



Health Advisory and Guidelines for Eating Fish from Castaic Lake and Castaic Lagoon (Los Angeles County)

Updated February 2023



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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
DMA	direct mercury analyzer
EPA	eicosapentaenoic acid
FDA	United States Food and Drug Administration
Hg	mercury
ICP-MS	inductively coupled plasma-mass spectrometry
MDL	method detection limit
MeHg	methylmercury
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
RWB4	Regional Water Board 4 (Los Angeles)
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 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 updated guidelines for eating fish from Castaic Lake and Castaic Lagoon in Los Angeles 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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Women
(18-49 Years)
Children
(1-17 Years)



Women
(50+ Years)
Men
(18+ Years)


A GUIDE TO EATING FISH

from


CASTAIC LAKE

(LOS ANGELES 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.

7	7	
TOTAL SERVINGS A WEEK	TOTAL SERVINGS A WEEK	 Silverside Species
OR	OR	
3	3	 Sunfish Species
TOTAL SERVINGS A WEEK	TOTAL SERVINGS A WEEK	
OR	OR	
2	7	 Threadfin Shad
TOTAL SERVINGS A WEEK	TOTAL SERVINGS A WEEK	
OR	OR	
1	4	 Common Carp  Striped Bass ♥ high in omega-3s
TOTAL SERVING A WEEK	TOTAL SERVINGS A WEEK	
OR	OR	
0	1	 Black Bass Species  Channel Catfish
DO NOT EAT	TOTAL SERVING A WEEK	


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


Eat only the meat



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

Updated 02/2023



Women
(18-49 Years)

Children
(1-17 Years)



Women
(50+ Years)

Men
(18+ Years)

A GUIDE TO EATING FISH

from

CASTAIC LAGOON

(LOS ANGELES COUNTY)

7 TOTAL SERVINGS A WEEK

OR

2 TOTAL SERVINGS A WEEK

OR

1 TOTAL SERVING A WEEK

7 TOTAL SERVINGS A WEEK

OR


2 TOTAL SERVINGS A WEEK

OR

2 TOTAL SERVINGS A WEEK


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.




Sculpin




Silverside Species




Sunfish Species



Threadfin Shad



Common Carp




Black Bass Species

♥ high in omega-3s


Serving Size

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

For Adults



For Children




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Eat only the skinless fillet



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

Eat only the meat



Updated 02/2023

INTRODUCTION

This report updates and supersedes the previous guidelines developed by the Office of Environmental Health Hazard Assessment (OEHHA, 2017) for eating fish from Castaic Lake and Castaic Lagoon (Figure 1), also known as Upper Lake and Lower Lake, respectively, in Los Angeles County, California. The collection of additional data made it possible to update this advisory with the inclusion of silverside species, Striped Bass, and Threadfin Shad for Castaic Lake, and sculpin, silverside species, and Threadfin Shad for Castaic Lagoon. Castaic Lake consumption advice for black bass species and Common Carp was changed based on the inclusion of new data. Consumption advice for eating black bass species, Channel Catfish, Common Carp, silverside species, Striped Bass, sunfish species, and Threadfin Shad from Castaic Lake, and black bass species, Common Carp, sculpin, silverside species, sunfish species, and Threadfin Shad from Castaic Lagoon, is based on levels of mercury (Hg) and/or polychlorinated biphenyls (PCBs) found in fish collected from these water bodies.

Castaic Lake is known for very large Largemouth Bass, including the state record-holder (and third largest in the world), weighing 21 pounds, 12 ounces, caught at Castaic Lake in 1991. As a result, there is significant interest in fishing for Largemouth Bass at the lake (Stienstra, 2004). The minimum legal size for black bass at Castaic Lake is 15 inches (381 mm), which is larger than the typical minimum legal size of 12 inches (305 mm) for black bass for most other water bodies in the state.³ For advisory purposes, this size requirement is also applied to black bass species caught from Castaic Lagoon. Striped Bass are quite popular at Castaic Lake, and other species pursued by sportfishers in both the lake and lagoon include Bluegill, catfish, crappie, and Rainbow Trout (Stienstra, 2004).

Elderberry Forebay is a small reservoir at the northern end of Castaic Lake used for hydroelectric purposes (Fed.Reg., 2020). Fishing is not permitted at Elderberry Forebay; however, because it is thought that fish can move from Elderberry Forebay to Castaic Lake, some fish contaminant data collected from this water body were used in the development of fish consumption advice for Castaic Lake. This allowed advice to be developed for one additional species (Channel Catfish) and to provide supplemental data for Largemouth Bass and Striped Bass. Contaminant levels in fish collected from Castaic Lagoon were generally lower than in fish collected from Castaic Lake; thus, separate advice was developed for Castaic Lake and Castaic Lagoon.

LOCATION

Castaic Lake and Castaic Lagoon are located just east of Interstate 5, about ten miles north of Santa Clarita, CA. Castaic Lake and Dam is one of the 34 reservoirs and 25 dams that comprise the State Water Project,⁴ a system of storing and delivering water to

³ Fishing for Black Bass, CDFW, online at: <https://wildlife.ca.gov/Fishing/Inland/Black-Bass>.

⁴ For information on the State Water Project, visit the California Department of Water Resources online at: <https://water.ca.gov/Programs/State-Water-Project>.

approximately two-thirds of Californians. Castaic Lake has 29 miles of shoreline, a surface area of 2,240 acres, and a 425-foot-high dam.⁵ Just south of the lake is Castaic Lagoon (afterbay), which has three miles of shoreline and a surface area of 200 acres.

FIGURE 1. LOCATION OF CASTAIC LAKE AND CASTAIC LAGOON



APPROACH USED

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

⁵ For information on the dam at Castaic Lake and Castaic Lake recreation, visit the California Department of Water Resources online at: <https://water.ca.gov/Programs/State-Water-Project/SWP-Facilities/Southern/Castaic-Dam-Modernization> and <https://water.ca.gov/What-We-Do/Recreation/Castaic-Lake-Recreation>.

- 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)⁶ 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 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 POTENTIAL CONCERN

Certain chemicals, because of their toxicity and their ability to accumulate in fish tissue, are of potential concern for people who eat fish. The majority of fish consumption advisories in California are issued because of mercury, followed by PCBs and, in a few cases, selenium (Se), polybrominated diphenyl ethers (PBDEs), or some 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 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.

⁶ 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.

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 or learning and behavior in children.

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 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 Castaic Lake, Elderberry Forebay, and Castaic Lagoon and used in advisory development were analyzed for mercury. Some fish were analyzed for PCBs, PBDEs, selenium, and legacy pesticides as indicated in Table 1. Fish species that do not typically accumulate PCBs or other organic chemicals were not analyzed for these contaminants.

DATA SOURCES

The guidelines for eating fish from Castaic Lake and Castaic Lagoon are based on the chemicals detected in 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)

This survey of inland water bodies, conducted by the State Water Resources Control Board’s (SWRCB) Surface Water Ambient Monitoring Program (SWAMP), was the

State's largest survey 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 Channel Catfish and Largemouth Bass from Elderberry Forebay, Common Carp and Largemouth Bass from Castaic Lake, and Largemouth Bass and Redear Sunfish from Castaic Lagoon in 2007, which were analyzed for chlordanes, DDTs, dieldrin, mercury, PBDEs, PCBs, and, in some species, selenium.

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 Bluegill, Channel Catfish, Common Carp, Striped Bass, and Threadfin Shad from Castaic Lake, and Common Carp, Largemouth Bass, Inland Silverside, sculpin, and Threadfin Shad from Castaic Lagoon in 2014 to analyze for mercury in all species, PCBs in Common Carp and Striped Bass, and legacy pesticides (chlordanes, DDTs, and dieldrin) in Striped Bass.

LONG-TERM MONITORING OF BASS LAKES AND RESERVOIRS IN CALIFORNIA, 2015 (SWAMP)

This monitoring study is a multi-year effort initiated in 2015 to document status and trends related to contamination in sport fish from California lakes and reservoirs where bass species reside (Davis et al., 2019). In 2015, the program collected Common Carp, Largemouth Bass, and Inland Silverside from Castaic Lake, which were analyzed for mercury. Common Carp were also analyzed for chlordanes, DDTs, dieldrin, and PCBs.

REGIONAL WATER QUALITY CONTROL BOARD, LOS ANGELES FISH CONTAMINATION STUDY, 2010 – 2019 (RWB4 LAKES)

The Los Angeles Regional Water Quality Control Board, Region 4 (RWB4) coordinates ongoing sampling efforts to monitor contaminant levels, including mercury, in sport fish caught from lakes and reservoirs within the region (LARWQCB, 2012). RWB4 collected Channel Catfish, Largemouth Bass, and Striped Bass from Elderberry Forebay in 2012. From Castaic Lake, Bluegill were collected in 2010 and 2019, Common Carp in 2019, Largemouth Bass in 2010, 2013, and 2019, and Mississippi Silverside in 2019. Bluegill, Common Carp (also collected in 2010), Largemouth Bass, Mississippi Silverside, and sculpin were collected from Castaic Lagoon in 2019. All these species were analyzed for mercury (except Striped Bass) and most for selenium. Species collected from Elderberry Forebay and Common Carp from Castaic Lagoon were also analyzed for chlordanes, DDTs, dieldrin, and PCBs.

CHANGES FROM THE 2017 ADVISORY

This update includes the following changes and additions to the previous 2017 Castaic Lake and Castaic Lagoon advisories:⁷

- 1) Castaic Lake: Consumption advice for silverside species, Striped Bass, and Threadfin Shad was added to the advisory based on data from samples collected by the Los Angeles Regional Water Quality Control Board Fish Contamination Study (2012, 2019), the SWAMP Survey of Lakes and Reservoirs with Low Concentrations of Contaminants in Sport Fish study (2014), and the SWAMP Long-Term Monitoring of Bass Lakes and Reservoirs in California study (2015).
- 2) Castaic Lake: The advice for black bass species for the general population was changed from a maximum of two servings a week to a maximum of one serving per week based on the inclusion of additional mercury data from the SWAMP Long-Term Monitoring of Bass Lakes and Reservoirs in California study (2015) and the Los Angeles Regional Water Quality Control Board Fish Contamination Study (2019).
- 3) Castaic Lake: The advice for Common Carp for the sensitive population was changed from a maximum of two servings a week to a maximum of one serving per week, and advice for the general population was changed from a maximum of three servings per week to a maximum of four servings per week based on the inclusion of additional mercury and PCB data from the SWAMP Long-Term Monitoring of Bass Lakes and Reservoirs in California study (2015) and the Los Angeles Regional Water Quality Control Board Fish Contamination Study (2019).
- 4) Castaic Lagoon: Consumption advice for sculpin, silverside species, and Threadfin Shad was added to the advisory based on data from samples collected by the Los Angeles Regional Water Quality Control Board Fish Contamination Study (2019) and the SWAMP Survey of Lakes and Reservoirs with Low Concentrations of Contaminants in Sport Fish study (2014).

FISH SAMPLED FROM CASTAIC LAKE, CASTAIC LAGOON, AND ELDEBERRY FOREBAY

The fish sampling data used in this advisory were retrieved from the California Environmental Data Exchange Network (CEDEN),⁸ 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, 2022). A summary of all fish species evaluated for this advisory is shown in Table 1, including the name of the

⁷ In 2018, OEHHA updated the age ranges for women in each population group. The sensitive population changed from women 18 – 45 years to 18 – 49 years, and the general population from women 46 years and older to 50 years and older.

⁸ Online at: <http://ceden.waterboards.ca.gov/AdvancedQueryTool>.

species, number of samples collected, total number of fish, project name, year sampled, and contaminants analyzed.

TABLE 1. FISH SAMPLES EVALUATED FOR THE CASTAIC LAKE ADVISORY

Common Name	Scientific Name	Number of Samples	Total Number of Fish	Project	Year Collected	Contaminants Analyzed
Bluegill	<i>Lepomis macrochirus</i>	3	15	RWB4	2010	Hg
		1	5	SWAMP	2014	Hg
		2	10	RWB4	2019	Hg, Se
Channel Catfish	<i>Ictalurus punctatus</i>	1	1	SWAMP	2014	Hg
Channel Catfish (Elderberry Forebay)	<i>Ictalurus punctatus</i>	2	10	SWAMP	2007	chlordanes, DDTs, dieldrin, Hg, PBDEs, PCBs
		1	5	SWAMP	2007	Se
		1	5	RWB4	2012	chlordanes, DDTs, dieldrin, Hg, PCBs
Common Carp	<i>Cyprinus carpio</i>	2	10	SWAMP	2007	DDTs, dieldrin, Hg, PBDEs, PCBs
		1	10	SWAMP	2007	chlordanes, Se
		2	10	SWAMP	2014	Hg
		1	10	SWAMP	2014	PCBs
		2	10	SWAMP	2015	chlordanes, DDTs, dieldrin, Hg, PCBs
		2	10	RWB4	2019	Hg, Se
Largemouth Bass	<i>Micropterus salmoides</i>	8	8	SWAMP	2007	Hg
		2	10	SWAMP	2007	chlordanes, DDTs, dieldrin, PBDEs, PCBs
		2	2	RWB4	2010	Hg

Common Name	Scientific Name	Number of Samples	Total Number of Fish	Project	Year Collected	Contaminants Analyzed
Largemouth Bass	<i>Micropterus salmoides</i>	5	5	RWB4	2013	Hg
		6	6	SWAMP	2015	Hg
		5	5	RWB4	2019	Hg
		2	19	RWB4	2019	Se
Largemouth Bass (Elderberry Forebay)	<i>Micropterus salmoides</i>	4	4	SWAMP	2007	Hg
		2	10	SWAMP	2007	chlordanes, DDTs, dieldrin, PBDEs, PCBs
		2	2	RWB4	2012	Hg
		1	5	RWB4	2012	chlordanes, DDTs, dieldrin, PCBs
Mississippi Silverside ^a	<i>Menidia audens</i>	1	10	RWB4	2019	Hg, Se
Inland Silverside ^a	<i>Menidia beryllina</i>	1	10	SWAMP	2015	Hg
Striped Bass	<i>Morone saxatilis</i>	22	22	SWAMP	2014	Hg
		1	5	SWAMP	2014	chlordanes, DDTs, dieldrin
		2	10	SWAMP	2014	PCBs
Striped Bass (Elderberry Forebay)	<i>Morone saxatilis</i>	1	5	RWB4	2012	chlordanes, DDTs, dieldrin, PCBs
Threadfin Shad ^a	<i>Dorosoma petenense</i>	1	20	SWAMP	2014	Hg

Samples were analyzed as skinless fillets, with the following exception:

^a Samples were analyzed as whole organisms, including head, skin, internal organs, muscle, and bones.

TABLE 2. FISH SAMPLES EVALUATED FOR THE CASTAIC LAGOON ADVISORY

Common Name	Scientific Name	Number of Samples	Total Number of Fish	Project	Year Collected	Contaminants Analyzed
Bluegill	<i>Lepomis macrochirus</i>	1	5	RWB4	2019	Hg, Se
Common Carp	<i>Cyprinus carpio</i>	1	5	RWB4	2010	chlordanes, DDTs, dieldrin, Hg, PCBs
		2	10	SWAMP	2014	Hg, PCBs
		1	5	RWB4	2019	Hg, Se
Largemouth Bass	<i>Micropterus salmoides</i>	3	3	SWAMP	2007	Hg
		2	10	SWAMP	2007	chlordanes, DDTs, dieldrin, PBDEs, PCBs
		7	7	SWAMP	2014	Hg
		3	3	RWB4	2019	Hg
Mississippi Silverside ^a	<i>Menidia audens</i>	1	10	RWB4	2019	Hg, Se
Redear Sunfish	<i>Lepomis microlophus</i>	2	10	SWAMP	2007	chlordanes, DDTs, dieldrin, Hg, PBDEs, PCBs
		1	5	SWAMP	2007	Se
Inland Silverside ^a	<i>Menidia beryllina</i>	1	20	SWAMP	2014	Hg
Sculpin ^a	<i>Cottus spp.</i>	1	20	SWAMP	2014	Hg
		1	10	RWB4	2019	Hg, Se
Threadfin Shad ^a	<i>Dorosoma petenense</i>	1	20	SWAMP	2014	Hg

Samples were analyzed as skinless fillets, with the following exception:

^a Samples were analyzed as whole organisms, including head, skin, internal organs, muscle, and bones.

CHEMICAL CONCENTRATIONS

As shown in Table 1, samples were analyzed for one or more of the following: total mercury, selenium, chlordanes (5 congeners), DDTs (6 congeners), dieldrin, PBDEs (7 congeners), and PCBs (54-55 congeners).⁹ Among the chemicals analyzed in fish tissue samples from Elderberry Forebay, Castaic Lake, and Castaic Lagoon, only mercury and PCB levels were sufficiently high to impact consumption advice.

All fish samples were prepared as skinless fillets, except for the sculpin, Inland Silverside, Mississippi Silverside, and Threadfin Shad samples, which were analyzed as whole bodies. 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 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, which is the most common form found in fish and is also the more toxic form (Bloom, 1992). Tables 3 and 4 show the averages and ranges for total length,¹⁰ as well as mercury concentrations in each fish species for Castaic Lake and Castaic Lagoon, respectively. The DMA method detection limits (MDLs)¹¹ for total mercury were reported at 3, 4, or 12 parts per billion (ppb), depending on the study. The reporting limits (RLs)¹² were 9, 12, or 36 ppb, depending on the study.

PCBs, PBDEs, AND PESTICIDES

Pesticides, PBDEs, and PCBs in composite samples 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. Because 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

⁹ Congeners are related compounds with similar chemical forms. Five and six congeners are typically analyzed for chlordanes and DDTs, respectively. Of the 209 possible PBDE and PCB congeners, 6–7 and 48–54 are generally analyzed, respectively. See the OEHHA (2022) Sampling Protocol available online at <https://oehha.ca.gov/media/downloads/fish/report/fishadvisorysamplinganalysisprotocolreport2022.pdf>.

¹⁰ 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.

¹¹ The MDL is the lowest quantity of a chemical that can be distinguished (as greater than zero) in a sample.

¹² The RL is the lowest quantity of a chemical that can be accurately quantified in a sample.

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). Tables 5 and 6 show the averages and ranges for total length, as well as PCB concentrations in each fish species for Castaic Lake and Castaic Lagoon, respectively.

SELENIUM

The CDFW MLML analyzed species collected from Castaic Lake and Castaic Lagoon 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 ratio to detect the total selenium concentration in a sample. The MDL and the RL for total selenium were reported at 100 or 230 ppb, and 300 or 700 ppb respectively, depending on the study.

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

TABLE 3. MERCURY CONCENTRATIONS IN FISH FROM CASTAIC LAKE AND ELDERBERRY FOREBAY

Species	Number of Samples ^a	Total Number of Fish	Mean Total Length ^b (mm)	Range of Total Lengths ^c (mm)	Mercury (ppb)	
					Mean ^b	Range ^c
Bluegill	6	30	164	136 – 199	45	27 – 55
Channel Catfish	4	16	601	488 – 695	205	126 – 1000
Common Carp	8	40	599	515 – 756	144	63 – 251
Largemouth Bass	32	32	422	382 – 490 ^d	464	170 – 805
Silverside Species	2	20	63	33 – 90	18	0 – 35
Mississippi Silverside	1	10	41	33 – 48	0	n/a
Inland Silverside	1	10	85	76 – 90	35	n/a
Striped Bass	22	22	398	327 – 694	152	38 – 321
Threadfin Shad	1	20	91	83 – 98	91	n/a

^a Samples were prepared as skinless fillets, except as noted in the footnotes to Table 1.

^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.

^d Data from Largemouth Bass of legal size for Castaic Lake measuring at least 15 inches (381 mm).

n/a = not applicable due to a single sample

TABLE 4. MERCURY CONCENTRATIONS IN FISH FROM CASTAIC LAGOON

Species	Number of Samples ^a	Total Number of Fish	Mean Total Length ^b (mm)	Range of Total Lengths ^c (mm)	Mercury (ppb)	
					Mean ^b	Range ^c
Common Carp	4	20	645	550 – 790	39	15 – 61
Largemouth Bass	13	13	442	398 – 504 ^d	279	124 – 542
Sculpin	2	30	64	33 – 89	20	15 – 22
Silverside Species	2	30	81	64 – 93	28	15 – 34
Mississippi Silverside	1	10	76	64 – 86	15	n/a

Species	Number of Samples ^a	Total Number of Fish	Mean Total Length ^b (mm)	Range of Total Lengths ^c (mm)	Mercury (ppb)	
					Mean ^b	Range ^c
Inland Silverside	1	20	84	74 – 93	34	n/a
Sunfish Species	3	15	199	139 – 242	22	18 – 25
Bluegill	1	5	151	139 – 167	18	n/a
Redear Sunfish	2	10	223	206 – 242	24	23 – 25
Threadfin Shad	1	20	83	76 – 92	28	n/a

^a Samples were prepared as skinless fillets, except as noted in the footnotes to Table 1.

^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.

^d Data from Largemouth Bass of legal size for Castaic Lake measuring at least 15 inches (381 mm).
n/a = not applicable due to a single sample

TABLE 5. PCB CONCENTRATIONS IN FISH FROM CASTAIC LAKE AND ELDERBERRY FOREBAY

Species	Number of Samples ^a	Total Number of Fish	Mean Total Length ^b (mm)	Range of Total Lengths ^c (mm)	PCBs (ppb)	
					Mean ^b	Range ^c
Channel Catfish	3	15	598	488 – 695	92	13 – 146
Common Carp	5	30	599	549 – 714	12	0.4 – 19
Largemouth Bass	5	25	364	317 – 439 ^d	17	8 – 32
Striped Bass	3	15	422	351 – 542	10	2 – 25

^a Samples were prepared as skinless fillets.

^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.

^d Some fish in the Largemouth Bass composite samples analyzed for PCBs were below legal size for Castaic Lake (381 mm), but above legal size (305 mm) for most other California water bodies. These data were included in the evaluation because it was health protective to consider the contribution of PCBs to the toxicity of this species.

TABLE 6. PCB CONCENTRATIONS IN FISH FROM CASTAIC LAGOON

Species	Number of Samples ^a	Total Number of Fish	Mean Total Length ^b (mm)	Range of Total Lengths ^c (mm)	PCBs (ppb)	
					Mean ^b	Range ^c
Common Carp	3	15	651	550 – 790	23	13 – 42
Largemouth Bass	2	10	366	329 – 401 ^d	7	5 – 9
Redear Sunfish	2	10	223	206 – 242	1	0.8 - 1

^a Samples were prepared as skinless fillets.

^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.

^d Some fish in the Largemouth Bass composite samples analyzed for PCBs were below legal size for Castaic Lake (381 mm), but above legal size (305 mm) for most other California water bodies. These data were included in the evaluation because it was health protective to consider the contribution of PCBs to the toxicity of this species.

DEVELOPMENT OF GUIDELINES FOR EATING FISH FROM CASTAIC LAKE AND CASTAIC LAGOON

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 (DHA) and eicosapentaenoic acid (EPA) (USDA/USDHHS, 2020; Weaver et al., 2008).

The US Department of Agriculture (USDA) recommends “including at least 8 ounces of cooked seafood¹³ per week. Young children need less, depending on their age and calorie needs.”¹⁴ According to the 2020–2025 Dietary Guidelines (USDA/USDHHS, 2020), “women who are pregnant or lactating should consume at least 8 and up to 12 ounces of a variety of seafood per week from choices that are lower in methylmercury.” Additionally, “based on FDA and EPA’s advice, 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” (USDA/USDHHS, 2020). For more detailed information, see USDA/USDHHS (2020) and other USDA MyPlate.gov materials. The particular fish that people eat is an important factor in determining the net beneficial

¹³ Seafood as used here refers to fish and shellfish from freshwater and marine environments.

¹⁴ Online at: <https://www.myplate.gov/>.

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 (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 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 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 Appendix). For fish fillets, a serving size is considered to be 8 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, in a similar concentration. The potential effect of multiple chemical exposures (mercury, DDTs, and PCBs) was assessed in Channel Catfish, Common Carp, Largemouth Bass, and Striped Bass from Castaic Lake and affected advice for Channel Catfish and Common Carp. Similarly, the potential effect of multiple chemical exposures (mercury, DDTs, and PCBs) was assessed in Common Carp, Largemouth Bass, and Redear Sunfish from Castaic Lagoon but did not affect advice. Advice for all species from Castaic Lagoon, and all species from Castaic Lake other than Channel Catfish and Common Carp, was based solely on mercury or PCB concentrations.

OEHHA recommends that individuals strive to meet the US Dietary Guidelines' seafood consumption recommendations,¹⁵ 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. When noted, OEHHA's consumption advice for a particular fish species can be extended to other closely related fish species¹⁶ 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 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 CASTAIC LAKE AND CASTAIC LAGOON

OEHHA's advisory protocol (OEHHA, 2022) 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 to develop advice for species that are commonly caught and consumed from a given water body but where available data may be limited. Generally, this practice applies when the advice supports no consumption of that species. For Castaic Lake, the sample size criterion was met for the following species: Bluegill, Channel Catfish, Common Carp, Largemouth Bass, silverside species, Striped Bass, and Threadfin Shad. For Castaic

¹⁵ Online at: <https://www.dietaryguidelines.gov/>.

¹⁶ Fish species within the same genus are most closely related, and family is the next level of relationship.

Lagoon, the sample size criterion was met for the following species: Common Carp, Largemouth Bass, sculpin, silverside species, sunfish species, and Threadfin Shad. There were not sufficient data to evaluate other species that may be found in this water body. For fish species found in Castaic Lake or Castaic Lagoon that are not included in this advisory, OEHHA recommends following the statewide advisory for lakes and reservoirs without site-specific advice.¹⁷

The following advice is based solely on mercury and/or PCB concentrations. The sensitive population is defined as women ages 18 to 49 years and children ages 1 to 17 years, and the general population is defined as women 50 years and older and men 18 years and older.

CASTAIC LAKE

BLACK BASS SPECIES (LARGEMOUTH BASS)

Black bass species are one of the most targeted species of freshwater game fish in California. OEHHA groups black bass species because they have similar predatory diets, which suggests a 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 has also evaluated mercury concentrations in black bass species in many water bodies in California and has found a similar range of mercury concentrations when two or more of these species were caught from the same water body. Therefore, OEHHA extends the consumption advice for Largemouth Bass to other black bass species, including Redeye, Smallmouth, and Spotted Bass.

The mean mercury and PCB concentrations in Largemouth Bass from Castaic Lake were 464 and 17 ppb, respectively. Based on the concentration of mercury in black bass species from Castaic Lake, OEHHA recommends no consumption for the sensitive population, and a maximum of one serving a week for the general population. PCBs did not impact advice.

CHANNEL CATFISH

The mean mercury and PCB concentrations in Channel Catfish from Castaic Lake were 205 and 92 ppb, respectively. OEHHA recommends no consumption of Channel Catfish for the sensitive population, based on multiple-chemical exposure analysis of mercury and PCBs, and a maximum of one serving a week for the general population, based on PCBs.

¹⁷ Online at: <https://oehha.ca.gov/advisories/statewide-advisory-eating-fish-californias-lakes-and-reservoirs-without-site-specific>.

COMMON CARP

The mean mercury and PCB concentrations in Common Carp from Castaic Lake were 144 and 12 ppb, respectively. OEHHA recommends a maximum of one serving a week of Common Carp for the sensitive population, based on multiple-chemical exposure analysis of mercury and PCBs, and a maximum of four servings a week for the general population, based on mercury.

SILVERSIDE SPECIES (MISSISSIPPI SILVERSIDE, INLAND SILVERSIDE)

The mean mercury concentration in silverside species from Castaic Lake was 18 ppb. Mercury concentrations for individual silverside species were as follows, Mississippi Silverside (Hg: 0 ppb) and Inland Silverside (Hg: 35 ppb). Based on the concentration of mercury in silverside species from Castaic Lake, OEHHA recommends a maximum of seven servings a week for the sensitive population and the general population.

STRIPED BASS

The mean mercury and PCB concentrations in Striped Bass from Castaic Lake were 152 and 10 ppb. Based on the concentration of mercury in Striped Bass from Castaic Lake, OEHHA recommends a maximum of one serving a week for the sensitive population, and a maximum of four servings a week for the general population. PCBs did not impact advice.

SUNFISH SPECIES (BLUEGILL)

OEHHA groups sunfish species due to a known ability to hybridize (Avisé and Smith, 1974) and extensive dietary overlap (Kirby, 1982), which suggests a similar contaminant uptake. OEHHA has evaluated mercury concentrations in sunfish species in many water bodies in California and has found a similar range of mercury concentrations when two or more of these species were caught from the same water body. There are not sufficient data from high-PCB water bodies in the state to determine whether PCB concentrations would be similar in different sunfish species. However, due to the similar dietary preferences of sunfish and their ability to hybridize,¹⁸ it is expected that PCB concentrations would be similar between sunfish species. Therefore, OEHHA extends the consumption advice for Bluegill to other sunfish species, including, Green Sunfish, Pumpkinseed, and Redear Sunfish.

¹⁸ Species profiles for Bluegill, Green Sunfish, Pumpkinseed, and Redear Sunfish can be found on the University of Michigan website, online at: https://animaldiversity.org/accounts/Lepomis_macrochirus/, https://animaldiversity.org/accounts/Lepomis_cyanellus/, https://animaldiversity.org/accounts/Lepomis_gibbosus/, and https://animaldiversity.org/accounts/Lepomis_microlophus/.

The mean mercury concentration in Bluegill from Castaic Lake was 45 ppb. PCBs were not analyzed in Bluegill. Although small sunfish species, such as Bluegill, are generally low in PCBs, PCB concentrations in these species can be elevated in some environments. Because the level of PCBs affected consumption advice for other species in Castaic Lake, OEHHA considered it prudent to use the concentration of PCBs in another, larger sunfish species (Largemouth Bass, 17 ppb) to provide advice for Bluegill and other small sunfish species. Based on the potential exposure to PCBs, OEHHA thus recommends a maximum of three servings a week of Bluegill for the sensitive population and the general population.

THREADFIN SHAD

The mean mercury concentration in Threadfin Shad from Castaic Lake was 91 ppb. Based on the concentration of mercury in Threadfin Shad, OEHHA recommends a maximum of two servings a week for the sensitive population, and a maximum of seven servings a week for the general population.

CASTAIC LAGOON

BLACK BASS SPECIES (LARGEMOUTH BASS)

The mean mercury and PCB concentrations in Largemouth Bass from Castaic Lagoon were 279 and 7 ppb, respectively. Based on the concentration of mercury in black bass species from Castaic Lagoon, OEHHA recommends a maximum of one serving a week for the sensitive population, and a maximum of two servings a week for the general population. PCBs did not impact advice. For the reasons stated in the Castaic Lake section above, OEHHA extends the consumption advice for Largemouth Bass to other black bass species, including Redeye, Smallmouth, and Spotted Bass.

COMMON CARP

The mean mercury and PCB concentrations in Common Carp from Castaic Lagoon were 39 and 23 ppb, respectively. Based on the concentration of PCBs in Common Carp from Castaic Lagoon, OEHHA recommends a maximum of two servings a week for the sensitive population and the general population.

SCULPIN

The mean mercury concentration in sculpin from Castaic Lagoon was 20 ppb. Based on the concentration of mercury in sculpin from Castaic Lagoon, OEHHA recommends a maximum of seven servings a week for the sensitive population and the general population.

SILVERSIDE SPECIES (MISSISSIPPI SILVERSIDE, INLAND SILVERSIDE)

The mean mercury concentration in silverside species from Castaic Lagoon was 28 ppb. Mercury concentrations for individual silverside species were as follows, Mississippi Silverside (Hg: 15 ppb) and Inland Silverside (Hg: 34 ppb). Based on the concentration of mercury in silverside species from Castaic Lagoon, OEHHA recommends a maximum of seven servings a week for the sensitive population and the general population.

SUNFISH SPECIES (BLUEGILL, REDEAR SUNFISH)

The mean mercury and PCB concentrations in sunfish species from Castaic Lagoon were 22 ppb and 1 ppb, respectively. Mercury and PCB concentrations for individual sunfish species were as follows, Bluegill (Hg: 18 ppb, PCBs: not analyzed) and Redear Sunfish (Hg: 24, PCBs: 1 ppb). Based on the concentration of mercury in these sunfish species, OEHHA recommends a maximum of seven servings a week for the sensitive population and the general population. PCBs did not impact advice. For the reasons stated in the Castaic Lake section above, OEHHA extends the consumption advice for sunfish species (Bluegill, Redear Sunfish) to other sunfish species, including Green Sunfish and Pumpkinseed.

THREADFIN SHAD

The mean mercury concentration in Threadfin Shad from Castaic Lake was 28 ppb. Based on the concentration of mercury in Threadfin Shad, OEHHA recommends a maximum of seven servings a week for the sensitive population and the general population.

RECOMMENDED MAXIMUM NUMBER OF SERVINGS

The recommended maximum numbers of servings per week for fish from Castaic Lake and Castaic Lagoon are shown in Tables 7 and 8.

TABLE 7. RECOMMENDED MAXIMUM NUMBER OF SERVINGS PER WEEK FOR FISH FROM CASTAIC LAKE

Fish Species	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
Channel Catfish	0	1
Common Carp	1	4
Silverside Species	7	7
Striped Bass	1	4
Sunfish Species	3	3
Threadfin Shad	2	7

TABLE 8. RECOMMENDED MAXIMUM NUMBER OF SERVINGS PER WEEK FOR FISH FROM CASTAIC LAGOON

Fish Species	Women 18–49 years and Children 1–17 years	Women 50 years and older and Men 18 years and older
Black Bass Species	1	2
Common Carp	2	2
Sculpin	7	7
Silverside Species	7	7
Sunfish Species	7	7
Threadfin Shad	7	7

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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 dose¹⁹ 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 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 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 (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.

¹⁹ 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.