OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT

GOOD CATCH CALIFORNIA
Your Fish Advisor

Health Advisory and Guidelines for Eating Fish from Bass Lake (Madera County)

December 2025

Fish, Incident Response, Seafood Safety, and Harmful Algal Bloom Section
Pesticide and Environmental Toxicology Branch
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LIST OF ACRONYMS AND ABBREVIATIONS

ATL	Advisory Tissue Level
CDFW	California Department of Fish and Wildlife
CEDEN	California Environmental Data Exchange Network
DDT(s)	dichlorodiphenyltrichloroethane (DDT) and its metabolites dichlorodiphenyldichloroethane (DDD) and dichlorodiphenyldichloroethylene (DDE)
DMA	direct mercury analyzer
FDA	United States Food and Drug Administration
Hg	mercury
ICP-MS	inductively coupled plasma-mass spectrometry
MDL	method detection limit
mm	millimeters
MPSL	Marine Pollution Studies Laboratory at Moss Landing Marine Laboratories
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
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.[1] 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 posted on OEHHA's website and published in the California Department of Fish and Wildlife's (CDFW) Inland and Ocean Sport Fishing Regulations in their respective sections on public health advisories.[2]

This report presents guidelines for eating fish from Bass Lake in Madera 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 the List of Figures and Tables.

[1] Sport fish includes all fish and shellfish caught from California waters for non-commercial purposes (e.g., recreational, tribal/cultural, and subsistence practices).
[2] CDFW's Inland and Ocean Sport Fishing Regulations can be found online at: https://wildlife.ca.gov/Fishing/Inland and https://wildlife.ca.gov/Fishing/Ocean, respectively.

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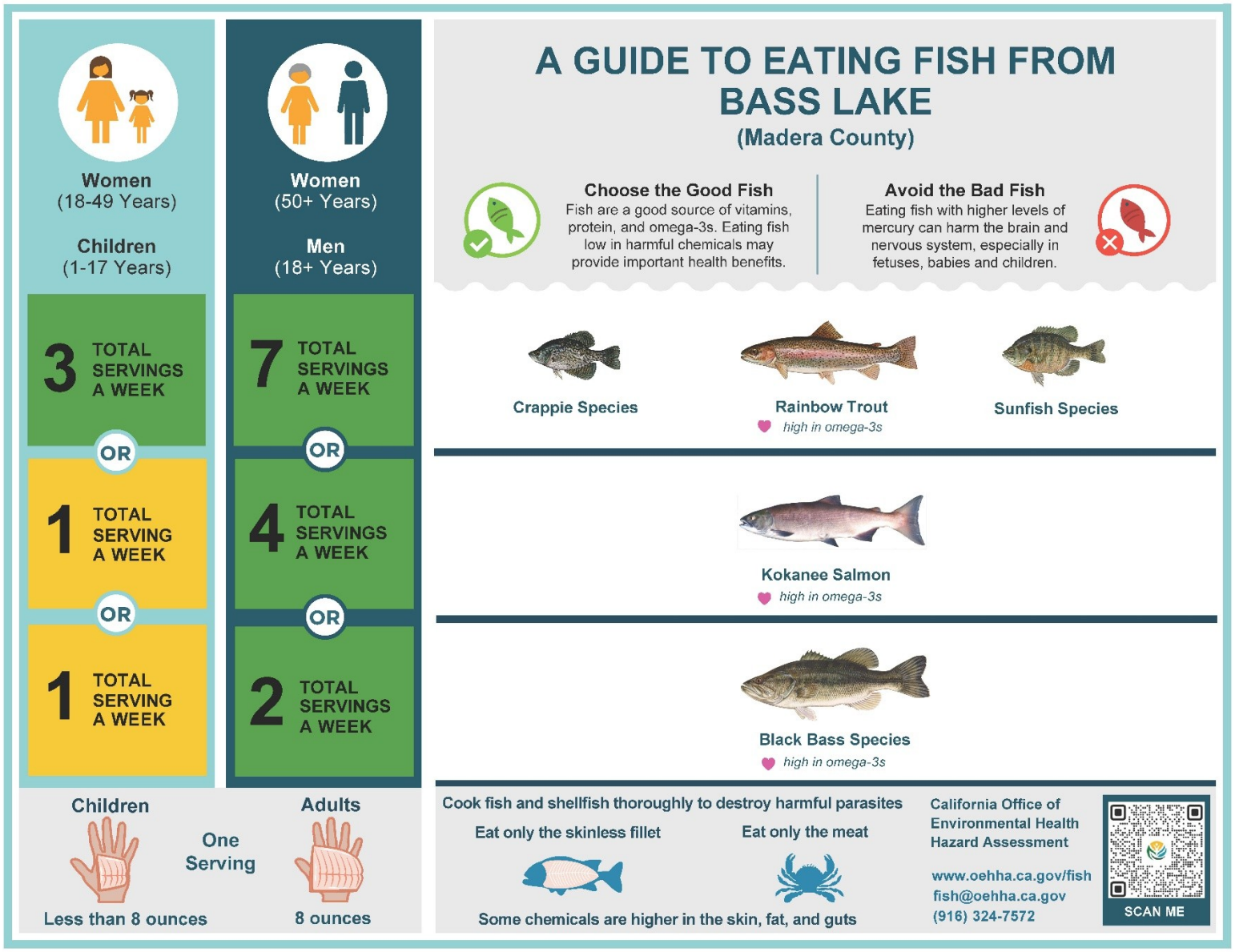
A GUIDE TO EATING FISH FROM BASS LAKE
(Madera County)
Choose the Good Fish
Fish are a good source of vitamins, protein, and omega-3s. Eating fish low in harmful chemicals may provide important health benefits.
Avoid the Bad Fish
Eating fish with higher levels of mercury can harm the brain and nervous system, especially in fetuses, babies and children.
Women (18-49 Years)
Children (1-17 Years)
3 TOTAL SERVINGS A WEEK
OR
1 TOTAL SERVING A WEEK
OR
1 TOTAL SERVING A WEEK
Women (50+ Years)
Men (18+ Years)
7 TOTAL SERVINGS A WEEK
OR
4 TOTAL SERVINGS A WEEK
OR
2 TOTAL SERVINGS A WEEK
Crappie Species
Rainbow Trout
high in omega-3s
Sunfish Species
Kokanee Salmon
high in omega-3s
Black Bass Species
high in omega-3s
Children
Less than 8 ounces
One Serving
Adults
8 ounces
Cook fish and shellfish thoroughly to destroy harmful parasites
Eat only the skinless fillet
Eat only the meat
Some chemicals are higher in the skin, fat, and guts
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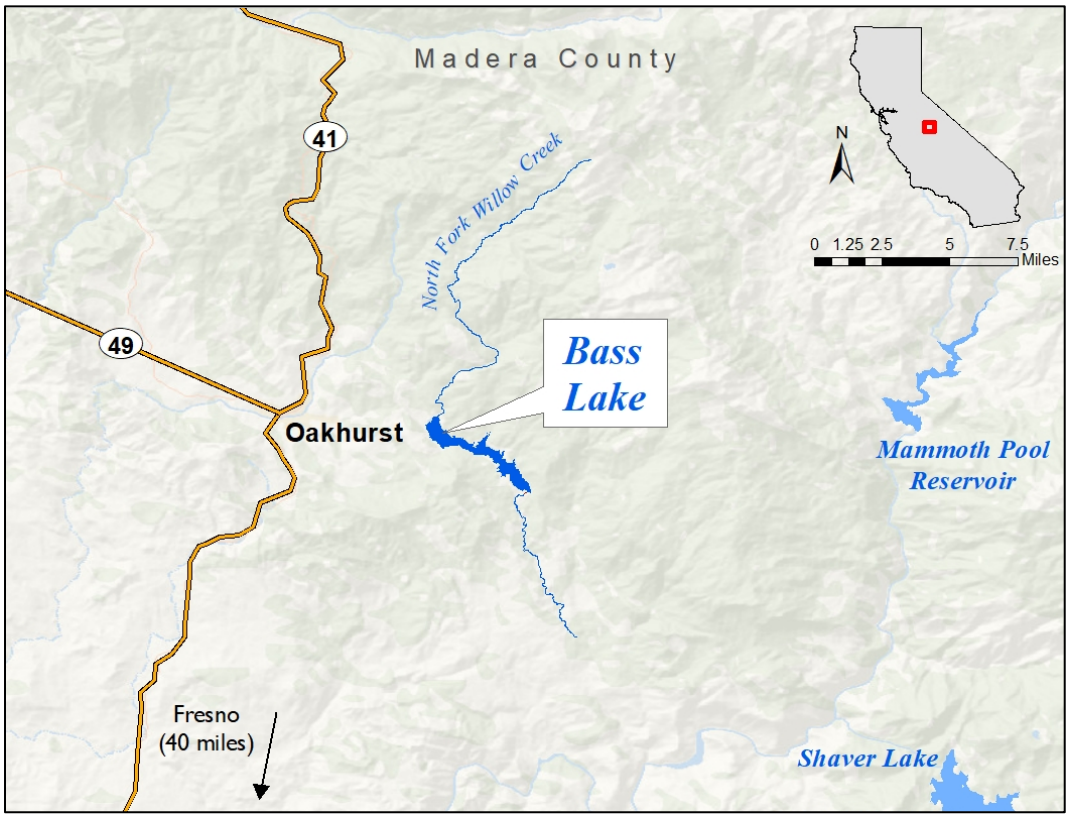
INTRODUCTION

This report presents guidelines for eating black bass species, crappie species, Kokanee Salmon, Rainbow Trout, and sunfish species from Bass Lake (Figure 1). Consumption advice is based on levels of mercury found in these species.

LOCATION

Bass Lake is located about 40 miles northeast of Fresno, CA, in the foothills of the Sierra Nevada Mountains. The lake is approximately 5 miles in length and 0.5 miles wide, with 15 miles of shoreline. It was developed in the early 1900s by construction of the Crane Valley Dam. Bass lake is owned and operated by the Pacific Gas and Electric Company and serves multiple purposes, including hydroelectric power generation, agricultural irrigation, flood control, and recreation.[3]

FIGURE 1. LOCATION OF BASS LAKE



[3] Information on Bass Lake can be found online at: https://www.pge.com/en/about/land-use-and-sales.html

APPROACH USED

The Office of Environmental Health Hazard Assessment (OEHHA) used the results from three monitoring studies described in this report to develop the Bass 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 mean)[4] and other descriptive statistics of the contaminant data, as appropriate, for a chemical of concern for the selected fish species.
4) Comparison of the chemical concentrations with the OEHHA Advisory Tissue Levels (ATLs) for each chemical of 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 includes consideration of health benefits associated with including fish in the diet (OEHHA, 2008). The ATLs should not be interpreted as static “bright lines,” but as 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 CONCERN

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

Mercury is an element found in some rocks and soil. Human activities, such as burning coal and the historical 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 methylmercury, which can pass into and build up in fish. High levels of

[4] Means are an arithmetic average of individual values and/or composites weighted by number of fish. 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.

methylmercury can harm the brain, especially in fetuses and children, whose brains are still developing.

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

Selenium is an element 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.

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, which can disrupt learning and behavior in children, among other adverse effects.

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.

A detailed discussion of the toxicity of these chemicals is 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 Bass Lake and used in advisory development were analyzed for mercury. Some fish were also analyzed for PCBs and/or selenium as indicated in Table 1.

DATA SOURCES

The guidelines for eating fish from Bass Lake are based on the chemicals detected in 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 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. The studies or entities contributing data to this advisory are described below.

Contaminants in Fish From California Lakes and Reservoirs, 2007–2008 (SWAMP)

The Surface Water Ambient Monitoring Program (SWAMP), managed by the State Water Resources Control Board (SWRCB) in cooperation with the Central Valley Regional Water Quality Control Board, monitors water quality in California’s surface waters.

This survey of inland water bodies was the State’s largest assessment of chemical contaminants in sport fish. The survey sampled popular fishing sites at 272 lakes and reservoirs from 2007 to 2008 (SWRCB, 2010). The SWRCB used the data from this survey to characterize statewide water quality conditions. The program collected Largemouth Bass from Bass Lake in 2008, which were analyzed for mercury.

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

The purpose of this study was to identify and characterize lakes with low concentrations of mercury and other contaminants in fish tissue to improve the understanding of the conditions and factors that contribute to these lower concentrations (Davis et al., 2018). The program collected Black Crappie, Kokanee Salmon, Largemouth Bass, Pumpkinseed, and Rainbow Trout from Bass Lake in 2014 to analyze for mercury. Kokanee Salmon and Rainbow Trout were also analyzed for PCBs.

Long-Term Monitoring of Bass Lakes and Reservoirs in California, 2015–2023 (SWAMP)

This SWAMP monitoring study documented the status and trends related to contamination in sport fish from California lakes and reservoirs where bass species reside (Davis et al., 2022). In 2019, the program collected Bluegill, Kokanee Salmon, Rainbow Trout and Spotted Bass from Bass Lake, which were analyzed for mercury and selenium.

FISH SAMPLED FROM BASS LAKE

The fish sampling data used in this advisory were retrieved from the California Environmental Data Exchange Network (CEDEN),[5] 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

[5] Online at: http://ceden.waterboards.ca.gov/AdvancedQueryTool.

maturity and professional judgment (as described in OEHHA, 2022). 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 BASS LAKE ADVISORY

Common Name	Scientific Name	Number of Samples[a]	Total Number of Fish	Project	Year Collected	Contaminants Analyzed
Black Crappie	*Pomoxis nigromaculatus*	2	10	SWAMP	2014	Hg
Bluegill	*Lepomis macrochirus*	1	5	SWAMP	2019	Hg, Se
Kokanee Salmon	*Oncorhynchus nerka*	10	10	SWAMP	2019	Hg
		1	10	SWAMP	2019	Se
		1	2	SWAMP	2014	Hg, PCBs
Largemouth Bass	*Micropterus salmoides*	9	9	SWAMP	2014	Hg
		8	8	SWAMP	2008	Hg
Pumpkinseed	*Lepomis gibbosus*	1	7	SWAMP	2014	Hg
Rainbow Trout	*Oncorhynchus mykiss*	9	9	SWAMP	2019	Hg
		1	9	SWAMP	2019	Se
		3	3	SWAMP	2014	Hg
		1	3	SWAMP	2014	PCBs
Spotted Bass	*Micropterus punctulatus*	10	10	SWAMP	2019	Hg
		1	10	SWAMP	2019	Se

[a] Samples refer to individual fish or composites of multiple fish. All samples were analyzed as skinless fillets.
Abbreviations: Hg, mercury; PCBs, polychlorinated biphenyls; Se, selenium

CHEMICAL CONCENTRATIONS

As shown in Table 1, samples were analyzed for one or more of the following: total mercury, selenium, and PCBs (50 congeners).[6] Among the chemicals analyzed in fish

[6] Congeners are related compounds with similar chemical forms. Of the 209 possible PCB congeners, 48–54 are generally analyzed. See the OEHHA (2022) sampling protocol available online at https://oehha.ca.gov/media/downloads/fish/report/fishadvisorysamplinganalysisprotocolreport2022.pdf.

tissue samples from Bass Lake, only mercury levels were sufficiently high to impact consumption advice.

All 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) average (arithmetic mean) 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 Marine Pollution Studies Laboratory (MPSL) at Moss Landing Marine Laboratories. 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 (millimeters (mm)),[7] as well as mercury concentrations in each fish species. Depending on the study, the DMA method detection limits (MDLs)[8] for total mercury were reported at 3, 4 or 12 parts per billion (ppb), and the reporting limits (RLs)[9] were 9 or 12 ppb.

PCBs

PCBs in either individual fish or composite samples were analyzed by gas chromatography at the CDFW Water Pollution Control Laboratory. Where applicable, the concentrations presented were the sum of the detected analytes (parent compound, congeners, or metabolites). Individual congeners or metabolites with concentrations reported as non-detects were assumed to be zero (due to relatively low MDLs or RLs). 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).

Selenium

The MPSL analyzed species collected for selenium as composite samples, using inductively coupled plasma-mass spectrometry (ICP-MS). The ICP-MS method uses desolvation, atomization, and ionization with ion separation based on a mass-to-charge

[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.
[8] The MDL is the lowest amount of a chemical that can be distinguished (as greater than zero) in a sample.
[9] The RL is the lowest amount of a chemical that can be accurately quantified in a sample.

ratio to detect the total selenium concentration in a sample. Depending on the study, the ICP-MS MDLs and RLs for selenium were reported at 230 and 700 ppb, respectively.

Concentrations of PCBs and selenium were lower than the corresponding ATL threshold values for daily consumption (OEHHA, 2008 and 2011). Except for assessing multiple chemical exposures, these chemicals were not considered further for developing consumption advice and are not shown in this report.

TABLE 2. MERCURY CONCENTRATIONS IN FISH FROM BASS LAKE

Species from Bass Lake	Number of Samples	Total Number of Fish[a]	Mean[b] Total Length (mm)	Range of Total Lengths[c] (mm)	Mercury (ppb)	
					Mean[b]	Range[c]
Black Bass Species, all years	27	27	363	305 – 570	188	35 – 572
Largemouth Bass, 2008	8	8	376	330 – 415	119	64 – 197
Largemouth Bass, 2014	9	9	379	305 – 570	117	35 – 299
Spotted Bass, 2019	10	10	337	305 – 412	307	182 – 572
Black Crappie	2	10	182	155 – 218	57	36 – 78
Kokanee Salmon, all years	11	12	431	380 – 510	135	38 – 183
Kokanee Salmon, 2014	1	2	491	472 – 510	38	n/a
Kokanee Salmon, 2019	10	10	419	380 – 460	154	127 – 183
Rainbow Trout, all years	12	12	392	315 – 555	56	15 – 129
Rainbow Trout, 2014	3	3	376	361 – 385	48	37 – 58
Rainbow Trout, 2019	9	9	397	315 – 555	58	15 – 129
Sunfish Species	2	12	138	110 – 178	57	55 – 58
Bluegill	1	5	154	146 – 178	55	n/a
Pumpkinseed	1	7	127	110 – 150	58	n/a

Samples were analyzed as skinless fillets.

[a] Samples refer to individual fish or composite of multiple fish.

[b] Means are an arithmetic average of individual values and/or a weighted average of composites.

[c] 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 BASS 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 beneficial omega-3 fatty acids, docosahexaenoic acid and eicosapentaenoic acid (USDA/USDHHS, 2020; Weaver et al., 2008).

As part of a healthy US-style dietary pattern at the 2,000-calorie level, the "Dietary Guidelines for Americans, 2020 – 2025" (USDA/USDHHS, 2020) recommends consuming eight ounces of seafood[10] per week. Young children are advised to eat proportionately smaller amounts. "Women who are pregnant or lactating should consume at least eight and up to 12 ounces of a variety of seafood per week from choices that are lower in methylmercury." Additionally, "based on FDA [US Food and Drug Administration] and EPA's [US Environmental Protection Agency] advice,[11] depending on body weight, some women should choose seafood lowest in methylmercury or eat less seafood than the amounts in the Healthy U.S.-Style Dietary Pattern" and avoid certain species (USDA/USDHHS, 2020). The species of 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 FDA and the 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).

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 safely, for each species and from 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 18–49 years of age) and children 1–17 years of age, 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 fetuses 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,

[10] Seafood as used here refers to fish and shellfish from freshwater and marine environments.
[11] Online at: https://www.fda.gov/food/consumers/advice-about-eating-fish.

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 table of the ATLs used in this report is presented in the Appendix.

For each fish species in this advisory, OEHHA compared the mean chemical concentrations detected in the fillet to the corresponding ATLs to establish the maximum number of servings per week that can be safely consumed (see the Appendix). For fish fillets, a serving size is considered to be eight ounces, prior to cooking, or about the size and thickness of a hand. Children should be given smaller servings. For smaller fish species, several individual fish 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, multiple chemical exposure methodology involving hazard index calculations is employed. This may result in advising fewer servings per week than would be the case for the presence of either chemical alone, with a similar concentration. The potential effect of multiple chemical exposures (mercury and PCBs) was assessed in Kokanee Salmon and did not affect advice. The potential effect of multiple chemical exposures was not assessed for Rainbow Trout due to non-detectable levels 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,[12] 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 listed fish species. People should eat no more than the recommended number of servings for each fish species or species group. When noted, OEHHA's consumption advice for a particular fish species can be extended to other closely related fish species[13] 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 one serving of fish from that category and one from a category that recommends more than two servings per week (if

[12] Online at: https://www.dietaryguidelines.gov/.
[13] Fish species within the same genus are most closely related, and family is the next level of relationship.

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 BASS LAKE

OEHHA's sampling and analysis protocol (OEHHA, 2022) requires that a minimum of nine edible-size fish of a species that may be legally caught are collected and analyzed 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 Bass Lake, the sample size criterion was met for the following species: black bass species, crappie species, Kokanee Salmon, Rainbow Trout, and sunfish species. There is not sufficient data to evaluate other species that may be found in this water body. For fish species found in Bass Lake that are not included in this advisory, OEHHA recommends following the statewide advisory for lakes and reservoirs without site-specific advice.[14]

The mean mercury concentration in black bass species collected from Bass Lake between 2008 and 2019 was 188 ppb. However, when mercury concentrations in black bass species were summarized by the year sampled, newer samples (Spotted Bass collected in 2019, 307 ppb) had a mean concentration approximately 2½-fold higher than those previously sampled (Largemouth Bass collected in 2008 and 2014, 119 and 117 ppb, respectively). Spotted Bass collected in 2019 were smaller than Largemouth Bass collected in previous years, so size did not account for the difference in mercury concentrations. Davis et al. (2025) reported a statewide trend of increasing mercury concentrations in black bass species. The authors hypothesized that the statewide increase in mercury levels may be due to substantial changes in hydrological conditions between years.

Similarly, Kokanee Salmon collected in 2019 had a roughly 4-fold increase in mercury over samples collected in 2014 (154 ppb versus 38 ppb, respectively) despite being smaller in size. Because the higher mercury concentrations in black bass (Spotted Bass) and Kokanee Salmon sampled in 2019 resulted in more conservative advice, OEHHA elected to base advice for these two species solely on the newer data.

The mean mercury concentrations in Rainbow Trout and sunfish species (also sampled in 2014 and 2019) did not show similar increases. OEHHA chose to base advice on all the available data for these species.

Although there has been a statewide trend of increasing mercury concentrations in black bass species (Davis et al, 2025), this does not fully account for increased concentrations of mercury in black bass species and Kokanee Salmon from Bass Lake, as mercury levels in Rainbow Trout and sunfish species from the same water body have

[14] Online at: https://oehha.ca.gov/advisories/statewide-advisory-eating-fish-californias-lakes-and-reservoirs-without-site-specific.

remained relatively stable. Thus, the cause of the increased mercury levels in some species of fish and not others in Bass Lake remains unclear.

Nonetheless, the following advice is based solely on mercury concentrations in fish caught from Bass Lake. The sensitive population is defined as women ages 18–49 years and children ages 1–17 years, and the general population is defined as women 50 years and older and men 18 years and older.

Black Bass Species (Spotted Bass)

Black bass species are one of the most targeted species of freshwater sport fish in California. OEHHA groups black bass species because they have similar predatory diets and likely comparable chemical uptake (Long and Fisher, 2000). They are also known to hybridize (Pierce and Van Den Avyle, 1997), largely due to species introductions for angling purposes and weak genetic barriers between members of the genus (Thongda et al., 2020). OEHHA 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 Spotted Bass to other black bass species, including Largemouth, Redeye, and Smallmouth Bass.

Based on the mean mercury concentration of 307 ppb in Spotted Bass collected in 2019, OEHHA recommends a maximum of one serving a week of black bass species from Bass Lake for the sensitive population, and a maximum of two servings a week for the general population.

Crappie Species (Black Crappie)

OEHHA groups Black and White Crappie because they have similar diets and may hybridize when they are co-located, making them difficult to distinguish (Dunham et al., 1994; Kelly and Baumhoer, 2014). Further, analysis of statewide Black and White Crappie data shows similar mean mercury concentrations. Therefore, OEHHA extends the consumption advice for Black Crappie to White Crappie.

The mean mercury concentration in Black Crappie from Bass Lake was 57 ppb. OEHHA recommends a maximum of three servings a week of crappie species for the sensitive population, and a maximum of seven servings a week for the general population.

Kokanee Salmon

The mean mercury concentration in Kokanee Salmon collected in 2019 from Bass Lake was 154 ppb. OEHHA recommends a maximum of one serving a week of Kokanee Salmon for the sensitive population, and a maximum of four servings a week for the general population.

Rainbow Trout

The mean mercury concentration in Rainbow Trout from Bass Lake was 56 ppb. OEHHA recommends a maximum of three servings a week of Rainbow Trout for the sensitive population, and a maximum of seven servings a week for the general population.

Sunfish Species (Bluegill, Pumpkinseed)

OEHHA groups sunfish species due to their known ability to hybridize (Avise and Smith, 1974) and extensive dietary overlap (Kirby, 1982), which suggests a similar contaminant uptake. OEHHA has evaluated mercury concentrations in sunfish species from 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 Bluegill and Pumpkinseed to other sunfish species, including Green Sunfish and Redear Sunfish.

The mean mercury concentration in sunfish species from Bass Lake was 57 ppb. Mercury concentrations for individual sunfish species were as follows: Bluegill, 55 ppb; and Pumpkinseed, 58 ppb. OEHHA recommends a maximum of three servings a week of sunfish species for the sensitive population and a maximum of seven servings a week for the general population.

RECOMMENDED MAXIMUM NUMBER OF SERVINGS

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

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

Fish Species	Women 18–49 years and Children 1–17 years		Women 50 years and older and Men 18 years and older	
	Number of Servings	Risk Driver[a]	Number of Servings	Risk Driver[a]
Black Bass Species	1	Hg	2	Hg
Crappie Species	3	Hg	7	–
Kokanee Salmon	1	Hg	4	Hg
Rainbow Trout	3	Hg	7	–
Sunfish Species	3	Hg	7	–

[a] The risk driver is the contaminant that results in the fewest recommended servings per week.
Abbreviation: Hg, mercury
"–" denotes that all chemicals analyzed were below levels that would restrict consumption to less than seven servings a week

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APPENDIX. ADVISORY TISSUE LEVELS

Advisory Tissue Levels (ATLs; OEHHA, 2008 and 2011) 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 reference dose[15] on an average daily basis 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 risk level is chosen based on OEHHA's policy to balance the benefits and risks of fish consumption.

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 a water body are followed, exposure to chemicals in fish from that water body 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[b] (Women 18–49 and children 1–17)	≤ 31	> 31–36	> 36–44	> 44–55	> 55–70	> 70–150	> 150–440	> 440
MeHg (Women ≥ 50 and men ≥ 18)	≤ 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	≤ 1,000	> 1,000–1,200	> 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.
[b]All mercury detected is assumed to be methylmercury (MeHg), which is the most common form found in fish and is also the more toxic form (Bloom, 1992).

[15] 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.