California Regional Water Quality Control Board

San Francisco Bay Region

Surface Water Ambient Monitoring Program Environmental Justice and Community Outreach Project 2022-2023

Final Staff Report

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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

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https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/water_quality.html#swamp

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1. Summary

In 2022 and 2023 the Surface Water Ambient Monitoring Program (SWAMP) at the San Francisco Bay Regional Water Quality Control Board (Water Board) conducted an environmental justice and community outreach project. One goal of this project was to address some of the environmental health issues in disadvantaged and underserved communities. Therefore, we collected approximately 100 water samples across seven publicly accessible creeks in the East Bay. These data were used to inform communities of potential water quality issues that may impact their health using culturally relevant methods of communication. The other goal of the project was to build positive relationships with community groups impacted by environmental injustice through listening to their needs and providing requested resources. To meet this goal, we delivered 13 water quality-based workshops and lessons to approximately 200 BIPOC youth and young adults from the communities. We believe these educational experiences will help advance their academic and future careers, potentially inspire some of them to work in environmental fields, and result in future positive outcomes in their communities.

2. Purpose

In 2022, the Surface Water Ambient Monitoring Program (SWAMP) at the San Francisco Bay Regional Water Quality Control Board (Water Board) began an environmental justice (EJ) and community outreach based project. The overarching goal of this project was to address some of the principles of environmental justice and objectives in the State Water Board's Racial Equity Plan. In addition, environmental justice work is a regional priority as stated in the 2023 San Francisco Bay Water Board Strategic Workplan. For this project, environmental justice was defined as the fair teatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Environmental justice communities were defined as communities disproportionately impacted by environmental burdens. In the initial planning phase, we identified specific objectives that were attainable within the scope and available resources of SWAMP (Table 1). The role of SWAMP at the Water Board is focused on designing and implementing water quality monitoring programs, primarily in creeks. SWAMP also has the following resources to implement EJ based projects: a contract and moderate budget with a chemistry lab, water quality monitoring equipment, two full time staff and 2-3 seasonal staff with varying degrees of environmental education and EJ outreach experience.

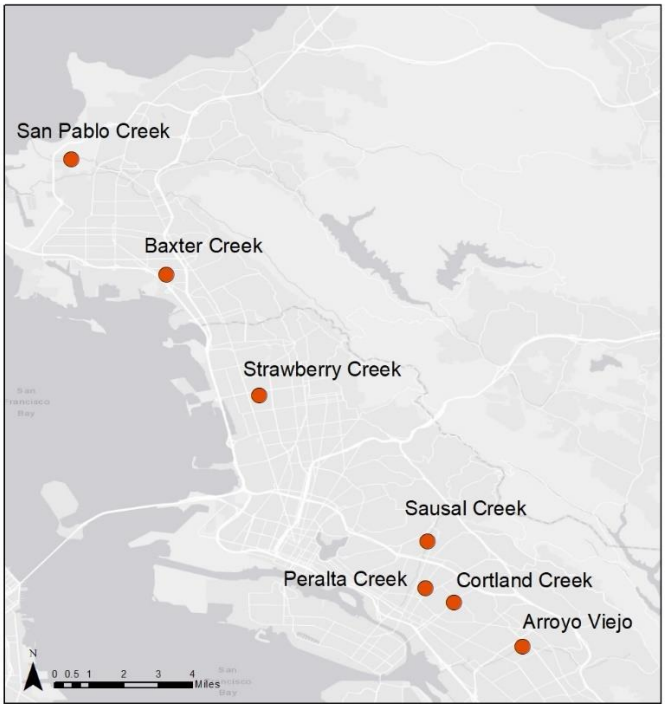
Table 1 – List of objectives and actions for 2022-2023

Objectives	Actions
Build positive relationships with communities	Provide workshops to youth to foster academic and career advancement
	Provide SWAMP resources (e.g., water quality equipment, access to chemistry lab)
	Share water quality data
Identify potential health risks	Identify publicly accessible stream sites within EJ communities
	Collect weekly pathogen samples
	Collect other analytes of interest for the community
Inform communities of potential health risks with culturally relevant, multilingual, accessible, and equitable data	Post water quality warning signage in multiple languages
	Create online interactive map with resources
	Deliver in-person presentations
Improve water quality conditions in the creek	Inform local municipalities and County health departments
	Conduct trash clean ups and restoration projects

3. Scope

We used several criteria to determine the spatial scope of this project. During 2022 and 2023, we focused on EJ communities in the East Bay with access to perennial streams (i.e., streams that have water all year). For many urban neighborhoods in the Bay Area, local parks are the only open space that is accessible to communities. Some of these parks have streams that are heavily visited and used by the community, but high pollutant levels may pose a threat to public health. To select sampling sites, we conducted a spatial analysis overlaying daylighted streams, public access areas, and the CalEnviroScreen layer which includes environmental, health, and socioeconomic information, and identifies communities that are most affected by many sources of pollution (Figure 1).

Figure 1 – Map of *E. coli* monitoring sites for 2022 and 2023.



We also focused our efforts in watersheds where we could form paternships with community organizations. The Water Board had just begun a coordinated effort to develop relationships with EJ based organizations in the region, so to not overwhelm communities with multiple requests from the Water Board, we limited outreach to organizations where SWAMP staff had existing professional contacts. We also decided to focus on community partners that were led by and/or primarily served communities of color. To determine the actions listed in Table 2, we consulted with community partners on their concerns regarding their local creeks and protecting public health. They also shared what resources they needed to support their programs and the people they serve. These requests were then modified based on available SWAMP resources.

The actions taken in the seven watersheds/communities are summarized in Table 2. These included water quality monitoring, public data sharing, and community outreach. Some actions varied by location and by year due to varying levels of community participation, water quality needs and conditions, and SWAMP staff availability.

Table 2 – List of partners and accomplishments by watershed/community

Watershed/ Community	Community Partners	2022 Accomplishments	2023 Accomplishments
San Pablo Creek (San Pablo)	Urban Tilth	11 weeks of *E. coli* monitoring and 1 workshop (20 participants)	2 workshops (25 participants)
	Contra Costa College	None	1 presentation (40 participants)
Baxter Creek (Richmond)	Stege Elementary	14 weeks of *E. coli* monitoring and public signage	5 weeks of *E. coli* monitoring, 2 classroom lesson, and 2 fieldtrips (50 students)
Strawberry Creek (Berkeley)	None	None	5 weeks of *E. coli* monitoring
Sausal Creek (Oakland)	Peralta Hacienda	14 weeks of E. coli monitoring and public signage	5 weeks of *E. coli* monitoring by community partner
Peralta Creek (Oakland)	Peralta Hacienda	4 weeks of *E. coli* monitoring by community partner, 2 water quality collection trainings, 1 stream workshop (23 participants)	5 weeks of *E. coli* monitoring by community partner, 1 water quality collection training (15 students) and 1 stream workshop (15 students)
Cortland Creek (Oakland)	Peralta Hacienda	None	5 weeks of *E. coli* monitoring by community partner and public signage
Arroyo Viejo (Oakland)	None	14 weeks of *E. coli* monitoring, public signage, and Water Board staff creek clean up	5 weeks of *E. coli* monitoring by community partner and public signage

3.1 Water Quality Monitoring

3.1.1 Bacteria Monitoring

For this study, we focused on fecal indicator bacteria (e.g., *E.* coli) in creeks. High fecal indicator bacteria levels can indicate the presence of disease-causing organisms that are found in waste from warm-blooded animals (e.g., humans, cows, horses, dogs, etc.). Exposure can pose potential health risks to people who recreate in contaminated waters. Many of the urban streams in this

study were known to have high levels of bacteria, yet there was no public signage to allow the community to make healthy, informed decisions (e.g., avoidance or proper hand washing). To assess if bacteria conditions are protective of human health, the Water Board uses two water quality objectives for *E. coli*: Below 100 MPN/100ml for 5–6-week geomeans and/or no more than 10% of single samples exceeding 320 MPN/100ml per month. We assessed bacteria conditions using the overall geomean and individual single exceedances for the entire study period.

Microbial source tracking (MST) samples were also collected to determine potential sources of bacteria (e.g., human or dog waste). This analysis is costly and was only collected at a subset of sample dates and sites. The method is based on the genetic analysis of host associated Bacteroidales bacteria, which are commonly found in the feces of humans and other warm-blooded animals. Since different host species (e.g., human, dog, horse, bovine) have different types of Bacteroidales associated with them, the detection of DNA from Bacteroidales bacteria in the environment can be used to determine the origin of the fecal pollution.

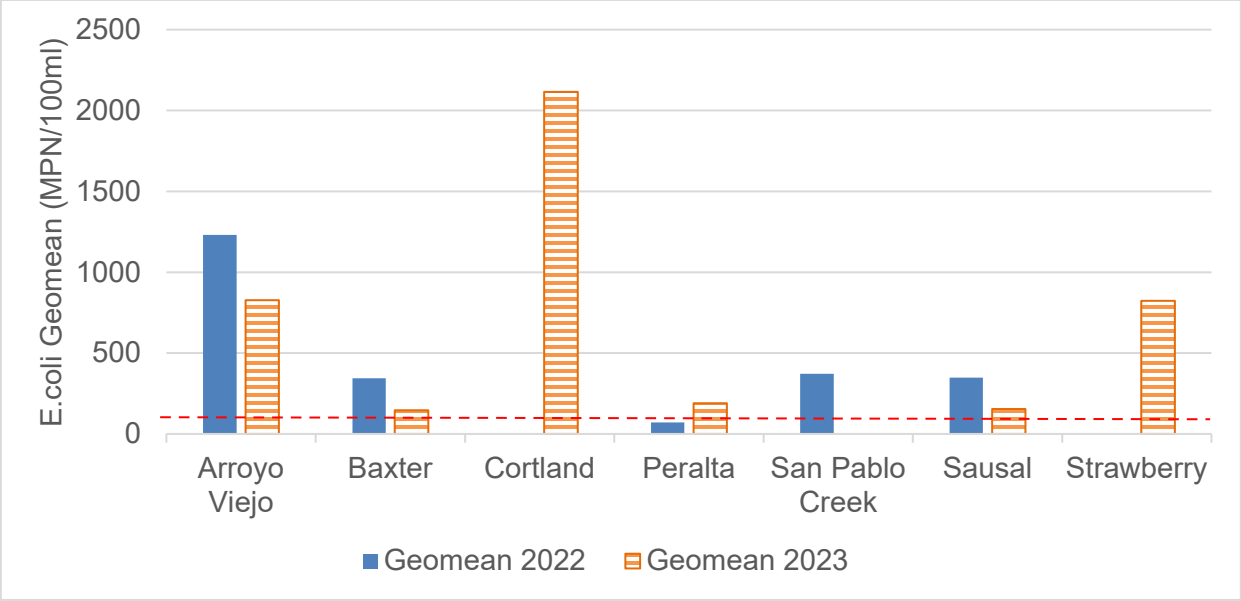
SWAMP staff collected weekly *E. coli* samples for 14 weeks in 2022 and 5 weeks in 2023. In both years, SWAMP trained and provided equipment to teens and young adults in the Peralta Hacienda Water Keepers program to collect the samples at some of the Oakland sites (Table 2).

In 2022, *E. coli* levels exceeded the multi-week water quality objective at most sites (Figure 2) and were consistently above the water quality objective for single samples. Arroyo Viejo had the highest *E. coli* levels with an overall geomean of 1231 MPN/100 mL. Peralta Creek was the only site that met the *E. coli* water quality objective, with a geomean of 74MPN/100 mL. MST data was collected at all sites five times. Across all sites, the most common source of bacteria was associated with the human marker (80% of samples), whereas the dog marker was only found in 28% of the samples.

In 2023, *E. coli* levels were above the geomean water quality objective for all sampled locations (Figure 2). The levels were lower in Arroyo Viejo, Sausal and Baxter creeks in 2023 than in 2022, but this may be because we only sampled 5 times in 2023 compared to 14 times in 2022. Strawberry Creek and Cortland Creek were only sampled in 2023 and far exceeded the water quality objectives (822 MPN/100mL and 2115 MPN/100mL geomeans, respectively). MST data was only collected twice at a subset of sites. As with 2022, the most common source of bacteria was associated with the human markers (100% of samples) and the dog marker was only found in 38% of samples.

One of the likely sources of human bacteria in the creeks was runoff from homeless encampments. During our study we observed multiple encampments around and upstream of all of the sample sites, with the exception of Strawberry and Sausal Creek. Other possible sources could be leaking sewage lines underground, especially in areas near fault lines. In 2022 we observed an active above ground sewage spill on Sausal Creek. Water was flowing down the street and into the storm drain directly upstream of our sample site.

Figure 2 – Plot of *E. coli* geomeans at each site in 2022 (solid blue) and 2023 (orange striped), with the water quality objective (WQO) of 100 MPN/100ml indicated with the red dashed line. No samples were collected in 2022 at Strawberry and Courtland Creeks.



3.1.2 Metal Monitoring

The staff at the Peralta Hacienda Community Center informed us that people from the neighborhood were regularly harvesting and consuming watercress from Peralta Creek. We conducted a brief literature review and found that certain metals (e.g., lead and nickel) and bacteria in waterbodies can be ingested when consuming watercress. We tested for a suite of metals (e.g., lead, aluminum, copper) at Peralta Creek in 2022 and 2023 and the levels did not exceed the water quality objectives for agricultural and municipal (drinking water) beneficial uses.

3.2 Signage and Data Sharing

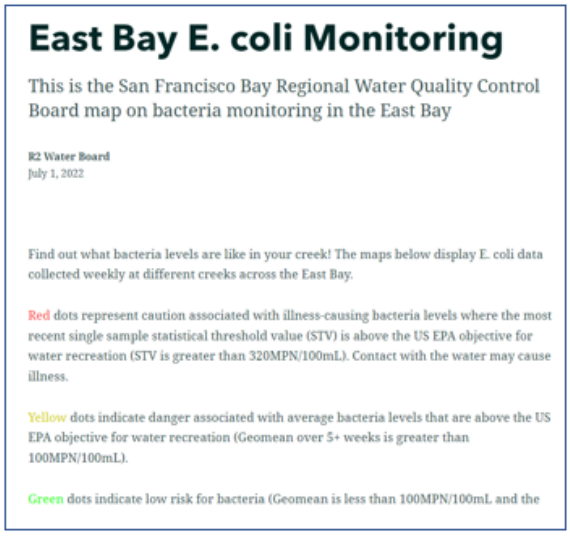
SWAMP designed advisory signs to inform community members of the potential health risks of having physical contact with the creek (Figure 3). The signs were laminated and posted at main access points with high visibility around the creeks. To make the signs culturally relevant, we included information about the different ways people were using the creek in the community (as described by our partners). This included bathing, harvesting food, playing in, and walking dogs. We also included both pictures and words in multiple languages on the signs; we chose English, Spanish, Chinese, and Vietnamese based on the recommendations from our community partners. A QR code on the signs took users to an interactive map that showed the sites and watershed, the weekly *E. coli* levels, a description of the project, and an interpretation of the results (Figure 4).

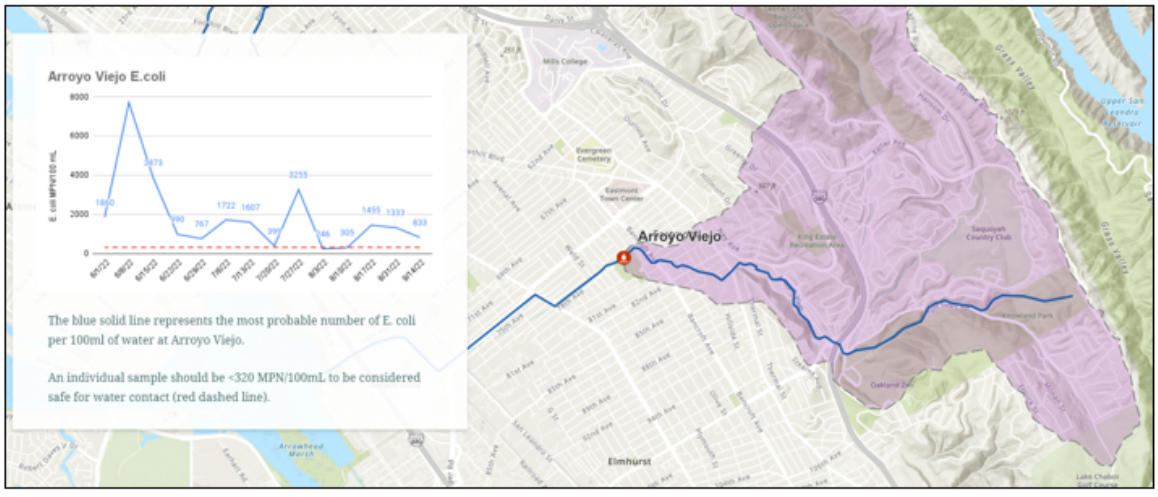
The 2022 map can be found at:
https://gispublic.waterboards.ca.gov/portal/apps/storymaps/stories/25bcd1a9f7ca45828cd9fc287bbd21b2

The 2023 map can be found at:
https://gispublic.waterboards.ca.gov/portal/apps/storymaps/stories/cc77bd52c277498b95e39472210f68e4

Figure 3 – The danger signs in English and in Spanish that were put up at high bacteria level sites. Other signage included Chinese and Vietnamese translations.

Figure 4 – Screen shots of the 2022 online interactive map accessible via the QR code





We worked with city staff to post advisory signs at sites with consistently high *E. coli* levels; this was particularly important at some sites where children were seen playing at the creek during our sampling visits. Advisory signs were posted at most sites in 2022 and at Arroyo Viejo and Courtland in 2023 (Table 2). The City of Richmond and Oakland both approved of the signs prior to posting. The plan was to take down the signs after a couple of weeks of improved water quality, but *E. coli* levels remained consistently high at these sites. Signs were removed three weeks after the last sample date since most children were back in school by September. We were also concerned that the signs would lose their impact in communicating potential health risks if they were up year-round. Strawberry Creek had very high *E. coli* levels in 2023 and consistently had children playing in the creek at each visit; however, we did not post signs at this creek because the City of Berkeley never approved of posting signage.

In 2022 and 2023, there were over 800 visits to the online creek map via the QR code on the signs. Assuming that only a subset of people who saw these signs clicked on the QR code, we estimate that the total number of people that saw the signs was significantly higher. Besides providing useful public health information, this study educated communities about our agency's role and mission, so community members now know how to report spills or other water quality concerns to the Water Board.

3.3 Building Community Relationships: Workshop, Lessons, and Resource Sharing

One of the most important components of this project was developing positive relationships with community partners. Based on conversations with community members, it seemed they either had no knowledge of the Water Board or had a general distrust of government agencies. Therefore, it was important that our interactions with the community were done thoughtfully and respectfully. At the beginning of this study, the Water Board was beginning a coordinated effort to build relationships with EJ groups in the Bay Area. For this study, we did not want to overburden these groups with multiple Water Board requests or projects, so we only approached organizations if SWAMP staff had an existing professional connection (primarily from staffs' previous jobs). Another important approach to our work was to ask community groups what resources they needed rather than telling them. This process allowed us to learn about community specific issues that we would not have otherwise known (e.g., bathing and watercress harvesting in Peralta Creek). The community organizations that we collaborated with were primarily focused on youth and young adults. As such, these organizations requested trainings, informational presentations, and experiential opportunities to engage the youth and young adults in environmental issues.

3.3.1 Peralta Hacienda Water Keepers Program (Oakland)

The Peralta Hacienda Water Keepers Program was one of our main collaborators. This program provides a stipend to primarily youth and young adults of color in the Fruitvale/Peralta Hacienda neighborhood who participate in a hands-on program about water quality issues in Oakland. The program leaders wanted the participants to collect the samples each week, so SWAMP led three sessions to train students to collect *E. coli,* MST, and metals samples following SWAMP standard operating procedures. These students collected samples from Peralta Creek in 2022, and additionally at Courtland and Sausal Creek in 2023. SWAMP loaned the equipment to conduct the work and delivered their weekly samples to the lab. Additionally, SWAMP staff led two 2-hour stream assessment workshops for 30 participants in total. This included hands-on lessons at Peralta Creek on measuring stream flow, stream elevation and macroinvertebrates to assess stream health (Figure 5). At these workshops, SWAMP shared the results of the water quality data they had collected in prior weeks and engaged students in conversation about the potential sources and implications of the data. Lastly, we talked to the students about general science/environmental careers and specifically about how to apply for jobs at the Water Board.

Figures 5a and 5b – Photo of SWAMP staff leading an aquatic macroinvertebrate surveying workshop in Peralta Creek (left), and Peralta Hacienda Water Keepers Program youth sampling for *E. coli* in Sausal Creek (right).

3.3.2 Urban Tilth (Richmond)

We also partnered with Urban Tilth in Richmond, a nonprofit dedicated to hiring and training residents to cultivate food for the community and sustain green spaces. Their watershed restoration training team requested that we sample bacteria levels on San Pablo Creek adjacent to their farm and facility. Additionally, Urban Tilth requested three hands-on workshops for approximately 35 primarily BIPOC interns and staff. The workshops included stream flow and macroinvertebrate sampling but were primarily focused on stream surveying because Urban Tilth had received funding to survey in Codornices Creek (Figure 6). SWAMP also loaned surveying equipment for their project.

Figures 6a and 6b – Photos of SWAMP staff leading stream surveying workshops with Urban Tilth.

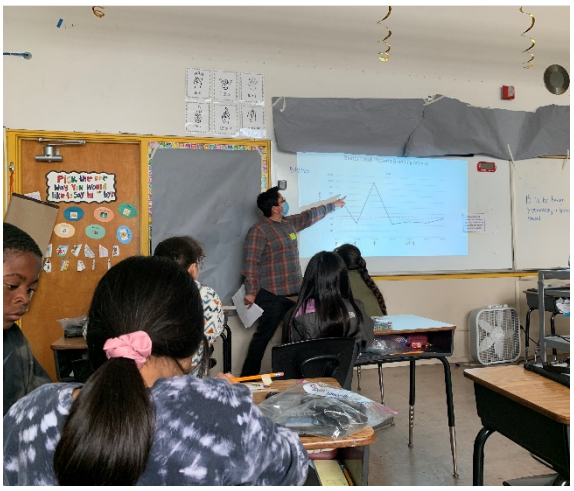
3.3.3 Contra Costa College (San Pablo)

In San Pablo Creek we partnered with Contra Costa College, a community college that primarily serves the BIPOC and/or first-generation community. They requested that we give a lecture to their STEM seminar to engage students with local environmental issues and to learn about career opportunities. The presentation covered our bacteria monitoring in San Pablo and Baxter Creek, as well as other recent surface and groundwater cases the Water Board was addressing in the community. We also discussed the different career opportunities with the Water Board and how to apply for jobs.

3.3.4 Stege Elementary (Richmond)

In the Baxter Creek Watershed, we partnered with Stege Elementary. Baxter creek is daylighted in Booker T Anderson Park, halfway between Stege Elementary and the government housing where most of the students live. This creek is heavily used by the community and is one of the few open spaces in the neighborhood. The teachers requested a classroom lesson and a field trip to engage students with their local creek. We developed a lesson plan for 4th and 5th grade students that taught them about the natural history of the creek, sources of pollution in the watershed, and wildlife in the creek. We also had the students plot the *E. coli* data and assess if it exceeded our water quality objectives (Figure 7). For the field trip, students collected water quality data using various instruments; collected aquatic invertebrates and learned how they can be used to assess water quality; performed a creek clean up; and identified various riparian trees (Figure 8).

Figures 7a and 7b– Photos of SWAMP staff teaching Stege Elementary students about *E. coli*



levels in Baxter Creek and about stream organisms during a field trip to Baxter Creek.

3.3.5 Arroyo Viejo (Oakland)

At Arroyo Viejo we did not have a community partner, although we talked with the Arroyo Viejo Community Center coordinator who said he would like the creek to be safe and clean enough so the students can use it for recreation or education. For the 2022 Creek to Bay Day, Water Board organized a cleanup at Arroyo Viejo where 15 Water Board staff picked up over 20 large garbage bags of trash before the rainy season (Figure 9).

Figure 8 – Photo of Water Board staff after the creek clean up at Arroyo Viejo Community Center.

4. Future Work

In the future, we plan to work in other regions around the Bay Area that are impacted by environmental injustice, and to develop positive relationships with community organizations. To accomplish this, SWAMP will continue to listen to the needs of the communities and adapt to their specific needs. Another key to success for the future is to ensure SWAMP staff are trained to be culturally competent and are aware of the historical contexts and injustices in the communities that we serve. Likewise, it is important that the SWAMP staff continue to represent the diversity of these communities.

Another important component of this project is to work with other agencies and within the Water Board to try and fix the water quality issues identified in this project. The bacteria data will be used to support listing these waterbodies on the federal Clean Water Act 303(d) list of impaired waterbodies and could be used to develop Total Maximum Daily Loads (TMDLs), which are large-scale plans to improve water quality. This process is long so we will also work within our agency's other programs (e.g., Storm Water Program) to improve water quality conditions and health outcomes for the community.

It is important to note that this project is part of a larger effort by the Water Board to address the inequities and injustices in the underserved communities around the Bay Area as described in the 2023 Strategic Workplan. For example, our staff are ensuring that industrial facilities and dischargers near these communities are frequently inspected and in compliance. The pollutants in these cases likely have more deleterious health impacts than bacteria in creeks. Nonetheless, the Water Board is directed toward achieving the highest water quality consistent with maximum benefit to the people of the state.

5. Acknowledgements

We would like to thank our community partners for sharing their knowledge of their local watershed, collecting water quality samples, and inviting us to collaborate with their youth and young adults.

SWAMP staff that conducted the water quality monitoring and outreach events included Jazzy Graham-Davis, Jacqueline Hewitt, Jamal Jaffer, Lucy Montgomery, Rebecca Nordenholt, Lily Partida, Andie Terman, and Kristina Yoshida. Water Board staff that assisted in signage translations included Minh Ngo, Melinda Wong, and Tong Yin.