OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT

GOOD CATCH CALIFORNIA
Your Fish Advisor

Health Advisory and Guidelines for Eating Fish from Lake Chabot (Alameda County)

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Fish, Ecotoxicology, and Water Section
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LIST OF ACRONYMS AND ABBREVIATIONS

ATL	Advisory Tissue Level
CDFW	California Department of Fish and Wildlife
DDT(s)	dichlorodiphenyltrichloroethane (DDT) and its metabolites dichlorodiphenyldichloroethane (DDD) and dichlorodiphenyldichloroethylene (DDE)
DHA	docosahexaenoic acid
EBMUD	East Bay Municipal Utility District
EBRPD	East Bay Regional Park District
EPA	eicosapentaenoic acid
FDA	Food and Drug Administration
Hg	mercury
MDL	method detection limit
MLML	Moss Landing Marine Laboratories
mm	millimeters
OEHHA	Office of Environmental Health Hazard Assessment
PBDEs	polybrominated diphenyl ethers
PCBs	polychlorinated biphenyls
ppb	parts per billion
RL	reporting limit
RWB2	Regional Water Board 2 (San Francisco Bay)
Se	selenium
SWAMP	Surface Water Ambient Monitoring Program

TSMP	Toxic Substances Monitoring Program
USDA	United States Department of Agriculture
USDHHS	United States Department of Health and Human Services
US EPA	United States Environmental Protection Agency

PREFACE

The Office of Environmental Health Hazard Assessment (OEHHA), a department in the California Environmental Protection Agency, is responsible for evaluating potential public health risks from chemical contamination of sport fish. This includes issuing fish consumption advisories, when appropriate, for the State of California. OEHHA's authorities to conduct these activities are based on mandates in the:

- California Health and Safety Code
  - Section 59009, to protect public health
  - Section 59011, to advise local health authorities
- California Water Code
  - Section 13177.5, to issue health advisories

The health advisories are published in the California Department of Fish and Wildlife Sport Fishing Regulations in the section on public health advisories.

This report presents guidelines for eating fish from Lake Chabot in Alameda County. The report provides background information and a technical description of how the guidelines were developed. The resulting advice is summarized in the illustrations after the Table of Contents and List of Figures and Tables.

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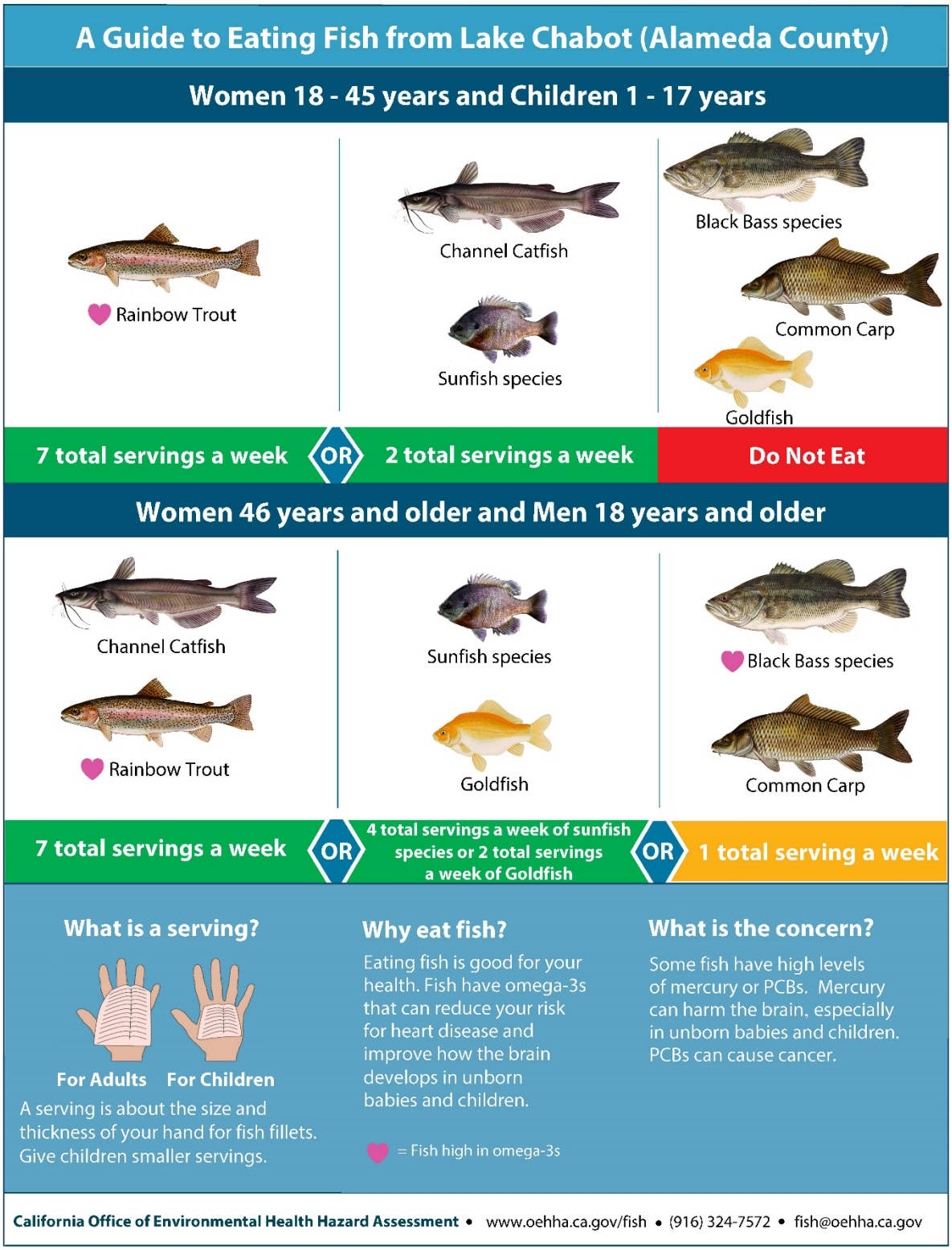

A Guide to Eating Fish from Lake Chabot (Alameda County)
Women 18 - 45 years and Children 1 - 17 years
Rainbow Trout
Channel Catfish
Sunfish species
Black Bass species
Common Carp
Goldfish
7 total servings a week
OR
2 total servings a week
Do Not Eat
Women 46 years and older and Men 18 years and older
Channel Catfish
Rainbow Trout
Sunfish species
Goldfish
Black Bass species
Common Carp
7 total servings a week
OR
4 total servings a week of sunfish species or 2 total servings a week of Goldfish
OR
1 total serving a week
What is a serving?
For Adults
For Children
A serving is about the size and thickness of your hand for fish fillets. Give children smaller servings.
Why eat fish?
Eating fish is good for your health. Fish have omega-3s that can reduce your risk for heart disease and improve how the brain develops in unborn babies and children.
= Fish high in omega-3s
What is the concern?
Some fish have high levels of mercury or PCBs. Mercury can harm the brain, especially in unborn babies and children. PCBs can cause cancer.
California Office of Environmental Health Hazard Assessment • www.oehha.ca.gov/fish • (916) 324-7572 • fish@oehha.ca.gov

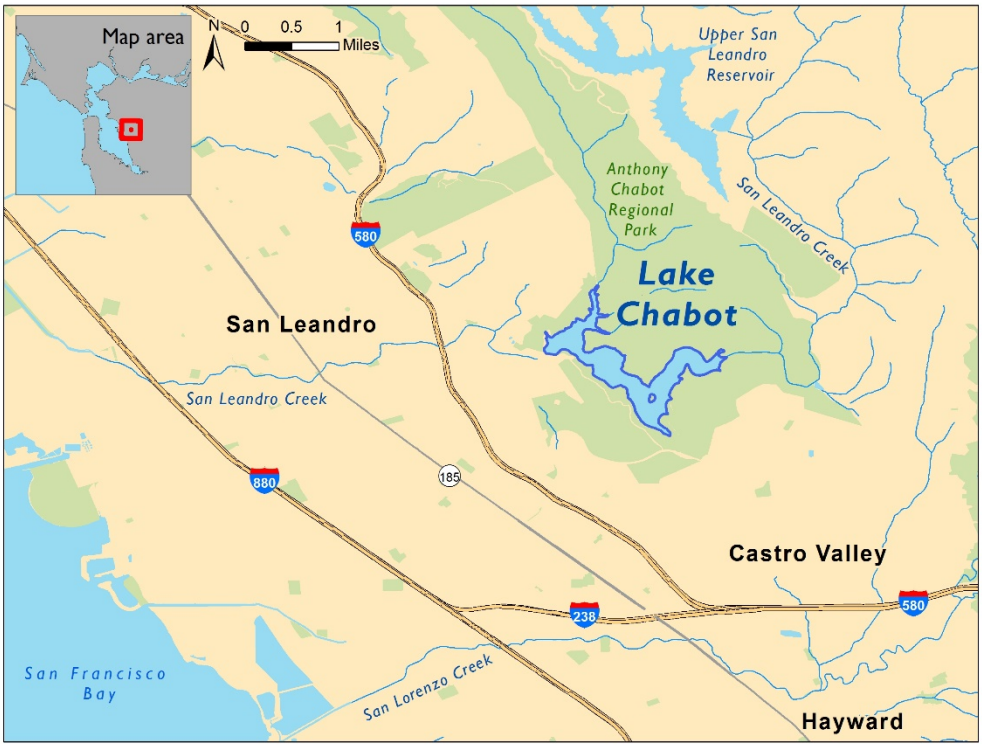
INTRODUCTION

This report presents an update for eating fish from Lake Chabot (Figure 1), located east of San Leandro and north of Castro Valley in Alameda County. The previous update was developed in 2009 and included advice for black bass species, Channel Catfish, Common Carp, and sunfish species. Adequate data are available to update the previous advisory to include Goldfish and Rainbow Trout.

LOCATION

Lake Chabot was formed in 1874 by construction of an earthen dam on San Leandro Creek.[1] In 1966, the 315-acre lake was opened to recreational use. The East Bay Municipal Utility District (EBMUD) manages the Lake Chabot Dam, and the East Bay Regional Park District (EBRPD) manages Lake Chabot Regional Park, including the lake. EBRPD, in cooperation with the California Department of Fish and Wildlife, plants Rainbow Trout from fall through spring, and Channel Catfish in summer.

FIGURE 1. LOCATION OF LAKE CHABOT



[1] Information regarding Lake Chabot was obtained from the East Bay Regional Park District and the East Bay Municipal Utility District. Online at: http://www.ebparks.org/parks/lake_chabot and https://www.ebmud.com/about-us/construction-my-neighborhood/chabot-dam-upgrade.

APPROACH USED

The Office of Environmental Health Hazard Assessment (OEHHA) used the results from four monitoring studies described in this report to develop the Lake Chabot Advisory. OEHHA uses the following general process in developing consumption advice for sport fish:

1) Evaluation of all fish contaminant data available from a water body and selection of appropriate data that meet data quality criteria and sampling plan guidelines.
2) Determination of fish species for which adequate data are available to issue fish consumption advice.
3) Calculation of an appropriate measure of central tendency (often a weighted arithmetic mean[2]) and other descriptive statistics of the contaminant data, as appropriate, for a chemical of potential concern for the selected fish species.
4) Comparison of the chemical concentrations with the OEHHA Advisory Tissue Levels (ATLs) for each chemical of potential concern.
5) Development of final advice based on a thorough review of the data and best professional judgment relating to the benefits and risks of consuming a particular fish species.

The ATLs (discussed further in a subsequent section of this report) are chemical levels in fish tissue that are considered acceptable, based on chemical toxicity, for a range of consumption rates. Development of the ATLs also included consideration of health benefits associated with including fish in the diet (OEHHA, 2008). The ATLs should not be interpreted as static “bright lines”, but one component of a complex process of data evaluation and interpretation used by OEHHA in the assessment and communication of benefits and risks of consuming sport fish.

CHEMICALS OF POTENTIAL CONCERN

Certain chemicals are considered to be of potential concern for people who eat fish because of their toxicity and their ability to accumulate in fish tissue. The majority of fish consumption advisories in California are issued because of mercury (Hg), followed by polychlorinated biphenyls (PCBs) and, in a few cases, selenium (Se) or some legacy pesticides (pesticides that are no longer used but remain in the environment).

Mercury is a natural element found in some rock and soil. Human activities, such as burning coal and the historic use of mercury to mine gold, also add mercury to the environment. If mercury enters waterways, it can be converted to a more toxic form

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[2] Means are an arithmetic average of individual values and/or a weighted average of composites. A weighted average of composites is calculated by multiplying the chemical concentration in each composite by the number of fish in that composite for each species. Products are then summed and divided by the total number of fish in all composites for that species, combined.

known as methylmercury – which can pass into and build up in fish. High levels of methylmercury can harm the brain, especially in fetuses and children.

PCBs are industrial chemicals previously used in electrical transformers, plastics, and lubricating oils, often as flame retardants or electrical insulators. Their use was banned in the 1970s, but they persist in the environment because they do not break down easily and can accumulate in fish. Depending on the exposure level, PCBs may cause cancer or other health effects, including neurotoxicity, in humans.

Selenium is a naturally occurring metalloid and at low doses is an essential nutrient for many important human health processes, including thyroid regulation and vitamin C metabolism. Higher doses cause selenium toxicity, which can include symptoms ranging from hair loss and gastrointestinal distress to dizziness and tremors.

Chlordanes, dichlorodiphenyltrichloroethane (DDT), dieldrin, and toxaphene are pesticides that were banned from use in 1973 (DDT), the late 1980s (chlordanes and dieldrin) and 1990 (toxaphene), but are still found in some fish in certain water bodies in California. Depending on the exposure level, these chemicals may cause cancer or adverse effects on the nervous system.

Polybrominated diphenyl ethers (PBDEs) are a class of flame retardants historically used in a variety of consumer products including furniture, textiles, automotive parts, and electronics. The use of PBDEs in new products was largely phased out by 2013 but, due to their wide usage and persistence in the environment, they are still being detected in fish tissues. PBDEs may affect hormone levels or learning and behavior in children.

Detailed discussion of the toxicity of these chemicals and references are presented in “Development of Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport Fish: Chlordane, DDTs, dieldrin, methylmercury, PCBs, selenium, and toxaphene” (OEHHA, 2008) and “Development of Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport Fish: Polybrominated Diphenyl Ethers (PBDEs)” (OEHHA, 2011).

All fish species collected from Lake Chabot and used in advisory development were analyzed for mercury (as a measure of methylmercury). Channel Catfish, Common Carp, Goldfish, Largemouth Bass, Rainbow Trout, and Redear Sunfish were analyzed for the legacy pesticides chlordanes, dieldrin, DDTs (DDT and its metabolites dichlorodiphenyldichloroethane [DDD] and dichlorodiphenyldichloroethylene [DDE]) and Channel Catfish, Common Carp, and Largemouth Bass were also analyzed for the legacy pesticide toxaphene. With the exception of Bluegill and Largemouth Bass, all other fish species were also analyzed for PCBs. Additionally, Common Carp were analyzed for PBDEs and selenium. Among the chemicals analyzed in fish tissue samples from Lake Chabot, mercury and PCB levels were sufficiently high to impact consumption advice. For this reason, levels of other contaminants are not shown in this report.

DATA SOURCES

The guidelines for eating fish from Lake Chabot are based on the chemicals detected in the fish collected for the four monitoring studies described below. These studies met OEHHA's data quality criteria, including adequate documentation of sample collection, fish preparation method (e.g., skinning or filleting), chemical analyses, quality assurance, and sufficiently low detection limits. "Sample," as used in this report, refers to an individual fish or a composite of multiple fish for which contaminant data was reported. "Sampling" or "sampled" refers to the act of collecting fish for chemical analysis.

Surface Water Ambient Water Monitoring Program (SWAMP): Contaminants in Fish From California Lakes and Reservoirs, 2007-2008

The Surface Water Ambient Monitoring Program (SWAMP), operated by the State Water Resources Control Board (SWRCB) in cooperation with Regional Water Quality Control Board staff, monitors water quality in California's surface waters. As part of a SWAMP statewide sampling effort to survey contaminants in sport fish found in California lakes and reservoirs, the program collected Common Carp and Largemouth Bass from Lake Chabot in 2007 to analyze mercury in both species, and chlordanes, DDTs, dieldrin, PBDEs, PCBs, and selenium in Common Carp (SWRCB, 2010).

Regional Water Quality Control Board, San Francisco Bay Fish Contamination Study (RWB2 Lakes)

The San Francisco Bay Regional Water Quality Control Board (RWB2) staff collected Channel Catfish, Goldfish, Rainbow Trout, and Redear Sunfish in 2005 from Lake Chabot to analyze for levels of mercury, PCBs, chlordanes, DDTs, and dieldrin. Green Sunfish were also collected in 2010 to analyze for mercury and PCBs (RWQCB, 2013).

Regional Water Quality Control Board, San Francisco Bay (RWB2), East Bay Regional Park District (EBRPD) Fish Bioaccumulation Study, 2013

The RWB2 staff, in cooperation with the East Bay Regional Park District (EBRPD), collected Bluegill from Lake Chabot in 2013 to analyze for mercury levels. This is part of an ongoing monitoring effort for lakes throughout the EBRPD (RWQCB, 2013).

Toxic Substances Monitoring Program (TSMP)

The TSMP (1976-2003) was a state water quality-monitoring program managed by the SWRCB (SWRCB, 2007 and 2013). Its objective was to provide statewide information on the occurrence of toxic substances by monitoring water bodies with known or suspected water quality impairment. California Department of Fish and Wildlife (CDFW) staff, then known as the California Department of Fish and Game, collected Channel Catfish, Common Carp, Largemouth Bass, and Redear Sunfish from Lake Chabot 2001, as part of the program. All fish samples were analyzed for mercury. Additionally,

Channel Catfish, Common Carp, and Largemouth Bass were analyzed for chlordanes, DDTs, dieldrin, and toxaphene.

FISH SAMPLED FROM LAKE CHABOT

The fish sampling data used in this advisory were retrieved from the California Environmental Data Exchange Network (CEDEN), the state's repository for environmental data. Samples were excluded when the fish were not legal size to take or did not meet OEHHA's criteria for minimum "edible" size based on species size at maturity, and professional judgment (as described in OEHHA, 2005). A summary of all fish species included in this advisory is shown in Table 1, including the name of the species, number of samples collected, total number of fish, project name, year sampled, and contaminants analyzed.

TABLE 1. FISH SAMPLES EVALUATED FOR THE LAKE CHABOT ADVISORY

Common Name	Scientific Name	Number of Samples	Total Number of Fish	Project	Year Collected	Contaminants Analyzed
Bluegill	*Lepomis macrochirus*	1	5	RWB2 EBRPD	2013	Hg
Channel Catfish	*Ictalurus punctatus*	2	9	RWB2 Lakes	2005	chlordanes, DDTs, dieldrin, Hg, PCBs
		4	10	TSMP[a]	2001	chlordanes, DDTs, dieldrin, Hg, toxaphene
Common Carp	*Cyprinus carpio*	2	10	SWAMP	2007	chlordanes, DDTs, dieldrin, Hg, PBDEs, PCBs, Se
		3	12	TSMP[a]	2001	chlordanes, DDTs, dieldrin, Hg, toxaphene
Goldfish	*Carassius auratus*	2	9	RWB2 Lakes	2005	chlordanes, DDTs, dieldrin, Hg, PCBs
Green Sunfish	*Lepomis cyanellus*	1	15	RWB2 Lakes	2010	Hg, PCBs
Largemouth Bass	*Micropterus salmoides*	3	9	TSMP[a]	2001	chlordanes, DDTs, dieldrin, Hg, toxaphene
		7	7	SWAMP	2007	Hg
Rainbow Trout	*Oncorhynchus mykiss*	2	9	RWB2 Lakes	2005	chlordanes, DDTs, dieldrin, Hg, PCBs
Redear Sunfish	*Lepomis microlophus*	2	6	TSMP[a]	2001	Hg
		1	6	RWB2 Lakes	2005	chlordanes, DDTs, dieldrin, Hg, PCBs

[a]Study report did not specify whether skin was removed from fillets prior to tissue analysis.

CHEMICAL CONCENTRATIONS

As shown in Table 1, samples were analyzed for one or more of the following: total mercury, selenium, chlordanes, DDTs, dieldrin, PBDEs, PCBs (54-55 congeners[3]), and toxaphene. All fish samples were prepared as skinless fillets, except for the TSMP study where the fillet preparation method for Channel Catfish, Common Carp, Largemouth Bass, and Redear Sunfish was not recorded. Samples were analyzed as individual fish or composites.

Composites were prepared from equal amounts of tissue from several similarly sized individual fish of a species. For composite samples, the total length of the smallest fish in a composite sample must be at least 75% of the length of the largest fish in the sample (US EPA, 2000a). This information is not available for samples collected in the TSMP program; however, OEHHA assumes that the data complies with the 75% rule. All composite samples from Lake Chabot met this requirement, except for a single composite of 15 Green Sunfish where the length of the shortest fish in the sample was 63% of the length of the longest fish in the sample. Though not as prevalent as Largemouth Bass, sunfish species are commonly found at Lake Chabot (Stienstra, 2004; EBRPD, 2011). All 15 Green Sunfish met the OEHHA minimum length of 100 millimeters (mm), and provided a more robust sample for PCB analysis for sunfish collected from Lake Chabot (PCBs were not evaluated in Bluegill and only a single composite of 6 Redear Sunfish was analyzed for PCBs). As PCBs were a driver for consumption advice for some species collected from Lake Chabot, and the Green Sunfish met OEHHA's minimum quantity (n=9) and length for sunfish species, OEHHA elected to include this sample in the dataset to develop advice for sunfish species.

For this advisory, OEHHA used the weighted (by the number of individual fish) arithmetic mean (average) of the chemical concentrations (in wet weight) for each fish species to estimate average human exposure.

MERCURY

Samples were analyzed for total mercury, as either individual fish or composite samples, using a direct mercury analyzer (DMA) at the CDFW Moss Landing Marine Laboratories (MLML). The DMA method utilizes thermal decomposition and atomic absorption. OEHHA assumed all mercury detected was methylmercury, which is the most common form found in fish and is also the more toxic form (Bloom, 1992). Table 2 shows the averages and ranges for total length[4], as well as mercury concentrations in

[3] Congeners are related compounds with similar chemical forms. Of the 209 possible PCB congeners, 54-55 are generally reported.
[4] Total length is the maximum length of the fish, measured from the tip of the closed mouth to the tip of the pinched tail fin.

each fish species. The DMA method detection limit (MDL)[5] and the reporting limit (RL)[6] for total mercury were reported at 4, 9, or 12 and 12, 26, or 36 parts per billion (ppb), respectively. Although mercury was detected at commonly found concentrations in the TSMP study, the MDL and RL for mercury were not reported.

PCBs, PBDEs, and Pesticides

Some composite samples were analyzed for PCBs, PBDEs, and the legacy pesticides (chlordanes, DDTs, dieldrin, and toxaphene). Pesticides, PBDEs and PCBs were analyzed by gas chromatography at the CDFW Water Pollution Control Laboratory. For chlordanes, DDTs, PCBs, and PBDEs, each of the concentrations presented was the sum of the detected parent compound, congeners, or metabolites, where applicable. Since the MDLs or RLs were relatively low (≤ 5 ppb), individual congeners or metabolites with concentrations reported as non-detects were assumed to be zero. This is a standard method of handling non-detect values for PCBs and other chemicals with multiple congeners or metabolites in a given sample when detection levels are adequate (US EPA, 2000a). Table 3 shows the averages and ranges for total length[7], as well as PCB concentrations in each fish species. Concentrations of chlordanes, dieldrin, DDTs, PBDEs, and toxaphene were not sufficiently high to alter consumption advice and are not shown.

Selenium

A single composite sample of five Common Carp was analyzed for selenium with the MDL and RL reported at 100 and 300 ppb, respectively. The selenium concentration was not sufficiently high to alter consumption advice and is not shown.

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[5] The MDL is the lowest quantity of a chemical that can be distinguished (as greater than zero) in a sample.
[6] The RL is the lowest quantity of a chemical that can be accurately quantified in a sample.
[7] Total length is the maximum length of the fish, measured from the tip of the closed mouth to the tip of the pinched tail fin.

TABLE 2. MERCURY CONCENTRATIONS IN FISH FROM LAKE CHABOT

Species from Lake Chabot	Number of Samples	Total Number of Fish	Mean* Total Length (mm)	Range of Total Lengths** (mm)	Mercury (ppb)	
					Mean*	Range**
Channel Catfish	5	16	491	438 - 575	77	25 - 127
Common Carp	5	22	506	470 - 575	553	291 - 728
Goldfish	2	9	397	390 – 415	391	310 - 456
Largemouth Bass	10	16	377	323 – 490	548	380 - 715
Rainbow Trout	2	9	317	293 – 337	0	0
Sunfish species	5	32	139	102 – 180	135	81 - 192
Bluegill	1	5	130	123 – 137	81	n/a
Green Sunfish	1	15	127	102 – 162	138	n/a
Redear Sunfish	3	12	158	133 – 180	155	118 - 192

*Means are an arithmetic average of individual values and/or a weighted average of composites.
**Range of individuals and/or range of the composites.
n/a = not applicable due to a single sample

TABLE 3. PCB CONCENTRATIONS IN FISH FROM LAKE CHABOT

Species from Lake Chabot	Number of Samples	Total Number of Fish	Mean* Total Length (mm)	Range of Total Lengths** (mm)	PCBs (ppb)	
					Mean*	Range**
Channel Catfish	2	9	497	438 – 560	7	6 - 9
Common Carp	2	10	521	472 – 575	98	48 - 148
Goldfish	2	9	397	390 – 415	30	12 - 44
Rainbow Trout	2	9	317	293 – 337	6	6 - 6
Sunfish species	2	21	139	102 – 180	5	5 - 5
Green Sunfish	1	15	127	102 – 162	5	n/a
Redear Sunfish	1	6	170	164 – 180	5	n/a

*Means are an arithmetic average of individual values and/or a weighted average of composites.
**Range of individuals and/or range of the composites.
n/a = not applicable due to a single sample

DEVELOPMENT OF GUIDELINES FOR EATING FISH FROM LAKE CHABOT

The OEHHA fish advisory process considers the health benefits of fish consumption as well as the risk from exposure to the chemical contaminants found in fish. Benefits are included in the advisory process because there is considerable evidence and scientific consensus that fish should be part of a healthy, well-balanced diet. Fish contain many nutrients that are important for general health and, in particular, help promote optimal growth and development of babies and young children, and may reduce the incidence of heart disease in adults (FDA/US EPA, 2017; American Heart Association, 2014; OEHHA, 2008; Institute of Medicine, 2007; Kris-Etherton et al., 2002). Fish are a significant source of the specific omega-3 fatty acids, docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) thought to be associated with these beneficial health effects (USDA/USDHHS, 2015; Weaver et al., 2008).

The 2015-2020 U.S. Dietary Guidelines recommend that 1) the general population “consume eight or more ounces per week (less for young children)” of a variety of

seafood[8] "for the total package of nutrients that seafood provides, including its EPA and DHA content" and 2) "women who are pregnant or breastfeeding should consume at least eight and up to twelve ounces of a variety of seafood per week from choices that are lower in methylmercury" (USDA/USDHHS, 2015). The particular fish that people eat is an important factor in determining the net beneficial effects of fish consumption. For example, studies have shown that children of mothers who ate low-mercury fish during pregnancy scored better on cognitive tests compared to children of mothers who did not eat fish or ate high-mercury fish (Oken et al., 2005 and 2008). Accordingly, because of the high mercury content of certain fish species, the Food and Drug Administration (FDA) and the United States Environmental Protection Agency (US EPA) recommend that women who are pregnant (or might become pregnant) or breastfeeding, and young children avoid consuming shark, swordfish, tilefish (Gulf of Mexico), bigeye tuna, marlin, orange roughy, and king mackerel (FDA/US EPA, 2017).

In order to address the potential health concerns associated with exposure to contaminants in sport fish, OEHHA has established ATLs for chemicals that are known to accumulate in the edible tissues of fish. ATLs consider both the toxicity of the chemical and potential benefits of eating fish. OEHHA uses the ATLs to determine the maximum number of servings per week that consumers can eat, for each species and at each location, to limit their exposure to these contaminants. Consumers can use OEHHA's guidance when choosing which fish and how much to eat as part of an overall healthy diet.

There are two sets of ATLs for methylmercury in fish because of the age-related toxicity of this chemical (OEHHA, 2008). The fetus and children are more sensitive to the toxic effects of methylmercury. Thus, the ATLs for the sensitive population, including women who might become pregnant (typically 18 to 45 years of age) and children 1-17 years, are lower than those for women 46 years and older, and men 18 years and older. The lower ATL values for the sensitive population provide additional protection to allow for normal growth and development of the brain and nervous system of unborn babies and children. Detailed discussion about the toxicity of common fish contaminants and health benefits of fish consumption, as well as derivation of the ATLs, are provided in "Development of Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport Fish: Chlordane, DDTs, dieldrin, methylmercury, PCBs, selenium, and toxaphene" (OEHHA, 2008) and "Development of Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport Fish: Polybrominated Diphenyl Ethers (PBDEs)" (OEHHA, 2011). A list of the ATLs used in this report is presented in Appendix I.

[8] "Marine animals that live in the sea and in freshwater lakes and rivers. Seafood includes fish, such as salmon, tuna, trout, and tilapia, and shellfish, such as shrimp, crab, and oysters" (USDHHS/USDA, 2015).

For each fish species in this advisory, OEHHA compared the mean mercury and PCB concentrations detected in the fillet to the corresponding ATLs to establish the maximum number of servings per week that could be consumed (see Appendix I).

The consumption advice for a fish species is initially based on the chemical with the lowest allowable number of servings per week. Because some chemicals, such as mercury and PCBs, are known to have similar adverse effects, additivity of toxicity is assumed in such cases and may be assessed using multiple chemical exposure methodology (US EPA, 1989 and 2000b). If two or more chemicals with similar adverse effects are present in fish tissue at levels above the corresponding ATL values for daily consumption, multiple chemical exposure methodology is employed. This may result in advising the sensitive population to consume fewer meals per week than would be the case for the presence of one chemical alone, in a similar concentration. The potential effect of multiple chemical exposures (mercury and PCBs) was assessed in Channel Catfish, Common Carp, Goldfish, Rainbow Trout, and sunfish species and affected advice for Goldfish. Advice for other species in this advisory was based solely on mercury or PCB concentrations.

OEHHA recommends that individuals strive to meet the US Dietary Guidelines seafood consumption recommendations, while also adhering to federal and OEHHA recommendations to limit the consumption of fish with higher contaminant levels. The advice discussed in the following section represents the maximum recommended number of servings per week for different fish species. People should eat no more than the recommended number of servings for each fish species or species group. OEHHA's advice on consuming a particular fish species can be extended to other closely related fish species[9] known to accumulate similar levels of contaminants.

Consumption advice should not be combined. That is, if a person chooses to eat a fish from the "one-serving-a-week'' category, then they should not eat any other fish from any source (including commercial) until the next week. If a person chooses to eat a fish from the "two-servings-per-week" category, they can combine fish species from that category, or eat one fish from that category and one from a category that recommends more than two-servings-per-week (if available), for a total of two servings in that week. Then they should not eat any other fish from any source (including commercial) until the following week.

CONSUMPTION ADVICE FOR FISH FROM LAKE CHABOT

OEHHA's advisory protocol requires at least nine fish of a species to be collected from a water body before an advisory can be developed for the primary contaminant of concern. This is to ensure the sample dataset is representative of the fish species population in the water body. In some cases, an exception is made for species that are

[9] Fish species within the same genus are most closely related, and Family is the next level of relationship.

commonly caught and consumed from a given water body but where available data may be limited. For Lake Chabot, the sample size criterion was met for the following species: Channel Catfish, Common Carp, Goldfish, Largemouth Bass, Rainbow Trout, and sunfish species. There were not sufficient data to evaluate other species that may be found in this water body.

Black Bass Species (Largemouth Bass)

Based on the mean mercury concentration of 548 ppb, OEHHA recommends no consumption of black bass species from Lake Chabot for the sensitive population (women 18 to 45 years and children 1 to 17 years), and a maximum of one serving a week for the general population (women 46 years and older, and men 18 years and older). PCBs were not analyzed in Largemouth Bass from Lake Chabot.

OEHHA has evaluated mercury concentrations in black bass species in many water bodies in California and has found a similar range of mercury concentrations when two or more of these species were caught from the same water body. Therefore, OEHHA extends the consumption advice for Largemouth Bass to other black bass species, including Redeye, Smallmouth, and Spotted Bass.

Channel Catfish

The mean mercury and PCB concentrations in Channel Catfish from Lake Chabot were 77 and 7 ppb, respectively. OEHHA recommends a maximum of two servings a week of Channel Catfish for the sensitive population (women 18 to 45 years and children 1 to 17 years) based on mercury, and a maximum of seven servings a week for the general population (women 46 years and older, and men 18 years and older), based on mercury or PCBs.

Common Carp

The mean mercury and PCB concentrations in Common Carp from Lake Chabot were 553 and 98 ppb, respectively. OEHHA recommends no consumption of Common Carp for the sensitive population (women 18 to 45 years and children 1 to 17 years) based on mercury, and a maximum of one serving a week for the general population (women 46 years and older, and men 18 years and older), based on mercury or PCBs.

Goldfish

The mean mercury and PCB concentrations in Goldfish from Lake Chabot were 391 and 30 ppb, respectively. OEHHA recommends no consumption of Goldfish for the sensitive population (women 18 to 45 years and children 1 to 17 years), based on a combined exposure to mercury and PCBs, and a maximum of 2 servings a week for the general population (women 46 years and older, and men 18 years and older), based on mercury or PCBs.

RAINBOW TROUT

The mean mercury and PCBs concentrations in Rainbow Trout from Lake Chabot were 0 and 6 ppb, respectively. OEHHA recommends a maximum of seven servings a week of Rainbow Trout for both the sensitive population (women 18 to 45 years and children 1 to 17 years) and the general population (women 46 years and older, and men 18 years and older), based on PCBs.

SUNFISH SPECIES (BLUEGILL, GREEN SUNFISH, REDEAR SUNFISH)

The mean mercury and PCB concentrations in sunfish species from Lake Chabot were 135 ppb and 5 ppb, respectively. Mercury and PCB concentrations for individual sunfish species were as follows, Bluegill (Hg: 81 ppb, PCB: not analyzed), Green Sunfish (Hg: 138 ppb, PCB: 5 ppb), and Redear Sunfish (Hg: 155, PCB: 5 ppb). OEHHA recommends a maximum of two servings a week of sunfish species for the sensitive population (women 18 to 45 years and children 1 to 17 years), and a maximum of four servings a week for the general population (women 46 years and older, and men 18 years and older), based on mercury. PCBs did not impact advice.

OEHHA has evaluated mercury concentrations in sunfish species in many water bodies in California and has found a similar range of mercury concentrations when two or more of these species were caught from the same water body. Therefore, OEHHA extends the consumption advice for sunfish species (Bluegill, Green Sunfish, Redear Sunfish) to other sunfish species, including Pumpkinseed.

RECOMMENDED MAXIMUM NUMBER OF SERVINGS

The recommended maximum numbers of servings per week for fish from Lake Chabot are shown in Table 4.

TABLE 4. RECOMMENDED MAXIMUM NUMBER OF SERVINGS PER WEEK FOR FISH FROM LAKE CHABOT

Fish Species	Women 18–45 years and Children 1–17 years	Women 46 years and older and Men 18 years and older
Black Bass species	0	1
Channel Catfish	2	7
Common Carp	0	1
Goldfish	0	2
Rainbow Trout	7	7
Sunfish species	2	4

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APPENDIX I. ADVISORY TISSUE LEVELS

Advisory Tissue Levels (ATLs) guide the development of advice for people eating sport fish. ATLs are levels of contaminants found in fish that correspond to the maximum numbers of recommended fish servings. OEHHA uses ATLs to provide advice to prevent consumers from being exposed to:

- More than the average daily reference dose[10] for chemicals not known to cause cancer, such as methylmercury, or
- For cancer-causing chemicals, a risk level greater than one additional cancer case in a population of 10,000 people consuming fish at the given consumption rate over a lifetime. This cancer endpoint is the maximum acceptable risk level recommended by the US EPA (2000b) for fish advisories.

For each chemical, ATLs were determined for both cancer and non-cancer risk, if appropriate, for one to seven eight-ounce servings per week. The most health-protective ATLs for each chemical, selected from either cancer or non-cancer based risk, are shown in the table below for zero to seven servings per week. When the guidelines for eating fish from Lake Chabot are followed, exposure to chemicals in fish from Lake Chabot would be at or below the average daily reference dose or the cancer risk probability of one in 10,000.

ADVISORY TISSUE LEVELS FOR SELECTED ANALYTES

Contaminant	Consumption Frequency Categories (8-ounce servings/week)[a] and ATLs (in ppb)							
	7	6	5	4	3	2	1	0
Chlordanes	≤ 80	>80-90	>90-110	>110-140	>140-190	>190-280	>280-560	>560
DDTs	≤ 220	>220-260	>260-310	>310-390	>390-520	>520-1,000	>1,000-2,100	>2,100
Dieldrin	≤ 7	>7-8	>8-9	>9-11	>11-15	>15-23	>23-46	>46
MeHg (Women 18-45 and children 1-17)	≤ 31	>31-36	>36-44	>44-55	>55-70	>70-150	>150-440	>440
MeHg (Women > 45 and men)	≤ 94	>94-109	>109-130	>130-160	>160-220	>220-440	>440-1,310	>1,310
PBDEs	≤ 45	>45-52	>52-63	>63-78	>78-100	>100-210	>210-630	>630
PCBs	≤ 9	>9-10	>10-13	>13-16	>16-21	>21-42	>42-120	>120
Selenium	≤ 1000	>1,000-1200	>1,200-1,400	>1,400-1,800	>1,800-2,500	>2,500-4,900	>4,900-15,000	>15,000
Toxaphene	≤ 87	>87-100	>100-120	>120-150	>150-200	>200-300	>300-610	>610

[a] Serving sizes (prior to cooking, wet weight) are based on an average 160-pound person. Individuals weighing less than 160 pounds should eat proportionately smaller amounts.

[10] The reference dose is an estimate of the maximum daily exposure to a chemical likely to be without significant risk of harmful health effects during a lifetime.