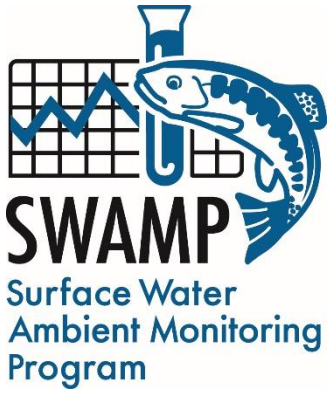

Surface Water Ambient Monitoring Program Bioaccumulation Monitoring Program Realignment for the San Francisco Bay Region

Monitoring and Analysis Workplan

December 2024

Acknowledgements

This Monitoring and Analysis Workplan was prepared by the Surface Water Ambient Monitoring Program (SWAMP) and the San Francisco Bay Regional Water Quality Control Board (Regional Board), collectively known as the Water Boards Realignment Team, as part of the SWAMP Bioaccumulation Monitoring Program's Realignment efforts in the San Francisco Bay Region.

The development of this Workplan was guided by the San Francisco Bay Realignment Advisory Workshop Attendees and invited guests.

San Francisco Bay Realignment Advisory Workshop Attendees:

- The Honorable Carla Munoz, Costanoan Rumsen Carmel Tribe
- Kyle Rabellino (Archaeologist and GIS Specialist), Federated Indians of Graton Rancheria
- Lauren Weston, Acterra: Action for a Healthy Planet
- LaDonna Williams, All Positives Possible
- Andria Ventura, Clean Water Action
- Arieann Harrison & Tonia Randell, Marie Harrison Community Foundation
- Janet Johnson, Richmond Shoreline Alliance
- Carolyn Horne-Wesley, Sarah's Soft Landing

Invited Guests:

- Autumn Bonnema & Billy Jakl, Moss Landing Marine Laboratories
- Loren Chumney, Office of Environmental Health Hazard Assessment (OEHHA)
- Jay Davis, Safe to Eat Workgroup & San Francisco Estuary Institute
- Duyen Kauffman, Biomonitoring California & CA Dept. of Public Health (CDPH)
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Table of Contents

Acronyms and Abbreviations

The below table defines acronyms and abbreviations that are used throughout this document.

Acronym or Abbreviation	Definition
Attendee	San Francisco Bay Realignment Advisory Workshop Attendees
Bay RMP	Regional Monitoring Program for Water Quality in the San Francisco Bay
CDPH	California Department of Public Health
CBO	Community-Based Organizations
CWA	Clean Water Act
OC pesticides	Organochlorine pesticides
OEHHA	California Office of Environmental Health Hazard Assessment
PBDEs	Polybrominated Diphenyl Ethers
PCBs	Polychlorinated biphenyls
PFASs	Perfluoroalkyl and polyfluoroalkyl substances
Program	SWAMP Bioaccumulation Monitoring Program
QAPP	Quality Assurance Project Plan
Realignment	SWAMP Bioaccumulation Monitoring Program Realignment Process
Regional Board	San Francisco Bay Regional Water Quality Control Board
State Board	California State Water Resources Control Board
STEW	Safe to Eat Workgroup
SWAMP	Surface Water Ambient Monitoring Program
SWAMP IQ	SWAMP Information Management and Quality Assurance Center
tribe(s)	California Native American Tribe(s)
Water Boards	California State Water Resources Control Board and Regional Water Quality Control Boards, collectively

Introduction

A key component of the Surface Water Ambient Monitoring Program (SWAMP) Bioaccumulation Monitoring Program Realignment Process (Realignment) involves conducting targeted sampling according to the recommendations of San Francisco Bay Realignment Advisory Workshop Attendees (Attendees). This document presents a plan for sampling and analysis of fish and shellfish in a one-year effort (in 2025) to get a better understanding of contaminant levels in areas and species that are important for consumption, subsistence, and sustenance by underrepresented communities, as well as traditions, culture, and subsistence of California Native American Tribes (tribes) within the boundaries of the San Francisco Bay Regional Water Quality Control Board (Regional Board). The development of this Workplan was guided by Attendees and invited guests, and the work will be performed as part of the SWAMP Bioaccumulation Monitoring Program (Program).

Recent and Current Monitoring Efforts within the Region

Statewide SWAMP Bioaccumulation Monitoring Summary

Since 2007, the Program and the Safe to Eat Workgroup (STEW) have partnered to conduct surveys focused on collecting and analyzing fish tissue for mercury, legacy pesticides, and other bioaccumulative pollutants, such as polychlorinated biphenyls (PCBs), and assessing these data to provide insight into the safety of eating fish. These surveys have been conducted in lakes and reservoirs, rivers and streams, and coastal waters of California. The sampling and analysis conducted as part of this Realignment effort, as described in this Workplan, is intended to complement surveys that have already been conducted or are scheduled to be conducted by the Program on a statewide basis (Figure 1).

Coordination

The Program regularly coordinates with other efforts to leverage the monitoring and analysis funds and achieve a more thorough evaluation of bioaccumulation within California water bodies. A number of efforts in the Region have been or are planned to be underway, which the Program will coordinate with, learn from, and/or build upon during Realignment efforts, including:

- San Francisco Bay Region project with Community-Based Organizations (CBOs) to develop and pilot a consumption survey questionnaire (2023-2025)
- Regional Monitoring Program for Water Quality in San Francisco Bay (Bay RMP) sport fish monitoring efforts (ongoing) - see the Bay RMP section below for more details
- All Positives Possible Carquinez Strait monitoring study (2023-2024)

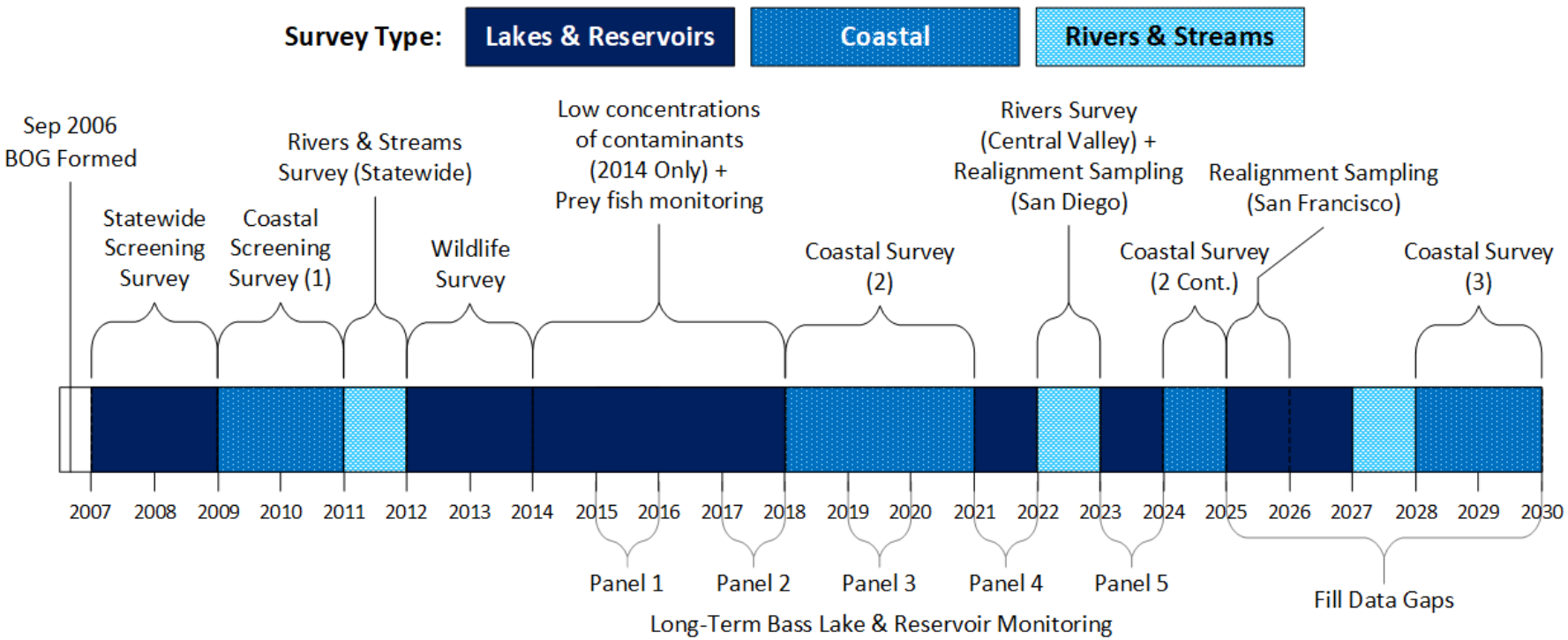


Figure 1. SWAMP Statewide Bioaccumulation Monitoring Schedule. Timeline of bioaccumulation monitoring surveys that have been conducted and are planned by the Program and the Safe to Eat Workgroup in lakes and reservoirs, rivers and streams, and coastal waters of California.

Monitoring Design

Before each sampling season, the Program and the STEW develop the monitoring design by selecting the sampling sites, the types and size of fish to be collected, and the analyses to be conducted on tissue samples, according to the Program's Quality Assurance Project Plan (QAPP). The QAPP defines procedures and criteria that will be used for each respective project, such as criteria for data quality acceptability, procedures for sample collection and laboratory analyses, testing (including deviations) and calibration, as well as preventative and corrective measures. The responsibilities of each agency or laboratory involved in the project are also defined.

During regular monitoring across the state, including in the San Francisco Bay Region, tissue samples are collected and analyzed in a manner that allows the Program's data to be used by the California Office of Environmental Health Hazard Assessment (OEHHA) to develop fish consumption advisories with the following assumptions:

- Consumption of fish and shellfish is at a rate consistent with recreation. This equates to approximately 1 - 7 servings per week depending on the person and the species they are consuming.
- Those consuming the fish are only eating the skinless fillet, unless otherwise noted, such as in the case of issuing advice for small species, which are typically analyzed whole.

The sampling design and analysis plan for this Realignment effort is described below, will follow the methods defined in the Program QAPP, but may deviate slightly from regular statewide monitoring and analysis protocols.

Locations

Between 2007 and 2023, the Program conducted sampling at 40 lake or reservoir stations and 9 coastal stations within the Region (49 total stations; Figure 2). The Program has plans to sample a minimum of 5 lake or reservoir locations in the Region in 2025-2026 as part of 2025-2029 Program Monitoring Plan. Locations that will be sampled in 2025 include:

- Alpine Lake
- Kent Lake
- Lake Madigan
- San Pablo Reservoir
- Stafford Lake

Locations that may be sampled as backup in 2025 or as primary locations in 2026, budget permitting, include:

- Bon Tempe Lake
- Lake Chabot
- Lake Herman
- Lake Sonoma
- San Pablo Reservoir (revisit for the oxygenation study below)

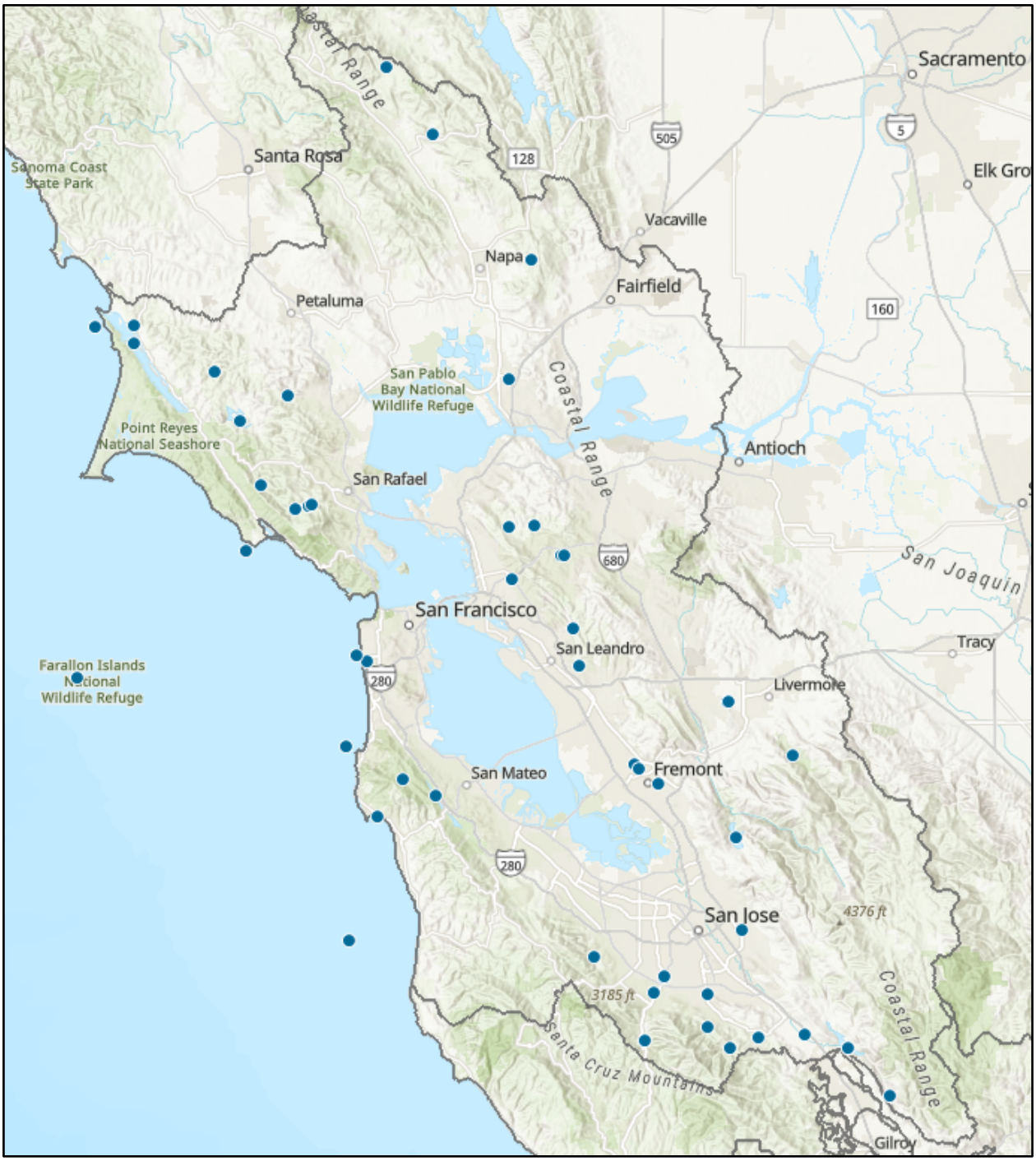


Figure 2. Water bodies sampled by the Program in the San Francisco Bay Region between 2007 and 2023 (blue points). San Francisco Bay Regional Water Quality Control Board boundary indicated by solid gray line. Screenshot from the SWAMP Data Dashboard.

Species and Tissue Types

The Program has collected close to 100 different species during sampling of lakes, reservoirs, and coastal areas across the state. In the San Francisco Bay Region, species that are collected can be broken down by waterbody type and placed into broad categories, as described below in Table 1.

Table 1. Species regularly sampled in the San Francisco Bay Region by the Bioaccumulation Monitoring Program. Species listed according to frequency of collection in descending order, with the first species listed being caught most often. Monitoring within San Francisco Bay is performed by the Regional Monitoring Program for Water Quality in San Francisco Bay (discussed in the Bay RMP Monitoring Summary below).

Lake & Reservoir	Coastal
Largemouth Bass	Rockfish, Lingcod & Sculpin species
Carp	Perch & Surfperch species
Bluegill	Croaker
Catfish species	Topsmelt & Jacksmelt

Analytes

The type of pollutant (henceforth referred to as analyte) selected for analysis during regularly scheduled statewide monitoring varies slightly for each survey and location. The general classes of analytes that are analyzed at each survey type are provided in Table 2.

Additionally, a suite of physical measurements or observations of fish that are collected at each sampling location are recorded, including:

- Total Length (mm; the length of a fish measured from the tip of the snout to the tip of the longer lobe of the caudal fin)
- Fork Length (mm; the length of a fish measured from the tip of the snout to the end of the middle caudal fin rays)
- Standard Length (mm; the length of a fish measured from the tip of the snout to the posterior end of the last vertebra; measurement for prey sized fish in the lakes only)
- Weight (g)
- Sex (sport fish only)
- Moisture (%)
- Lipid Content (%; when organics are analyzed)
- Collection Location (latitude/longitude)

Table 2. List of analytes during each type of survey. Not all analytes listed below are measured in all surveys or in all locations. Rather, a suite of analytes is selected for each survey and location. Organochlorine (OC) pesticides are measured very infrequently.

		Survey Type		
Analyte Groups	**Analyte Class**	**Lake and Reservoir**	**Coastal**	**River and Stream**
Metals and metalloids	Total Mercury	X	X	X
	Total Selenium	X	X	X
	Total Arsenic	-	X[1]	-
PCBs	PCBs (polychlorinated biphenyls)	X	X	X
Organochlorine (OC) pesticides	Chlordanes	X	X	X
	Cyclodienes[2]	X	X	X
	DDTs (dichlorodiphenyltrichloroethane)	X	X	X
	HCHs (hexachlorocyclohexane)	X	X	X
	Other Pesticides[3]	X	X	X
PBDE	PBDEs (Polybrominated Diphenyl Ethers)	X[4]	-	-

1) The only Program samples analyzed for total arsenic were measured by Southern California Bight laboratories as part of the 2018 collaborative effort
2) Cyclodienes include: Aldrin, Dieldrin, Endrin
3) Other pesticides include: Dacthal, Endosulfan I, Hexachlorobenzene, Methoxychlor, Mirex, and Oxadiazon
4) The Program analyzed PBDEs at a screening level only in 2007 and 2008. Analysis continues to be cost prohibitive and therefore has not been conducted in later years.

See Appendix 1 for results with the highest average mercury concentration for any species in San Francisco Bay Region water bodies sampled by the Program between 2007 and 2023.

The Program is currently exploring what statewide monitoring of perfluoroalkyl and polyfluoroalkyl substances (PFASs) will look like in the future, and has only monitored for PFASs for region-specific projects (e.g. for the San Diego Region Realignment Process; see the San Diego Region's Realignment Monitoring and Analysis Workplan for more details).

Regional SWAMP Bioaccumulation Monitoring Summary

In 2021, the STEW sampled fish from many reservoirs to assess their contaminant levels, particularly mercury. The Regional Board contributed funds to this effort for additional fish collection and mercury analysis from six reservoirs: Calero Reservoir, Camden Percolation Pond, Lafayette Reservoir, Shadow Cliffs Reservoir, San Pablo Reservoir, and Soulajule Reservoir. The

Regional Board selected these six reservoirs for mercury monitoring primarily because they are all listed as impaired for mercury on the 2018/2020 California Integrated Report Clean Water Act section 303(d) list of impaired waters (303(d) List), and the most recent data collected for each reservoir was over a decade old. Camden Percolation Pond was the exception to that rationale and was selected as a site because of low mercury concentrations in the past. In addition, all these reservoirs are open to public fishing. Sport fish and prey fish were collected from each reservoir to compare against both Statewide Sport Fish Water Quality Objectives and Statewide Prey Fish Water Quality Objectives. The results of these monitoring efforts are described in the 2021 Fish Mercury Data from Select Reservoirs Report. The results from this study highlight that fish tissue mercury concentrations in sport-size largemouth bass are higher in reservoirs impacted by upstream mercury mines (i.e., Soulajule and Calero Reservoirs) in comparison to reservoirs without a local mercury source (i.e., Camden, Lafayette, and Shadow Cliffs reservoirs). However, it is important to note that fish tissue mercury concentrations in all five reservoirs were higher than the Statewide Sport Fish Mercury Water Quality Objective.

In October 2023, East Bay Municipal Utility District (EBMUD) installed a hypolimnetic oxygenation system in San Pablo Reservoir to improve water quality, specifically to reduce iron and manganese, and improve taste and odor. From 2019 to 2021, the Regional Board funded monitoring efforts in the San Pablo Reservoir to get a baseline understanding of water quality before the hypolimnetic oxygenation system was installed, and to understand the effects the hypolimnetic oxygenation system will have on net mercury methylation and accumulation in the food web. In September 2023, statewide Program funds were used to collect additional sport fish and prey fish in San Pablo Reservoir to enhance the pre-oxygenation mercury baseline dataset.

Most recently, in May 2024, Regional SWAMP funds were used for sport fish and prey fish collection and mercury analysis from three reservoirs: Briones Reservoir, Del Valle Reservoir, and Soulajule Reservoir. Similarly, all three reservoirs are listed as impaired for mercury on the 2018/2020 303(d) List. Although Briones Reservoir is not open for public fishing, the Regional Board wants to establish a robust baseline as EBMUD is considering implementing a hypolimnetic oxygenation system at this reservoir.

Bay RMP Monitoring Summary

In 1993, the Regional Board used its Clean Water Act (CWA) permitting authority to encourage dischargers to initiate cooperative regional monitoring, replacing the uncoordinated monitoring of individual discharges that had occurred previously. Shortly thereafter, the Regional Monitoring Program for Water Quality in the San Francisco Bay (Bay RMP) began a systematic and multi-faceted bioaccumulation monitoring program (see The Pulse of the Bay (2017)). The Bay RMP is governed collaboratively by regulators and permit holders and RMP sport fish monitoring is coordinated through an advisory group that includes staff from the California

Department of Public Health (CDPH), OEHHA, the Regional Board, Moss Landing Marine Laboratories, and other interested parties. This collaborative governance and advisory group structure has fostered an atmosphere of trust and joint fact-finding that has minimized conflict in the regulatory process.

Sport fish sampling by the Bay RMP began in 1997 and occurred through 2009 on a triennial basis. As of 2014, sampling occurs every five years; the most recent sampling effort occurred in 2019 (Buzby et al. 2021) and another round of sampling was conducted in 2024. Monitoring since 1997 has focused on understanding status and trends of contamination at nine locations, with other locations being added as needs and funding arise (Figure 3). This involves the collection of a range of fish species (19 in 2019) and analysis of a suite of contaminants, including: mercury, PCBs, dioxins, selenium, PFASs, and PBDEs. Data from the Bay RMP are publicly available via the California Environmental Data Exchange Network (CEDEN) database.

Bay RMP fish monitoring has supported TMDLs and other control plans for mercury, PCBs, selenium, dioxins, and legacy pesticides. Bay RMP monitoring thoroughly documented the successful reduction of PBDE flame retardants in the Bay as a result of a California law banning their use (The Pulse of the Bay (2022)). Data from Bay RMP fish monitoring have been used to develop and update an OEHHA fish consumption advisory for San Francisco Bay.

In 2024, the Bay RMP conducted another round of monitoring that generally follows the same design used in 2019 (Buzby et al. 2021), with approximately 16 species sampled at approximately 13 locations and analyzed for mercury, PCBs, PFASs, dioxins, selenium, PBDEs, and legacy pesticides. Modifications to the 2019 design include the following:

- PFASs will be analyzed in all samples for all species;
- Legacy pesticide monitoring will be resumed (they had not been included in recent rounds);
- Samples will be analyzed for microplastics;
- White sturgeon will not be sampled because they are now a protected species and fishing is not allowed; and
- Two stations in the Hunters Point area will be sampled for shiner surfperch and staghorn sculpin; these stations were added in response to discussion in Realignment meetings.

The Bay RMP anticipates supporting this Realignment effort by providing funding directly to community-based organizations for collection of fish in 2025, based on priorities established through the Realignment process. This work would follow a community-based monitoring model demonstrated by All Positives Possible in their Carquinez Strait Fish and Preservation Project. In that project, community members collected fish with the guidance of SFEI from October 2023 through February 2024.

Figure 3. Water bodies sampled by the Bay RMP in the San Francisco Bay in 2019 (13 total locations). Green points indicate locations that have been monitored since 1997 for long-term status and trends (9 locations); red points indicate additional locations monitored in 2019 that focused on PCB analysis to support the Region's PCB TMDL (4 stations).

San Francisco Bay Region Realignment Monitoring Plan

In addition to the regularly scheduled Statewide, Regional, and Bay RMP monitoring described above, Attendees have used the San Francisco Region Realignment Advisory Workshops to recommend and prioritize additional locations, species, tissue types, and analytes to be sampled in 2025. Attendees prioritized collecting data where it does not currently exist (i.e., filling data gaps) and developing a better understanding of contaminant levels in areas and species that are important for consumption, subsistence, and sustenance by traditionally underrepresented communities, as well as Tribal traditions, culture, and subsistence within the San Francisco Bay Region.

Monitoring Design

Locations

In addition to the locations that are planned to be sampled during regular statewide and regional monitoring, Attendees have identified and prioritized eight locations that they would like to be sampled in 2025 (Table 3; Figure 3).

Table 3. Priority classification for each of the locations that Realignment Workshop Attendees identified as being important to sample in 2025.

Sampling Priority	**WILL BE SAMPLED**	**BACKUP SITES[1]**
North Bay & Coast	Dillon Beach / Tomales Bay San Rafael Bay / Canal	Listed in order of priority Vallejo[2] Carquinez Strait[2] Benicia San Pablo Bay Napa River Lagunitas Creek No priority order given Point Reyes National Seashore Richardson Bay to Angel Island Sonoma Creek San Quentin Sausalito Tiburon Bay

Sampling Priority	**WILL BE SAMPLED**	**BACKUP SITES[1]**
East Bay	Point Richmond/Richmond Marina locations: ● fishing pier at base of Sante Fe Channel ● Point Richmond Pier ● Meeker Slough Hayward Shoreline	<u>Listed in order of priority</u> Keller Beach Point Pinole Regional Shoreline <u>No priority order given</u> Albany Bulb Bay Trail Shoreline that meets Point Isabel Wet Weather Facility Brickyard Cove at McLaughlin Eastshore State Park Lone Tree Point (Rodeo)
South Bay[3]		East Palo Alto Shoreline Alviso Slough Dumbarton Bridge
San Francisco	Hunters Point / Candlestick Park Pier 39	Crissy Field Heron's Head Park

1) Note that backup sites are still of great importance and Attendees would like these sites to be sampled in 2025 if budget or logistics allow.

2) Note that the Carquinez Strait and Vallejo locations were of great importance to some Attendees, but are included as BACKUP SITES because All Positives Possible has recently completed extensive monitoring at those locations. It is recommended that these sites be revisited by the Program in the coming years.

3) Attendees recommended conducting more thorough outreach to South Bay communities to determine priority locations that would be appropriate for future sampling efforts.

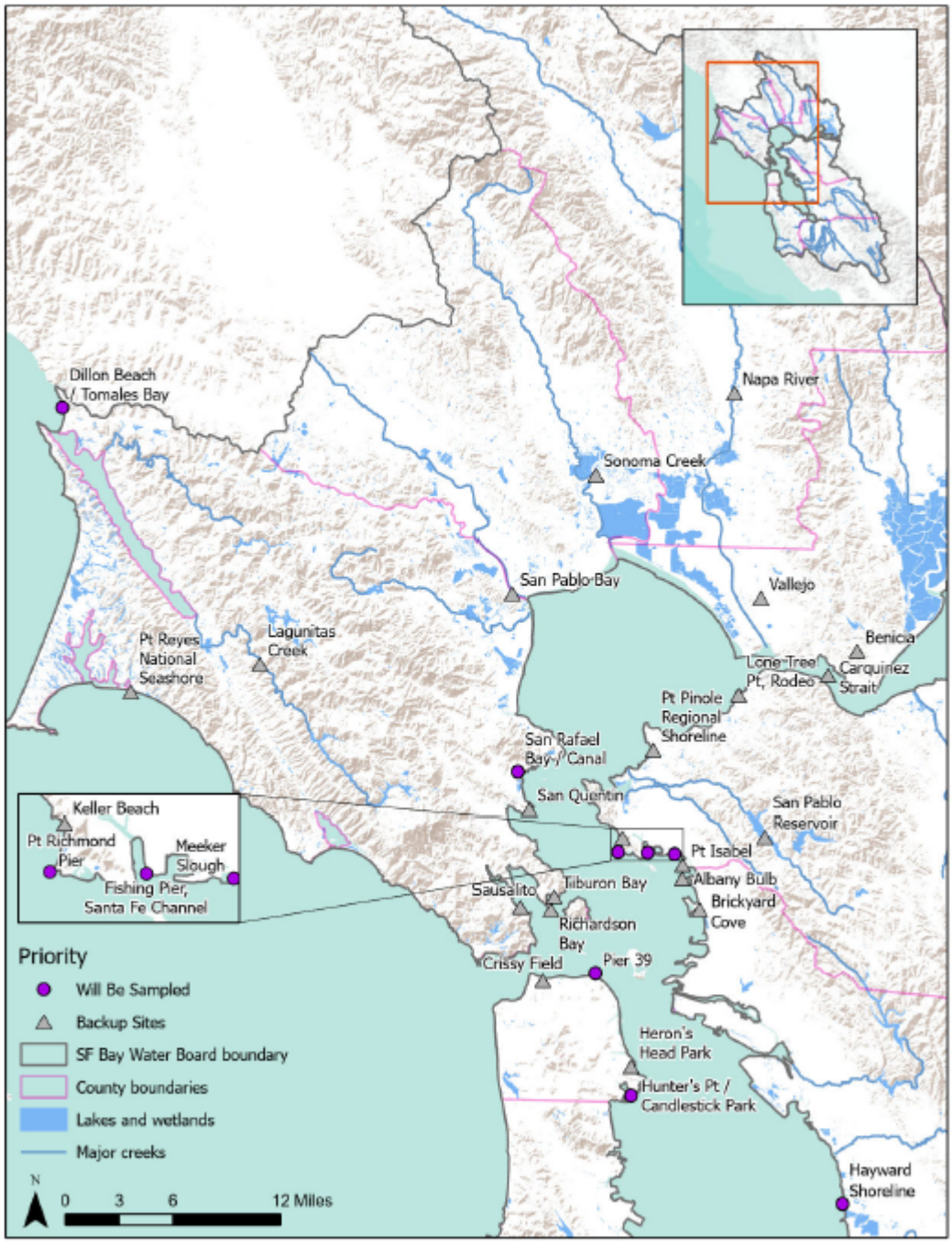


Figure 4. Water bodies identified by Realignment Workshop Attendees as being of importance for consumption, subsistence, and sustenance within the region. Circles indicate locations that are a high priority for sampling in 2025 (8 locations). Triangles indicate locations that should continue to be prioritized for longer-term monitoring in the region (20 locations). South Bay locations identified in Table 3 are omitted since attendees recommended conducting more thorough outreach to South Bay communities to determine priority locations that would be appropriate for future sampling efforts. San Francisco Bay Regional Water Quality Control Board boundary indicated by gray line; county boundaries indicated by pink lines.

Species and Tissue Types

In addition to the species that are planned to be sampled during regular statewide and regional monitoring, Attendees have identified and prioritized a number of additional species that they would like to be sampled in 2025 or in the future as budgets allow (Table 4).

Additional species were identified as being of interest, but not recommended to be sampled for a multitude of reasons including: the species is not consumed regularly and collection and analysis methods are outside of the Program's current capacity; population levels are currently low, threatened, or endangered; it is illegal to collect the species; and/or it is very difficult to collect. These species included: pinnipeds, waterfowl, abalone, salmon, sturgeon. For White sturgeon specifically, as of July 12, 2024, fishing is closed because the species is a candidate for listing under California Endangered Species Act and is protected during the review process. See the California Department of Fish and Wildlife White Sturgeon webpage for more information.

It is important to note that fish species have variable distributions within the region. To cope with this, the sampling crew will have a prioritized menu of several potential primary target species, which will be given the highest priority for collection. If primary target species are not available in sufficient numbers, secondary target species have been identified (Table 4). Other species will also be observed in the process of fish collection. This "bycatch" will not be collected, but the sampling crew will record the presence of each species observed; when possible, numbers of individuals within each species observed will also be noted. This information may be useful if follow-up studies are needed at any of the sampled locations.

In addition to tissue samples that are collected and analyzed in a manner that allows the Program's data to be used to develop OEHHA fish advisories (e.g. skin-off filets), Attendees recommend some samples also be analyzed in a manner that represents consumption of tissue, skin, and organs (i.e., skin-on filet, whole body). It is important to note that for some species and sizes, analyzing whole body samples is logistically or budgetarily prohibitive, and in some cases even unsafe for laboratory personnel. Common names of fish that may be considered for whole body preparation are identified in Appendix 4.

Table 4. Priority classification for each set of primary target and secondary species to sample in 2025. **Bold** indicates the species is already included in statewide or regional monitoring. Red indicates the species that Realignment Workshop Attendees identified as being important to sample in 2025. Black indicates species that were recommended by the Program or invited guests. Asterisks (*) indicate bottom-feeding species, which Attendees have identified as important to their communities. *Italics* indicates species that will be analyzed as individuals for mercury as well as composited for other analytes. If the target species to be analyzed as individuals for mercury are not available, substitutions will be made.

PRIMARY TARGET SPECIES	SECONDARY TARGET SPECIES	
Jacksmelt Monkeyface prickleback Northern anchovy Pacific herring Plainfin midshipman *Rockfish species (Brown rockfish)* *Sharks (Leopard shark)* Shiner surfperch Staghorn sculpin ***Striped bass*** **Topsmelt** Walleye Surfperch **White croaker*** White Surfperch	Bat ray California halibut Diamond turbot Starry flounder <u>Unlikely to be found at bay locations</u> **Carp*** **Catfish*** Cod* Grouper* **Sea bass*** ***Largemouth bass*** Mackerel species (Chub Mackerel) Pacific saury	<u>Shellfish</u> Clams Crab Crayfish / Crawfish Mussels Olivella Oyster Scallops Shrimp Urchin

<u>Analytes</u>

In addition to the analytes that are selected for analysis during regular statewide monitoring, Attendees have identified and prioritized a number of additional analytes that they would like to be analyzed in 2025 or some other time in the future as budgets allow (Table 5). The specifics regarding target species, size ranges, and processing instructions are provided in Appendix 2 and Appendix 3.

Table 5. Priority classification for each analyte to analyze in 2025. **Bold** indicates the analyte is already included in statewide monitoring.

WILL BE ANALYZED	BACKUP ANALYSES[1]
Mercury **Selenium** **PCBs** PFASs[2] **OC Pesticides**, in select locations Arsenic, in select locations	Listed in order of priority **OC Pesticides** **PBDEs** (rarely included in statewide monitoring) Arsenic Algal Toxins, in water[3] Microplastics, in tissue[4] Industrial waste products

1) Note that backup analyses are still of great importance and Attendees would like these analytes to be included in 2025 if budget or logistics allow.
2) To be sampled at select locations as logistics and budget allow (i.e. not required at all locations in 2025)
3) Collect water samples and visual observations in combination with existing monitoring (See Appendix 7 of the San Diego Region Monitoring and Analysis Workplan (2021) for guidance)
4) Note that the monitoring and analysis methods of assessing microplastic concentrations is still in early development and not ready (or fiscally or logistically feasible) for application by the Program at this time.

Quality Assurance

Wherever possible, the Program will follow sampling, analysis, and quality assurance procedures already defined in the Program QAPP. When different sampling or analysis procedures are needed for the 2025 Realignment efforts, they will be described or referenced below.

Sample and Analysis Timing

Sampling will be conducted from approximately April through October 2025. Field crews will do their best to collect the targeted species at all recommended sites, however unforeseen circumstances may prevent field crews from collecting all species at all locations identified in this plan.

After tissue samples are collected in the field, they will be sent to a laboratory (as defined in the QAPP) for analysis. It can take laboratories many months to process samples and send the results back to the Program; the exact amount of time this process takes depends on the analyte. Once results are received from the laboratory, the SWAMP Information Management

and Quality Assurance Center (SWAMP IQ) will conduct quality assurance and quality control checks of the data before submitting it into the SWAMP database. Data in the SWAMP database are publicly available via the CEDEN, the California Open Data Portal, and the SWAMP Data Dashboard.

Products and Timeline

A cruise report summarizing the 2025 sampling efforts will be drafted by March 2026. A data report summarizing analytical results will be drafted by October 2026. The final report, incorporating revisions in response to Committee and reviewer comments, will be completed and released three months after the organics data are available in CEDEN.

Additional Recommendations

In addition to the recommended and prioritized locations, species, tissue types, and analytes listed above, Attendees recommended the following for longer term discussion and consideration:

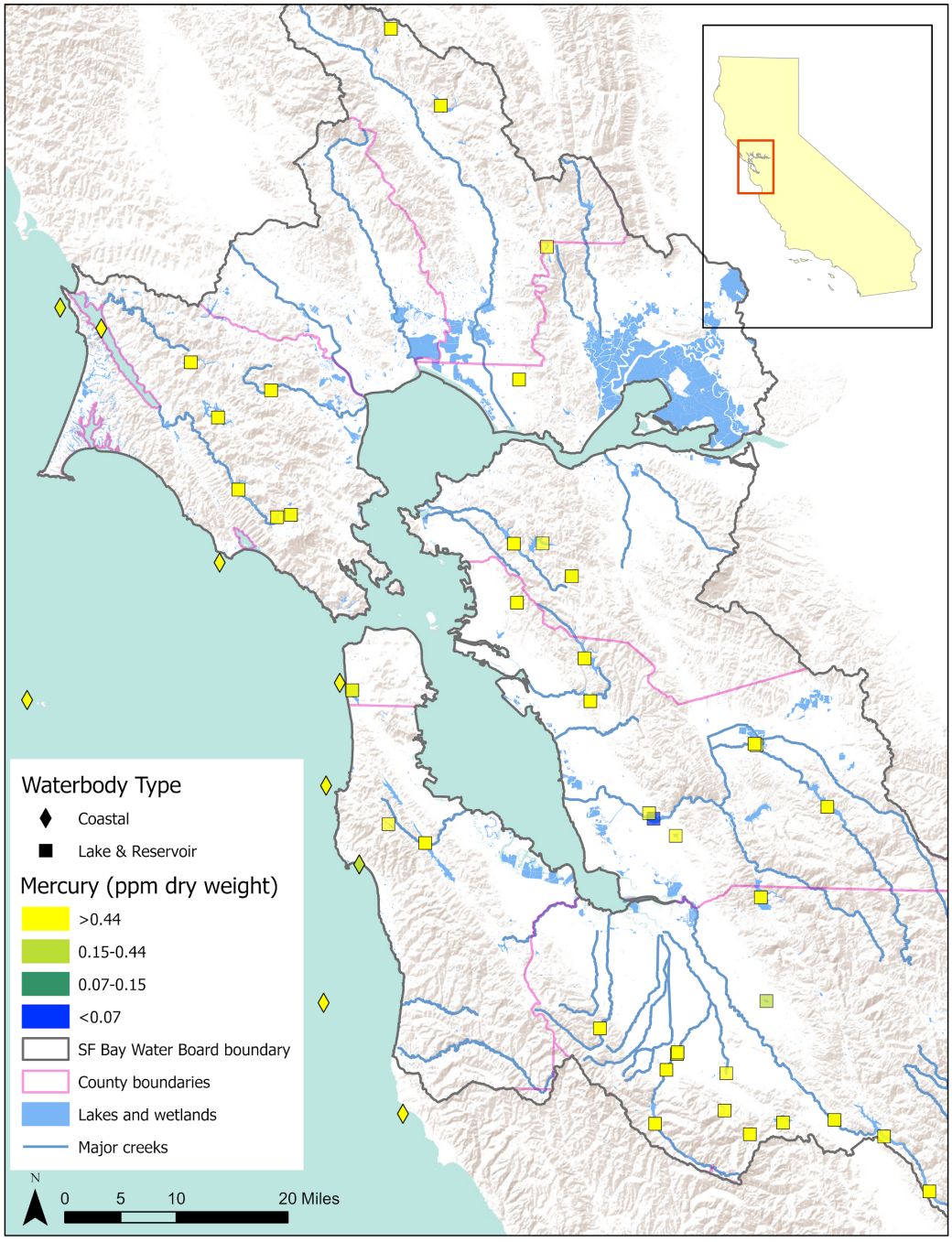
- In addition to the species identified in Table 4, Appendix 2, and Appendix 3, Attendees recommended the Program and partners consider assessing exposure via non-animal species as they relate to tribal consumption and cultural purposes. Species include but are not limited to: kelp, seaweed, and native plants (e.g., cattail, pickleweed, tule, willow). It would be helpful if there was more guidance on the safety of consuming these types of species, especially in the context of algal toxin exposure.
- More engagement with tribes and communities throughout the Region is essential, particularly in the South Bay. Efforts should be made to build relationships, engage, and include these communities throughout this process as soon as possible.
- Attendees noted that there is a lack of OEHHA Fish Consumption Advisory Signs posted along shorelines where community members tend to fish. More signs should be posted throughout the Bay and at locations that are easily visible to potential fishers.

The logistics of addressing or implementing these recommendations will require multiple discussions, and long-term partnership and coordination between SWAMP teams as well as Tribal and community partners, and other agency partners (e.g. OEHHA, CDPH, CDFW).

Appendix

Appendix 1: Highest average mercury concentrations, 2007 - 2023

Mercury results in and around the San Francisco Bay Region for the species with the highest average concentration are indicated by color, location types are indicated by shape. Colors represent OEHHA Advisory Tissue Levels (ATLs) for the sensitive population (Women 18-49 years and children 1-17 years). SWAMP data from CEDEN pulled from the SWAMP Data Dashboard.



Appendix 2: Target species, size ranges, and processing instructions

Target species, size ranges, and processing instructions. I - process as individuals. C - process as composites. Target sizes will be adjusted as necessary based on location-specific size limits to maintain a focus on legal sized fish. Not all species are requested at all locations; see Appendix 3 for the list of species that are requested at each location.

Fish Species	Process for Mercury	Process for PCBs, PFASs, and/or Selenium	Number of individuals per composite (Corresponding size range; mm)	Desired number of composites per location and size range
Group 1) Primary Target Species (High priority for sampling)				
Jacksmelt	C	C	5X (≥ 150)	1
Monkeyface prickleback	C	C	5X (≥ 360)	4
Northern anchovy	C	C	20-100X (≥ 50)	1
Pacific herring	C	C	5X (≥ 170)	4
Plainfin midshipman	C	C	5X (≥ 100)	1
Rockfish, Brown	I, C	C	3X (150-199), 2X (200-249), 5X (>250)	1
Shark, Leopard	I, C	C	3X (914-1074), 4X (1074-1234), 3X (> 1234)	1
Shiner Surfperch	C	C	20X (100-150)	1
Staghorn sculpin	C	C	5X (80-150), 5X (≥ 150)	1
Striped bass	I, C	C	2X (250-349), 2X (350-456), 7X (457-599), 3X (> 600)	1
Topsmelt	C	C	5X (≥ 150)	1

Fish Species	Process for Mercury	Process for PCBs, PFASs, and/or Selenium	Number of individuals per composite (Corresponding size range; mm)	Desired number of composites per location and size range
Walleye Surfperch	C	C	5X (≥ 115)	1
White Croaker	C	C	5X (200-300)	1
White Surfperch	C	C	5X (≥ 125)	1
Group 2) Secondary Target Species (Medium priority for sampling)				
Bat Ray	C	C	3X (disc width ≥ 610)	7
California Halibut	C	C	3X (≥ 559)	1
Diamond turbot	C	C	5X (≥ 165)	4
Starry flounder	C	C	5X (≥ 365)	4
Group 3) Unlikely to be found at bay locations				
White catfish	C	C	5X (200-305)	1
Channel catfish	C	C	5X (375-500)	1
Common carp	C	C	5X (450-600)	1
Largemouth Bass	I, C	C	2X (200-249), 2X (250-304), 7X (305-406), 3X (407-500)	1
Chub Mackerel	C	C	5X (≥ 260)	1

Links to relevant tables, for ease of reference:

- Table 4. Priority classification for each set of primary target and secondary species to sample.
- Table 5. Priority classification for each analyte.

OEHHA Requests: Suggest analyzing any herring, anchovy, and sardines caught as whole organism or whole without head, tail, guts.

Appendix 3: Target species, size ranges, and analyses - by location

North Bay & Coast

LOCATIONS TO BE SAMPLED

Dillon Beach / Tomales Bay

Location (approximate lat, lon): 38.252760, -122.970092

Target species and analyses (see Appendix 2 for full list of species and analyses):

- Group 1) PRIMARY TARGET SPECIES
    - FINFISH: Jacksmelt, Monkeyface prickleback, Northern anchovy, Pacific herring, Plainfin midshipman, Brown rockfish, Leopard shark, Shiner surfperch, Staghorn sculpin, Striped bass, Topsmelt, Walleye Surfperch, White croaker, White Surfperch: Mercury, Selenium, PCBs, PFASs, OC Pesticides, PBDEs, and Arsenic
    - FLATFISH: Bat ray, California halibut, Diamond turbot, Starry flounder: Mercury, Selenium, PCBs, PFASs, OC Pesticides, PBDEs, and Arsenic
- Group 2) UNLIKELY TO BE FOUND - Cod, Grouper, Sea bass, Chub Mackerel, Pacific saury: Mercury, Selenium, PCBs, PFASs
    - Do not target, but keep if caught

For species with large collection numbers (n) that aren't already composited, please prepare the usual skin off filets for analysis as well as whole body samples, when feasible.

San Rafael Bay / Canal

Locations (approximate lat, lon): 37.970429, -122.495231

Target species and analyses (see Appendix 2 for full list of species and analyses):

- Group 1) PRIMARY TARGET SPECIES
    - FINFISH: Jacksmelt, Monkeyface prickleback, Northern anchovy, Pacific herring, Plainfin midshipman, Brown rockfish, Leopard shark, Shiner surfperch, Staghorn sculpin, Striped bass, Topsmelt, Walleye Surfperch, White croaker, White Surfperch: Mercury, Selenium, PCBs, PFASs
    - FLATFISH: Bat ray, California halibut, Diamond turbot, Starry flounder: Mercury, Selenium, PCBs, PFASs
- Group 2) UNLIKELY TO BE FOUND - Cod, Grouper, Sea bass, Chub Mackerel, Pacific saury: Mercury, Selenium, PCBs, PFASs
    - Do not target, but keep if caught

BACKUP SITES

Bay or Coastal Locations (approximate lat, lon):

- Vallejo: 38.1156, -122.2513
- Carquinez Strait: 38.054934, -122.180779
- Benicia: 38.07476, -122.15165
- San Pablo Bay: 38.114214, -122.505883
- Point Reyes National Seashore: 38.026602, -122.891321
- Richardson Bay to Angel Island: 37.862237, -122.458065
- San Quentin: 37.941311, -122.482627
- Sausalito: 37.863695, -122.489176
- Tiburon Bay: 37.87287, -122.455078

Use the same Target species and analyses as described for the San Rafael Bay / Canal location

River Locations (approximate lat, lon):

- Napa River: 38.280174, -122.283406
- Rivers in Sonoma and Marin Counties
    - Sonoma Creek: 38.211528, -122.42344
    - Lagunitas Creek: 38.051814, -122.760158

Target species and analyses (see Appendix 2 for full list of species and analyses):

- Group 1) PRIMARY TARGET SPECIES - White catfish, Channel catfish, Common carp, Cod, Grouper, Sea bass, Largemouth Bass, Chub Mackerel, Pacific saury: Mercury, Selenium, PCBs, PFASs

- Group 2) UNLIKELY TO BE FOUND - Jacksmelt, Monkeyface prickleback, Northern anchovy, Pacific herring, Plainfin midshipman, Brown rockfish, Leopard shark, Shiner surfperch, Staghorn sculpin, Striped bass, Topsmelt, Walleye Surfperch, White croaker, White Surfperch, Bat ray, California halibut, Diamond turbot, Starry flounder: Mercury, Selenium, PCBs, PFASs
    - Do not target, but keep if caught

East Bay

LOCATIONS TO BE SAMPLED

Locations (approximate lat, lon):

- ***Fishing pier at base of Sante Fe Channel (37.909399, -122.360633)***
- ***Point Richmond Pier (37.909272, -122.391028)***
- ***Meeker Slough (37.908782, -122.333124)***
- ***Hayward Shoreline (37.630539, -122.153779)***

Target species and analyses (see Appendix 2 for full list of species and analyses):

- Group 1) PRIMARY TARGET SPECIES
    - FINFISH: Jacksmelt, Monkeyface prickleback, Northern anchovy, Pacific herring, Plainfin midshipman, Brown rockfish, Leopard shark, Shiner surfperch, Staghorn sculpin, Striped bass, Topsmelt, Walleye Surfperch, White croaker, White Surfperch: Mercury, Selenium, PCBs, PFASs, OC Pesticides / DDT, Arsenic
    - FLATFISH: Bat ray, California halibut, Diamond turbot, Starry flounder: Mercury, Selenium, PCBs, PFASs, OC Pesticides / DDT, Arsenic
- Group 2) UNLIKELY TO BE FOUND - Cod, Grouper, Sea bass, Chub Mackerel, Pacific saury: Mercury, Selenium, PCBs, PFASs, OC Pesticides / DDT, Arsenic
    - Do not target, but keep if caught

BACKUP SITES

Locations (approximate lat, lon):

- Keller Beach: 37.921507, -122.386800
- Point Pinole Regional Shoreline: 37.991218, -122.3577
- Albany Bulb: 37.889776, -122.324877
- Bay Trail Shoreline that meets Point Isabel Wet Weather Facility: 37.90097, -122.3248
- Brickyard Cove at McLaughlin Eastshore State Park: 37.865329, -122.306331
- Lone Tree Point (Rodeo): 38.03744, -122.27178

Use the same Target species and analyses as described for the above priority East Bay locations

San Francisco

LOCATIONS TO BE SAMPLED

Locations (approximate lat, lon):

- ***Hunters Point / Candlestick Park (37.713646, -122.371416)***
- ***Pier 39 (37.811428, -122.410907)***

Target species and analyses (see Appendix 2 for full list of species and analyses):

- Group 1) PRIMARY TARGET SPECIES
    - FINFISH: Jacksmelt, Monkeyface prickleback, Northern anchovy, Pacific herring, Plainfin midshipman, Brown rockfish, Leopard shark, Shiner surfperch, Staghorn sculpin, Striped bass, Topsmelt, Walleye Surfperch, White croaker, White Surfperch: Mercury, Selenium, PCBs, PFASs
    - FLATFISH: Bat ray, California halibut, Diamond turbot, Starry flounder: Mercury, Selenium, PCBs, PFASs
- Group 2) UNLIKELY TO BE FOUND - Cod, Grouper, Sea bass, Chub Mackerel, Pacific saury: Mercury, Selenium, PCBs, PFASs
    - Do not target, but keep if caught

BACKUP SITES

Locations (approximate lat, lon):

- Crissy Field: 37.805085, -122.464459
- Heron's Head Park: 37.73771, -122.372181

Use the same Target species and analyses as described for the above priority San Francisco locations.

Links to relevant tables, for ease of reference:

- Table 3. Priority classification for each of the locations to sample in 2025.
- Table 4. Priority classification for each set of primary target and secondary species to sample in 2025.
- Table 5. Priority classification for each analyte to analyze in 2025.

Appendix 4: Species for which whole-body analysis may be an option

Preparation method will be evaluated on a case by case basis, determined by length and weight of the catch, among other factors. Similarly structured fish may also be requested.

Common names of fish that may be considered for whole body preparation include:

- Barred surfperch
- Bluegill
- California corbina
- Chub mackerel
- Green sunfish
- Jack mackerel
- Jacksmelt
- Northern Anchovy
- Pacific bonito
- Pacific sardine
- Queenfish
- Redear sunfish
- Shiner Surfperch
- Walleye surfperch