Ynez and San Antonio HUs in 2023, **Table 3-127** presents descriptive statistics for dissolved oxygen concentration, and **Table 3-128** presents descriptive statistics for oxygen saturation.

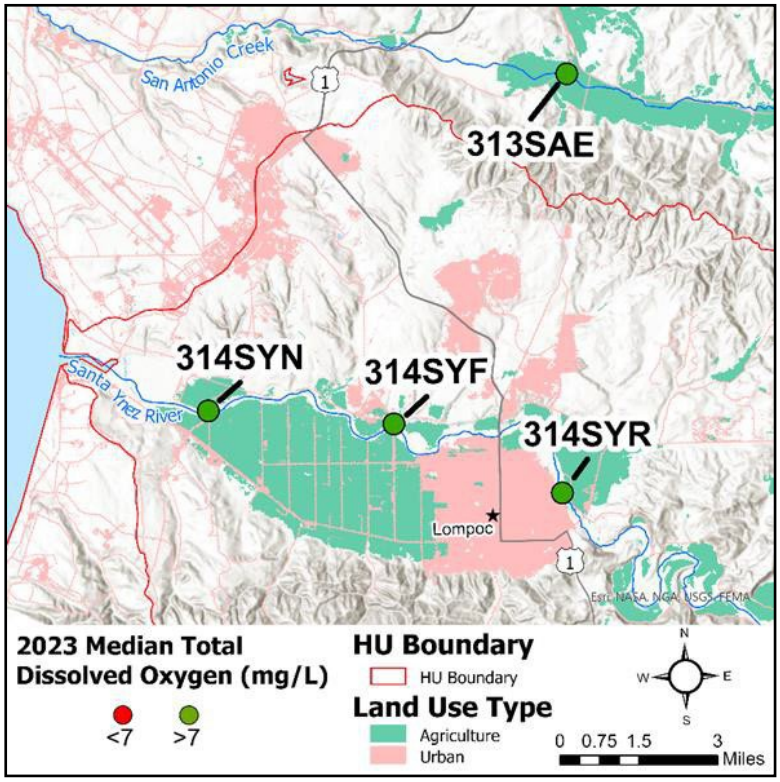


Figure 3-63. 2023 Median Dissolved Oxygen Concentrations for Sites in HUs 313 and 314

- Median DO concentrations in the Santa Ynez and San Antonio HUs for 2023 ranged from 9.51 mg/L at the 13th St. site (314SYN) to 12.59 mg/L at Santa Ynez River at River Park (314SYR).
- The lowest median DO concentration and percent saturation measured at the Santa Ynez River sites was at 13th Street (314SYN) – 9.51 mg/L and 95%, respectively.
- San Antonio Creek (313SAE) and Santa Ynez River at River Park (314SYR) both met the 7 mg/L minimum Water Quality Objective in all samples for 2023. Santa Ynez River at Floradale Ave. (314SYF) and Santa Ynez River at 13th St. (314SYN) exceeded the Water Quality Objective in 17% of samples.
- For the period of 2005 to 2023, two sites (Santa Ynez River at Floradale Ave [314SYF] andSanta Ynez River at River Park . [314SYR]) showed statistically significant increasing trends in DO concentrations.

Table 3-127. Descriptive Statistics for Dissolved Oxygen in Hydrologic Units 313 and 314 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Percent Exceedance	Trend[2]
313SAE	4	8.74	12.07	10.30	10.20	0%	Increasing
314SYF	6	6.99	12.80	10.37	10.50	17%	**Increasing**
314SYN	12	0.52	14.84	9.39	9.51	17%	Increasing
314SYR	12	9.30	16.22	12.37	12.59	0%	**Increasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- For the period of 2005-2023, Santa Ynez River at Floradale Ave. (314SYF) showed statistically significant trends in oxygen saturation.

Table 3-128. Descriptive Statistics for Oxygen Saturation in Hydrologic Units 313 and 314 (%)

Site ID[1]	N[3]	Min	Max	Mean	Median	WQO Exceedance?	Trend[2]
313SAE	4	89	106	98	98	N/A	Increasing
314SYF	6	79	130	106	108	N/A	**Increasing**
314SYN	12	6	177	99	95	N/A	Increasing
314SYR	12	87	167	131	130	N/A	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant (α = 0.05).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

N/A There is no applicable Water Quality Objective for this site.

3.6.10 pH

The Basin Plan pH objective applicable to all Santa Ynez River and San Antonio Creek HU sites is 7-8.3 standard pH units. **Figure 3-64** depicts annual median pH levels for sites within the Santa Ynez and San Antonio HUs in 2023 and **Table 3-129** presents descriptive statistics.

- In 2023, no site in the Santa Ynez and San Antonio HUs met the applicable pH Water Quality Objective. At the sites, no samples were below 7 pH units, but rather exceeded the 8.3 standard pH units Water Quality Objective.
- The minimum and maximum pH values measured in 2023 were 7.25 and 8.61 standard pH units, respectively, at Santa Ynez River at 13th St. (314SYN).
- Median pH for the Santa Ynez and San Antonio HU sites in 2023 ranged from 7.91 standard pH units at the San Antonio Creek site (313SAE) to 8.29 standard pH units at Santa Ynez River at River Park (314SYR).
- For the period of 2005-2023, one site showed statistically significant increasing trend in pH (Santa Ynez River at Floradale Ave. [314SYF]).

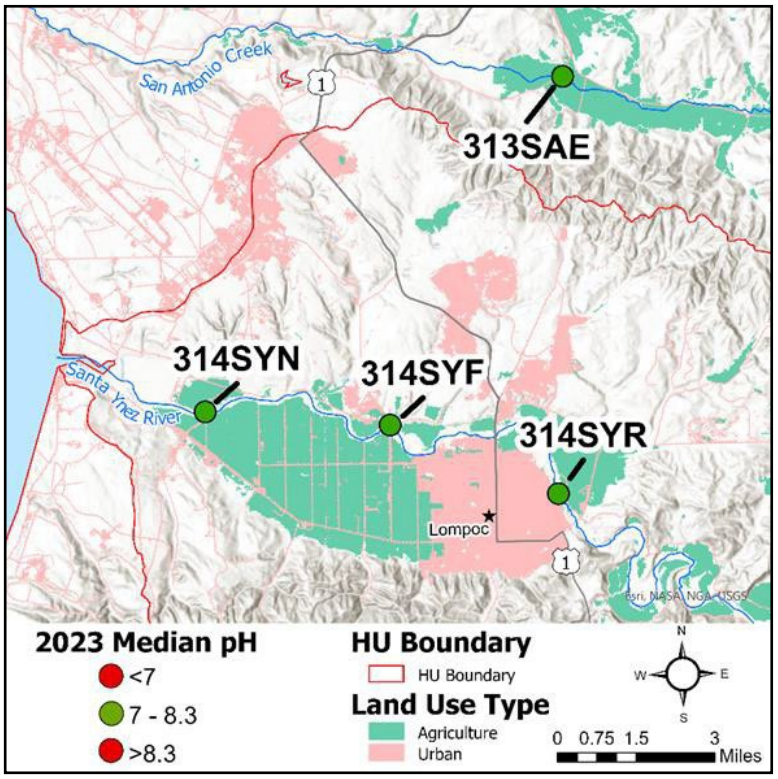


Figure 3-64. 2023 Median pH for Sites in HUs 313 and 314

Table 3-129. Descriptive Statistics for pH in Hydrologic Units 313 and 314 (pH units)

Site ID[1]	N[3]	Min	Max	Mean	Median	Percent Exceedance	Trend[2]
313SAE	4	7.29	8.55	7.92	7.91	25%	Decreasing
314SYF	6	7.56	8.45	8.05	8.13	33%	**Increasing**
314SYN	12	7.25	8.61	8.09	8.18	33%	Increasing
314SYR	12	7.99	8.50	8.27	8.29	50%	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023 for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.6.11 Aquatic Toxicity Results

The potential for toxic effects to aquatic and sediment-dwelling organisms is assessed by the CMP via bioassays for sensitive algal species (*S. capricornutum* growth) in water, and for sensitive invertebrate species in water (*C. dubia* reproduction and *C. dubia and C. dilutus* survival) and sediment (*H. azteca* growth and survival). Test organism survival and reproduction or growth is measured in environmental samples as well as in non-toxic control samples. A statistical test is then applied to determine significant differences in organism performance between environmental and control samples. When test organism performance is significantly lower in the environmental sample than in the control, *and* the difference exceeds a 20% effect threshold, a sample is determined to be "toxic" and in exceedance of the narrative Basin Plan objective for "no toxic substances in toxic amounts." All sites in the San Antonio and Santa Ynez HUs have a significant toxic effect non-TMDL area limit for survival, growth, and reproduction in water and sediment. *H. azteca* reproduction in sediment is not tested for by the CMP so is not included in the non-TMDL area limit exceedance discussion. No bioassays for the toxicity-related parameters were collected in the San Antonio HU due to dry conditions. See **Table 2-5** and **Appendix A** for a summary of applicable toxic effect non-TMDL area limits in the Santa Ynez HU. Results from aquatic and sediment bioassays conducted on samples from the Santa Ynez HU in 2023 are illustrated in Figure 3-65a-d and tabulated in **Table 3-130**.

- There was no significant toxicity (reduced growth in sample water relative to a non-toxic control) to algae in the Santa Ynez HU in 2023 (**Figure 3-65 a**).
- There was no significant mortality to *C. dilutus* in water was observed in the Santa Ynez River HU and San Antonio HU. No significant mortality in water to *C. dubia* was observed in the Santa Ynez HU in 2023 (**Figure 3-65 b, d**). All sites achieved the significant toxic effect non-TMDL area limit for *C. dubia* survival in water (**Figure 3-65 d**).
- Significant toxicity to invertebrate reproduction in water was observed in four samples out of the ten bioassays collected from Santa Ynez HU and San Antonio HU (**Figure 3-65 c**). Three sites (San Antonio Creek [313SAE], Santa Ynez River at Floradale Ave. [314SYF], and Santa Ynez at River Park [314SYR]) had one out of one, one out of two, and two out of three toxic samples, respectively. One site (Santa Ynez River at 13th St. [314SYN]) achieved the significant toxic effect non-TMDL area limit for reproduction in water (**Figure 3-65 c**).
- One sediment sample per site was collected at the Santa Ynez HU sites in 2023 and analyzed for sediment toxicity. Toxicity to invertebrate growth in sediment was not observed at any sites sampled. No toxicity to invertebrate survival in sediment was observed in any sites sampled (**Figure 3-65 e, f**). Due to dry conditions, there were no samples collected in San Antonio Creek (313SAE). All sites achieved the significant toxic effect non-TMDL area limit for growth in sediment (**Figure 3-65 e**). All sites achieved the significant toxic effect non-TMDL area limit for survival in sediment (**Figure 3-65 f**).
- For the period of 2005-2023, two statistically significant trends were identified:
    - One statistically significant increasing (improving, decreased toxicity) trend in toxicity to algae was observed at the Santa Ynez River at River Park (314SYR). (**Appendix E**).
    - One statistically significant decreasing (worsening, increased toxicity) trend in toxicity to invertebrate survival in sediment was observed at the Santa Ynez River at River Park (314SYR). (**Appendix E**).

Detailed trend analysis results, including trend directions and statistical significance, can be found in **Appendix E**. A summary of these results is presented in **Table 3-130**.

Table 3-130. Summary of Toxicity and Trends in Hydrologic Unit 313 and 314

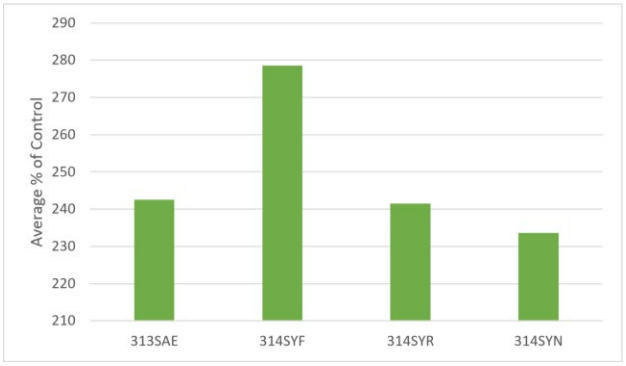
Site ID[1]	Algal Growth		*C. dilutus* - Survival		*C. dubia* - Reproduction		*C. dubia* - Survival		*H. azteca* - Growth		*H. azteca* - Survival	
	# of Toxic Samples[3]	Trend[2]	# of Toxic Samples[3]	Trend[2]	# of Toxic Samples[3]	Trend[2]	# of Toxic Samples[3]	Trend[2]	# of Toxic Samples[3]	Trend[2]	# of Toxic Samples[3]	Trend[2]
313SAE	0/1	Decreasing	0/1	Increasing	1/1	Increasing	0/1	Decreasing	0/0	N/A[2]	0/0	N/A[2]
314SYF	0/2	Decreasing	0/2	Increasing	1/2	Decreasing	0/2	Decreasing	0/1	Decreasing	0/1	Decreasing
314SYN	0/4	Increasing	0/4	Increasing	0/4	Decreasing	0/4	Decreasing	0/1	Increasing	0/1	Decreasing
314SYR	0/4	**Increasing**	0/3	Increasing	2/3	Increasing	0/4	Increasing	0/1	Decreasing	0/1	**Decreasing**

Notes:

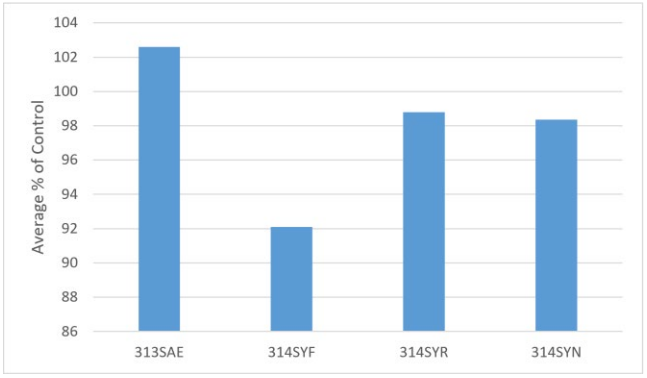
1 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant (α = 0.05).

2 None = No Mann-Kendall trend analysis exists for this site due to the limited historical data associated with it.

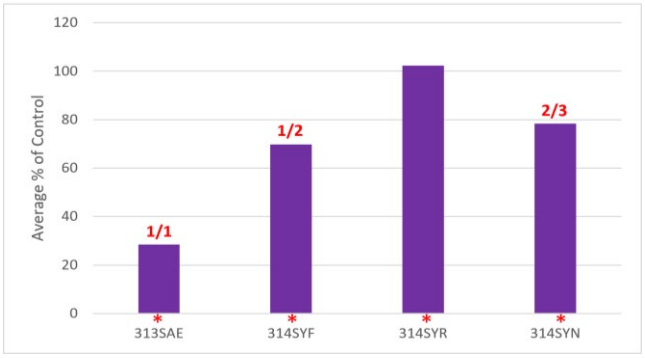
3 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.



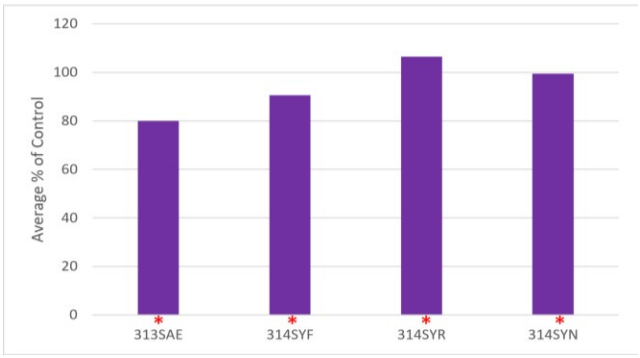
a) Algal Toxicity in Water – Growth



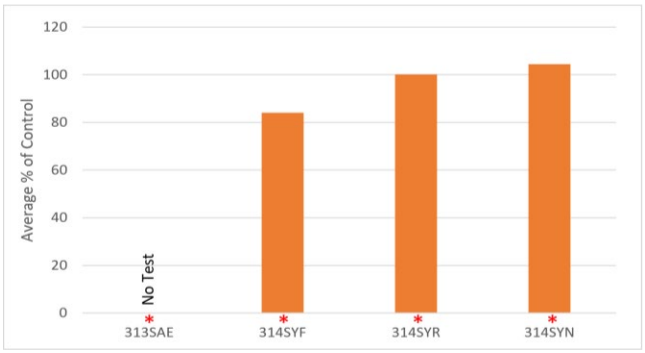
b) *C. dilutus* Toxicity in Water – Survival



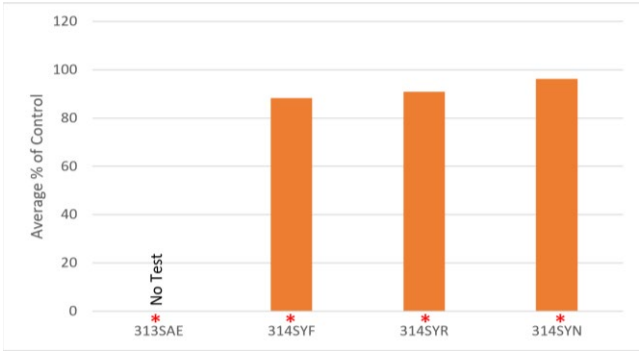
c) Invertebrate Toxicity in Water – Reproduction



d) Invertebrate Toxicity in Water – Survival



e) Invertebrate Toxicity in Sediment – Growth



f) Invertebrate Toxicity in Sediment – Survival

Figure 3-65. Results for Aquatic Toxicity (Water and Sediment) Monitoring in the San Antonio and Santa Ynez HUs

Notes:

1. Bars represent the mean survival, reproduction, or growth rate for all 2023 samples at each site, as compared to laboratory controls.
2. There are generally four water toxicity sampling events for algae and invertebrates and two sediment toxicity events scheduled for each site, each year.
3. "No Test" indicates sites where no toxicity samples were collected due to dry channel or ponded conditions.
4. Results >100% indicate organism performance rates in the environmental sample were greater than in the control.
5. If a site experienced "significant toxicity" red fractions indicate the number of significantly toxic samples relative to the total number of toxicity samples collected (e.g., 1/2 indicates the site had two samples collected, one of which was significantly toxic.)
6. *C. dubia* reproduction graphs generally reflect *C. dubia* tests but in some cases reflect a salinity-tolerant alternate test species, which in some cases test for "growth" instead of "reproduction" as the sub-lethal endpoint.

* Site with an applicable non-TMDL area limit for a given test species and endpoint.

3.7 SOUTH COAST HYDROLOGIC UNIT (HU 315)

Descriptions of the South Coast HU are summarized from the SWRCB's SWAMP Assessment Report for the Central Coast Region (SWRCB 2007b). The South Coast HU is made up of small coastal watersheds originating in the southern Los Padres National Forest and draining to the Santa Barbara coast. All watersheds in this unit are completely within Santa Barbara County. The lowest reaches of several of these creeks flow through county and State Park campgrounds; these include Jalama County Park, Gaviota, Refugio, El Capitan and Carpinteria State Parks. Channelization is common in the HU, as many of these creeks flow through urbanized flood plains. In the Carpinteria and Santa Barbara area, channelized watersheds include Arroyo Burro, Mission, Sycamore, San Ysidro, Romero, Toro, Arroyo Paredon, Santa Monica and Franklin Creeks. Franklin and Santa Monica Creeks are contained in cement box channels as they flow through intensive multi-use agriculture in the form of greenhouses and nurseries, as well as residential and light commercial development. Arroyo Paredon Creek is located just north of the city of Carpinteria and flows primarily through rural residential and greenhouse areas. The Goleta Slough watershed includes Los Carneros, Glen Annie, San Jose, San Pedro, Atascadero, and Maria Ygnacio Creeks. Each of these creeks is channelized to some extent as they flow through the urban areas of Goleta. Los Carneros, Glen Annie, San Pedro, and San Jose Creeks have been converted to cement box channels in the lowest reaches and sediment is mechanically removed annually. Gaviota Creek has been completely channelized as it flows along Highway 101.

Most of these creeks originate in steep chaparral, southern coastal scrub, and woodland habitat; then flow through mid-elevations that may support estate homes and rural residential uses; and then through flat coastal terraces to the ocean. In the northwestern part of the HU, coastal terraces are predominately used for grazing and agriculture. From Goleta southeast through the communities of Santa Barbara and Carpinteria, the terrace is largely urbanized. Several of the nurseries and greenhouses in these watersheds have direct discharge points to the creek channels.

Monitoring for the CMP was initiated in this HU in January 2006. There are four core sites monitored for the CMP in the Santa Barbara Coastal Creeks HU. These are in Bell Creek (315BEF), Glen Annie Creek (315GAN), Arroyo Paredon (315APF), and Franklin Creek (315FMV). Bell Creek and Glen Annie Creek are located west of Goleta, and Arroyo Paredon and Franklin Creek are located east of Santa Barbara, just west of Carpinteria. Beginning in 2012, an additional site – Los Carneros Creek (315LCC) – was added to the program, to be addressed in part by CMP monitoring and in part via data collected by the existing monitoring conducted by the Santa Barbara Channel Keeper organization (**6**).

The Beneficial Uses designated by the Basin Plan for waterbodies monitored by the CMP in the South Coast Region include nearly every Beneficial Use, with the exceptions being preservation of biological habitats of special significance and shellfish harvesting (Table 2-2).

Applicable TMDLs for sites within the South Coast HU include the Arroyo Paredon Nitrate TMDL; Bell Creek Nitrate TMDL; Franklin Creek Nutrients TMDL; Glen Annie Creek, Tecolotito Creek, and Carneros Creek Nitrate TMDL; and Arroyo Paredon Diazinon TMDL. Non-TMDL area limits for sites within the South Coast HU include non-TMDL area turbidity limits and non-TMDL area toxicity limits. See **Appendix A** for a summary of applicable routine parameter TMDL limits and non-TMDL area limits for sites in the South Coast HU.

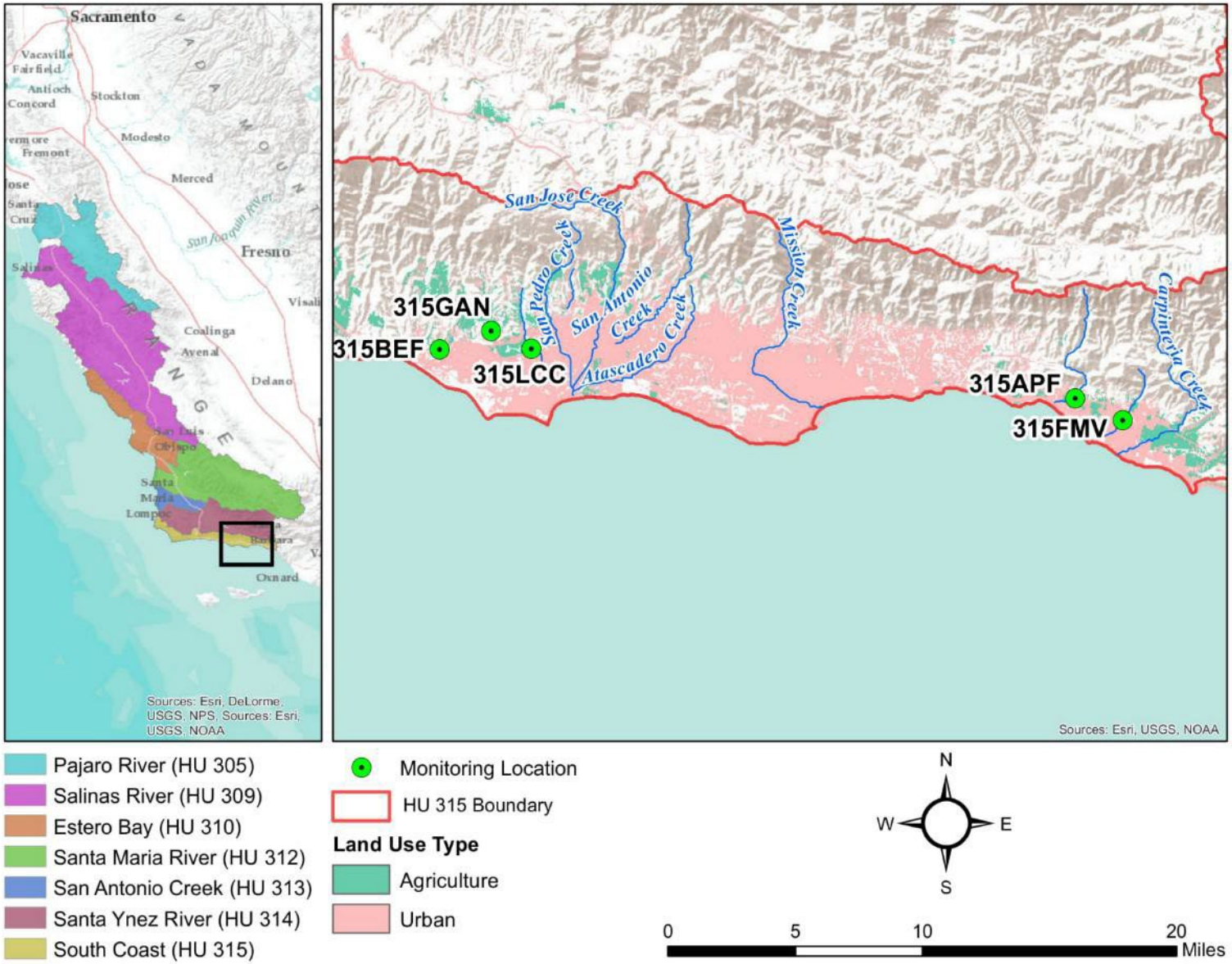


Figure 3-66. CMP Core Monitoring Sites and Distribution of Major Land Uses in the South Coast Hydrologic Unit

3.7.1 Flow Results

Seasonal patterns for the Santa Barbara Region are characterized by precipitation that occurs primarily from November through April, with the highest historical monthly average flows reported in February (46 CFS) and March (61 CFS) (USGS 2009). During the 2023 monitoring year, the annual average flow (15.68 CFS) at the *Carpinteria Creek* USGS stream gage was above the historic annual average (3.83 CFS, 1941-2022) and ranged from 0.02 CFS (December 17, 2023) to 1457.57 CFS (January 9, 2023) (USGS 2023)[1]. The 2023 cumulative annual rainfall (30.53") at the *Santa Barbara* rain gauge was nearly twice the historic average (16.49", 1994-2022) (**Figure 3-67**) (CDWR 2023).

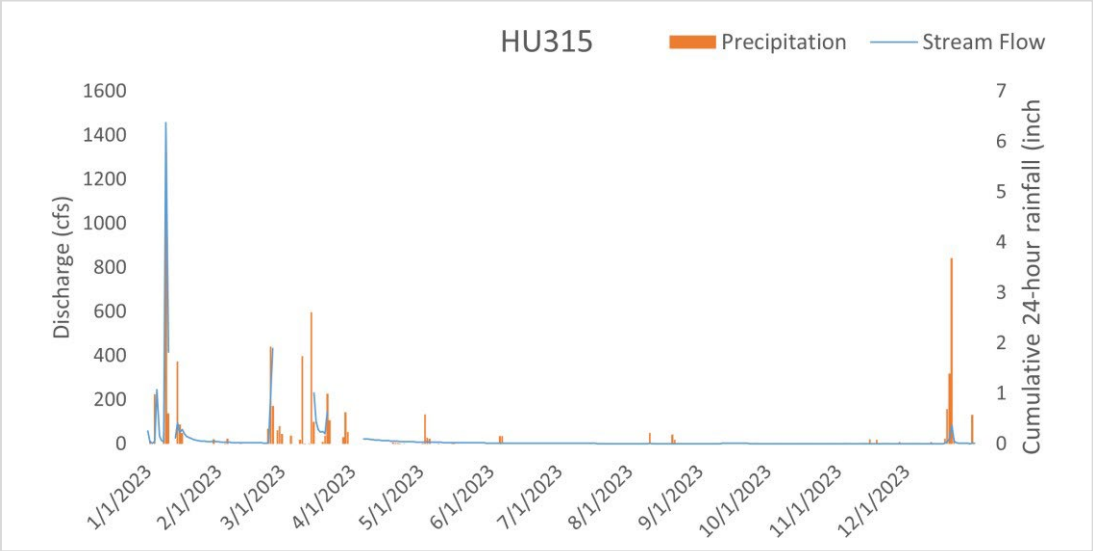


Figure 3-67. 2023 Carpinteria Creek Hydrograph and Downtown Santa Barbara Precipitation Totals

[1] USGS data contains provisional values, subject to revision; flow values may have been updated since the publishing of this report.

In 2023, flows measured at the five South Coast HU sites were elevated in January and March through April, with lower flows and/or dry channel conditions in the other months. **Figure 3-68** depicts annual median flow for sites within the South Coast HU for 2023 and **Table 3-131** presents descriptive statistics.

- During 2023, both the lowest and highest flows were recorded at Arroyo Paredon at Foothill Rd. (315APF), ranging from 0 CFS to 46.24 CFS.
- Median flows ranged from 0.16 CFS at Franklin Creek at Mountain View Ln. (315FMV) to 0.47 CFS at Arroyo Paredon at Foothill Rd. (315APF).
- For the period of 2005-2023, three sites showed statistically significant decreasing trends in flow (Bell Creek [315BEF], Franklin Creek [315FMV], and Glen Annie Creek [315GAN]). One site, Los Carneros Creek at Calle Real (315LCC) showed statistically significant increasing trend in flow.

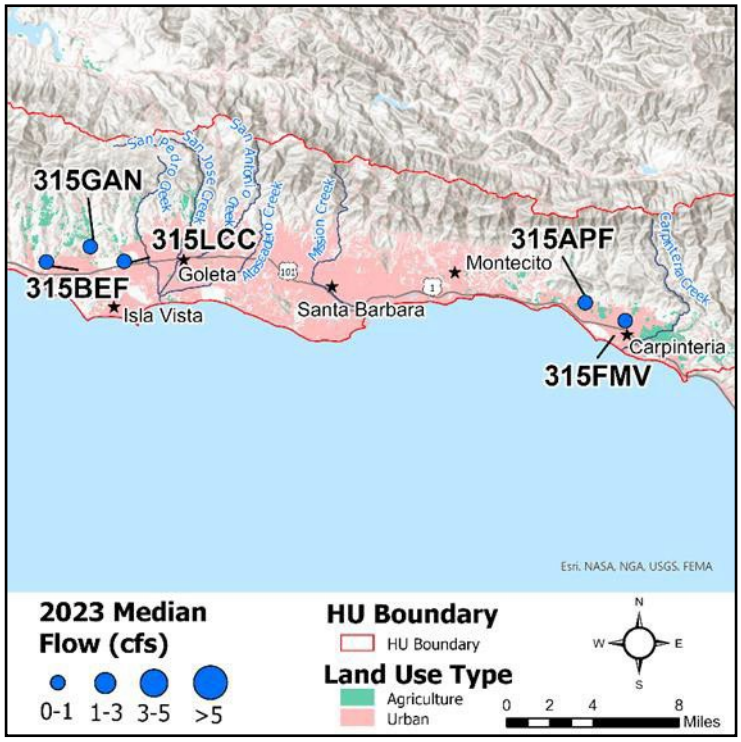


Figure 3-68. 2023 Median Flows for Sites in HU 315

Table 3-131. Descriptive Statistics for Flow in Hydrologic Unit 315 (CFS)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
315APF	12	0.00	46.24	6.36	0.47	Increasing
315BEF	12	0.04	42.66	5.74	0.45	**Decreasing**
315FMV	12	0.01	19.55	2.15	0.16	**Decreasing**
315GAN	12	0.08	16.07	2.71	0.40	**Decreasing**
315LCC	12	0.03	18.15	2.79	0.27	**Increasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4

3.7.2 Water Temperature

The Basin Plan contains a general Water Quality Objective for temperature: natural receiving water temperature of intrastate waters shall not be altered. The Basin Plan also has specific objectives for cold and warm water habitats: At no time or place shall the temperature be increased by more than 5°F above natural receiving water temperature. Water temperature can influence the results of other field measurements including dissolved oxygen, pH, and conductivity and therefore is an important factor to consider when interpreting results. The temperature of certain water bodies can also fluctuate greatly over a 24-hour period. This fluctuation means that results and trends should be interpreted with discretion as they can be affected by the time of day at which the sample is collected.

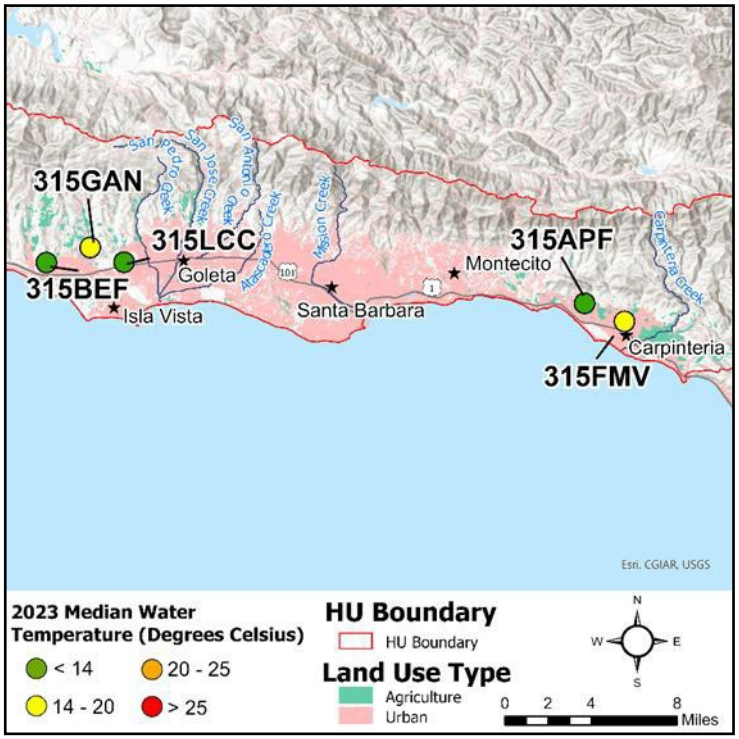


Figure 3-69. 2023 Median Water Temperature for Sites in HU 315

Temperature of natural receiving waters has not been defined for waterbodies within the South Coast HU; therefore, the focus of this report is descriptive statistics. In 2023, water temperatures peaked throughout the year in the South Coast HU primarily in July and August, and minimum temperatures at most sites were recorded during January and February. **Figure 3-69** depicts annual median temperatures for sites in the South Coast HU for 2023, and **Table 3-132** presents descriptive statistics.

- In 2023, median water temperatures in the South Coast HU ranged from 13.6°C at Arroyo Paredon (315APF) to 16.6°C at Franklin Creek (315FMV).
- The lowest water temperature (7.8°C) was observed at Arroyo Paredon (315APF) and the highest water temperature (23.0°C) was observed at Franklin Creek (315FMV).
- For the period of 2005-2023, no sites showed statistically significant trends in water temperature.

Table 3-132. Descriptive Statistics for Water Temperature in Hydrologic Unit 315 (°C)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
315APF	12	7.80	20.60	13.77	13.60	Increasing
315BEF	12	9.90	20.20	14.61	14.85	Increasing
315FMV	12	10.10	23.00	16.34	16.60	Increasing
315GAN	12	9.80	19.90	14.60	15.20	Increasing
315LCC	12	8.90	19.60	14.34	14.65	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.7.3 Turbidity and TSS Results

All sites in the South Coast HU have a cold water Beneficial Use, with a non-TMDL Area turbidity limit of 25 NTU. See **Table 2-5** and **Appendix A** for a summary of applicable non-TMDL area limits for turbidity in the South Coast HU. **Figure 3-70** depicts annual median turbidity concentrations and TSS loading for sites within the South Coast HU for 2023, and **Table 3-133** and **Appendix B** present descriptive statistics and turbidity limit exceedances.

- Median turbidities for 2023 ranged from 3 NTU in Los Carneros Creek (315LCC) to 7 NTU at three sites (Arroyo Paredon [315APF], Franklin Creek [315FMV], and Glen Annie Creek [315GAN]).
- The highest turbidity (327 NTU) was measured in Arroyo Paredon (315APF).
- All sites exceeded the 25 NTU turbidity limit in 2023 in at least 17% samples.

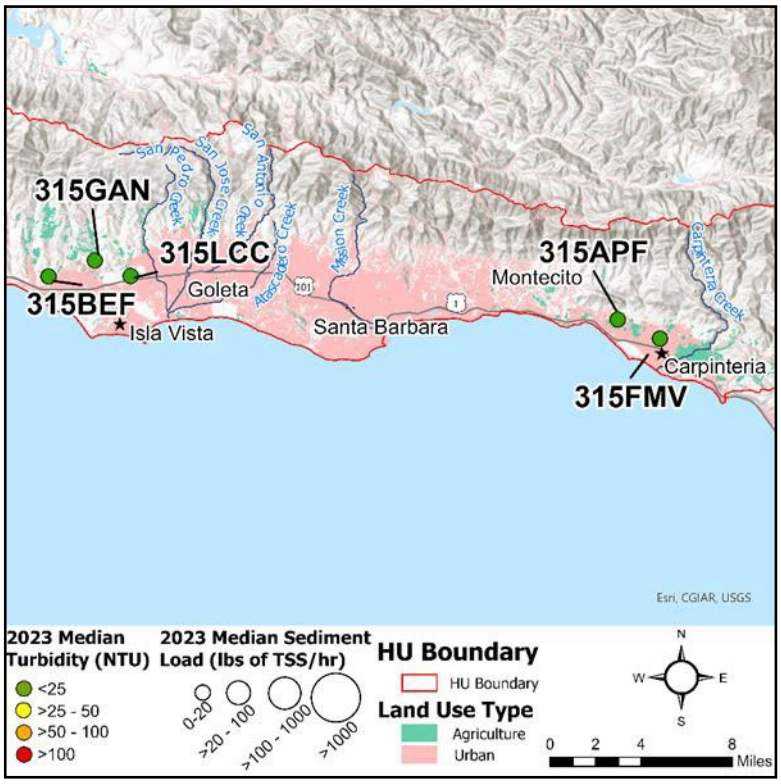


Figure 3-70. 2023 Median Turbidity and TSS Loading for Sites in HU 315

- Low median flows and TSS concentrations resulted in low TSS loading throughout the South Coast HU. (**Appendix B**).
- For the period of 2005-2023, all sites showed statistically significant increasing trends in turbidity.
- For the period of 2012-2023, three sites (Arroyo Paredon [315APF], Glen Annie Creek [315GAN], and Los Carneros Creek [315LCC]) showed statistically significant increasing trends in TSS loading. TSS was not monitored prior to 2012, so the period of record for TSS trend analysis is shorter than that for turbidity and flow.

Table 3-133. Descriptive Statistics for Turbidity in Hydrologic Unit 315 (NTU)

Site ID[1]	N[3]	Min	Max	Mean	Median	Non-TDML Area Limit Percent Exceedance[2]	Turbidity Trend[4,5]	TSS Loading Trend[4,5]
315APF	12	1	327	45	7	25%	**Increasing**	**Increasing**
315BEF	12	2	179	31	4	17%	**Increasing**	Increasing
315FMV	12	2	270	33	7	17%	**Increasing**	Decreasing
315GAN	12	1	258	40	7	33%	**Increasing**	**Increasing**
315LCC	12	1	167	25	3	17%	**Increasing**	**Increasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 The relevant numeric criterion is 25.0 NTU [COLD].

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

5 Turbidity was monitored from 2005-2023 and TSS was monitored from 2012-2023.

3.7.4 Unionized Ammonia and Total Ammonia

All sites within the South Coast HU have a non-TMDL area unionized ammonia limit of 0.025 mg/L (**Appendix A).** See **Table 2-5** and **Appendix A** for a summary of applicable annual TMDL and non-TMDL area limits for unionized ammonia in the South Coast HU. **Figure 3-71** depicts annual median unionized ammonia concentrations for sites within the South Coast HU for 2023, **Table 3-134** presents descriptive statistics, and **Table 3-135** and **Appendix B** present non-TMDL area limit exceedances.

Samples were also collected and analyzed for total ammonia. There is currently no TMDL limit, non-TMDL area limit, or Basin Plan numeric Water Quality Objective for total ammonia applicable to CMP sites in the South Coast HU. Therefore, the focus of this report is descriptive statistics, which are presented in **Table 3-136**.

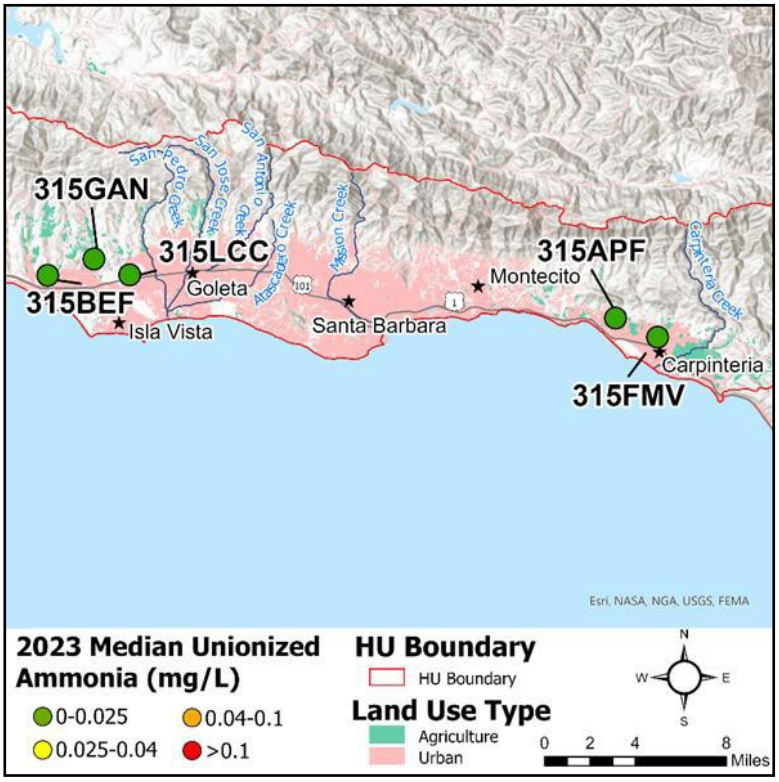


Figure 3-71. 2023 Median Unionized Ammonia for Sites in HU 315

- In 2023, unionized ammonia concentrations ranged from a minimum of 0.0001 mg/L at three sites (Arroyo Paredon [315APF], Bell Creek (315BEF), and Franklin Creek (315FMV) to a maximum of 0.0094 mg/L at Franklin Creek (315FMV).
- For the period of 2005-2023, three sites showed statistically significant decreasing trends in unionized ammonia concentrations (Arroyo Paredon [315APF], Bell Creek [315BEF], and Franklin Creek [315FMV]).

Table 3-134. Descriptive Statistics for Unionized Ammonia in Hydrologic Unit 315 (mg/L as N)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
315APF	12	0.0001	0.0044	0.0013	0.0011	**Decreasing**
315BEF	12	0.0001	0.0017	0.0007	0.0005	**Decreasing**
315FMV	12	0.0001	0.0094	0.0028	0.0017	**Decreasing**
315GAN	12	0.0003	0.0022	0.0009	0.0009	Decreasing
315LCC	12	0.0002	0.0047	0.0015	0.0006	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant (α = 0.05).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- There were no samples in the South Coast HU that exceeded the non-TMDL area limit (0.025 mg/L) for unionized ammonia in 2023.

Table 3-135. Summary of Non-TMDL Area Nutrient Limit Exceedances for Unionized Ammonia in Hydrologic Unit 315

Site ID[1]	Non-TMDL Area Limit Percent Exceedance[2]
315APF	0%
315BEF	0%
315FMV	0%
315GAN	0%
315LCC	0%

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations,* 2023, for detailed site descriptions.
2 The relevant numeric criterion is 0.025 mg/L.

- The spatial distribution and relative magnitudes of total ammonia concentrations were similar to unionized ammonia concentrations.
- For the period of 2005-2023, two sites (Arroyo Paredon [315APF] and Bell Creek [315BEF]) showed a statistically significant decreasing trends in unionized ammonia concentrations.

Table 3-136. Descriptive Statistics for Total Ammonia in Hydrologic Unit 315 (mg/L as N)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
315APF	12	0.0035	0.0670	0.0283	0.0215	**Decreasing**
315BEF	12	0.0035	0.1410	0.0272	0.0160	**Decreasing**
315FMV	12	0.0130	0.6640	0.0961	0.0375	Decreasing
315GAN	12	0.0261	0.1310	0.0567	0.0369	Increasing
315LCC	12	0.0090	0.1740	0.0537	0.0389	Increasing

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.7.5 Nitrate and Total Nitrogen

Samples were collected and analyzed for "nitrate + nitrite"; however, this report primarily refers to "nitrate" as nitrite levels are assumed to be very low. All sites within the South Coast HU have a TMDL limit for nitrate. All TMDL limits for nitrate are associated with the Arroyo Paredon Nitrate TMDL; Bell Creek Nitrate TMDL; Franklin Creek Nitrate TMDL; or Glen Annie Creek, Tecolotito Creek, and Carneros Creek Nitrate TMDL. See **Table 2-5** and **Appendix A** for a summary of applicable annual TMDL limits for nitrate in the South Coast HU. **Figure 3-72** depicts annual median nitrate concentrations and loading for sites within the South Coast HU for 2023, **Table 3-137** presents descriptive statistics, and **Table 3-138** and **Appendix B** present TMDL and non-TMDL area limit exceedances.

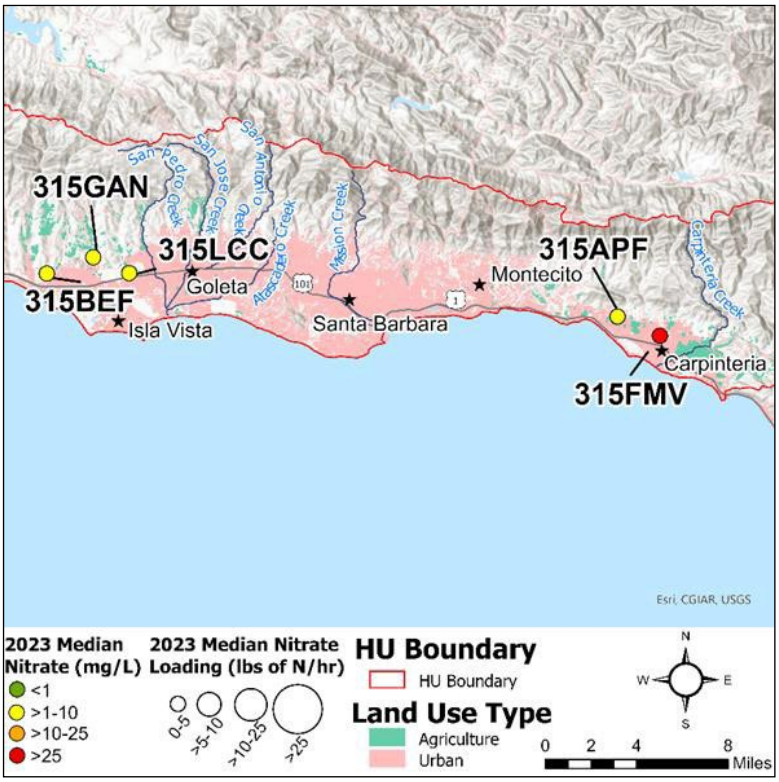


Figure 3-72. 2023 Median Nitrate as N for Sites in HU 315

Samples were also collected and analyzed for total nitrogen. One site (Franklin Creek [315FMV]) has applicable wet season and dry season TMDL limits for total nitrogen. No other site in the South Coast HU has a TMDL limit, non-TMDL area limit, or Basin Plan numeric water quality objective for total nitrogen applicable to it. See **Table 2-5** and **Appendix A** for a summary of applicable dry season and wet season total nitrogen TMDL limits in the South Coast. HU Descriptive statistics are presented in **Table 3-139** and TMDL and non-TMDL area limit exceedances are presented in **Table 3-140** and **Appendix B**.

- In 2023, median nitrate concentrations ranged from 1.08 mg/L in Arroyo Paredon (315APF) to 29.35 mg/L in Franklin Creek (315FMV).
- Regardless of nitrate concentrations, lower median flows resulted in low nitrate loading throughout the South Coast HU (**Appendix B**).
- For the period of 2005-2023, two sites showed statistically significant decreasing trends in nitrate concentrations (Bell Creek [315BEF] and Glen Annie Creek [315GAN]) and one site (Arroyo Paredon [315APF]) showed a statistically significant increasing trend in nitrate concentrations.
- For the period of 2005-2023, three sites showed statistically significant decreasing trends in nitrate concentrations (Bell Creek [315BEF], Franklin Creek [315FMV], and Glen Annie Creek [315GAN]) while one site (Los Carneros Creek [3155LCC]) showed a statistically significant increasing trend.

Table 3-137. Descriptive Statistics for Nitrate in Hydrologic Unit 315 (mg/L as N)

Site ID[1]	N[3]	Min	Max	Mean	Median	Nitrate Trend[2]	Nitrate Loading Trend[2]
315APF	12	0.01	6.63	1.66	1.08	**Increasing**	Increasing
315BEF	12	1.18	7.28	4.52	4.47	**Decreasing**	**Decreasing**
315FMV	12	1.15	37.50	26.04	29.35	Decreasing	**Decreasing**
315GAN	12	0.03	14.70	8.50	9.59	**Decreasing**	**Decreasing**
315LCC	12	0.42	4.75	2.36	2.40	Decreasing	**Increasing**

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant (α = 0.05).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- 83% of samples at Franklin Creek (315FMV) and 50% of samples at Glen Annie Creek (315GAN) exceeded the 10 mg/L TMDL limit for nitrate. The other sites had no exceedances of the nitrate TMDL limit in 2023.

Table 3-138. Summary of TMDL and Non-TMDL Area Nutrient Limit Exceedances for Nitrate in Hydrologic Unit 315

Site ID[1]	Arroyo Paredon Nitrate Annual Percent Exceedance[2]	Bell Creek Nitrate TMDL Annual Percent Exceedance[2]	Franklin Creek Nutrients TMDL Annual Percent Exceedance[2]	Glenn Annie Canyon, Tecolotito Creek, and Carneros Creek Nitrate TMDL Annual Percent Exceedance[2]	Non-TMDL Area Limit Percent Exceedance
315APF	0%	N/A	N/A	N/A	N/A
315BEF	N/A	0%	N/A	N/A	N/A
315FMV	N/A	N/A	83%	N/A	N/A
315GAN	N/A	N/A	N/A	50%	N/A
315LCC	N/A	N/A	N/A	0%	N/A

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations,* 2023, for detailed site descriptions.
2 The TMDL numeric criterion is 10.0 mg/L.
N/A There is no applicable TMDL or non-TMDL area limit criterion for nitrate at this site.

- Median total nitrogen concentrations in 2023 ranged from 1.44 mg/L at Arroyo Paredon (315APF) to 30.49 mg/L at Franklin Creek (315FMV).
- For the period of 2005-2023, two sites (Bell Creek [315BEF] and Glen Annie Creek [315GAN]) showed statistically significant decreasing trends in total nitrogen, and one site (Franklin Creek [315FMV]) showed a statistically significant increasing trend in total nitrogen.

Table 3-139. Descriptive Statistics for Total Nitrogen in Hydrologic Unit 315 (mg/L as N)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
315APF	12	0.16	7.19	2.07	1.44	Decreasing
315BEF	12	1.95	7.83	4.95	4.80	**Decreasing**
315FMV	12	2.44	37.80	27.04	30.49	**Increasing**
315GAN	12	2.75	15.51	9.49	10.43	**Decreasing**
315LCC	12	0.97	5.17	2.95	2.81	Increasing

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Franklin Creek (315FMV) exceeded its dry and wet season TMDL limit for total nitrogen in 100% and 86% of samples collected, respectively.

Table 3-140. Summary of Franklin Creek Nutrients TMDL and Non-TMDL Area Nutrient Limit Exceedances for Total Nitrogen in Hydrologic Unit 315

Site ID[1]	TMDL Dry Season Percent Exceedance	TMDL Wet Season Percent Exceedance	Non-TMDL Area Limit Percent Exceedance
315FMV[2]	100%[3]	86%[4]	N/A

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations,* 2023, for detailed site descriptions.
2 The total nitrogen TMDL limit is not applicable to any other site.
3 The relevant dry season numeric criterion is 1.1 mg/L.
4 The relevant wet season numeric criterion is 8.0 mg/L.
N/A There is no applicable non-TMDL area limit criterion for total Nitrogen at this site.

3.7.6 Orthophosphate and Total Phosphorus

One site (Franklin Creek [315FMV]) has an applicable wet and dry weather TMDL limit for total phosphorus. See **Table 2-5** and **Appendix A** for a summary of applicable annual TMDL limits for orthophosphate in the South Coast HU. **Figure 3-73** depicts annual median orthophosphate concentrations for sites within the South Coast HU for 2023. **Table 3-141** presents descriptive statistics for orthophosphate, **Table 3-142** presents descriptive statistics for total phosphorus, and **Table 3-143** and **Appendix B** present TMDL and non-TMDL area limit exceedances for total phosphorus.

- Orthophosphate concentrations in the South Coast HU ranged from 0.004 mg/L at Arroyo Paredon (315APF) to 7.260 mg/L at Franklin Creek (315FMV).
- In 2023, median orthophosphate concentrations ranged from 0.004 mg/L in Arroyo Paredon (315APF) to 0.750 mg/L in Franklin Creek (315FMV).

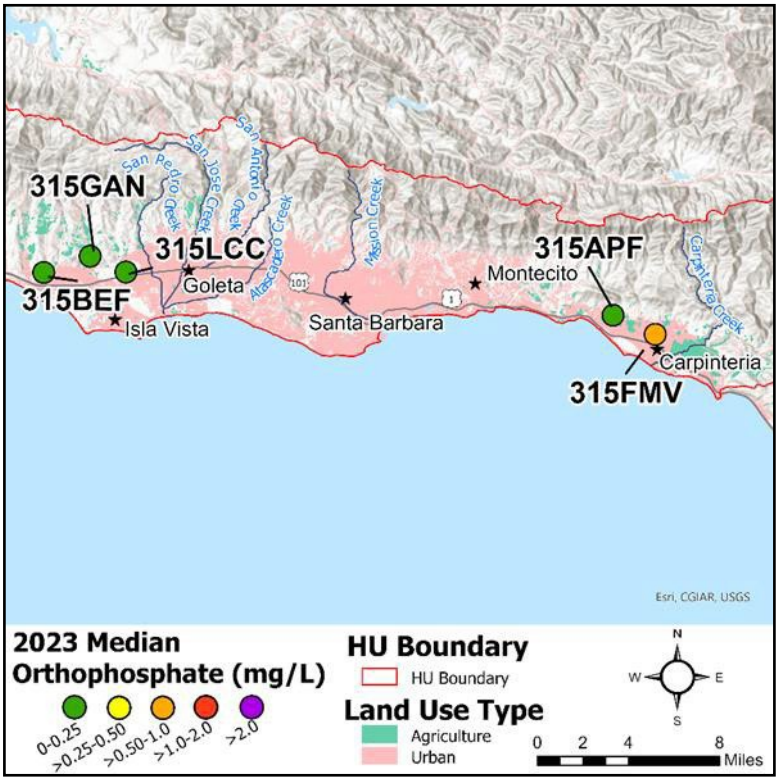


Figure 3-73. 2023 Median Orthophosphate as P for Sites in HU 305

- For the period of 2005-2023, one site (Franklin Creek [315FMV]) showed a statistically significant increasing trend in orthophosphate concentrations. Two sites showed statistically significant decreasing trends in orthophosphate concentrations (Bell Creek [315BEF] and Glen Annie Creek [315GAN]).

Table 3-141. Descriptive Statistics for Orthophosphate as P in Hydrologic Unit 315 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
315APF	12	0.004	0.035	0.012	0.004	Increasing
315BEF	12	0.013	0.057	0.039	0.043	**Decreasing**
315FMV	12	0.015	7.260	1.921	0.750	**Increasing**
315GAN	12	0.015	0.484	0.118	0.093	**Decreasing**
315LCC	12	0.035	0.103	0.065	0.063	Decreasing

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- The spatial distribution and relative magnitudes of total phosphorus concentrations were similar to orthophosphate concentrations.
- The maximum total phosphorus concentration at any South Coast HU site was observed at Franklin Creek (315FMV) (7.430 mg/L).
- Median total phosphorus concentrations ranged from 0.060 mg/L at Arroyo Paredon (315APF) to 1.170 mg/L at Franklin Creek (315FMV).
- For the period of 2005-2023, two sites (Franklin Creek [315FMV] and Glen Annie Creek [315GAN]) showed a statistically significant increasing trends in total phosphorus concentrations.

Table 3-142. Descriptive Statistics for Total Phosphorus in Hydrologic Unit 315 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
315APF	12	0.004	0.326	0.093	0.060	Decreasing
315BEF	12	0.063	0.295	0.120	0.090	Decreasing
315FMV	12	0.184	7.430	2.238	1.170	**Increasing**
315GAN	12	0.021	0.994	0.319	0.212	**Increasing**
315LCC	12	0.056	0.538	0.188	0.146	Increasing

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Franklin Creek (315FMV) exceeded the dry and wet season total phosphorous TMDL limit in 100% and 71% of samples collected, respectively.

Table 3-143. Summary of Franklin Creek Nutrient TMDL and Non-TMDL Area Nutrient Limit Exceedances for Total Phosphorus in Hydrologic Unit 315

Site ID[1]	TMDL Dry Season Percent Exceedance	TMDL Wet Season Percent Exceedance	Non-TMDL Area Limit Percent Exceedance
315FMV[2]	100%[3]	71%[4]	N/A

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations,* 2023, for detailed site descriptions.
2 The total phosphorus TMDL limit is not applicable to any other site.
3 The relevant dry season numeric criterion is 0.075 mg/L.
4 The relevant wet season numeric criterion is 0.3 mg/L.
N/A There is no applicable Lower Salinas River Watershed Nutrient TMDL or non-TMDL area limit criterion for Total Phosphorus at this site.

3.7.7 Specific Conductivity

A conductivity objective to protect agricultural uses applies to four South Coast HU sites, Arroyo Paredon (315APF), Franklin Creek (315FMV), Glen Annie Creek (315GAN), Los Carneros Creek (315LCC). This agricultural objective does not define a numeric value to evaluate exceedance frequencies, but provides ranges:

- <750 µS/cm, "No Problem";
- 750-3,000 µS/cm, "Increasing Problems" and
- >3,000 µS/cm, "Severe".

Figure 3-74 depicts annual median conductivity for sites within the South Coast HU for 2023 and **Table 3-144** presents descriptive statistics.

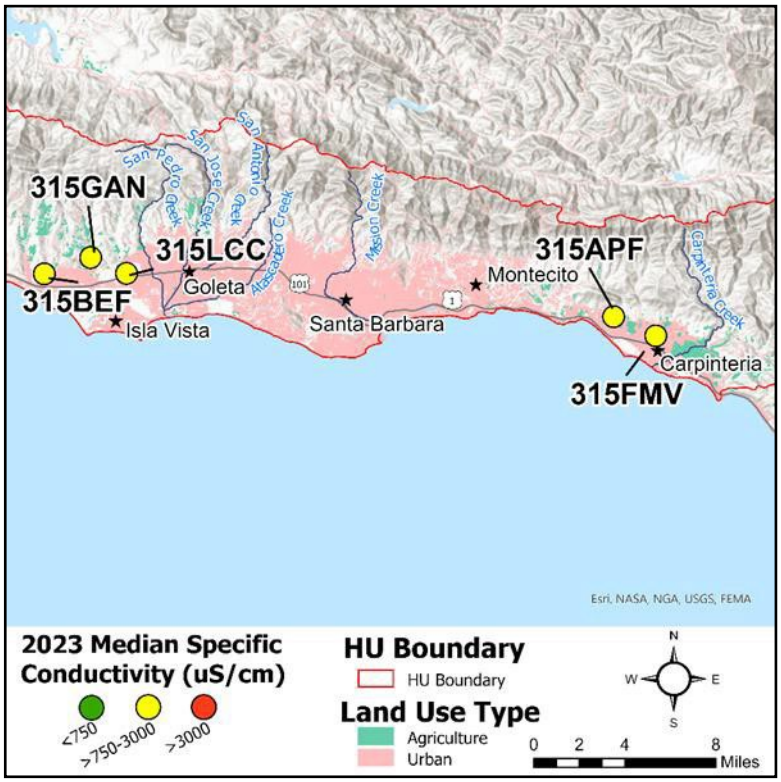


Figure 3-74. 2023 Median Conductivity for Sites in HU 315

- Median conductivities ranged from 1,505 µS/cm in Arroyo Paredon (315APF) to 2,842 µS/cm in Bell Creek (315BEF).
- In 2023, the highest conductivity in the South Coast HU was measured at Bell Creek (315BEF) (3,420 µS/cm).
- The four sites to which the objectives apply exceeded the low-end of the listed ranges (750 µS/cm) on a mean and median basis indicating increasing problems.
- For the period of 2005-2023, three sites showed statistically significant increasing trends in conductivity (Bell Creek [315BEF], Franklin Creek [315FMV], and Glen Annie Creek [315GAN]). Los Carneros Creek (315LCC) showed a statistically decreasing trend.

Table 3-144. Descriptive Statistics for Conductivity in Hydrologic Unit 315 (µS/cm)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
315APF	12	426	2,000	1,431	1,505	Decreasing
315BEF	12	668	3,420	2,340	2,842	**Increasing**
315FMV	12	362	1,799	1,496	1,710	**Increasing**
315GAN	12	715	2,485	1,823	2,202	**Increasing**
315LCC	12	458	3,078	2,142	2,393	**Decreasing**

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.7.8 Total Dissolved Solids and Salinity

The Basin Plan contains no numeric Water Quality Objective for TDS or the following analytes applicable to CMP sites in the South Coast HU: salinity, alkalinity, calcium, magnesium, sodium, potassium, sulfate, and chloride. No trend analyses were performed on the latter six analytes due to limited historical data associated with them. **Figure 3-75** depicts annual median TDS concentrations for sites within the South Coast HU for 2023. **Table 3-145**, **Table 3-146**, **Table 3-147**, **Table 3-148**, **Table 3-149**, **Table 3-150**, **Table 3-151**, **Table 3-152**, and **Table 3-153** present descriptive statistics for TDS, salinity, alkalinity, calcium, magnesium, sodium, potassium, sulfate, and chloride, respectively.

- Median TDS concentrations in 2023 ranged from 978 mg/L in Arroyo Paredon (315APF) to 1,848 mg/L in Bell Creek (315BEF).
- The highest TDS concentration in 2023 was measured in Bell Creek (315BEF) (2,222 mg/L).

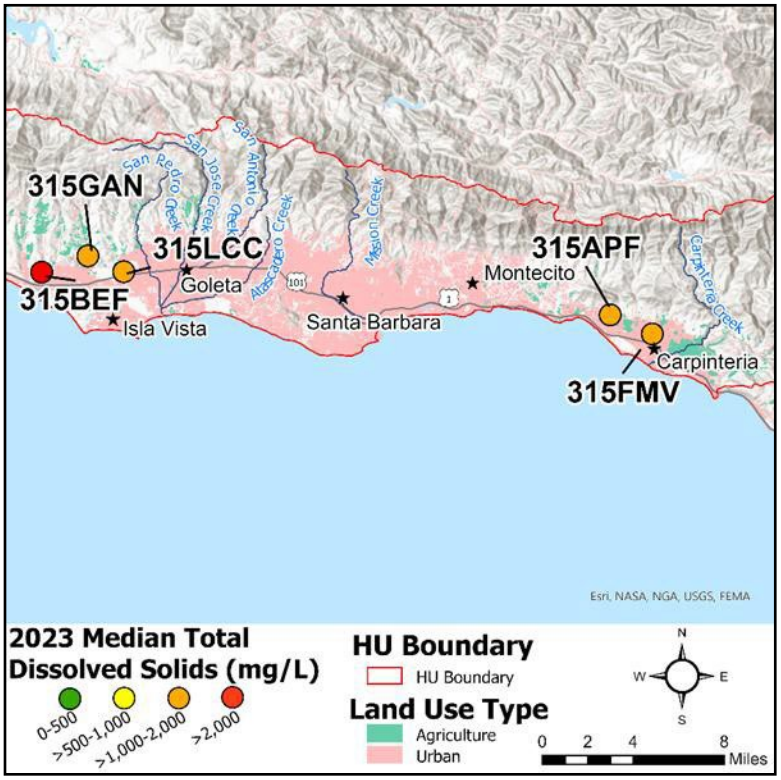


Figure 3-75. 2023 Median Total Dissolved Solids for Sites in HU 315

- For the period of 2005-2023, two sites showed statistically significant increasing trends in TDS concentrations (Arroyo Paredon [315APF] and Bell Creek [315BEF]). Los Carneros Creek (315LCC) showed a statistically significant decreasing trend.

Table 3-145. Descriptive Statistics for Total Dissolved Solids in Hydrologic Unit 315 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	WQO Exceedance?	Trend[2]
315APF	12	278	1,300	923	978	N/A	**Increasing**
315BEF	12	339	2,222	1,513	1,848	N/A	**Increasing**
315FMV	12	233	1,170	962	1,111	N/A	Decreasing
315GAN	12	363	1,613	1,176	1,431	N/A	Decreasing
315LCC	12	232	2,001	1,387	1,555	N/A	**Decreasing**

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

N/A There is no applicable Water Quality Objective for this site.

- The spatial distribution and relative magnitudes of salinity were similar to TDS concentrations.
- For the period of 2005-2023, two sites showed statistically significant increasing trends in salinity (Bell Creek [315BEF] and Glen Annie Creek [315GAN]). Los Carneros Creek (315LCC) showed a statistically significant decreasing trend.

Table 3-146. Descriptive Statistics for Salinity in Hydrologic Unit 315 (ppt)

Site ID[1]	N[3]	Min	Max	Mean	Median	Trend[2]
315APF	12	0.21	1.03	0.72	0.76	Decreasing
315BEF	12	0.33	1.80	1.22	1.48	**Increasing**
315FMV	12	0.17	0.92	0.76	0.86	Decreasing
315GAN	12	0.35	1.29	0.93	1.13	**Increasing**
315LCC	12	0.22	1.62	1.11	1.23	**Decreasing**

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median alkalinity concentrations ranged from 235 mg/L at Arroyo Paredon (315APF) to 341 mg/L at Bell Creek (315BEF). Franklin Creek (315FMV) had both the lowest (81 mg/L) and highest (459 mg/L) concentrations of alkalinity.

Table 3-147. Descriptive Statistics for Alkalinity in Hydrologic Unit 315 (mg/L)

Site ID[1]	N	Min	Max	Mean	Median
315APF	4	114	303	235	261
315BEF	4	150	446	341	383
315FMV	4	81	459	336	402
315GAN	4	153	421	324	361
315LCC	4	138	444	330	368

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- The lowest median concentration of calcium was 109 mg/L (Arroyo Paredon [315APF]) and the highest median concentration was 271 mg/L (Bell Creek [315BEF]).

Table 3-148. Descriptive Statistics for Calcium in Hydrologic Unit 315 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
315APF	4	42	112	93	109
315BEF	4	81	339	240	271
315FMV	4	27	145	100	114
315GAN	4	90	312	217	234
315LCC	4	65	294	199	219

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Magnesium concentrations in the South Coast HU ranged from 11 mg/L at Franklin Creek (315FMV) to 170 mg/L at Bell Creek (315BEF).

Table 3-149. Descriptive Statistics for Magnesium in Hydrologic Unit 315 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
315APF	4	15	41	33	39
315BEF	4	26	170	105	112
315FMV	4	11	106	70	82
315GAN	4	36	110	77	80
315LCC	4	23	127	81	88

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median sodium concentrations ranged from 103 mg/L at Franklin Creek (315FMV) to 186 mg/L at Bell Creek (315BEF).

Table 3-150. Descriptive Statistics for Sodium in Hydrologic Unit 315 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
315APF	4	31	261	153	161
315BEF	4	33	264	167	186
315FMV	4	22	113	85	103
315GAN	4	51	171	121	132
315LCC	4	52	260	162	168

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median potassium concentrations ranged from 2.5 mg/L at four sites (Arroyo Paredon [315APF], Bell Creek [315BEF], Glen Annie Creek [315GAN],and Los Carneros Creek [315LCC]) to 12.9 mg/L at Franklin Creek (315FMV).

Table 3-151. Descriptive Statistics for Potassium in Hydrologic Unit 315 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
315APF	4	2.5	2.5	2.5	2.5
315BEF	4	2.5	2.5	2.5	2.5
315FMV	4	2.5	29.6	14.5	12.9
315GAN	4	2.5	2.5	2.5	2.5
315LCC	4	2.5	2.5	2.5	2.5

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- Median sulfate concentrations ranged from 179 mg/L at Arroyo Paredon (315APF) to 858 mg/L at Bell Creek (315BEF).

Table 3-152. Descriptive Statistics for Sulfate in Hydrologic Unit 315 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
315APF	4	69	250	169	179
315BEF	4	171	1,080	742	858
315FMV	4	41	316	218	257
315GAN	4	225	886	609	663
315LCC	4	143	997	665	761

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

- The lowest concentration of chloride (20 mg/L) was measured at Franklin Creek (315FMV) and the highest concentration (385 mg/L) was measured at Bell Creek (315BEF).

Table 3-153. Descriptive Statistics for Chloride in Hydrologic Unit 315 (mg/L)

Site ID[1]	N[2]	Min	Max	Mean	Median
315APF	4	27	382	217	229
315BEF	4	28	385	242	277
315FMV	4	20	100	75	89
315GAN	4	38	145	101	111
315LCC	4	36	227	142	153

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.7.9 Dissolved Oxygen

The minimum DO objective for protection of cold water or spawning aquatic life Beneficial Uses (7 mg/L) applies to four South Coast HU sites: Franklin Creek (315FMV), Glen Annie Creek (315GAN), Arroyo Paredon Creek (315APF), and Los Carneros Creek (315LCC). Bell Creek (315BEF) does not have specifically assigned Beneficial Uses in the Basin Plan; therefore, the Basin Plan specifies a general numeric objective of at least 5 mg/L and 85% saturation. General water quality objectives apply to all waterbodies unless a more protective beneficial use and water quality objective are designated. **Figure 3-76** depicts annual median dissolved oxygen concentrations for sites within the South Coast HU for 2023, **Table 3-154** presents descriptive statistics for dissolved oxygen concentration, and **Table 3-155** presents descriptive statistics for oxygen saturation.

- In 2023, median DO concentrations in the South Coast HU ranged from 9.08 mg/L at Glen Annie Creek (315GAN) to 13.56 mg/L at Franklin Creek (315FMV).

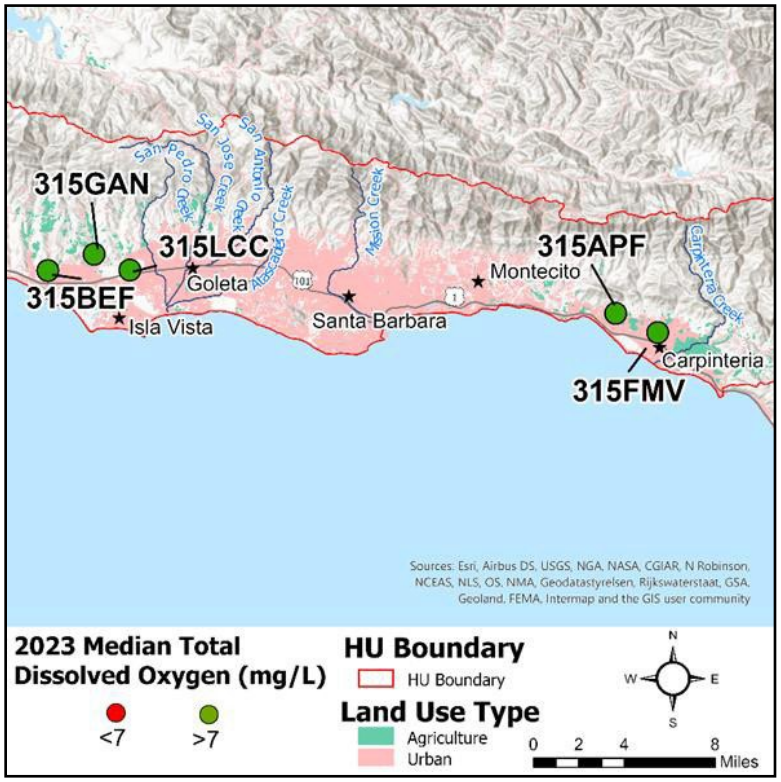


Figure 3-76. 2023 Median Dissolved Oxygen Concentrations for Sites in HU 315

- All sites met the 7 mg/L minimum Water Quality Objective in all 2023 samples.
- The one site with a minimum WQO of 5 mg/L (Bell Creek [315BEF]) met the objective in all samples in 2023.
- For the period of 2005-2023, one site (Glen Annie Creek [315GAN]) showed a statistically significant decreasing trend in DO concentrations, and one site (Arroyo Paredon [315APF]) showed a significantly increasing trend in DO concentrations. Trends in DO must be interpreted with caution, as diel patterns in DO can be influenced by temperature and biological activity depending on the time of day at which sampling occurs and changes in DO can manifest as either depressed or very high concentrations.

Table 3-154. Descriptive Statistics for Dissolved Oxygen in Hydrologic Unit 315 (mg/L)

Site ID[1]	N[3]	Min	Max	Mean	Median	Percent Exceedance	Trend[2]
315APF	12	9.13	13.95	10.78	10.58	0%	**Increasing**
315BEF	12	8.40	13.38	10.78	10.67	0%[4]	Decreasing
315FMV	12	9.60	21.36	13.95	13.56	0%	Increasing
315GAN	12	7.29	12.89	9.34	9.08	0%	**Decreasing**
315LCC	12	9.21	13.44	10.38	9.82	0%	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

4 Water quality objective is >5 mg/L; all other sites have a water quality objective of >7 mg/L.

- The one site with an 85% saturation Water Quality Objective (Bell Creek [315BEF]) met the objective in all samples collected.
- For the period of 2005-2023, one site (Glen Annie Creek [315GAN]) showed a statistically significant decreasing trend in oxygen saturation, and one site (Arroyo Paredon [315APF]) showed a statistically significant increasing trend in oxygen saturation.

Table 3-155. Descriptive Statistics for Oxygen Saturation in Hydrologic Unit 315 (%)

Site ID[1]	N[3]	Min	Max	Mean	Median	WQO Exceedance?	Trend[2]
315APF	12	85.7	117.8	103.8	103.3	N/A	**Increasing**
315BEF	12	87.7	137.3	106.4	99.8	No	Increasing
315FMV	12	88.6	237.1	143.9	145.7	N/A	Increasing
315GAN	12	75.6	115.4	91.8	91.0	N/A	**Decreasing**
315LCC	12	86.9	123.5	101.7	101.3	N/A	Increasing

Notes:

1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.

2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

N/A There is no applicable Water Quality Objective for this site.

3.7.10 pH

The Basin Plan pH objective applicable to all South Coast HU sites is 7-8.3 standard pH units. **Figure 3-77** depicts annual median pH for sites within the South Coast HU for 2023 and **Table 3-156** presents descriptive statistics.

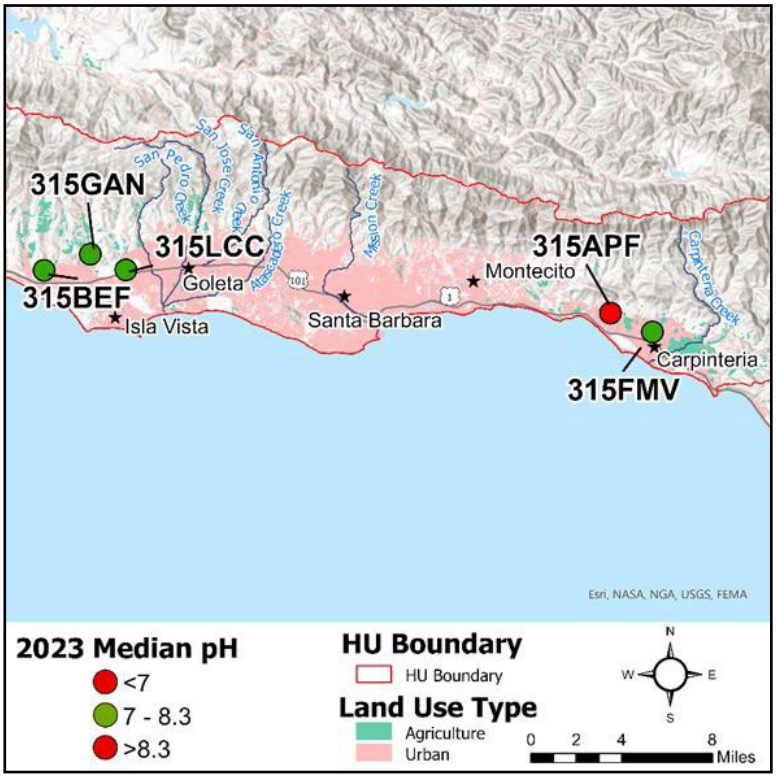


Figure 3-77. 2023 Median pH for Sites in HU 315

- In 2023, only one site in the South Coast HU met the applicable pH Water Quality Objective in all samples (Glen Annie Creek [315GAN]).
- Arroyo Paredon (315APF) exceeded the Water Quality Objective in 67% of samples and Franklin Creek (315FMV) exceeded the Objective in 42% of samples. One site (315FMV) had a single sample below 7 pH units (6.88 pH units). One other South Coast HU site, Arroyo Paredon (315APF), resulted in a median that exceeded the 8.3 standard pH units Water Quality Objective.
- The highest and lowest pH (8.76 pH units and 6.88 pH units) were both measured in Franklin Creek (315FMV).
- For the period of 2005-2023, one site (Franklin Creek [315FMV]) showed a statistically significant decreasing trend in pH, and one site (Arroyo Paredon [315APF]) showed a statistically significant increasing trend in pH.

Table 3-156. Descriptive Statistics for pH in Hydrologic Unit 315 (pH units)

Site ID[1]	N[3]	Min	Max	Mean	Median	Percent Exceedance	Trend[2]
315APF	12	7.57	8.63	8.32	8.36	67%	**Increasing**
315BEF	12	7.88	8.55	8.13	8.11	17%	Increasing
315FMV	12	6.88	8.76	8.15	8.18	42%	**Decreasing**
315GAN	12	7.43	8.18	7.84	7.85	0%	Increasing
315LCC	12	7.77	8.37	8.07	8.08	8%	Increasing

Notes:
1 Refer to Section 2.1, Table 2-1, *Core Monitoring Locations*, 2023, for detailed site descriptions.
2 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).
3 If N < 12, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.

3.7.11 Aquatic Toxicity Results

The potential for toxic effects to aquatic and sediment-dwelling organisms is assessed by the CMP via bioassays for sensitive algal species (*S. capricornutum*) in water, and for sensitive invertebrate species in water (*C. dubia* reproduction and *C. dubia and C. dilutus* survival) and sediment (*H. azteca* growth and survival). Test organism survival and reproduction or growth is measured in environmental samples as well as in non-toxic control samples. A statistical test is then applied to determine significant differences in organism performance between environmental and control samples. When test organism performance is significantly lower in the environmental sample than in the control, *and* the difference exceeds a 20% effect threshold, a sample is determined to be "toxic".

No site in the South Coast HU has a significant toxic effect TMDL; however, all sites in the San South Coast HU have a significant toxic effect non-TMDL area limit for survival, growth, and reproduction in water and sediment. See **Table 2-5** and **Appendix A** for a summary of applicable toxic effect non-TMDL area limits in the South Coast HU. Results from aquatic and sediment bioassays conducted on samples from the South Coast HU in 2023 are illustrated in Figure 3-78a-d and tabulated in **Table 3-157**. *H. azteca* reproduction in sediment is not tested for by the CMP so is not included in the non-TMDL area limit exceedance discussion.

- In 2023, significant toxicity (reduced growth in sample water relative to a non-toxic control) to algae was observed in one of four bioassays collected from Glen Annie Creek (315GAN) and Los Carneros Creek (315LCC) (**Figure 3-78 a**).
- One site, Franklin Creek (315FMV) resulted in significant mortality to *C. dilutus* in water in one of four samples. No significant mortality to *C. dubia* in water was observed in any bioassays collected from the South Coast HU sites (**Figure 3-78 d**).
- Toxicity to invertebrate reproduction in water was observed in six samples from all five sites: one of four bioassays from Arroyo Paredon (315APF); one of two bioassays from Bell Creek (315BEF); two of four bioassays from Franklin Creek (315FMV); one of four samples from Glen Annie Creek (315GAN), and one out of three samples for Los Carneros Creek (315LCC) (**Figure 3-78 c**). In the South Coast HU, no sites achieved the significant toxic effect non-TMDL area limit for reproduction in water (**Figure 3-78 c**).
- One sediment sample per site was collected in 2023 and analyzed for sediment toxicity. Toxicity to invertebrate growth in sediment was observed in the sample collected for Franklin Creek (315FMV), but no other sites. No toxicity to invertebrate survival in sediment was observed at any of the five sites (**Figure 3-78 e, f**). All sites except for Franklin Creek (315FMV) achieved the significant toxic effect non-TMDL area limit for growth in sediment (**Figure 3-78 e**). All sites achieved the significant toxic effect non-TMDL area limit for survival in sediment (**Figure 3-78 f**).
- For the period of 2005-2023, the following statistically significant trends were observed:
    - One site (Bell Creek [315BEF]) showed a statistically significant increasing (improving, decreased toxicity) trend in algal growth.
    - Two sites (Bell Creek [315BEF] and Franklin Creek [315FMV]) showed statistically significant increasing (improving, decreased toxicity) trends in *C. dilutus* survival in water.
    - Three sites showed statistically significant decreasing (worsening, increased toxicity) trends in invertebrate growth in sediment (Arroyo Paredon [315APF], Bell Creek [315BEF], and Glen Annie Creek [315GAN]).
    - One site (Bell Creek [315BEF]) showed a statistically significant decreasing (worsening, increased toxicity) trend in invertebrate survival in sediment.

Detailed trend analysis results, including trend directions and statistical significance, can be found in **Appendix E**. A summary of these results is presented in **Table 3-157**.

Table 3-157. Summary of Toxicity and Trends in Hydrologic Unit 315

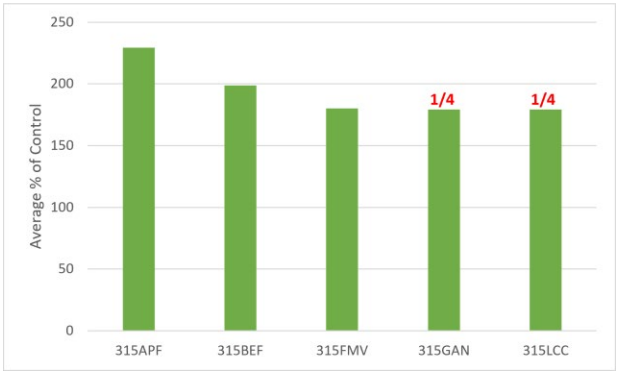
Site ID[1]	Algal Growth		*C. dilutus* - Survival		*C. dubia* - Reproduction		*C. dubia* - Survival		*H. azteca* - Growth		*H. azteca* - Survival	
	# of Toxic Samples[3]	Trend[1]	# of Toxic Samples[3]	Trend[1]	# of Toxic Samples[3]	Trend[1]	# of Toxic Samples[3]	Trend[1]	# of Toxic Samples[3]	Trend[1]	# of Toxic Samples[3]	Trend[1]
315APF	0/4	Increasing	0/4	Decreasing	1/4	Increasing	0/4	Decreasing	0/1	**Decreasing**	0/1	Increasing
315BEF	0/4	**Increasing**	0/2	**Increasing**	1/2	Increasing	0/4	Decreasing	0/1	**Decreasing**	0/1	**Decreasing**
315FMV	0/4	Increasing	1/4	**Increasing**	2/4	Decreasing	0/4	Decreasing	1/1	Decreasing	0/1	Increasing
315GAN	1/4	Increasing	0/4	Increasing	1/4	Increasing	0/4	Increasing	0/1	**Decreasing**	0/1	Decreasing
315LCC	1/4	Increasing	0/3	Increasing	1/3	Increasing	0/4	Decreasing	0/1	Decreasing	0/1	Decreasing

Notes:

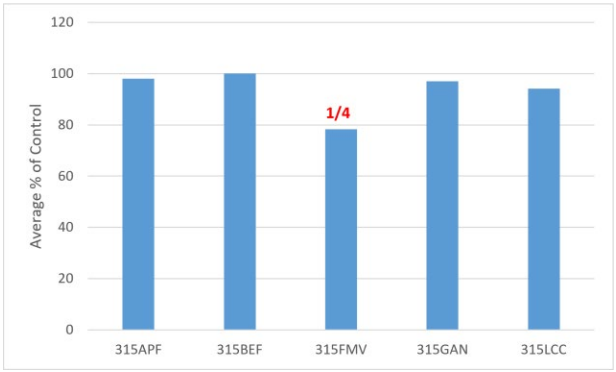
1 Increasing/decreasing trends pursuant to the results of a Mann-Kendall Analysis. **Bold** trends are statistically significant ($\alpha = 0.05$).

2 None = No monotonic trend (i.e., increasing or decreasing) was identified.

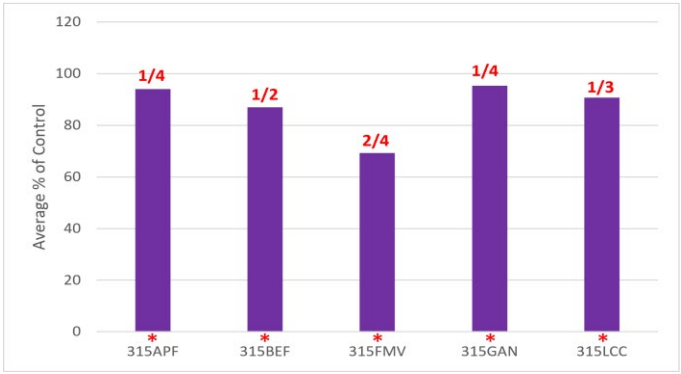
3 If N < 4, the site was not sampled during routine monitoring events due to conditions such as disconnected pools, absence of flow, or inaccessibility.



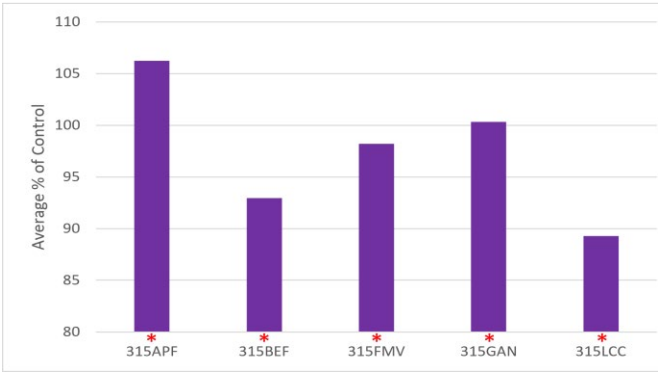
a) Algal Toxicity in Water – Growth



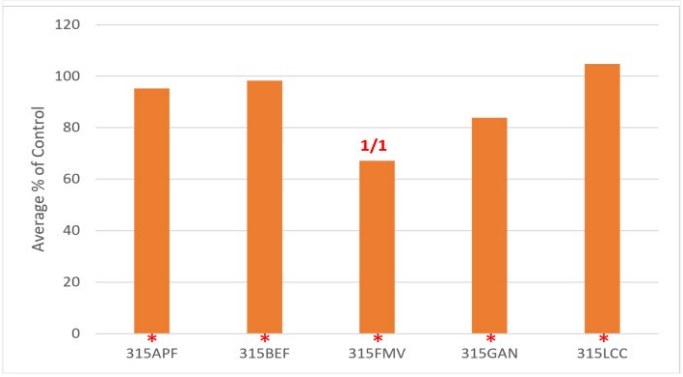
b) *C. dilutus* Toxicity in Water – Survival



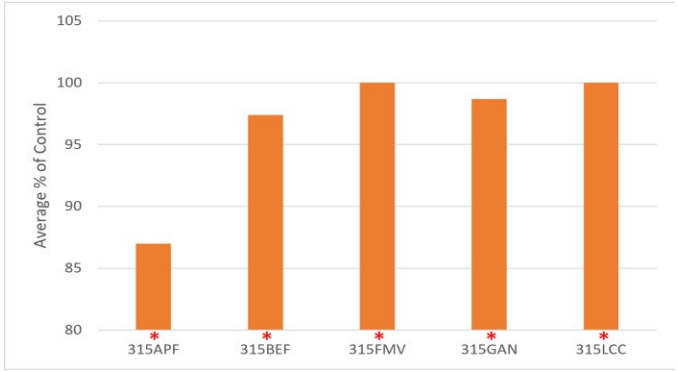
c) Invertebrate Toxicity in Water – Reproduction



d) Invertebrate Toxicity in Water – Survival



e) Invertebrate Toxicity in Sediment – Growth



f) Invertebrate Toxicity in Sediment – Survival

Figure 3-78. Results for Aquatic Toxicity (water and sediment) Monitoring in the South Region

Notes:

1. Bars represent the mean survival, reproduction, or growth rate for all 2023 samples at each site, as compared to laboratory controls.
2. There are generally four water toxicity sampling events for algae and invertebrates and two sediment toxicity events scheduled for each site, each year.
3. "No Test" indicates sites where no toxicity samples were collected due to dry channel or ponded conditions.
4. Results >100% indicate organism performance rates in the environmental sample were greater than in the control.
5. If a site experienced "significant toxicity" red fractions indicate the number of significantly toxic samples relative to the total number of toxicity samples collected (e.g., 1/2 indicates the site had two samples collected, one of which was significantly toxic.)

* Site with an applicable non-TMDL area limit for a given test species and endpoint

4.0 DISCUSSION

The results of CMP monitoring were evaluated for spatial patterns and temporal trends in water quality. Results from the 2023 monitoring year were compared between sites and sub-regions to evaluate differences in water quality across the Central Coast Region. Trend analysis was also performed for the period of record from each site (i.e., monthly data since either 2005 or 2006) to evaluate changes over time through 2023.

4.1 SPATIAL PATTERNS IN PARAMETERS OF CONCERN

Spatial patterns in monitoring results were evaluated broadly by HU. At this broad scale, there are important differences between areas of the Central Coast Region in which CMP sites are located. These broad regional patterns are often not reflective of water quality at every individual site within the HUs, nor do they necessarily represent water quality in areas of the HUs not monitored by the CMP.

4.1.1 Spatial Patterns in Select Routine Parameters

Monthly results and summary statistics for routine field and lab-analyzed parameters are summarized in **Appendix B**. "Aggregate median" results, which are summarized in **Table 4-1**, reflect the median value of all results for the relevant HU and parameters from 2023, and corresponding box plots are presented in **Appendix C**. **Table 4-2** summarizes Basin Plan Water Quality Objective exceedances in a given HU regardless of whether there are TMDL or Non-TMDL limits that supersede the Basin Water Quality Objectives for individual site-parameter combinations.

Table 4-1. Hydrologic Unit Aggregate Medians for Select Parameters

HU	Ammonia as N, Unionized (mg/L)	Nitrate (mg/L)	Oxygen, Dissolved (mg/L)	Oxygen, Saturation (%)	pH	Specific Conductivity (µS/cm)	Turbidity (NTU)	Orthophosphate as P (mg/L)
305	0.0016	7.36	9.0	86.0	8.0	1,416	28.0	0.12
309	0.0044	11.30	10.0	97.5	8.1	1,424	51.7	0.31
310	0.0006	5.15	8.6	83.4	7.7	1,121	4.4	0.31
312	0.0027	14.30	9.8	95.0	7.8	1,646	70.0	0.42
313/314	0.0013	0.85	10.3	102.7	8.2	1,167	22.4	0.38
315	0.0009	4.48	10.6	101.3	8.1	2,202	6.6	0.06

Notes: HU Key: 305=Pajaro; 309=Salinas; 310=Estero Bay; 312=Santa Maria; 313= San Antonio; 314=Santa Ynez; 315=South Coast

Table 4-2. Hydrologic Unit Water Quality Objective Exceedance Summary

HU	Ammonia as N, Unionized			Nitrate			Oxygen, Dissolved			pH		
	# of Exc.	n	% Exc.	# of Exc.	n	% Exc.	# of Exc.	n	% Exc.	# of Exc.	n	% Exc.
305	10	136	7	65	136	48	27	136	20	46	136	34
309	28	168	17	45	93	48	14	176	8	54	176	31
310	0	60	0	12	60	20	11	60	18	4	60	7
312	16	84	19	55	84	65	2	84	2	10	84	12
313/314	1	24	4	0	34	0	3	34	9	13	34	38
315	0	60	0	16	60	27	0	60	0	16	60	27

Notes: HU Key: 305=Pajaro; 309=Salinas; 310=Estero Bay; 312=Santa Maria; 313= San Antonio; 314=Santa Ynez; 315=South Coast
Exc. Exceedances
n Sample count
1 Represents the number of exceedances and sample count for only those sites with a nitrate WQO.

- The Santa Maria HU had the highest aggregate median turbidity concentration (70.0 NTU) in 2023, followed by the Salinas (51.7 NTU) and Pajaro (28.0 NTU) HUs.
- The Santa Maria HU had the highest percentage of samples (19%, 16 of 84 samples) exceeding the Water Quality Objective and TMDL limit for unionized ammonia (0.025 mg/L) in 2023, followed by the Salinas (17%, 28 of 168 samples), the Pajaro (7%, 10 of 136 samples), and the San Antonio and Santa Ynez (4%, 1 of 24 samples) HUs. There were no samples from the Estero Bay and South Coast HUs that exceeded the Water Quality Objective for unionized ammonia. The Salinas HU had the highest aggregate median unionized ammonia concentration (0.0044 mg/L).
- The Santa Maria HU had the highest aggregate median orthophosphate as P concentration (0.42 mg/L) in 2023, followed closely by the San Antonio and Santa Ynez HUs (0.38 mg/L).
- The Santa Maria HU had the highest percent of samples (65%, 55 of 84 samples) exceeding the Water Quality Objective and TMDL limit for nitrate (10 mg/L), followed by both the Pajaro and Salinas HUs (48%, with 65 of 136 samples and 45 of 93 samples, respectively), the South Coast (27%, 16 of 60 samples), and the Estero Bay (20%, 12 of 60 samples) HUs. There were no samples from the San Antonio and Santa Ynez HUs that exceeded the Water Quality Objective for Nitrate. The Santa Maria HU also had the highest aggregate median nitrate concentration (14.30 mg/L) for 2023, followed by the Salinas HU (11.30 mg/L).
- The South Coast HU had the highest aggregate median specific conductivity (2,202 µS/cm) in 2023, followed by the Santa Maria (1,646 µS/cm) and Salinas (1,424 µS/cm) HUs. All HUs had an aggregate median greater than the lowest of the suggested thresholds pertinent to the Central Coast region (i.e., 750 µS/cm).
- The Estero Bay HU had the lowest aggregate median dissolved oxygen concentration (8.6 mg/L) in 2023, followed by the Pajaro (9.0 mg/L) and Santa Maria (9.8 mg/L) HUs. The Pajaro HU had the highest percent of samples (20%, 27 of 136 samples) failing to meet the applicable Basin Plan dissolved oxygen Water Quality Objective (i.e., >5 or 7 mg/L) in 2023, followed by the Estero Bay HU (18%, 11 of 60 samples).
- The San Antonio and Santa Ynez HUs had the highest percent of samples (38%, 13 of 34 samples) exceeding the Water Quality Objective for pH (7-8.3 pH units) in 2023, followed by the Pajaro (34%, 46 of 136 samples) and Salinas (31%, 54 of 176 samples) HUs. The highest aggregate median pH for 2023 was also in the San Antonio and Santa Ynez HUs (8.2 pH units), while the lowest aggregate median pH was in the Estero Bay HU (7.7 pH units). Though both of these aggregate median pH values fall within the acceptable range per the Basin Plan, all HUs had exceedances on an individual site basis in 2023.

4.1.2 Spatial Patterns in Toxicity-Related Parameters

Differences in toxicity monitoring results between HUs are illustrated in **Figure 4-1**. As in prior years, toxicity to algae was less common on a regional basis compared to invertebrate toxicity in water and sediment:

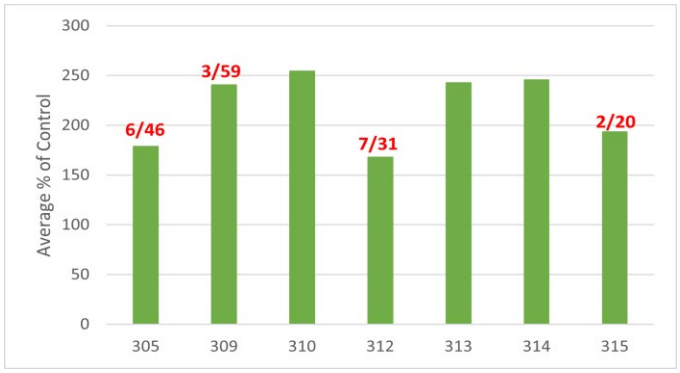
- Toxicity to algae was most frequent in samples collected from the Santa Maria HU (22.6%, 7 of 31 samples), followed by the Pajaro HU (13%, 6 of 46 samples), then the South Coast HU (10%, 2 of 20) (**Figure 4-1 a**). The Estero Bay and South Coast HUs showed no toxicity to algae during 2023.
- In 2023, toxicity to invertebrates in water occurred more frequently than toxicity to algae, with toxicity to *C. dubia* reproduction being the most common. Toxicity to *C. dilutus* survival was observed most frequently in samples collected from the Santa Maria HU (56.5%, 13 of 23 samples) and the Salinas HU (29.8%, 14 of 47 samples) (**Figure 4-1 b**). Toxicity to *C. dubia* survival was observed most commonly in samples collected from the Salinas HU (25.0%, 14 of 56 samples) and the Santa Maria HU (22.6%, 7 of 31 samples) (**Figure 4-1 d**) Toxicity to sub-lethal endpoints (i.e., reproduction or growth) for *C. dubia* and alternate species was most frequent in samples collected from the Santa Maria HU (60.9%, 14 of 23 samples) and Estero Bay HU (50%, 10 of 20 samples) (**Figure 4-1 c)**. The Salinas, South Coast, and Santa Ynez HUs also showed toxicity to invertebrate reproduction in water (36.2%, 35.3%, and 33.3% of samples, respectively). The following comparisons are based on results from bioassays with lethal *and* sub-lethal endpoints. The test

protocol for the alternative species *H. azteca* has only one endpoint, survival, so this small subset of results was not included.

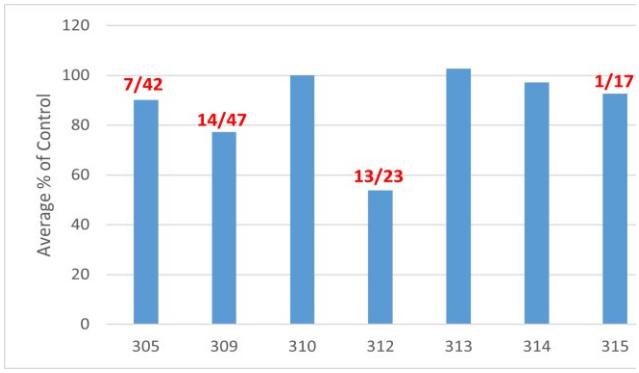
  - Regionwide, 74% of samples for *C. dubia* and alternate species (61 of 83 samples) with significant toxicity showed only sub-lethal effects, with no significant mortality.
  - In the Salinas HU, 31% of samples for *C. dubia* and alternate species (8 of 26 samples) with significant toxicity, showed both lethal and sub-lethal effects. Nine samples showed only sub-lethal effects and one sample showed only lethal effects.
  - In the Santa Maria HU, 24% of samples (5 of 21 samples) with significant toxicity, showed both lethal and sub-lethal effects. Many of samples showed only sublethal effects (43%, 9 of 21 samples).

- In 2023, toxicity to invertebrates in sediment was observed everywhere in the Central Coast region except for the Santa Ynez (**Figure 4-1 e, f**). Toxicity to invertebrate growth in sediment was observed most frequently in samples collected from Salinas (56.3%, 9 of 16 samples) and Santa Maria (50%, 3 of 6 samples) HUs (**Figure 4-1 e**). Toxicity to invertebrate survival in sediment was observed most frequently in samples collected from the Salinas (68.8%, 11 of 16 samples) and Santa Marina (66.7%, 4 of 6 samples) HUs (**Figure 4-1 f**). The following comparisons are based only on results from bioassays with lethal and sub-lethal endpoints. The test protocol for the alternative species *H. azteca* has only one endpoint, survival, so this small subset of results was not included.
  - Regionwide, 53% of sediment samples (18 of 34 samples) with significant toxicity showed only sub-lethal effects, with no significant mortality.
  - Of the samples that showed lethal toxic effects, 75% (12 of 16 samples) occurred in northern HUs while 25% (4 of 16 samples) occurred in southern HUs.
  - In the Salinas HU, 21% of sediment samples (3 of 14 samples) with significant toxicity, showed both lethal and sub-lethal effects.
  - In the Santa Maria HU, 33% of sediment samples (2 of 6 samples) with significant toxicity, showed both lethal and sub-lethal effects.

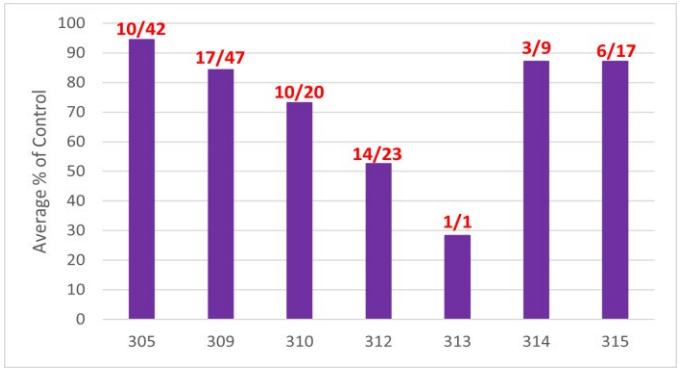
In some situations, it is difficult to determine the cause(s) of aquatic toxicity, and in these cases, it can be useful to perform a Toxicity Identification Evaluation (TIE). In a TIE, sample water known to be toxic to one or more aquatic species is manipulated in a variety of ways to assess the presence of various suspected toxicants, one or more of which can then be identified as responsible for causing the observed toxicity. The TIE approach is most helpful when a wide array of potential toxicants exists, in order to narrow the list of possible toxicants that need to be analyzed. However, in the case of the CMP, the list of most likely toxicants is relatively constrained to a few classes of pesticides and herbicides. Past monitoring efforts have generally confirmed that where aquatic toxicity is observed at CMP sites, sufficient concentrations of just a few materials (sampled concurrently) are present to explain most or all of the toxicity. Under these circumstances it is more efficient to sample concurrently for the few classes of probable toxicants than to perform TIEs. Since the approach of concurrent sampling for aquatic toxicity and probable toxicants (i.e., pesticides and herbicides) has proven relatively consistent throughout the history of the CMP, additional TIE studies are not recommended at this time, but will be used when a toxicity profile cannot be described by known contaminants. Further discussion is provided in the supplemental report titled *Central Coast Cooperative Monitoring Program Supplemental Monitoring Report, 2021 and 2022 Aquatic Toxicity and Potential Toxicants* (CCWQP 2023).



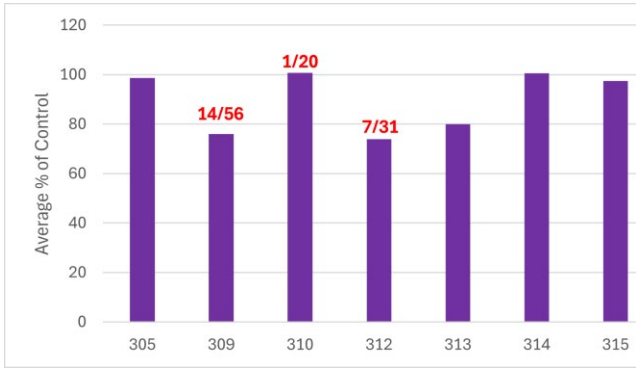
a) Algal Toxicity in Water – Growth



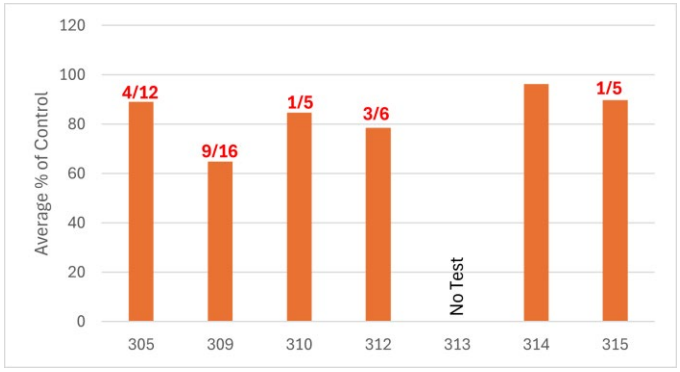
b) *C. dilutus* Toxicity in Water – Survival



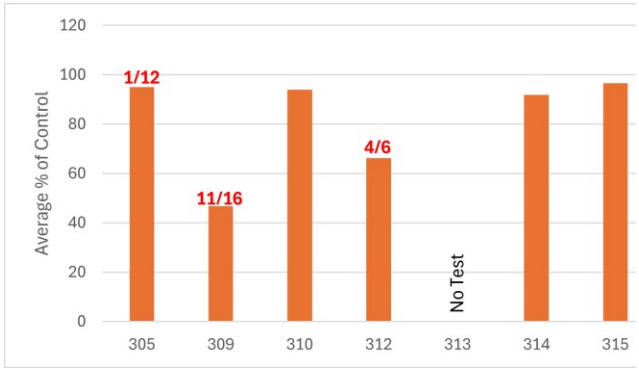
c) Invertebrate Toxicity in Water – Reproduction



d) Invertebrate Toxicity in Water – Survival



e) Invertebrate Toxicity in Sediment – Growth



f) Invertebrate Toxicity in Sediment – Survival

Figure 4-1. Summary of Toxicity in Water and Sediment Results from 2023

Notes:

1. Bars represent the mean survival, reproduction, or growth rate for all 2023 samples at each site, as compared to laboratory controls.
2. There are generally four water toxicity sampling events for algae and invertebrates and two sediment toxicity events scheduled for each site, each year.
3. Results >100% indicate organism performance rates in the environmental sample were greater than in the control.
4. If a HU experienced "significant toxicity" red fractions indicate the number of significantly toxic samples relative to the total number of toxicity samples collected (e.g., 1/2 indicates the site had two samples collected, one of which was significantly toxic).
5. *C. dubia* reproduction graphs generally reflect *C. dubia* tests but in some cases reflect a salinity-tolerant alternate test species, which in some cases test for "growth" instead of "reproduction" as the sub-lethal endpoint.
6. HU Key: 305=Pajaro; 309=Salinas; 310=Estero Bay; 312=Santa Maria; 313= San Antonio; 314=Santa Ynez; 315=South Coast

4.2 TEMPORAL PATTERNS – TRENDS OVER TIME

A primary objective of the CMP is to detect trends in water quality over time, should changes occur. In 2010, a power analysis was conducted which indicated varying levels of statistical power to detect trends with the seasonal Mann-Kendall test based upon the monthly monitoring schedule, observed variability in past CMP monitoring results, and test scenarios of 5- to 20-year periods of record (CCWQP 2010). For example, high variability in turbidity monitoring results limits the CMP's power to detect trends such that in a 5- to 10-year monitoring period, 50% reductions in turbidity levels would be needed to create a detectable trend at even 10% of the CMP sites (CCWQP 2010). In contrast, salinity-related parameters tend to be less variable such that 30% changes in conductivity (or salinity or TDS) can be reliably detected at 40% of CMP sites in just five years. Recent trend analyses have shown a better-than-expected ability to detect trends for some parameters; most notably, turbidity.

Trend analysis performed on the first five years of CMP results identified trends (i.e., statistically significant changes over time) in 21% of possible site-by-parameter combinations. Trend analysis in 2018, 2019, 2020, 2021, 2022, and 2023 identified trends in 32%, 33%, 36%, 37%, 37%, and 37% of possible site-by-parameter combinations, respectively. For this report, the "rkt" package for the R statistical computing software version 3.5.3 (https://CRAN.R-project.org/) was used to perform Mann-Kendall monotonic trend analysis on all site-by-parameter combinations with sufficient records in the CMP dataset from 2005 through 2023. An alpha value of 0.05 was used to determine significance for all trends. As discussed in Section 2.7, the seasonal Mann-Kendall test (Hirsch and Slack 1984) is the primary statistical test used for the CMP; however, where there was insufficient intra-annual data for site-by-parameter combinations, a non-seasonal Mann-Kendall test (Mann 1945) was performed. Trend direction and significance are depicted for each site/parameter in **Figure 4-2**. See **Appendix E** for a summary of all Mann-Kendall results including p-values and Kendall's Tau, which describe the significance and directionality of trends, respectively.

4.2.1 Trends for Select Routine Parameters

Trends for the period of 2005-2023 are presented for all sites and routine parameters in Section 3 of this report (Water Quality Monitoring Results). The significant trends for select parameters were further evaluated for continuity or reversals relative to prior trend analyses presented in the 2022 Annual Report (CCWQP 2022). The results of this evaluation are discussed in this Section of the report with regard to location in the northern monitoring unit or HUs (i.e., Pajaro River and Salinas) versus southern monitoring unit or HUs (i.e., Estero Bay, Santa Maria, Santa Ynez, and South Coast). Unless otherwise specified, within this section the term "trends" refers only to statistically significant trends.

- Through 2023, trends in stream flow were almost entirely decreasing (76.7%, 23 of 30 trends). All but two increasing trends were observed in northern HUs. The general distribution and direction of trends for flow were consistent with the 2022 trend analysis. One trend reversal was found in one north monitoring unit site (Merritt Ditch upstream from Highway 183 [309MER]) which changed from a previously decreasing trend to an increasing trend. In the Estero Bay, Santa Maria, and Santa Ynez, all statistically significant trends in flow were decreasing.
- Trends in pH were observed throughout the Central Coast Region, but more common in the northern HUs. The majority of decreasing trends (87%, 13 of 15 decreasing trends) were observed in northern HUs, and all increasing trends were observed in southern HUs. One hundred percent (13 of 13) of trends observed in the northern HUs and 22% (2 of 9) of all trends observed in the southern HUs were decreasing. The general distribution and direction of trends for pH were consistent with the 2015, 2016, 2017, 2018, 2019, 2020, and 2022 trend analyses that showed primarily decreasing trends in northern HUs and primarily increasing trends in southern HUs. No reversals of trends were found. In the Estero Bay, Santa Maria and Santa Ynez HUs, all statistically significant trends in pH were increasing, and in Pajaro and Salinas HUs, all trends were decreasing.
- Through 2023, a slight majority of decreasing trends (51%, 19 of 37 decreasing trends) for salinity, specific conductivity, and TDS, were observed in southern HUs. A slight majority of increasing trends (58%, 18 of

31 increasing trends) were also observed in southern HUs. Forty two percent (13 of 31) of all trends observed in the northern HUs and 49% (18 of 37) of all trends observed in the southern HUs were increasing. The general distribution and direction of trends for salinity-related parameters were consistent with the 2022 trend analysis. No reversals of trends were found. In the Santa Ynez HU, all statistically significant trends in salinity, specific conductivity, and TDS were increasing.

- Decreasing trends in dissolved oxygen were observed at eight sites throughout the monitoring area. Sixty-three percent (5 of 8 decreasing trends) were observed in the northern HUs and 38% (3 of 8 decreasing trends) were observed in the southern HUs. Of the 18 increasing trends in dissolved oxygen, eight were observed in the northern HUs and ten in the southern HUs. Thirty-nine percent (5 of 13) of all trends observed in the northern HUs and 23% (3 of 13) of all trends observed in the southern HUs were decreasing. The distribution of trends in 2023 was generally consistent with the 2022 trend analysis. No reversal of trends was observed. Increasing dissolved oxygen levels are difficult to interpret, as they can indicate either improved or worsened water quality depending on the time of sampling and the relationship of photosynthesizer communities to biostimulatory substances in the water. Diel sampling would be required to fully establish dissolved oxygen conditions but is generally beyond the scope of this program.
- Trends in turbidity were predominantly decreasing through2023. Eighty-one percent (17 of 21) of all trends observed in the northern HUs, and 21% (3 of 14) of all trends observed in the southern HUs were decreasing. The majority of increasing trends were observed in southern HUs (73%, 11 of 15 increasing trends) and the majority of decreasing trends were observed in northern HUs (85%, 17 of 20 decreasing trends). In the Estero Bay, Santa Ynez, and South Coast HUs, all statistically significant trends in turbidity were increasing. In the Santa Maria HU, all statistically significant trends in turbidity were decreasing and all but one of the trends in the Salinas HU were decreasing. The distribution of trends in 2023 was generally consistent with the 2022 trend analysis. No reversals of trends were observed. Similar to turbidity, flow-weighted turbidity was predominantly decreasing (60.6%, 20 of 33) through 2023. Fifty-three percent (8 of 15) of all trends observed in the northern HUs and 66.7% (12 of 18) of all trends observed in the southern HUs were decreasing.
- Throughout the Central Coast Region, a majority of trends in orthophosphate through 2023 were decreasing (87%, 27 of 31 trends). The slight majority of decreasing trends were observed in the northern HUs (59%, 16 of 27 decreasing trends), and the majority of increasing trends were observed in the southern HUs (75%, 3 of 4 increasing trends). Ninety-four percent (16 of 17) of trends observed in the northern HUs and 77% (11 of 14) of trends observed in the southern HUs were decreasing. These geographical and directional trends for orthophosphate were consistent with the 2022 trend analysis. No reversals of trends were observed. In the Salinas, Estero Bay, and Santa Ynez HUs, all statistically significant trends in Orthophosphate were decreasing.
- In 2023, the majority of trends in nitrate concentration were decreasing (66.7%, 18 of 27 trends). Forty-six percent (6 of 13 decreasing trends) were found in northern HUs and 86% (12 of 14 decreasing trends) were found in southern HUs. Fifty-four percent (7 of 13) of trends observed in northern HUs and 14% (2 of 14) of trends observed in southern HUs were increasing. In the Estero Bay and Santa Maria HUs, all statistically significant trends in nitrate were decreasing.
- Trends in total ammonia were predominantly increasing through 2023. All trends (13 of 13) in northern HUs were increasing and 88% (7 of 8) of trends in southern HUs were decreasing. All decreasing trends (100%, 7 of 7 decreasing trends) were observed in the southern HUs. A majority of trends for unionized ammonia were decreasing (83%, 24 of 29 trends). The slight majority of decreasing trends were observed in northern HUs (54%, 13 of 24 decreasing trends) and all of increasing trends were found within the southern HUs (100%, 5 of 5 increasing trends). Of the 15 sites that showed trends in both Ammonia-related parameters, three site had trends that did not match in terms of directionality (i.e., increasing vs. decreasing) for the two parameters (Llagas Creek [305LCS], Blanco Drain below Pump [309BLA], and Salinas River at Spreckels Gage [309SSP]). In the Santa Maria, Estero Bay, Santa Ynez, and South Coast HUs, all statistically significant trends in unionized ammonia were decreasing.

This page intentionally left blank.

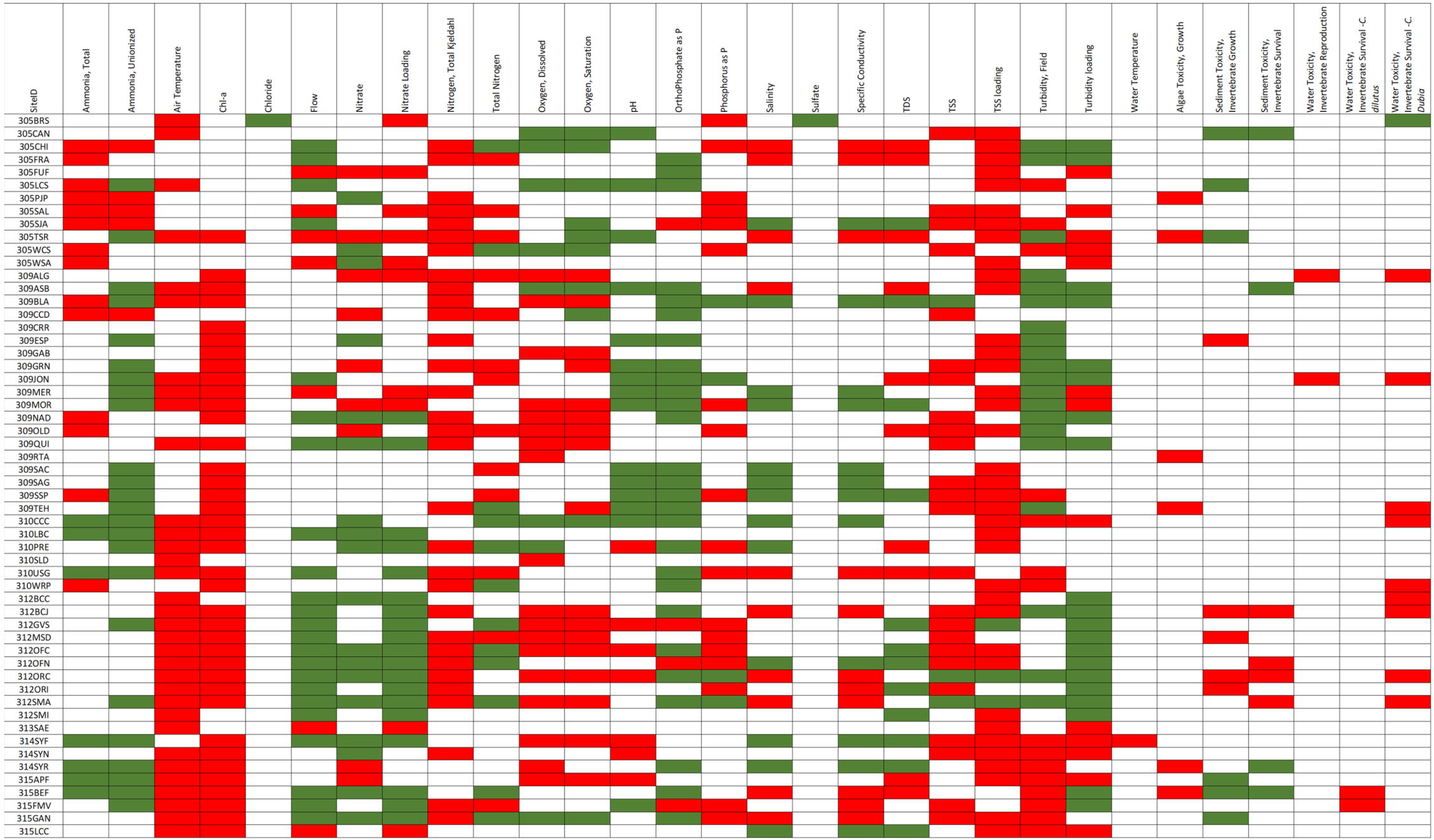


Figure 4-2. Summary of Significant Trends Detected in CMP Data with Mann-Kendall Analysis Using R, 2005-2023

Red blocks in the matrix indicate significant increasing trends, which usually indicate worsening water quality conditions (notable exceptions are dissolved oxygen and the toxicity related parameters, where increasing trends indicate improved test organism performance). Green blocks indicate significant decreasing trends, which usually indicate improved water quality (notable exceptions are dissolved oxygen and the toxicity-related parameters, where declining trends indicate reduced test organism performance).

This page intentionally left blank.

4.2.2 Trends for Toxicity-Related Parameters

Monitoring for parameters related to aquatic toxicity occurs less frequently and as such this portion of the dataset does not lend itself as readily to formal trend analysis as the other parameters. Due to the length of monitoring history, it is now possible to perform statistical tests for trends on some CMP toxicity data. However, due to the variability of the data, the number of statistically significant trends in toxicity is low. To supplement this limited dataset and to further understand the general direction of toxicity trends in the monitoring area, temporal patterns in the data were also evaluated with time series plots. **Appendix F** includes two different types of time series plots. One type depicts all monitoring locations within a HU for each parameter—the time series is presented as a black line while the associated trend of the data (determined by the Mann-Kendall analysis) is denoted as a blue line. The blue line represents the Theil-Sen Slope which is a statistic that is produced during the Mann-Kendall analysis and approximates the strength of the trend and correlates with Kendall's Tau. A dashed blue line indicates a non-significant trend (p-value >0.05), and a solid blue line indicates a significant trend (p-value ≤ 0.05). The other type of time series plot represents results for each sample location and parameter combination (a total of 1,562 plots). These plots include individual sample results denoted with a black line; a blue trend line based on the Theil-Sen Slope and having the same interpretive logic described above; and a locally estimated scatterplot smoothing (LOESS) line, which fits a smooth line to the data. LOESS is a "local" regression technique that gives more weight to nearby data than to data located further up or down the x-axis. LOESS is not a separate trend analysis method, but rather a visual tool to help see the relationship between localized subsets of data and to foresee potential trends. The results of water column toxicity trend analyses are presented below, as well as in **Figure 4-2**. With regard to aquatic toxicity, increasing trends generally indicate improvement (i.e., higher survival, reproduction, or growth rates over time). Unless otherwise specified, within this section the term "trends" refers only to statistically significant trends.

- Through 2023 six significant increasing trends (i.e., improvement) for algae growth were observed in the monitoring area. Four of the six increasing trends were observed in northern HUs. No significant decreasing trends were observed.
- Through 2023, two significant increasing trends (i.e., improvement) for invertebrate reproduction were observed. These trends were observed in the Salinas HU. No significant decreasing trends were observed.
- Through 2023, nine significant increasing trends (i.e., improvement) and one significant decreasing trend (i.e., worsening) for invertebrate survival in water for *C. dubia* were observed. The only decreasing trend was observed in the Pajaro HU. Two significant increasing trends were observed in the South Coast HU for *C. dilutus*.
- Through 2023, five significant increasing trends (i.e., improvement) and six significant decreasing trends (i.e., worsening) for invertebrate growth in sediment were observed. Three of the decreasing trends occurred in northern HUs and three occurred in southern HUs. All increasing trends occurred in the Santa Maria HU, with the exception of one in the Salinas HU.
- Through 2023, four significant increasing trends (i.e., improvement) and four significant decreasing trends (i.e., worsening) for invertebrate survival in sediment were observed in the monitoring area. Two of the four decreasing trends occurred as the only observed trends in the northern HUs and the remaining two decreasing trends occurred in southern HUs.

4.3 STORMWATER QUALITY

The impact of stormwater at monitoring sites was assessed by documenting "wet events" (i.e., monitoring events performed during or within 18 hours following a rain event that is sufficient to cause runoff, ponding, erosion, or other water quality problems and generally produces more than 0.5 inch of rain within 24 hours) for each HU according to site-by-site field observations, including current weather conditions, increase in stage and stream flow velocity, and/or the presence of storm related agricultural field runoff. A wet/dry determination was applied to all applicable field and analytical data gathered from each site visit based upon the conditions at the time of monitoring. **Table 4-3** displays the wet/dry status of monitoring events conducted in 2023.

Table 4-3. Summary of Wet/Dry Monitoring Events for 2023

HU	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
305	Dry	**Wet**	**Wet^{T}**	Dry	Dry^{T}	Dry	Dry	Dry^{T}	Dry	Dry	Dry	Wet^{P,T}
309	Dry^{P}	Wet^{P,T}	Wet^{P}	Dry	Dry^{T}	Dry^{P,T}	Dry	Dry	Dry	Dry	Dry	Dry^{P,T}
310	Dry^{T}	Dry	**Wet**	Dry	Dry^{T}	Dry	Dry	Dry^{T}	Dry	Dry	Dry	Dry^{T}
312	Dry^{T}	Dry^{P,T}	**Wet**	Dry	Dry^{T}	Dry^{P}	Dry	Dry^{T}	Dry	Dry	Dry	Dry^{T}
313/314	Dry	**Wet^{T}**	**Wet**	Dry	Dry^{T}	Dry	Dry	Dry^{T}	Dry	Dry	Dry	Dry^{T}
315	Dry	**Wet^{T}**	**Wet**	Dry	Dry^{T}	Dry	Dry	Dry^{T}	Dry	Dry	Dry	Dry^{T}

Notes:

P Mixed weather conditions were observed for a given HU and monitoring event; therefore, the predominant weather condition of the monitoring event (i.e., greater than 50% of monitoring locations) is noted.

T Toxicity samples collected and analyzed.

Wet Indicates if a HU was entirely (all sites) influenced by precipitation.

For this stormwater analysis, a two-sample, unpaired t-test assuming unequal variance was used to compare *wet* vs *dry* 2023 sample results. A t-test compares the average of the two groups to determine if any differences are significant (α=0.05). Below is a summary of all statistically significant results. See **Appendix D** for a summary of all test results.

4.3.1 Stormwater Analysis for Pajaro Hydrologic Unit

The results of the unpaired t-test for the Pajaro HU (HU305) showed:

- Algae growth was significantly higher during wet events.
- Unionized ammonia was significantly lower during wet events while total ammonia was significantly higher.
- Total nitrogen and nitrate levels were significantly lower during wet events.
- Potassium and calcium levels were significantly higher during wet events.
- Salinity levels were significantly lower during wet events.
- pH was significantly lower during wet events.
- Water temperatures were significantly lower during wet events.

4.3.2 Stormwater Analysis for Salinas Hydrologic Unit

The results of the unpaired t-test for the Salinas HU (HU309) showed:

- Algae growth was significantly lower during wet events.
- Unionized ammonia was significantly lower during wet events.
- Survival in water for *C. dilutus* was significantly lower during wet events.
- Invertebrate reproduction in water for *C. dubia* was significantly lower during wet events.
- Dissolved oxygen was significantly higher in wet events.

- pH was significantly lower during wet events.
- Salinity was significantly lower during wet events.
- Specific conductivity was significantly lower during wet events.
- TDS, alkalinity, calcium, and sulfate levels were significantly lower during wet events.
- Turbidity levels were significantly higher during wet events.
- Water temperatures were significantly lower during wet events.

4.3.3 Stormwater Analysis for Estero Bay Hydrologic Unit

The results of the unpaired t-test for the Estero Bay HU (HU310) showed:

- Unionized ammonia was significantly lower during wet events.
- Nitrate and total nitrogen were significantly lower during wet events.
- Total Kjeldahl nitrogen was significantly higher during wet events.
- Salinity and specific conductivity were significantly lower during wet events.
- TDS was significantly lower during wet events.
- TSS and turbidity were significantly higher during wet events.
- Water temperatures were significantly lower during wet events.

4.3.4 Stormwater Analysis for Santa Maria Hydrologic Unit

The results of the unpaired t-test for the Santa Maria HU (HU312) showed:

- Alkalinity was significantly lower during wet events.
- Survival in water for *C. dilutus* was significantly lower during wet events.
- Ammonia and unionized ammonia were significantly lower during wet events.
- Calcium and chlorophyll levels were significantly lower during wet events.
- Nitrate was significantly lower during wet events.
- Oxygen saturation levels were significantly lower during wet events.
- pH was significantly lower during wet events.
- Potassium was significantly lower during wet events.
- Phosphorus trends were higher during wet events.
- Specific conductivity was significantly lower during wet events.
- TDS, salinity, and sulfate levels were significantly lower during wet events.
- Turbidity and TSS trends were significantly higher during wet events.
- Water temperatures were significantly lower during wet events.
- Survival in water for *C. dilutus* was significantly lower during wet events.
- Invertebrate reproduction in water for *C. dubia* was significantly lower during wet events.

4.3.5 Stormwater Analysis for San Antonio Hydrologic Unit

The results of the unpaired t-test for the San Antonio HU (HU313) showed:

- Nitrate loading trends were significantly higher during wet events.
- TSS loading trends were significantly higher during wet events.

4.3.6 Stormwater Analysis for Santa Ynez Hydrologic Unit

The results of the unpaired t-test for the Santa Ynez HU (HU314) showed:

- Algae growth was significantly lower during wet events.
- Unionized ammonia was significantly lower during wet events.
- Alkalinity and calcium trends were lower during wet events.
- Flow was significantly higher during wet events.
- Nitrate loading was significantly higher during wet events.
- Oxygen saturation trends were significantly lower during wet events.
- Magnesium was significantly lower during wet events.
- pH was significantly lower during wet events.
- Phosphorus was significantly higher during wet events.
- Sulfate was significantly lower during wet events.
- Turbidity and TSS were significantly higher during wet events.
- Water temperatures were significantly lower during wet events.

4.3.7 Stormwater Analysis for South Coast Hydrologic Unit

The results of the unpaired t-test for the South Coast HU (HU315) showed:

- Chlorophyll and alkalinity levels were significantly lower during wet events.
- Calcium and chloride levels were significantly lower during wet events.
- Flow was significantly higher during wet events.
- Invertebrate reproduction in water for *C. dubia* was significantly higher during wet events.
- Total nitrogen and nitrate levels were significantly lower during wet events.
- Magnesium levels were significantly lower during wet events.
- pH was significantly lower during wet events.
- Sulfate levels were all significantly lower during wet events.
- Turbidity, TSS, and TSS loading trends were significantly higher during wet events.
- Water temperatures were significantly lower during wet events.

4.4 WATER QUALITY IMPACTS & EXCEEDANCES

Agricultural discharges may contain eroded soils, fertilizers, and other amendments, and/or pest control materials. As an ambient monitoring program, the CMP is not designed to locate nor characterize individual agricultural discharges, but rather to assess the cumulative impact of multiple discharges at the bottom of watersheds. Monitoring sites for the CMP were selected to reflect substantial agricultural land use and known water quality impairments. Most CMP watersheds include other land uses in addition to agriculture (i.e., urban, rural residential, etc.). Therefore, monitoring results must be interpreted with caution and in the context of land uses specific to each watershed.

Water quality impacts and exceedances at CMP sites in 2023 included the following:

- Elevated turbidity from newly eroded soils and/or resuspension of stream-bottom sediments consisting of previously eroded soils and/or naturally occurring soft substrate. Turbidity levels were monitored monthly and reported quarterly in 2023, each time being submitted to the California Environmental Data Exchange

Network (CEDEN) via the California Data Upload and Checking System (CalDUCS) maintained by Moss Landing Marine Laboratories. The Water Quality Objective for turbidity is narrative and dependent on natural background levels, hence exceedances could not be enumerated in **Appendix B** of this report (Summary Statistics and Exceedance Frequencies). Elevated turbidity levels are reported and discussed in detail by HU in Sections 3.2.3, 3.3.3, 3.4.3, 3.5.3, 3.6.3, and 3.7.3 of this report, and summarized in Sections 4.1 and 4.2.

- Elevated nutrient levels from fertilizers or other amendments, and in some cases from wastewater treatment plant effluent and other urban sources. Nutrient levels were monitored monthly and reported quarterly in 2023, each time being submitted to the CEDEN via the CalDUCS maintained by Moss Landing Marine Laboratories. Exceedances of numeric Water Quality Objectives for nitrate and unionized ammonia are also enumerated in **Appendix C** of this report. For other forms of nitrogen without numeric Water Quality Objectives, as well as total phosphorus and orthophosphate, elevated concentrations are also reported and discussed in detail by HU in Sections 3.2, 3.3, 3.4, 3.5, 3.6, and 3.7 of this report, and summarized in Section 4.1 and 4.2.
- In 2023, water column toxicity from pest control materials was monitored four times and sediment toxicity monitored once. This monitoring reflects two summer/dry season events and two winter/wet season events for water, and a spring event for sediment. Bioassay results and statistical determinations of significant toxic effects were reported quarterly in 2023 via submittal to CEDEN via the CalDUCS maintained by Moss Landing Marine Laboratories. Significant toxic effects are reported and discussed in detail by HU in Sections 3.2.11, 3.3.11, 3.4.11, 3.5.11, 3.6.11, and 3.7.11 of this report, and summarized in Sections 4.1 and 4.2.

This page intentionally left blank.

5.0 SUMMARY AND CONCLUSIONS

All 12 CMP monitoring events planned for 2023 were successfully conducted, with a total of 552 of the 654 planned site visits (84.4%) resulting in samples being collected. Samples were not collected during 102 site visits because 50 site visits observed a dry channel, 45 site visits observed disconnected pools and/or discontinuous flows, and 7 were inaccessible due to storm damage. All the collected samples were analyzed. The monitoring results were evaluated in accordance with the CMP QAPP (CCWQP 2018) and determined overall to be of high quality with few qualifications that would limit use.

There were some broad regional trends observed in the CMP monitoring results:

- Twenty-six statistically significant trends in dissolved oxygen were observed across the Central Coast Region, 18 of which were increasing. The statistically significant trends were primarily increasing in the Salinas, Santa Maria, and Santa Ynez Hus, and primarily decreasing in the Pajaro HU. The South Coast HU had an equal number of increasing and decreasing trends, and no trends were observed within the San Antonio HU. The increasing trends could indicate improvements, or conversely, could be part of a worsening trend involving reduced oxygen levels at night, caused by the same algal populations responsible for the daytime highs. The CMP does not monitor dissolved oxygen at night. The Pajaro and Salinas Hus had the highest percentage of dissolved oxygen Water Quality Objective exceedances in the Region.
- There were 35 statistically significant trends in turbidity, 20 decreasing and 15 increasing. The Salinas HU comprised the majority of the decreasing trends (70% of decreasing trends). In the Estero Bay, Santa Ynez, and South Coast Hus, all statistically significant trends in turbidity were increasing. In the Santa Maria HU, all statistically significant trends in turbidity were decreasing. There were 30 statistically significant trends in flow, which were primarily decreasing (seven exceptions). Three statistically significant increasing trends were observed in the Pajaro HU and one statistically significant increasing trend was observed in the Salinas HU. Twenty-two statistically significant trends in pH were observed throughout the Region. These statistically significant trends were most commonly decreasing in the Pajaro River and Salinas Hus and increasing in the Santa Maria and Santa Ynez Hus. The Estero Bay and South Coast Hus were primarily increasing with the exception of two decreasing statistically significant trends at one site in each HU. The Salinas HU comprised 67% (10 of 15) of the statistically significant decreasing trends in the Central Coast Region. The Pajaro HU had the highest percentage of pH Water Quality Objective exceedances in the Region.
- Statistically significant trends for ammonia were mostly increasing throughout the Central Coast Region, accounting for 67% (14 of 21) of trends. Statistically significant trends for unionized ammonia were mostly decreasing throughout the Region (83%, 24 of 29 trends). The Salinas HU had the highest percentage of ammonia WQO (including WQOs that were superseded by TMDL or Non-TMDL limit criteria) exceedances in the Region, and the Estero Bay and South Coast Hus achieved all unionized ammonia TMDL and non-TMDL limits.
- Statistically significant trends in orthophosphate were primarily decreasing in 2023 (87%, 27 of 31 trends), similar to last year's trends (82%, 24 of 29 trends).
- Statistically significant trends in salinity-related parameters were primarily decreasing throughout the Region (57% decreasing). Mostly all trends throughout the Pajaro and South Coast HUs were increasing. No HU had monotonic trends.
- Twenty-seven statistically significant trends in nitrate were observed across the Central Coast Region, 9 of which were increasing. Of the increasing trends, most were observed in the Pajaro River and Salinas HUs. Two statistically significant increasing trends in nitrate loading had a corresponding decreasing trend in nitrate concentration. The Pajaro HU had the highest percentage of nitrate WQO (including WQOs that were superseded by TMDL or Non-TMDL limit criteria) exceedances in the Region. San Antonio and Santa Ynez HUs achieved all nitrate TMDL limits.

- Six statistically significant increasing trends (i.e., improving, reduced toxicity) for algae growth were observed throughout the Region. No statistically significant decreasing trends were observed.
    - Toxicity to algae was observed most frequently in the Pajaro and Salinas HUs.
- Nine statistically significant increasing trends (i.e., improving, reduced toxicity) and one statistically significant decreasing trend (i.e., worsening) for Toxicity to *C. dubia* survival in water were observed throughout the region.
    - Toxicity to *C. dubia* survival in water was observed most frequently in samples collected from the Salinas HU, followed by the Santa Maria and Estero Bay HUs.
- Toxicity to *C. dilutus* survival in water was observed in all HUs except for Estero Bay, San Antonio, and San Ynez HUs. Additionally, Santa Maria only had one significantly toxic sample.
- Toxicity to invertebrate reproduction in water was observed in samples collected from all HUs, with Santa Maria having the highest number of significantly toxic samples.
- Throughout the monitoring area, most *C. dubia* bioassays showing significant toxicity in water had only sub-lethal effects with no significant effect to mortality, while most bioassays showing significant toxicity in sediment showed both sub-lethal and lethal effects.
- Toxicity to invertebrate survival and growth in sediment occurred most frequently in samples collected in the Salinas HU, followed by the Santa Maria HU.

The CMP results from 2023 continue to support the conclusion that low dissolved oxygen, elevated pH, elevated nitrate and ammonia, and water and sediment toxicity are parameters of concern in many waterbodies. However, the presence of statistically significant trends indicates that some conditions may be changing. Due to the ongoing drought conditions followed by severe atmospheric river events in the Central Coast Region, some of these changes are likely influenced by climatic factors; however, improved management by growers such as the implementation of more efficient irrigation technology (R. Taylor, D. Zilberman 2017) in conjunction with the implementation and improvement of erosion, nutrient, and pesticide best management practices reported by many regional growers (CCRWQCB 2020, Section 2.7.1), may also contribute to trends.

To address observed exceedances of surface water limits, which are summarized in Section 3 and 4 of this Report, CCWQP will implement the “Follow-up Surface Receiving Water Implementation Work Plan for the Central Coast Irrigated Lands Program: High Priority Areas” (Follow-up Monitoring Work Plan)(Note, this Work Plan is currently in draft form and will be finalized in 2025) which was developed in part with a goal of identifying and abating the specific sources of water quality impacts from agricultural discharges. To achieve this goal, CCWQP will implement measures described in the Follow-up Monitoring Work Plan to include conducting follow-up surface water monitoring in high priority agricultural watersheds to identify the sources of agricultural discharges contributing to receiving water quality impacts; performing watershed and ranch level outreach and education; and supporting and facilitating coordinated implementation of on-farm practices, drainage conveyance maintenance and operations, and sub-watershed enhancement projects

6.0 REFERENCES

California 100 2023. Central Coast Region. 2023. (https://california100.org/wp-content/uploads/2023/10/Central-Coast-Region-FINAL.pdf)

CCAMP 2016. Data Navigator. http://rdc-omega.mlml.calstate.edu/DNMSSQL/view_data.php?org_id=rb3#pagetop. Central Coast Ambient Monitoring Program (CCAMP). Accessed April 2016.

CCRWQCB 2000. Salinas River Watershed Characterization Report 1999. Central Coast Regional Water Quality Control Board (CCRWQCB). San Luis Obispo, CA. July

CCRWQCB 2003. Pajaro River Watershed Characterization Report 1998. Central Coast Regional Water Quality Control Board (CCRWQCB). San Luis Obispo, California. Revised January 2003.

CCRWQCB 2007. Santa Maria River Hydrologic Unit Assessment Report 2000. Central Coast Regional Water Quality Control Board (CCRWQCB). San Luis Obispo, CA. October.

CCRWQCB 2017. Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands. Central Coast Regional Water Quality Control Board (CCRWQCB). San Luis Obispo, CA. March.

CCRWQCB 2019. Water Quality Control Plan for the Central Coast Basin (Basin Plan). California Regional Water Quality Control Board Central Coast Region. San Luis Obispo, CA.

CCRWQCB 2020. Proposed General Waste Discharge Requirements for Discharges from Irrigated Lands (Agricultural Order) Final Environmental Impact Report. Central Coast Regional Water Quality Control Board (CCRWQCB). San Luis Obispo, CA. February.

CCRWQCB 2021. General Waste Discharge Requirements for Discharges From Irrigated Lands. Order No. R3-2021-0040. Central Coast Regional Water Quality Control Board (CCRWQCB). San Luis Obispo, California. April.

CCWQP 2010. Central Coast Cooperative Monitoring Program 2005-2008 Water Quality Report. Central Coast Water Quality Preservation, Inc. Watsonville, CA. Revised April 2010.

CCWQP 2013. Region 3 Conditional Waiver Cooperative Monitoring Program: Quality Assurance Project Plan for Monitoring Designed for the Agricultural Waiver Monitoring Program in the Central Coast Region. Revision 9. Prepared for Central Coast Water Quality Preservation, Inc. (CCWQP) by Pacific EcoRisk, Fairfield, CA.

CCWQP 2017. Amendment to Central Coast Cooperative Monitoring Program Quality Assurance Program Plan. Central Coast Water Quality Preservation, Inc. (CCWQP). Watsonville, CA. February 15.

CCWQP 2018. Revised Amendment to Central Coast Cooperative Monitoring Program Quality Assurance Program Plan. Central Coast Water Quality Preservation, Inc. (CCWQP). Watsonville, CA. April 12.

CCWQP 2021. Central Coast Cooperative Monitoring Program 2020 Annual Water Quality Report. Central Coast Water Quality Preservation, Inc. (CCWQP). Watsonville, CA. July.

CCWQP 2023. Central Coast Cooperative Monitoring Program Supplemental Monitoring Report, 2021 and 2022 Aquatic Toxicity and Potential Toxicants. Central Coast Water Quality Preservation, Inc. (CCWQP). Watsonville, CA. July.

CDC 2016. Important Farmland Data. 2016. (ftp://ftp.consrv.ca.gov/pub/dlrp/fmmp/2016/)

CDWR 2022. California Irrigation Management Information System (CIMIS) Station Reports (https://CDWR.water.ca.gov/WSNReportCriteria.aspx).

County of Santa Barbara 2019. Santa Barbara County Integrated Regional Water Management Plan. Santa Barbara, CA.

Hirsch, R. M. and J. R. Slack 1984. A Nonparametric Test for Seasonal Data with Serial Dependence. Water Resources Research 20 pp. 727-732.

Mann, H.B. 1945. Nonparametric Tests Against Trend. *Econometrica*, 13(3) pp. 245-259.

Marchetto 2017. Mann-Kendall Test, Seasonal and Regional Kendall Tests. 2017. (https://cran.r-project.org/web/packages/rkt/index.html)

R Core Team 2020. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. 2019. (https://www.r-project.org/)

SWRCB 2003. Central Coast Ambient Monitoring Program Hydrologic Unit Report for the 2000-03 Estero Bay Watershed Rotation Area. SWAMP Assessment Repot for the Central Coast Region 2000-03. https://www.waterboards.ca.gov/water_issues/programs/swamp/docs/reglrpts/rb3_esterobayreport.pdf

SWRCB 2007a. SWAMP Assessment Report for the Central Coast Region 2001-02: Central Coast Ambient Monitoring Program Hydrologic Unit Report for the 2001-02 Santa Ynez Watershed Rotation Area. State Water Resources Control Board (SWRCB). Sacramento, CA. June.

SWRCB 2007b. SWAMP Assessment Report for the Central Coast Region 2001-02: Central Coast Ambient Monitoring Program Hydrologic Unit Report for the 2001-02 South Coast Watershed Rotation Area. State Water Resources Control Board (SWRCB). Sacramento, CA. June.

Taylor R. and D. Zilberman 2017. Diffusion of Drip Irrigation: The Case of California, Applied Economic Perspectives and Policy, Volume 39, Issue 1, March 2017, Pages 16–40. (https://doi.org/10.1093/aepp/ppw026).

USEPA 2000. Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Organisms. U.S. Environmental Protection Agency (USEPA), Office of Water, Washington, D.C.

USEPA 2002. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, 4th Edition. U.S. Environmental Protection Agency (USEPA), Office of Water, Washington, D.C.

USGS 2008. Annual Water Data Reports. United States Geological Survey (USGS) (https://wdr.water.usgs.gov/).

USGS 2009. Annual Water Data Reports. United States Geological Survey (USGS) (https://wdr.water.usgs.gov/).

USGS 2022. Annual Water Data Reports. United States Geological Survey (USGS) (https://wdr.water.usgs.gov/).

APPENDIX A – TMDL AND NON-TMDL AREA LIMITS

This page intentionally left blank.

Summary of Annual, Dry Season, and Wet Season TMDL Limits and Non-TMDL Area Limits for Sites in Hydrologic Unit 305 (HU 305)

CMP Site ID	CMP Site Description	Pajaro River Watershed Nutrient TMDL								Pajaro River Watershed Chlorpyrifos and Diazinon TMDL		Non-TMDL Area Limits[1]				
		Unionized Ammonia, mg/L	Nitrate as N, mg/L	Nitrate as N, mg/L (Dry Season)	Nitrate as N, mg/L (Wet Season)	Total Nitrogen, mg/L (Dry Season)	Total Nitrogen, mg/L (Wet Season)	Orthophosphate, mg/L (Dry Season)	Orthophosphate, mg/L (Wet Season)	No Significant Toxic Effect, 7-Day, Chronic Exposure with *. dubia* in Water (Survival & Reproduction)	No Significant Toxic Effect, 10-Day, Chronic Exposure *with H. azteca* in Sediment (Survival& Reproduction[2])	Turbidity, NTU	Unionized Ammonia, mg/L	Nitrate as N, mg/L	No Significant Effect Based on Chronic or Acute Toxicity to Applicable Test Organism in Water (Survival, Growth, & Reproduction)	No Significant Effect Based on Chronic or Acute Toxicity to Applicable Test Organism in Sediment (Survival, Growth, & Reproduction[2])
305BRS	Beach Road Ditch at Shell Rd.	<0.025	<10	<3.3	<8	-	-	<0.14	<0.3	-	-	<25	-	-	Survival, Growth, and Reproduction	Survival and Growth
305CAN	Carnadero Creek upstream of Pajaro River	<0.025	<10	<1.8	<8	-	-	<0.05	<0.3	-	-	<25	-	-	Survival, Growth, and Reproduction	Survival and Growth
305CHI	Pajaro River at Chittenden	<0.025	<10	<3.9	<8	-	-	<0.14	<0.3	Survival and Reproduction	Survival	<25	-	-	Growth	Growth
305SAL	Salsipuedes Creek downstream of Corralitos Creek upstream from Highway 129	<0.025	<10	<1.8	<8	-	-	<0.14	<0.3	-	-	<25	-	-	Survival, Growth, and Reproduction	Survival and Growth
305FRA	Millers Canal at Frazier Lake Rd.	<0.025	<10	-	-	<1.1	<8.0	<0.04	<0.3	-	-	<25	-	-	Survival, Growth, and Reproduction	Survival and Growth
305FUF	Furlong Creek at Frazier Lake Rd.	<0.025	<10	<1.8	<8	-	-	<0.05	<0.3	-	-	<25	-	-	Survival, Growth, and Reproduction	Survival and Growth
305LCS	Llagas Creek at Southside	<0.025	<10	<1.8	<8	-	-	<0.05	<0.3	Survival and Reproduction	Survival	<25	-	-	Growth	Growth
305PJP	Pajaro River at Main St.	<0.025	<10	<3.9	<8	-	-	<0.14	<0.3	Survival and Reproduction	Survival	<25	-	-	Growth	Growth
305SJA	San Juan Creek at Anzar Rd.	<0.025	<10	<3.3	<8	-	-	<0.12	<0.3	-	-	<25	-	-	Survival, Growth, and Reproduction	Survival and Growth
305TSR	Tequisquita Slough u/s Pajaro River at Shore Rd.	<0.025	<10	<2.2	<8	-	-	<0.12	<0.3	-	-	<40	-	-	Survival, Growth, and Reproduction	Survival and Growth
305WCS	Watsonville Creek at Salinas Road/Hudson Landing	-	-	-	-	-	-	-	-	-	-	<25	<0.025	<10	Survival, Growth, and Reproduction	Survival and Growth
305WSA	Watsonville Slough at San Andreas Rd.	<0.025	<10	-	<8	<2.1	-	<0.14	<0.3	-	-	<40	-	-	Survival, Growth, and Reproduction	Survival and Growth

Note:

1. Dischargers in an area without an established TMDL for a pollutant must not cause or contribute to an exceedance of the pollutant's surface receiving water limit in Ag Order 4.0 Table C.3-3 for nutrients, Table C-3.5 for pesticides and toxicity, and Table C.3-7 for turbidity in accordance with the compliance dates specified in the applicable table (CCRWQCB 2021).
2. *H. azteca* reproduction in sediment is not tested for by the CMP so is not included in the TMDL limit and non-TMDL area limit discussions in this report.

\- No applicable TMDL or non-TMDL Area Limits.

Summary of Annual, Dry Season, and Wet Season TMDL Limits and Non-TMDL Area Limits for Sites in Hydrologic Unit 309 (HU 309)

CMP Site ID	CMP Site Description	Lower Salinas River Watershed Nutrient TMDL								Lower Salinas River Watershed Sediment Toxicity and Pyrethroids in Sediment TMDL	Non-TMDL Area Limits[1]				
		Unionized Ammonia, mg/L	Nitrate as N, mg/L	Nitrate as N, mg/L (Dry Season)	Nitrate as N, mg/L (Wet Season)	Total Nitrogen, mg/L (Dry Season)	Total Nitrogen, mg/L (Wet Season)	Orthophosphate, mg/L (Dry Season)	Orthophosphate, mg/L (Wet Season)	No Significant Toxic Effect, 10-Day, Chronic Exposure *with H. azteca* in Sediment (Survival)	Turbidity, NTU	Unionized Ammonia, mg/L	Nitrate as N, mg/L	No Significant Effect Based on Chronic or Acute Toxicity to Applicable Test Organism in Water (Survival, Growth, & Reproduction)	No Significant Effect Based on Chronic or Acute Toxicity to Applicable Test Organism in Sediment (Survival, Growth, & Reproduction[2])
309ALG	Salinas Reclamation Canal at La Guardia St.	<0.025	-	<6.4	<8	-	-	<0.13	<0.3	Survival	<40	-	-	Survival, Growth, and Reproduction	Growth
309ASB	Alisal Slough at White Barn	<0.025	-	<6.4	<8	-	-	<0.13	<0.3	Survival	<25	-	-	Survival, Growth, and Reproduction	Growth
309BLA	Blanco Drain below Pump	<0.025	-	<6.4	<8	-	-	<0.13	<0.3	Survival	<40	-	--	Survival, Growth, and Reproduction	Growth
309CCD	Chualar Creek West of Highway 1 on River Rd.	<0.025	<10	-	-	-	-	-	-	Survival	<25	-	-	Survival, Growth, and Reproduction	Growth
309CRR	Chualar Creek North Branch East of Hwy 1	<0.025	<10	-	-	-	-	-	-	Survival	<25	-	-	Survival, Growth, and Reproduction	Growth
309ESP	Espinosa Slough upstream of Alisal Slough	<0.025	-	<6.4	<8	-	-	<0.13	<0.3	-	<40	-	-	Survival, Growth, and Reproduction	Survival and Growth
309GAB	Gabilan Creek at Boronda Rd.	<0.025	-	<2	<8	-	-	<0.07	<0.3	Survival	<25	-	-	Survival, Growth, and Reproduction	Growth
309GRN	Salinas River at Elm Rd. in Greenfield	-	-	-	-	-	-	-	-	-	<25	<0.025	<10	Survival, Growth, and Reproduction	Survival and Growth
309JON	Salinas Reclamation Canal at San Jon Rd.	<0.025	-	<6.4	<8	-	-	<0.13	<0.3	Survival	<40	-	-	Survival, Growth, and Reproduction	Growth
309MER	Merritt Ditch upstream from Highway 183	<0.025	-	<6.4	<8	-	-	<0.13	<0.3	Survival	<25	-	-	Survival, Growth, and Reproduction	Growth
309MOR	Moro Cojo Slough at Highway 1	<0.025	-	-	-	<1.7	<8	<0.13	<0.3	-	<25	-	<10	Survival, Growth, and Reproduction	Survival and Growth
309NAD	Natividad Creek upstream from Salinas Reclamation Canal	<0.025	-	<2	<8	-	-	<0.07	<0.3	Survival	<25	-	-	Survival, Growth, and Reproduction	Growth
309OLD	Old Salinas River at Monterey Dunes Wy.	<0.025	-	<3.1	<8	-	-	<0.07	<0.3	Survival	<25	-	-	Survival, Growth, and Reproduction	Growth

CMP Site ID	CMP Site Description	Lower Salinas River Watershed Nutrient TMDL								Lower Salinas River Watershed Sediment Toxicity and Pyrethroids in Sediment TMDL	Non-TMDL Area Limits[1]				
		Unionized Ammonia, mg/L	Nitrate as N, mg/L	Nitrate as N, mg/L (Dry Season)	Nitrate as N, mg/L (Wet Season)	Total Nitrogen, mg/L (Dry Season)	Total Nitrogen, mg/L (Wet Season)	Orthophosphate, mg/L (Dry Season)	Orthophosphate, mg/L (Wet Season)	No Significant Toxic Effect, 10-Day, Chronic Exposure *with H. azteca* in Sediment (Survival)	Turbidity, NTU	Unionized Ammonia, mg/L	Nitrate as N, mg/L	No Significant Effect Based on Chronic or Acute Toxicity to Applicable Test Organism in Water (Survival, Growth, & Reproduction)	No Significant Effect Based on Chronic or Acute Toxicity to Applicable Test Organism in Sediment (Survival, Growth, & Reproduction[2])
309QUI	Quail Creek at Highway 101	<0.025	<10	-	-	-	-	-	-	Survival	<25	-	-	Survival, Growth, and Reproduction	Growth
309RTA	Santa Rita Creek at Santa Rita Creek Park	<0.025	-	<6.4	<8	-	-	<0.13	<0.3	-	<25	-	-	Survival, Growth, and Reproduction	Survival and Growth
309SAC	Salinas River at Chualar Bridge on River Rd.	<0.025	-	<1.4	<8	-	-	<0.07	<0.3	Survival	<25	-	-	Survival, Growth, and Reproduction	Growth
309SAG	Salinas River at Gonzales River Rd. Bridge	<0.025	-	<1.4	<8	-	-	<0.07	<0.3	Survival	<25	-	-	Survival, Growth, and Reproduction	Growth
309SSP	Salinas River at Spreckels Gage	<0.025	-	<1.4	<8	-	-	<0.07	<0.3	Survival	<25	-	-	Survival, Growth, and Reproduction	Growth
309TEH	Tembladero Slough at Haro St.	<0.025	-	<6.4	<8	-	-	<0.13	<0.3	Survival	<40	-	-	Survival, Growth, and Reproduction	Growth

Note:

1. Dischargers in an area without an established TMDL for a pollutant must not cause or contribute to an exceedance of the pollutant's surface receiving water limit in Ag Order 4.0 Table C.3-3 for nutrients, Table C-3.5 for pesticides and toxicity, and Table C.3-7 for turbidity in accordance with the compliance dates specified in the applicable table (CCRWQCB 2021).
2. *H. azteca* reproduction in sediment is not tested for by the CMP so is not included in the TMDL limit and non-TMDL area limit discussions in this report.

\- No applicable TMDL or non-TMDL Area Limits.

Summary of Annual, Dry Season, and Wet Season TMDL Limits and Non-TMDL Area Limits for Sites in Hydrologic Unit 310 (HU 310)

CMP Site ID	CMP Site Description	Los Berros Creek Nitrate TMDL	San Luis Obispo Creek Nitrate TMDL	Los Osos Creek, Warden Creek, and Warden Lake WetlandNutrient TMDL	Non-TMDL Area Limits[1]				
		Nitrate as N, mg/L	Nitrate as N, mg/L	Nitrate as N, mg/L	Turbidity, NTU	Unionized Ammonia, mg/L	Nitrate as N, mg/L	No Significant Effect Based on Chronic or Acute Toxicity to Applicable Test Organism in Water (Survival, Growth, & Reproduction)	No Significant Effect Based on Chronic or Acute Toxicity to Applicable Test Organism in Sediment (Survival, Growth, & Reproduction[2])
310CCC	Chorro Creek upstream from Chorro Flats	-	-	-	<25	<0.025	<10	Survival, Growth, and Reproduction	Survival and Growth
310LBC	Los Berros Creek at Century	<10	-	-	<25	<0.025	-	Survival, Growth, and Reproduction	Survival and Growth
310PRE	Prefumo Creek at Calle Joaquin	-	<10	-	<25	<0.025	-	Survival, Growth, and Reproduction	Survival and Growth
310SLD	Davenport Creek at Broad Street	-	-	-	<25	<0.025	<10	Survival, Growth, and Reproduction	Survival and Growth
310USG	Arroyo Grande Creek at old USGS Gage	-	-	-	<25	<0.025	<10	Survival, Growth, and Reproduction	Survival and Growth
310WRP	Warden Creek at Wetlands Restoration Preserve	-	-	<10	<25	<0.025	-	Survival, Growth, and Reproduction	Survival and Growth

Note:

1. Dischargers in an area without an established TMDL for a pollutant must not cause or contribute to an exceedance of the pollutant's surface receiving water limit in Ag Order 4.0 Table C.3-3 for nutrients, Table C-3.5 for pesticides and toxicity, and Table C.3-7 for turbidity in accordance with the compliance dates specified in the applicable table (CCRWQCB 2021).
2. *H. azteca* reproduction in sediment is not tested for by the CMP so is not included in the TMDL limit and non-TMDL area limit discussions in this report.

\- No applicable TMDL or non-TMDL Area Limits.

Summary of Annual, Dry Season, and Wet Season TMDL Limits and Non-TMDL Area Limits for Sites in Hydrologic Unit 312 (HU 312)

CMP Site ID	CMP Site Description	Santa Maria River Watershed Nutrients TMDL							Santa Maria River Watershed Toxicity and Pesticide TMDL		Non-TMDL Area Limits[1]				
		Unionized Ammonia, mg/L	Nitrate as N, mg/L	Nitrate as N, mg/L (Dry Season)	Nitrate as N, mg/L (Wet Season)	Orthophosphate, mg/L	Orthophosphate, mg/L (Dry Season)	Orthophosphate, mg/L (Wet Season)	No Significant Toxic Effect, 7-Day, Chronic Exposure with *C. dubia* in Water (Survival & Reproduction)	No Significant Toxic Effect, 10-Day, Chronic Exposure *with H. azteca* in Sediment (Survival)	Turbidity, NTU	Unionized Ammonia, mg/L	Nitrate as N, mg/L	No Significant Effect Based on Chronic or Acute Toxicity to Applicable Test Organism in Water (Survival, Growth, & Reproduction)	No Significant Effect Based on Chronic or Acute Toxicity to Applicable Test Organism in Sediment (Survival, Growth, & Reproduction[2])
312BCC	Bradley Canyon Creek	<0.025	-	<4.3	<8	-	<0.19	<0.3	Survival and Reproduction	Survival	<25	-	<10	Growth	Growth
312BCJ	Bradley Channel at Jones Street	<0.025	<10	-	-	-	-	-	Survival and Reproduction	Survival	<25	-	-	Growth	Growth
312GVS	Green Valley at Simas	<0.025	-	<4.3	<8	-	<0.19	<0.3	Survival and Reproduction	Survival	<25	-	<10	Growth	Growth
312MSD	Main Street Canal u/s Ray Road at Highway 166	<0.025	<10	-	-	-	-	-	Survival and Reproduction	Survival	<25	-	-	Growth	Growth
312OFC	Oso Flaco Creek at Oso Flaco Lake Rd.	<0.025	<5.7	-	-	<0.08	-	-	Survival and Reproduction	Survival	<40	-	-	Growth	Growth
312OFN	Little Oso Flaco Creek	<0.025	<5.7	-	-	<0.08	-	-	Survival and Reproduction	Survival	<25	-	-	Growth	Growth
312ORC	Orcutt Solomon Creek u/s of Santa Maria River	<0.025	-	<4.3	<8	-	<0.19	<0.3	Survival and Reproduction	Survival	<25	-	<10	Growth	Growth
312ORI	Orcutt Solomon Creek at Highway 1	<0.025	-	<4.3	<8	-	<0.19	<0.3	Survival and Reproduction	Survival	<25	-	<10	Growth	Growth
312SMA	Santa Maria River at Estuary	<0.025	-	<4.3	<8	-	<0.19	<0.3	Survival and Reproduction	Survival	<25	-	<10	Growth	Growth
312SMI	Santa Maria River at Highway 1	<0.025	-	<4.3	<8	-	<0.19	<0.3	Survival and Reproduction	Survival	<25	-	<10	Growth	Growth

Note:

1. Dischargers in an area without an established TMDL for a pollutant must not cause or contribute to an exceedance of the pollutant's surface receiving water limit in Ag Order 4.0 Table C.3-3 for nutrients, Table C-3.5 for pesticides and toxicity, and Table C.3-7 for turbidity in accordance with the compliance dates specified in the applicable table (CCRWQCB 2021).
2. *H. azteca* reproduction in sediment is not tested for by the CMP so is not included in the TMDL limit and non-TMDL area limit discussions in this report.

\- No applicable TMDL or non-TMDL Area Limits.

Summary of Annual, Dry Season, and Wet Season TMDL Limits and Non-TMDL Area Limits for Sites in Hydrologic Unit 313 and 314 (HU 313 and 314)

CMP Site ID	CMP Site Description	Non-TMDL Area Limits[1]				
		Turbidity, NTU	Unionized Ammonia, mg/L	Nitrate as N, mg/L	No Significant Effect Based on Chronic or Acute Toxicity to Applicable Test Organism in Water (Survival, Growth, & Reproduction)	No Significant Effect Based on Chronic or Acute Toxicity to Applicable Test Organism in Sediment (Survival, Growth, & Reproduction[2])
313SAE	San Antonio Creek at San Antonio Road East	<25	<0.025	<10	Survival, Growth, and Reproduction	Survival and Growth
314SYF	Santa Ynez River at Floradale Ave.	<25	<0.025	<10	Survival, Growth, and Reproduction	Survival and Growth
314SYR	Santa Ynez River at River Park	<25	<0.025	<10	Survival, Growth, and Reproduction	Survival and Growth
314SYN	Santa Ynez River at 13th St.	<25	<0.025	<10	Survival, Growth, and Reproduction	Survival and Growth

Note:

1. Dischargers in an area without an established TMDL for a pollutant must not cause or contribute to an exceedance of the pollutant's surface receiving water limit in Ag Order 4.0 Table C.3-3 for nutrients, Table C-3.5 for pesticides and toxicity, and Table C.3-7 for turbidity in accordance with the compliance dates specified in the applicable table (CCRWQCB 2021).
2. *H. azteca* reproduction in sediment is not tested for by the CMP so is not included in the TMDL limit and non-TMDL area limit discussions in this report.

\- No applicable TMDL or non-TMDL Area Limits.

Summary of Annual, Dry Season, and Wet Season TMDL Limits and Non-TMDL Area Limits for Sites in Hydrologic Unit 315 (HU 315)

CMP Site ID	CMP Site Description	Arroyo Paredon Nitrate TMDL	Bell Creek Nitrate TMDL	Franklin Creek Nutrients TMDL					Glen Annie Creek, Tecolotito Creek, and Carneros Creek Nitrate TMDL	Non-TMDL Area Limits[1]				
		Nitrate as N, mg/L	Nitrate as N, mg/L	Nitrate as N, mg/L	Total Nitrogen, mg/L (Dry Season)	Total Nitrogen, mg/L (Wet Season)	Total Phosphorus, mg/L (Dry Season)	Total Phosphorus, mg/L (Wet Season)	Nitrate as N, mg/L	Turbidity, NTU	Nitrate as N, mg/L	Unionized Ammonia, mg/L	No Significant Effect Based on Chronic or Acute Toxicity to Applicable Test Organism in Water (Survival, Growth, & Reproduction)	No Significant Effect Based on Chronic or Acute Toxicity to Applicable Test Organism in Sediment (Survival, Growth, & Reproduction[2])
315APF	Arroyo Paredon at Foothill Rd.	<10	-	-	-	-	-	-	-	<25	-	<0.025	Survival, Growth, and Reproduction	Survival and Growth
315BEF	Bell Creek at Winchester Canyon Park	-	<10	-	-	-	-	-	-	<25	-	<0.025	Survival, Growth, and Reproduction	Survival and Growth
315FMV	Franklin Creek at Mountain View Ln.	-	-	<10	<1.1	<8.0	<0.075	<0.3	-	<25	-	<0.025	Survival, Growth, and Reproduction	Survival and Growth
315GAN	Glen Annie Creek upstream Cathedral Oaks	-	-	-	-	-	-	-	<10	<25	-	<0.025	Survival, Growth, and Reproduction	Survival and Growth
315LCC	Los Carneros Creek at Calle Real	-	-	-	-	-	-	-	<10	<25	-	<0.025	Survival, Growth, and Reproduction	Survival and Growth

Note:

1. Dischargers in an area without an established TMDL for a pollutant must not cause or contribute to an exceedance of the pollutant's surface receiving water limit in Table C.3-3 for nutrients, Table C-3.5 for pesticides and toxicity, and Table C.3-7 for turbidity in accordance with the compliance dates specified in the applicable table (CCRWQCB 2021).
2. *H. azteca* reproduction in sediment is not tested for by the CMP so is not included in the TMDL limit and non-TMDL area limit discussions in this report.

\- No applicable TMDL or non-TMDL Area Limits.

This page intentionally left blank.

APPENDIX B – SUMMARY STATISTICS, LOADING ESTIMATES, BASIN PLAN WATER QUALITY OBJECTIVE EXCEEDANCES, AND TMDL EXCEEDANCES

This page intentionally left blank.

APPENDIX C – BOX PLOTS

Box plots reports associated with the collection of water and sediment samples in 2023 are provided on the attached USB flash drive.

This page intentionally left blank.

Appendix C. Box Plots of Water Quality Data

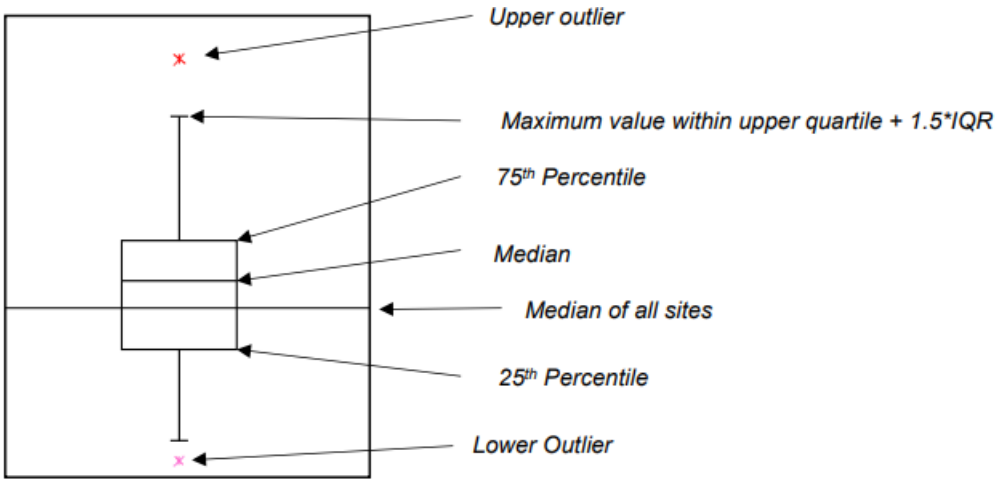
Box and whisker plots are provided for all CMP water quality parameters with results. Box plots illustrate the distribution of results for core sites within a hydrologic unit. Any data below detection are represented at the detection limit for the analyte. Plots are organized by Hydrologic Unit and Analyte.

The box plots summarize the distribution of points for each site. The ends of the box are the 25th and 75th quantiles. The difference between the quartiles is the *interquartile range*. The line across the middle of the box identifies the median sample value. Each box has lines, sometimes called *whiskers*, which extend from each end. The whiskers extend from the ends of the box to the outermost data point that falls within the distances computed as:

upper quartile + 1.5*(*interquartile range*)

lower quartile - 1.5*(*interquartile range*).

If the Minimum or Maximum values are outside this range, then they are shown as outliers.



Notes:

- Some extreme values are not displayed to allow comparison between sites and more clear illustration of broad differences in distributions in an untransformed scale for most parameters.
- Some parameters are displayed in log-scale to allow adequate visualization of distributions and comparisons between sites. Negative or zero values will not plot correctly in log-scale plots; however, log-scale plots were still used in instances where it provided the best possible visualization.
- Some plots have insufficient data to construct proper box plots. These plots may lack “whiskers” or other box components. They are included for completeness.
- “NS” denotes sites that had no samples collected for a given parameter.

This page intentionally left blank.

APPENDIX D – WET-DRY WEATHER COMPARISON

Wet-dry weather comparison associated with the collection of water and sediment samples in 2023 are provided on the attached USB flash drive.

This page intentionally left blank.

APPENDIX E – MANN-KENDALL TREND TEST SUMMARY

This page intentionally left blank

APPENDIX F – TIME SERIES PLOTS

Time series plots are provided on the attached USB flash drive. Two different types of time series plots are provided. One type depicts all monitoring locations within a HU for each parameter to allow for easy comparison of results and trends amongst sites. This time series is presented as a black line while the associated trend of the data (determined by the Mann-Kendall analysis) is denoted as a blue line. The blue line represents the Theil-Sen Slope which is a statistic that is produced during the Mann-Kendall analysis and approximates the strength of the trend and correlates with Kendall's Tau. A dashed blue line indicates a non-significant trend (p-value >0.05) and a solid blue line indicates a significant trend (p-value ≤ 0.05). The other type of time series plots represents results for each sample location and parameter combination. These plots include individual sample results denoted with a black line; a blue trend line based on the Theil Sen Slope and having the same interpretive logic described above; and a locally estimated scatterplot smoothing (LOESS) line, which fits a smooth line to the data. LOESS is a "local" regression technique that gives more weight to nearby data than to data located further up or down the x-axis. LOESS is not a separate trend analysis method, but rather a visual tool to help see the relationship between localized subsets of data and to foresee potential trends.

This page intentionally left blank.

APPENDIX G – FIELD LOGS FOR COLLECTION OF WATER AND SEDIMENT SAMPLES

Field logs associated with the collection of water and sediment samples in 2023 are provided on the attached USB flash drive.

This page intentionally left blank.

APPENDIX H – PHOTOS FROM INDIVIDUAL MONITORING EVENTS

Photographs of monitoring sites taken during the collection of water and sediment samples in 2023 are provided on the attached USB flash drive.

This page intentionally left blank.

APPENDIX I – LABORATORY REPORTS FOR ANALYSES OF WATER QUALITY AND SEDIMENT SAMPLES

Laboratory reports associated with the collection of water and sediment samples in 2023 are provided on the attached USB flash drive.

This page intentionally left blank.

APPENDIX J – DATA USED FOR EVALUATION OF MONITORING RESULTS

Raw data associated with water and sediment samples collected in 2023 is provided on the attached USB flash drive.

This page intentionally left blank.