OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT

GOOD CATCH CALIFORNIA
Your Fish Advisor

Health Advisory and Guidelines for Eating Fish from the Bear River (Nevada, Placer, Sutter, and Yuba Counties)

September 2018

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

ATL	Advisory Tissue Level
CEDEN	California Environmental Data Exchange Network
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
FMP	Fish Mercury Project
Hg	mercury
MDL	method detection limit
MLML	Moss Landing Marine Laboratories
mm	millimeters
NWIS	National Water Information System
OEHHA	Office of Environmental Health Hazard Assessment
ppb	parts per billion
RL	reporting limit
Se	selenium
SWAMP	Surface Water Ambient Monitoring Program
TSMP	Toxic Substances Monitoring Program
UCD	University of California, Davis
USDA	United States Department of Agriculture
USDHHS	United States Department of Health and Human Services
US EPA	United States Environmental Protection Agency
USGS	United States Geological Survey

PREFACE

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

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

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

This report presents guidelines for eating fish from the Bear River, which runs through Nevada, Placer, Sierra, and Yuba Counties. 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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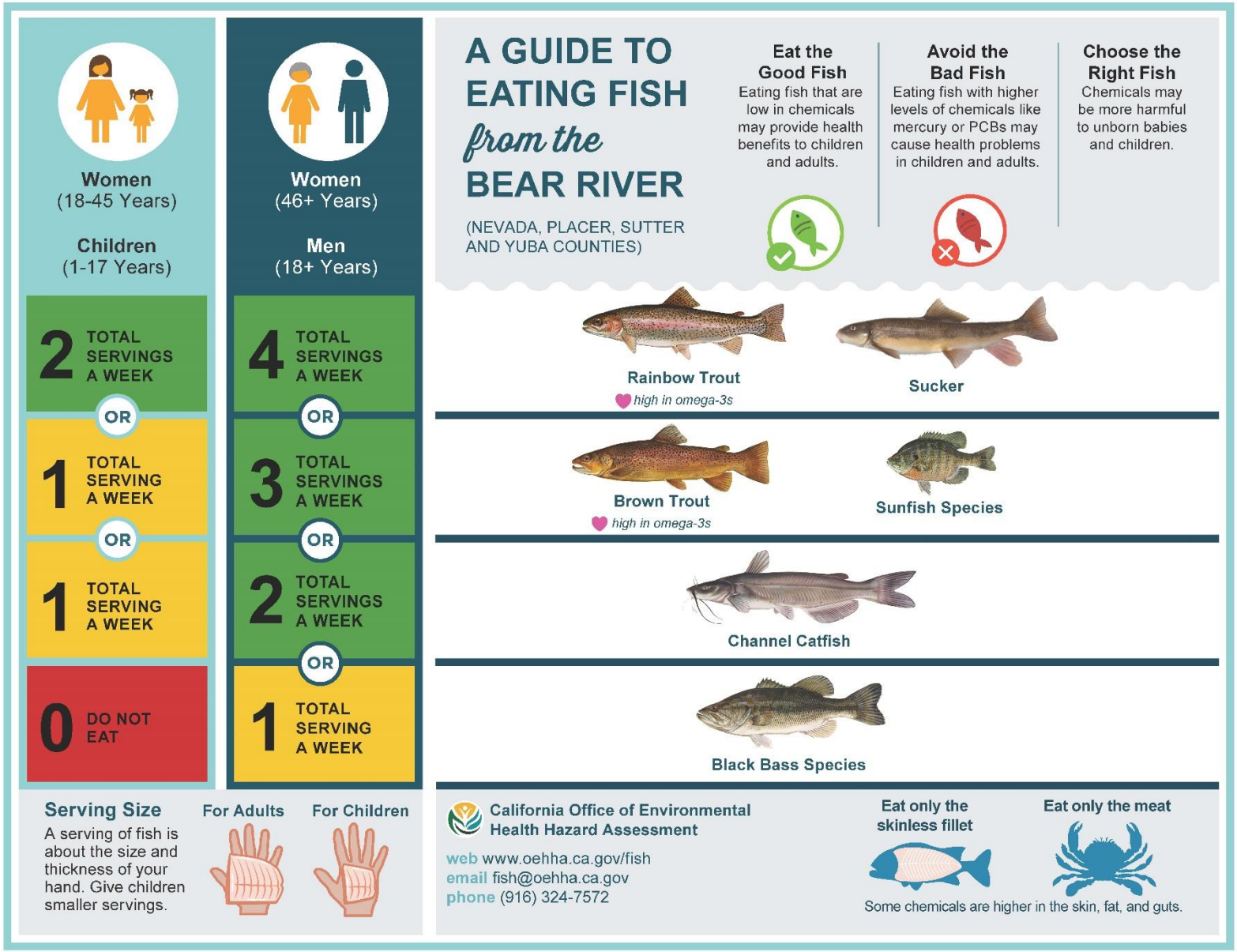

Women
(18-45 Years)
Children
(1-17 Years)
2 TOTAL SERVINGS A WEEK
OR
1 TOTAL SERVING A WEEK
OR
1 TOTAL SERVING A WEEK
0 DO NOT EAT
Women
(46+ Years)
Men
(18+ Years)
4 TOTAL SERVINGS A WEEK
OR
3 TOTAL SERVINGS A WEEK
OR
2 TOTAL SERVINGS A WEEK
OR
1 TOTAL SERVING A WEEK
A GUIDE TO EATING FISH from the BEAR RIVER
(NEVADA, PLACER, SUTTER AND YUBA COUNTIES)
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
Brown Trout
high in omega-3s
Sunfish Species
Channel Catfish
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
Eat only the meat
Some chemicals are higher in the skin, fat, and guts.

INTRODUCTION

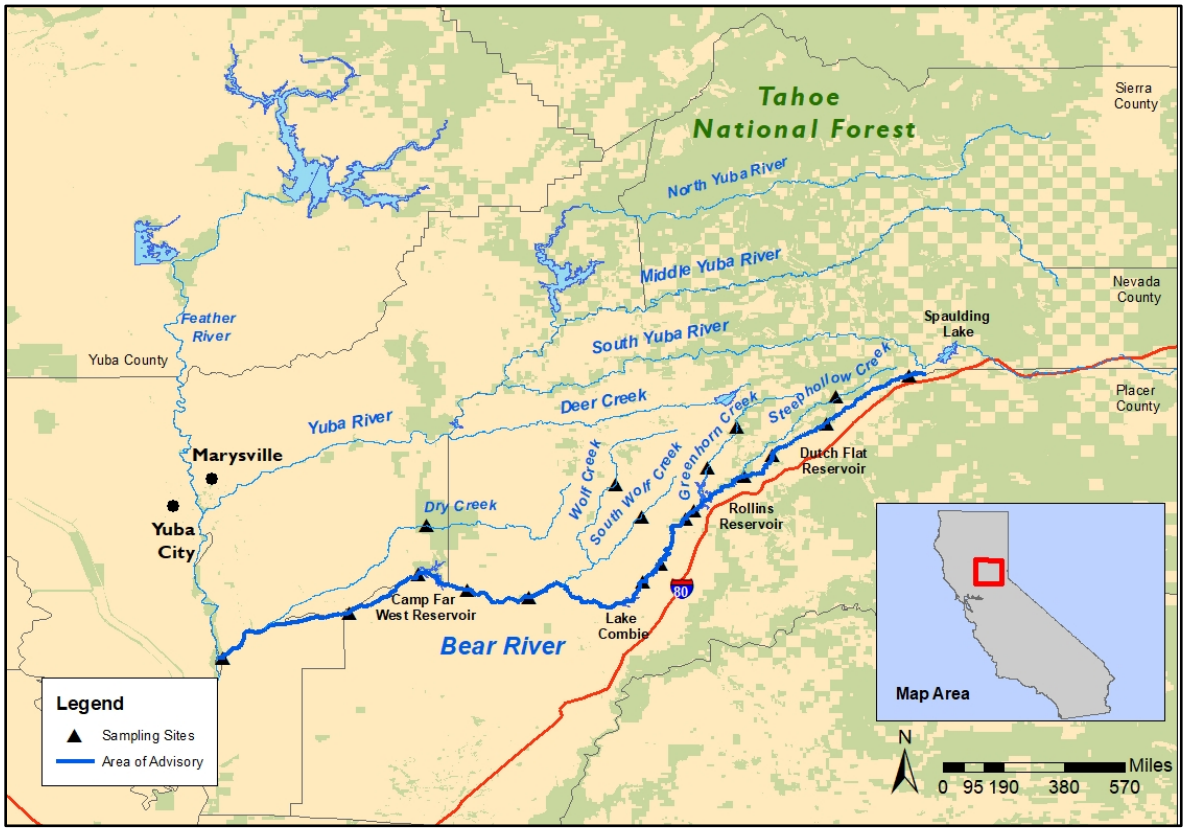
This report presents a guideline for eating fish from the Bear River (Figure 1), which runs through Nevada, Placer, Sierra, and Yuba counties. The Bear River watershed is located between the Yuba River and American River watersheds.

LOCATION

The Bear River watershed covers an area of 300 square miles and is the Feather River's second largest tributary. The headwaters of the Bear River are located in the Tahoe National Forest, in northern Placer County, and the river creates the Nevada-Placer county boundary for much of its path. Spaulding Lake feeds the Bear River via Drum Canal, and the river continues to run through Dutch Flat Reservoir, Rollins Reservoir, Lake Combie, and Camp Far West Reservoir before joining the Feather River south of Marysville and Yuba City[1]. The Bear River has several tributaries, and data collected from Dry Creek, Greenhorn Creek, Steephollow Creek, South Wolf Creek, and Wolf Creek were incorporated into consumption advice for this advisory. However, this advisory pertains solely to the Bear River, and does not include other flowing waters within the Bear River watershed, nor the reservoirs that impound the river. Site-specific advisories are available for Rollins Reservoir, Lake Combie, and Camp Far West Reservoir.

[1] Information regarding the Bear River was obtained from the Sacramento River Watershed Program. Online at: http://www.sacriver.org/aboutwatershed/roadmap/watersheds/american/bear-river-watershed

FIGURE 1. LOCATION OF THE BEAR RIVER



APPROACH USED

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

1) Evaluation of all fish contaminant data available from a water body and selection of appropriate data that meet data quality criteria and sampling plan guidelines.
2) Determination of fish species for which adequate data are available to issue fish consumption advice.

3) Calculation of an appropriate measure of central tendency (often a weighted arithmetic mean[2]) and other descriptive statistics of the contaminant data, as appropriate, for a chemical of potential concern for the selected fish species.
4) Comparison of the chemical concentrations with the OEHHA Advisory Tissue Levels (ATLs) for each chemical of potential concern.
5) Development of final advice based on a thorough review of the data and best professional judgment relating to the benefits and risks of consuming a particular fish species.

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

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.

Detailed discussion of the toxicity of these chemicals and references are presented in "Development of Fish Contaminant Goals and Advisory Tissue Levels for Common

[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.

Contaminants in California Sport Fish: Chlordane, DDTs, dieldrin, methylmercury, PCBs, selenium, and toxaphene" (OEHHA, 2008).

All fish species collected from the Bear River and used in advisory development were analyzed for mercury (as a measure of methylmercury). Green Sunfish and Sacramento Sucker were additionally analyzed for selenium.

DATA SOURCES

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

FISH MERCURY PROJECT (FMP)

The FMP was a three-year (2005 to 2007) sampling program funded by CALFED[3] (SFEI, 2009; Grenier et al., 2007). Monitoring of sport fish from Central Valley water bodies was planned and conducted by staff at the California Department of Fish and Wildlife (CDFW), OEHHA, California Department of Public Health, University of California, Davis, and the San Francisco Estuary Institute. More than 4,000 fish and 31 sport fish species were collected under the project objective to characterize spatial and temporal trends in mercury in fishery resources. Redear Sunfish and Sacramento Sucker were collected from the Bear River in 2005, and analyzed for mercury.

TOXIC SUBSTANCES MONITORING PROGRAM (TSMP)

The TSMP (1976-2003) was a state water quality-monitoring program managed by the State Water Resources Control Board (SWRCB, 2007 and 2013). Its objective was to provide statewide information on the occurrence of toxic substances by monitoring water bodies with known or suspected water quality impairment. Green Sunfish and Sacramento Sucker were collected from the Bear River between 1982 and 1990, and analyzed for mercury and selenium.

[3] The CALFED Bay Delta Program was a state and federal partnership to improve water quality, increase water supply, as well as support ecosystem restoration and levee improvement in the San Francisco Bay-Delta.

UNITED STATES GEOLOGICAL SURVEY 1999 (USGS1)

The USGS conducted a reconnaissance survey of mercury concentrations in edible tissue from fish throughout the northwestern Sierra Nevada. The USGS collected 161 fish samples for analysis in 1999, at 22 designated sites in the region (May et al., 2000), including the Bear River. Bluegill, Brown Trout, Channel Catfish, Largemouth Bass, Rainbow Trout, and Spotted Bass were collected from the Bear River, and all samples were analyzed for mercury.

UNITED STATES GEOLOGICAL SURVEY 2003-2006 (USGS2)

The USGS, in cooperation with the Sacramento Regional County Sanitation District, the Nevada County Resource Conservation District, and the US Environmental Protection Agency (US EPA), sampled fish at several locations in the Bear River watershed from 2003 to 2006. The purpose of the study was to determine the mercury bioaccumulation factor at stream sites in the Bear River watershed. Bluegill, Brown Trout, Green Sunfish, Largemouth Bass, Rainbow Trout, and Smallmouth Bass were collected for this study, and analyzed for mercury[4].

UNITED STATES GEOLOGICAL SURVEY 2012 (USGS3)

The USGS collected fish tissue samples from 20 to 24 Sierra Nevada streams in 2011 and 2012 during low-flow conditions. This study was part of a larger effort to assess factors that influence mercury levels in fish tissue and to develop a predictive model for mercury concentrations in selected fish species in Sierra Nevada streams (Stumpner et al., 2017). As part of this study, Brown Trout and Rainbow Trout were collected from the Bear River in 2012, and analyzed for mercury.

UNIVERSITY OF CALIFORNIA, DAVIS (UCD)

From 1993 to 1995, Slotton et al. (1997) at UCD conducted a study to examine the extent of mercury contamination of the aquatic invertebrates and trout in the rivers of historic gold mining regions. One Rainbow Trout was collected for this study in 1995 from the Bear River and was analyzed for mercury.

FISH SAMPLED FROM THE BEAR RIVER

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, the Fish Mercury Project's Final Technical Report (FMP 2007), and the USGS's National Water Information System (NWIS). Samples were excluded when

[4] At the time of this advisory, data from this USGS study were pending publication; however, the raw data may be accessed from https://waterdata.usgs.gov/nwis.

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 BEAR RIVER ADVISORY

Common Name	Scientific Name	Number of Samples	Total Number of Fish	Project	Year Collected	Contaminants Analyzed
Bluegill	*Lepomis macrochirus*	4	4	USGS2[a]	2006	Hg
		5	9	USGS1	1999	Hg
Brown Trout	*Salmo trutta*	12	12	USGS1	1999	Hg
		7	7	USGS2[a]	2005 - 2006	Hg
		5	5	USGS3[a]	2012	Hg
Channel Catfish	*Ictalurus punctatus*	13	13	USGS1	1999	Hg
Green Sunfish	*Lepomis cyanellus*	2	41	TSMP[a]	1982	Hg
		15	15	USGS2[a]	2006	Hg
		1	6	TSMP[a]	1987	Hg, Se
Largemouth Bass	*Micropterus salmoides*	1	1	USGS1	1999	Hg
		1	1	USGS2[a]	2005	Hg
Rainbow Trout	*Oncorhynchus mykiss*	1	1	UCD	1995	Hg
		10	13	USGS1	1999	Hg
		3	3	USGS3[a]	2012	Hg
		5	5	USGS2[a]	2003 - 2006	Hg
Redear Sunfish	*Lepomis microlophus*	10	10	FMP	2005	Hg
Sacramento Sucker	*Catostomus occidentalis*	4	4	FMP	2005	Hg
		1	6	TSMP[a]	1987	Hg, Se
		1	6	TSMP[a]	1990	Hg
Smallmouth Bass	*Micropterus dolomieu*	3	3	USGS2[a]	2006	Hg

Common Name	Scientific Name	Number of Samples	Total Number of Fish	Project	Year Collected	Contaminants Analyzed
Spotted Bass	*Micropterus punctulatus*	14	14	USGS1	1999	Hg

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

CHEMICAL CONCENTRATIONS

Fish samples from the FMP, UCD, and USGS1 studies were prepared as skinless fillets. The fillet preparation method for fish collected for the TSMP, USGS2, and USGS3 studies was not recorded. As shown in Table 1, all samples were analyzed for total mercury and/or selenium. Only mercury levels were sufficiently high to impact consumption advice.

Samples were analyzed as individual fish or composites. Composites were prepared from equal amounts of tissue from several similarly sized individual fish of a species for the TSMP and USGS1 studies. Ideally, for composite samples, the total length of the smallest fish in a composite sample is at least 75% of the length of the largest fish in the sample (US EPA, 2000a). This information was not reported for composite samples collected for the TSMP; however, the USGS1 study prepared composite samples in compliance with the 75% recommendation.

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. Samples from the FMP project (Grenier et al., 2007) were analyzed using a direct mercury analyzer (DMA) at the Moss Landing Marine Laboratories (MLML). The DMA method detection limit (MDL)[5] and the reporting limit (RL)[6] for total mercury were not reported for this study. Fish samples collected for the UCD study utilized cold vapor atomic absorption spectrometry, as described in Slotton et al. (1997). Samples collected for the USGS3 study (Stumpner et al., 2017) were analyzed using a Perkin-Elmer Flow Injection Mercury System (FIMS) at UCD. Analytical methodology, MDL, and RL for the remaining studies were not reported; however, mercury levels were detected at commonly found concentrations in all studies. OEHHA assumed all

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

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[7], as well as mercury concentrations in each fish species.

SELENIUM

The CDFW MLML analyzed species collected from the Bear River for selenium, as composite samples. The analytical methodology (e.g. single element Atomic Absorption) was not reported, nor was the method detection limit (MDL) or the reporting limit (RL); however, selenium levels were detected at commonly found concentrations. Concentrations for selenium were lower than the corresponding ATL threshold value for daily consumption (OEHHA, 2008). Selenium was therefore not considered further for developing consumption advice and is not shown in this report.

TABLE 2. MERCURY CONCENTRATIONS IN FISH FROM THE BEAR RIVER

Species from Bear River	Number of Samples	Total Number of Fish	Mean* Total Length (mm)	Range of Total Lengths** (mm)	Mercury (ppb)	
					Mean*	Range**
Black Bass Species	19	19	366	315 - 455	1047	580 - 1649
Largemouth Bass	2	2	361	335 - 387	950	810 - 1089
Smallmouth Bass	3	3	365	365 - 365	1554	1425 - 1649
Spotted Bass	14	14	367	315 - 455	952	580 - 1500
Brown Trout	24	24	269	200 - 416	178	20 - 430
Channel Catfish	13	13	523	437 - 585	425	160 - 750
Rainbow Trout	19	22	235	200 - 320	150	59 - 380
Sacramento Sucker	6	16	414	322 - 458	131	61 - 253
Sunfish Species	37	85	129	100 - 200	199	71 - 422
Bluegill	9	13	160	130 - 193	233	150 - 410
Green Sunfish	18	62	115	100 - 178	201	110 - 364
Redear Sunfish	10	10	179	167 - 200	139	71 - 422

*Means are an arithmetic average of individual values and/or a weighted average of composites.
**Range of individuals and/or range of the composites.

DEVELOPMENT OF GUIDELINES FOR EATING FISH FROM THE BEAR RIVER

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

[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.

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 U.S. Dietary Guidelines recommend that 1) the general population "consume eight or more ounces per week (less for young children)" of a variety of seafood[8] "for the total package of nutrients that seafood provides, including its EPA and DHA content" and 2) "women who are pregnant or breastfeeding should consume at least eight and up to twelve ounces of a variety of seafood per week from choices that are lower in methylmercury" (USDA/USDHHS, 2015). The particular fish that people eat is an important factor in determining the net beneficial effects of fish consumption. For example, studies have shown that children of mothers who ate low-mercury fish during pregnancy scored better on cognitive tests compared to children of mothers who did not eat fish or ate high-mercury fish (Oken et al., 2005 and 2008). Accordingly, because of the high mercury content of certain fish species, the 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).

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

There are two sets of ATLs for methylmercury in fish because of the age-related toxicity of this chemical (OEHHA, 2008). The fetus and children are more sensitive to the toxic effects of methylmercury. Thus, the ATLs for the sensitive population, including women who might become pregnant (typically 18 to 45 years of age) and children 1-17 years, are lower than those for women 46 years and older, and men 18 years and older. The lower ATL values for the sensitive population provide additional protection to allow for normal growth and development of the brain and nervous system of unborn babies and children. Detailed discussion about the toxicity of common fish contaminants and health

[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).

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). 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 concentration detected in the fillet to the corresponding ATLs to establish the 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.

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 species[9] known to accumulate similar levels of contaminants.

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

CONSUMPTION ADVICE FOR FISH FROM THE BEAR RIVER

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 commonly caught and consumed from a given water body but where available data may be limited. For the Bear River, the sample size criterion was met for the following species: black bass species, Brown Trout, Channel Catfish, Rainbow Trout, Sacramento Sucker, and sunfish species. Advice for each species is based solely on

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

the mean concentration of mercury. There were not sufficient data to evaluate other species that may be found in this water body.

Black Bass Species (Largemouth Bass, Smallmouth Bass, Spotted Bass)

The mean mercury concentration of black bass species in the Bear River was 1047 parts per billion (ppb). Mercury concentrations for individual species were as follows: Largemouth Bass (950 ppb), Smallmouth Bass (1554 ppb), and Spotted Bass (952 ppb). OEHHA recommends no consumption of black bass species from the Bear River for the sensitive population (women 18 to 45 years and children 1 to 17 years), and a maximum of one serving a week for the general population (women 46 years and older, and men 18 years and older).

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

Brown Trout

The mean mercury concentrations in Brown Trout from the Bear River was 178 ppb. OEHHA recommends a maximum of one serving a week of Brown Trout for the sensitive population (women 18 to 45 years and children 1 to 17 years), and a maximum of three servings a week for the general population (women 46 years and older, and men 18 years and older).

Channel Catfish

The mean mercury concentration in Channel Catfish from the Bear River was 425 ppb. OEHHA recommends a maximum of one serving per week of Channel Catfish for the sensitive population (women 18 to 45 years and children 1 to 17 years), and a maximum of two servings a week for the general population (women 46 years and older, and men 18 years and older).

Rainbow Trout

The mean mercury concentrations in Rainbow Trout from the Bear River was 150 ppb. OEHHA recommends a maximum of two servings per week of Rainbow Trout for the sensitive population (women 18 to 45 years and children 1 to 17 years), and a maximum of four servings a week for the general population (women 46 years and older, and men 18 years and older).

SACRAMENTO SUCKER

The mean mercury concentration in Sacramento Sucker from the Bear River was 131 ppb. OEHHA recommends a maximum of two servings a week of Sacramento Sucker for the sensitive population (women 18 to 45 years and children 1 to 17 years), and a maximum of four servings a week for the general population (women 46 years and older, and men 18 years and older).

SUNFISH SPECIES (BLUEGILL, GREEN SUNFISH, REDEAR SUNFISH)

The mean mercury concentration in sunfish species from the Bear River was 199 ppb. Mercury concentrations for individual sunfish species were as follows, Bluegill (233 ppb), Green Sunfish (201 ppb), and Redear Sunfish (139 ppb). OEHHA recommends a maximum of one serving a week of sunfish species for the sensitive population (women 18 to 45 years and children 1 to 17 years), and a maximum of three servings a week for the general population (women 46 years and older, and men 18 years and older).

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

RECOMMENDED MAXIMUM NUMBER OF SERVINGS

The recommended maximum numbers of servings per week for fish from the Bear River are shown in Table 3.

TABLE 3. RECOMMENDED MAXIMUM NUMBER OF SERVINGS PER WEEK FOR FISH FROM THE BEAR RIVER

Fish Species from Bear River	Women 18–45 years and Children 1-17 years	Women 46 years and older and Men 18 years and older
Black Bass species	0	1
Brown Trout	1	3
Channel Catfish	1	2
Rainbow Trout	2	4
Sacramento Sucker	2	4
Sunfish 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 dose[10] for chemicals not known to cause cancer, such as methylmercury, or
- For cancer-causing chemicals, a risk level greater than one additional cancer case in a population of 10,000 people consuming fish at the given consumption rate over a lifetime. This cancer endpoint is the maximum acceptable risk level recommended by the US EPA (2000b) for fish advisories.

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

ADVISORY TISSUE LEVELS FOR SELECTED ANALYTES

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

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

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