# Malibu Creek Watershed Monitoring Program

## Fish Tissue Bioaccumulation Survey 2005

THE MALIBU CREEK WATERSHED MONITORING PROGRAM

Presented by:

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## 1.0 Introduction

This report includes the results and analyses of fish tissue bioaccumulation data collected at six sites in the Malibu Creek Watershed in the fall of 2005 as part of the Malibu Creek Monitoring Program's, NPDES storm water permit.

## 2.0 Materials and Methods

Fish samples for bioaccumulation analysis were collected on September 21st, 2006 from 6 sites in the Malibu Watershed. Sites were located in Malibu, Las Virgenes, Medea, Lindero and Trifuno Creeks (Figure 1, Table 1). Fish were collected using a 15 by 6 foot beach seine with 3/8 inch mesh size. Multiple seines were taken until sufficient biomass for tissue analysis had been collected. Fish were identified to species, placed in clean zip-lock bags, covered with wet ice and taken to Aquatic Bioassay and Consulting Laboratories in Ventura, CA. Upon return to the laboratory, the standard length of each fish was measured to the nearest centimeter and the total biomass was compiled for each species by station. The samples were frozen and then shipped to CRG Marine Laboratories in Torrance, California.

Composite samples were created by homogenizing a minimum of six fish of the same species, from the same station in a blender. Each composite sample was analyzed for the following constituents:

- Chlorinated pesticides by GCMS using EPA Method 8270Cm
- Polychlorinated biphenyls (PCBs) by GCMS using EPA Method 8270Cm
- Total trace metals by ICPMS using EPA Method 6020m
- Percent lipids

All results are presented in wet weight.

Arsenic, selenium, cadmium, total chlordane, total DDT and total PCB concentrations from the Malibu Watershed were compared to monthly fish consumption limits for carcinogenic (CHE) and non-carcinogenic (NCHE) health endpoints from the *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 2 Risk Assessment and Fish Consumption Limits* (EPA, 2000). Where available concentrations were also compared to screening values used to identify contaminant concentrations that are of potential health concern from the *Development of Guidance Tissue Levels and Screening Values for Common Contaminants in California Sport Fish, Draft* (OEHHA 2006). Mean chemical concentrations and confidence intervals from each fish species in the Malibu Watershed were compared to statewide fish data from the Toxic Substances Monitoring (TSM) Program (1978-2000) database (http://www.waterboards.ca.gov/programs/smw/index.html).

## 3.0 Results

Fish tissue bioaccumulation sampling locations and information are presented in Figure 1 and Table 1. Fish species, abundances and biomass are reported in Tables 2 and 3. Table 4 shows OEHHA contaminant screening values. Whole fish tissue concentrations for each contaminant measured by site are presented in Table 5. Figure 2 shows the concentrations of contaminants in each fish species by location in the Malibu Creek Watershed. Tissue contaminant concentrations measured in Malibu Creek Watershed species during the 2004 survey were compared to

concentrations in the same species collected from other locations in California in Figures 3 thru 8. The Appendix provides information for fish abundances by size class (Table A1), fish tissue contaminant concentrations used in this report and measured in the California State Water Resources Control Board (SWRCB), Toxic Substances Monitoring Program (TSM) (Tables A2 and A3) and the entire analyte list and method detection limits for the Malibu Creek Watershed survey (Table A4). Contaminants that were below detection in all fish tissues at all sites are not discussed in the results.

Fish were collected on September 21st, 2005 from six locations in the Malibu Creek Watershed (Figure 1, Table 1). A total of 325 fish, representing six species were collected: Arroyo chub (*Gila orcuttii*), bluegill (*Lepomis macrochirus*), common carp (*Cyprinus carpio*), fathead minnow (*Pimephales promelas*), green sunfish (*Lepomis cyanelius*), and largemouth bass (*Micropterus salmoides*) (Table 2). The target number of six fish of the same species per composite sample was met at each site, except for the green sunfish (n = 5) and largemouth bass (n = 4) at Medea Creek (MED2). Since these individuals were relatively large, the decision was made to include them in the analysis (Table 3).

The Malibu Creek site (MAL) was located above the lagoon, has residential housing set back from its southern bank and is easily accessed by the public. The reach has numerous runs, riffles and pools, the riparian corridor is relatively wide and the banks are undercut in many places with overhanging vegetation which made for ideal habitat for green sunfish and common carp.

The lower Las Virgenes (LV2), Medea Creek (MED2) and Triunfo Creek (TRI) sites all had good canopy cover and relatively good instream cover, but did not have the same high level of complexity throughout their reaches as were found at the Malibu Creek reach. All three sites had many undercut bank areas with overhanging canopy cover. Arroyo chub, blue gill and largemouth bass were captured at these sites.

The upper Lindero Creek site (LIN1) is located in a cement drainage that leads to a retention basin. Likewise, the upper Medea Creek site (MED1) is located in a storm water channel with cement stabilized banks and streambed, although portions of the reach have a natural bottom. The retention basin at Lindero Creek was relatively deep and was only wadeable along its banks. Cattails provided cover along much of the bank where Arroyo chub, fathead minnow and green sunfish were captured. The Medea Creek site, while apparently poor fish habitat, still had several deep pools surrounded by reeds that provided good cover for several largemouth bass.

*Arsenic*

The greatest arsenic concentrations were measured in fathead minnows collected in Lindero Creek and the lowest concentrations were measured in green sunfish at Medea Creek (Table 5, Figure 2). Arsenic concentrations were similar between sites in the watershed for the same species and in all cases either approached or exceeded the EPA cancer health end point consumption standard of 1 meal / month (Figure 2). Average concentrations of arsenic in Malibu Creek Watershed fish were similar to concentrations measured in the same fish collected from other locations in California, except for the common carp which had greater arsenic concentrations (Figure 3).

*Cadmium*

The greatest cadmium concentrations were measured in Arroyo Chubs collected in Las Virgenes Creek (LV2) and the lowest concentrations were measured in green sunfish in Malibu Creek near

the lagoon and largemouth bass in Trifuno Creek (Table 5, Figure 2). Cadmium concentrations were below the EPA cancer health end point consumption standards for each location and species except for Arroyo Chub at Lindero Creek (12 meals / month) and Arroyo Chub at Las Virgenes Creek (4 meals / month). Average concentrations of cadmium in Malibu Creek Watershed fish were somewhat greater than in the same fish collected from other locations in California (Figure 3).

*Copper*

The greatest copper concentrations were measured in Arroyo chubs collected in Las Virgenes Creek and largemouth bass collected at Trifuno Creek (Table 5, Figure 2). The lowest concentrations were measured in green sunfish in Malibu and Medea Creeks. No EPA or OEHHA consumption limits have been set for copper. Average copper concentrations in Malibu Creek Watershed fish were similar to concentrations measured in fish collected form other locations in California, except in largemouth bass which were greater in Malibu (Figure 3).

*Mercury*

Mercury concentrations were low in all fish species with the greatest concentrations measured in green sunfish collected in Malibu and Medea Creeks, where concentrations slightly exceeded the 16 meal / month consumption limit (Table 5, Figure 2). Average mercury concentrations in Malibu Creek Watershed fish were slightly to somewhat lower when compared to concentrations measured in fish collected form other locations in California (Figure 3).

*Nickel*

The greatest nickel concentrations were measured in fathead minnows collected in Lindero Creek followed closely by Arroyo Chubs in Las Virgenes Creek (Table 5, Figure 2). The lowest concentrations were measured in green sunfish in Malibu Creek. There is no OEHHA or EPA consumption limits for nickel. Average concentrations of nickel were slightly greater in common carp, Arroyo chub and fathead minnows in the Malibu Creek Watershed compared to the same fish collected from other locations in California (Figure 3). Nickel concentrations were similar in green sunfish and less in largemouth bass collected at other locations in California.

*Selenium*

The greatest selenium concentrations were measured in Arroyo chubs collected in Las Virgenes Creek, where they exceeded the EPA consumption limit of 16 meals / day and the OEHHA screening value (Tables 4 and 5, Figure 2). The lowest concentrations were measured in green sunfish in Medea Creek. Average concentrations of selenium in Malibu Creek Watershed fish were somewhat greater than in the same fish collected from other locations in California, especially for the common carp and fathead minnow (Figure 9).

*Silver*

The greatest silver concentration was measured in common carp collected in Malibu Creek (Table 5, Figure 2). The lowest concentrations were measured in largemouth bass in Medea Creek. No EPA or OEHHA consumption limits have been set for silver. Average concentrations of silver in Malibu Creek Watershed fish were in all cases greater than in the same fish collected from other locations in California (Figure 3).

*Zinc*

The greatest zinc concentrations were measured in common carp in Malibu Creek and Arroyo chubs collected in Las Virgenes Creek (Table 5, Figure 2). The lowest concentrations were measured in largemouth bass in Medea Creek. No EPA or OEHHA consumption limits have been set for zinc. Average concentrations of zinc in Malibu Creek Watershed fish were similar to the same fish collected from other locations in California (Figure 3).

*Total DDT*

The greatest total DDT concentrations were measured in Arroyo chubs collected in Las Virgenes Creek and were below detection in common carp in Malibu Creek near the lagoon (Table 5, Figure 2). Total DDT concentrations for each fish species collected at Lindero Creek exceeded the EPA cancer health end point consumption limit of 16 meals / month, green sunfish at Medea Creek exceeded the 12 meals / month limit and Arroyo Chub at Las Virgenes Creek exceeded the 1 meal / month limit. Average concentrations of total DDT in Malibu Creek Watershed fish were lower than in the same fish collected from other locations in California (Figure 3).

*Chlordane*

The greatest chlordane concentrations were measured in green sunfish collected in Medea Creek where they exceeded the EPA cancer health end point consumption standard of 16 meals / month (Table 5, Figure 2). Chlordane concentrations were lowest and below detection in common carp in Malibu Creek. Average concentrations of chlordane in Malibu Creek Watershed fish were similar to or lower than in the same fish collected from other locations in California, except for green sunfish which had slightly greater average concentrations (Figure 3).

*Total PCB*

Total PCB concentrations were below detection at all sites except Lindero and Trifuno Creeks (Table 5, Figure 2). Total PCB concentrations exceeded the EPA cancer health end point consumption standard of 8 meals / month in all cases. Average concentrations of total PCB in Malibu Creek Watershed fish were similar to or below concentrations measured in the same fish collected from other locations in California (Figure 3).

## 4.0 Summary

A total of 325 fish, representing six species were collected on September 21st, 2005 from six locations in the Malibu Creek Watershed to assess contaminant bioaccumulation. These species included the Arroyo Chub (*Gila orcuttii*), bluegill (*Lepomis macrochirus*), common carp (*Cyprinus carpio*), fathead minnow (*Pimephales promelas*), green sunfish (*Lepomis cyanellus*), and largemouth bass (*Micropterus salmoides*). The main assimilation pathway for contaminants in fish is through ingestion. Therefore, it is important to understand the general feeding habits of the fish that are being surveyed since contaminant concentrations can tend to increase up the food chain from herbivores (feeding on phytoplankton and vegetation) to piscivores (feeding on other fish). Since the majority of contaminants are associated with the sediments, fish feeding near the benthos may accumulate more contaminants than fish feeding in the water column. Additionally, tissue contaminant concentrations increase over a fish's life span so that larger fish of the same species tend to have higher concentrations than smaller fish. The general feeding strategies for the fish collected for this survey were as follows (McGinnis 1984):

- Fathead minnow - browser feeding on phytoplankton, invertebrates and organic debris.
- Arroyo Chub - omnivorous feeding on vegetation and invertebrates associated with vegetation.
- Common carp - benthivorous feeding on benthic invertebrates both selectively from the sediment surface and by "grubbing", a technique where the fish takes sediment into its mouth and rakes out the invertebrates.
- Bluegill – omnivorous feeding on plants, invertebrates, fish eggs and other fish.
- Green sunfish - carnivores feeding as young fish on small invertebrates and as adults become partially piscivorous.
- Largemouth bass – piscivores feeding on other fish and are the top predators in their habitat.

Several of the metals and organic contaminants measured in this study were compared to the EPA monthly fish consumption limits for carcinogenic and non-carcinogenic health endpoints (USEPA 2000). These limits are based a monthly allowable dose of each contaminant relating to a 1:100,000 lifetime cancer risk level. The limits assume that a fisherman consumes 8 oz. muscle fillet for each meal. As contaminant concentrations increase, the number of meals per month decreases based on the total dose allowable over a 1-month period. Of the species collected for the Malibu Creek Watershed survey, Arroyo Chub and fathead minnow are not generally consumed by fishermen.

Of the ten metals measured in this survey, all were detected in each species at each of the six locations. Chromium and lead were below the method detection limits at all sites except for at Lindero Creek where chromium was measured in fathead minnows and lead was measured in Arroyo Chub and fathead minnows. Arsenic, cadmium, nickel and zinc were all elevated in the tissues of Arroyo Chub and fathead minnows collected at Las Virgenes and Lindero Creeks compared to the other sampling locations. Arsenic concentrations exceeded the EPA's monthly consumption limit of one meal / month for each species at nearly all sites (USEPA 2000). Cadmium concentrations exceeded the EPA limit of four meals / month for the Arroyo Chub at Las Virgenes Creek. Mercury concentrations were generally low across sites and species, but exceeded the 16 meal / month limit for green sunfish at Malibu and Medea Creeks. Selenium concentrations were similar across sites and were greatest in Arroyo Chub at Las Virgenes Creek where the EPA limit of 16 meals / month was exceeded.

Metal concentrations in fish collected in the Malibu Creek Watershed were similar to or slightly elevated above concentrations measured in the same fish from other watersheds in California by the State of California Water Resources Control Board (SWRCB), Toxic Substances Monitoring Program (TSM) (http://www.waterboards.ca.gov/programs/smw/index.html). In the cases of cadmium, selenium and silver, nearly each of the Malibu Creek fish species contained greater concentrations than the same fish collected by the TSM. Mercury concentrations were slightly lower in each or the Malibu Creek species, when compared to concentrations in the TSM fish.

Chlorinated pesticides (total DDT and total chlordane) were detected in each species, at each location except for in common carp at Malibu Creek. 4,4'-DDE was the dominant congener of DDT present in most samples. DDT concentrations were relatively low across sites except in the Arroyo Chub at Las Virgenes Creek where concentrations exceeded the one meal / month EPA consumption limit. Additionally, green sunfish exceeded the 12 meal / month limit at Medea Creek

and Arroyo Chub, green sunfish and fathead minnow exceeded the 16 meal / month limit at Lindero Creek. Chlordane concentrations were greatest in green sunfish at Medea Creek where the 16 meal / month limit was exceeded. PCBs were only detected in fish collected in Lindero and Trifuno Creeks, where concentration exceeded the 8 meal / month limit.

Total DDT, total chlordane and total PCB concentrations in fish collected in the Malibu Creek Watershed were lower than concentrations measured in the same fish from other watersheds by the SWRCB, TSM program. The average concentrations of each of these organic contaminants were elevated in fathead minnows collected by the TSM in several Ventura County streams including Calleguas Creek, Conejo Creek and Revolon Slough. These water bodies are currently in the process of a Total Maximum Daily Load (TMDL) program for these constituents.

**5.0 Literature Cited**

McGinnis, S.M. 1984. Freshwater fishes on California. University of California Press, Berkeley and Los Angeles, CA. pp. 316.

OEHHA. 2006. Development of guidance tissue levels and screening values for common contaminants in California sport fish: chlordane, DDTs, dieldrin, methylmercury, PCBs, selenium, and toxaphene (DRAFT). Pesticide and Environmental Toxicology Branch, Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. Oakland, CA.

USEPA. 2000. Guidance for assessing chemical contaminant data for use in fish advisories, vol. 2, risk assessment and fish consumption limits, 3rd Ed., (EPA 823-B-00-008).

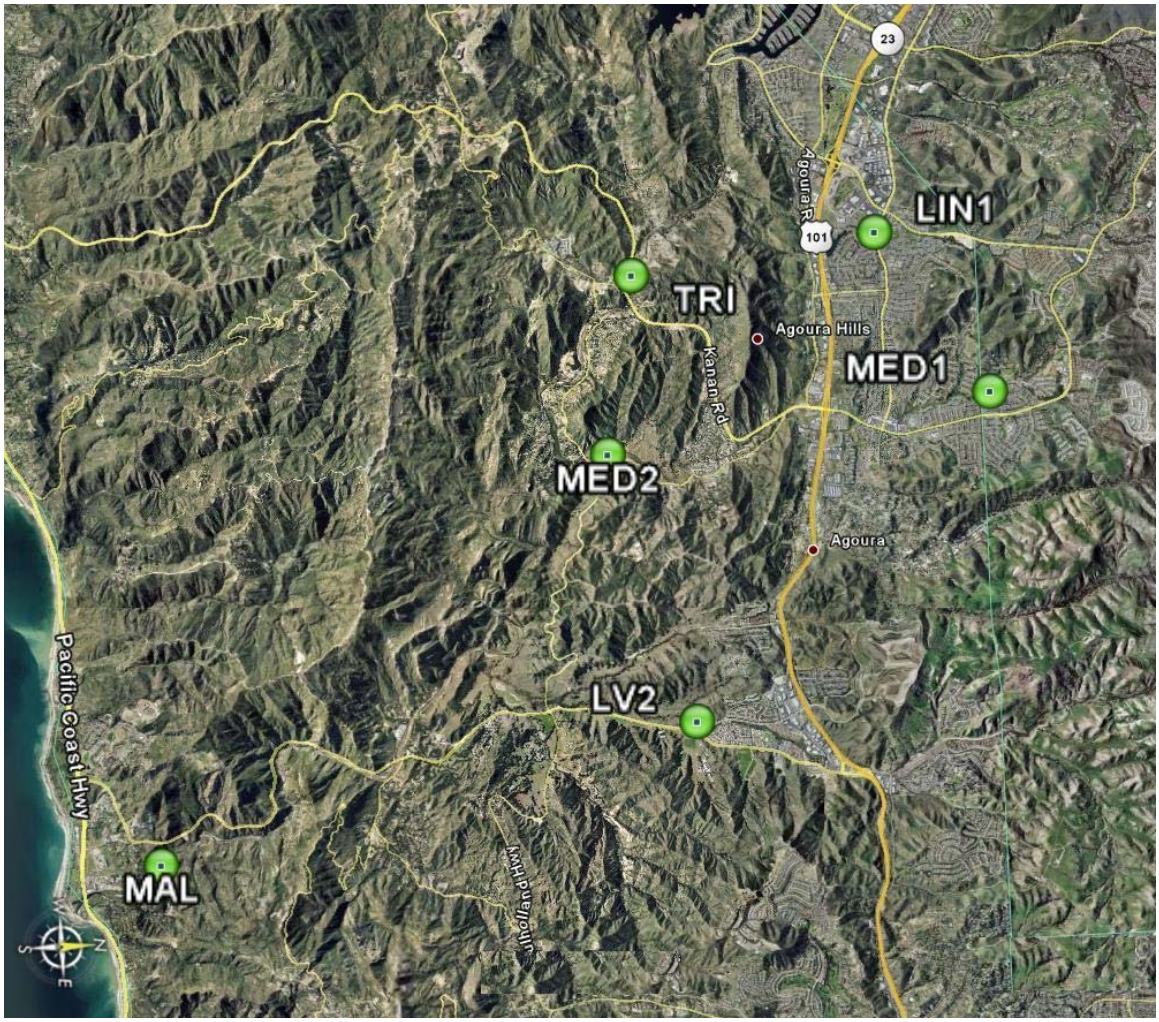



Figure 1. Fish bioaccumulation station locations in the Malibu Watershed.

Table 1. Malibu Creek Watershed fish bioaccumulation station locations and sample information.

| Sta.ID | Sample Date | Sample Time | Stream | Latitude | Longitude | Elev. (ft) |
|---|---|---|---|---|---|---|
| MAL | 21-Sep-05 | 8:20 | Malibu Creek | 34° 02.837' N | 118° 41.373' W | 27 |
| LV2 | 21-Sep-05 | 9:53 | Las Virgenes Creek | 34° 07.513' N | 118° 42.501' W | 611 |
| MED2 | 21-Sep-05 | 12:00 | Medea Creek | 34° 06.834' N | 118° 45.351' W | 722 |
| MED1 | 21-Sep-05 | 14:15 | Medea Creek | 34° 10.227' N | 118° 45.755' W | 964 |
| LIN1 | 21-Sep-05 | 13:27 | Lindero Creek | 34° 09.322' N | 118° 47.462' W | 970 |
| TRI | 21-Sep-05 | 15:20 | Trifuno Creek | 34° 07.930' N | 118° 49.272' W | 840 |

Table 2. Fish abundances at each Malibu Creek Watershed sampling location.

| Common Name | Scientific Name | Abundance | | | | | |
|---|---|---|---|---|---|---|---|
| | | MAL | LV2 | MED2 | MED1 | LIN1 | TRI |
| Arroyo Chub | *Gila orcuttii* | 0 | 88 | 0 | 0 | 27 | 0 |
| Bluegill | *Lepomis macrochirus* | 0 | 0 | 27 | 0 | 0 | 0 |
| Common Carp | *Cyprinus carpio* | 23 | 0 | 0 | 0 | 0 | 0 |
| Fathead Minnow | *Pimephales promelas* | 0 | 0 | 0 | 0 | 47 | 0 |
| Green Sunfish | *Lepomis cyanellus* | 9 | 0 | 0 | 5 | 9 | 0 |
| Largemouth Bass | *Micropterus salmoides* | 0 | 0 | 56 | 4 | 0 | 30 |
| | **Individuals** | **32** | **88** | **83** | **9** | **83** | **30** |

Table 3. Fish biomass (Kg) collected at each Malibu Creek Watershed sampling location.

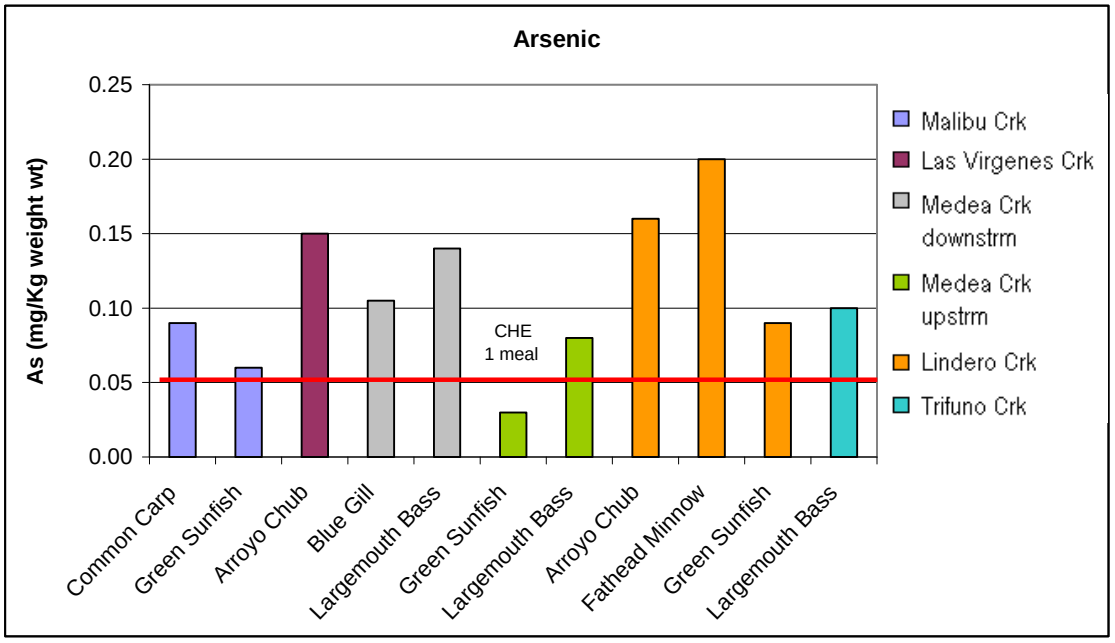
| Common Name | Scientific Name | Biomass (kg) | | | | | |
|---|---|---|---|---|---|---|---|
| | | MAL | LV2 | MED2 | MED1 | LIN1 | TRI |
| Arroyo Chub | *Gila orcuttii* | | 0.125 | | | 0.262 | |
| Bluegill | *Lepomis macrochirus* | | | 0.612 | | | |
| Common Carp | *Cyprinus carpio* | 0.412 | | | | | |
| Fathead Minnow | *Pimephales promelas* | | | | | 0.095 | |
| Green Sunfish | *Lepomis cyanellus* | 0.417 | | | 0.548 | 0.334 | |
| Largemouth Bass | *Micropterus salmoides* | | | 0.304 | 0.326 | | 0.302 |

Table 4. OEHHA contaminant screening values.

| Contaminant | Screening Value | Units, wet weight |
|---|---|---|
| Chlordane | 200 | ppb |
| DDT | 560 | ppb |
| PCB | 20 | ppb |
| Mercury | 0.08 | ppm |
| Selenium | 1.94 | ppm |

Table 5. Whole fish tissue concentrations of metals (ppm wet weight) and organic (ppb wet weight) contaminants in the Malibu Creek Watershed.

| Station | MAL | | LV2 | MED2 | | MED1 | | LIN1 | | | TRI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Constituent | Common Carp | Green Sunfish | Arroyo Chub | Blue Gill | Largemouth Bass | Green Sunfish | Largemouth Bass | Arroyo Chub | Fathead Minnow | Green Sunfish | Largemouth Bass |
| **Metals (µg/wet g)** | | | | | | | | | | | |
| Arsenic | 0.09 | 0.06 | 0.15 | 0.11 | 0.14 | 0.03 | 0.08 | 0.16 | 0.20 | 0.09 | 0.10 |
| Cadmium | 0.10 | 0.03 | 0.41 | 0.06 | 0.08 | 0.07 | 0.05 | 0.23 | 0.16 | 0.07 | 0.03 |
| Chromium | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | 0.04 | <0.025 | <0.025 |
| Copper | 1.49 | 0.60 | 2.23 | 0.72 | 0.85 | 0.56 | 1.68 | 1.60 | 1.46 | 0.71 | 2.29 |
| Lead | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | 0.05 | 0.06 | <0.025 | <0.025 |
| Mercury | 0.02 | 0.04 | 0.01 | 0.01 | 0.02 | 0.05 | 0.01 | 0.02 | 0.01 | 0.02 | 0.02 |
| Nickel | 0.17 | 0.06 | 0.27 | 0.11 | 0.11 | 0.07 | 0.10 | 0.19 | 0.35 | 0.10 | 0.07 |
| Selenium | 1.48 | 1.49 | 2.99 | 1.43 | 1.32 | 0.81 | 1.05 | 1.91 | 1.93 | 2.10 | 1.99 |
| Silver | 0.32 | 0.25 | 0.29 | 0.17 | 0.12 | 0.25 | 0.15 | 0.25 | 0.28 | 0.26 | 0.16 |
| Zinc | 34.50 | 13.90 | 34.20 | 16.15 | 19.50 | 17.35 | 12.50 | 30.70 | 29.50 | 16.60 | 17.90 |
| **Complex Organics (ng/wet g)[1.]** | | | | | | | | | | | |
| 4,4'-DDD | <1 | <1 | 42.1 | <1 | <1 | 11.0 | <1 | <1 | <1 | <1 | <1 |
| 4,4'-DDE | <1 | 2.8 | 9.4 | 5.8 | 5.3 | 12.3 | 6.2 | 18.9 | 15.6 | 19.5 | 10.8 |
| **Total Detectable DDTs** | 0.0 | 2.8 | 51.5 | 5.8 | 5.3 | 23.3 | 6.2 | 18.9 | 15.6 | 19.5 | 10.8 |
| Chlordane-alpha | <1 | <1 | 1.7 | 1.5 | 1.1 | <1 | 1.0 | 1.6 | 2.1 | 1.2 | 1.8 |
| cis-Nonachlor | <1 | <1 | <1 | 2.2 | 1.8 | 3.9 | 1.4 | 1.9 | 1.4 | 2.8 | 3.7 |
| Heptachlor Epoxide | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 3.2 | <1 | <1 |
| trans-Nonachlor | <1 | 1.8 | 1.7 | 4.7 | 4.4 | 13.3 | 3.2 | 4.3 | 3.2 | 5.8 | 6.4 |
| **Total Chlordane** | 0.0 | 1.8 | 3.4 | 8.4 | 7.3 | 17.2 | 5.6 | 7.8 | 6.7 | 9.8 | 11.9 |
| PCB052 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 1.2 |
| PCB066 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 1.3 |
| PCB101 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 1.0 |
| PCB110 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 1.6 | 1.4 | 1.1 | |
| PCB114 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| PCB118 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 1.8 | 1.3 | 1.2 | 1.1 |
| PCB138 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 3.7 | 2.5 | 3.1 | 1.7 |
| PCB153 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 2.5 | 1.3 | 1.7 | <1 |
| **Total Detectable PCBs** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9.6 | 6.5 | 7.1 | 6.3 |



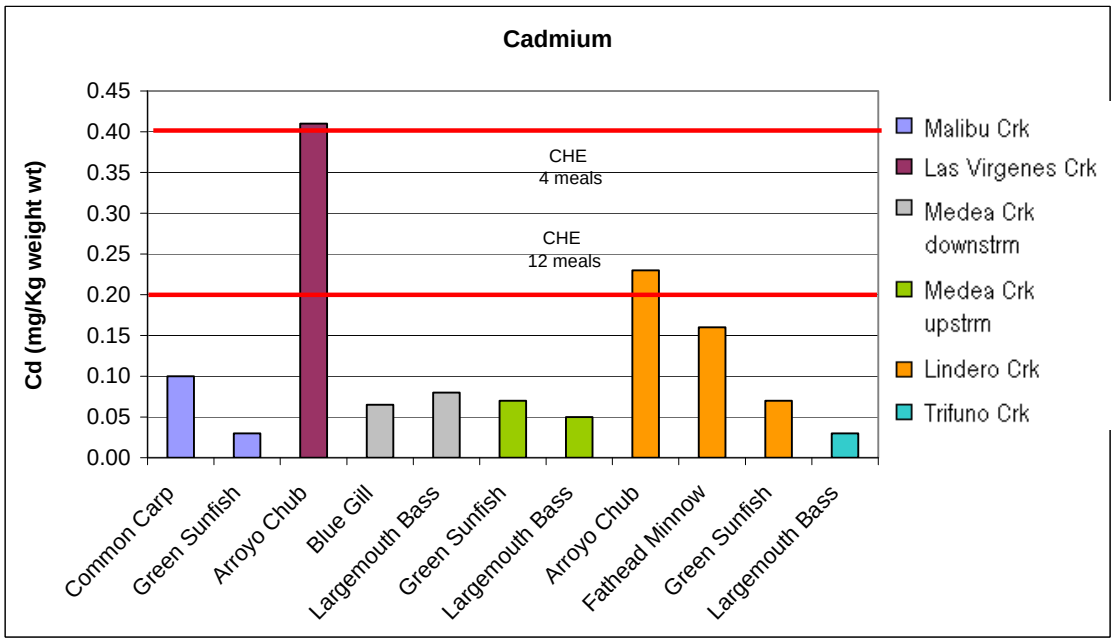
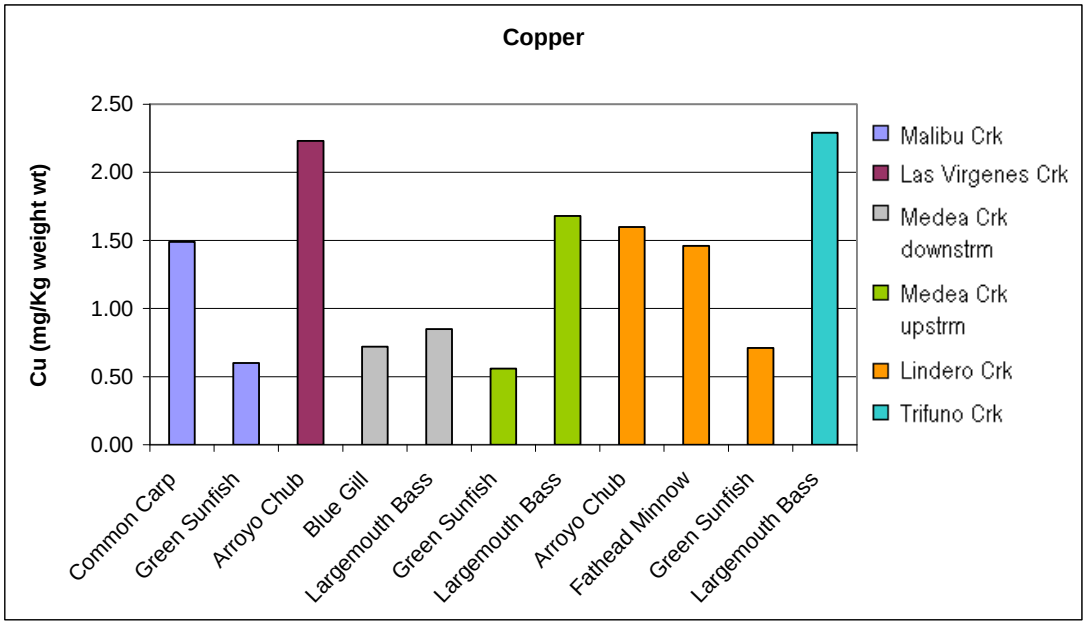
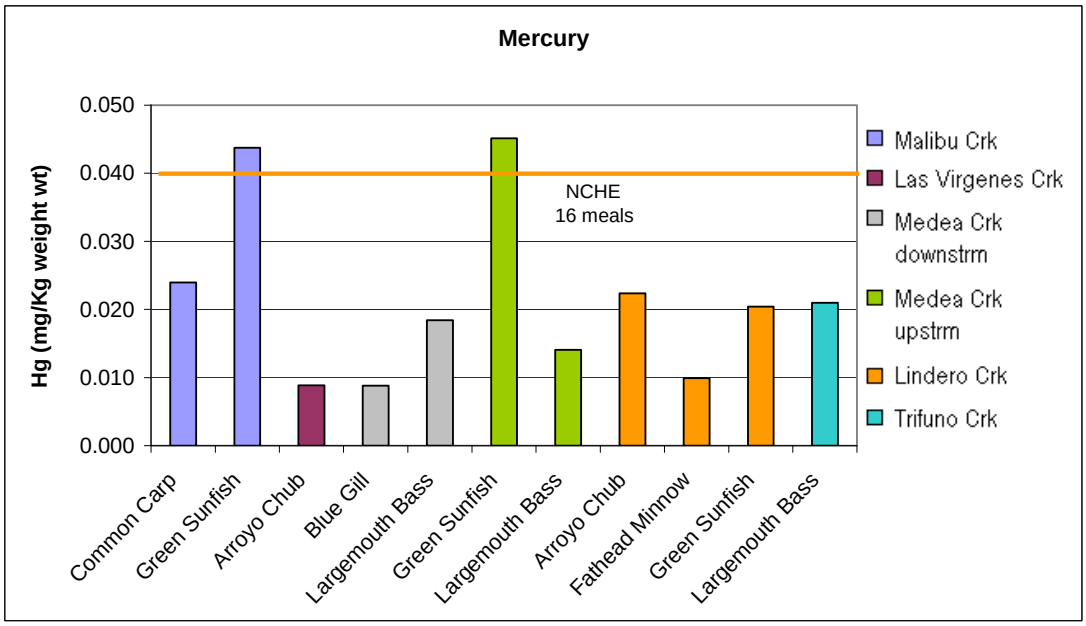




Figure 2. Whole fish contaminant concentrations (metals = ppm wet weight, organics = ppb wet weight) in fish collected at sites in the Malibu Creek Watershed. Red horizontal lines represent EPA fish tissue concentrations with associated cancer health endpoints (CHE) with the risk based consumption limit in meals per month appearing above the bar. Orange horizontal lines represent the EPA non-cancer health endpoints. Magenta horizontal lines represent OEHHA screening values indicating the contaminant concentration that is of potential health concern. All OEHHA screening values are presented in Table 4.

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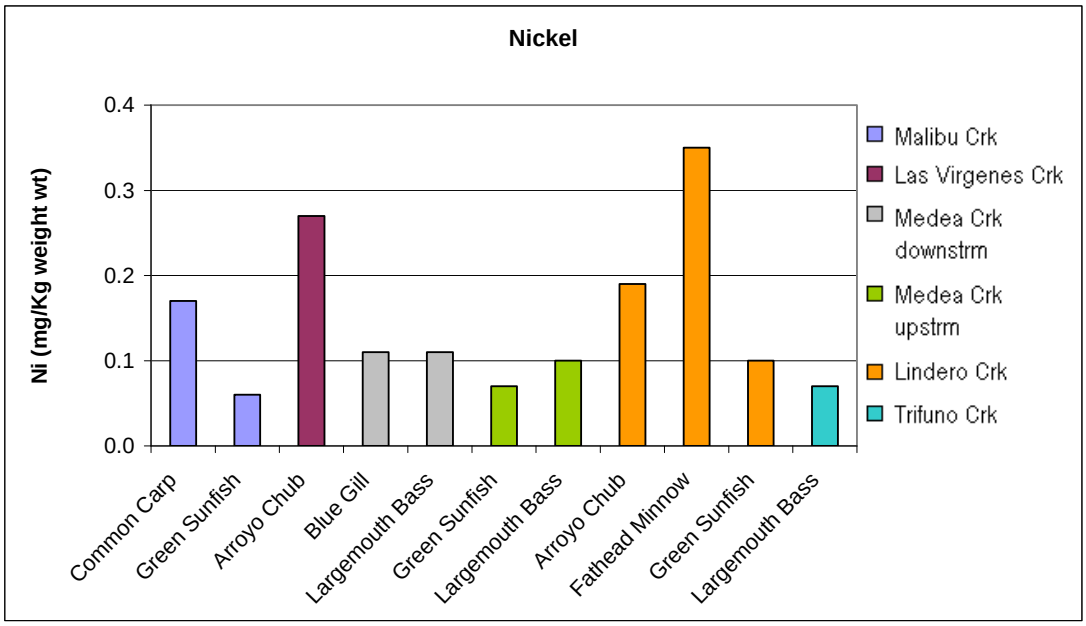


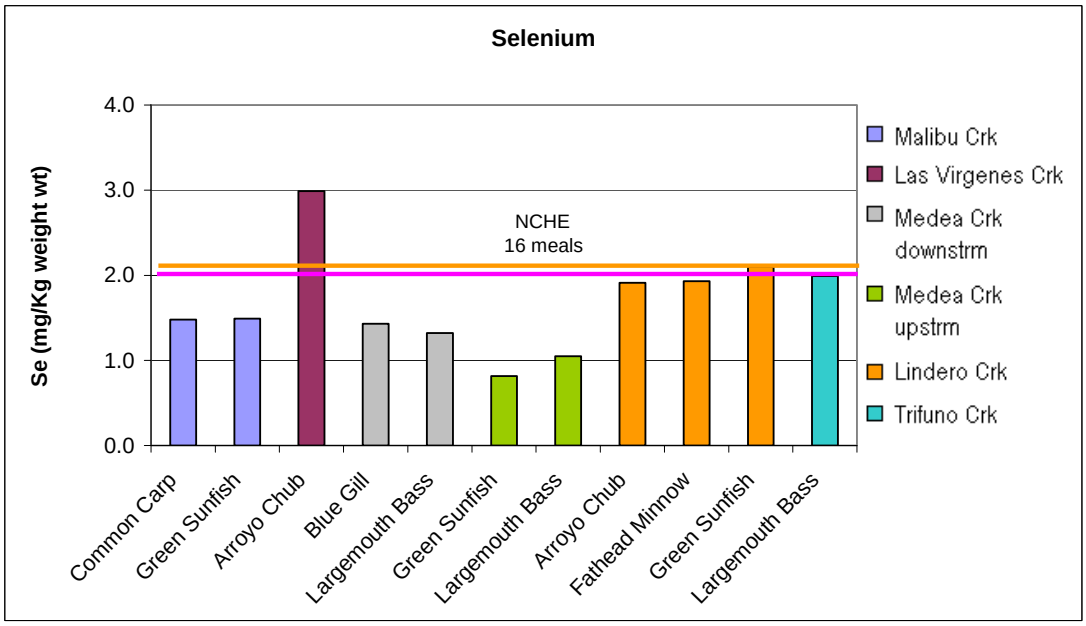


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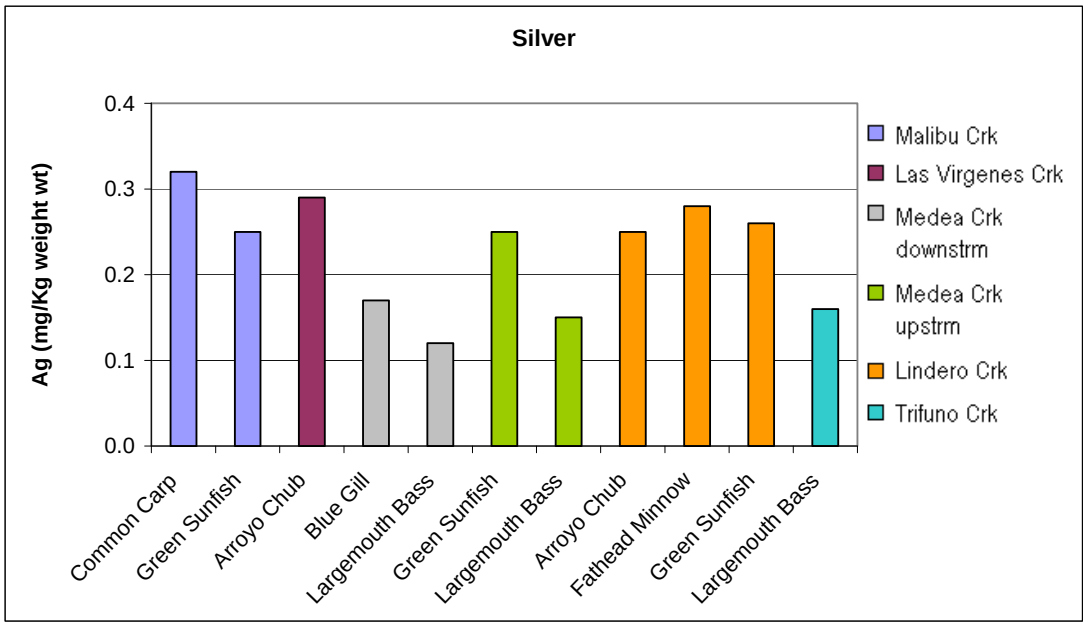


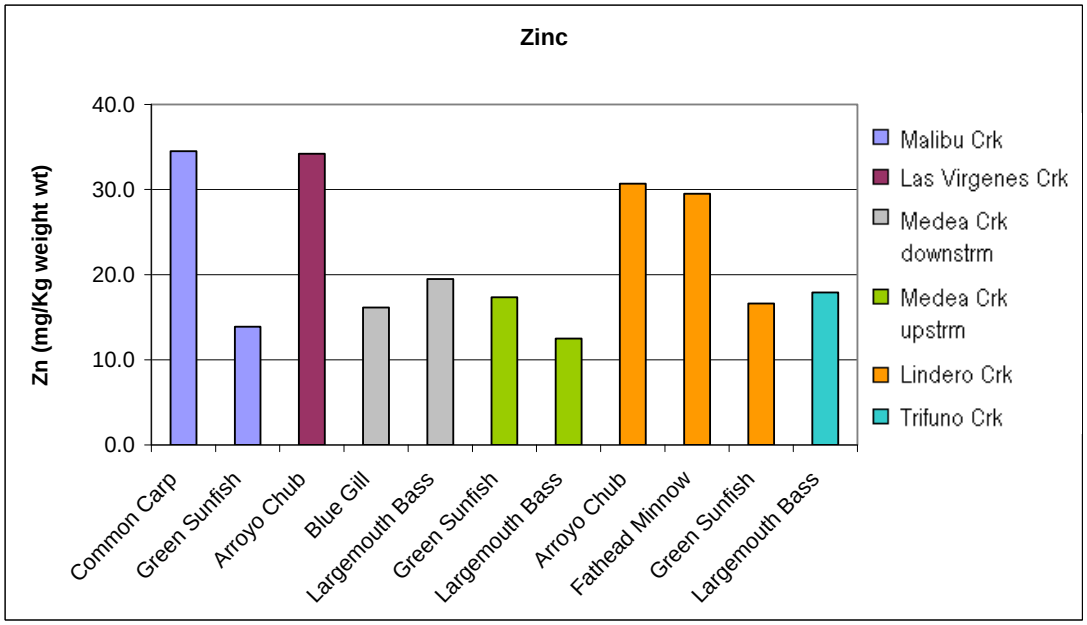


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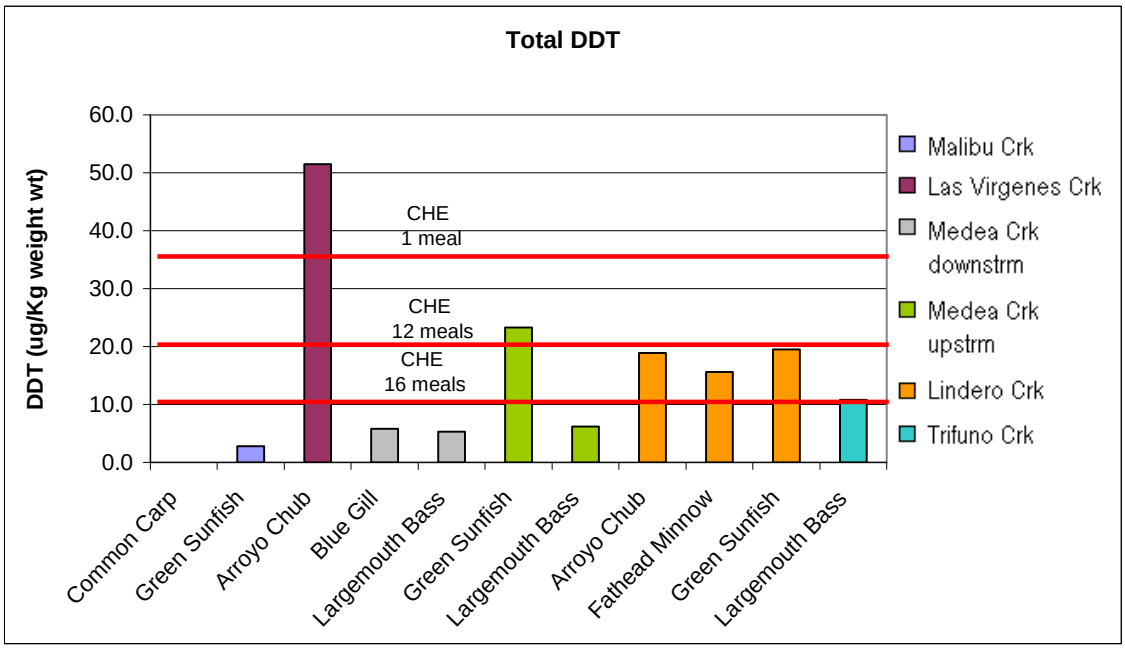


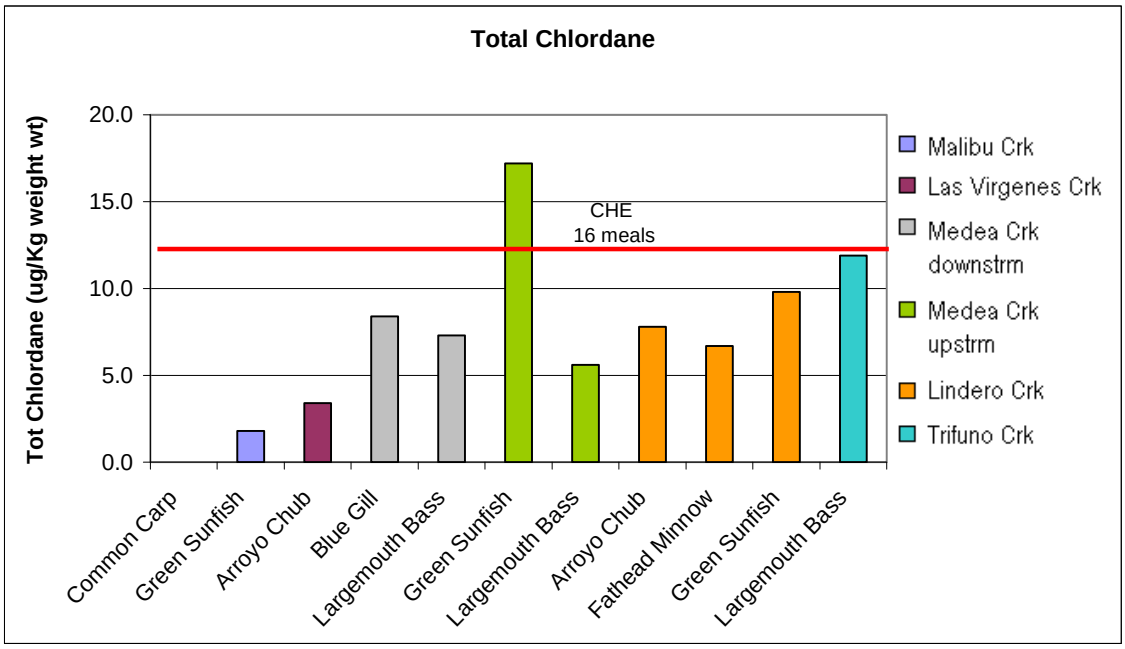


Figure 2. (continued)

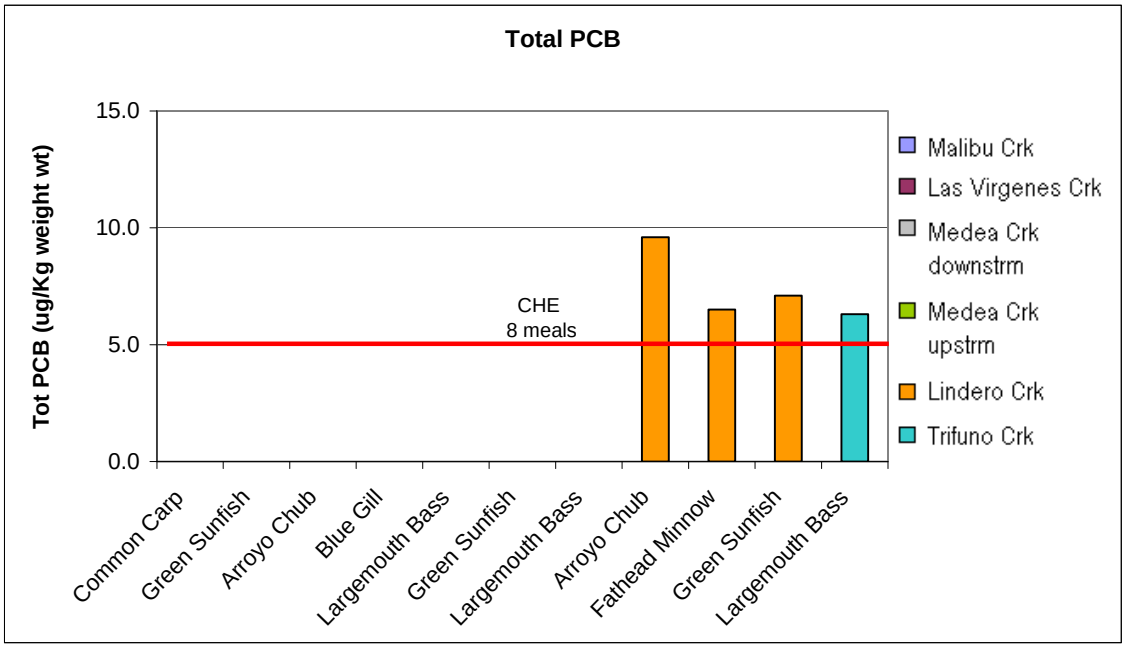


Figure 2. (continued)

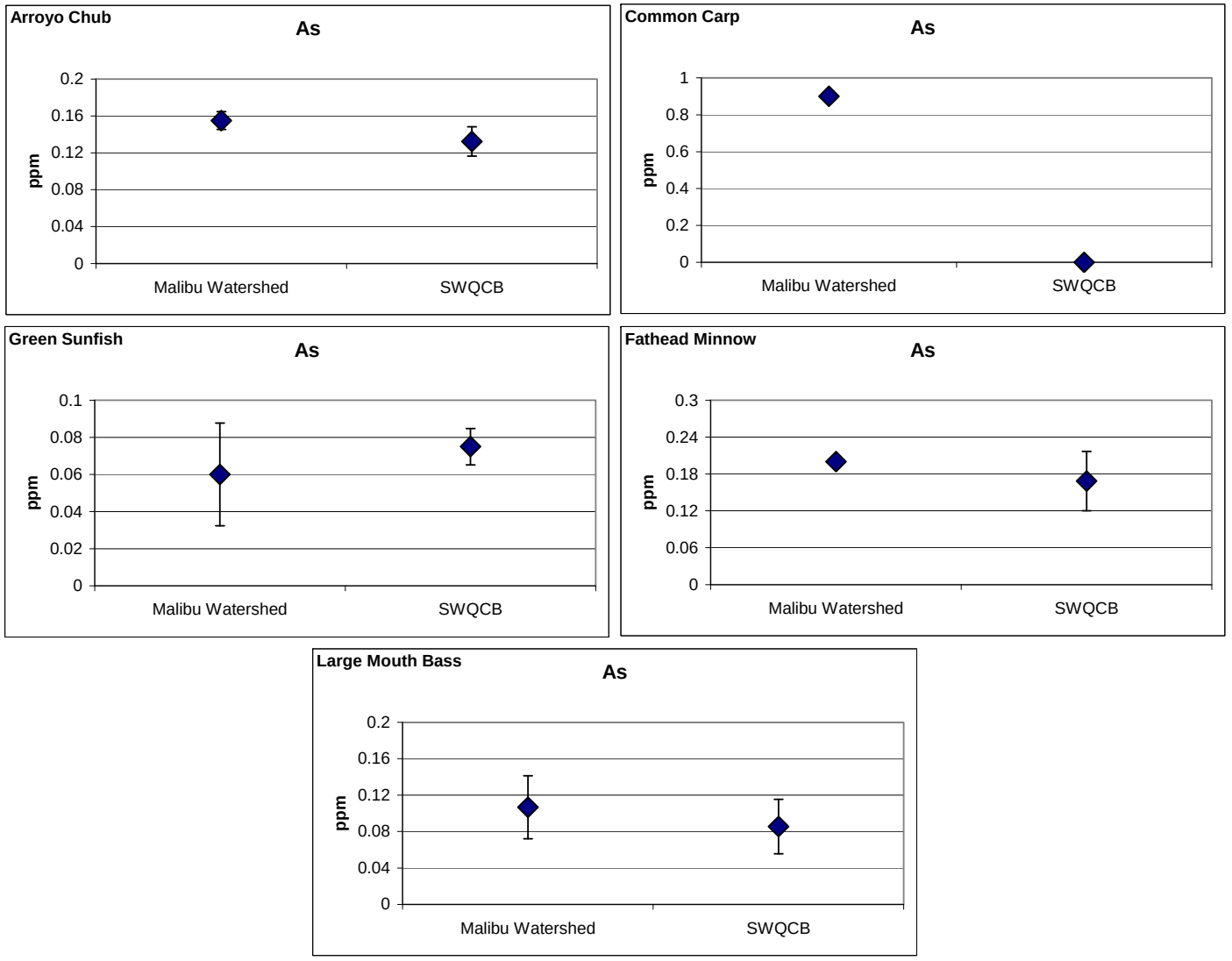


Figure 3. Comparison of average (± 95% CI) whole fish heavy metal (ppm wet weight) and organic contaminants (ppb wet weight) in fish collected at sites in the Malibu Creek Watershed and at locations throughout California by the SWRQB, TSM Program. Where no 95% CI are presented, n = 1. Appendix Tables A2 to A7 shows concentrations, sampling and site location information for the SWRQB data.

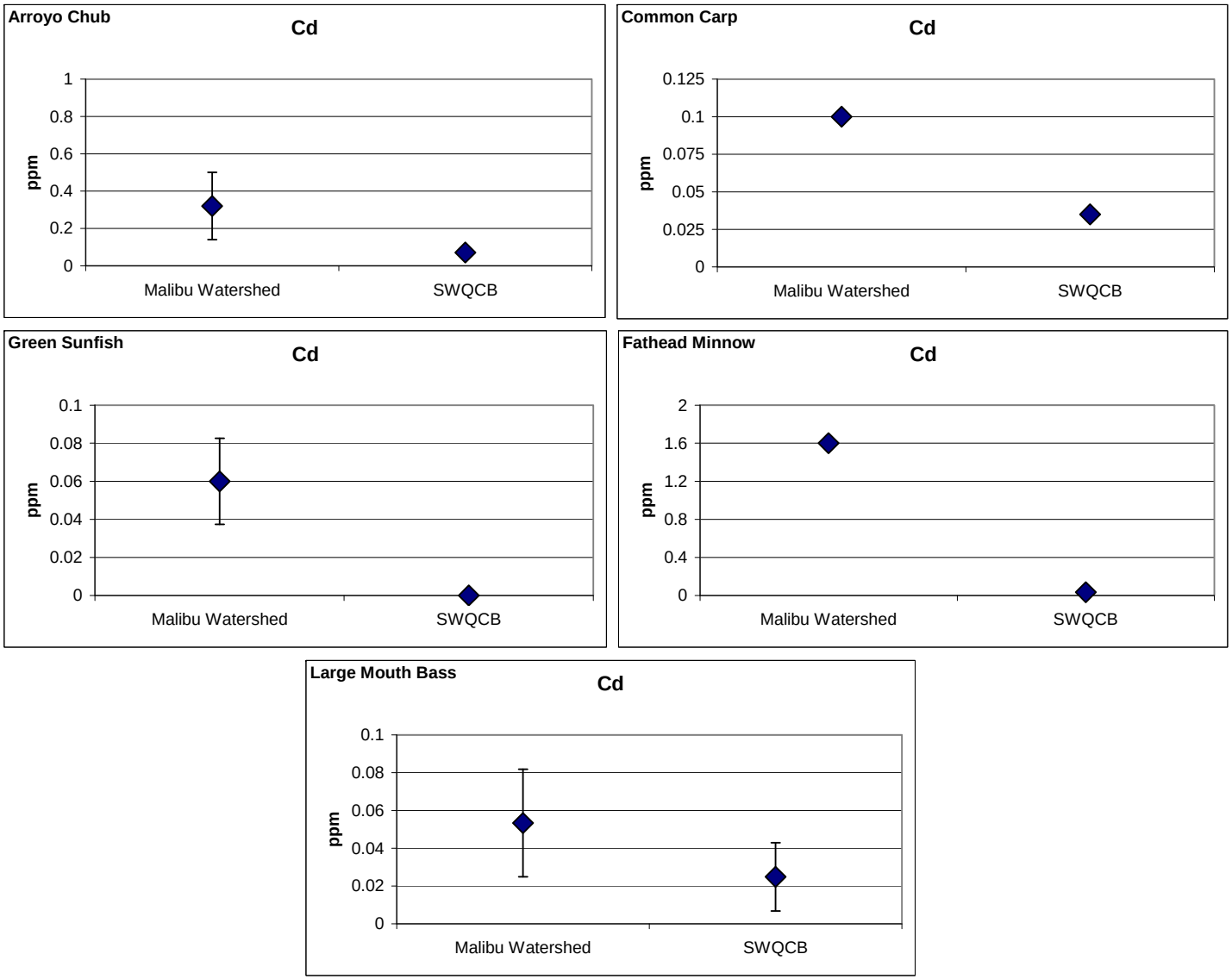


Figure 3. (continued)

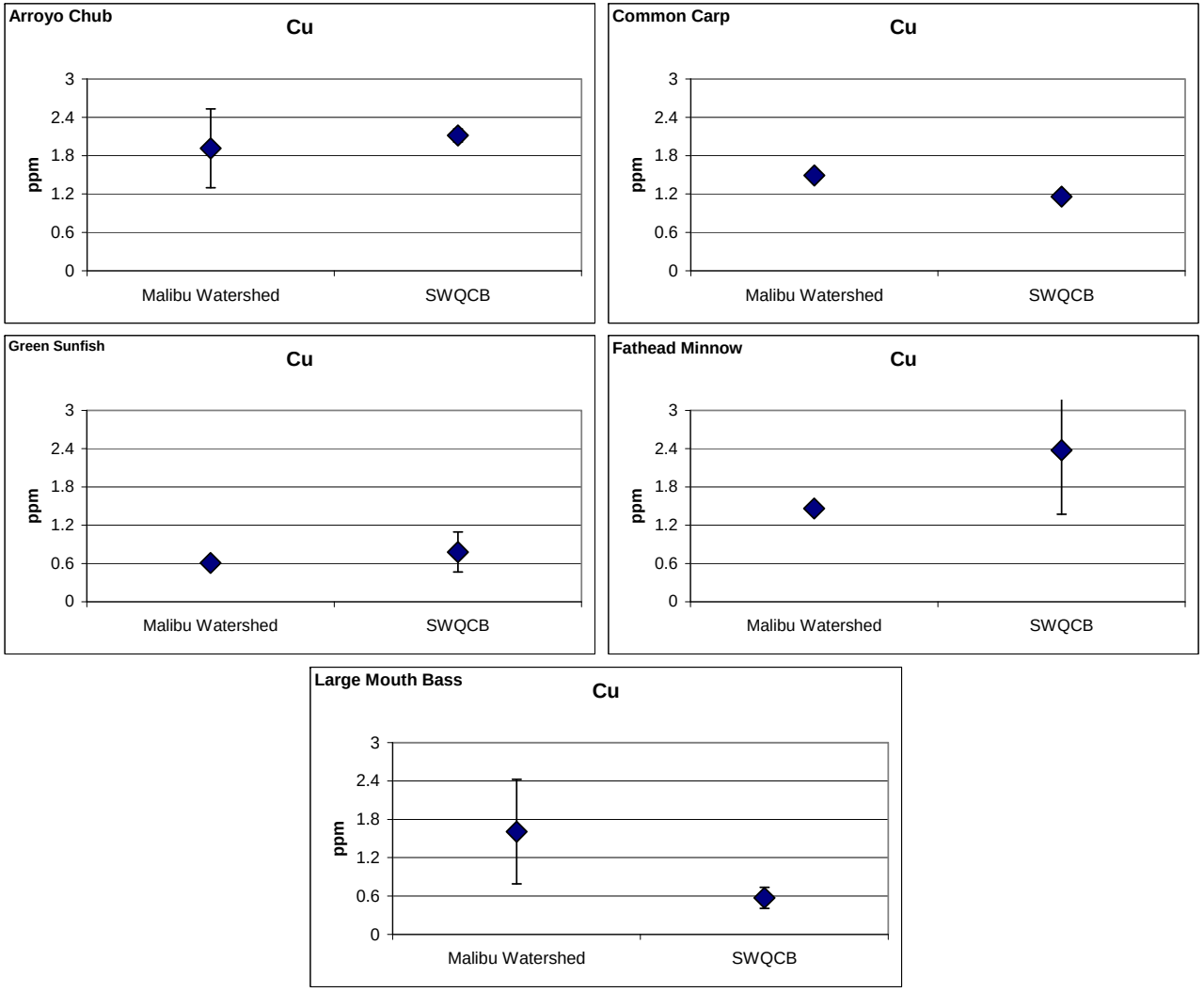


Figure 3. (continued)

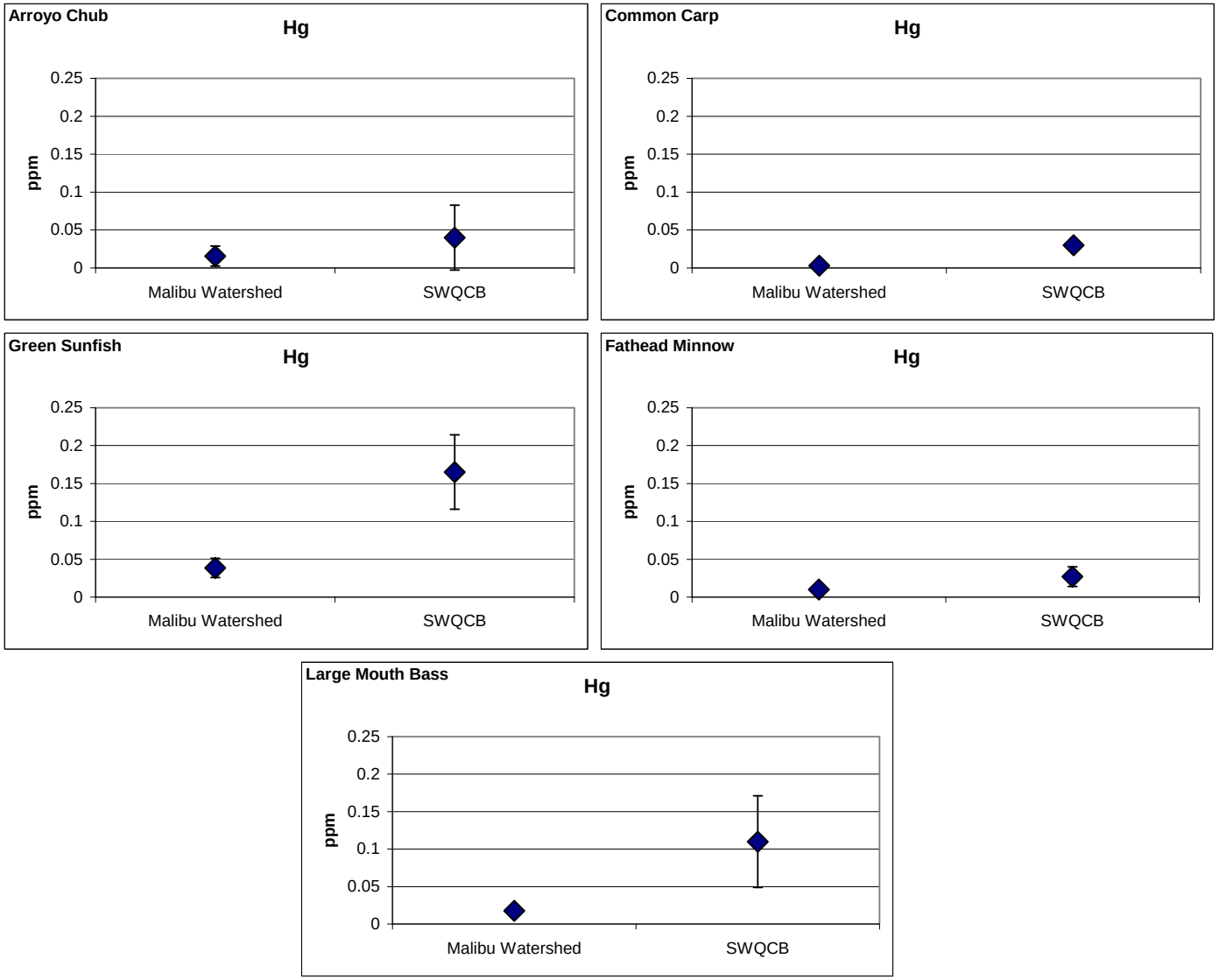


Figure 3. (continued)

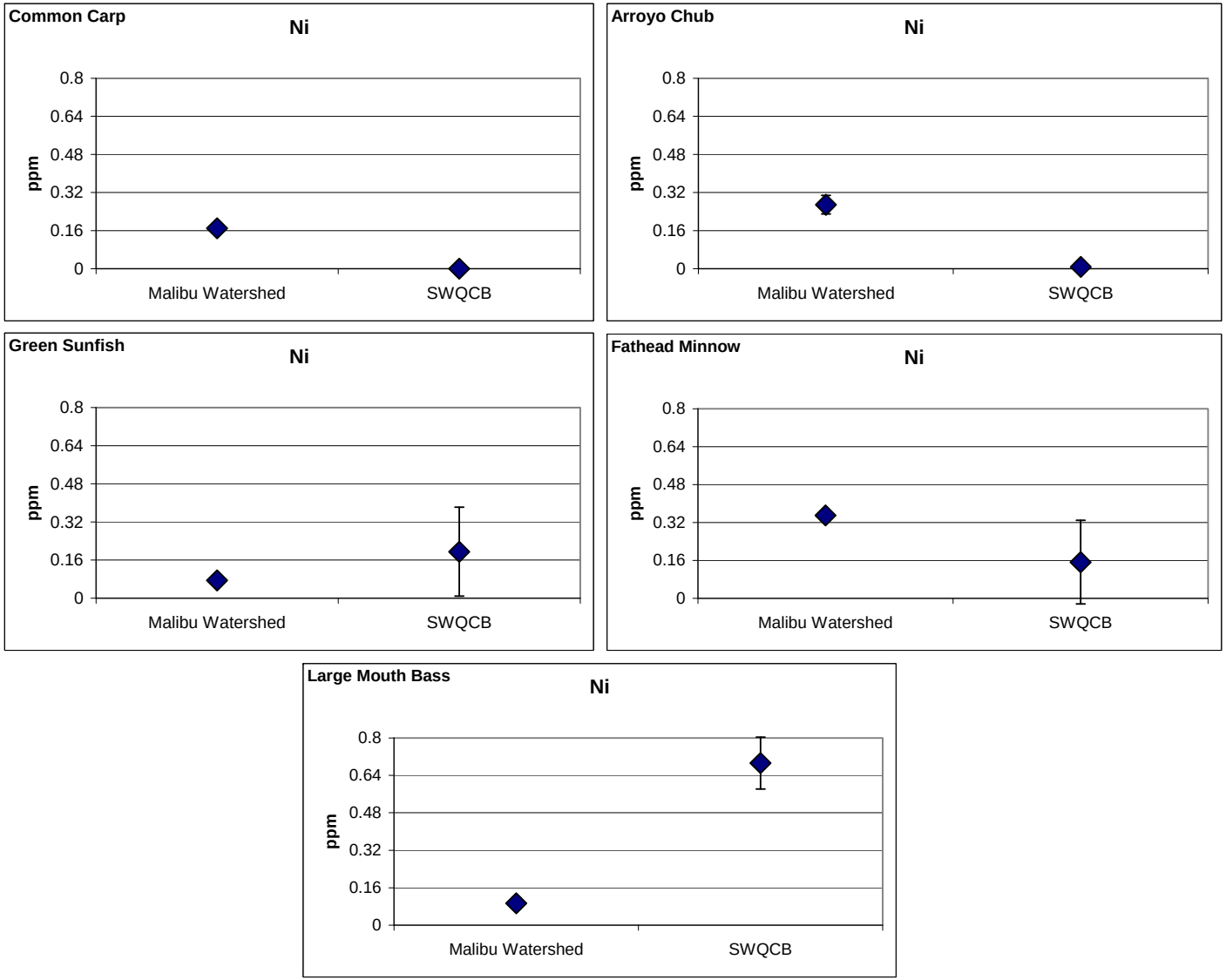


Figure 3. (continued)

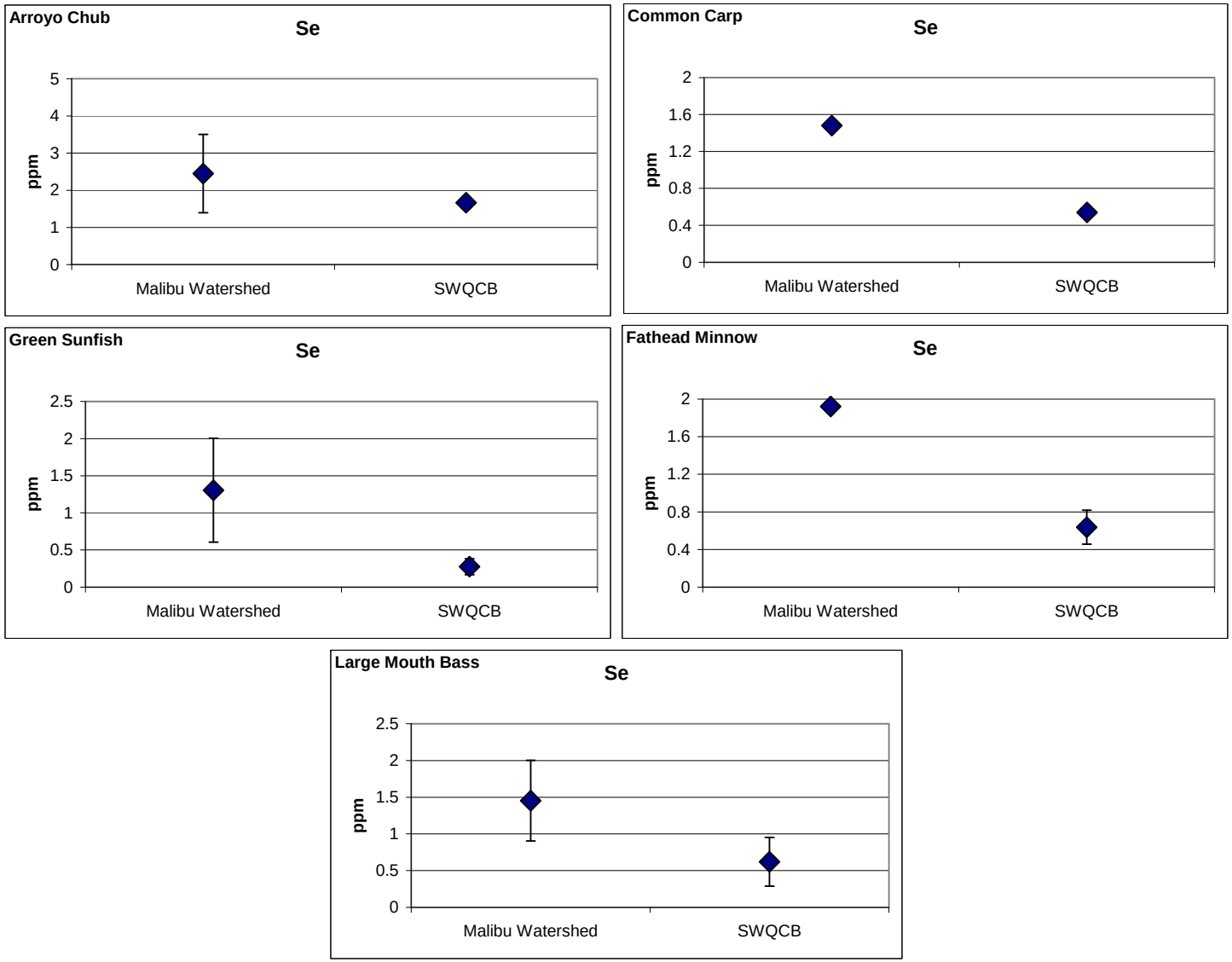


Figure 3. (continued)

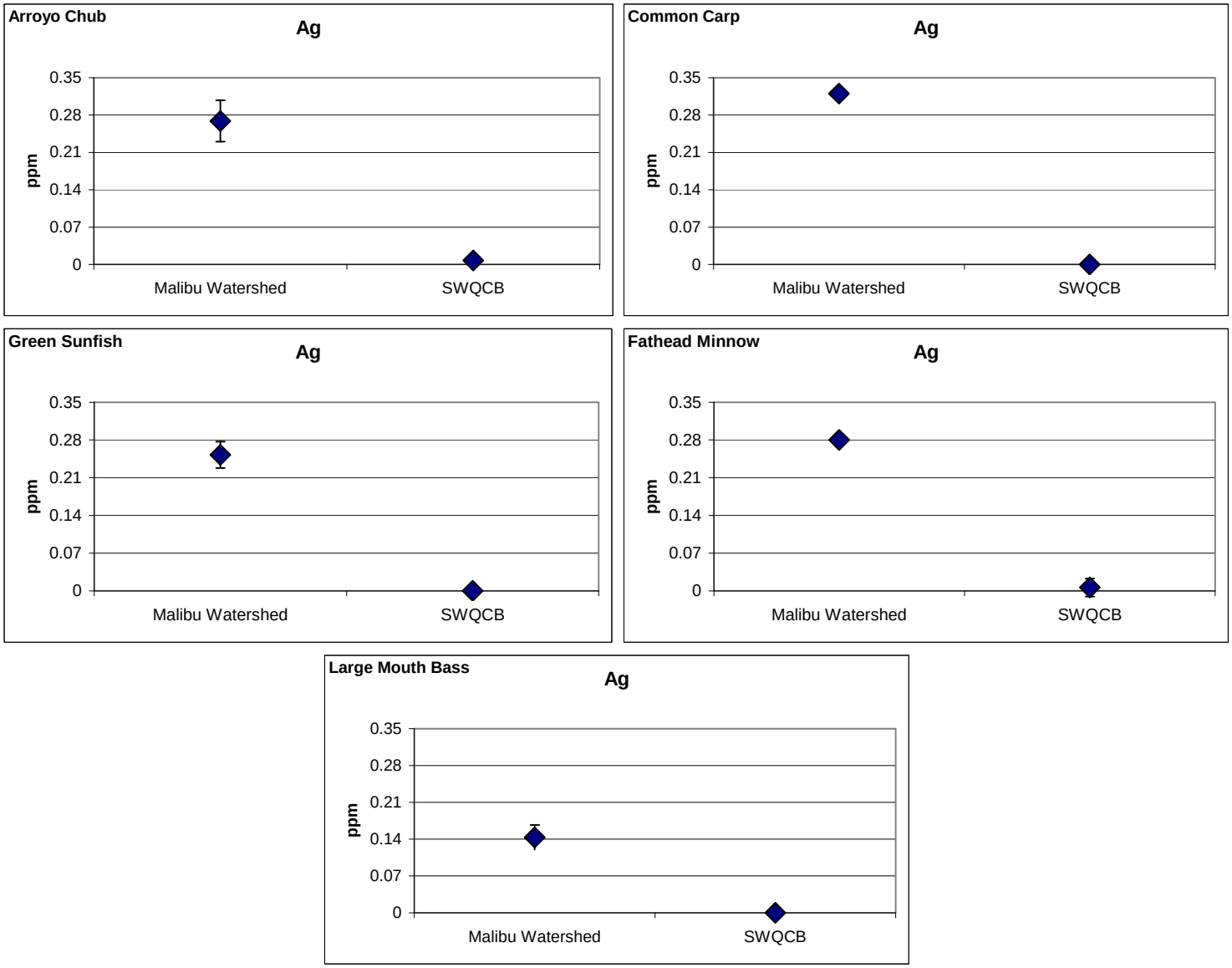


Figure 3. (continued)

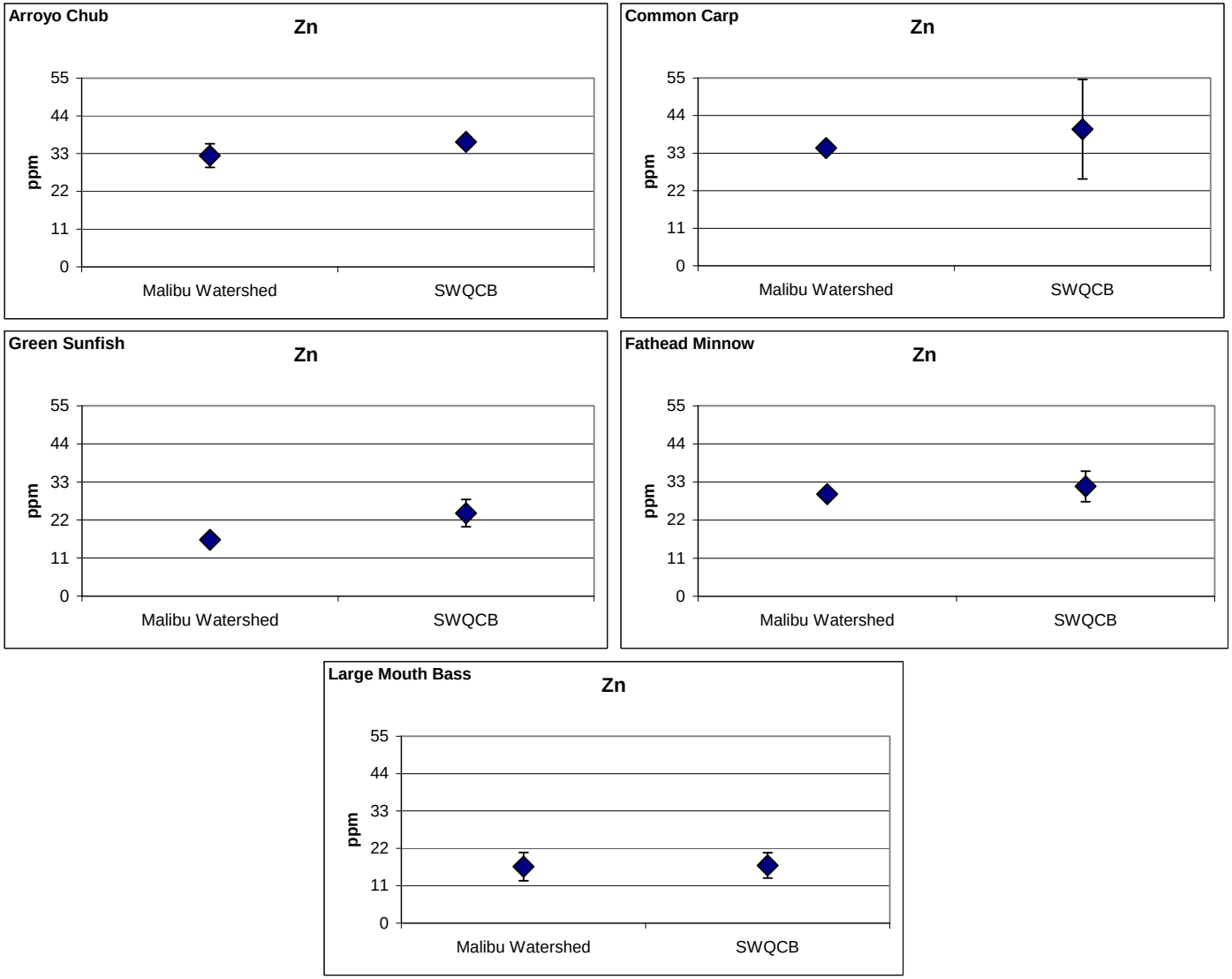


Figure 3. (continued)

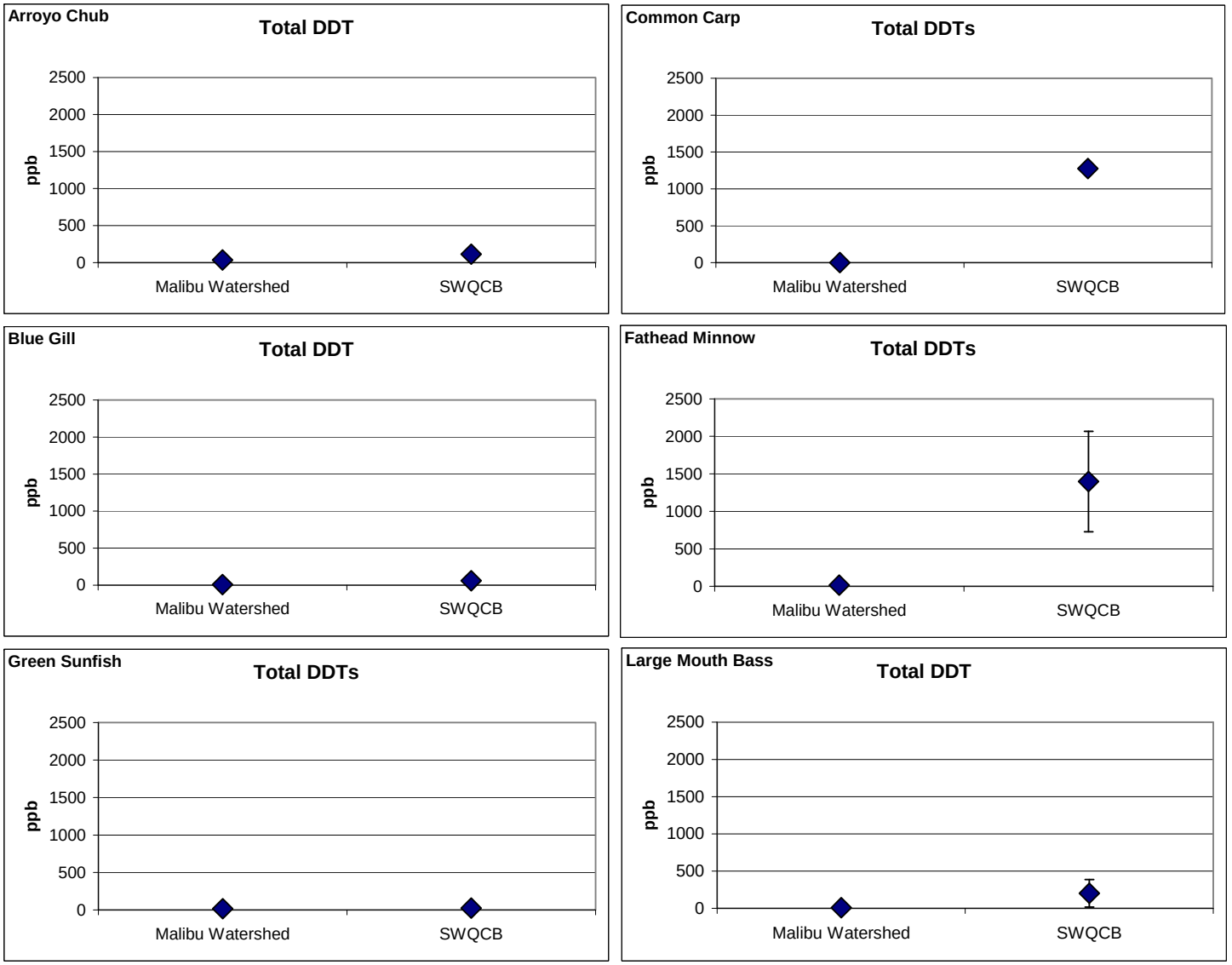


Figure 3. (continued)

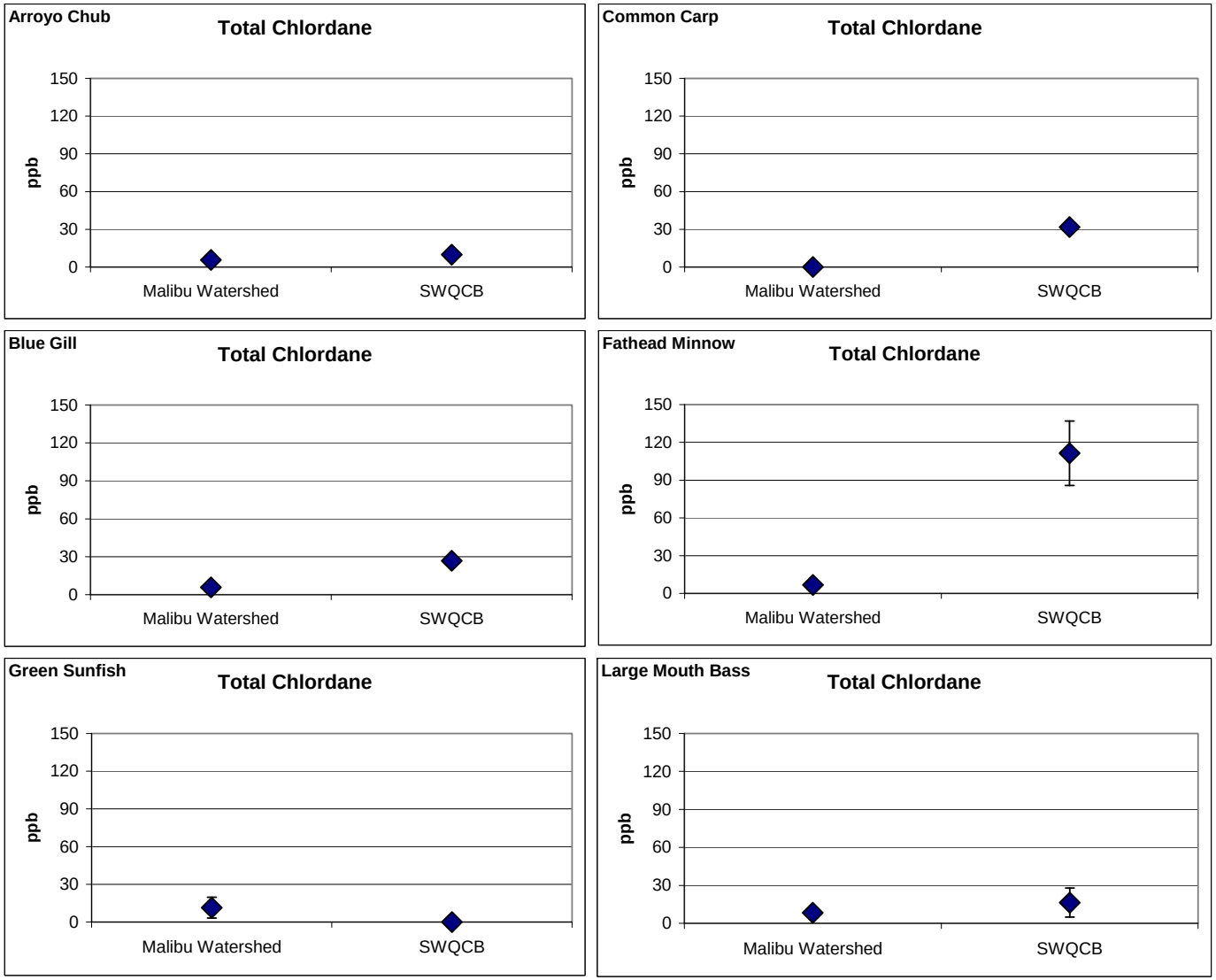


Figure 3. (continued)

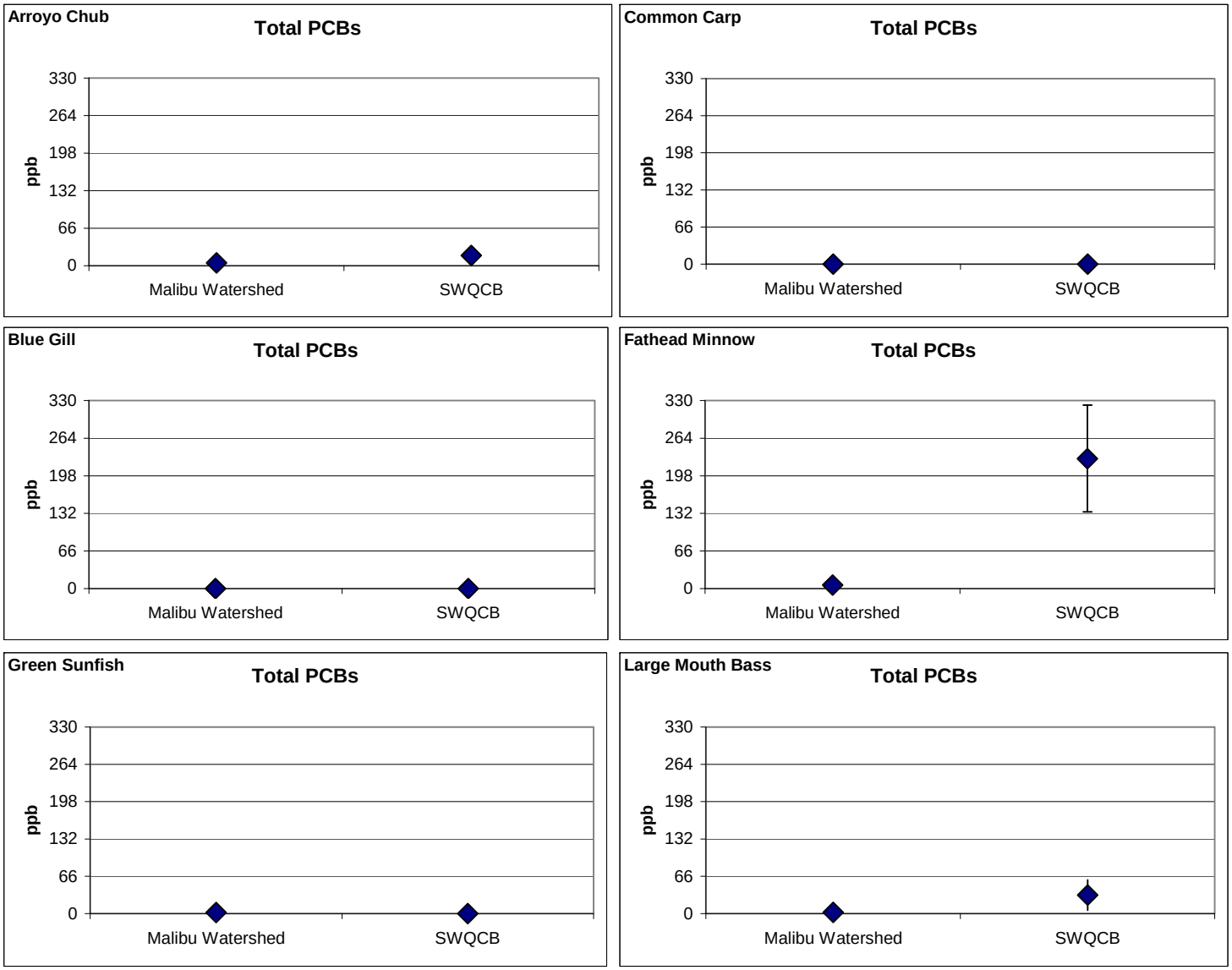


Figure 3. (continued)

## 6.0 Appendix

Table A1. Fish abundances by size class for each sampling location in the Malibu Creek Watershed.

| Common Name | Scientific Name | Size Class (cm) | Abundance | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | MAL | LV2 | MED2 | MED1 | LIN1 | TRI |
| Arroyo Chub | *Gila orcuttii* | 3 | | 27 | | | | |
| | | 4 | | 47 | | | 3 | |
| | | 5 | | 13 | | | 2 | |
| | | 6 | | 1 | | | | |
| | | 7 | | | | | 6 | |
| | | 8 | | | | | 11 | |
| | | 9 | | | | | 5 | |
| Bluegill | *Lepomis macrochirus* | 4 | | | 2 | | | |
| | | 5 | | | 5 | | | |
| | | 6 | | | 6 | | | |
| | | 7 | | | 3 | | | |
| | | 9 | | | 3 | | | |
| | | 10 | | | 2 | | | |
| | | 11 | | | 2 | | | |
| | | 12 | | | 2 | | | |
| | | 13 | | | 2 | | | |
| Common Carp | *Cyprinus carpio* | 5 | 4 | | | | | |
| | | 6 | 7 | | | | | |
| | | 7 | 7 | | | | | |
| | | 8 | 1 | | | | | |
| | | 10 | 2 | | | | | |
| | | 13 | 1 | | | | | |
| | | 16 | 1 | | | | | |
| Fathead Minnow | *Pimephales promelas* | 3 | | | | | 3 | |
| | | 4 | | | | | 22 | |
| | | 5 | | | | | 16 | |
| | | 6 | | | | | 3 | |
| | | 7 | | | | | 3 | |
| Green Sunfish | *Lepomis cyanellus* | 4 | | | | | 1 | |
| | | 6 | 1 | | | | | |
| | | 7 | 1 | | | | 1 | |
| | | 8 | | | | 1 | | |
| | | 9 | 1 | | | | 2 | |
| | | 10 | 2 | | | | 4 | |
| | | 11 | | | | 1 | | |
| | | 12 | 1 | | | | | |
| | | 13 | 1 | | | | | |
| | | 14 | 2 | | | | | |
| | | 16 | | | | 3 | 1 | |
| Largemouth Bass | *Micropterus salmoides* | 4 | | | 1 | | | |
| | | 5 | | | 4 | | | |
| | | 6 | | | 19 | | | 2 |
| | | 7 | | | 25 | | | 15 |
| | | 8 | | | 5 | | | 12 |
| | | 9 | | | 2 | | | 1 |
| | | 13 | | | | 1 | | |
| | | 14 | | | | 1 | | |
| | | 15 | | | | 1 | | |
| | | 18 | | | | 1 | | |

Table A2. Heavy metal (ppm wet weight) concentrations in whole fish composites collected for the State of California, Toxic Substances Monitoring Program.

| Common Name | Scientific Name | County | Station Name | Latitude | Longitude | Sample Date | Arsenic (ppm) | Cadmium (ppm) | Copper (ppm) | Mercury (ppm) | Nickel (ppm) | Selenium (ppm) | Zinc (ppm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Arroyo Chub | *Gila orcuttii* | Los Angeles | Malibu Creek/Tapia Park | 34° 4'39" | 118°42' 3" | 3-Jun-92 | 0.06 | 0.55 | 2.2 | 0.07 | -0.1 | 1.7 | 37 |
| | | | | | | 10-Sep-99 | 0.26 | 0.12 | 1.64 | 0.031 | 0.175 | 1.32 | 33.5 |
| | | | Santa Clara River/Valencia | 34°26' 5" | 118°36'43" | 15-Sep-92 | 0 | 0.025 | 2 | 0.06 | -0.1 | 0.72 | 40 |
| | | Orange | San Juan Creek/Camino Capistrano | 33°29'32" | 117°39'44" | 25-Jul-00 | 0.454 | 0.042 | 1.31 | 0.023 | -0.002 | 1.38 | 40 |
| | | San Bernardino | Mojave River | 34°34' 4" | 117°18'38" | 28-Oct-94 | 0.12 | 0.02 | 2.4 | 0.07 | -0.1 | 0.16 | 42 |
| | | | | | | 29-Oct-96 | <0.05 | <0.01 | 1.8 | 0.04 | -0.1 | 0.27 | 37 |
| | | San Diego | Rainbow Creek | 33°24'40" | 117°12'35" | 24-Jun-92 | <0.05 | 0.07 | 3.7 | 0.02 | -0.1 | 0.99 | 49 |
| | | Ventura | Arroyo Conejo/u/s HCTP | 34°12'52" | 118°54'54" | 9-Aug-00 | 0.21 | 0.04 | 2.61 | 0.027 | -0.002 | 1.67 | 31.6 |
| | | | Arroyo Simi/Madera Road | 34°16'40" | 118°47'48" | 25-Jun-98 | 0.138 | 0.036 | 1.172 | 0.011 | 0.055 | 1.59 | 22.3 |
| | | | | | | 12-Aug-99 | 0.226 | 0.041 | 1.41 | 0.045 | 0.13 | 3.42 | 35.9 |
| | | | | | | 9-Aug-00 | 0.232 | 0.045 | 1.76 | 0.029 | -0.002 | 3.85 | 35.4 |
| | | | Calleguas Creek | 34°10'45" | 119° 2'40" | 9-Aug-00 | 0.121 | 0.031 | 2.32 | 0.031 | -0.002 | 0.832 | 42.2 |
| | | | Santa Clara River Estuary | 34°14' 0" | 119°15'19" | 13-Aug-99 | 0.126 | 0.031 | 1.22 | 0.041 | 0.15 | 1.51 | 36.6 |
| | | | | | | 9-Aug-00 | 0.1885 | 0.079 | 1.865 | -0.01 | -0.002 | 1.345 | 32.4 |
| | | | Santa Paula Creek/Stekel Park | 34°24'43" | 119° 4'52" | 30-Jun-95 | <0.05 | 0.04 | 2.5 | 0.06 | -0.1 | 1.2 | 43 |
| | | | Ventura River/d/s OVSD Discharge | 34°20'30" | 119°17'51" | 21-Jun-93 | <0.05 | 0.02 | 4.1 | 0.11 | -0.1 | 2.2 | 40 |
| | | | | | | 26-Jun-98 | 0.095 | 0.053 | 2.34 | 0.016 | 0.011 | 1.78 | 28.1 |
| | | | | | | 17-Aug-00 | 0.191 | 0.012 | 2.45 | 0.037 | -0.002 | 3.94 | 36.4 |
| | | | Ventura River/u/s OVSD Discharge | 34°21'19" | 119°18'33" | 26-Jun-98 | 0.128 | 0.115 | 2.006 | 0.026 | 0.033 | 1.96 | 30.9 |
| | | | | | | 13-Aug-99 | 0.124 | 0.074 | 1.89 | 0.094 | 0.136 | 2.68 | 40.9 |
| Common Carp | *Cyprinus carpio* | San Diego | Escondido Creek/Camino Del Norte | 33° 2'54" | 117°13'31" | 10-Jun-92 | <0.05 | 0.02 | 1.5 | 0.03 | -0.1 | 0.54 | 37 |
| | | Ventura | Ventura River | 34°18' 6" | 119°18'10" | 20-Jun-91 | <0.05 | 0.05 | 0.82 | 0.03 | -0.1 | 0.54 | 43 |
| Fathead Minnow | *Pimephales promelas* | Los Angeles | Belvedere Park Lake | 34° 2' 6" | 118° 9'26" | 18-Apr-91 | 0.12 | 0.03 | 4.05 | -0.02 | 0.1 | 0.3 | 45 |
| | | | | | | 25-Apr-92 | <0.05 | <0.01 | 2.3 | 0.03 | 0.08 | 0.2 | 49 |
| | | | Los Angeles River/Los Feliz Road | 34° 7'15" | 118°16' 8" | 28-Jun-92 | 0.06 | 0.04 | 1.3 | 0.06 | -0.1 | 0.61 | 25 |
| | | | Los Angeles River/Sepulveda Basin | 34°10'16" | 118°28'40" | 28-Jun-92 | 0.08 | 0.02 | 1.7 | 0.06 | -0.1 | 1 | 32 |
| | | Orange | Craig Park Lake | 33°54' 0" | 117°53' 4" | 19-May-87 | 0.115 | <0.01 | 1.15 | 0.04 | -0.1 | 0.525 | 22 |
| | | Riverside | Anza Channel | 33°57' 8" | 117°27'35" | 23-May-89 | 0.18 | 0.03 | 3.4 | -0.02 | 0.2 | 0.47 | 42 |
| | | | | | | 22-May-90 | 0.21 | 0.03 | 2.3 | 0.04 | 0.1 | 0.56 | 15 |
| | | | | | | 6-Jun-92 | 0.25 | 0.04 | 3.15 | 0.03 | -0.1 | 0.41 | 37 |
| | | | | | | 18-May-93 | 0.25 | 0.04 | 12 | 0.02 | 0.3 | 0.4 | 34 |
| | | | | | | 1-Jun-94 | 0.14 | 0.02 | 1.6 | 0.02 | -0.1 | 0.53 | 35 |
| | | Santa Barbara | Atascadero Creek | 34°25'30" | 119°48'35" | 29-Aug-00 | 0.503 | 0.022 | 1.34 | 0.031 | 1.82 | 1.01 | 32.9 |
| | | Santa Clara | Coyote Creek/Brokaw Road | 37°23' 0" | 121°54'15" | 3-Jul-87 | 0.36 | <0.01 | 1.7 | -0.02 | -0.1 | 0.79 | 35 |
| | | Sonoma | Laguna de Santa Rosa/Stony Point | 38°21' 8" | 122°44'25" | 13-Oct-94 | 0.29 | 0.01 | 0.73 | 0.06 | 0.41 | 0.24 | 41 |
| | | Ventura | Arroyo Simi | 34°17'11" | 118°51'42" | 19-Jun-91 | 0.07 | 0.04 | 0.9 | 0.11 | 0.2 | 2.2 | 44 |
| | | | Calleguas Creek | 34°10'45" | 119° 2'40" | 16-Jul-97 | 0.065 | 0.0155 | 0.6 | 0.014 | 0.04 | 0.44 | 17.1 |
| | | | Conejo Creek | 34°11'15" | 119° 0'45" | 2-Jun-92 | 0.145 | 0.145 | 2.15 | 0.03 | 0.5 | 0.74 | 30 |
| | | | Revolon Slough | 34°10'11" | 119° 5'42" | 16-Jul-97 | 0.171 | 0.052 | 0.8 | 0.014 | -0.0002 | 1.19 | 15.7 |
| Green Sunfish | *Lepomis cyanellus* | Sonoma | Petaluma River/Petaluma | 38°15'41" | 122°39'37" | 25-Aug-93 | 0.08 | <0.01 | 0.62 | 0.14 | 0.1 | 0.22 | 26 |
| | | | Russian River/Odd Fellows Park Bridge | 38°30'11" | 122°57'33" | 23-Jul-92 | 0.07 | <0.01 | 0.94 | 0.19 | 0.29 | 0.33 | 22 |
| Largemouth Bass | *Micropterus salmoides* | Los Angeles | Belvedere Park Lake | 34° 2' 6" | 118° 9'26" | 24-Jun-98 | 0.031 | 0.016 | 0.507 | 0.061 | 0.022 | 0.573 | 20.3 |
| | | | Malibu Creek/Tapia Park | 34° 4'39" | 118°42' 3" | 10-Aug-00 | 0.152 | 0.098 | 0.595 | 0.035 | -0.002 | 2.11 | 18.1 |
| | | | Malibu Creek/u/s Tapia Discharge | 34° 5' 5" | 118°42'42" | 10-Sep-99 | 0.089 | 0.052 | 0.465 | 0.035 | 0.176 | 1.1 | 19.4 |
| | | Merced | Merced River/Hatfield St Recreation Area | 37°21'30" | 120°57'10" | 5-Nov-98 | 0.08 | 0.007 | 1.078 | 0.113 | -0.001 | 0.414 | 12.8 |
| | | Placer | Camp Far West | 39° 1'53" | 121°16' 9" | 28-Oct-98 | 0.047 | 0.028 | 1.018 | 0.275 | 0.07 | 0.354 | 13.5 |
| | | Sacramento/Yolo | Sacramento River/Hood | 38°22'13" | 121°31'16" | 19-Nov-98 | 0.167 | 0.014 | 0.421 | 0.326 | -0.001 | 0.491 | 10.8 |
| | | San Diego | Sweetwater River/Interstate 805 | 32°39'27" | 117° 4'12" | 22-Jun-97 | 0.012 | 0.001 | 0.18 | 0.022 | -0.0002 | 0.13 | 10.8 |
| | | San Joaquin | San Joaquin River/Vernalis | 37°40'22" | 121°14'38" | 18-Aug-98 | 0.138 | 0.003 | 0.41 | 0.156 | -0.001 | 0.663 | 12.9 |
| | | Santa Cruz | Schwann Lake | 36°57'45" | 121°59'43" | 7-Aug-91 | 0.08 | <0.01 | 0.77 | 0.04 | -0.1 | 0.15 | 31 |
| | | Stanislaus | Tuolumne River/Shilo Road | 37°36'26" | 121° 8'41" | 11-Sep-98 | 0.044 | 0.004 | 0.367 | 0.122 | -0.001 | 0.476 | 13.4 |
| | | Trinity | Claire Engle Lake | 40°49'30" | 122°45'45" | 1-Oct-89 | 0.1 | 0.05 | 0.48 | 0.04 | 0.6 | 0.37 | 24 |

Table A3. Organic constituent (ppb wet weight) concentrations in whole fish composites collected for the State of California, Toxic Substances Monitoring Program.

| Common Name | Scientific Name | County | Station Name | Latitude | Longitude | Sample Date | Total DDTs (ppb) | Total Chlordane (ppb) | Total PCBs (ppb) |
|---|---|---|---|---|---|---|---|---|---|
| Arroyo Chub | *Gila orcuttii* | Los Angeles | Malibu Creek/Tapia Park | 34° 4'39" | 118°42' 3" | 6/3/1992 | 41 | 11 | 0 |
| | | | | | | 9/10/1999 | 19 | 5.3 | 14 |
| | | | Santa Clara River/Valencia | 34°26' 5" | 118°36'43" | 6/11/1991 | 22 | 0 | 108 |
| | | | | | | 9/15/1992 | 59.5 | 22.05 | 55 |
| | | Orange | San Juan Creek/Camino Capistrano | 33°29'32" | 117°39'44" | 7/25/2000 | 31.7 | 7.6 | 35 |
| | | San Bernardino | Mojave River | 34°34' 4" | 117°18'38" | 10/28/1994 | 6.1 | 0 | 0 |
| | | San Diego | Rainbow Creek | 33°24'40" | 117°12'35" | 6/24/1992 | 13 | 0 | 0 |
| | | | | | | 7/26/1995 | 28.5 | 7.3 | 0 |
| | | Ventura | Arroyo Conejo/u/s HCTP | 34°12'52" | 118°54'54" | 8/9/2000 | 63.4 | 42.1 | 12 |
| | | | Arroyo Simi/Madera Road | 34°16'40" | 118°47'48" | 6/25/1998 | 38 | 2.5 | 29.1 |
| | | | | | | 8/12/1999 | 69.5 | 16.3 | 40 |
| | | | | | | 8/9/2000 | 23.5 | 2.9 | 18 |
| | | | Calleguas Creek | 34°10'45" | 119° 2'40" | 8/9/2000 | 1954.7 | 34.7 | 100 |
| | | | Santa Clara River Estuary | 34°14' 0" | 119°15'19" | 8/13/1999 | 42.6 | 1.4 | 0 |
| | | | | | | 8/9/2000 | 17.65 | 0.5 | 0 |
| | | | Santa Clara River/Santa Paula | 34°20'55" | 119° 3' 5" | 6/29/1992 | 57 | 5.2 | 0 |
| | | | Ventura River/d/s OVSD Discharge | 34°20'30" | 119°17'51" | 6/21/1993 | 58 | 23.8 | 0 |
| | | | | | | 6/26/1998 | 20.1 | 8.4 | 0 |
| | | | | | | 8/17/2000 | 11 | 6.9 | 11 |
| | | | Ventura River/u/s OVSD Discharge | 34°21'19" | 119°18'33" | 6/26/1998 | 20 | 5.8 | 0 |
| | | | | | | 8/13/1999 | 11.4 | 4.2 | 11 |
| Bluegill | *Lepomis macrochirus* | Sonoma | Mark West Creek | 38°29'41" | 122°51' 4" | 8/7/1997 | 60 | 26.8 | 0 |
| Common Carp | *Cyprinus carpio* | San Diego | Escondido Creek/Camino Del Norte | 33° 2'54" | 117°13'31" | 6/10/1992 | 6.7 | 0 | 0 |
| | | Santa Cruz | Watsonville Slough/u/s Harkins Slough | 36°53'40" | 121°47'52" | 6/5/1985 | 3815 | 95 | 0 |
| | | Ventura | Ventura River | 34°18' 6" | 119°18'10" | 6/20/1991 | 8.4 | 0 | 0 |
| Fathead Minnow | *Pimephales promelas* | Los Angeles | Belvedere Park Lake | 34° 2' 6" | 118° 9'26" | 4/18/1991 | 69 | 156.4 | 158 |
| | | | | | | 4/25/1992 | 185 | 208.7 | 400 |
| | | | Los Angeles River/Los Feliz Road | 34° 7'15" | 118°16' 8" | 6/28/1992 | 22 | 41 | 0 |
| | | | Los Angeles River/Sepulveda Basin | 34°10'16" | 118°28'40" | 6/28/1992 | 58 | 91 | 0 |
| | | Orange | Craig Park Lake | 33°54' 0" | 117°53' 4" | 5/19/1987 | 121.5 | 215.75 | 220 |
| | | Riverside | Anza Channel | 33°57' 8" | 117°27'35" | 5/23/1989 | 807 | 33.3 | 890 |
| | | | | | | 5/22/1990 | 433 | 71.4 | 853 |
| | | | | | | 6/6/1992 | 429 | 108.05 | 430 |
| | | | | | | 6/1/1994 | 458 | 43.7 | 223 |
| | | Santa Barbara | Atascadero Creek | 34°25'30" | 119°48'35" | 8/29/2000 | 47 | 29.8 | 188 |
| | | Santa Clara | Coyote Creek/Brokaw Road | 37°23' 0" | 121°54'15" | 7/3/1987 | 424 | 207.6 | 480 |
| | | Sonoma | Laguna de Santa Rosa/Stony Point | 38°21' 8" | 122°44'25" | 10/13/1994 | 11 | 15.2 | 0 |
| | | Ventura | Arroyo Simi | 34°17'11" | 118°51'42" | 6/19/1991 | 60 | 17.6 | 54 |
| | | | Calleguas Creek | 34°10'45" | 119° 2'40" | 6/2/1992 | 1784 | 94.1 | 57 |
| | | | | | | 6/20/1993 | 2385 | 109.6 | 0 |
| | | | | | | 6/23/1994 | 1495 | 48 | 0 |
| | | | | | | 7/16/1997 | 4813 | 107.35 | 345.5 |
| | | | Conejo Creek | 34°11'15" | 119° 0'45" | 6/2/1992 | 1584.5 | 86.15 | 69 |
| | | | Oxnard Drainage Ditch 2 | 34° 7'47" | 119° 6'47" | 6/21/1994 | 1683 | 128 | 0 |
| | | | Revolon Slough | 34°10'11" | 119° 5'42" | 6/20/1993 | 3222 | 130 | 0 |
| | | | | | | 6/23/1994 | 4679 | 127 | 140 |
| | | | | | | 7/16/1997 | 5938 | 265.1 | 495 |
| Green Sunfish | *Lepomis cyanellus* | Sonoma | Russian River/Odd Fellows Park Bridge | 38°30'11" | 122°57'33" | 7/23/1992 | 24 | 0 | 0 |
| Largemouth Bass | *Micropterus salmoides* | Los Angeles | Belvedere Park Lake | 34° 2' 6" | 118° 9'26" | 6/24/1998 | 9.3 | 1.7 | 31 |
| | | | Malibu Creek/Tapia Park | 34° 4'39" | 118°42' 3" | 8/10/2000 | 4.7 | 1.3 | 0 |
| | | | Malibu Creek/u/s Tapia Discharge | 34° 5' 5" | 118°42'42" | 9/10/1999 | 7.1 | 1.1 | 0 |
| | | Merced | Merced River/Hatfield St Recreation Area | 37°21'30" | 120°57'10" | 11/5/1998 | 543.3 | 22.6 | 27 |
| | | Sacramento/Yolo | Sacramento River/Hood | 38°22'13" | 121°31'16" | 11/19/1998 | 53.1 | 3.1 | 53.2 |
| | | San Diego | Sweetwater River/Interstate 805 | 32°39'27" | 117° 4'12" | 6/22/1997 | 39 | 52.6 | 0 |
| | | San Joaquin | San Joaquin River/Vernalis | 37°40'22" | 121°14'38" | 8/18/1998 | 739.6 | 30.5 | 60.5 |
| | | Santa Cruz | Schwann Lake | 36°57'45" | 121°59'43" | 8/7/1991 | 18 | 11.1 | 0 |
| | | Stanislaus | Tuolumne River/Shilo Road | 37°36'26" | 121° 8'41" | 9/11/1998 | 402.9 | 23.5 | 122.8 |

Table A4. Tissue chemistry detection limits and units for each constituent measured during the Malibu Creek Watershed survey.

| Constituent | Detection Limit | Units |
|---|---|---|
| 2,4'-DDD | 1 | ng/wet g |
| 2,4'-DDE | 1 | ng/wet g |
| 2,4'-DDT | 1 | ng/wet g |
| 4,4'-DDT | 1 | ng/wet g |
| Aldrin | 1 | ng/wet g |
| BHC-alpha | 1 | ng/wet g |
| BHC-beta | 1 | ng/wet g |
| BHC-delta | 1 | ng/wet g |
| BHC-gamma | 1 | ng/wet g |
| Chlordane-gamma | 1 | ng/wet g |
| Dieldrin | 1 | ng/wet g |
| Endosulfan Sulfate | 1 | ng/wet g |
| Endosulfan-I | 1 | ng/wet g |
| Endosulfan-II | 1 | ng/wet g |
| Endrin | 1 | ng/wet g |
| Endrin Aldehyde | 1 | ng/wet g |
| Endrin Ketone | 1 | ng/wet g |
| Heptachlor | 1 | ng/wet g |
| Methoxychlor | 1 | ng/wet g |
| Mirex | 1 | ng/wet g |
| Oxychlordane | 1 | ng/wet g |
| Toxaphene | 10 | ng/wet g |
| PCB018 | 1 | ng/wet g |
| PCB028 | 1 | ng/wet g |
| PCB031 | 1 | ng/wet g |
| PCB033 | 1 | ng/wet g |
| PCB037 | 1 | ng/wet g |
| PCB044 | 1 | ng/wet g |
| PCB049 | 1 | ng/wet g |
| PCB070 | 1 | ng/wet g |
| PCB074 | 1 | ng/wet g |

| Constituent | Detection Limit | Units |
|---|---|---|
| PCB077 | 1 | ng/wet g |
| PCB081 | 1 | ng/wet g |
| PCB087 | 1 | ng/wet g |
| PCB095 | 1 | ng/wet g |
| PCB097 | 1 | ng/wet g |
| PCB099 | 1 | ng/wet g |
| PCB105 | 1 | ng/wet g |
| PCB114 | 1 | ng/wet g |
| PCB119 | 1 | ng/wet g |
| PCB123 | 1 | ng/wet g |
| PCB126 | 1 | ng/wet g |
| PCB128+167 | 1 | ng/wet g |
| PCB141 | 1 | ng/wet g |
| PCB149 | 1 | ng/wet g |
| PCB151 | 1 | ng/wet g |
| PCB156 | 1 | ng/wet g |
| PCB157 | 1 | ng/wet g |
| PCB158 | 1 | ng/wet g |
| PCB168+132 | 1 | ng/wet g |
| PCB169 | 1 | ng/wet g |
| PCB170 | 1 | ng/wet g |
| PCB177 | 1 | ng/wet g |
| PCB180 | 1 | ng/wet g |
| PCB183 | 1 | ng/wet g |
| PCB187 | 1 | ng/wet g |
| PCB189 | 1 | ng/wet g |
| PCB194 | 1 | ng/wet g |
| PCB200 | 1 | ng/wet g |
| PCB201 | 1 | ng/wet g |
| PCB206 | 1 | ng/wet g |