MAY 6, 2023

SNAPSHOT DAY

FINAL REPORT

Central Coast Snapshot Day 2023
organized by:

The Monterey Bay National Marine Sanctuary (MBNMS)
Water Quality Protection Program
www.montereybay.noaa.gov

With assistance from:

California Marine Sanctuary Foundation (CMSF)
www.californiamsf.org

Central Coast Ambient Monitoring Program (CCAMP)
www.ccamp.org

City of Santa Cruz
www.cityofsantacruz.com

City of Scotts Valley
www.scottsvalley.org

Coastal Watershed Council
www.coastal-watershed.org

County of Santa Cruz
www.co.santa-cruz.ca.us

Monterey Stormwater Education Alliance
www.montereysea.org

Morro Bay National Estuary Program
https://www.mbnep.org

San Mateo County Public Health Lab
www.smchealth.org/publichealthlab

San Mateo Resource Conservation District
www.sanmateorcd.org

Upper Salinas-Las Tablas Resource Conservation District
www.us-ltrcd.org

Watsonville Wetlands Watch
www.watsonvillewetlandswatch.org

Table of Contents

Executive Summary

Since Earth Day 2000, volunteers have assembled on the first Saturday morning of May each year, except for 2020 due to the COVID pandemic, to collect water quality samples from waterbodies entering Monterey Bay National Marine Sanctuary (MBNMS). Snapshot Day has become an annual event that has created partnerships, drawn over 3,000 volunteers, and has helped foster an ethic of watershed stewardship for local citizens. The 23 years of data collected by volunteers has become a valuable source of water quality data for the region. MBNMS and California Marine Sanctuary Foundation (CMSF) organized Snapshot Day 2023 with regional support from the San Mateo Resource Conservation District (RCD), Upper Salinas Las Tablas RCD, Morro Bay National Estuary Program, Watsonville Wetlands Watch, and the Coastal Watershed Council.

In 2023, volunteers ventured out on the morning of May 6th to watershed sites in four counties bordering MBNMS: San Mateo, Santa Cruz, Monterey, and San Luis Obispo. On their journey to specific sites along creeks and rivers, volunteers carried with them sample equipment and bottles to collect water samples for laboratory analysis and field measurements at assigned sites. This year, 95 community scientists donated between four and six hours of their time to monitor 86 sites. Of the 77 sites with flowing water, 18 sites or 23% met all of the Water Quality Objectives (WQOs) or Action Levels that were measured.

Results reveal that pH was the most common field measurement to exceed WQOs and nitrate concentration was the most common lab measurement to exceed WQOs. The pH measurements (whether the water was acidic or basic) exceeded the WQO at 40% of the sites where it was measured as compared to 12% in 2022 and 5% of sites in 2021. Nitrate concentrations exceeded the WQO at 25% of sites in 2023 as compared to 26% in 2022 and 16% of sites in 2021.

Thirteen Areas of Concern, or sites that exceeded three or more WQOs or Action Levels, were identified this year as compared to 14 in 2022, 11 in 2021, and 12 in 2019. The 13 Areas of Concern for 2023 spanned 10 waterbodies in three of the four counties: Santa Cruz, Monterey, and San Luis Obispo. The Santa Cruz County Areas of Concern were on two waterbodies: Moore and Pilkington Creek. Monterey County Areas of Concern were on eight waterbodies: Moro Cojo Slough, Castroville Slough, Alisal Creek, Majors Creek, Reclamation Ditch, Santa Rita Creek, and Tembladero Slough. The one San Luis Obispo County Area of Concern site was on Santa Ysabela Creek.

The 23 years of data gathered by trained Snapshot Day volunteers is used to help resource managers focus attention on problem areas. Programs such as Snapshot Day are an important way for communities to connect to their local waterways and to inspire actions focused on improving water quality. Snapshot Day is used to inform public policy through inclusion of data collected by volunteers into the pool of data used to determine 303(d) listing of impaired waterbodies by the Central Coast Regional Water Quality Control Board. We would like to thank our volunteers and all of our partners for making this event a success!

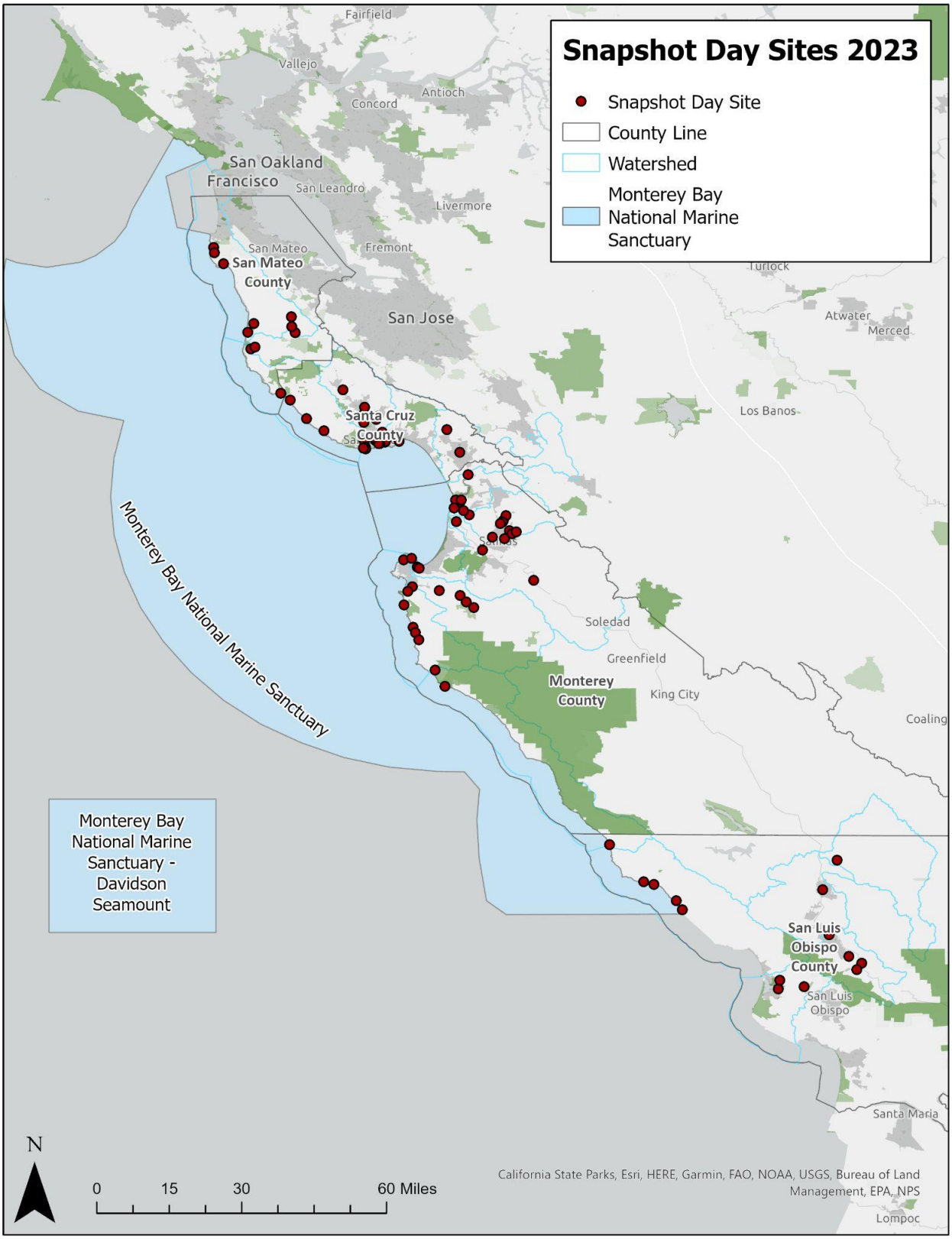

Figure 1. Map of Snapshot Day 2023 monitoring sites.

Introduction

Water quality monitoring is an important tool for watershed management because its focus is to identify pollutants and their sources. Monitoring is required to determine if targets have been met for beneficial uses and whether water quality is improving or deteriorating. Monitoring also provides necessary data on the health of a stream or river and can be analyzed spatially and temporally. Unfortunately, a lack of funding for watershed monitoring results in a lack of information about many waterways and their health. In order to gather data about creeks and rivers flowing into Monterey Bay National Marine Sanctuary (MBNMS), MBNMS works with volunteers, local agencies, and nonprofits to monitor the health of streams and rivers during an annual water quality monitoring event called Snapshot Day. The focus of Snapshot Day is to inspire volunteers to care for their local watersheds, and to collect long-term data focused on assessing the health of Central California creeks and rivers flowing into MBNMS.

Methods

Each April, Snapshot Day training is usually conducted in all four counties bordering the sanctuary: San Mateo, Santa Cruz, Monterey, and San Luis Obispo. Since many Snapshot Day volunteers have never taken field measurements or collected water samples before, training is important in developing the necessary skills. Snapshot Day training covers the program's history, how to take field measurements, and how to collect lab samples.

During Snapshot Day each monitoring team is equipped with a kit that includes a 5-gallon bucket, a digital thermometer, a CHEMets dissolved oxygen kit, an Oakton conductivity meter, Machery-Nagel non-bleeding pH strips, and a transparency tube. The kits also include distilled water, gloves, paper towels, trash bags, pencils, sample bottles, a clipboard with data sheets, field and instrument instructions, and maps with directions to each site. Volunteers take field measurements for air and water temperature, dissolved oxygen, conductivity, pH, and transparency. Grab samples are collected for lab analysis of bacteria (*E. coli*) and nutrients (nitrate as N and orthophosphate as P). Each team monitors a minimum of two sites, while some teams monitor up to five sites.

All monitoring results (lab and field) are compared with receiving water standards established for beneficial uses in a stream, lake, or the ocean. Water Quality Objectives (WQOs) and Action Levels are designated by the Central Coast Ambient Monitoring Program (CCAMP), the Regional Water Quality Control Board (RWQCB) through the Water Quality Control Plan for the Central Coast Basin (Basin Plan), or the US Environmental Protection Agency (U.S. EPA) (**Table 1**). Since there are no numerical WQOs in the RWQCB Basin Plan for *E. coli*, nitrate, and orthophosphate, those results are compared with the U.S. EPA WQOs and CCAMP's Action Levels. The U.S. EPA objectives are for the protection of human health while CCAMP's Action Levels are benchmarks set for receiving water concentrations at which pollutants may impact cold-water fish. Action Levels represent existing regulatory standards that are derived from the literature or other agency references, or from data that shows levels are elevated relative to the data distribution for that parameter on the Central Coast. For this event, a state approved Quality Assurance Project Plan and Monitoring Plan (QAPP) is followed.


Help your watershed! Join us for
Snapshot Day

Table 1. Water Quality Objectives (WQOs) and Action Levels

Parameter (reporting units)	Water Quality Objectives/Action Levels	Source of Objective
Dissolved Oxygen (mg/L)	Not lower than 7 or greater than 12	Water Quality Control Plan for the Central Coast Basin (RWQCB)
E. coli (MPN/100mL)	Not to exceed 235 [1]	U.S. EPA Ambient Water Quality Criteria
Nitrate as N (ppm)	Not to exceed 1.00 [2]	Central Coast Ambient Monitoring Program (CCAMP)
Orthophosphate as P (ppm)	Not to exceed 0.12 [3]	Central Coast Ambient Monitoring Program (CCAMP)
pH	Not lower than 7 or greater than 8.5	Water Quality Control Plan for the Central Coast Basin (RWQCB)
Transparency (cm)	Not less than 25	Central Coast Ambient Monitoring Program (CCAMP)
Water Temperature (°C)	Not more than 21 [4]	Central Coast Ambient Monitoring Program (CCAMP)

[1] Environmental Protection Agency, Updated WQO.
[2] Central Coast Ambient Monitoring Program, Pajaro River Watershed Characterization Report 1998, rev 2003.
[3] Williamson, The Establishment of Nutrient Objectives, Sources, Impacts and Best Management Practices for the Pajaro River and Llagas Creek, 1994.
[4] Moyle, P. 1976. Inland Fisheries of California. University of California Press.

Results

On May 6th, 2023, 95 volunteers comprising 14 teams, monitored 86 sites along creeks and rivers that flowed into MBNMS (**Figure 1**). This year, nine sites were either completely dry, had water that was stagnant, or were unsafe to access. Seventy-seven sites (90%) had flowing water. Eighteen sites (23%) with flowing water met the WQOs for all lab and field parameters. Snapshot Day 2023 results reveal that no analyte had its highest number of WQO exceedances as compared to the past 22 years (**Table 2**). All data is available in **Appendix 1**.

Table 2. Number of sites that exceeded the WQO or Action Level for field and lab measurements each year.

Year	*E. coli*	Nitrate as N	Orthophos-phate as P	Dissolved Oxygen	pH	Transparency	Water Temperature
2023	17	19	16	18	31	13	1
2022	23	19	18	23	9	9	3
2021	17	12	29	17	4	13	0
2020	No Snapshot Day due to COVID pandemic						
2019	36	20	15	25	16	11	3
2018	28	19	34	37	35	12	4
2017	38	16	19	38	70	17	5
2016	44	21	19	29	22	19	0
2015	34	13	20	28	37	12	3
2014	29	15	8	34	25	15	11
2013	51	20	20	48	46	16	10
2012	62	23	23	38	49	23	9
2011	49	25	21	39	53	19	5
2010	47	29	52	34	66	21	6
2009	87	23	34	64	57	18	3
2008	60	34	19	24	38	16	6
2007	54	25	21	37	28	16	6
2006	49	27	35	33	7	21	3
2005	52	18	28	21	31	17	8
2004	55	23	39	37	31	13	18
2003	36	19	33	17	16	11	9
2002	30	14	30	26	15	7	1
2001	70	12	40	15	8	13	0
2000	16	1	8	13	16	NR	3

NR = Not Recorded

Field Measurements

Dissolved Oxygen

Aquatic organisms rely on sufficient amounts of dissolved oxygen to perform regular behaviors like feeding, spawning, and incubating. Excessive nutrients in water can cause an increase in plant growth which uses up oxygen in the water once plants die and bacteria deplete the oxygen available to aquatic organisms as they decompose plant material.

The Basin Plan Objective for dissolved oxygen is for results to fall between 7 mg/L and 12 mg/L, an optimal range for cold water fish. In 2023, 18 (23%) of the 77 sites where dissolved oxygen was measured did not meet the WQO. The lowest dissolved oxygen result of 5 mg/L was recorded from Santa Rita Creek at Van Buren Avenue in Monterey County. No site had a dissolved oxygen level above 12 mg/L.

- San Mateo County had two sites that did not meet the WQO objective:
    - The mouth of Pomponio Creek
    - San Gregorio Creek at Stage Road
- Santa Cruz County had four sites that did not meet the WQO:
    - Arroyo Creek at Delaware Ave
    - Leona Creek between the roads Salero and Pompeii
    - Leona Creek at Brommer Street
    - The mouth of Moore Creek
- Monterey County had 11 sites that did not meet the WQO for dissolved oxygen:
    - Lower Sycamore Canyon
    - Asilomar State Park at the bridge
    - Hartnell Gulch behind City of Monterey Library
    - Lower Majors Creek
    - Natividad Creek at Las Casitas Road
    - Reclamation Ditch at Davis Road
    - Santa Rita Creek at Bellinzona
    - Santa Rita Creek at Van Buren Avenue
    - Tembladero Slough at Monterey Dunes
    - Tembladero Slough at Hwy 183
    - Tembladero Slough at Preston Bridge
- San Luis Obispo County had one site that did not meet the WQO for dissolved oxygen:
    - Santa Rosa Creek at Windsor

The sites that did not meet the WQO for dissolved oxygen are listed in **Table 3** with the respective dissolved oxygen measurement in mg/L for a total of 18 sites. Averaged dissolved oxygen results for each waterbody are depicted in **Figure 2**.

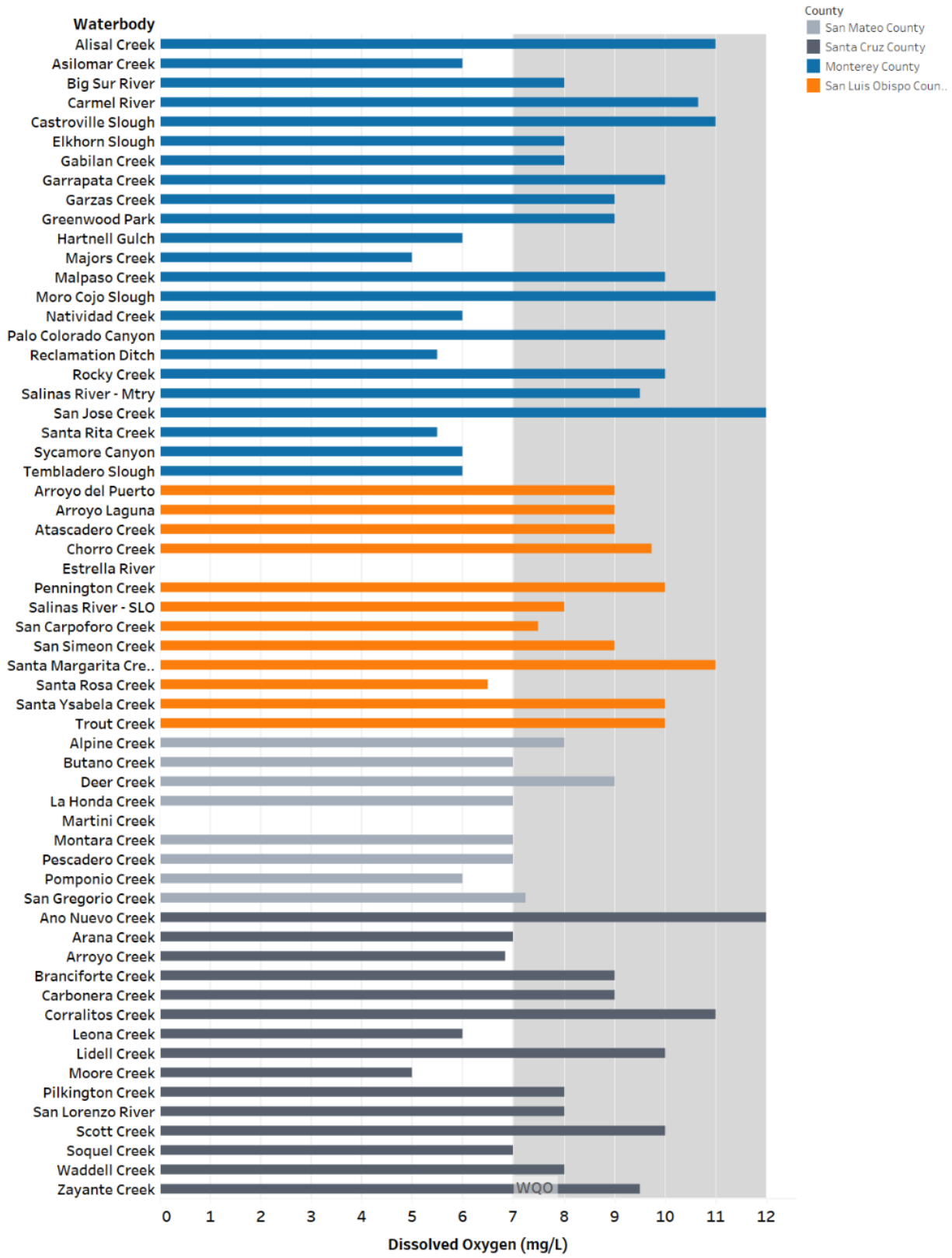

Figure 2. Average dissolved oxygen measurements for each waterbody monitored. Waterbodies with more than one site have averaged results. Waterbodies are separated by county and the WQO range is shown in gray.

Table 3. Sites from Snapshot Day 2023 that exceeded the WQO for dissolved oxygen with the respective county and dissolved oxygen measurement. If duplicate field measurement was collected, the displayed result is the average of the original and duplicate values.

Site ID	Site Name	Dissolved Oxygen (mg/L)	County
308-SYCAM-32	Sycamore Canyon lower	6	Monterey County
309-ASILO-31	Asilomar State Park at bridge	6	Monterey County
309-LIBRA-31	Library or Hartnell Gulch behind Monterey City library	6	Monterey County
309-MAJOR-31	Majors Creek lower	5.25	Monterey County
309-NATIV-31	Natividad Creek at Las Casitas Road	6	Monterey County
309-RECDI-31	Reclamation Ditch at Davis Road	6.25	Monterey County
309-SRITA-32	Santa Rita Creek at Bellinzona	6	Monterey County
309-SRITA-35	Santa Rita Creek at Van Buren Avenue	5	Monterey County
309-TEMBL-31	Tembladero Slough at Monterey Dunes	6	Monterey County
309-TEMBL-32	Tembladero Slough Hwy 183	6	Monterey County
309-TEMBL-33	Tembladero Slough at Preston Bridge	6	Monterey County
310-SANTA-43	Santa Rosa Creek at Windsor	6.75	San Luis Obispo County
202-POMPO-11	Pomponio Creek mouth	6	San Mateo County
202-SANGR-12	San Gregorio Creek at Stage Road	6.5	San Mateo County
304-ARROY-22	Arroyo Seco at Delaware Avenue	5.5	Santa Cruz County
304-LEONA-21	Leona Creek between Salerno and Pompeii Roads	6	Santa Cruz County
304-LEONA-22	Leona Creek at Brommer Street	6	Santa Cruz County
304-MOORE-26	Moore Creek at mouth	5.5	Santa Cruz County

pH

pH is a measure of the percent of hydrogen ions in water. A value of 7 is neutral, above 9 is alkaline (or basic), and below 5 is acidic. Many aquatic organisms require a very specific pH range to carry out necessary chemical and biological reactions; extremely low or high pH levels impede essential functions for survival or damage tissues.

The Basin Plan Objective for pH is for results to fall between 7 and 8.5. In 2023, 31 (40%) of the 77 sites where pH was measured did not meet the WQO. The lowest pH result of 6.0 was found at four different sites: Asilomar State Park at the bridge, Hartnell Gulch behind the City of Monterey library, Leona Creek at Brommer Street, and Corralitos Creek at Green Valley Road. The highest pH result of 9.25 was found at the lower Moro Cojo Slough.

- San Mateo County had two sites that did not meet the WQO for pH:
    - Butano Creek at Pescadero Road
    - Montara Creek downstream at Date and Harte Streets
- Santa Cruz County had 11 sites that did not meet the WQO:
    - Branciforte Creek above the confluence with San Lorenzo River
    - Leona Creek between Salerno and Pompeii roads
    - Leona Creek at Brommer Street
    - The mouth of Moore Creek
    - Pilkington Creek at the Santa Cruz Natural History Museum
    - The mouth of the San Lorenzo River
    - San Lorenzo River at the Hwy 1 pedestrian bridge
    - San Lorenzo River at Junction Park
    - Zayante Creek at Quail Hollow Road
    - Corralitos Creek at Green Valley Road
    - Corralitos Creek at Las Colinas Road
- Monterey County had 13 sites that did not meet the pH WQO:
    - Lower Moro Cojo Slough
    - Castroville Slough above the confluence with the Moro Cojo Slough
    - Carmel River at Rosie's Bridge
    - Carmel River at Garland Park
    - Carmel River at Schulte Road
    - Garzas Creek at Garzas Road
    - Big Sur River at Andrew Molera Park
    - Malpaso Creek
    - Rocky Creek
    - San Jose Creek at Hwy 1
    - Asilomar State Park at the bridge
    - Hartnell Gulch behind the City of Monterey library
    - Lower Majors Creek
- San Luis Obispo County had five sites that did not meet the pH WQO:
    - Santa Margarita Creek at El Camino Real and Asuncion Road
    - San Carpoforo Creek upstream of the mouth

- Pennington Creek
- Santa Ysabela Creek on Turri Road
- Upper Chorro Flats at Chorro Creek and Morro Creek roads

The sites that did not meet the WQO for pH are listed in **Table 4** with the respective pH measurement for a total of 31 sites. Averaged pH results for each waterbody are depicted in **Figure 3**.

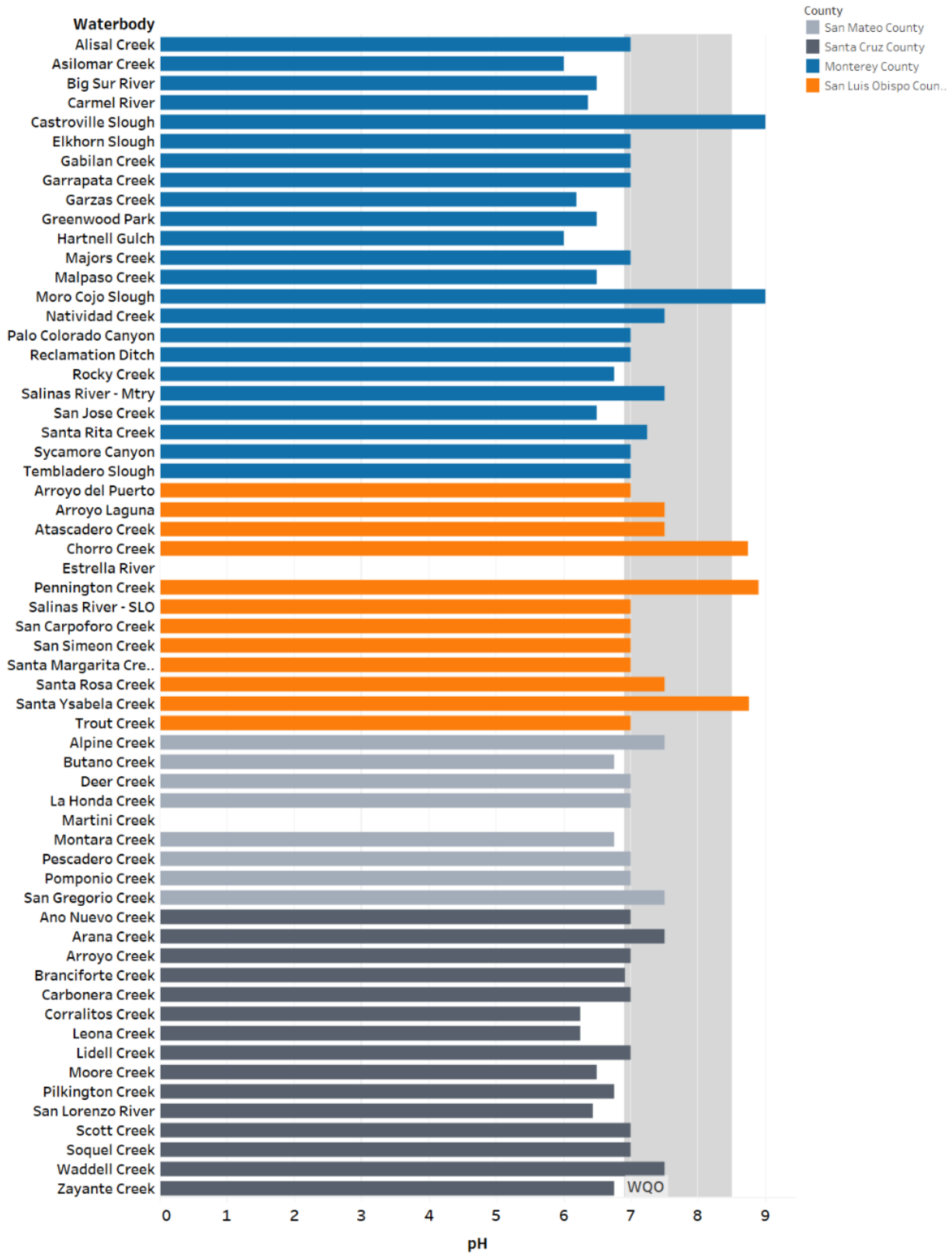

Figure 3. Average pH measurements for each waterbody monitored. Waterbodies with more than one site have averaged results. Waterbodies are separated by county and the WQO range is shown in gray.

Table 4. Sites from Snapshot Day 2023 that exceeded, or were less than the WQO for pH with the respective county and dissolved oxygen measurement. If duplicate field measurement was collected, the displayed result is the average of the original and duplicate values.

Site ID	Site Name	pH	County
306-MOROC-33	Moro Cojo Slough lower	9.25	Monterey County
306-MOROC-34	Castroville Slough above the confluence with the Moro Cojo Slough	9	Monterey County
307-CARME-33	Carmel River at Rosie's Bridge	6.5	Monterey County
307-CARME-35	Carmel River at Garland Park	6.1	Monterey County
307-CARME-36	Carmel River at Schulte Road MBNMS	6.5	Monterey County
307-GARZA-31	Garzas Creek at Garzas Road	6.2	Monterey County
308-BIGSU-31	Big Sur River at Andrew Molera Park	6.5	Monterey County
308-MALPA-31	Malpaso Creek	6.5	Monterey County
308-ROCKY-31	Rocky Creek (Private property)	6.75	Monterey County
308-SANJO-31	San Jose Creek at Hwy 1	6.5	Monterey County
309-ASILO-31	Asilomar State Park at bridge	6	Monterey County
309-LIBRA-31	Library or Hartnell Gulch behind Monterey City library	6	Monterey County
309-MAJOR-31	Majors Creek lower	6.75	Monterey County
309-SMARG-41	Santa Margarita Creek at El Camino Real and Asuncion Road	6.75	San Luis Obispo County
310-CARPO-41	San Carpoforo Creek upstream of mouth	6.75	San Luis Obispo County
310-PENN-41	Pennington Creek	8.9	San Luis Obispo County
310-SYB-41	Santa Ysabela Creek on Turri Road	8.76	San Luis Obispo County
310-UCF-41	Upper Chorro Flats at Chorro Creek and Morro Creek Roads	8.74	San Luis Obispo County
202-BUTAN-11	Butano Creek at Pescadero Road	6.75	San Mateo County
202-MONTA-12	Montara Creek downstream at Date and Harte Streets	6.75	San Mateo County
304-BRANC-21	Branciforte above confluence w/SLR	6.75	Santa Cruz County

304-LEONA-21	Leona Creek between Salerno and Pompeii Roads	6.5	Santa Cruz County
304-LEONA-22	Leona Creek at Brommer Street	6	Santa Cruz County
304-MOORE-26	Moore Creek at mouth	6.75	Santa Cruz County
304-PILKI-21	Pilkington Creek @ SC Natural History Museum	6.75	Santa Cruz County
304-SANLO-22	San Lorenzo River Mouth	6.625	Santa Cruz County
304-SANLO-24	San Lorenzo River at Hwy 1 pedestrian bridge	6.3	Santa Cruz County
304-SANLO-27	San Lorenzo River at Junction Park	6.5	Santa Cruz County
304-ZAYAN-22	Zayante Creek at Quail Hollow Road	6.5	Santa Cruz County
305-CORRA-21	Corralitos Creek at Green Valley Road	6	Santa Cruz County
305-CORRA-22	Corralitos Creek at Las Colinas Road	6.5	Santa Cruz County

Transparency

Transparency is a measure of the clarity of a liquid by quantifying the visibility of a secchi disk through a column of water. Normal transparency measurements vary for different waterbodies, but in general low transparency, also known as high turbidity, can indicate problems such as erosion, nutrient loading, or extraordinary algae growth.

CCAMP's Action Level for transparency is not less than 25 centimeters. Transparency was measured at 77 sites and 13 (17%) did not meet the Action Level. The lowest transparency measurement of 5.3 cm was taken at the Castroville Slough above the confluence with the Moro Cojo Slough in Monterey County. No sites from Santa Cruz County exceeded the Action Level for transparency.

- San Mateo County had one site that did not meet the Action Level for transparency:
    - Deer Creek behind Creekside Smokehouse
- Monterey County had 11 sites that did not meet the Action Level for transparency:
    - Lower Moro Cojo Slough
    - Castroville Slough above the confluence with Moro Cojo Slough
    - Upper Alisal Creek
    - Lower Majors Creek
    - Reclamation Ditch at Davis Road
    - Salinas River at Davis Road
    - Salinas River at Chualar Bridge
    - Santa Rita Creek at Bellinzona
    - Tembladero Slough at Monterey Dunes
    - Tembladero Slough at Hwy 183
    - Tembladero Slough at Preston Bridge

- San Luis Obispo County had one site that did not meet the Action Level for transparency:
    - Santa Ysabela Creek on Turri Road

The sites that did not meet the WQO for transparency are listed in **Table 5** with the respective transparency measurement in centimeters for a total of 13 sites. Averaged transparency results for each waterbody are depicted in **Figure 4**.

Table 5. Sites from Snapshot Day 2023 that exceeded the WQO for transparency with the respective county and transparency measurement. If duplicate field measurement was collected, the displayed result is the average of the original and duplicate values.

Site ID	Site Name	Transparency (cm)	County
306-MOROC-33	Moro Cojo Slough lower	13.8	Monterey County
306-MOROC-34	Castroville Slough above the confluence with the Moro Cojo Slough	5.3	Monterey County
309-ALISA-32	Alisal Creek upper	7.8	Monterey County
309-MAJOR-31	Majors Creek lower	6	Monterey County
309-RECDI-31	Reclamation Ditch at Davis Road	8.6	Monterey County
309-SALIN-32	Salinas River at Davis Road MBNMS	18	Monterey County
309-SALIN-33	Salinas River at Chualar Bridge	18.6	Monterey County
309-SRITA-32	Santa Rita Creek at Bellinzona	20	Monterey County
309-TEMBL-31	Tembladero Slough at Monterey Dunes	9.3	Monterey County
309-TEMBL-32	Tembladero Slough Hwy 183	7.3	Monterey County
309-TEMBL-33	Tembladero Slough at Preston Bridge	9	Monterey County
310-SYB-41	Santa Ysabela Creek on Turri Road	24	San Luis Obispo County
202-DEERC-12	Deer Creek behind Creekside Smokehouse	17.5	San Mateo County

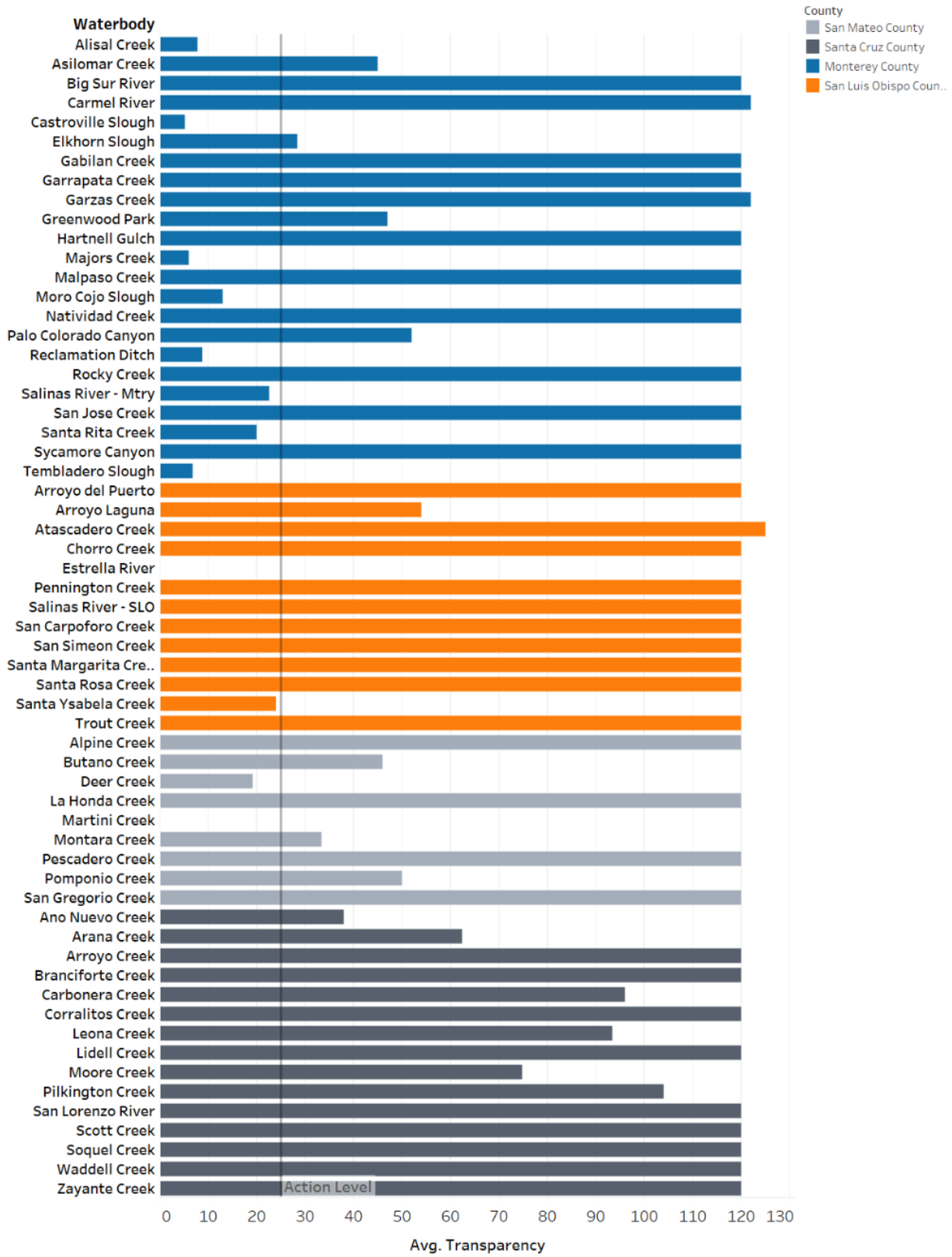

Figure 4. Average transparency measurements for each waterbody monitored. Waterbodies with more than one site have averaged results. Waterbodies are separated by county and the Action Level is indicated by the gray line.

Water Temperature

Just as temperature on land impacts terrestrial plants and animals, the temperature of the water can affect the life and health of aquatic organisms. Many fish species and other aquatic life need specific temperature ranges to survive and reproduce. Water temperature can also affect the amount of dissolved oxygen with higher temperatures causing a decrease in dissolved oxygen. Slowing water flow or removing streamside vegetation, which provides shade, can also cause water temperatures to rise to undesirable levels that may harm aquatic life. Snapshot Day data is collected during the morning hours, so water temperature measurements do not necessarily reflect the maximum daily temperatures for the waterbody.

The Basin Plan Objective sets the upper limit of acceptable water temperature at 21 degrees Celsius (°C). Temperatures above 21°C can harm cold water fish such as salmon and steelhead, as well as other aquatic organisms. In 2023, one of the 77 sites (1%) where water temperature was measured exceeded the WQO. No sites measured in San Mateo, Santa Cruz, and San Luis Obispo Counties exceeded the WQO for temperature.

- Monterey County did not meet the objective for water temperature at one site:
    - Castroville Slough above the confluence with the Moro Cojo Slough

The site that did not meet the WQO for temperature is listed in **Table 6** with the respective temperature measurement in degrees Celsius. Averaged temperature results for each waterbody are depicted in **Figure 5**.

Table 6. One site exceeded the WQO for temperature with the respective county and temperature measurement. If a duplicate field measurement was collected, the displayed result is the average of the original and duplicate values.

Site ID	Site Name	Temperature (Deg C)	County
306-MOROC-34	Castroville Slough above the confluence with the Moro Cojo Slough	23	Monterey County

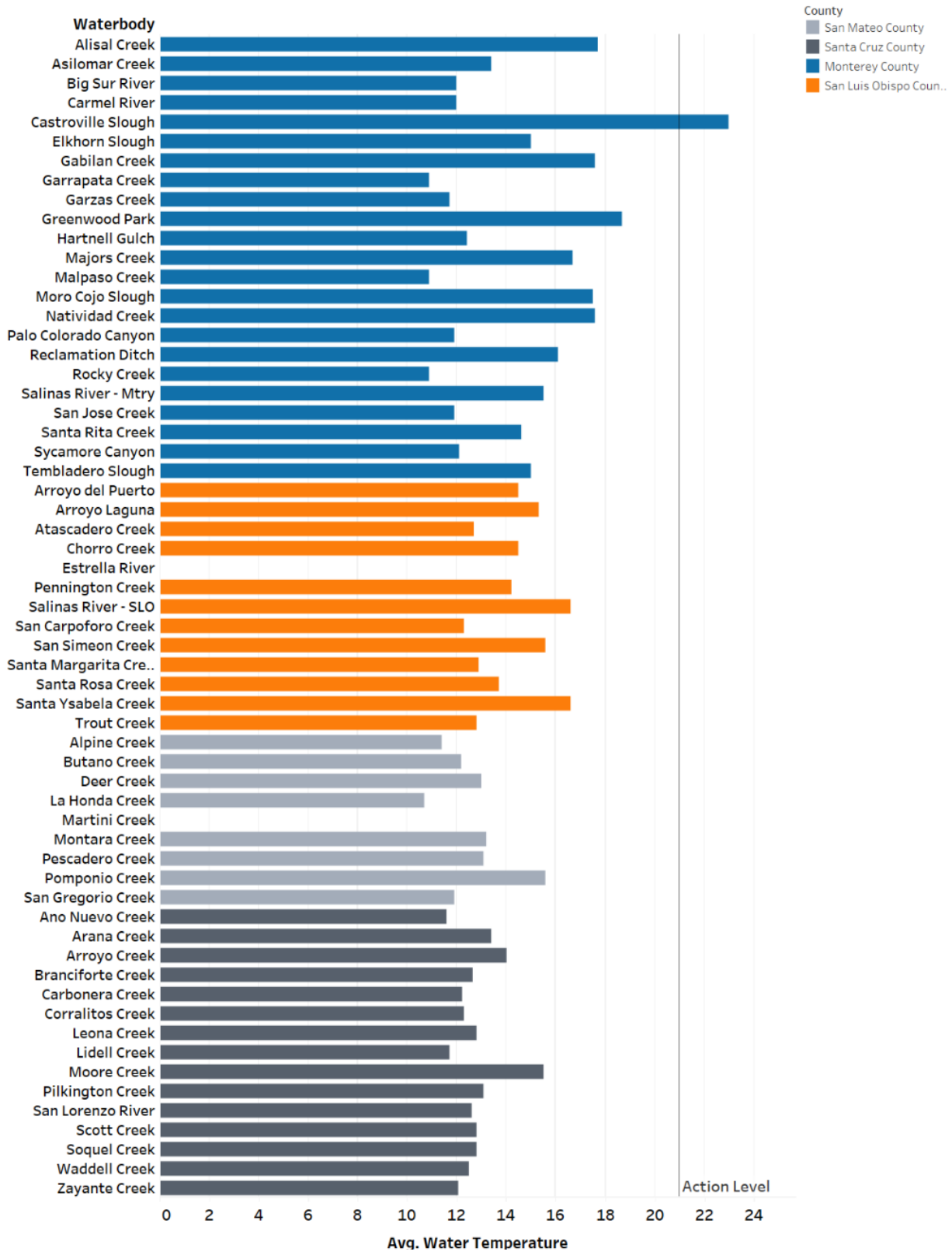

Figure 5. Average water temperature measurements for each waterbody monitored. Waterbodies with more than one site have averaged results. Waterbodies are separated by county and the Action Level is indicated by the gray line.

Lab Analysis Results

E. coli Bacteria

Coliform bacteria generally originate from the feces of warm-blooded animals such as humans, pets, livestock, or wildlife. While coliform bacteria are usually not the cause of sickness, their presence can indicate that other illness causing pathogens are present.

The EPA has set a WQO for *E. coli* at 235 MPN/100mL. Seventeen (22%) of the 77 sites where *E. coli* was measured did not meet the WQO (**Figure 7**). The highest *E. coli* result of 25,994 MPN/ 100mL was from Carbonera Creek at the bridge in Santa Cruz County.

- San Mateo County had two sites that did not meet the WQO for *E. coli*:
  - Butano Creek at Pescadero Road
  - Deer Creek behind the Creekside Smokehouse
- Santa Cruz County had seven sites that did not meet the WQO for *E. coli*:
  - Arroyo Creek at Delaware Ave
  - Arroyo Creek at West Cliff, near Auburn and Sacramento Avenues
  - Branciforte above the confluence with the San Lorenzo River
  - Carbonera Creek downstream of the Camp Evers confluence
  - Carbonera Creek at the bridge
  - The mouth of Moore Creek
  - Pilkington Creek at the Santa Cruz Natural History Museum
- Monterey County had six sites that did not meet the WQO for *E. coli*:
  - Castroville Slough above the confluence with the San Lorenzo River
  - Upper Alisal Creek
  - Greenwood Park at Central and 13th streets
  - Lower Majors Creek
  - Reclamation Ditch at Davis Road
  - Santa Rita Creek at Van Buren Avenue
- San Luis Obispo County had two sites that did not meet the WQO for *E. coli*:
  - Santa Margarita Creek at El Camino and Asuncion Road
  - The mouth of Arroyo Laguna

The sites that did not meet the WQO for *E. coli* are listed in **Table 7** with the respective *E. coli* lab result in MPN/100mL for a total of 17 sites. Averaged *E. coli* results for each waterbody are depicted in **Figure 6**.

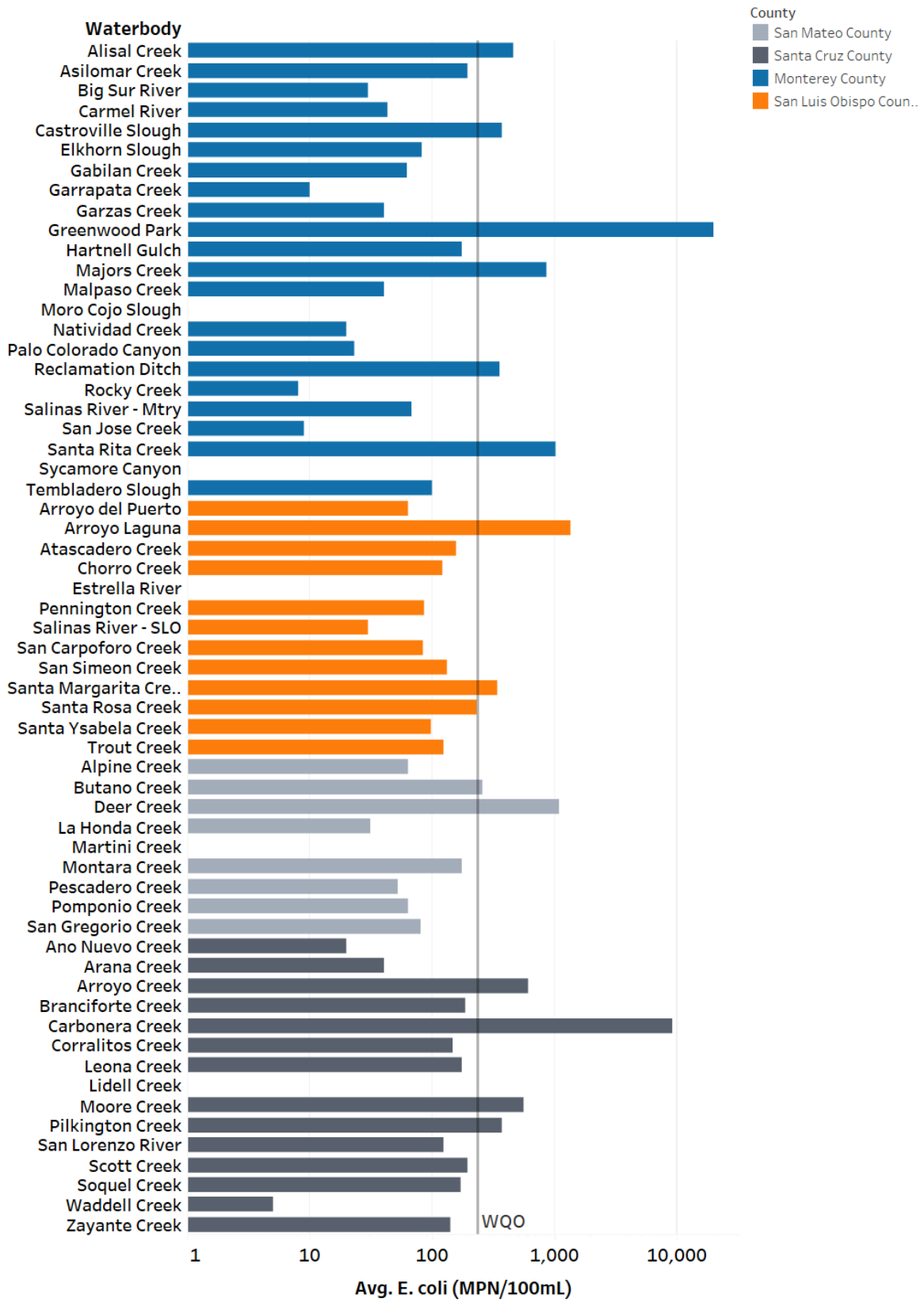

Figure 6. Average *E. coli* concentrations for each waterbody monitored. Waterbodies with more than one site have averaged results. Waterbodies are separated by county and the WQO is indicated by the gray line.

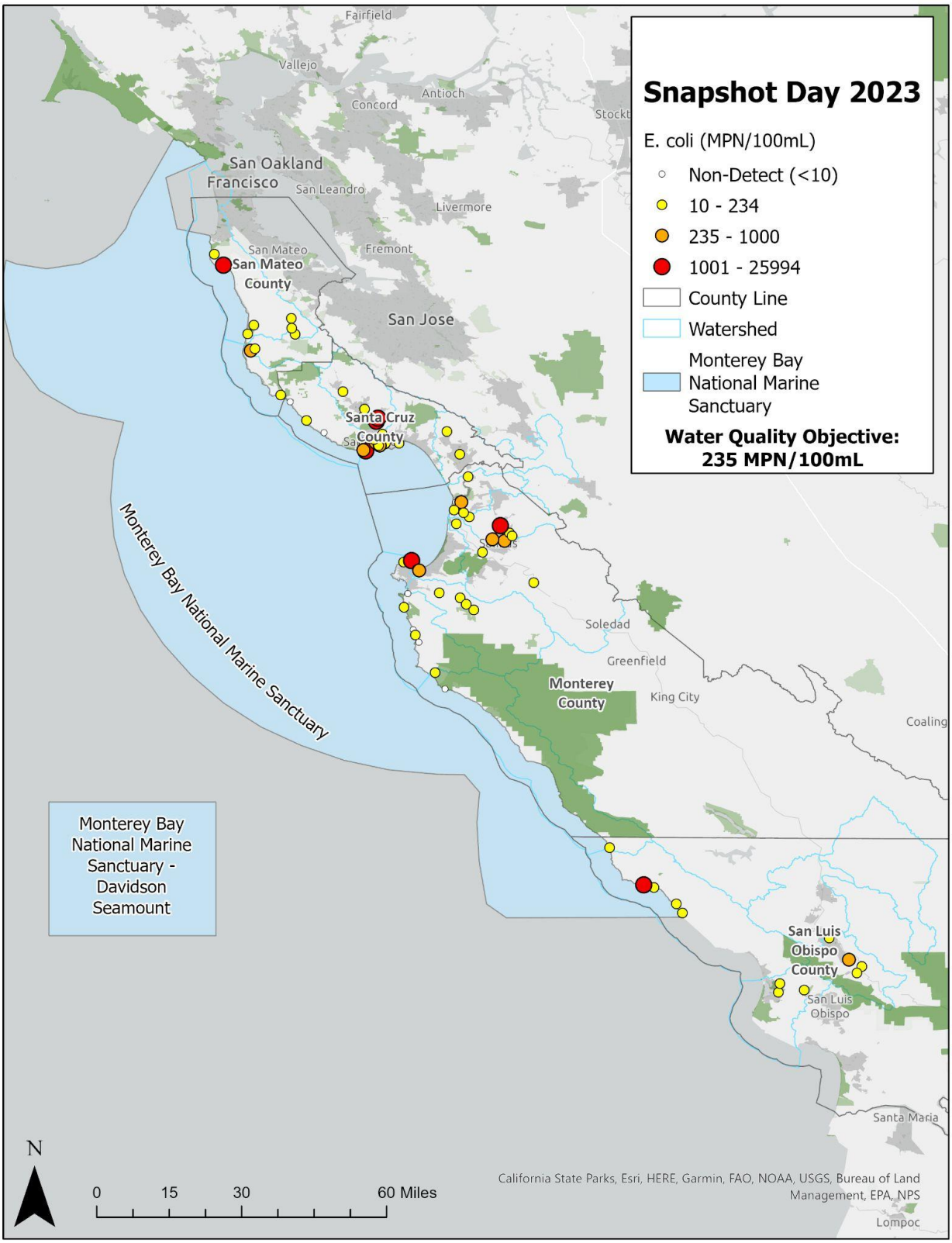

Figure 7. *E. coli* results for Snapshot Day 2023.

Table 7. Sites from Snapshot Day 2023 that exceeded the WQO for *E. coli* with the respective county and lab result. Duplicate samples were averaged with the original samples, and all field blanks were below the reporting limits.

Site ID	Site Name	E. coli (MPN/100mL)	County
306-MOROC-34	Castroville Slough above the confluence with the Moro Cojo Slough	370	Monterey County
309-ALISA-32	Alisal Creek upper	456	Monterey County
309-CENTR-31	Greenwood Park at Central and 13th Streets in Pacific Grove	19,608	Monterey County
309-MAJOR-31	Majors Creek lower	852	Monterey County
309-RECDI-31	Reclamation Ditch at Davis Road	350	Monterey County
309-SRITA-35	Santa Rita Creek at Van Buren Avenue	1,008	Monterey County
309-SMARG-41	Santa Margarita Creek at El Camino Real and Asuncion Road	341	San Luis Obispo County
310-LAGUN-41	Arroyo Laguna mouth	1,334	San Luis Obispo County
202-BUTAN-11	Butano Creek at Pescadero Road	256	San Mateo County
202-DEERC-12	Deer Creek behind Creekside Smokehouse	1,067	San Mateo County
304-ARROY-22	Arroyo Seco at Delaware Avenue	584	Santa Cruz County
304-ARROY-23	Arroyo Seco at West Cliff, near Auburn & Sacramento Avenues	1,122	Santa Cruz County
304-BRANC-21	Branciforte above confluence w/SLR	432	Santa Cruz County
304-CARBO-23	Carbonera Crk d/s of Camp Evers confluence	1,262	Santa Cruz County
304-CARBO-24	Carbonera Creek at bridge	25,994	Santa Cruz County
304-MOORE-26	Moore Creek at mouth	558	Santa Cruz County
304-PILKI-21	Pilkington Creek @ SC Natural History Museum	366	Santa Cruz County

Nitrate as N

Nitrate (as N) is naturally occurring in streams and rivers, however other sources that can contribute nitrate to creeks and rivers include fertilizers, pesticides, detergents, animal waste, sewage, and/or industrial wastes. Heightened levels of nutrients can lead to excessive algal or aquatic plant growth which can ultimately deplete the amount of oxygen available in a waterway when plants die off and bacteria decompose plant material.

Nineteen (25%) sites of the 77 sites measured for nitrate did not meet the CCAMP Action Level of 1.00 mg-N/L. The highest nitrate as N result of 44.8 mg-N/L was from upper Alisal Creek in Monterey County. Twenty-nine (38%) sites had non-detectable levels of nitrate as N (**Figure 9**). No sites in San Mateo county exceeded the Action Level.

- Santa Cruz County had two sites that did not meet the Action Level for nitrate:
    - Arana Creek at North Harbor
    - Corralitos Creek at Green Valley Road
- Monterey County had 15 sites that did not meet the nitrate Action Level:
    - Elkhorn Slough at Garin Road
    - Castroville Slough above the confluence with the San Lorenzo River
    - Upper Alisal Creek
    - Greenwood Park at Central and 13th streets
    - Gabilan Creek at Independence Road
    - Natividad Creek at Las Casitas Road
    - Reclamation Ditch at Davis Road
    - Salinas River at Trestle Bridge
    - Salinas River at Davis Road
    - Salinas River at Chualar Bridge
    - Santa Rita Creek at Bellinzona
    - Santa Rita Creek at Van Buren Avenue
    - Tembladero Slough at Monterey Dunes
    - Tembladero Slough at Hwy 183
    - Tembladero Slough at Preston Bridge
- San Luis Obispo County had two sites that did not meet the nitrate Action Level:
    - Santa Ysabela Creek on Turri Road
    - The mouth of Arroyo Laguna

The sites that did not meet the Action Level for nitrate are listed in **Table 8** with the respective nitrate lab result in mg/L for a total of 19 sites. Averaged transparency results for each waterbody are depicted in **Figure 8**.

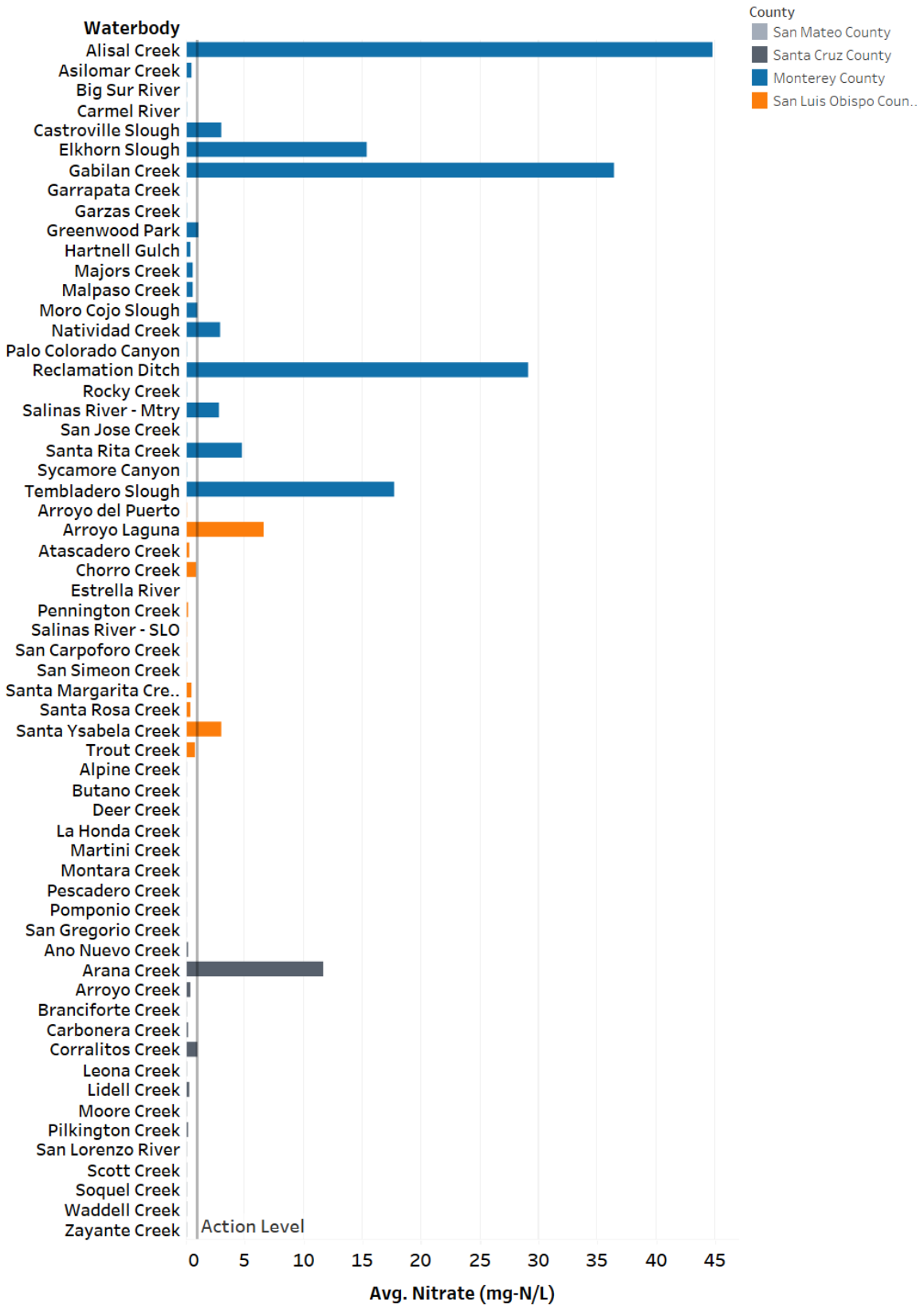

Figure 8. Average nitrate concentrations for each waterbody monitored. Waterbodies with more than one site have averaged results. Waterbodies are separated by county and the Action Level is indicated by the gray line.

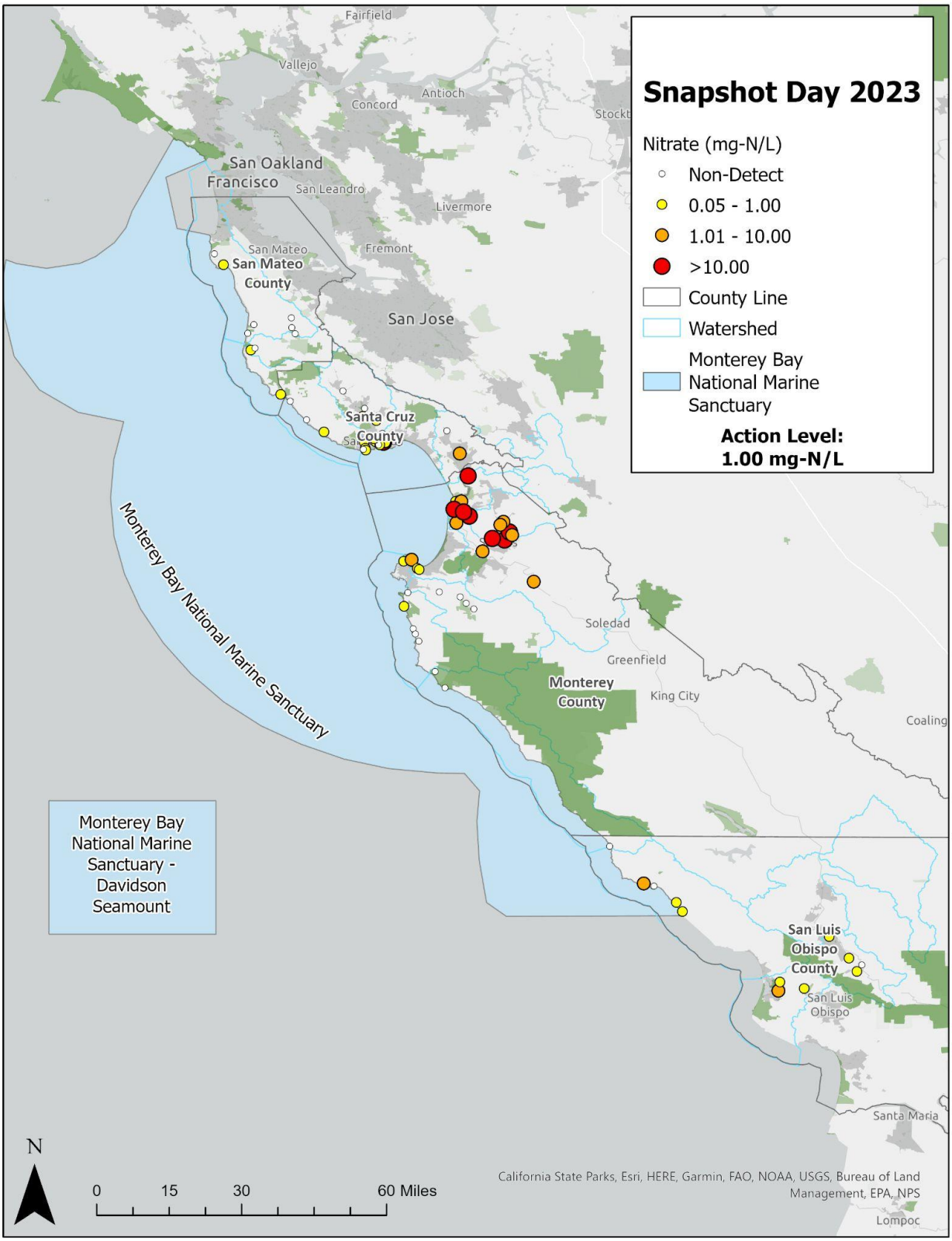

Figure 9. Nitrate results for Snapshot Day 2023.

Table 8. Sites from Snapshot Day 2023 that exceeded the Action Level for nitrate with the respective county and lab result. Duplicate samples were averaged with the original samples, and all field blanks were below the reporting limits.

Site ID	Site Name	Nitrate (mg-N/L)	County
306-ELKHO-34	Elkhorn Slough at Garin Road	15.4	Monterey County
306-MOROC-34	Castroville Slough above the confluence with the Moro Cojo Slough	3	Monterey County
309-ALISA-32	Alisal Creek upper	44.8	Monterey County
309-CENTR-31	Greenwood Park at Central and 13th Streets in Pacific Grove	1.1	Monterey County
309-GABIL-31	Gabilan Creek at Independence Road	36.4	Monterey County
309-NATIV-31	Natividad Creek at Las Casitas Road	2.9	Monterey County
309-RECDI-31	Reclamation Ditch at Davis Road	29.1	Monterey County
309-SALIN-31	Salinas River at Trestle Bridge	3.7	Monterey County
309-SALIN-32	Salinas River at Davis Road MBNMS	2.7	Monterey County
309-SALIN-33	Salinas River at Chualar Bridge	2.1	Monterey County
309-SRITA-32	Santa Rita Creek at Bellinzona	1.3	Monterey County
309-SRITA-35	Santa Rita Creek at Van Buren Avenue	8.2	Monterey County
309-TEMBL-31	Tembladero Slough at Monterey Dunes	14.3	Monterey County
309-TEMBL-32	Tembladero Slough Hwy 183	22.8	Monterey County
309-TEMBL-33	Tembladero Slough at Preston Bridge	16.1	Monterey County
310-LAGUN-41	Arroyo Laguna mouth	6.6	San Luis Obispo County
310-SYB-41	Santa Ysabela Creek on Turri Road	3	San Luis Obispo County
304-ARANA-22	Arana Creek at North Harbor	11.7	Santa Cruz County
305-CORRA-21	Corralitos Creek at Green Valley Road	1.9	Santa Cruz County

Orthophosphate as P

Orthophosphate (as P) is also naturally occurring in streams and rivers, however other sources that can contribute phosphate to creeks and rivers include fertilizers, pesticides, detergents, animal waste, sewage, and/or industrial wastes. Heightened levels of nutrients can lead to excessive algal or aquatic plant growth which ultimately deplete the amount of oxygen available in a waterway when plants die off and bacteria decompose plant material.

Sixteen (21%) of the 77 sites measured for orthophosphate as P did not meet the CCAMP Action Level of 0.12 mg/L. The highest orthophosphate concentration of 0.94 mg/L was from upper Alisal Creek in Monterey County. Thirty-one sites (40%) had non-detectable levels of orthophosphate (**Figure 11**).

- San Mateo County had one site that did not meet the Action Level for orthophosphate:
    - Alpine Creek at Alpine Road
- Santa Cruz County had two sites that did not meet the Action Level for orthophosphate:
    - Pilkington Creek at the Santa Cruz Natural History Museum
    - Zayante Creek at Mount Hermon and Bean Creek
- Monterey County had 11 sites that did not meet the Action Level for orthophosphate:
    - Elkhorn Slough at Garin Road
    - Lower Moro Cojo Slough
    - Castroville Slough above the confluence with the San Lorenzo River
    - Upper Alisal Creek
    - Lower Majors Creek
    - Reclamation Ditch at Davis Road
    - Santa Rita Creek at Bellinzona
    - Santa Rita Creek at Van Buren Avenue
    - Tembladero Slough at Monterey Dunes
    - Tembladero Slough at Hwy 183
    - Tembladero Slough at Preston Bridge
- San Luis Obispo had two sites that did not meet the Action Level for orthophosphate:
    - Trout Creek at 3 Bridges
    - Upper Chorro Flats at Chorro Creek and Morro Creek Roads

The sites that did not meet the Action Level for orthophosphate are listed in **Table 9** with the respective orthophosphate lab result in mg/L for a total of 16 sites. Averaged transparency results for each waterbody are depicted in **Figure 10**.

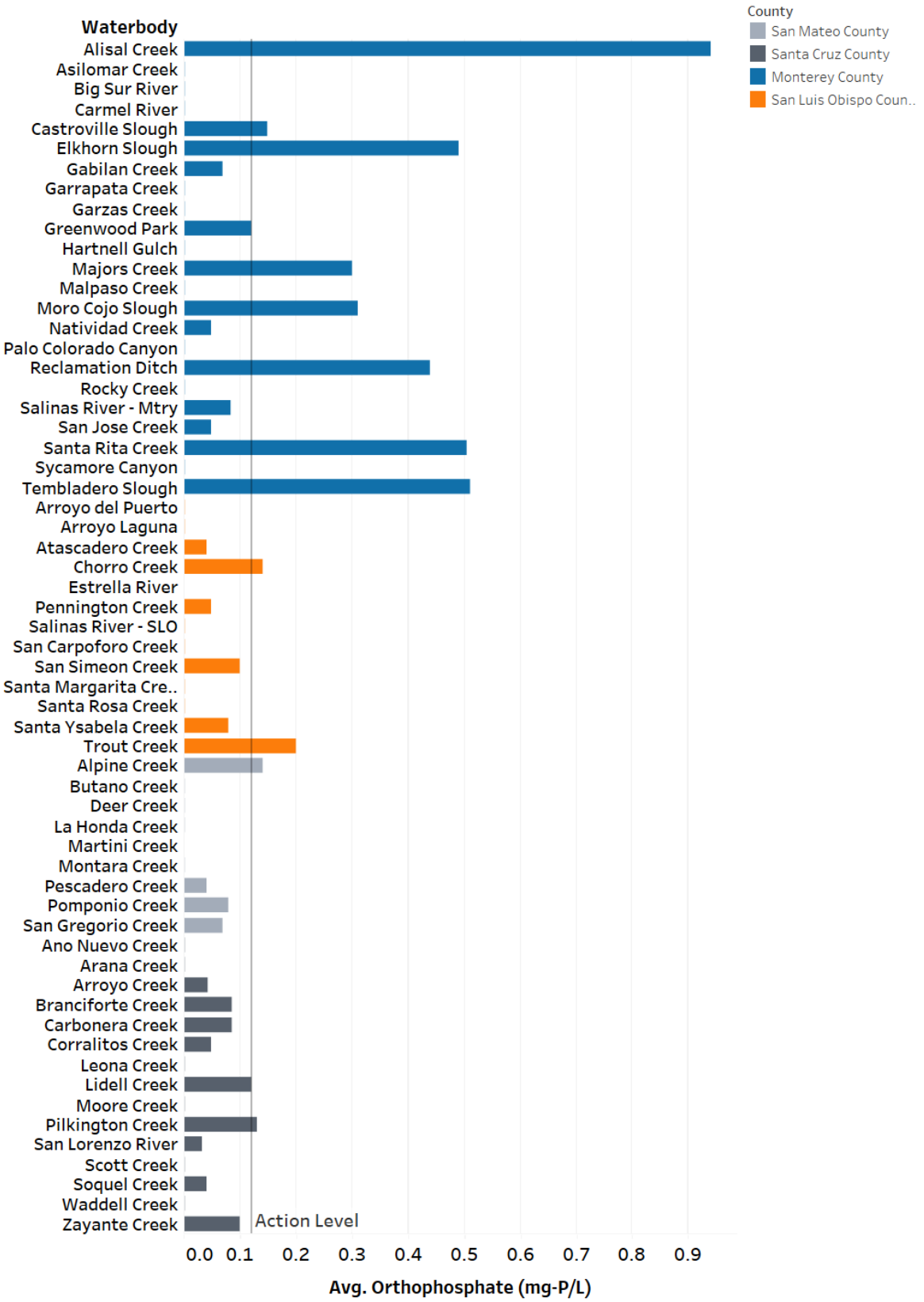

Figure 10. Average orthophosphate concentrations for each waterbody monitored. Waterbodies with more than one site have averaged results. Waterbodies are separated by county and the Action Level is indicated by the gray line.

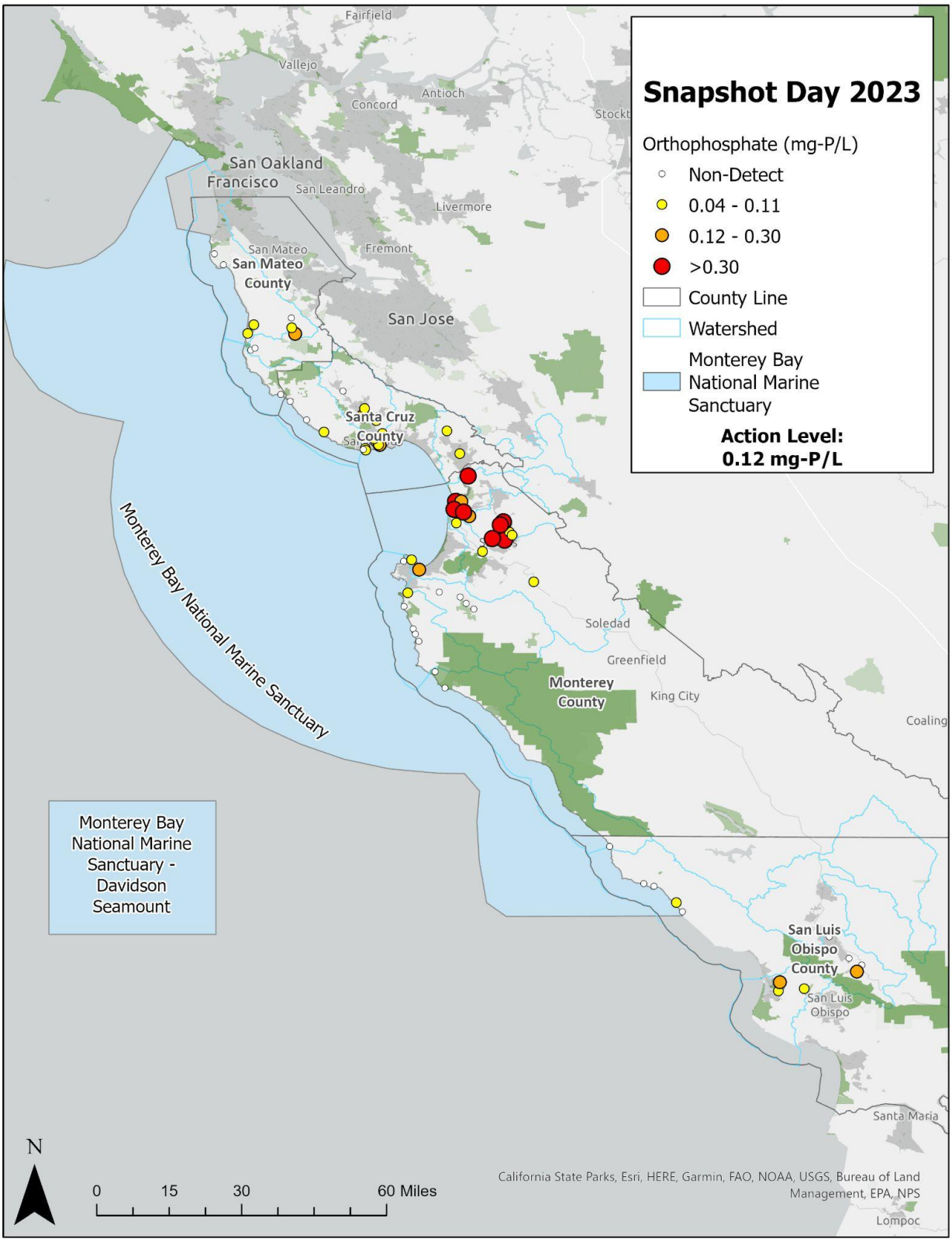

Figure 11. Orthophosphate results for Snapshot Day 2023.

Table 9. Sites from Snapshot Day 2023 that exceeded the Action Level for orthophosphate with the respective county and lab result. Duplicate samples were averaged with the original samples, and all field blanks were below the reporting limits.

Site ID	Site Name	Orthophosphate (mg-P/L)	County
306-ELKHO-34	Elkhorn Slough at Garin Road	0.49	Monterey County
306-MOROC-33	Moro Cojo Slough lower	0.31	Monterey County
306-MOROC-34	Castroville Slough above the confluence with the Moro Cojo Slough	0.15	Monterey County
309-ALISA-32	Alisal Creek upper	0.94	Monterey County
309-MAJOR-31	Majors Creek lower	0.3	Monterey County
309-RECDI-31	Reclamation Ditch at Davis Road	0.44	Monterey County
309-SRITA-32	Santa Rita Creek at Bellinzona	0.52	Monterey County
309-SRITA-35	Santa Rita Creek at Van Buren Avenue	0.49	Monterey County
309-TEMBL-31	Tembladero Slough at Monterey Dunes	0.66	Monterey County
309-TEMBL-32	Tembladero Slough Hwy 183	0.22	Monterey County
309-TEMBL-33	Tembladero Slough at Preston Bridge	0.65	Monterey County
309-TROUT-41	Trout Creek at 3 bridges	0.2	San Luis Obispo County
310-UCF-41	Upper Chorro Flats at Chorro Creek and Morro Creek Roads	0.14	San Luis Obispo County
202-ALPIN-11	Alpine Creek at Alpine Road	0.14	San Mateo County
304-PILKI-21	Pilkington Creek @ SC Natural History Museum	0.13	Santa Cruz County
304-ZAYAN-21	Zayante Creek at Mount Hermon and Bean Creek	0.13	Santa Cruz County

Field Observations

Similar to the past 23 years Snapshot Day has been conducted, trash was noted at many sites in 2023. Trash included plastic bags, plastic bottles, aluminum cans, plastic food wrappers, and glass bottles. Several volunteers noted that there were less remnants of debris along the creeks than in previous years and obvious signs of flooding and river expansion. Wildlife such as waterfowl and other birds such as hawks and robins, raccoons, squirrels, elephant seals, frogs, invertebrate animals like worms and banana slugs, and pets were also noted at the sites.

Areas of Concern

When lab and field results for a single site do not meet three or more Water Quality Objectives or Action Levels the site is labeled an Area of Concern. A single waterbody can have multiple sites that represent Areas of Concern. For example, this year three sites monitored on Tembladero Slough were designated as Areas of Concern on the same waterbody. For this reason we have chosen to display the Area of Concern data two ways: by waterbody (**Figures 12, 13, 14, and 15**) and by site (**Figure 16**).

In 2023, 13 sites (17%) were designated Areas of Concern on 10 waterbodies. Six of the Areas of Concern are on four waterbodies that have been designated Areas of Concern for more than ten of the past 22 years: Tembladero Slough, Alisal Creek, Santa Rita Creek, and the Salinas Reclamation Canal, all located in Monterey County. The other three Areas of Concern located in Monterey County are in Moro Cojo Slough, Castroville Slough, and Majors Creek. Two other Areas of Concern are located in Santa Cruz County at Moore and Pilkington Creek. Santa Ysabela Creek is the only area of concern located in San Luis Obispo County. For the seventh year in a row, San Mateo County had no Areas of Concern.

The sites that exceeded three or more of these criteria are listed in **Table 10, 11, and 12** for each county in 2023 (Monterey, San Luis Obispo, and Santa Cruz) with the corresponding waterbody, the standard exceeded, and the measurement for that standard.

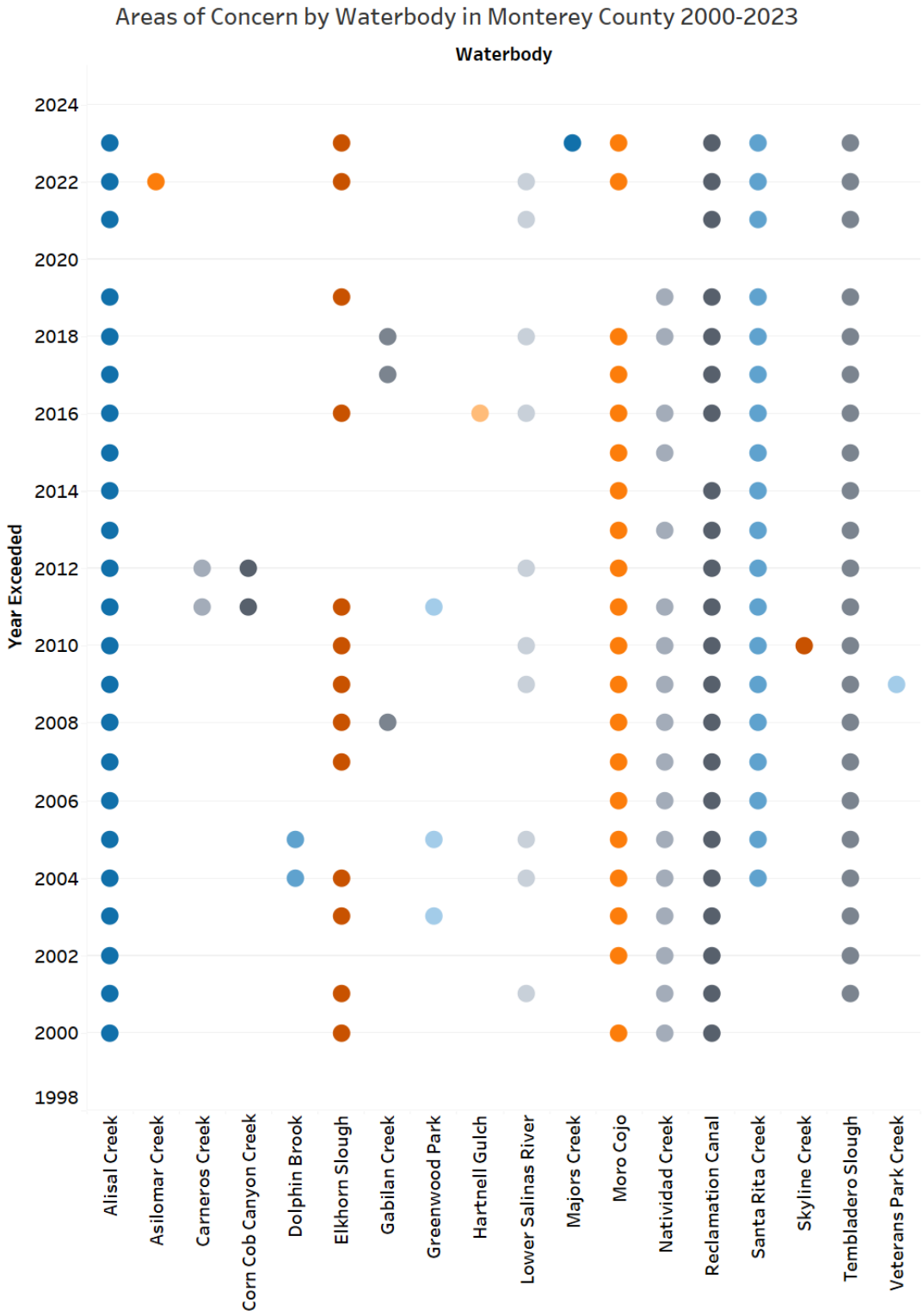

Figure 12. Areas of Concern by waterbody in Monterey County from 2000-2023 with the dots signifying the year that the waterbody exceeded three or more WQOs or Action Levels for the given year.

Table 10. Sites from 2023 in Monterey County that were designated as an Area of Concern with the corresponding waterbody, standard exceeded, and measurement.

Site ID	Site Name	Standard Exceeded	Measurement	County	Waterbody
306-MOROC-33	Moro Cojo Slough lower	Orthophosphate as P (mg/L)	0.31	Monterey County	Moro Coho Slough
306-MOROC-33	Moro Cojo Slough lower	pH	9.25	Monterey County	Moro Coho Slough
306-MOROC-33	Moro Cojo Slough lower	Transparency (cm)	13.8	Monterey County	Moro Coho Slough
306-MOROC-34	Castroville Slough above the confluence with the Moro Cojo Slough	Nitrate as N (mg/L)	3	Monterey County	Castroville Slough
306-MOROC-34	Castroville Slough above the confluence with the Moro Cojo Slough	Orthophosphate as P (mg/L)	0.15	Monterey County	Castroville Slough
306-MOROC-34	Castroville Slough above the confluence with the Moro Cojo Slough	Transparency (cm)	5.3	Monterey County	Castroville Slough
306-MOROC-34	Castroville Slough above the confluence with the Moro Cojo Slough	E. coli (MPN/100mL)	370	Monterey County	Castroville Slough
306-MOROC-34	Castroville Slough above the confluence with the Moro Cojo Slough	Temperature (Deg C)	23	Monterey County	Castroville Slough
306-MOROC-34	Castroville Slough above the confluence with the Moro Cojo Slough	pH	9	Monterey County	Castroville Slough
309-ALISA-32	Alisal Creek upper	Nitrate as N (mg/L)	44.8	Monterey County	Alisal Creek
309-ALISA-32	Alisal Creek upper	Orthophosphate as P (mg/L)	0.94	Monterey County	Alisal Creek
309-ALISA-32	Alisal Creek upper	E. coli (MPN/100mL)	456	Monterey County	Alisal Creek
309-ALISA-32	Alisal Creek upper	Transparency (cm)	7.8	Monterey	Alisal Creek

				County	
309-MAJOR-31	Majors Creek lower	Orthophosphate as P (mg/L)	0.3	Monterey County	Majors Creek
309-MAJOR-31	Majors Creek lower	E. coli (MPN/100mL)	852	Monterey County	Majors Creek
309-MAJOR-31	Majors Creek lower	Transparency (cm)	6	Monterey County	Majors Creek
309-MAJOR-31	Majors Creek lower	pH	6.75	Monterey County	Majors Creek
309-MAJOR-31	Majors Creek lower	Oxygen, Dissolved (mg/L)	5.25	Monterey County	Majors Creek
309-RECDI-31	Reclamation Ditch at Davis Road	Nitrate as N (mg/L)	29.1	Monterey County	Reclamation Ditch
309-RECDI-31	Reclamation Ditch at Davis Road	Orthophosphate as P (mg/L)	0.44	Monterey County	Reclamation Ditch
309-RECDI-31	Reclamation Ditch at Davis Road	E. coli (MPN/100mL)	350	Monterey County	Reclamation Ditch
309-RECDI-31	Reclamation Ditch at Davis Road	Oxygen, Dissolved (mg/L)	6.25	Monterey County	Reclamation Ditch
309-RECDI-31	Reclamation Ditch at Davis Road	Transparency (cm)	8.6	Monterey County	Reclamation Ditch
309-SRITA-32	Santa Rita Creek at Bellinzona	Nitrate as N (mg/L)	1.3	Monterey County	Santa Rita Creek
309-SRITA-32	Santa Rita Creek at Bellinzona	Orthophosphate as P (mg/L)	0.52	Monterey County	Santa Rita Creek
309-SRITA-32	Santa Rita Creek at Bellinzona	Oxygen, Dissolved (mg/L)	6	Monterey County	Santa Rita Creek
309-SRITA-32	Santa Rita Creek at Bellinzona	Transparency (cm)	20	Monterey County	Santa Rita Creek
309-SRITA-35	Santa Rita Creek at Van Buren Avenue	Nitrate as N (mg/L)	8.2	Monterey County	Santa Rita Creek
309-SRITA-35	Santa Rita Creek at Van Buren Avenue	Orthophosphate as P (mg/L)	0.49	Monterey County	Santa Rita Creek
309-SRITA-35	Santa Rita Creek at Van Buren Avenue	E. coli (MPN/100mL)	1,008	Monterey County	Santa Rita Creek

309-SRITA-35	Santa Rita Creek at Van Buren Avenue	Oxygen, Dissolved (mg/L)	5	Monterey County	Santa Rita Creek
309-TEMBL-31	Tembladero Slough at Monterey Dunes	Nitrate as N (mg/L)	14.3	Monterey County	Tembladero Slough
309-TEMBL-31	Tembladero Slough at Monterey Dunes	Orthophosphate as P (mg/L)	0.66	Monterey County	Tembladero Slough
309-TEMBL-31	Tembladero Slough at Monterey Dunes	Oxygen, Dissolved (mg/L)	6	Monterey County	Tembladero Slough
309-TEMBL-31	Tembladero Slough at Monterey Dunes	Transparency (cm)	9.3	Monterey County	Tembladero Slough
309-TEMBL-32	Tembladero Slough Hwy 183	Nitrate as N (mg/L)	22.8	Monterey County	Tembladero Slough
309-TEMBL-32	Tembladero Slough Hwy 183	Orthophosphate as P (mg/L)	0.22	Monterey County	Tembladero Slough
309-TEMBL-32	Tembladero Slough Hwy 183	Oxygen, Dissolved (mg/L)	6	Monterey County	Tembladero Slough
309-TEMBL-32	Tembladero Slough Hwy 183	Transparency (cm)	7.3	Monterey County	Tembladero Slough
309-TEMBL-33	Tembladero Slough at Preston Bridge	Nitrate as N (mg/L)	16.1	Monterey County	Tembladero Slough
309-TEMBL-33	Tembladero Slough at Preston Bridge	Orthophosphate as P (mg/L)	0.65	Monterey County	Tembladero Slough
309-TEMBL-33	Tembladero Slough at Preston Bridge	Oxygen, Dissolved (mg/L)	6	Monterey County	Tembladero Slough
309-TEMBL-33	Tembladero Slough at Preston Bridge	Transparency (cm)	9	Monterey County	Tembladero Slough

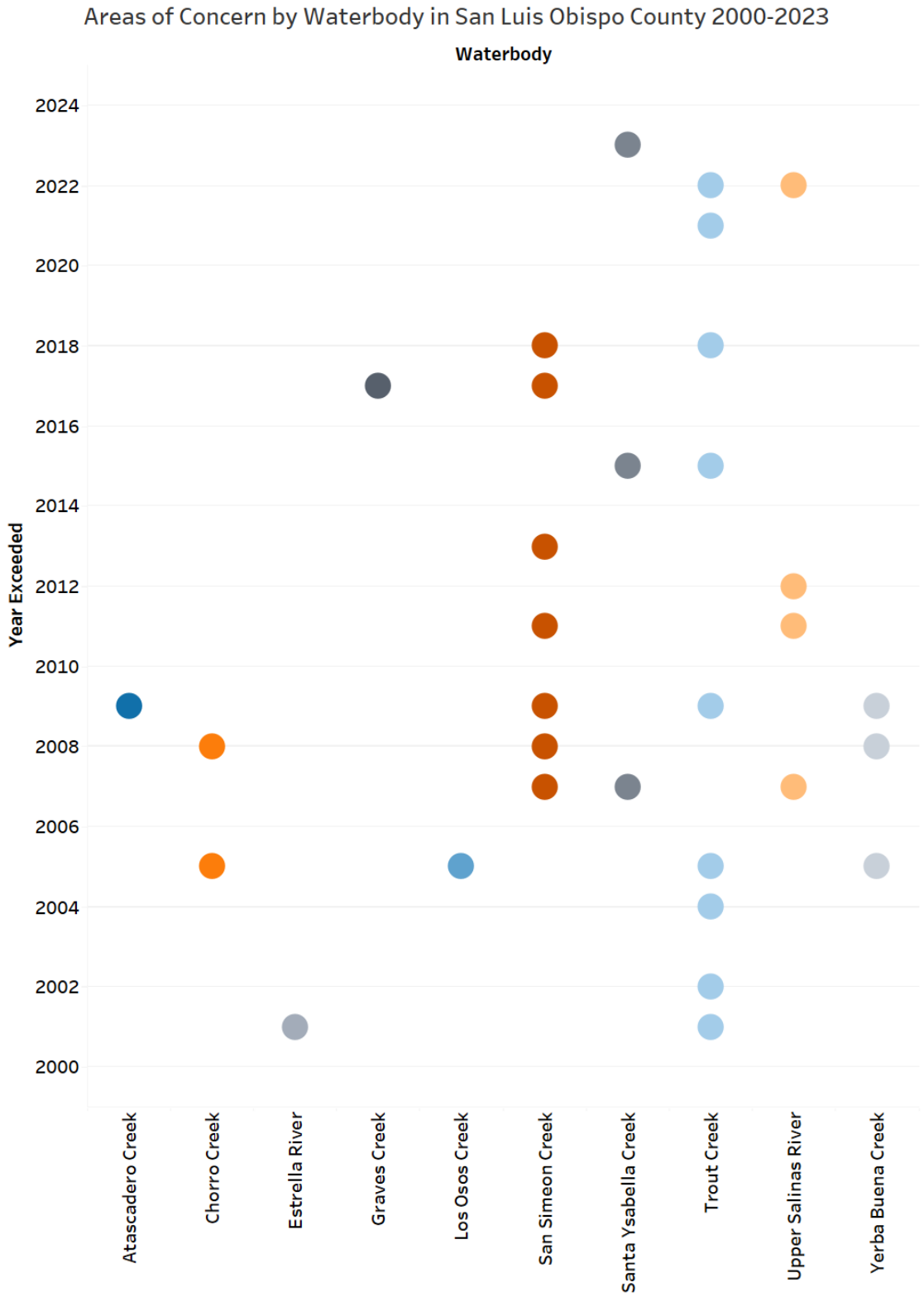

Figure 13. Areas of Concern by waterbody in San Luis Obispo County from 2000-2023 with the dots signifying the year that the waterbody exceeded three or more WQOs or Action Levels for the given year.

Table 11. Sites from 2023 in San Luis Obispo County that were designated as an Area of Concern with the corresponding waterbody, standard exceeded, and measurement.

Site ID	Site Name	Standard Exceeded	Measurement	County	Waterbody
310-SYB-41	Santa Ysabela Creek on Turri Road	Nitrate as N (mg/L)	3	San Luis Obispo County	Santa Ysabela Creek
310-SYB-41	Santa Ysabela Creek on Turri Road	pH	8.75	San Luis Obispo County	Santa Ysabela Creek
310-SYB-41	Santa Ysabela Creek on Turri Road	Transparency (cm)	24	San Luis Obispo County	Santa Ysabela Creek

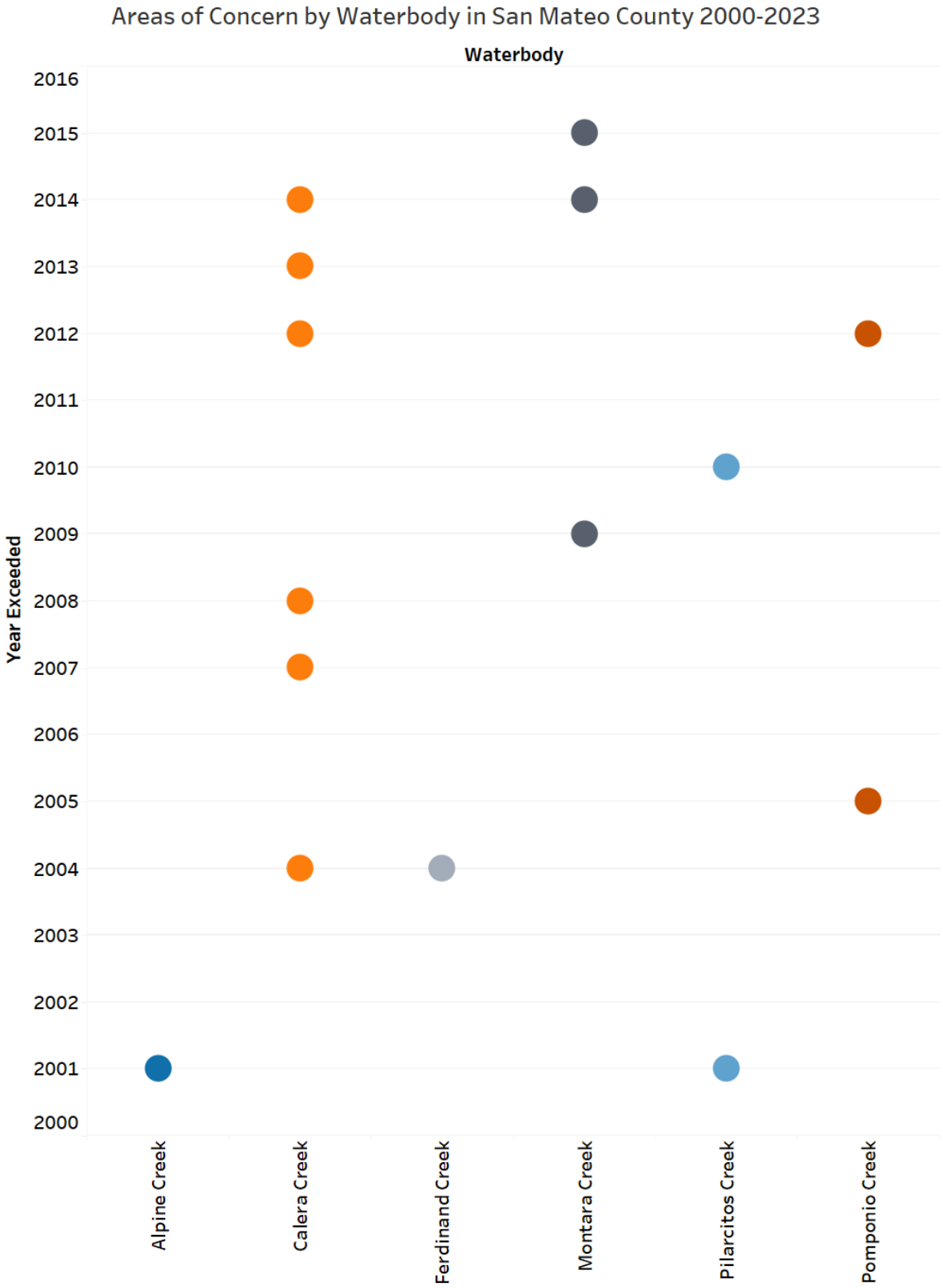

Figure 14. Areas of Concern by waterbody in San Mateo County from 2000-2023 with the dots signifying the year that the waterbody exceeded three or more WQOs or Action Levels for the given year. No waterbody in San Mateo County in 2023 was designated as an Area of Concern.

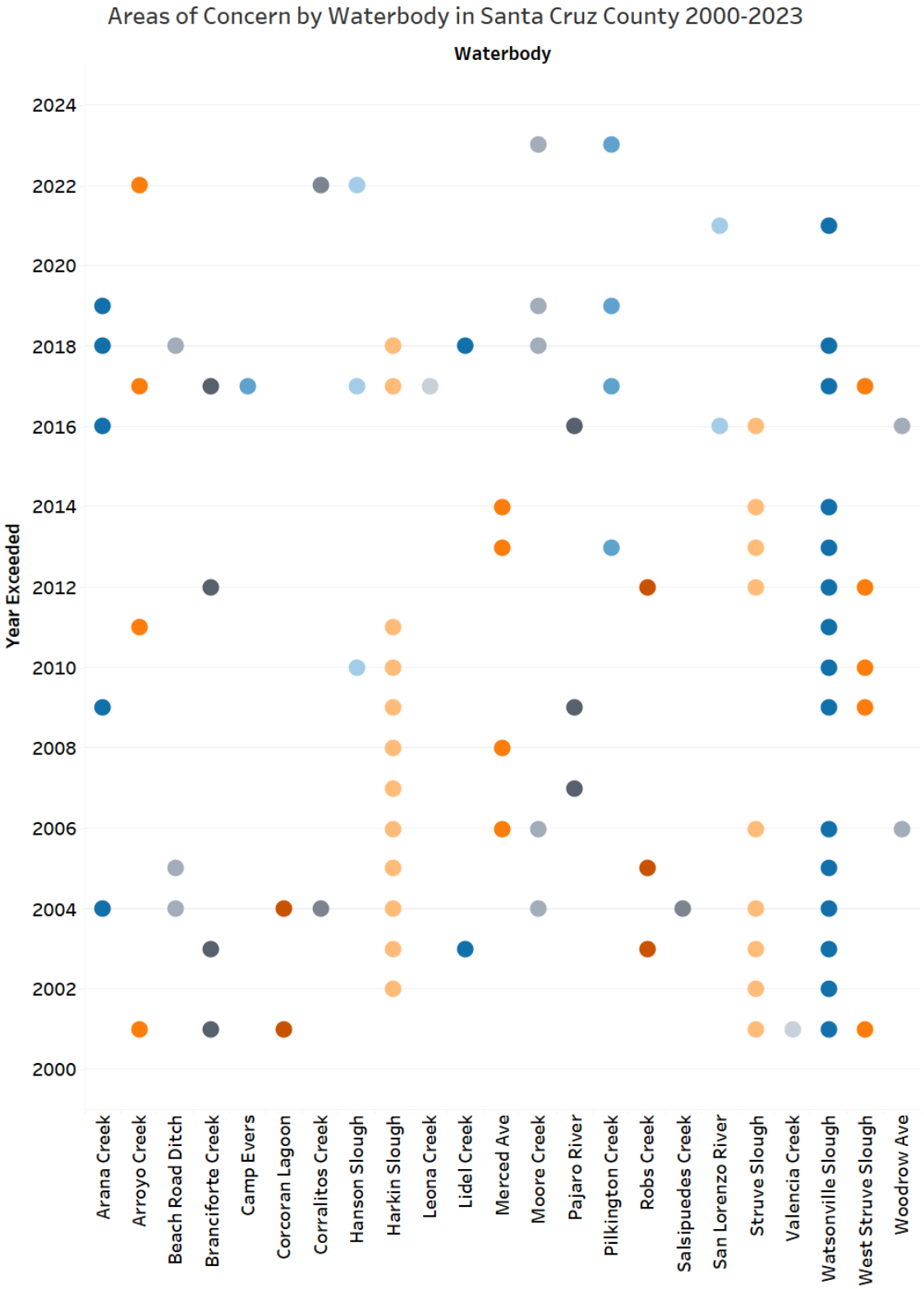

Figure 15. Areas of Concern by waterbody in Santa Cruz County from 2000-2023 with the dots signifying the year that the waterbody exceeded three or more WQOs or Action Levels for the given year.

Table 12. Sites from 2023 in Santa Cruz County that were designated as an Area of Concern with the corresponding waterbody, standard exceeded, and measurement.

Site ID	Site Name	Standard Exceeded	Measurement	County	Waterbody
304-MOORE-26	Moore Creek at mouth	E. coli (MPN/100mL)	558	Santa Cruz County	Moore Creek
304-MOORE-26	Moore Creek at mouth	Oxygen, Dissolved (mg/L)	5.5	Santa Cruz County	Moore Creek
304-MOORE-26	Moore Creek at mouth	pH	6.75	Santa Cruz County	Moore Creek
304-PILKI-21	Pilkington Creek @ SC Natural History Museum	Orthophosphate as P (mg/L)	0.13	Santa Cruz County	Pilkington Creek
304-PILKI-21	Pilkington Creek @ SC Natural History Museum	E. coli (MPN/100mL)	366	Santa Cruz County	Pilkington Creek
304-PILKI-21	Pilkington Creek @ SC Natural History Museum	pH	6.75	Santa Cruz County	Pilkington Creek

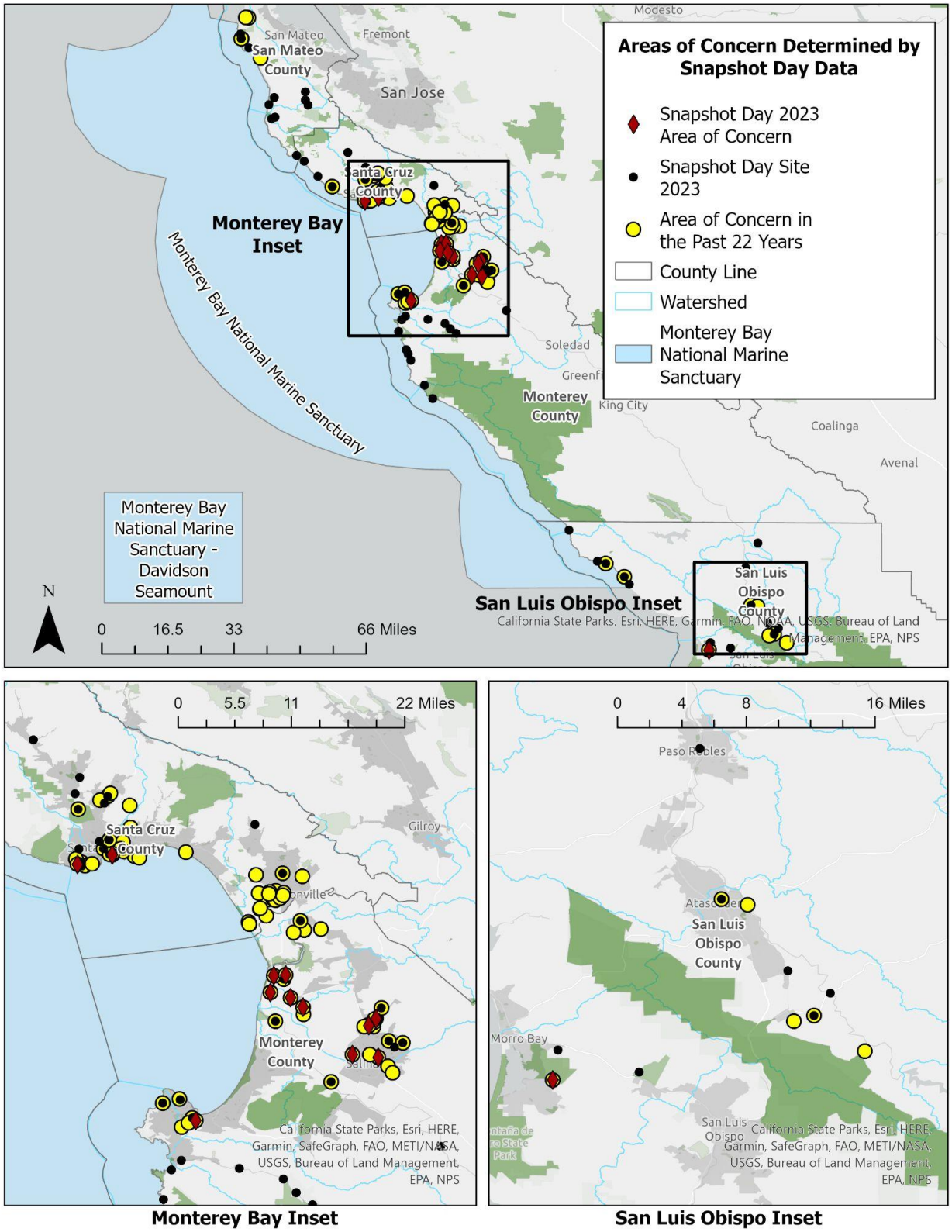

Figure 16. Areas of Concern for Snapshot Day 2023.

Conclusion

In its 23rd year, Snapshot Day 2023 brought together 95 committed community members to monitor the water quality of 86 sites in creeks and rivers draining into the Monterey Bay National Marine Sanctuary. Throughout the past 23 years, over 3,000 volunteers have donated more than 17,000 hours of their time to monitor creeks and rivers as part of Snapshot Day. In 2023, 18 sites or 23% of the sites monitored had no Water Quality Objective or Action Level exceedances for any parameter and provided good conditions for cold-water fish, one beneficial use by which Snapshot Day data is compared. Several atmospheric rivers occurred over the winter season on the central coast this year which flushed out many streams in the area. Potentially due to this high level of flow, many sites this year had very low exceedances of *E. coli* and a fairly low number of exceedances overall with none reported as the highest in Snapshot Day history. The rain events occurring later in the winter season could have contributed to the higher number of pH exceedances that were observed.

Thirteen sites along 10 waterbodies were listed as Areas of Concern (sites with three or more Water Quality Objective or Action Level exceedances) for 2023. Snapshot Day sites at the end of large rivers or creeks that have urban areas and/or agricultural influences show the most significant concentrations and exceedances of nutrients and bacteria, and lower dissolved oxygen levels. In comparison, creeks and rivers on the San Mateo County and Big Sur coast have few to no exceedances. Of the 10 waterbodies listed as Areas of Concern, all are also listed on the 303(d) list for impaired waterways by the Regional Water Quality Control Board. The 303(d) listed waterbodies are: Moro Cojo Slough, Castroville Slough, Alisal Creek, Majors Creek, Reclamation Ditch, Santa Rita Creek, Tembladero Slough, Santa Ysabela Creek, Moore Creek, and Pilkington Creek. The methodology for this listing can be found at the State Board website: www.swrcb.ca.gov.

It is our hope that improvements in water quality continue through efforts focused on both urban and agricultural management measures that control trash, nitrate, orthophosphate, *E. coli,* and conditions that lead to harmful dissolved oxygen levels.

We would like to thank all of the volunteers who made this event possible. A monitoring effort of this magnitude could only be completed by a large group of dedicated volunteers. The data generated by volunteers is a valuable resource for identifying long-term trends in central California waterbodies. Snapshot Day is a successful annual event due in large part to continued interest and support by volunteers and partner organizations.

Appendix 1

2023 Results by County and Site

	Site	E. coli (MPN/ 100mL)	Nitrate as N (mg-N/ L)	Orthopho -sphate as P (mg-P/L)	Dissolved Oxygen (mg/L)	pH	Transparency (cm)	Water Temperature (Deg C)
Monterey County Sites	306-ELKHO-34	82	15.4	0.49	8	7	28.5	15
	306-MOROC-31	NC	NC	NC	NC	NC	NC	NC
	306-MOROC-33	1	1	0.31	10	9.25	13.8	18
	306-MOROC-34	370	3	0.15	11	9	5.3	23
	307-CARME-33	30	ND	ND	9	6.5	122	11.55
	307-CARME-35	60	ND	ND	11	6.1	122	11.8
	307-CARME-36	40	ND	ND	12	6.5	122	12.6
	307-CARME-38	NC	NC	NC	NC	NC	NC	NC
	307-GARZA-31	40	ND	ND	9	6.2	122	11.7
	308-BIGSU-31	30	ND	ND	8	6.5	120	12
	308-GARRA-31	10	ND	ND	10	7	120	10.9
	308-MALPA-31	40	0.6	ND	10	6.5	120	10.9
	308-PALOC-31	23	ND	ND	10	7	52	11.9
	308-ROCKY-31	8	ND	ND	10	6.75	120	10.9
	308-SANJO-31	9	ND	0.05	12	6.5	120	11.85
	308-SYCAM-32	1	ND	ND	6	7	120	12.1
	309-ALISA-32	456	44.8	0.94	11	7	7.8	17.7
	309-ASILO-31	194	0.5	ND	6	6	45	13.4
	309-CENTR-31	19608	1.1	0.12	9.5	7	52.6	18.7
	309-GABIL-31	62	36.4	0.07	8	7	120	17.6
	309-LIBRA-31	172	0.4	ND	6	6	120	12.4
	309-MAJOR-31	852	0.6	0.3	5.25	6.75	6	16.65
	309-NATIV-31	20	2.9	0.05	6	7.5	120	17.6
	309-RECDI-31	350	29.1	0.44	6.25	7	8.6	16.1
	309-SALIN-31	148	3.7	0.1	8.75	7	31.6	14.95
	309-SALIN-32	15	2.7	0.08	9	8.5	18	16.1

	309-SALIN-33	40	2.1	0.07	11	7	18.6	15.3
	309-SRITA-32	NC	1.3	0.52	6	7	20	15
	309-SRITA-33	NC	NC	NC	NC	NC	NC	NC
	309-SRITA-34	NC	NC	NC	NC	NC	NC	NC
	309-SRITA-35	1008	8.2	0.49	5	7.5	NC	15.2
	309-TEMBL-31	196	14.3	0.66	6	7	9.3	15.25
	309-TEMBL-32	39	22.8	0.22	6	7	7.3	14.7
	309-TEMBL-33	62	16.1	0.65	6	7	9	15
	309-UPPER-31	NC	NC	NC	NC	NC	NC	NC
San Luis Obispo County Sites	309-ATASC-41	156	0.3	0.04	9	7.5	125	12.7
	309-SALIN-45	30	ND	ND	8	7	120	16.6
	309-SALIN-47	NC	NC	NC	NC	NC	NC	NC
	309-SMARG-41	341	0.5	ND	10.5	6.75	120	12.85
	309-TROUT-41	122	0.8	0.2	10	7	120	12.75
	310-ARROY-41	63	ND	ND	9	7	120	14.5
	310-CARPO-41	84	ND	ND	7.25	6.75	120	12.55
	310-LAGUN-41	1334	6.6	ND	9	7.5	54	15.3
	310-PENN-41	86	0.2	0.05	10	8.9	120	14.2
	310-SANSI-41	131	0.08	0.1	9	7	120	15.6
	310-SANTA-43	228	0.4	ND	6.75	7.38	66	14
	310-SYB-41	98	3	0.08	10	8.75	24	16.6
	310-UCF-41	121	0.9	0.14	9.72	8.74	120	14.55
	317-ESTRE-41	NC	NC	NC	NC	NC	NC	NC
San Mateo County Sites	202-ALPIN-11	63	ND	0.14	8	7.5	120	11.4
	202-BUTAN-11	256	0.07	ND	7	6.75	46	12.2
	202-DEERC-12	1067	0.05	ND	9	7	17.5	13
	202-LAHON-11	63	ND	0.07	8	7.5	120	11.3
	202-MARTI-11	NC	NC	NC	NC	NC	NC	NC
	202-MONTA-12	175	ND	ND	7	6.75	33.4	13.2
	202-PESCA-11	52	ND	0.04	7	7	120	13.1
	202-POMPO-11	63	ND	0.08	6	7	50	15.6
	202-SANGR-12	97	ND	0.07	6.5	7.5	120	12.5
	202-SANGR-14	31	ND	ND	7	7	120	10.65

Santa Cruz County Sites	304-ARANA-22	40	11.7	ND	7	7.5	62.5	13.4
	304-ARROY-21	104	0.3	ND	7	7	120	14.4
	304-ARROY-22	584	0.2	0.07	5.5	7	120	13.7
	304-ARROY-23	1122	0.7	0.06	8	7	120	14
	304-BRANC-21	432	0.2	0.08	8	6.75	120	12.8
	304-BRANC-22	40	ND	0.11	10	7	120	12.3
	304-BRANC-23	82	0.2	0.07	9	7	120	12.9
	304-CARBO-21	62	0.4	0.06	9	7	120	12.4
	304-CARBO-23	1262	0.2	0.1	9	7	91	12.2
	304-CARBO-24	25994	0.09	0.1	9	7	77	12.1
	304-LEONA-21	126	0.1	ND	6	6.5	67	12.7
	304-LEONA-22	218	0.1	ND	6	6	120	12.9
	304-LIDEL-21	1	0.3	0.12	10	7	120	11.7
	304-MOORE-26	558	ND	ND	5.5	6.75	71.9	15.75
	304-NEWYE-11	20	0.2	ND	12	7	35	11.6
	304-PILKI-21	366	0.2	0.13	8	6.75	104	13.1
	304-SANLO-22	92	ND	0.05	8.5	6.63	120	13.5
	304-SANLO-24	104	0.1	0.05	7	6.3	120	12.5
	304-SANLO-26	NC	NC	NC	NC	NC	NC	NC
	304-SANLO-27	170	ND	ND	9	6.5	120	11.7
	304-SCOTT-25	194	ND	ND	10	7	120	12.75
	304-SOQUE-22	170	ND	0.04	7.5	7	120	12.85
	304-WADDE-20	5	ND	ND	8	7.25	120	12.5
	304-ZAYAN-21	220	0.1	0.13	10.5	7	120	12.35
	304-ZAYAN-22	62	ND	0.07	8	6.5	120	11.8
	305-CORRA-21	231	1.9	0.05	10	6	120	13
	305-CORRA-22	62	ND	0.05	12	6.5	120	11.7

NC - Not Collected
ND - Non-Detect