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NATIONAL MARINE SANCTUARIES CONSERVATION SERIES

2024 Snapshot Day: Annual Volunteer Water Quality Monitoring Report

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National Ocean Service
Nicole LeBoeuf, Assistant Administrator

Office of National Marine Sanctuaries
John Armor, Director

Report Authors:
Lindsay Brown[1,2], Pam Krone[1,2], Karen Grimmer[1]

[1]Monterey Bay National Marine Sanctuary [2]California Marine Sanctuary Foundation

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Cover photo: Snapshot Day volunteers at the Coastal Discovery Center in San Simeon on May 4, 2024. Photo: Sophia Barwegen/NOAA

About the National Marine Sanctuaries Conservation Series

The Office of National Marine Sanctuaries, part of the National Oceanic and Atmospheric Administration, serves as the trustee for a system of underwater parks encompassing more than 620,000 square miles of ocean and Great Lakes waters. The 18 national marine sanctuaries and two marine national monuments within the National Marine Sanctuary System represent areas of America's ocean and Great Lakes environment that are of special national significance. Within their waters, giant humpback whales breed and calve their young, coral colonies flourish, and shipwrecks tell stories of our nation's maritime history. Habitats include beautiful coral reefs, lush kelp forests, whale migration corridors, spectacular deep-sea canyons, and underwater archaeological sites. These special places also provide homes to thousands of unique or endangered species and are important to America's cultural heritage. Sites range in size from less than one square mile to almost 583,000 square miles. They serve as natural classrooms and cherished recreational spots, and are home to valuable commercial industries.

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Report Availability

Electronic copies of this report may be downloaded from the Office of National Marine Sanctuaries website.

Contact

Lindsay Brown, Water Quality Program Coordinator, lindsay.brown@noaa.gov

Pam Krone, Water Quality Program Manager, pam.krone@noaa.gov

Karen Grimmer, Resource Protection Coordinator, karen.grimmer@noaa.gov

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Acknowledgements

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.

We would also like to thank the numerous organizations that helped us coordinate, use their space, and/or collaborate with on this event. These organizations include the San Mateo Resource Conservation District, City of Santa Cruz, County of Santa Cruz, City of Scotts Valley, Coastal Watershed Council, Monterey Stormwater Education Alliance, Morro Bay National Estuary Program, San Mateo County Public Health Lab, Watsonville Wetlands Watch, Central Coast Ambient Monitoring Program, Monterey Bay Analytical Services, and San Luis Obispo County Health Agency.

Last but not least, we would like to thank the California Marine Sanctuary Foundation and Monterey Bay National Marine Sanctuary staff for assisting and making this event a success.

Executive Summary

Monterey County volunteers gather to meet with their teams before going out to their assigned stream sites to collect water quality samples on May 4th, 2024. Photo: Pam Krone/NOAA

Since Earth Day 2000, volunteers have assembled on the first Saturday morning of May each year (except for 2020 due to the COVID-19 pandemic) to collect water quality samples from waterbodies entering Monterey Bay National Marine Sanctuary (MBNMS). This day, known as Snapshot Day, has become an annual event that has created partnerships, drawn over 3,500 volunteers, and has helped foster an ethic of watershed stewardship for local citizens. The 24 years of data collected by volunteers has become a valuable source of water quality data for the region. MBNMS and the California Marine Sanctuary Foundation organized Snapshot Day 2024 with regional support from the San Mateo Resource Conservation District, Morro Bay National Estuary Program, Watsonville Wetlands Watch, and the Coastal Watershed Council.

In 2024, volunteers ventured out on the morning of May 4th to watershed sites in four counties bordering MBNMS. 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, 90 community scientists donated between four and six hours of their time to monitor 80 sites. Of the 76 sites with flowing water, all measured parameters at 21 sites (28% of sites) met all of the Water Quality Objectives (WQOs) or Action Levels.

Results reveal that pH was the most common field measurement and *E. coli* was the most common lab measurement that did not meet WQOs. pH measurements tended to be more acidic than objectives and did not meet the WQO at 39% of the sites where it was measured, compared to 40% in 2023 and 12% in 2022. *E. coli* concentrations exceeded the WQO at 43% of sites in 2024, compared to 22% in 2023 and 26% in 2022.

Twenty-three Areas of Concern, or sites that exceeded three or more WQOs or Action Levels, were identified this year, compared to 13 in 2023, 14 in 2022, 11 in 2021, and 12 in 2019. The 23 Areas of Concern for 2024 spanned 19 waterbodies in all four counties. This increase in Areas of Concern compared to previous years is most likely due to the high amount of rainfall that occurred in the latter half of the morning on Snapshot Day, flushing contaminants from urban and agricultural areas through the watershed into local streams.

The 24 years of data gathered by trained Snapshot Day volunteers are 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 in the set of information used to determine 303(d) listing of impaired waterbodies by the Central Coast Regional Water Quality Control Board.

Introduction and Methods

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. To gather data about creeks and rivers flowing into Monterey Bay National Marine Sanctuary (MBNMS), staff have worked with volunteers, local agencies, and nonprofits since 2000 to monitor the health of streams and rivers during an annual water quality monitoring event called Snapshot Day. The purpose 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.

Each April, Snapshot Day training is conducted in all four counties bordering the sanctuary: San Mateo, Santa Cruz, Monterey, and San Luis Obispo (Figure 1). 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. In 2024, Snapshot Day occurred on May 4.

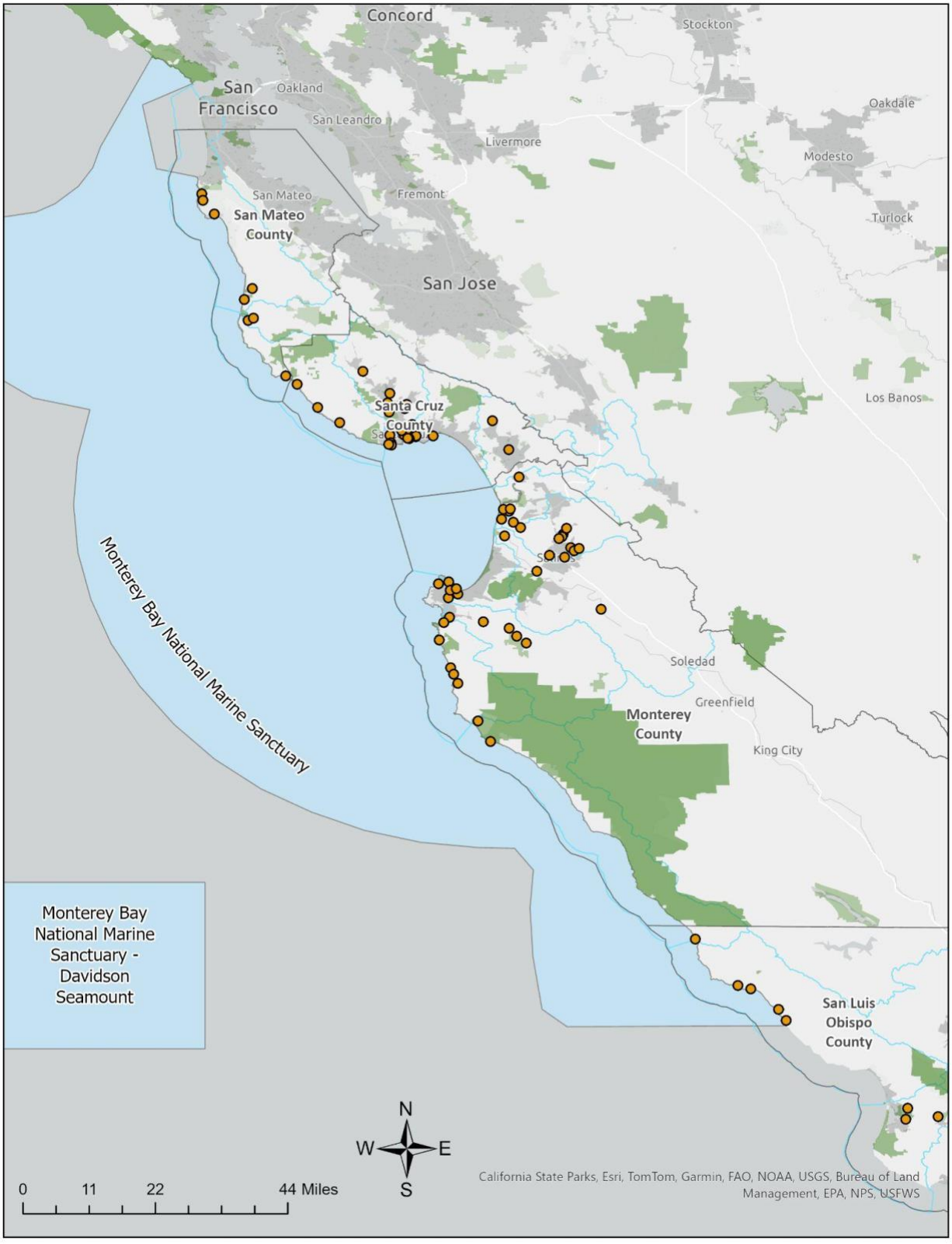

Figure 1. Map of Snapshot Day 2024 monitoring sites.

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. Additionally, in 2024, each team was assigned to collect trash at each of their sites for 10 minutes and record what they collected through the Clean Swell app, supported through the Ocean Conservancy. Collection of marine debris data will support MBNMS efforts to better understand sources of debris in the watersheds that flow into the sanctuary. More information on MBNMS marine debris is available in the MBNMS Marine Debris Final Report (Krone et al., 2023).

All monitoring results (lab and field) are compared with water standards established for beneficial uses in a stream, lake, or the ocean. These standards, known as 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 U.S. Environmental Protection Agency (EPA; Table 1). Since there are no numerical WQOs in the RWQCB Basin Plan for *E. coli*, nitrate, and orthophosphate, those results were compared with EPA WQOs and CCAMP Action Levels.

The EPA objectives are set 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 literature or other agency references, or from data that show 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 was followed.

Table 1. WQOs and Action Levels for parameters measured on Snapshot Day.

Parameter (reporting units)	WQO/Action Level	Source of Objective
Dissolved oxygen (mg/L)	Not lower than 7 or greater than 12	Regional Water Quality Control Board, 2019
E. coli (MPN/100mL)	Not to exceed 235	U.S. Environmental Protection Agency, 2012
Nitrate as N (ppm)	Not to exceed 1.00	California State Water Resources Control Board, 2003
Orthophosphate as P (ppm)	Not to exceed 0.12	Williamson et al., 1994
pH	Not lower than 7 or greater than 8.5	Regional Water Quality Control Board, 2019
Transparency (cm)	Not less than 25	Moyle, 1976
Water Temperature (°C)	Not more than 21	Moyle, 1976

Results

On Snapshot Day 2024, 90 volunteers comprising 22 teams monitored 80 sites along creeks and rivers that flowed into MBNMS (Figure 1). That year, 12 sites were either completely dry, had water that was stagnant, or were unsafe to access. Seventy-six sites (95%) had flowing water. Twenty-one sites (28%) with flowing water met the WQOs for all lab and field parameters. Snapshot Day 2024 results revealed that no analyte had its highest number of WQO exceedances compared to the past 23 years (Table 2). All data by site are available in Appendix A (Table A.1). No data were available for 2020 due to the COVID-19 pandemic.

Table 2. Number of sites that exceeded the WQO or Action Level for field and lab measurements each year. Data were not collected in 2020.

Year	*E. coli*	Nitrate as N	Orthophosphate as P	Dissolved Oxygen	pH	Transparency	Water Temperature	Number of Sites Monitored
2024	33	16	14	20	30	18	0	80
2023	17	19	16	18	31	13	1	86
2022	23	19	18	23	9	9	3	83
2021	17	12	29	17	4	13	0	83
2019	36	20	15	25	16	11	3	112
2018	28	19	34	37	35	12	4	124
2017	38	16	19	38	70	17	5	163
2016	44	21	19	29	22	19	0	111
2015	34	13	20	28	37	12	3	102
2014	29	15	8	34	25	15	11	112
2013	51	20	20	48	46	16	10	175
2012	62	23	23	38	49	23	9	180
2011	49	25	21	39	53	19	5	181
2010	47	29	52	34	66	21	6	140
2009	87	23	34	64	57	18	3	198
2008	60	34	19	24	38	16	6	173
2007	54	25	21	37	28	16	6	180
2006	49	27	35	33	7	21	3	189
2005	52	18	28	21	31	17	8	163
2004	55	23	39	37	31	13	18	168
2003	36	19	33	17	16	11	9	155
2002	30	14	30	26	15	7	1	149
2001	70	12	40	15	8	13	0	160
2000	16	1	8	13	16	NR	3	122

Field Measurements

Dissolved Oxygen

Aquatic organisms need adequate 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 7–12 mg/L, an optimal range for cold-water fish. In 2024, 20 (26%) of the 76 sites where dissolved oxygen was measured were outside of the healthy range and did not meet the WQO. The lowest dissolved oxygen result of 3 mg/L was recorded from the Tembladero Slough at Preston Bridge in Monterey County (Table 3). No site had a dissolved oxygen level above 12 mg/L. No sites in San Mateo County were outside the WQO for dissolved oxygen.

The sites that did not meet the WQO for dissolved oxygen and their respective dissolved oxygen levels are listed in Table 3. Average dissolved oxygen results for each waterbody are shown in Figure 2.

Table 3. Sites sampled on Snapshot Day 2024 that exceeded the WQO for dissolved oxygen, along with the respective county and dissolved oxygen measurement. If a 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
306-ELKHO-34	Elkhorn Slough at Garin Road	6	Monterey
306-MOROC-31	Moro Cojo Slough upper	5	Monterey
306-MOROC-33	Moro Cojo Slough lower	5	Monterey
306-MOROC-34	Castroville Slough above the confluence with the Moro Cojo Slough	4	Monterey
309-ASILO-31	Asilomar State Park at bridge	4.75	Monterey
309-LIBRA-31	Library or Hartnell Gulch behind Monterey City library	6	Monterey
309-NATIV-31	Natividad Creek at Las Casitas Road	5	Monterey
309-TEMBL-31	Tembladero Slough at Monterey Dunes	4.75	Monterey
309-TEMBL-33	Tembladero Slough at Preston Bridge	3	Monterey
309-VETER-31	Veterans Park at big turn in Veterans Drive	6	Monterey
309-DOLPH-31	Dolphin Brook at end of Van Buren Street	4	Monterey
310-SYB-41	Santa Ysabel Creek on Turri Road	6	San Luis Obispo
304-BRANC-22	Branciforte at DeLaveaga Park	6	Santa Cruz
304-LEONA-21	Leona Creek between Salerno and Pompeii roads	6	Santa Cruz
304-LIDEL-21	Liddell Creek at Bonny Doon Road	5.5	Santa Cruz
304-NEWYE-11	Año Nuevo Creek mouth	5.75	Santa Cruz
304-PILKI-21	Pilkington Creek @ SC Natural History Museum	5	Santa Cruz
304-SCOTT-25	Scott Creek at mouth	6	Santa Cruz
304-SOQUE-22	Soquel Creek at Lagoon	6	Santa Cruz
304-WADDE-20	Waddell Creek at mouth	5.5	Santa Cruz

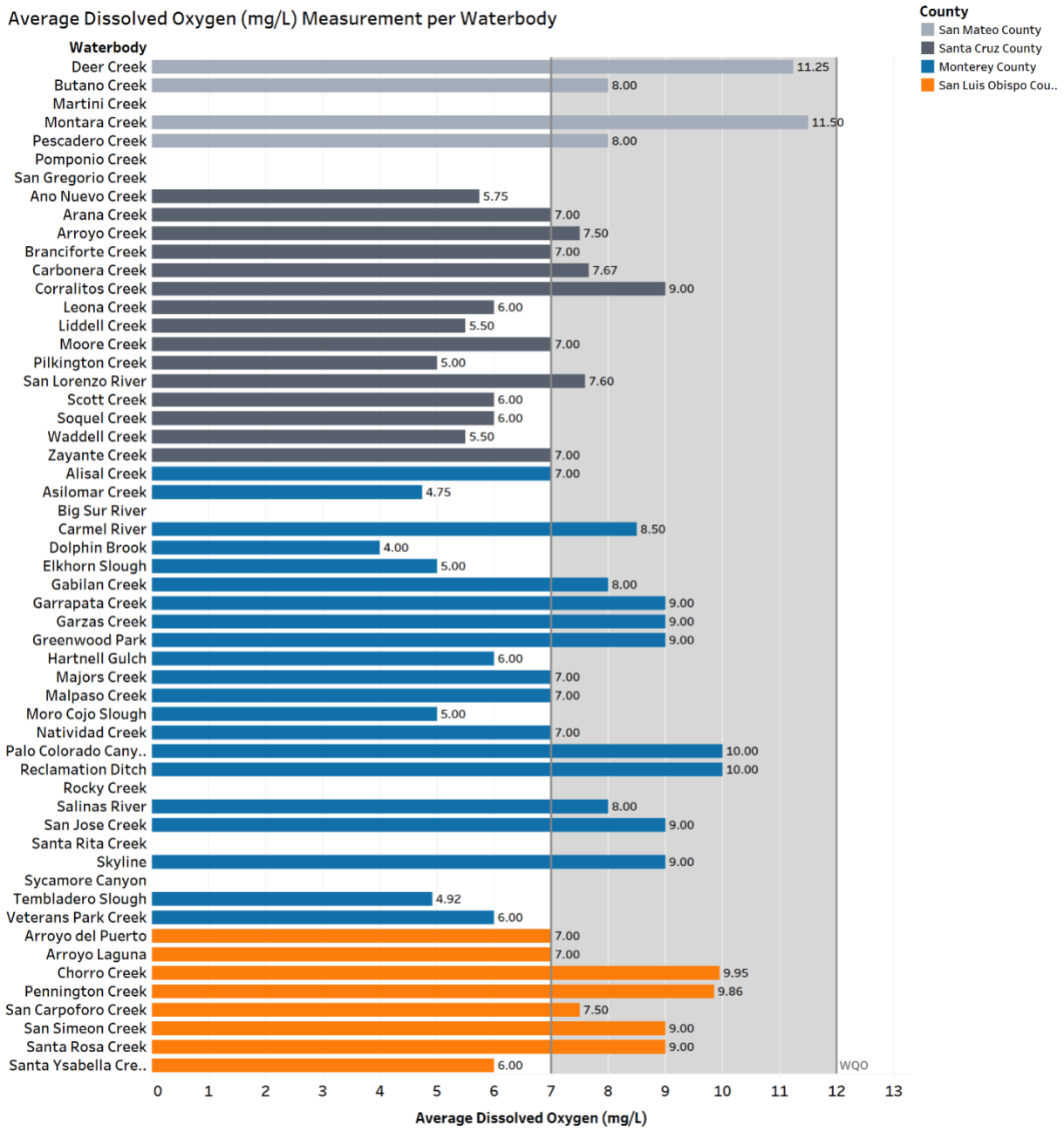

Figure 2. Average dissolved oxygen measurements for each waterbody monitored in 2024. Waterbodies with more than one site have averaged results. Waterbodies are separated by county and the WQO range is shown in gray.

pH

pH is a measure of the percentage 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 functions; extremely low or high pH levels impede essential functions for survival or damage tissues.

The Basin Plan Objective states that pH should fall between 7 and 8.5. In 2024, 30 (39%) of the 76 sites where pH was measured did not meet this WQO. The lowest pH measurement (6.0) was at Montara Creek downstream of Date and Harte streets in San Mateo County. No sites exceeded a pH of 8.5.

The sites that did not meet the WQO for pH and their respective pH measurements are listed in Table 4. Average pH results for each waterbody are shown in Figure 3.

Table 4. Sites from Snapshot Day 2024 that were below the WQO for pH, along with the respective county and pH measurement. If a duplicate field measurement was collected, the displayed result is the average of the original and duplicate values.

Site ID	Site Name	pH	County
307-CARME-33	Carmel River at Rosie's Bridge	6.75	Monterey
307-CARME-35	Carmel River at Garland Park	6.5	Monterey
307-CARME-38	Carmel River at Hwy 1 MBNMS	6.6	Monterey
308-GARRA-31	Garrapata Creek	6.25	Monterey
308-MALPA-31	Malpaso Creek	6.25	Monterey
308-SANJO-31	San Jose Creek at Hwy 1	6.5	Monterey
309-ALISA-32	Alisal Creek upper	6.75	Monterey
309-ASILO-31	Asilomar State Park at bridge	6.5	Monterey
309-GABIL-31	Gabilan Creek at Independence Road	6.75	Monterey
309-NATIV-31	Natividad Creek at Las Casitas Road	6.5	Monterey
309-SALIN-32	Salinas River at Davis Road MBNMS	6.5	Monterey
309-SALIN-33	Salinas River at Chualar Bridge	6.75	Monterey
309-TEMBL-32	Tembladero Slough Hwy 183	6.75	Monterey
309-TEMBL-33	Tembladero Slough at Preston Bridge	6.75	Monterey
310-CARPO-41	San Carpoforo Creek upstream of mouth	6.5	San Luis Obispo
310-LAGUN-41	Arroyo Laguna mouth	6.5	San Luis Obispo
202-DEERC-12	Deer Creek behind Creekside Smokehouse	6.25	San Mateo
202-MARTI-11	Martini Creek in Montara State Beach at McNee Ranch	6.25	San Mateo
202-MONTA-12	Montara Creek downstream at Date and Harte streets	6	San Mateo
304-ARROY-21	Arroyo Seco at Meder Park	6.5	Santa Cruz
304-BRANC-21	Branciforte above confluence w/SLR	6.5	Santa Cruz
304-LEONA-21	Leona Creek between Salerno and Pompeii roads	6.5	Santa Cruz
304-MOORE-26	Moore Creek at mouth	6.75	Santa Cruz
304-NEWYE-11	Año Nuevo Creek mouth	6.75	Santa Cruz
304-SANLO-26	San Lorenzo River at Paradise Park	6.5	Santa Cruz
304-SANLO-27	San Lorenzo River at Junction Park	6.5	Santa Cruz
304-SCOTT-25	Scott Creek at mouth	6.5	Santa Cruz

Site ID	Site Name	pH	County
304-WADDE-20	Waddell Creek at mouth	6.5	Santa Cruz
304-ZAYAN-21	Zayante Creek at Mount Hermon and Bean Creek	6.5	Santa Cruz
304-ZAYAN-22	Zayante Creek at Quail Hollow Road	6.5	Santa Cruz

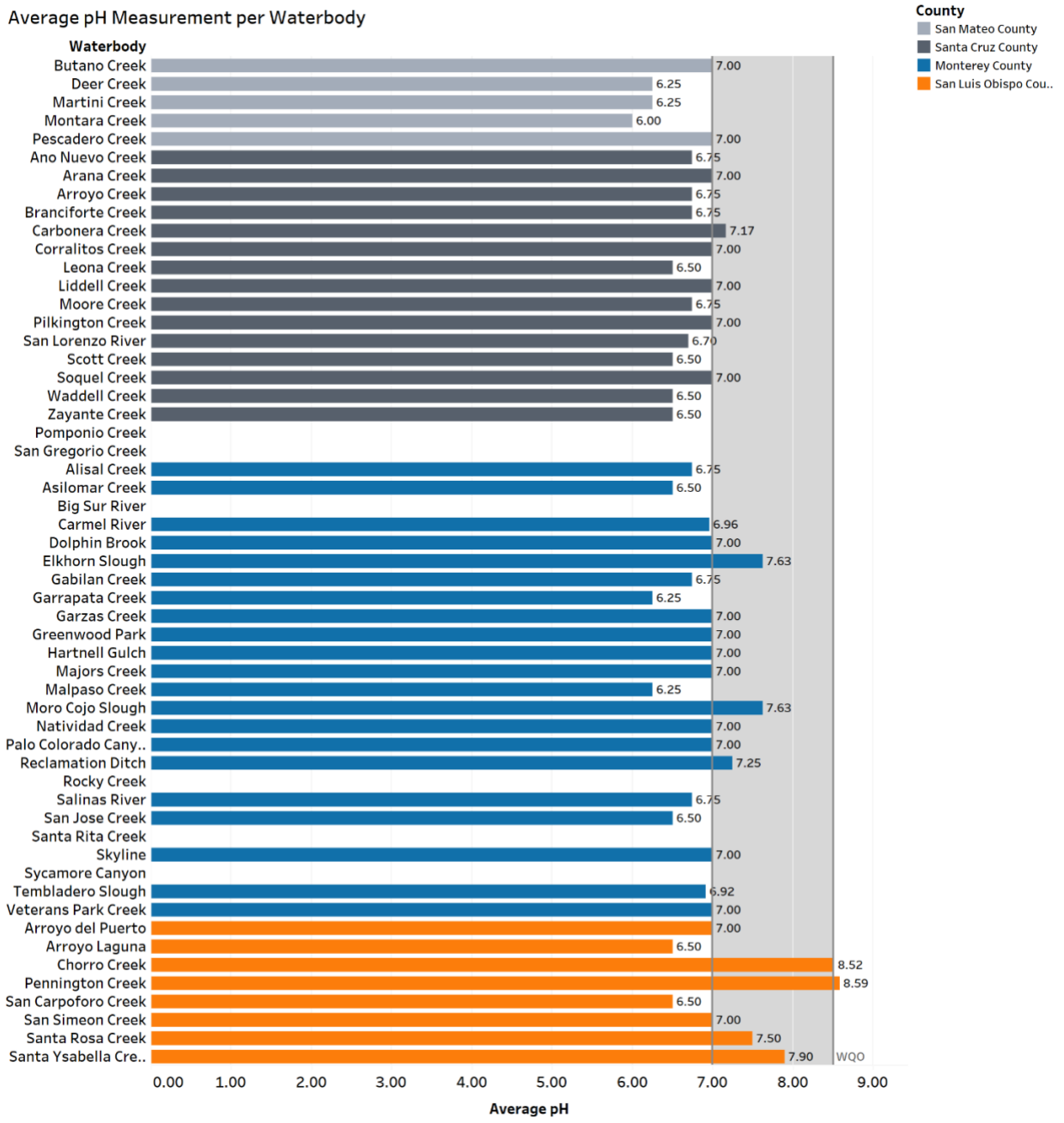

Figure 3. Average pH measurements for each waterbody monitored in 2024. Results were averaged for waterbodies where more than one site was measured. Waterbodies are separated by county and the WQO range is shown in gray.

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. Low transparency can indicate that there may not be enough light penetration for photosynthesis due to high concentrations of suspended particles, which may lead to eutrophication. Low transparency can also impact fish and other aquatic organisms by getting particles stuck in the gills, suffocating eggs, and impacting hunting ability.

CCAMP's Action Level for transparency is set at 25 centimeters, meaning action is taken when visibility is at or below this threshold, as measured by Secchi disk depth. Transparency was measured at 76 sites and 18 (24%) did not meet the Action Level. The lowest transparency measurement of 0.2 cm was taken at Martini Creek in Montara State Beach at McNee Ranch in San Mateo County. No sites from San Luis Obispo County exceeded the Action Level for transparency.

The sites that did not meet the WQO for transparency and their respective transparency measurements are listed in Table 5. Average transparency results for each waterbody are shown in Figure 4.

Table 5. Sites from Snapshot Day 2024 that exceeded the WQO for transparency with the respective county and transparency measurement. If a 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-31	Moro Cojo Slough upper	14	Monterey
306-MOROC-33	Moro Cojo Slough lower	20	Monterey
306-MOROC-34	Castroville Slough above the confluence with the Moro Cojo Slough	15	Monterey
309-ALISA-32	Alisal Creek upper	10.4	Monterey
309-CENTR-31	Greenwood Park at Central and 13th Streets in Pacific Grove	12	Monterey
309-RECDI-31	Reclamation Ditch at Davis Road	9.4	Monterey
309-SALIN-31	Salinas River at Trestle Bridge	24.5	Monterey
309-SALIN-32	Salinas River at Davis Road MBNMS	10.3	Monterey
309-SALIN-33	Salinas River at Chualar Bridge	18	Monterey
309-TEMBL-31	Tembladero Slough at Monterey Dunes	6.6	Monterey
309-TEMBL-32	Tembladero Slough Hwy 183	4.8	Monterey
309-TEMBL-33	Tembladero Slough at Preston Bridge	16.7	Monterey
202-DEERC-12	Deer Creek behind Creekside Smokehouse	3.1	San Mateo
202-MARTI-11	Martini Creek in Montara State Beach at McNee Ranch	0.2	San Mateo
202-MONTA-12	Montara Creek downstream at Date and Harte Streets	2	San Mateo

Site ID	Site Name	Transparency (cm)	County
304-ARROY-21	Arroyo Seco at Meder Park	5	Santa Cruz
304-ARROY-22	Arroyo Seco at Delaware Avenue	15	Santa Cruz
304-PILKI-21	Pilkington Creek @ SC Natural History Museum	8	Santa Cruz

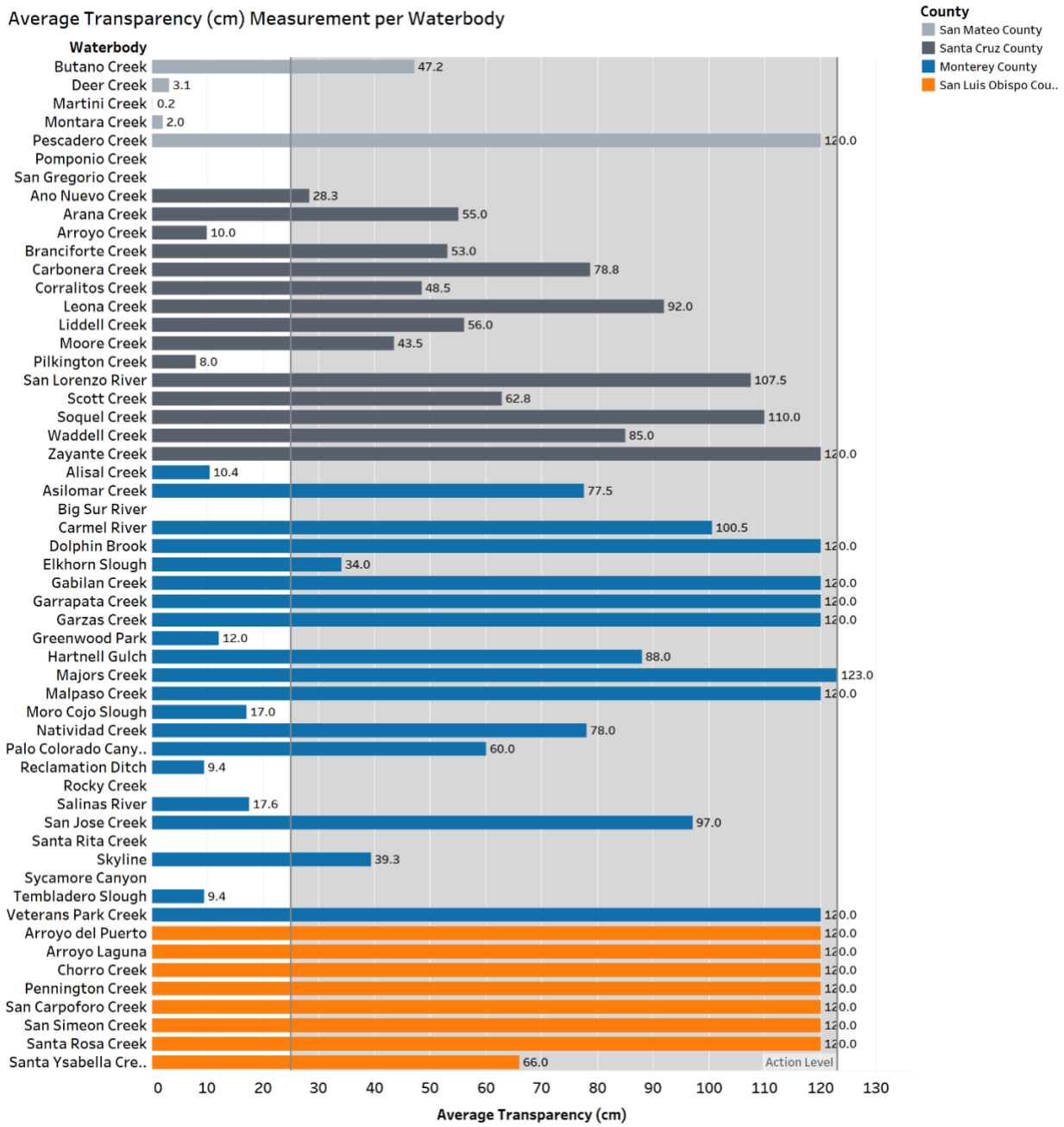

Figure 4. Average transparency measurements for each waterbody monitored in 2024. Results were averaged for waterbodies where more than one site was measured. Waterbodies are separated by county and the Action Level (25 cm) is indicated by the gray line. The shaded region signifies an acceptable transparency level and anything outside of the shaded region triggers action.

Water Temperature

Just as the 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 are 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 °C. Temperatures above 21 °C can harm cold-water fish such as salmon and steelhead, as well as other aquatic organisms. In 2024, all sites met the WQO for water temperature. Average water temperature results for each waterbody are shown in Figure 5.

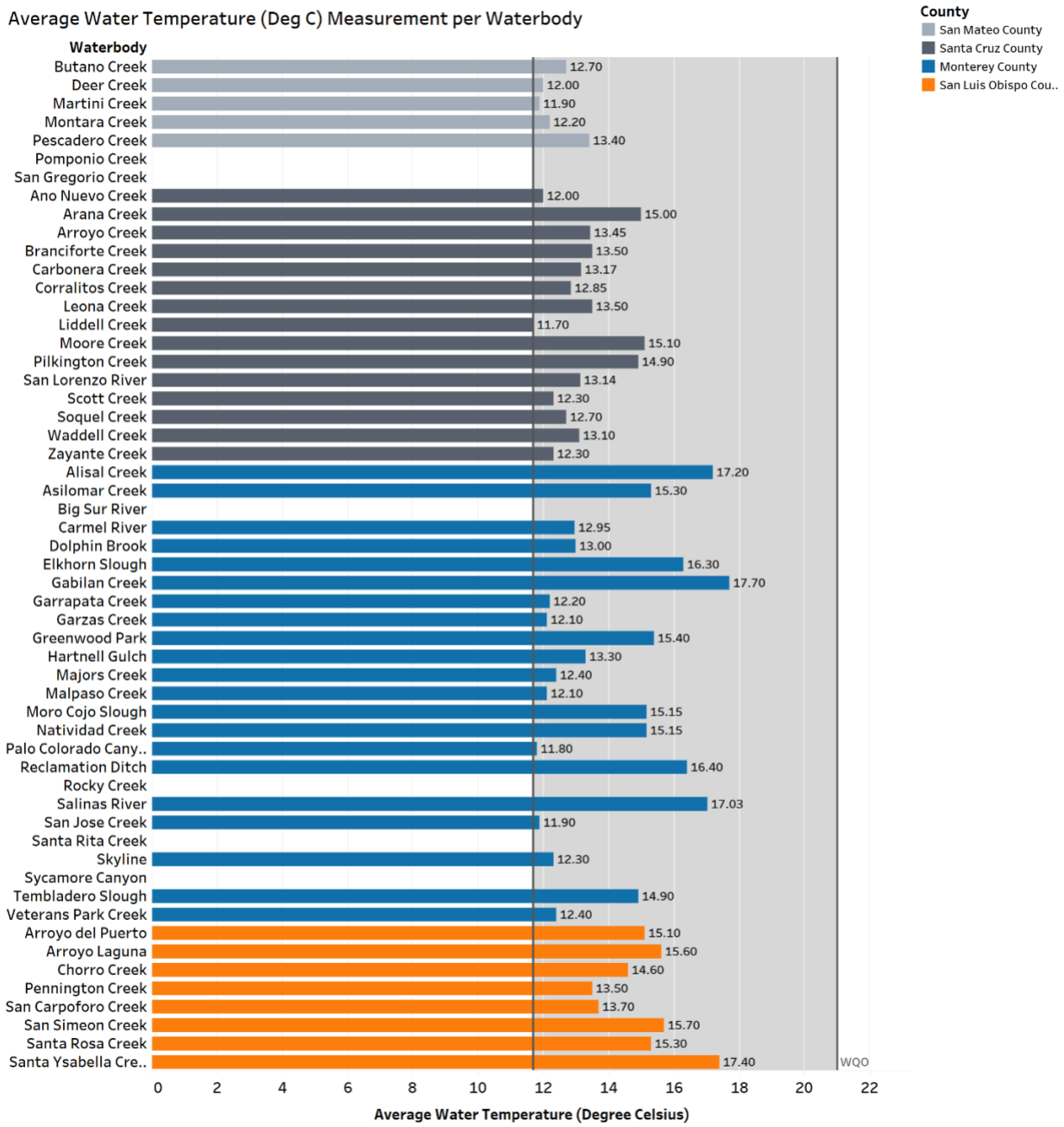

Figure 5. Average water temperature measurements for each waterbody monitored in 2024. Results were averaged for waterbodies where more than one site was measured. Waterbodies are separated by county and the shaded gray area indicates that all values measured that fell within the WQO (average water temperature less than 21 °C).

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 a cause of sickness in humans, their presence can indicate that other illness-causing pathogens are present.

The EPA has set a WQO for *E. coli* at 235 Most Probable Number (MPN)/100 mL. Thirty-three (43%) of the 76 sites where *E. coli* was measured did not meet the WQO. The highest *E. coli* result of 141,360 MPN/100 mL was from Greenwood Park at Central and 13th streets in Monterey County.

The sites that did not meet the WQO for *E. coli* and their respective *E. coli* lavels are listed in Table 6. Average *E. coli* results for each waterbody are shown in Figure 6. Figure 7 illustrates *E. coli* results by geographic location.

Table 6. Sites from Snapshot Day 2024 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/100 mL)	County
306-MOROC-31	Moro Cojo Slough upper	700	Monterey
307-CARME-38	Carmel River at Hwy 1 MBNMS	12,976	Monterey
309-ALISA-32	Alisal Creek upper	501	Monterey
309-ASILO-31	Asilomar State Park at bridge	34,658	Monterey
309-CENTR-31	Greenwood Park at Central and 13th Streets in Pacific Grove	141,360	Monterey
309-LIBRA-31	Library or Hartnell Gulch behind Monterey City library	370	Monterey
309-MAJOR-31	Majors Creek lower	402	Monterey
309-VETER-31	Veterans Park at big turn in Veterans Drive	129,970	Monterey
309-DOLPH-31	Dolphin Brook at end of Van Buren Street	342	Monterey
310-LAGUN-41	Arroyo Laguna mouth	323	San Luis Obispo
310-SYB-41	Santa Ysabela Creek on Turri Road	323	San Luis Obispo
310-UCF-41	Upper Chorro Flats at Chorro Creek and Morro Creek roads	288	San Luis Obispo
202-DEERC-12	Deer Creek behind Creekside Smokehouse	11,199	San Mateo
202-MARTI-11	Martini Creek in Montara State Beach at McNee Ranch	4,611	San Mateo
202-MONTA-12	Montara Creek downstream at Date and Harte streets	10,919	San Mateo
304-ARROY-21	Arroyo Seco at Meder Park	6,152	Santa Cruz

Site ID	Site Name	*E. coli* (MPN/100 mL)	County
304-ARROY-22	Arroyo Seco at Delaware Avenue	1,672	Santa Cruz
304-BRANC-21	Branciforte above confluence w/SLR	2,666	Santa Cruz
304-BRANC-22	Branciforte at DeLaveaga Park	682	Santa Cruz
304-CARBO-21	Carbonera Creek @ Brookside Avenue	422	Santa Cruz
304-CARBO-23	Carbonera Crk d/s of Camp Evers confluence	268	Santa Cruz
304-CARBO-24	Carbonera Creek at bridge	9,768	Santa Cruz
304-LEONA-21	Leona Creek between Salerno and Pompeii roads	290	Santa Cruz
304-LIDEL-21	Liddell Creek at Bonny Doon Road	320	Santa Cruz
304-MOORE-26	Moore Creek at mouth	5,510	Santa Cruz
304-NEWYE-11	Año Nuevo Creek mouth	512	Santa Cruz
304-PILKI-21	Pilkington Creek @ SC Natural History Museum	19,608	Santa Cruz
304-SANLO-22	San Lorenzo River Mouth	949	Santa Cruz
304-SANLO-26	San Lorenzo River at Paradise Park	990	Santa Cruz
304-SOQUE-22	Soquel Creek at Lagoon	1,288	Santa Cruz
304-ZAYAN-21	Zayante Creek at Mount Hermon and Bean Creek	320	Santa Cruz
305-CORRA-21	Corralitos Creek at Green Valley Road	4,766	Santa Cruz
305-CORRA-22	Corralitos Creek at Las Colinas Road	7,308	Santa Cruz

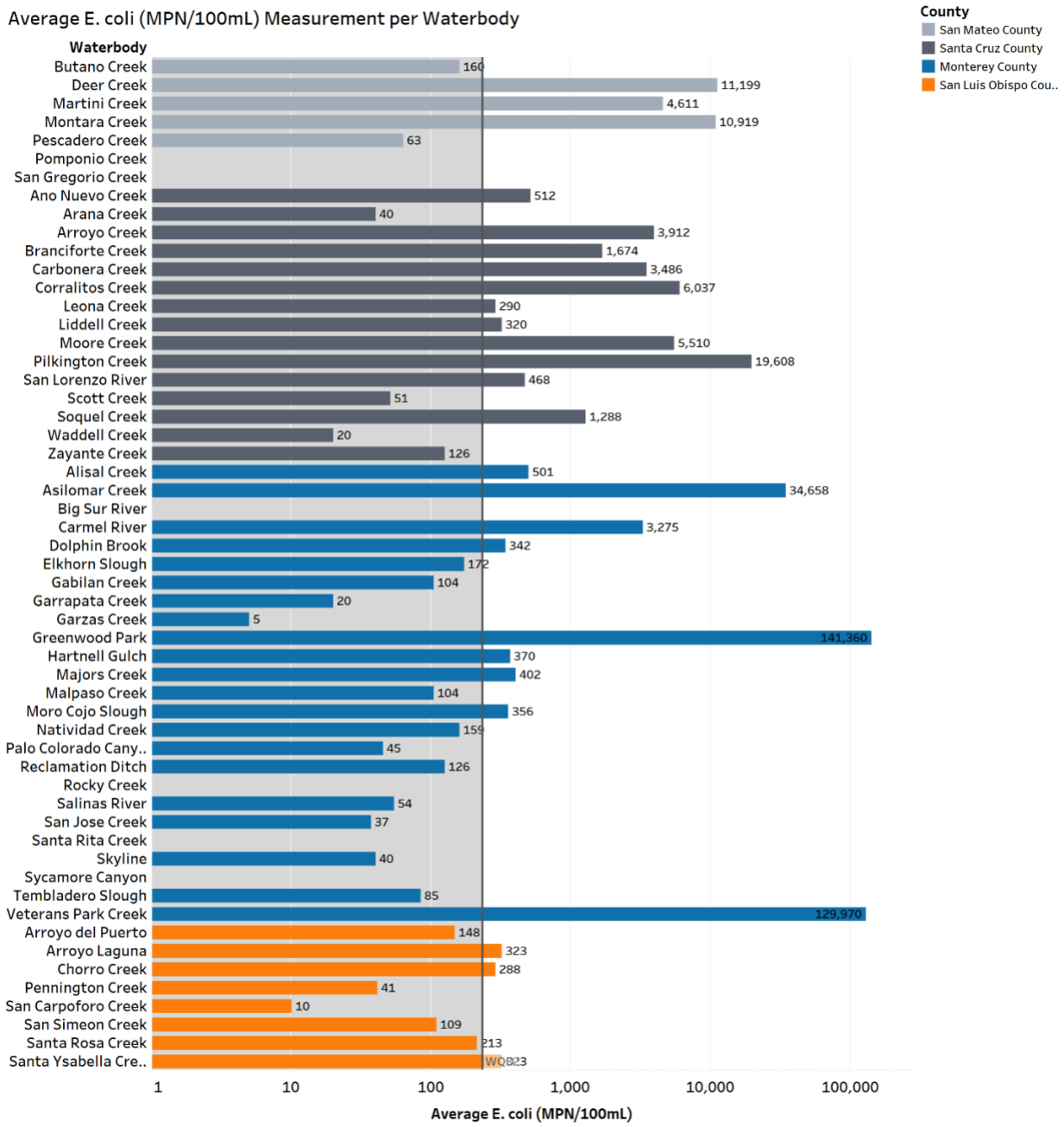

Figure 6. Average *E. coli* concentrations for each waterbody monitored in 2024. Results were averaged for waterbodies where more than one site was measured. Waterbodies are separated by county and the WQO range is indicated in gray.

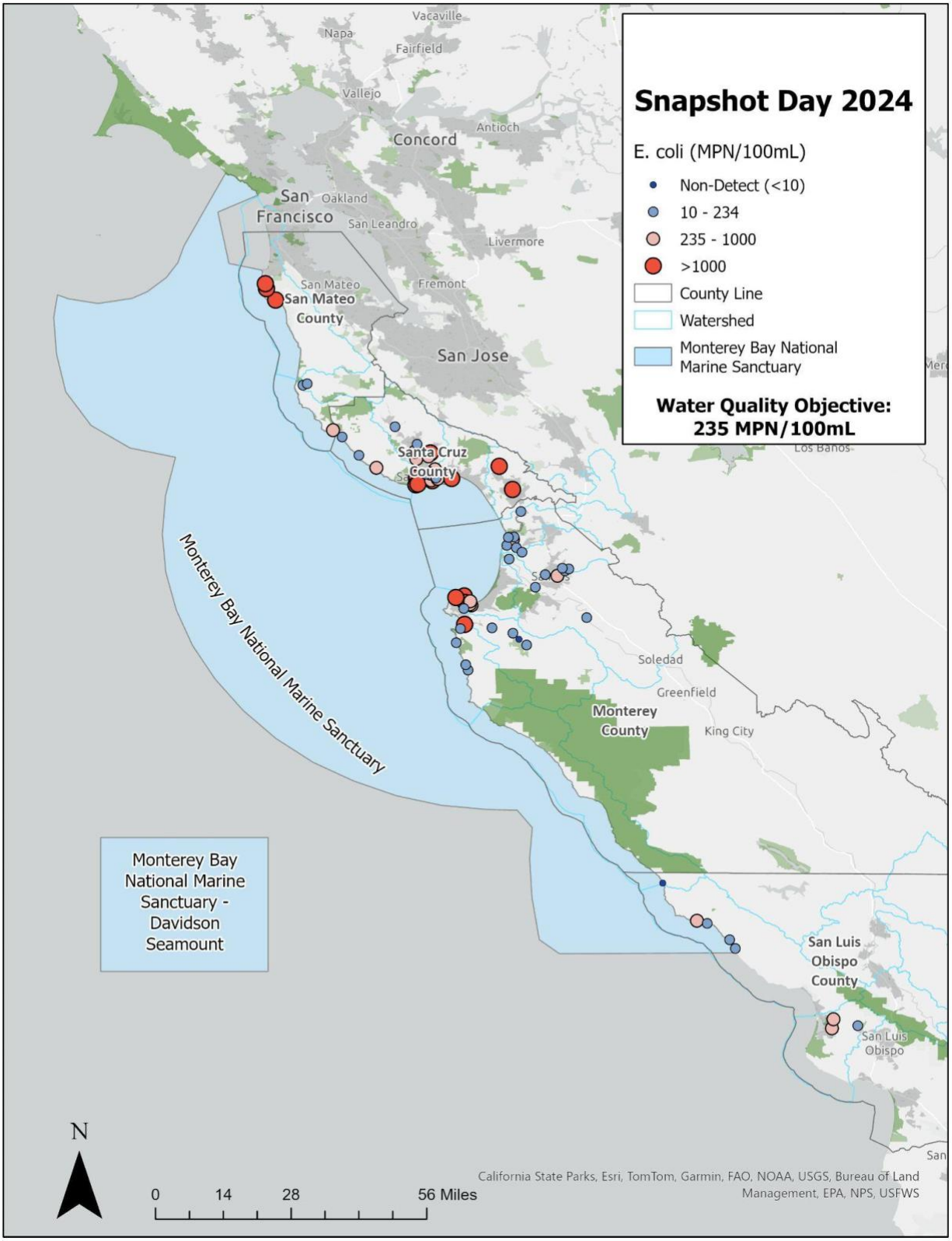

Figure 7. Map illustrating *E. coli* results for Snapshot Day 2024.

Nitrate as N

Nitrate is naturally occurring in streams and rivers, however other sources can contribute nitrate to creeks and rivers, including 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.

Sixteen (21%) of the 76 sites measured for nitrate exceeded the CCAMP Action Level of 1.00 mg-N/L. The highest nitrate result of 53.3 mg-N/L was from the Tembladero Slough at Preston Bridge in Monterey County. Thirty-six (47%) sites had non-detectable levels of nitrate as N. No sites in San Mateo County exceeded the Action Level.

The sites that did not meet the Action Level for nitrate and their respective nitrate levels are listed in Table 7. Average nitrate results for each waterbody are shown in Figure 8. Figure 9 illustrates nitrate results by geographic location.

Table 7. Sites from Snapshot Day 2024 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	12	Monterey
306-MOROC-31	Moro Cojo Slough upper	8.3	Monterey
309-ALISA-32	Alisal Creek upper	21	Monterey
309-GABIL-31	Gabilan Creek at Independence Road	34.7	Monterey
309-NATIV-31	Natividad Creek at Las Casitas Road	5.6	Monterey
309-RECDI-31	Reclamation Ditch at Davis Road	31.9	Monterey
309-SALIN-31	Salinas River at Trestle Bridge	2.8	Monterey
309-SALIN-32	Salinas River at Davis Road MBNMS	2.2	Monterey
309-SALIN-33	Salinas River at Chualar Bridge	2.2	Monterey
309-TEMBL-31	Tembladero Slough at Monterey Dunes	50.6	Monterey
309-TEMBL-32	Tembladero Slough Hwy 183	19.1	Monterey
309-TEMBL-33	Tembladero Slough at Preston Bridge	53.3	Monterey
309-UPPER-31	Natividad Creek upper	20.3	Monterey
309-VETER-31	Veterans Park at big turn in Veterans Drive	3.2	Monterey
310-SYB-41	Santa Ysabela Creek on Turri Road	2.2	San Luis Obispo
305-CORRA-21	Corralitos Creek at Green Valley Road	1.3	Santa Cruz

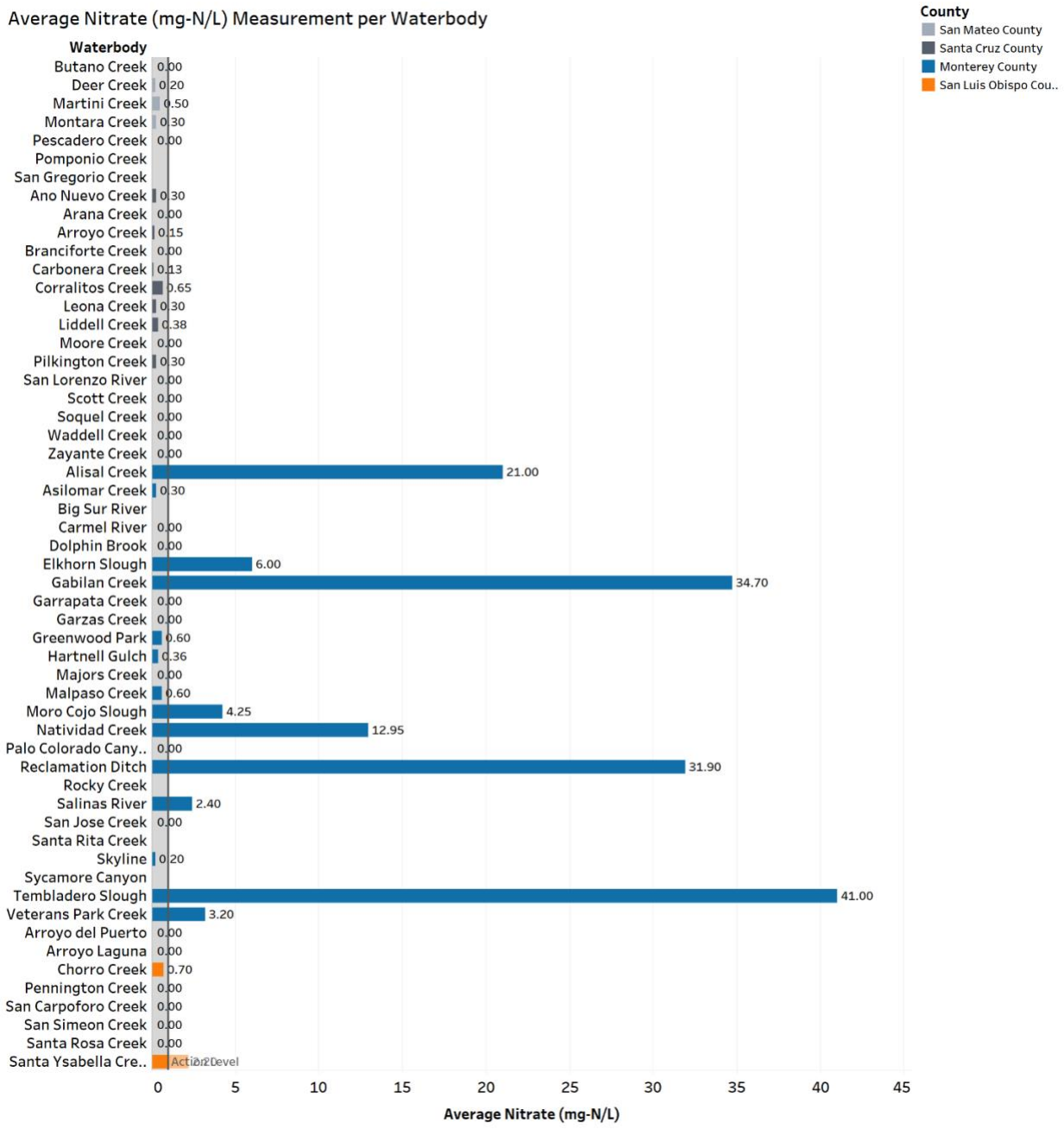

Figure 8. Average nitrate concentrations for each waterbody monitored in 2024. Results were averaged for waterbodies where more than one site was measured. Waterbodies are separated by county and the Action Level (1.0 mg-N/L) is indicated by the gray line.

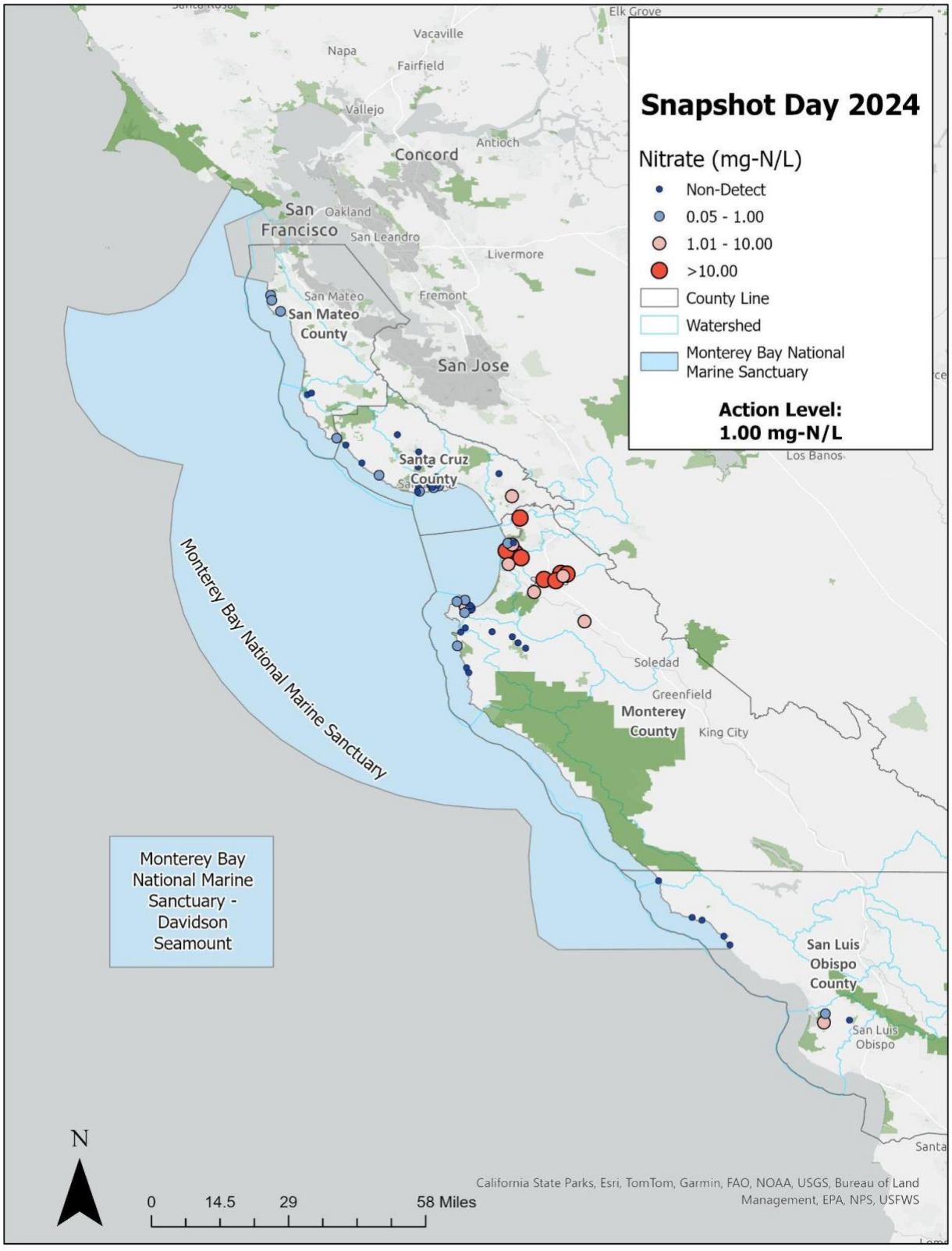

Figure 9. Map illustrating nitrate results for Snapshot Day 2024.

Orthophosphate as P

Orthophosphate 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 depletes the amount of oxygen available in a waterway when plants die off and bacteria decompose plant material.

Fourteen (18%) of the 76 sites measured for orthophosphate as P exceeded the CCAMP Action Level of 0.12 mg/L. The highest orthophosphate concentration of 1.7 mg/L was from Veterans Park in Monterey County. Fifty-four (71%) of the 76 sites had non-detectable levels of orthophosphate. No sites in San Mateo County exceeded the Action Level.

The 14 sites that did not meet the Action Level for orthophosphate and their respective orthophosphate levels are listed in Table 8. Average orthophosphate results for each waterbody are shown in Figure 10. Figure 11 illustrates nitrate results by geographic location.

Table 8. Sites from Snapshot Day 2024 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-MOROC-31	Moro Cojo Slough upper	0.57	Monterey
306-MOROC-33	Moro Cojo Slough lower	0.33	Monterey
306-MOROC-34	Castroville Slough above the confluence with the Moro Cojo Slough	1.1	Monterey
309-ALISA-32	Alisal Creek upper	0.26	Monterey
309-CENTR-31	Greenwood Park at Central and 13th Streets in Pacific Grove	0.69	Monterey
309-TEMBL-31	Tembladero Slough at Monterey Dunes	0.56	Monterey
309-TEMBL-33	Tembladero Slough at Preston Bridge	0.43	Monterey
309-UPPER-31	Natividad Creek upper	0.2	Monterey
309-SKYLI-31	Skyline at Forest Knoll Road	0.2	Monterey
309-VETER-31	Veterans Park at big turn in Veterans Drive	1.7	Monterey
310-UCF-41	Upper Chorro Flats at Chorro Creek and Morro Creek Roads	0.27	San Luis Obispo
304-LIDEL-21	Liddell Creek at Bonny Doon Road	0.2	Santa Cruz
304-PILKI-21	Pilkington Creek @ SC Natural History Museum	0.26	Santa Cruz
304-ZAYAN-21	Zayante Creek at Mount Hermon and Bean Creek	0.17	Santa Cruz

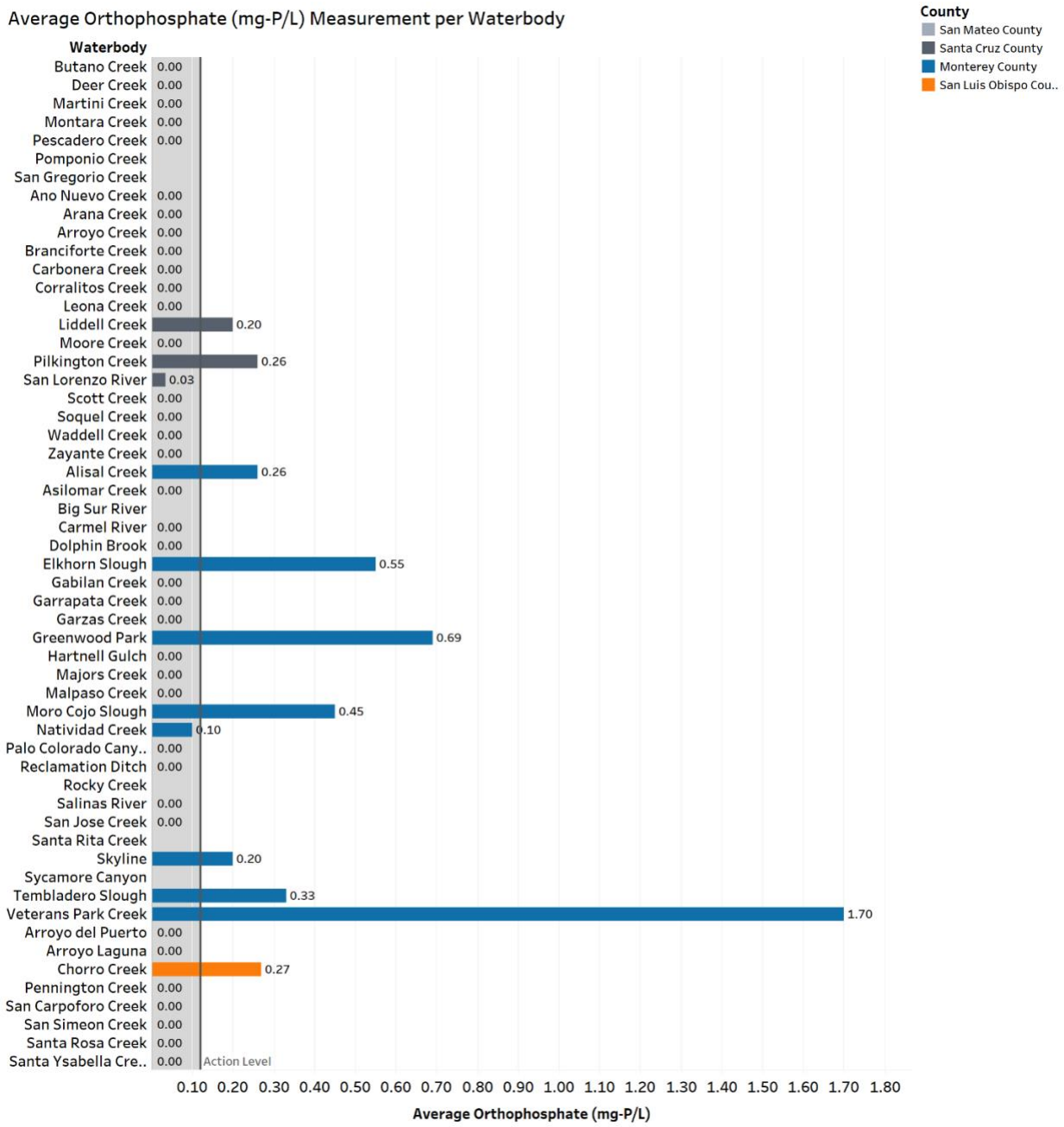

Figure 10. Average orthophosphate concentrations for each waterbody monitored in 2024. Results were averaged for waterbodies where more than one site was measured. Waterbodies are separated by county and the Action Level is indicated by the gray line.

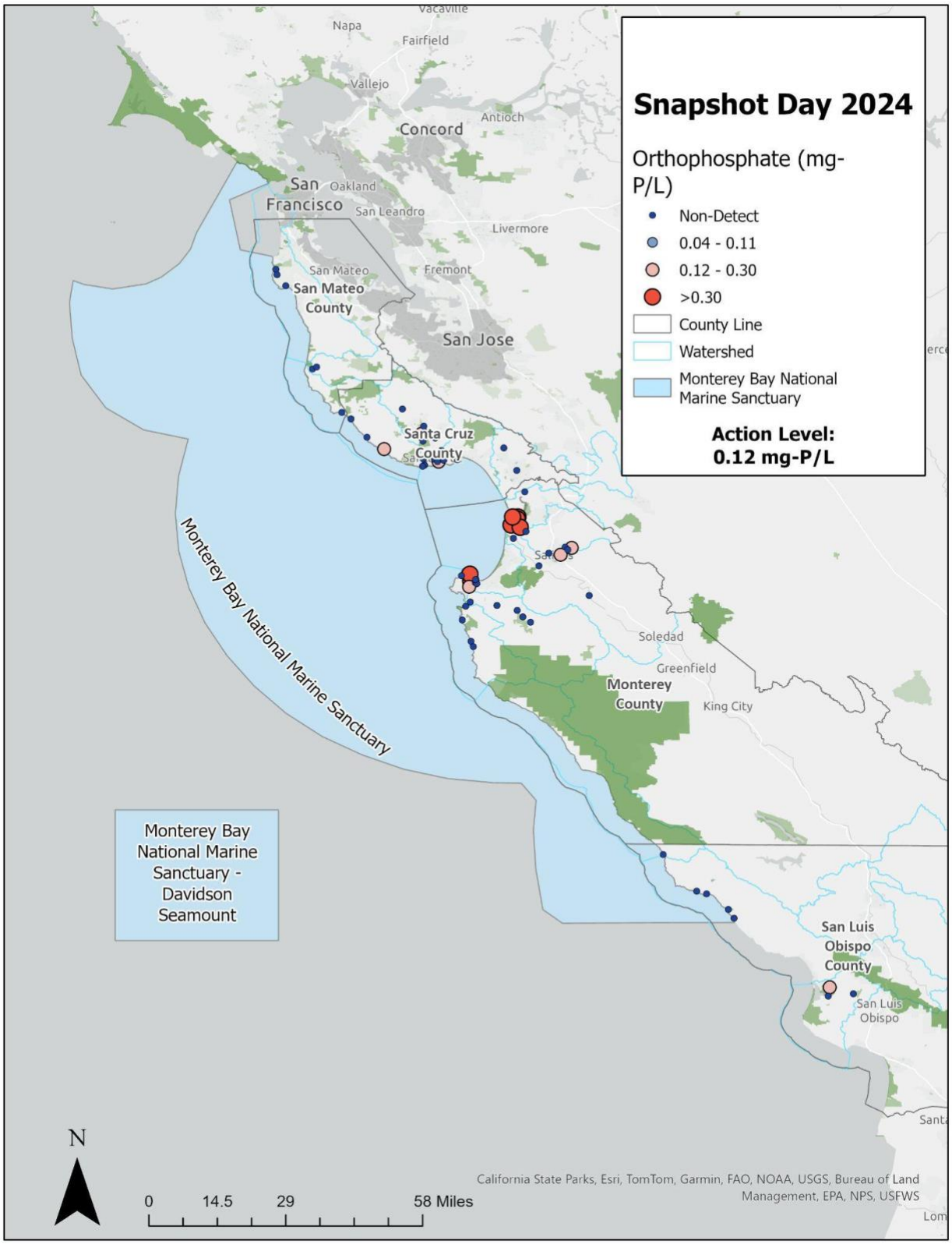

Figure 11. Map illustrating orthophosphate results for Snapshot Day 2024.

Trash/Debris Collection

Consistent with other Snapshot Day events over the previous 23 years, volunteers noted the presence of trash and debris at many sites in 2024. To better understand and quantify the amount of trash at the Snapshot Day sites, volunteers were asked to collect trash at their assigned sites for 10 minutes and record what they collected through the Clean Swell App developed by the Ocean Conservancy. On May 4th, at least 32 pounds of trash were recorded, with a total of 277 pieces of trash collected, 71% of which were plastic. The most common items were food wrappers (42 pieces), plastic/foam pieces (37 pieces), and unidentified plastic waste (22 pieces; Figure 12).

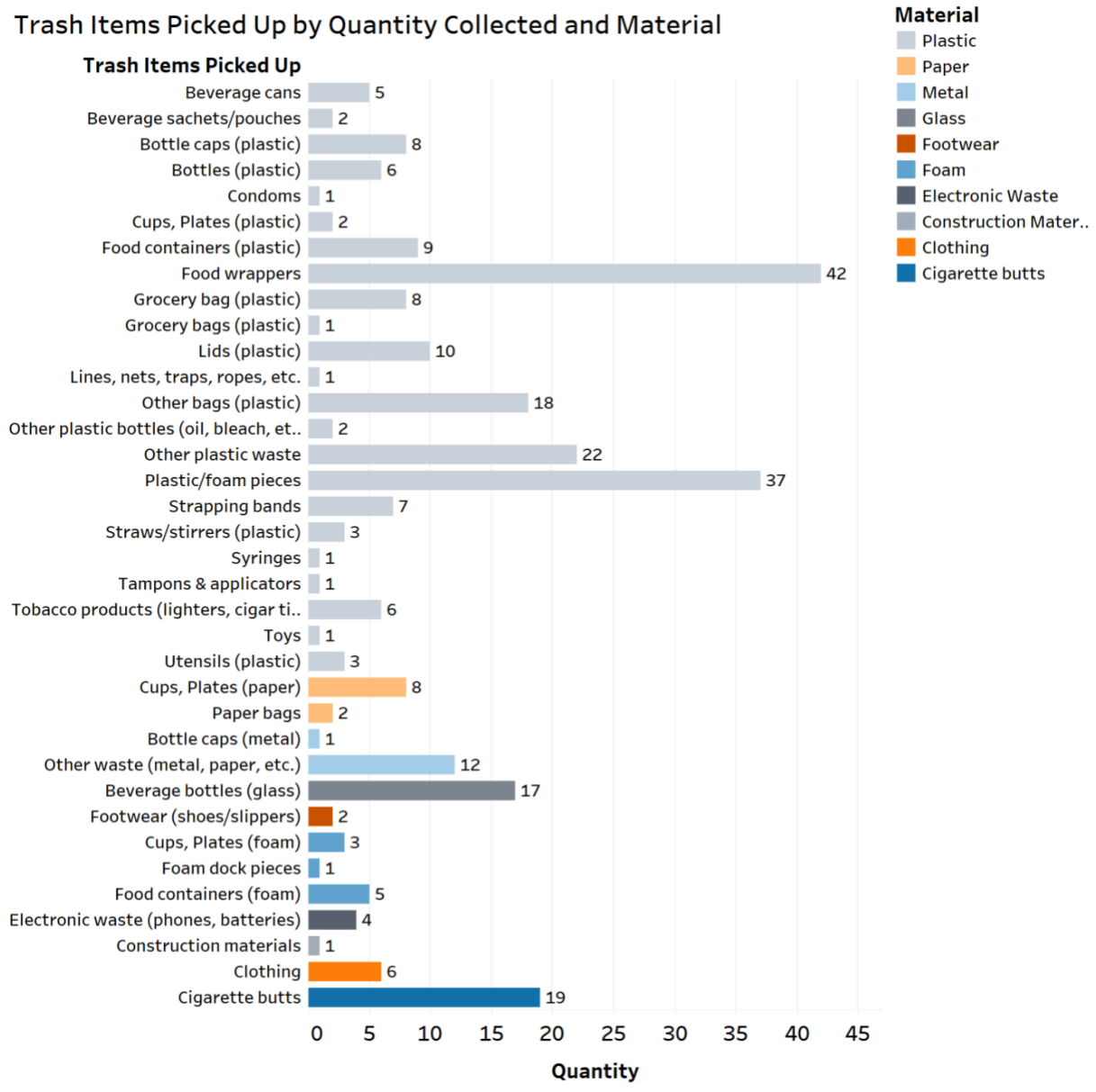

Figure 12. Type, quantity, and material of trash items collected by 2024 Snapshot Day volunteers.

Areas of Concern

When lab and field results for a single site do not meet three or more WQOs 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. For this reason, we have chosen to display the Area of Concern data two ways: by waterbody (Figures 13, 14, 15, and 16) and by site (Figure 17).

In 2024, 23 sites (30%) were designated Areas of Concern on 19 waterbodies. Four of the Areas of Concern are on two waterbodies that have been designated Areas of Concern for more than 10 of the past 22 years: Tembladero Slough and Alisal Creek, both located in Monterey County. The other nine Areas of Concern located in Monterey County are in Moro Cojo Slough, Castroville Slough, Asilomar Creek, Greenwood Park, Natividad Creek, Salinas River, and Veterans Park. Six other Areas of Concern are located in Santa Cruz County at Arroyo, Leona, Liddell, Año Nuevo, Pilkington, and Zayante creeks. Santa Ysabel was the only Area of Concern located in San Luis Obispo County. San Mateo County had three Areas of Concern on three waterbodies at Deer, Martini, and Montara creeks. This is the first time there have been Areas of Concern in San Mateo County in seven years.

The sites that exceeded three or more of these criteria are listed in Tables 9, 10, 11, and 12 for each county in 2024 (Monterey, San Luis Obispo, San Mateo, and Santa Cruz) with the corresponding waterbody, the standard exceeded, and the measurement for that standard.

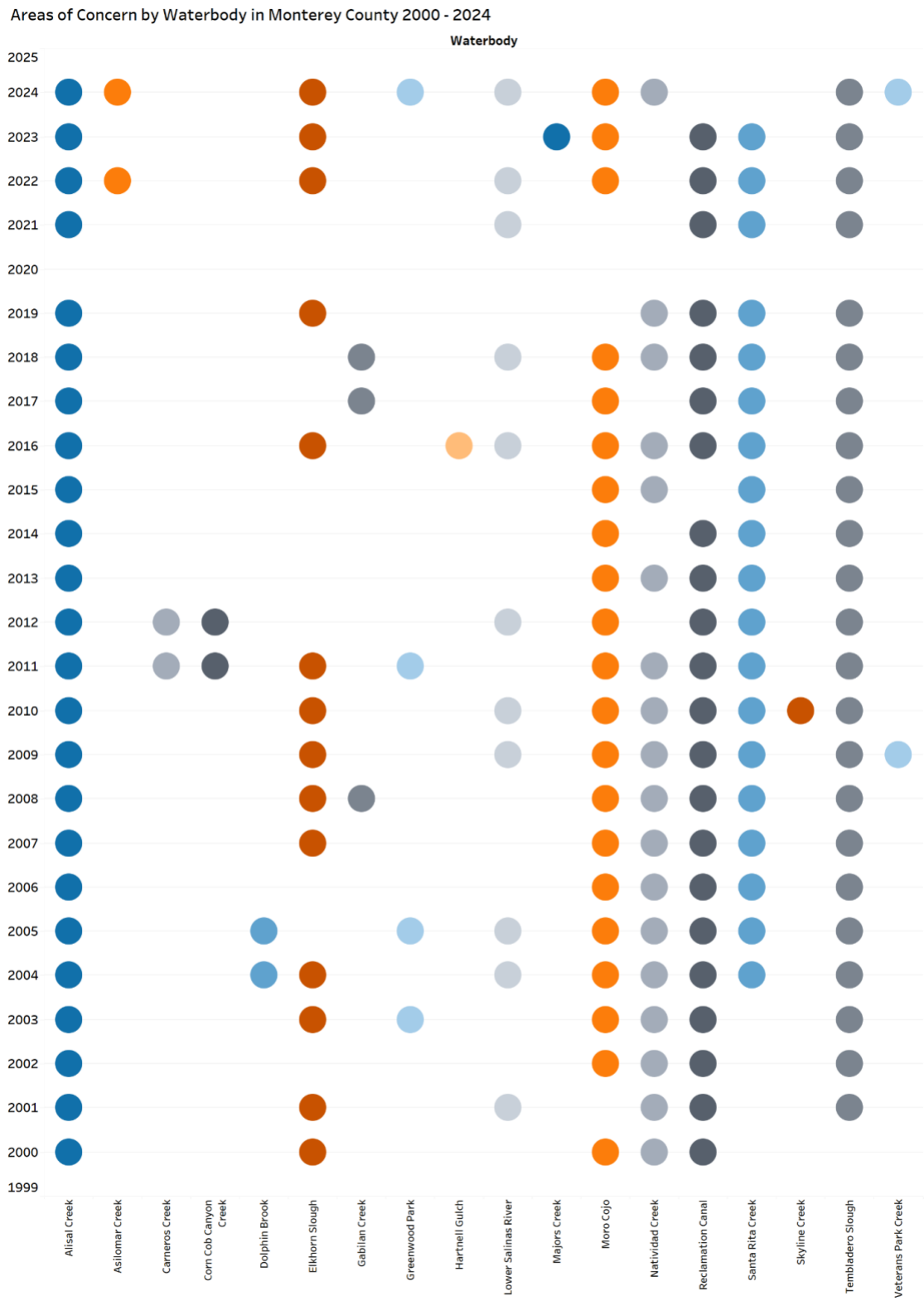

Figure 13. Years in which Areas of Concern (three or more WQOs or Action Levels exceeded) were detected for each waterbody in Monterey County from 2000–2024. Each color signifies a different waterbody.

Table 9. Sites from 2024 in Monterey County that were designated as Areas of Concern with the corresponding waterbody, standard exceeded, and measurement.

Site ID	Site Name	Standard(s) Exceeded	Waterbody
306-MOROC-31	Moro Cojo Slough upper	Nitrate (mg-N/L), Orthophosphate (mg-P/L), *E. coli* (MPN/100mL), Dissolved oxygen (mg/L), Transparency (cm)	Moro Cojo Slough
306-MOROC-33	Moro Cojo Slough lower	Orthophosphate (mg-P/L), Dissolved oxygen (mg/L), Transparency (cm)	Moro Cojo Slough
306-MOROC-34	Castroville Slough above the confluence with the Moro Cojo Slough	Orthophosphate (mg-P/L), Dissolved oxygen (mg/L), Transparency (cm)	Castroville Slough
309-ALISA-32	Alisal Creek upper	Nitrate (mg-N/L), Orthophosphate (mg-P/L), *E. coli* (MPN/100 mL), pH, Transparency (cm)	Alisal Creek
309-ASILO-31	Asilomar State Park at bridge	*E. coli* (MPN/100 mL), Dissolved oxygen (mg/L), pH	Asilomar Creek
309-CENTR-31	Greenwood Park at Central and 13th streets in Pacific Grove	Orthophosphate (mg-P/L), *E. coli* (MPN/100 mL), Transparency (cm)	Greenwood Park
309-NATIV-31	Natividad Creek at Las Casitas Road	Nitrate (mg-N/L), Dissolved oxygen (mg/L), pH	Natividad Creek
309-SALIN-32	Salinas River at Davis Road MBNMS	Nitrate (mg-N/L), pH, Transparency (cm)	Salinas River
309-SALIN-33	Salinas River at Chualar Bridge	Nitrate (mg-N/L), pH, Transparency (cm)	Salinas River
309-TEMBL-31	Tembladero Slough at Monterey Dunes	Nitrate (mg-N/L), Orthophosphate (mg-P/L), Dissolved oxygen (mg/L), Transparency (cm)	Tembladero Slough
309-TEMBL-32	Tembladero Slough Hwy 183	Nitrate (mg-N/L), pH, Transparency (cm)	Tembladero Slough
309-TEMBL-33	Tembladero Slough at Preston Bridge	Nitrate (mg-N/L), Orthophosphate (mg-P/L), Dissolved oxygen (mg/L), pH, Transparency (cm)	Tembladero Slough
309-VETER-31	Veterans Park at big turn in Veterans Drive	Nitrate (mg-N/L), Orthophosphate (mg-P/L), *E. coli* (MPN/100 mL), Dissolved oxygen (mg/L)	Veterans Park

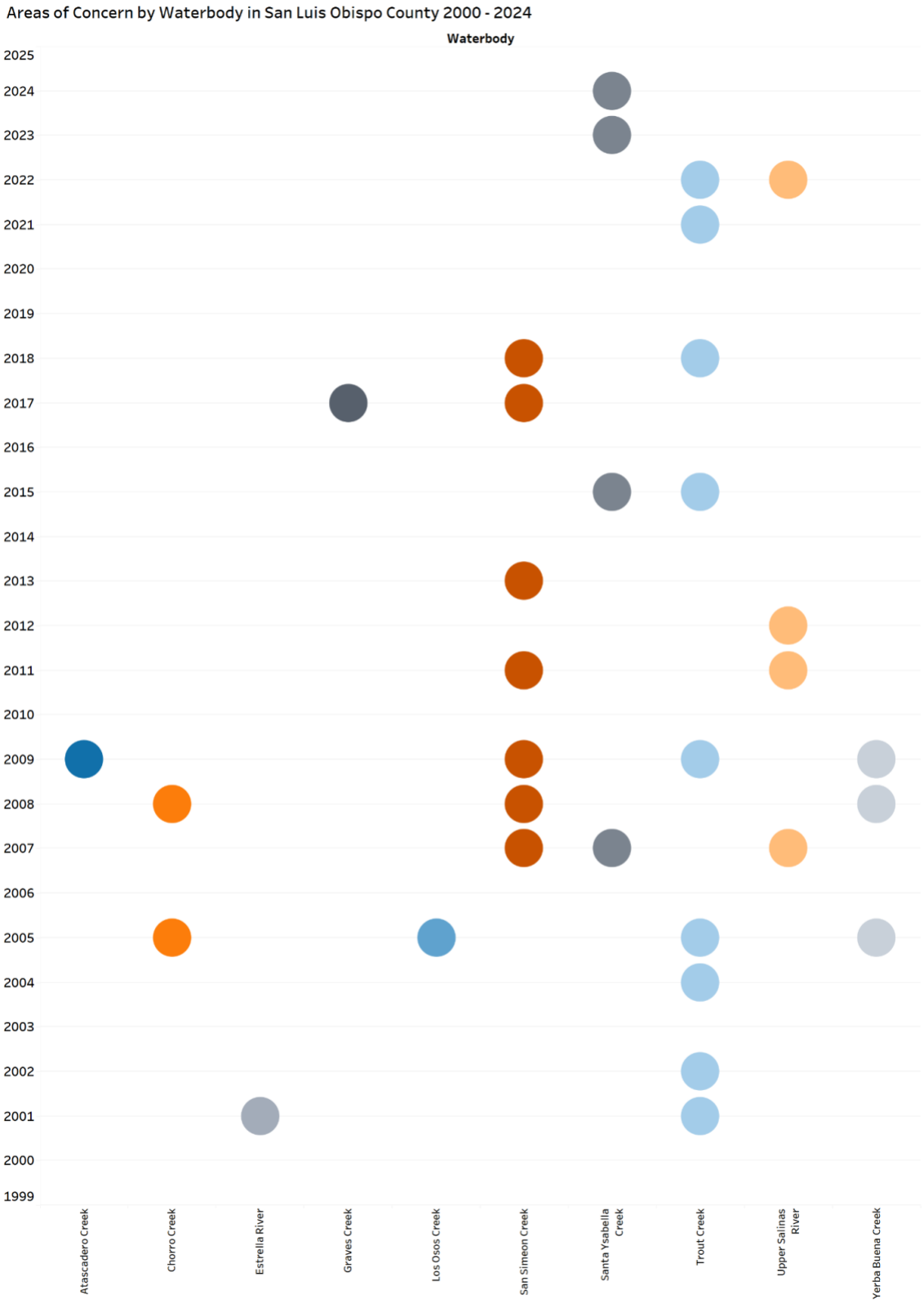

Figure 14. Years in which Areas of Concern (three or more WQOs or Action Levels exceeded) were detected for each waterbody in San Luis Obispo County from 2000–2024.

Table 10. Sites from 2024 in San Luis Obispo County that were designated as Areas of Concern with the corresponding waterbody, standard exceeded, and measurement.

Site ID	Site Name	Standard Exceeded	Waterbody
310-SYB-41	Santa Ysabel Creek on Turri Road	Nitrate (mg-N/L), *E. coli* (MPN/100 mL), Dissolved oxygen (mg/L)	Santa Ysabel Creek

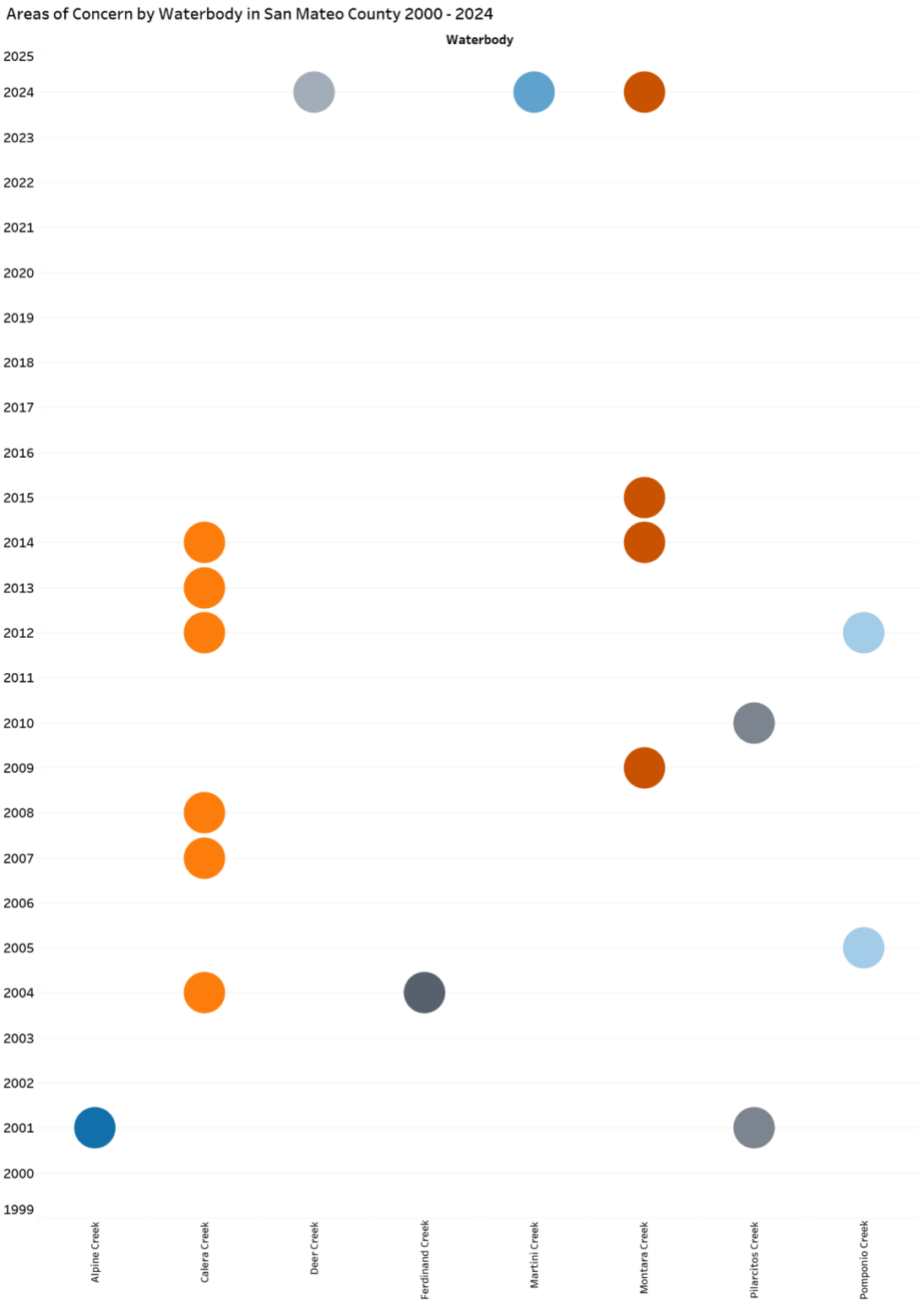

Figure 15. Years in which Areas of Concern (three or more WQOs or Action Levels exceeded) were detected for each waterbody in San Mateo County from 2000–2024.

Table 11. Sites from 2024 in San Mateo County that were designated as Areas of Concern with the corresponding waterbody, standard exceeded, and measurement.

Site ID	Site Name	Standard Exceeded	Waterbody
202-DEERC-12	Deer Creek behind Creekside Smokehouse	*E. coli* (MPN/100 mL), pH, Transparency (cm)	Deer Creek
202-MARTI-11	Martini Creek in Montara State Beach at McNee Ranch	*E. coli* (MPN/100 mL), pH, Transparency (cm)	Martini Creek
202-MONTA-12	Montara Creek downstream at Date and Harte streets	*E. coli* (MPN/100 mL), pH, Transparency (cm)	Montara Creek

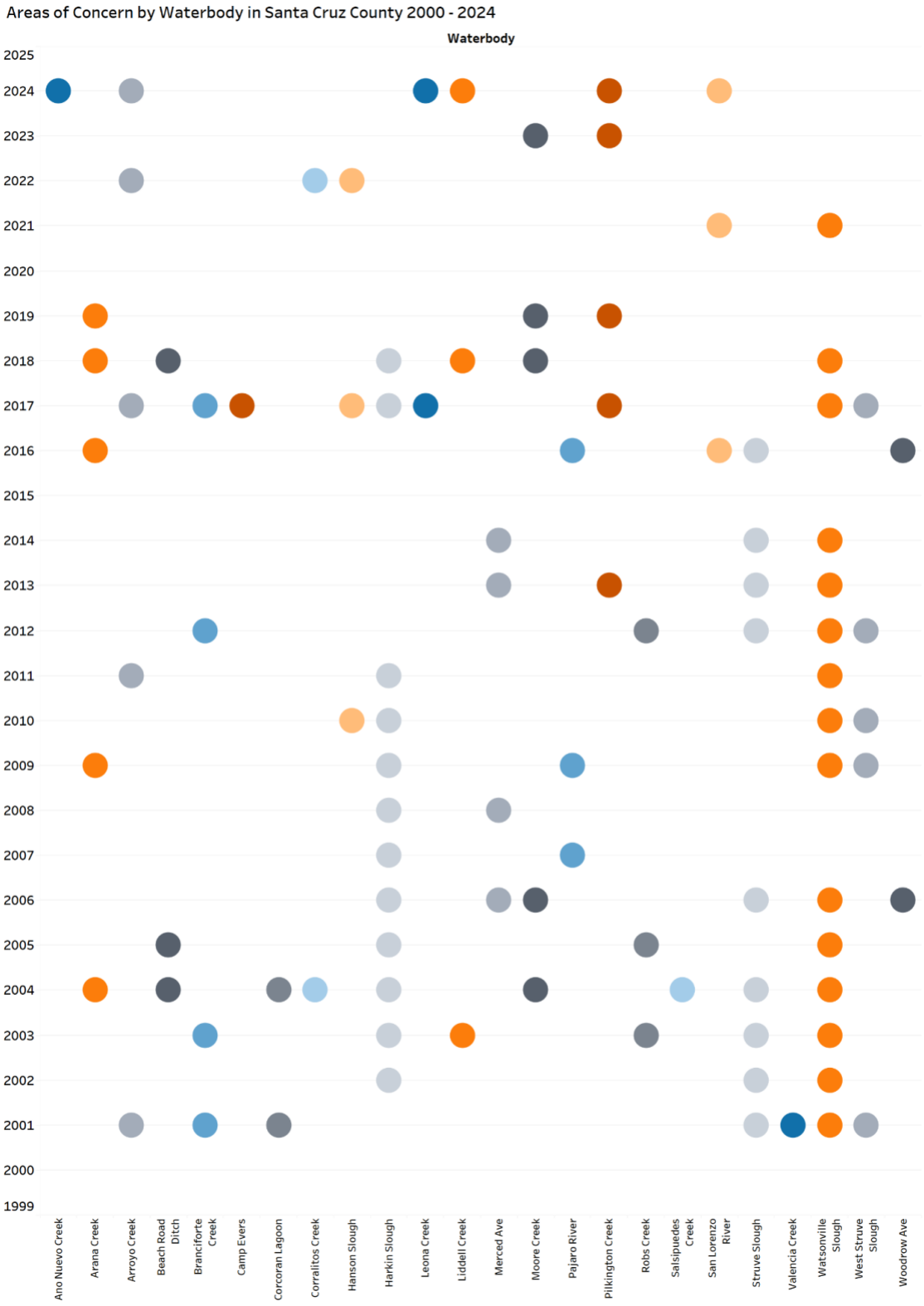

Figure 16. Years in which Areas of Concern (three or more WQOs or Action Levels exceeded) were detected for each waterbody in Santa Cruz County from 2000–2024.

Table 12. Sites from 2024 in Santa Cruz County that were designated as Areas of Concern with the corresponding waterbody, standard exceeded, and measurement.

Site ID	Site Name	Standard Exceeded	Waterbody
304-ARROY-21	Arroyo Seco at Meder Park	*E. coli* (MPN/100 mL), pH, Transparency (cm)	Arroyo Creek
304-LEONA-21	Leona Creek between Salerno and Pompeii Roads	*E. coli* (MPN/100 mL), Dissolved oxygen (mg/L), pH	Leona Creek
304-LIDEL-21	Liddell Creek at Bonny Doon Road	Orthophosphate (mg-P/L), *E. coli* (MPN/100 mL), Dissolved oxygen (mg/L)	Liddell Creek
304-NEWYE-11	Año Nuevo Creek mouth	*E. coli* (MPN/100 mL), Dissolved oxygen (mg/L), pH	Ano Nuevo Creek
304-PILKI-21	Pilkington Creek @ SC Natural History Museum	Orthophosphate (mg-P/L), *E. coli* (MPN/100 mL), Dissolved oxygen (mg/L), Transparency (cm)	Pilkington Creek
304-ZAYAN-21	Zayante Creek at Mount Hermon and Bean Creek	Orthophosphate (mg-P/L), *E. coli* (MPN/100 mL), pH	Zayante Creek

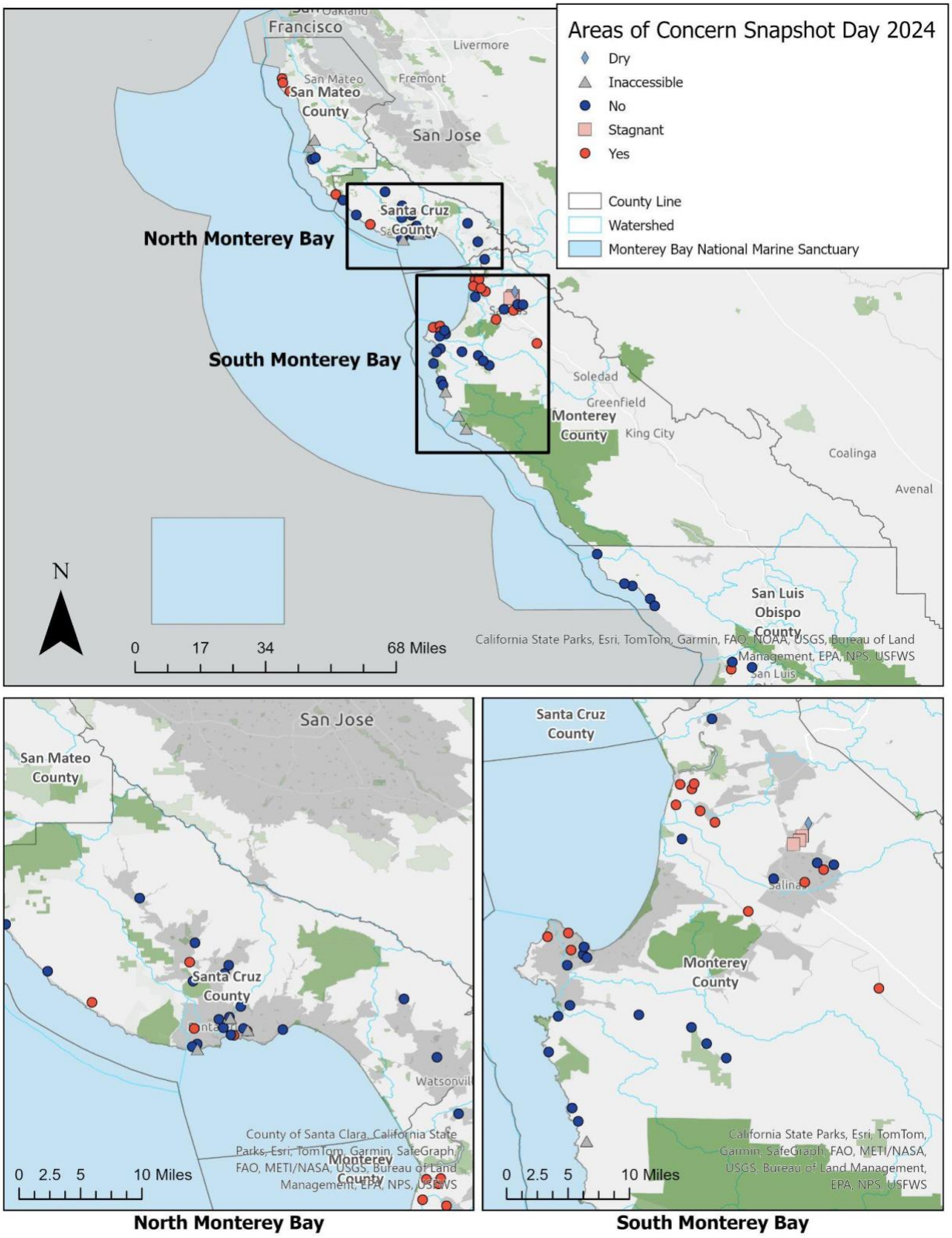

Figure 17. Maps of Areas of Concern identified by Snapshot Day 2024.

Discussion

The key to Snapshot Day's success is MBNMS's ability to mobilize a dedicated network of volunteers that each bring their own unique skills and shared commitment to watershed stewardship and data collection. Many volunteers return every year, involving their family and friends in the efforts, creating a strong sense of community. Additionally, college and university students contribute to the event by promoting it through classroom announcements, clubs, and campus organizations, broadening reach and impact. Over the past 24 years, the data collected by these volunteers have become a great resource for monitoring and understanding a subset of water quality in the region.

This year, 21 sites, or 28% of those monitored, did not exceed WQOs or Action Levels for any parameter, suggesting that these locations provided good conditions for cold-water fish, a key beneficial use monitored during Snapshot Day. This is an improvement from 2023 where 18 sites, or 23% of sites monitored, did not exceed WQOs or Action Levels. This year, however, a large rain event in the latter half of the morning on May 4th had a notable impact on water quality due to various pollutants washing into streams. This event likely contributed to the higher levels of *E. coli* and other parameters, increasing the number of Areas of Concern compared to the previous year.

A total of 23 sites along 19 waterbodies were classified as Areas of Concern in 2024, defined as sites with three or more WQO or Action Level exceedances. These exceedances were predominantly observed at sites located at the end of large rivers or creeks with significant urban and agricultural influences, where elevated nutrient and bacterial concentrations and lower dissolved oxygen levels were recorded. In contrast, creeks and rivers along the coasts of San Mateo County and Big Sur showed few or no exceedances, highlighting the influence of land use and human activities on water quality. Notably, nine of the 19 waterbodies listed as Areas of Concern—including Alisal Creek, Arroyo Seco River, Castroville Slough, Moro Mojo Slough, Natividad Creek, Old Salinas River, San Lorenzo River, Tembladero Slough, and Zayante Creek—are also included on the 303(d) list of impaired waterways maintained by the RWQCB. This overlap underscores the ongoing challenges in improving water quality in these areas.

Results revealed that pH was the most common field measurement to exceed its WQO, tending to be more acidic than target levels at 39% of the sites measured, consistent with findings from 2023 and slightly higher than 2022. According to the State Water Resources Control Board, there are two major factors that can cause a change to pH: buffering capacity and the input of basic or acidic substances, either human-made or natural (Clean Water Team, 2004). Since pH measurements were typically lower (more acidic) than the WQO range, this could be due to input of conifer needles into streams from the rain event, a change in stream bottom material, or a change in temperature. *E. coli* concentrations were the most frequently exceeded lab measurement, surpassing objectives at 43% of sites, a significant increase from 22% in 2023 and 26% in 2022. These findings align with existing literature that identifies urban and agricultural runoff as primary contributors to water quality degradation in coastal watersheds. The observed exceedances of nitrates, orthophosphates, *E. coli*, and conditions leading to acidic pH emphasize the need for targeted management strategies to address these issues.

The Snapshot Day program, with its training and use of state-approved Quality Assurance Project Plans, ensures reliable data collection and analysis. This year, volunteers collected trash and debris at monitoring sites and logged their findings through the Clean Swell app, adding an additional dimension to watershed stewardship. The inclusion of Snapshot Day data in the pool of information used for the 303(d) listing process further demonstrates its value in informing public policy and resource management decisions.

While the results offer valuable information, there are limitations to the program. Snapshot Day captures only a single point in time, which may not fully represent seasonal or long-term trends in water quality. The rain event on May 4th, while providing critical data on runoff impacts, also complicates year-to-year comparisons due to its unique influence on water quality parameters. A lack of continuous funding for watershed monitoring presents an ongoing challenge, resulting in gaps in data for many waterways. Future additions to the program could expand the scope of monitoring to include additional sampling events throughout the year, allowing for a more nuanced analysis of temporal variations and the effectiveness of implemented management measures. Evaluating the impact of new initiatives, such as the trash collection effort, could also provide insights into additional ways to protect watershed health.

Conclusion

The 24 years of data gathered by trained Snapshot Day volunteers have become important for understanding and addressing water quality issues in the MBNMS region. Snapshot Day 2024 identified an increase in Areas of Concern, reflecting the impact of rainfall on pollutant runoff and highlighting the need for ongoing water quality monitoring and management. Programs like Snapshot Day are critical for connecting communities to their local waterways and fostering a sense of stewardship. The data collected informs resource managers and public policy, contributing to the identification of impaired waterbodies and prioritizing restoration efforts.

Through its Water Quality Protection Program, MBNMS is actively collaborating with cities, counties, resource conservation districts, growers, and other resource managers to support their efforts in implementing best management practices that improve the quality of surface waters flowing into the sanctuary. The Water Quality Protection Program Committee fosters collaboration by sharing data and working collectively toward reducing pollutants, nutrients, sediments, and plastic waste that threaten watershed and marine health. Initiatives such as agricultural plastics reduction and healthy soils programs reflect these collaborative efforts to minimize plastic waste in the ocean and mitigate nutrient and sediment runoff. Volunteer programs like Snapshot Day not only provide essential long-term data, but also educate community members on pollution prevention and the importance of supporting municipalities in implementing best management practices.

Moving forward, water quality improvements can be achieved through enhanced urban and agricultural management measures aimed at controlling trash, nitrates, orthophosphates, *E. coli*, and conditions contributing to low pH levels. Further research should explore the effectiveness of specific interventions, such as riparian restoration and green infrastructure, in mitigating pollution and improving aquatic ecosystem health. Expanding the program to include seasonal sampling or continuous monitoring would provide a more comprehensive understanding of watershed health and support long-term restoration efforts. The continued partnership between volunteers, agencies, and nonprofits ensures that Snapshot Day remains a valuable tool for protecting Central California's creeks and rivers that flow into MBNMS.

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Appendix A:
2024 Results by County and Site

Table A.1. Measurements of water quality parameters at each sampling site on Snapshot Day 2024. Shading indicates values that did not meet WQOs or were beyond Action Level thresholds. “ND” indicates that a given parameter was not detected. “NC” indicates that data on a given parameter was not collected.

Site ID	County	*E. coli* (MPN/100 mL)	Nitrate (mg-N/L)	Orthophosphate (mg-P/L)	Dissolved Oxygen (mg/L)	pH	Transparency (cm)	Water Temperature (Deg C)
306-ELKHO-34	Monterey	172	12	ND	6	7.25	53	16.3
306-MOROC-31	Monterey	700	8.3	0.57	5	7	14	14.2
306-MOROC-33	Monterey	11	0.2	0.33	5	8.25	20	16
306-MOROC-34	Monterey	172	ND	1.1	4	8	15	16.3
307-CARME-33	Monterey	20	ND	ND	9	6.75	120	12.4
307-CARME-35	Monterey	82	ND	ND	7	6.5	120	12.6
307-CARME-36	Monterey	23	ND	ND	9	8	120	12.9
307-CARME-38	Monterey	12976	ND	ND	9	6.6	42	13.9
307-GARZA-31	Monterey	5	ND	ND	9	7	120	12.2
308-BIGSU-31	Monterey	NC	NC	NC	NC	NC	NC	NC
308-GARRA-31	Monterey	20	ND	ND	9	6.25	120	12.2
308-MALPA-31	Monterey	104	0.6	ND	7	6.25	120	12.1

Site ID	County	*E. coli* (MPN/100 mL)	Nitrate (mg-N/L)	Orthophosphate (mg-P/L)	Dissolved Oxygen (mg/L)	pH	Transparency (cm)	Water Temperature (Deg C)
308-PALOC-31	Monterey	45	ND	ND	10	7	60	11.8
308-ROCKY-31	Monterey	NC	NC	NC	NC	NC	NC	NC
308-SANJO-31	Monterey	37	ND	ND	9	6.5	97	11.9
308-SYCAM-32	Monterey	NC	NC	NC	NC	NC	NC	NC
309-ALISA-32	Monterey	501	21	0.26	7	6.75	10.4	17.2
309-ASILO-31	Monterey	34658	0.3	ND	4.75	6.5	77.5	15.3
309-CENTR-31	Monterey	141360	0.6	0.69	9	7	12	15.4
309-GABIL-31	Monterey	104	34.7	ND	8	6.75	120	17.7
309-LIBRA-31	Monterey	370	0.36	ND	6	7	88	13.3
309-MAJOR-31	Monterey	402	ND	ND	7	7	123	12.4
309-NATIV-31	Monterey	192	5.6	ND	5	6.5	36	13.8
309-RECDI-31	Monterey	126	31.9	ND	10	7.25	9.4	16.4
309-SALIN-31	Monterey	104	2.8	ND	8	7	24.5	16.8
309-SALIN-32	Monterey	38	2.2	ND	7	6.5	10.3	17.6
309-SALIN-33	Monterey	20	2.2	ND	9	6.75	18	16.4
309-SRITA-32	Monterey	NC	NC	NC	NC	NC	NC	NC

Site ID	County	*E. coli* (MPN/100 mL)	Nitrate (mg-N/L)	Orthophosphate (mg-P/L)	Dissolved Oxygen (mg/L)	pH	Transparency (cm)	Water Temperature (Deg C)
309-SRITA-33	Monterey	NC	NC	NC	NC	NC	NC	NC
309-SRITA-34	Monterey	NC	NC	NC	NC	NC	NC	NC
309-SRITA-35	Monterey	NC	NC	NC	NC	NC	NC	NC
309-TEMBL-31	Monterey	172	50.6	0.56	4.75	7.25	6.6	14.9
309-TEMBL-32	Monterey	20	19.1	ND	7	6.75	4.8	15.1
309-TEMBL-33	Monterey	62	53.3	0.43	3	6.75	16.7	14.6
309-UPPER-31	Monterey	126	20.3	0.2	9	7.5	120	16.5
309-SKYLI-31	Monterey	40	0.2	0.2	9	7	39.3	12.4
309-VETER-31	Monterey	129970	3.2	1.7	6	7	120	12.4
309-DOLPH-31	Monterey	342	ND	ND	4	7	120	13
310-ARROY-41	San Luis Obispo	148	ND	ND	7	7	120	15.1
310-CARPO-41	San Luis Obispo	10	ND	ND	7.5	6.5	120	13.6
310-LAGUN-41	San Luis Obispo	323	ND	ND	7	6.5	120	15.6
310-PENN-41	San Luis Obispo	41	ND	ND	9.86	8.5	120	13.5

Site ID	County	*E. coli* (MPN/100 mL)	Nitrate (mg-N/L)	Orthophosphate (mg-P/L)	Dissolved Oxygen (mg/L)	pH	Transparency (cm)	Water Temperature (Deg C)
310-SANSI-41	San Luis Obispo	109	ND	ND	9	7	120	15.7
310-SANTA-43	San Luis Obispo	213	ND	ND	9	7.5	120	15.2
310-SYB-41	San Luis Obispo	323	2.2	ND	6	7.9	66	17.4
310-UCF-41	San Luis Obispo	288	0.7	0.27	9.95	8.5	120	14.7
202-BUTAN-11	San Mateo	160	ND	ND	8	7	47.2	12.7
202-DEERC-12	San Mateo	11199	0.2	ND	11.25	6.25	3.1	12
202-MARTI-11	San Mateo	4611	0.5	ND	NC	6.25	0.2	11.9
202-MONTA-12	San Mateo	10919	0.3	ND	11.5	6	2	12.2
202-PESCA-11	San Mateo	63	ND	ND	8	7	120	13.4
202-POMPO-11	San Mateo	NC	NC	NC	NC	NC	NC	NC
202-SANGR-12	San Mateo	NC	NC	NC	NC	NC	NC	NC
304-ARANA-22	Santa Cruz	40	ND	ND	7	7	55	15
304-ARROY-21	Santa Cruz	6152	ND	ND	7	6.5	5	13.2
304-ARROY-22	Santa Cruz	1672	0.3	ND	8	7	15	13.7

Site ID	County	*E. coli* (MPN/100 mL)	Nitrate (mg-N/L)	Orthophosphate (mg-P/L)	Dissolved Oxygen (mg/L)	pH	Transparency (cm)	Water Temperature (Deg C)
304-ARROY-23	Santa Cruz	NC	NC	NC	NC	NC	NC	NC
304-BRANC-21	Santa Cruz	2666	ND	ND	8	6.5	35	14.3
304-BRANC-22	Santa Cruz	682	ND	ND	6	7	71	12.7
304-BRANC-23	Santa Cruz	NC	NC	NC	NC	NC	NC	NC
304-CARBO-21	Santa Cruz	422	0.4	ND	7	7	65	12
304-CARBO-23	Santa Cruz	268	ND	ND	7	7	92.5	13.3
304-CARBO-24	Santa Cruz	9768	ND	ND	9	7.5		14.3
304-LEONA-21	Santa Cruz	290	0.3	ND	6	6.5	92	13.5
304-LEONA-22	Santa Cruz	NC	NC	NC	NC	NC	NC	NC
304-LIDEL-21	Santa Cruz	320	0.38	0.2	5.5	7	56	11.7
304-MOORE-26	Santa Cruz	5510	ND	ND	7	6.75	43.5	15
304-NEWYE-11	Santa Cruz	512	0.3	ND	5.75	6.75	28.3	12
304-PILKI-21	Santa Cruz	19608	0.3	0.26	5	7	8	14.9
304-SANLO-22	Santa Cruz	949	ND	ND	7	7	112	14.1
304-SANLO-24	Santa Cruz	62	ND	ND	7	7	120	13.9
304-SANLO-26	Santa Cruz	990	ND	ND	7	6.5	75.2	12.7

Site ID	County	*E. coli* (MPN/100 mL)	Nitrate (mg-N/L)	Orthophosphate (mg-P/L)	Dissolved Oxygen (mg/L)	pH	Transparency (cm)	Water Temperature (Deg C)
304-SANLO-27	Santa Cruz	20	ND	ND	9	6.5	120	12.4
304-SCOTT-25	Santa Cruz	51	ND	ND	6	6.5	62.8	12.3
304-SOQUE-22	Santa Cruz	1288	ND	ND	6	7	110	12.7
304-WADDE-20	Santa Cruz	20	ND	ND	5.5	6.5	85	13.1
304-ZAYAN-21	Santa Cruz	320	ND	0.17	8	6.5	110.1	12.7
304-ZAYAN-22	Santa Cruz	126	ND	ND	7	6.5	120	12.3
305-CORRA-21	Santa Cruz	4766	1.3	ND	10	7	46	13.4
305-CORRA-22	Santa Cruz	7308	ND	ND	8	7	51	12.2

America's Underwater Treasures