OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT

GOOD CATCH CALIFORNIA
Your Fish Advisor

Health Advisory and Guidelines for Eating Fish from Lake Evans (Riverside 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
EPA	eicosapentaenoic acid
FDA	Food and Drug Administration
Hg	mercury
MDL	method detection limit
MLML	Moss Landing Marine Laboratories
mm	millimeters
n	sample size
OEHHA	Office of Environmental Health Hazard Assessment
PBDEs	polybrominated diphenyl ethers
PCBs	polychlorinated biphenyls
ppb	parts per billion
RL	reporting limit
Se	selenium
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Resources Control Board
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 task 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 Evans in Riverside County and expands upon an interim advisory released in October 2016 in response to elevated levels of PCBs found in catfish from the lake. This 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 Evans

Men, Women, and Children 1 - 17 years

Carp

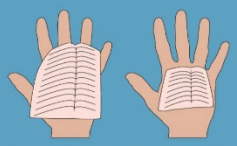
Black Bass species

Sunfish species

Channel Catfish

7 total servings a week	OR	4 total servings a week	Do not eat

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 and PCBs. Mercury can harm the brain, especially in unborn babies and children. PCBs can cause cancer.

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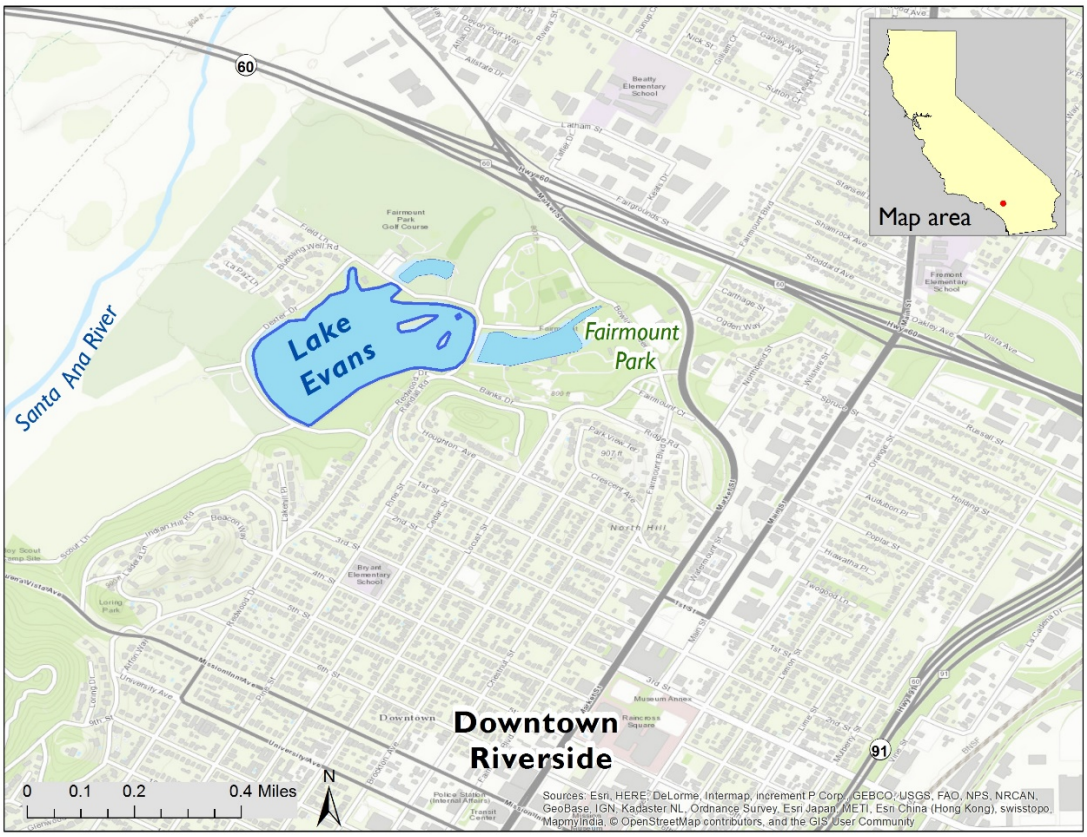
INTRODUCTION

This report presents guidelines for eating fish from Lake Evans (Figure 1) in Riverside, California, located just east of the Santa Ana River and north of downtown Riverside.

LOCATION

Lake Evans is a man-made lake at Fairmount Park, managed by the City of Riverside Parks, Recreation and Community Services Department[1]. This advisory applies to sport fishing at Lake Evans and does not include the surrounding water bodies of Brown Lake or Fairmont Lake. The City of Riverside has historically stocked catfish at Lake Evans. Bluegill, Common Carp and Largemouth Bass included in this advisory are self-sustaining populations.

FIGURE 1. LOCATION OF LAKE EVANS



[1] Information regarding Lake Evans was obtained from various City of Riverside Parks, Recreation and Community Services web pages. Online at http://www.riversideca.gov/park_rec/default.asp

APPROACH USED

The Office of Environmental Health Hazard Assessment (OEHHA) used the results from three monitoring studies described in this report to develop the Lake Evans 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, followed by polychlorinated biphenyls (PCBs), and in a few cases, selenium 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 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 known as

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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.

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" and "Development of Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport fish: Polybrominated Diphenyl Ethers (PBDEs)" (OEHHA, 2008 and 2011, respectively).

Fish sampling data used for the Lake Evans advisory were analyzed for two or more of the following contaminants: mercury (as a measure of methylmercury), PCBs, selenium, PBDEs and the legacy pesticides (chlordanes, dieldrin, and DDTs [DDT and its metabolites]). Fish species that do not normally accumulate PCBs or other organic chemicals (e.g., legacy pesticides) may not be analyzed for those contaminants in a particular monitoring study. Only mercury and PCB levels in fish tissue were sufficient to impact consumption advice for these water bodies; data for other contaminants are not shown in this report.

DATA SOURCES

The guidelines for eating fish from Lake Evans are based on the chemicals detected in the fish collected for the three 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 composite of multiple fish for which contaminant data were reported. "Sampling" or "sampled" refers to the act of collecting fish for chemical analysis.

Toxic Substances Monitoring Program (TSMP)

The TSMP (1976-2003) was a state water quality-monitoring program managed by the State Water Resources Control Board (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. The California Department of Fish and Wildlife, then known as the California Department of Fish and Game, collected Largemouth Bass in 1986 from Lake Evans as part of the program. Fish samples were analyzed for selenium.

SWAMP Contaminants in Fish From California Lakes and Reservoirs, 2007-2008

The SWAMP (Surface Water Ambient Monitoring Program), operated by the SWRCB in cooperation with Regional Water Quality Control Board staff, monitors water quality in California's surface waters. The program collected Common Carp and Largemouth Bass from Lake Evans in 2008 to analyze mercury. Common Carp were also evaluated for chlordanes, DDTs, dieldrin, PBDEs, PCBs and selenium, as part of a SWAMP statewide sampling effort to survey contaminants in sport fish found in California lakes and reservoirs (Davis et al., 2010).

SWAMP Survey of Lakes and Reservoirs with Low Concentrations of Contaminants in Sport Fish, 2014

In 2014, SWAMP collected Bluegill, Channel Catfish and Largemouth Bass from Lake Evans to analyze mercury and PCBs, as part of a SWAMP statewide sampling effort to identify and better characterize low-contaminant California lakes and reservoirs (SWRCB 2014).

FISH SAMPLED FROM LAKE EVANS

The fish sampling data used in this advisory were retrieved from the California Environmental Data Exchange Network (CEDEN). Because of elevated PCB levels found in catfish collected in 2014, the Santa Ana Regional Water Board (RWB8) resubmitted the Bluegill and Largemouth Bass samples from the SWAMP 2014 study to the CDFW Water Pollution Control Laboratory (WPCL) for PCB analysis. After CDFW WPCL performed the standard data validation and review procedure, the Department provided results directly to OEHHA to facilitate development of the Lake Evans Advisory. Samples were excluded when the fish were not of 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, years sampled, and contaminants analyzed.

TABLE 1. FISH SAMPLES EVALUATED FOR THE LAKE EVANS ADVISORY

Common Name	Scientific Name	Number of Samples	Total Number of Fish	Project	Year Collected	Contaminants Analyzed
Bluegill	*Lepomis macrochirus*	2	10	SWAMP	2014	Hg
		1	10	SWAMP	2014	PCBs
Channel Catfish	*Ictalurus punctatus*	2	10	SWAMP	2014	Hg
		1	10	SWAMP	2014	PCBs
Common Carp	*Cyprinus carpio*	2	10	SWAMP	2008	Hg
		1	5	SWAMP	2008	Chlordanes, DDTs, Dieldrin, PBDEs, PCBs, Se
Largemouth Bass	*Micropterus salmoides*	1	6	TSMP	1986	Se
		8	8	SWAMP	2008	Hg
		7	7	SWAMP	2014	Hg
		1[a]	7	SWAMP	2014	PCBs

DDTs = dichlorodiphenyltrichloroethane (DDT) and its metabolites
dichlorodiphenyldichloroethane (DDD)
dichlorodiphenyldichloroethylene (DDE)
Hg = mercury
PBDEs = polybrominated diphenyl ethers
PCBs = polychlorinated biphenyls
Se = selenium
[a]Samples did not meet the 75% minimum length rule for tissue composite samples.

CHEMICAL CONCENTRATIONS

As shown in Table 1, samples were analyzed for total mercury, selenium, chlordanes, DDTs, dieldrin, PBDEs, and PCBs (54-55 congeners[3]). All fish samples were prepared as skinless fillets. 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). Composite samples for all species from Lake Evans except Largemouth Bass met this requirement. There was one Largemouth Bass composite sample of seven fish where the smallest fish in the sample was 73% of the length of the largest fish. Largemouth Bass are reported to be a popular sport fish catch in Lake Evans; thus, OEHHA included these data to develop consumption advice for black bass 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 California Department of Fish and Wildlife (CDFW) Moss Landing Marine Laboratories (MLML). The DMA method utilizes thermal decomposition and atomic absorption. OEHHA assumed all mercury detected was methylmercury; methylmercury 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 each fish species. The DMA method detection limit (MDL)[5] and the reporting limit (RL)[6] for total mercury were both reported as 12 ppb for the SWAMP 2008 study, and as 4 and 12 ppb, respectively, for the SWAMP 2014 study.

PBDES, PCBS AND PESTICIDES

Samples were analyzed for legacy pesticides (chlordanes, DDTs, and dieldrin), PBDEs and PCBs. Pesticides, PBDEs and PCBs were analyzed by gas chromatography at the CDFW Water Pollution Control Laboratory. For PCBs, chlordanes, PBDEs and DDTs,

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[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.
[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.

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, ≤ 0.55 and ≤ 5 ppb, respectively, 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 2 shows the averages and ranges for total length as well as PCB concentrations in each species. Concentrations of chlordanes, dieldrin, DDTs, and PBDEs were not sufficiently high to alter consumption advice and are not shown.

Selenium

The CDFW MLML analyzed species collected from Lake Evans for selenium as composite samples, using inductively coupled plasma-mass spectrometry (ICP-MS). The ICP-MS method utilizes desolvation, atomization and ionization with ion separation based on a mass-to-charge ratio to detect the total selenium concentration in a sample. The ICP-MS method detection limit (MDL) and the reporting limit (RL) for total selenium were reported at 150 and 400 ppb, respectively, for the SWAMP 2008 study. The MDL and RL for selenium was not reported for the TSMP study. Selenium concentrations were not sufficiently high to alter consumption advice and are not shown.

Table 2. Mercury and PCB Concentrations in Fish from Lake Evans

Species from Lake Evans	Number of Samples	Total Number of Fish	Mean* Total Length (mm)	Range of Total Lengths** (mm)	Mercury (ppb)	
					Mean*	Range**
Bass, Largemouth	15	15	379	307 - 459	50	22 - 97
Bluegill	2	10	131	109 - 164	8	7 - 9
Carp, Common	2	10	323	290 - 391	ND	ND
Catfish, Channel	2	10	592	502 - 671	45	36 - 53
Species from Lake Evans	**Number of Samples**	**Total Number of Fish**	**Mean* Total Length (mm)**	**Range of Total Lengths** (mm)**	**PCBs (ppb)**	
					Mean*	**Range****
Bass, Largemouth	1	7	357	307 - 421	16	n/a
Bluegill	1	10	131	109 - 164	14	n/a
Carp, Common	1	5	323	294 - 337	5	n/a
Catfish, Channel	1	10	592	502 - 671	126	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 available and/or concentration was derived from a single composite sample.
ND= Non-detectable

DEVELOPMENT OF GUIDELINES FOR EATING FISH FROM LAKE EVANS

GENERAL INFORMATION

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 is 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[7] "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 US Food and Drug Administration (FDA) and US 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, or 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

[7] "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).

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" and "Development of Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport fish: Polybrominated Diphenyl Ethers (PBDEs)" (OEHHA 2008 and 2011, respectively). A list of the ATLs used in this report is presented in Appendix I.

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). For fish species in Lake Evans where chlordanes, dieldrin, DDTs, PBDEs and selenium were analyzed, mean concentrations of these chemicals were lower than the corresponding ATL threshold values for daily consumption (OEHHA, 2008 and 2011).

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 consumers to eat fewer meals per week than would be the case for the presence of one chemical alone, in a similar concentration. For the Lake Evans advisory, the potential effect of multiple chemical exposures was assessed and determined not to affect the consumption advice. For all species, advice was based on mercury or PCB concentrations alone.

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 from this water body. 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[8] known to accumulate similar levels of contaminants.

Consumption advice should not be combined. That is, if a person chooses to eat a serving of 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 serving of fish from the "two-servings-per-week" category, they can combine fish species from that category, or eat a serving of 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 EVANS

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. For Lake Evans, the sample size criterion was met for the following species Bluegill, Channel Catfish, Common Carp, and Largemouth Bass. There were not sufficient data to evaluate other species that may be found in this water body.

BLACK BASS SPECIES (LARGEMOUTH BASS)

The mean mercury and PCB concentrations in Largemouth Bass from Lake Evans were 50 and 16 ppb, respectively. OEHHA recommends a maximum of four servings a week of black bass species for the sensitive population (women 18 to 45 years and children 1 to 17 years) based on mercury or PCBs and a total of four servings a week for the general population (women 46 years and older, and men 18 years and older), based on PCBs.

OEHHA evaluated mercury concentrations in black bass species in many water bodies in California and 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.

CHANNEL CATFISH

The mean mercury and PCB concentrations in Channel Catfish from Lake Evans were 45 and 126 ppb, respectively. OEHHA recommends that neither the sensitive population (women 18 to 45 years and children 1 to 17 years) nor general population

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

(women 46 years and older, and men 18 years and older) consume Channel Catfish, based on PCBs.

Common Carp

The mean mercury and PCB concentrations in Common Carp from Lake Evans were less than the detection level and 5 ppb, respectively. OEHHA recommends a maximum of seven servings a week of Common Carp for both the sensitive population (women 18 to 45 years and children 1 to 17 years) and general population (women 46 years and older, and men 18 years and older), based on mercury or PCBs.

Sunfish Species (Bluegill)

The mean mercury and PCB concentrations in Bluegill from Lake Evans were 8 and 14 ppb, respectively. OEHHA recommends a maximum of four servings a week of sunfish species for both the sensitive population (women 18 to 45 years and children 1 to 17 years) and general population (women 46 years and older, and men 18 years and older) populations, based on PCBs.

OEHHA evaluated mercury concentrations in sunfish species in many water bodies in California and 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 Bluegill to other sunfish species.

RECOMMENDED MAXIMUM NUMBER OF SERVINGS

The recommended maximum numbers of servings per week for fish from Lake Evans are shown in Table 3.

TABLE 3. RECOMMENDED MAXIMUM NUMBER OF SERVINGS PER WEEK FOR FISH FROM LAKE EVANS

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	4	4
Carp	7	7
Channel Catfish	0	0
Sunfish species	4	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[9] 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 Evans are followed, exposure to chemicals in fish from Lake Evans 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

[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.

[9] 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.