



Health Advisory and Guidelines for Eating Fish from Topaz Lake (Mono County)

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Fish, Ecotoxicology, and Water Section
Pesticide and Environmental Toxicology Branch
Office of Environmental Health Hazard Assessment
California Environmental Protection Agency

LIST OF CONTRIBUTORS

Office of Environmental Health Hazard Assessment

Authors

Lori A. Chumney, M.S.
Huyen Tran Pham, M.P.H.

Primary Reviewers

Susan A. Klasing, Ph.D., Section Chief
Wesley Smith, Ph.D.

Final Reviewers

David Ting, Ph.D., Branch Chief
David Siegel, Ph.D., Assistant to the Deputy Director
Allan Hirsch, Chief Deputy Director

Director

Lauren Zeise, Ph.D.

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For further information, contact:

Pesticide and Environmental Toxicology Branch
Office of Environmental Health Hazard Assessment
California Environmental Protection Agency

1001 I Street, P.O. Box 4010
Sacramento, CA 95812-4010
Telephone: (916) 324-7572
Email address: fish@oehha.ca.gov

1515 Clay Street, 16th Floor
Oakland, California 94612
Telephone: (510) 622-3170

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
OEHHA	Office of Environmental Health Hazard Assessment
PBDEs	polybrominated diphenyl ethers
PCBs	polychlorinated biphenyls
ppb	parts per billion
RL	reporting limit
RWB6	Regional Water Board 6 (Lahontan)
Se	selenium
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Resources Control Board
TSMF	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 updated guidelines for eating fish from Topaz Lake in Mono County. This update differs from the previous guidelines by combining data for all sucker species collected from Topaz Lake to develop one set of advice for these fish. 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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Women
(18-49 Years)

Children
(1-17 Years)

1 TOTAL SERVING A WEEK

0 DO NOT EAT



Women
(50+ Years)

Men
(18+ Years)

3 TOTAL SERVINGS A WEEK


OR

1 TOTAL SERVING A WEEK


A GUIDE TO EATING FISH *from* TOPAZ LAKE

(MONO COUNTY)


Eat the Good Fish
Eating fish that are low in chemicals may provide health benefits to children and adults.




Avoid the Bad Fish
Eating fish with higher levels of chemicals like mercury or PCBs may cause health problems in children and adults.




Choose the Right Fish
Chemicals may be more harmful to unborn babies and children.



Rainbow Trout
high in omega-3s





Sucker Species
Photo credit: Fisheries and Oceans Canada, Douglas Watkinson



Black Bass Species

Serving Size
A serving of fish is about the size and thickness of your hand. Give children smaller servings.

For Adults 

For Children 

 **California Office of Environmental Health Hazard Assessment**

web www.oehha.ca.gov/fish
email fish@oehha.ca.gov
phone (916) 324-7572

Eat only the skinless fillet



Some chemicals are higher in the skin, fat, and guts.

Eat only the meat



Updated 02/2020

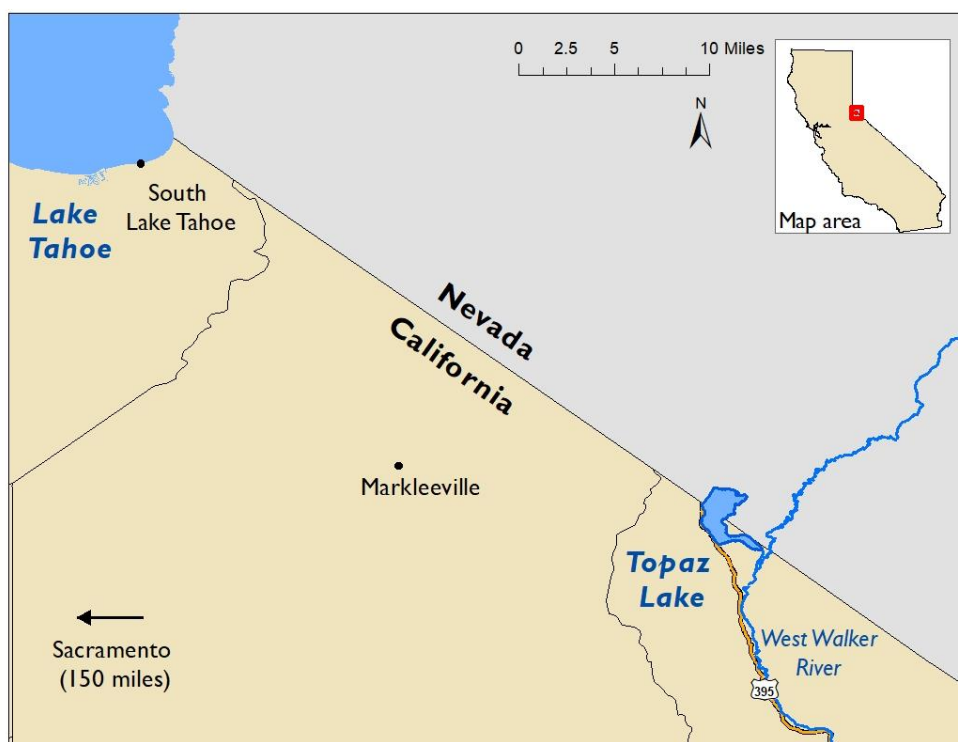
INTRODUCTION

This report presents guidelines for eating fish from Topaz Lake (Figure 1), located on the California-Nevada border, in Mono County. Topaz Lake is located approximately 40 miles southeast of Lake Tahoe and 150 miles east of Sacramento, CA.

LOCATION

Topaz Lake is a reservoir that was constructed in the early 1920's to store irrigation water, and is fed by waters from the West Walker River. Topaz Lake covers nearly 2500 acres and is operated by the Walker River Irrigation District. The Topaz Lake fishery is jointly managed by the California Department of Fish and Wildlife and the Nevada Department of Wildlife, which each stock the lake with trout.¹

FIGURE 1. LOCATION OF TOPAZ LAKE



¹ Information regarding Topaz Lake was obtained from the Nevada Department of Wildlife and the Walker River Irrigation District. Online at: http://www.ndow.org/Bodies_of_Water/Topaz_Lake/ and <http://www.wrid.us>.

APPROACH USED

The Office of Environmental Health Hazard Assessment (OEHHA) used the results from four monitoring studies described in this report to develop the Topaz Lake 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 mean²) 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 the 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

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 California water bodies. 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 Topaz Lake and used in advisory development were analyzed for mercury (as a measure of methylmercury). Rainbow Trout and suckers were also analyzed for selenium, and suckers were further analyzed for the legacy pesticides chlordanes (cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor, and oxychlordane), dieldrin, DDTs (DDT and its metabolites dichlorodiphenyldichloroethane [DDD] and dichlorodiphenyl-dichloroethylene [DDE]). Fish species that do not normally accumulate PCBs or other organic chemicals may not be analyzed for those contaminants in a particular monitoring study. Additionally, some studies do not analyze these chemicals and instead focus only on mercury.

DATA SOURCES

The guidelines for eating fish from Topaz Lake 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 methods (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 were reported. "Sampling" or "sampled" refers to the act of collecting fish for chemical analysis.

CONTAMINANTS IN FISH FROM CALIFORNIA LAKES AND RESERVOIRS, 2007-2008 (SWAMP)

The Surface Water Ambient Monitoring Program (SWAMP), operated by the State Water Resources Control Board (SWRCB) in cooperation with the 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 Rainbow Trout and suckers from Topaz Lake in 2007 to analyze for mercury in both species, and for chlordanes, DDTs, dieldrin, PBDEs, PCBs, and selenium in suckers (SWRCB, 2010).

REGIONAL WATER QUALITY CONTROL BOARD (RWB6)

The Lahontan Regional Water Quality Control Board (RWB6) coordinates ongoing sampling efforts to monitor contaminant levels, including mercury, in sport fish caught from lakes and reservoirs within the region. Rainbow Trout, Smallmouth Bass, and suckers were collected in Lake Topaz by RWB6 in 2017, and were analyzed for mercury.³

TOXIC SUBSTANCES MONITORING PROGRAM (TSMP)

The TSMP operated from 1976 to 2003 as a state water quality-monitoring program managed by 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. Staff from the California Department of Fish and Wildlife (CDFW), then known as the California Department of Fish and Game, collected Rainbow Trout from Topaz Lake in 1989, which were analyzed for mercury and selenium.

³ Information on the Lahontan Regional Water Quality Control Board is available online at: <https://www.waterboards.ca.gov/rwqcb6/>.

WILDLIFE BIOMAGNIFICATION FACTOR STUDY, 2013 (SWAMP)

This study was conducted by SWAMP with the goals of evaluating the mercury risk to piscivorous birds and to examine correlations between mercury concentrations in birds and fish in lakes and reservoirs throughout California. As part of this study, Smallmouth Bass were collected in 2013 from Topaz Lake and analyzed for mercury (Ackerman et. al 2015).

FISH SAMPLED FROM TOPAZ LAKE

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 evaluated for 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 TOPAZ LAKE ADVISORY

Common Name	Scientific Name	Number of Samples	Total Number of Fish	Project	Year Collected	Contaminants Analyzed
Rainbow Trout	<i>Oncorhynchus mykiss</i>	1	2	TSMP ^a	1989	Hg, Se
		1	5	SWAMP	2007	Hg
		5	5	RWB6	2017	Hg
Smallmouth Bass	<i>Micropterus dolomieu</i>	2	2	SWAMP	2013	Hg
		10	10	RWB6	2017	Hg
Sucker Species	<i>Catostomas spp.</i>	11	11	RWB6	2017	Hg
		1	5	SWAMP	2007	Chlordanes, DDTs, Dieldrin, PBDEs, PCBs, Se
		2	10	SWAMP	2007	Hg

^aStudy 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, and PCBs (52 congeners⁴). Among the chemicals analyzed in fish tissue samples from Topaz Lake, only mercury levels were sufficiently high to impact consumption advice.

Although the fillet preparation method for Rainbow Trout from the TSMP study was not recorded, all other fish samples were prepared as skinless fillets. Samples were analyzed as individual fish or composites.

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 length⁵, as well as mercury concentrations in each fish species. The DMA method detection limit (MDL)⁶ and the reporting limit (RL)⁷ for total mercury were reported at 3, 4, or 12 and 9 or 12 parts per billion (ppb), respectively. Although mercury was detected at commonly found concentrations in the TSMP study, the analysis method and the MDL and RL 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

⁴ Congeners are related compounds with similar chemical forms. Of the 209 possible PCB congeners, 54-55 are generally reported.

⁵ 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.

⁶ The MDL is the lowest quantity of a chemical that can be distinguished (as greater than zero) in a sample.

⁷ The RL is the lowest quantity of a chemical that can be accurately quantified in a sample.

with multiple congeners or metabolites in a given sample when detection levels are adequate (US EPA, 2000a).

SELENIUM

The CDFW MLML analyzed species collected from Topaz Lake 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 MDL and RL for total selenium were reported at 150 and 400 ppb, respectively.

Concentrations of chlordanes, dieldrin, DDTs, PBDEs, PCBs, and selenium were lower than the corresponding ATL threshold values for daily consumption (OEHHA, 2008 and 2011). These chemicals were therefore not considered further for developing consumption advice and are not shown in this report.

TABLE 2. MERCURY CONCENTRATIONS IN FISH FROM TOPAZ LAKE

Species from Topaz Lake	Number of Samples	Total Number of Fish	Mean* Total Length (mm)	Range of Total Lengths** (mm)	Mercury (ppb)	
					Mean*	Range**
Rainbow Trout	7	12	429	376 - 490	166	37 - 233
Smallmouth Bass	12	12	430	380 - 455	1101	660 - 1480
Sucker Species	13	21	240	201 - 295	170	77 - 237

*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 TOPAZ LAKE

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, 2016; 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 US Dietary Guidelines recommend that 1) the general population “consume eight or more ounces per week (less for young children)” of a variety of seafood⁸ “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 the US Environmental Protection Agency 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 49 years of age) and children 1-17 years, are lower than those for women 50 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.

For each fish species in this advisory, OEHHA compared the mean mercury concentrations detected in the fillet to the corresponding ATLS to establish the

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).

maximum number of servings per week that could be consumed (see Appendix I). A serving size is considered to be 8 ounces, prior to cooking, or about the size and thickness of a hand for fish fillets. Children should be given smaller servings. For smaller fish species, several individuals may be required to yield a serving.

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 not assessed in suckers, the only species for which both analytes were evaluated, due to the low concentration of PCBs. Advice for all species in this advisory was based solely on mercury 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 consumption advice for a particular fish species can be extended to other closely related fish species⁹ 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 TOPAZ LAKE

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 Topaz Lake, the sample size criterion was met for the following species: Rainbow Trout, Smallmouth Bass, and suckers. There were not sufficient data to evaluate other species that may be found in this water body. For fish species found in Lake Topaz that are not included in this advisory, OEHHA recommends following the [statewide advisory for lakes and reservoirs without site-specific advice](#).

BLACK BASS SPECIES (SMALLMOUTH BASS)

Based on the mean mercury concentration of 1101 ppb in Smallmouth Bass, OEHHA recommends no consumption of black bass species from Topaz Lake for the sensitive population (women 18 to 49 years and children 1 to 17 years), and a maximum of one serving a week for the general population (women 50 years and older, and men 18 years and older).

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 Smallmouth Bass to other black bass species, including Largemouth, Redeye, and Spotted Bass.

RAINBOW TROUT

The mean mercury concentration in Rainbow Trout from Topaz Lake was 166 ppb. OEHHA recommends a maximum of one serving a week of Rainbow Trout for the sensitive population (women 18 to 49 years and children 1 to 17 years), and a maximum of three servings a week for the general population (women 50 years and older, and men 18 years and older).

SUCKER SPECIES

The mean mercury concentration in suckers from Topaz Lake was 170 ppb. OEHHA recommends a maximum of one serving a week of sucker species for the sensitive population (women 18 to 49 years and children 1 to 17 years), and a maximum of three servings a week for the general population (women 50 years and older, and men 18 years and older).

RECOMMENDED MAXIMUM NUMBER OF SERVINGS

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

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

Fish Species from Topaz Lake	Women 18–49 years and Children 1-17 years	Women 50 years and older and Men 18 years and older
Black Bass Species	0	1
Rainbow Trout	1	3
Sucker Species	1	3

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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 dose¹⁰ 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 Topaz Lake are followed, exposure to chemicals in fish from Topaz Lake 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 18-49 and children 1-17)	≤ 31	>31-36	>36-44	>44-55	>55-70	>70-150	>150-440	>440
MeHg (Women > 49 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 over a lifetime.