



Health Advisory and Guidelines for Eating Fish from New Hogan Lake (Calaveras County)

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

LIST OF CONTRIBUTORS

Office of Environmental Health Hazard Assessment

Authors

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

Primary Reviewers

Susan A. Klasing, Ph.D., Section Chief
Wesley Smith, Ph.D.
Shannon R. Murphy, Ph.D.

Final Reviewers

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

Director

Lauren Zeise, Ph.D.

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For further information, contact:

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

1515 Clay Street, 16th Floor
Oakland, California 94612
Telephone: (510) 622-3170
Email address: fish@oehha.ca.gov

1001 I Street, P.O. Box 4010
Sacramento, CA 95812-4010
Telephone: (916) 324-7572

LIST OF ACRONYMS AND ABBREVIATIONS

ATL	Advisory Tissue Level
CDFW	California Department of Fish and Wildlife
DDT(s)	dichlorodiphenyltrichloroethane (DDT) and its metabolites dichlorodiphenyldichloroethane (DDD) and dichlorodiphenyldichloroethylene (DDE)
DHA	docosahexaenoic acid
EPA	eicosapentaenoic acid
FDA	Food and Drug Administration
FMP	Fish Mercury Project
Hg	mercury
MDL	method detection limit
MLML	Moss Landing Marine Laboratories
mm	millimeters
n	sample size
OEHHA	Office of Environmental Health Hazard Assessment
PBDEs	polybrominated diphenyl ethers
PCBs	polychlorinated biphenyls
ppb	parts per billion
RL	reporting limit
Se	selenium
SWAMP	Surface Water Ambient Monitoring Program
USDA	United States Department of Agriculture

USDHHS United States Department of Health and Human Services

US EPA United States Environmental Protection Agency

PREFACE

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

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

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

This report presents guidelines for eating fish from New Hogan Lake in Calaveras 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 List of Figures and Tables.

TABLE OF CONTENTS

A GUIDE TO EATING FISH FROM NEW HOGAN LAKE.....	6
INTRODUCTION	7
<i>Location</i>	7
<i>Approach Used</i>	8
CHEMICALS OF POTENTIAL CONCERN.....	8
DATA SOURCES.....	9
<i>The Fish Mercury Project (FMP)</i>	10
<i>Contaminants in Fish From California Lakes and Reservoirs, 2007-2008 (SWAMP)</i>	10
FISH SAMPLED FROM NEW HOGAN LAKE	10
CHEMICAL CONCENTRATIONS	12
<i>Mercury</i>	12
<i>PCBs, PBDEs and Pesticides</i>	12
<i>Selenium</i>	13
DEVELOPMENT OF GUIDELINES FOR EATING FISH FROM NEW HOGAN LAKE.....	14
<i>General Information</i>	14
CONSUMPTION ADVICE FOR FISH FROM NEW HOGAN LAKE	16
<i>Black Bass Species (Largemouth, Smallmouth)</i>	16
<i>Channel Catfish</i>	17
<i>Sunfish Species (Bluegill, Redear)</i>	17
RECOMMENDED MAXIMUM NUMBER OF SERVINGS.....	18
REFERENCES	19
APPENDIX I. Advisory Tissue Levels.....	22
New Hogan Lake Fish Advisory	4

LIST OF FIGURES AND TABLES

Figure 1. Location of New Hogan Lake	7
Table 1. Fish Samples Evaluated for the New Hogan Lake Advisory	11
Table 2. Mercury Concentrations in Fish from New Hogan Lake	13
Table 3. Recommended Maximum Number of Servings per Week for Fish from New Hogan Lake.....	18
Advisory Tissue Levels for Selected Analytes.....	22

A Guide to Eating Fish from New Hogan Lake

Women 18 - 45 years and Children 1 - 17 years



Sunfish species



Channel Catfish



Black Bass species

1 total serving a week

Do not eat

Women 46 years and older and Men 18 years and older



Sunfish species



Channel Catfish



♥ Black Bass species

3 total servings a week



2 total servings a week



1 total serving a week

What is a serving?



For Adults **For Children**

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

Why eat fish?

Eating fish is good for your health. Fish have omega-3s that can reduce your risk for heart disease and improve how the brain develops in unborn babies and children.

♥ = Fish high in omega-3s

What is the concern?

Some fish have high levels of mercury and PCBs. Mercury can harm the brain, especially in unborn babies and children. PCBs can cause cancer.

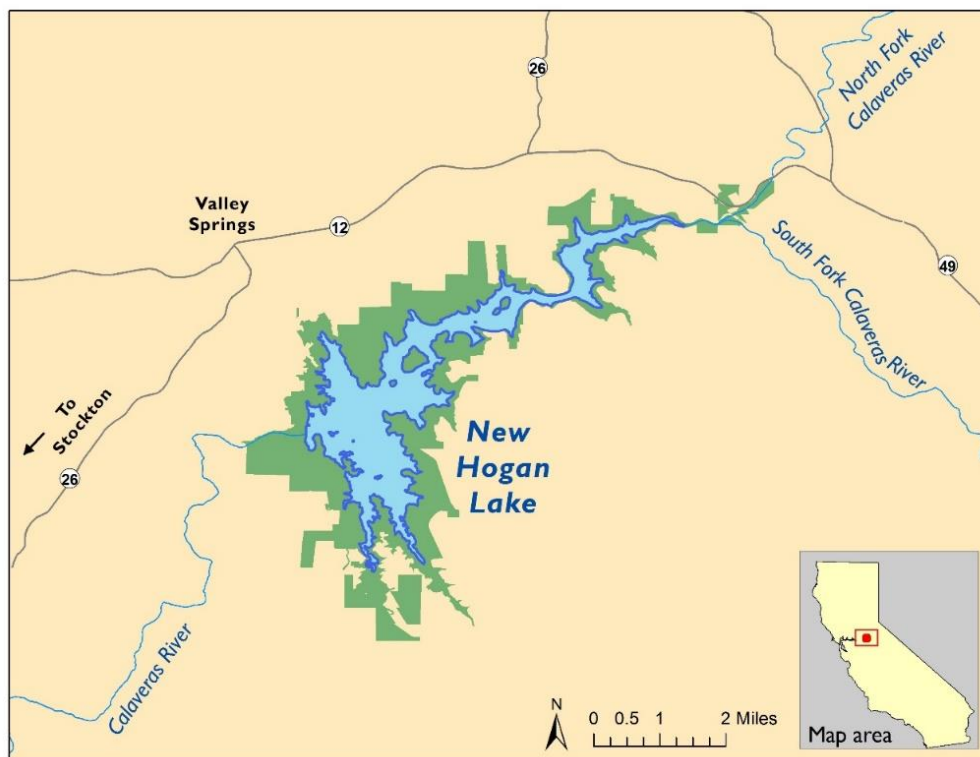
INTRODUCTION

This report presents guidelines for eating fish from New Hogan Lake (Figure 1) in Calaveras County, California, approximately 30 miles northeast of Stockton.

LOCATION

New Hogan Lake is located in the foothills of the Sierra Nevada near the historic gold rush towns of the California Mother Lode. It was created in 1964 by the completion of the New Hogan Dam on the Calaveras River. The north and south forks of the Calaveras River converge just upstream of the lake and provide the primary inflow to the lake. The 4,400 acre lake has 50 miles of shoreline when the water level is at full capacity. The New Hogan Dam is managed by the United States Army Corps of Engineers and serves multiple purposes, including supplying water for drinking, irrigation, and hydroelectric power, and providing flood protection for the City of Stockton.¹ This advisory only applies to New Hogan Lake and not adjacent water bodies.

FIGURE 1. LOCATION OF NEW HOGAN LAKE



¹ Information for New Hogan Lake was obtained from the Sacramento District US Army Corps of Engineers website. Online at: <http://www.spk.usace.army.mil/Locations/Sacramento-District-Parks/New-Hogan-Lake/>

APPROACH USED

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

- 1) Evaluation of all fish contaminant data available from a water body and selection of appropriate data that meet data quality criteria and sampling plan guidelines.
- 2) Determination of fish species for which adequate data are available to issue fish consumption advice.
- 3) Calculation of an appropriate measure of central tendency (often a weighted arithmetic mean²) and other descriptive statistics of the contaminant data, as appropriate, for a chemical of potential concern for the selected fish species.
- 4) Comparison of the chemical concentrations with the OEHHA Advisory Tissue Levels (ATLs) for each chemical of potential concern.
- 5) Development of final advice based on a thorough review of the data and best professional judgment relating to the benefits and risks of consuming a particular fish species.

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

CHEMICALS OF POTENTIAL CONCERN

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

Mercury is a natural element found in some rock and soil. Human activities, such as burning coal and the historic use of mercury to mine gold, also add mercury to the environment. If mercury enters waterways, it can be converted to a more toxic form

² Means are an arithmetic average of individual values and/or a weighted average of composites. A weighted average of composites is calculated by multiplying the chemical concentration in each composite by the number of fish in that composite for each species. Products are then summed and divided by the total number of fish in all composites for that species, combined.

known as methylmercury – which can pass into and build up in fish. High levels of methylmercury can harm the brain, especially in fetuses and children.

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

Selenium is a naturally occurring metalloid and at low doses is an essential nutrient for many important human health processes, including thyroid regulation and vitamin C metabolism. Higher doses cause selenium toxicity, which can include symptoms ranging from hair loss and gastrointestinal distress to dizziness and tremors.

Chlordanes, dichlorodiphenyltrichloroethane (DDT), dieldrin, and toxaphene are pesticides that were banned from use in 1973 (DDT), the late 1980s (chlordanes and dieldrin) and 1990 (toxaphene), but are still found in some fish in certain water bodies in California. Depending on the exposure level, these chemicals may cause cancer or adverse effects on the nervous system.

Polybrominated diphenyl ethers (PBDEs) are a class of flame retardants historically used in a variety of consumer products including furniture, textiles, automotive parts and electronics. The use of PBDEs in new products was largely phased out by 2013 but, due to their wide usage and persistence in the environment, they are still being detected in fish tissues. PBDEs may affect hormone levels or learning and behavior in children.

Detailed discussion of the toxicity of these chemicals and references are presented in “Development of Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport Fish: Chlordane, DDTs, dieldrin, methylmercury, PCBs, selenium, and toxaphene” (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).

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

DATA SOURCES

The guidelines for eating fish from New Hogan Lake are based on the chemicals detected in the fish collected for the two 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 was reported. “Sampling” or “sampled” refers to the act of collecting fish for chemical analysis.

THE FISH MERCURY PROJECT (FMP)

The FMP was a three-year (2005 to 2007) sampling program funded by CALFED³ (SFEI, 2009). 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 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. Fish samples were collected from 146 popular sport fishing locations in the Delta watershed. The fillets were analyzed for total mercury. The program collected Largemouth Bass and Bluegill from New Hogan Lake in 2005 and Smallmouth Bass, Channel Catfish and Redear Sunfish from the lake in 2006.

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

The SWAMP (Surface Water Ambient Monitoring Program), operated by SWRCB in cooperation with Regional Water Quality Control Board staff, monitors water quality in California’s surface waters. The program collected Largemouth Bass from New Hogan Lake in 2007 to analyze chlordanes, DDTs, dieldrin, mercury, PBDEs, PCBs, and selenium as part of a SWAMP statewide sampling effort to survey contaminants in sport fish found in California lakes and reservoirs (SWRCB, 2010).

FISH SAMPLED FROM NEW HOGAN LAKE

The fish sampling data used in these advisories were retrieved from the California Environmental Data Exchange Network (CEDEN). Samples were excluded when the fish were not legal size to take or did not meet OEHHA’s criteria for minimum “edible” size based on species size at maturity and professional judgment (as described in OEHHA, 2005). A summary of all fish species included in this advisory is shown in

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.

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 NEW HOGAN LAKE ADVISORY

Common Name	Scientific Name	Number of Samples	Total Number of Fish	Project	Year Collected	Contaminants Analyzed
Black Bass Species						
Largemouth Bass	<i>Micropterus salmoides</i>	22	22	SWAMP	2007	Hg
		1	15	SWAMP	2007	Chlordanes, DDTs, Dieldrin, PBDEs, PCBs, Se
		9	9	FMP	2005	Hg
Smallmouth Bass	<i>Micropterus dolomieu</i>	10	10	FMP	2006	Hg
Catfish						
Channel Catfish	<i>Ictalurus punctatus</i>	12	12	FMP	2006	Hg
Sunfish Species						
Bluegill	<i>Lepomis macrochirus</i>	10	10	FMP	2005	Hg
Redear	<i>Lepomis microlophus</i>	4	4	FMP	2006	Hg

Hg = Mercury, Se = Selenium, DDTs = dichlorodiphenyltrichloroethane, PBDEs = polybrominated diphenyl ethers, PCBs = polychlorinated biphenyls

CHEMICAL CONCENTRATIONS

As shown in Table 1, all samples were analyzed for total mercury; Largemouth Bass were also analyzed for chlordanes, DDTs, dieldrin, PBDEs, and PCBs (54-55 congeners⁴) and selenium. All fish samples were prepared as skinless fillets. Samples were analyzed as individual fish or composites.

Composites were prepared from equal amounts of tissue from several similarly sized individual fish of a species. For composite samples, the total length of the smallest fish in a composite sample must be at least 75% of the length of the largest fish in the sample (US EPA, 2000a). Composite samples for all species met this requirement.

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, either as individual fish or composite samples, using a direct mercury analyzer (DMA) at the CDFW Moss Landing Marine Laboratories (MLML). The DMA method utilizes thermal decomposition and atomic absorption. OEHHA assumed all mercury detected was methylmercury; methylmercury is the most common form found in fish and is also the more toxic form (Bloom, 1992). Table 2 shows the averages and ranges for total length⁵ as well as mercury concentrations in each fish species. The DMA method detection limit (MDL)⁶ and the reporting limit (RL)⁷ for total mercury were both reported at 12 parts per billion (ppb) for the SWAMP study. The Fish Mercury Project reported both the DMA MDL and the RL for total mercury at either 12 or 18 ppb.

PCBS, PBDES AND PESTICIDES

Largemouth Bass samples were analyzed for legacy pesticides (chlordanes, DDTs, and dieldrin), PCBs and PBDEs. Pesticides, PCBs and PBDEs were analyzed by gas chromatography at the CDFW Water Pollution Control Laboratory. For PBDEs, PCBs, chlordanes, and DDTs, each of the concentrations presented was the sum of the detected parent compound, congeners, or metabolites, where applicable. Since the MDLs or RLs were relatively low, ≤ 0.5 and ≤ 5 ppb, respectively, individual congeners or metabolites with concentrations reported as non-detects were assumed to be zero.

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

⁵ Total length is the maximum length of the fish, measured from the tip of the closed mouth to the tip of the pinched tail fin.

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

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

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). Concentrations of chlordanes, dieldrin, DDTs, PCBs and PBDEs were not sufficiently high to alter consumption advice and are not shown in this report.

SELENIUM

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

TABLE 2. MERCURY CONCENTRATIONS IN FISH FROM NEW HOGAN LAKE

Species from New Hogan Lake	Number of Samples	Total Number of Fish	Mean* Total Length	Range of Total Lengths**	Mercury (ppb)	
			(mm)	(mm)	Mean*	Range**
Black Bass Group***	41	41	369	310-459	527	263-997
Bass, Largemouth	31	31	373	314-459	493	263-997
Bass, Smallmouth	10	10	356	310-421	634	448-779
Channel Catfish	12	12	559	434-621	339	108-651
Sunfish Group***	14	14	192	159-256	204	113-360
Bluegill	10	10	171	159-182	219	113-360
Redear Sunfish	4	4	246	236-256	165	128-230

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

**Range of individuals and/or range of the composites.

***Largemouth Bass and Smallmouth Bass were combined ("Black Bass Group") and Bluegill and Redear Sunfish were combined ("Sunfish Group") for the purpose of developing consumption advice.

DEVELOPMENT OF GUIDELINES FOR EATING FISH FROM NEW HOGAN LAKE

GENERAL INFORMATION

The OEHHA fish advisory process considers the health benefits of fish consumption as well as the risk from exposure to the chemical contaminants found in fish. Benefits are included in the advisory process because there is considerable evidence and scientific consensus that fish should be part of a healthy, well-balanced diet. Fish contain many nutrients that are important for general health and, in particular, help promote optimal growth and development of babies and young children, and may reduce the incidence of heart disease in adults (FDA/US EPA, 2014; American Heart Association, 2014; OEHHA, 2008; Institute of Medicine, 2007; Kris-Etherton et al., 2002). Fish are a significant source of the specific omega-3 fatty acids, docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) thought to be associated with these beneficial health effects (USDA/USDHHS, 2015; Weaver et al., 2008).

The 2015-2020 US Dietary Guidelines recommend that 1) the general population “consume eight or more ounces per week (less for young children)” of a variety of seafood⁸ “for the total package of nutrients that seafood provides, including its EPA and DHA content” and 2) “women who are pregnant or breastfeeding should consume at least eight and up to twelve ounces of a variety of seafood per week from choices that are lower in methylmercury” (USDA/USDHHS, 2015). The particular fish that people eat is an important factor in determining the net beneficial effects of fish consumption. For example, studies have shown that children of mothers who ate low-mercury fish during pregnancy scored better on cognitive tests compared to children of mothers who did not eat fish or ate high-mercury fish (Oken et al., 2005 and 2008). Accordingly, because of the high mercury content of certain fish species, the FDA and US EPA recommend that women who are pregnant (or might become pregnant) or breastfeeding, and young children do not consume shark, swordfish, tilefish, or king mackerel, and limit consumption of white (albacore) tuna to six ounces per week (FDA/US EPA, 2004 and 2014).

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

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).

OEHHA's guidance when choosing which fish and how much to eat as part of an overall healthy diet.

There are two sets of ATLs for methylmercury in fish because of the age-related toxicity of this chemical (OEHHA, 2008). The fetus and children are more sensitive to the toxic effects of methylmercury. Thus, the ATLs for the sensitive population, including women who might become pregnant (typically 18 to 45 years of age) and children 1-17 years, are lower than those for women 46 years and older, and men 18 years and older. The lower ATL values for the sensitive population provide additional protection to allow for normal growth and development of the brain and nervous system of unborn babies and children. Detailed discussion about the toxicity of common fish contaminants and health benefits of fish consumption, as well as derivation of the ATLs, are provided in "Development of Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport Fish: Chlordane, DDTs, dieldrin, methylmercury, PCBs, selenium, and toxaphene" (OEHHA, 2008) and "Development of Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport Fish: Polybrominated Diphenyl Ethers (PBDEs)" (OEHHA, 2011). A list of the ATLs used in this report is presented in Appendix I.

For each fish species in this advisory, OEHHA compared the mean mercury concentrations detected in the fillet to the corresponding ATLs to establish the maximum number of servings per week that could be consumed (see Appendix I).

For Largemouth Bass in New Hogan Lake, the mean concentration of chlordanes, dieldrin, DDTs, PBDEs, PCBs and selenium detected in the fillet were determined to be lower than the corresponding ATL threshold values for daily consumption (OEHHA, 2008 and 2011).

The consumption advice for a fish species is initially based on the chemical with the lowest allowable number of servings per week. Because some chemicals, such as mercury and PCBs, are known to have similar adverse effects, additivity of toxicity is assumed in such cases and may be assessed using multiple chemical exposure methodology (US EPA, 1989 and 2000b). If two or more chemicals with similar adverse effects are present in fish tissue at levels above the corresponding ATL values for daily consumption, multiple chemical exposure methodology is employed. This may result in advising the sensitive population to consume fewer meals per week than would be the case for the presence of one chemical alone, in a similar concentration. For the New Hogan Lake Advisory, the concentrations of DDTs, PCBs and PBDEs were below the corresponding ATL values for daily consumption, and thus the potential effect of multiple chemical exposures was not evaluated. Advice for all species in this advisory was based solely on mercury concentrations.

OEHHA recommends that individuals strive to meet the US Dietary Guidelines seafood consumption recommendations, while also adhering to federal and OEHHA recommendations to limit the consumption of fish with higher contaminant levels. The advice discussed in the following section represents the maximum recommended

number of servings per week for different fish species. People should eat no more than the recommended number of servings for each fish species or species group. OEHHA's advice on consuming a particular fish species can be extended to other closely related fish species⁹ known to accumulate similar levels of contaminants.

Consumption advice should not be combined. That is, if a person chooses to eat a 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 NEW HOGAN LAKE

OEHHA's advisory protocol requires at least nine fish of a species or species group (e.g., sunfish) to be collected from a water body before an advisory can be developed for the primary contaminant of concern. This is to ensure the sample dataset is representative of the fish species population in the water body. For New Hogan Lake, the sample size criterion was met for the following species or species groups: black bass (Largemouth and Smallmouth), Channel Catfish, and sunfish (Bluegill and Redear). There were not sufficient data to evaluate other species that may be found in this water body.

BLACK BASS SPECIES (LARGEMOUTH, SMALLMOUTH)

The mean mercury level in black bass species from New Hogan Lake was 527 ppb. The mean mercury levels in individual black bass species were 493 (Largemouth Bass) and 634 (Smallmouth Bass) ppb, respectively. OEHHA recommends no consumption of black bass species 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), based on mercury. Black bass species include Largemouth, Smallmouth, Redeye, and Spotted Bass, all members of the same genus.

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

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

CHANNEL CATFISH

The mean mercury level in Channel Catfish from New Hogan Lake was 339 ppb. OEHHA recommends a maximum of one serving a 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), based on mercury.

SUNFISH SPECIES (BLUEGILL, REDEAR)

The mean mercury level in sunfish species from New Hogan Lake was 204 ppb. The mean mercury levels in individual sunfish species were 219 (Bluegill) and 165 (Redear) ppb, respectively. 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), based on mercury.

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

RECOMMENDED MAXIMUM NUMBER OF SERVINGS

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

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

Fish Species	Women 18–45 years and Children 1-17 years	Women 46 years and older and Men 18 years and older
Black Bass species	0	1
Channel Catfish	1	2
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 dose¹⁰ for chemicals not known to cause cancer, such as methylmercury, or
- For cancer-causing chemicals, a risk level greater than one additional cancer case in a population of 10,000 people consuming fish at the given consumption rate over a lifetime. This cancer endpoint is the maximum acceptable risk level recommended by the US EPA (2000b) for fish advisories.

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

ADVISORY TISSUE LEVELS FOR SELECTED ANALYTES

Contaminant	Consumption Frequency Categories (8-ounce servings/week) ^a and ATLs (in ppb)							
	7	6	5	4	3	2	1	0
Chlordanes	≤ 80	>80-90	>90-110	>110-140	>140-190	>190-280	>280-560	>560
DDTs	≤ 220	>220-260	>260-310	>310-390	>390-520	>520-1,000	>1,000-2,100	>2,100
Dieldrin	≤ 7	>7-8	>8-9	>9-11	>11-15	>15-23	>23-46	>46
MeHg (Women 18-45 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.