

**HEALTH ADVISORY
AND GUIDELINES FOR
EATING FISH FROM
VASONA LAKE
AND CAMDEN PONDS
(SANTA CLARA COUNTY)**

November 2013



**Office of Environmental Health Hazard Assessment
California Environmental Protection Agency**

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LIST OF ACRONYMS

ATL	Advisory Tissue Level
CDFW	California Department of Fish and Wildlife, formerly California Department of Fish and Game
DDTs	dichlorodiphenyltrichloroethane (DDT) and its metabolites dichlorodiphenyl dichloroethane (DDD) and dichlorodiphenyl dichloroethylene (DDE)
OEHHA	Office of Environmental Health Hazard Assessment
mm	millimeters
PCBs	polychlorinated biphenyls
ppb	parts per billion
RWB-2	San Francisco Bay Regional Water Quality Control Board
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Resources Control Board
U.S. 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 task 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 (formerly the Department of Fish and Game) Sport Fishing Regulations in the section on public health advisories.

This report presents guidelines for eating fish from Vasona Lake and associated percolation ponds in Santa Clara County. The report provides background information and a 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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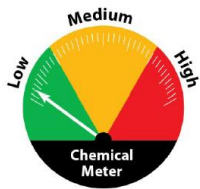
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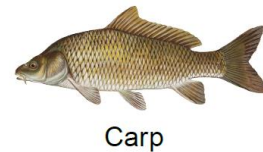
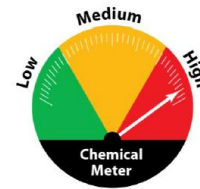
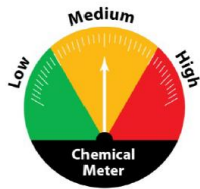
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A Healthy Guide to Eating Fish from Vasona Lake and Camden Ponds

Women 18-45 years and children 1-17 years



= High in Omega-3s



7 servings a week



1 serving a week of bass or catfish—or 2 servings of bluegill

Do not eat

Eat only the skinless fillet.

PCBs are in the fat and skin of the fish.



- Remove and throw away the skin before cooking.
- Cook thoroughly and allow the juices to drain away.

What is a serving?



For Adults For Children

The recommended serving is the size and thickness of your hand. 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.

What is the concern?

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

A Healthy Guide to Eating Fish from Vasona Lake and Camden Ponds

Women over 45 years and men can safely eat more fish



Bluegill or other sunfish



Catfish



Goldfish



Rainbow trout



Bass



Carp

♥ = High in Omega-3s

6 servings a week of bluegill—or 7 servings of trout



2 servings a week of catfish—or 3 servings of bass



1 serving a week

Eat only the skinless fillet.

PCBs are in the fat and skin of the fish.



- Remove and throw away the skin before cooking.
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INTRODUCTION

This report presents guidelines for eating fish from Vasona Lake, a reservoir in Vasona Lake County Park in Los Gatos, California, and nearby Camden Percolation Ponds #2 and #3 (Figures 1 and 2). Los Gatos Creek carries water from Lexington Reservoir northward to Vasona Lake. Los Gatos Creek then continues to flow from Vasona Lake to the Camden Groundwater Recharge or Percolation Ponds (Figure 2). The Santa Clara Valley Water District uses the ponds to replace water in deep underground aquifers. This process helps clean the water used by homes in the area. Eventually Los Gatos Creek carries water to the Guadalupe River, which empties into San Francisco Bay.

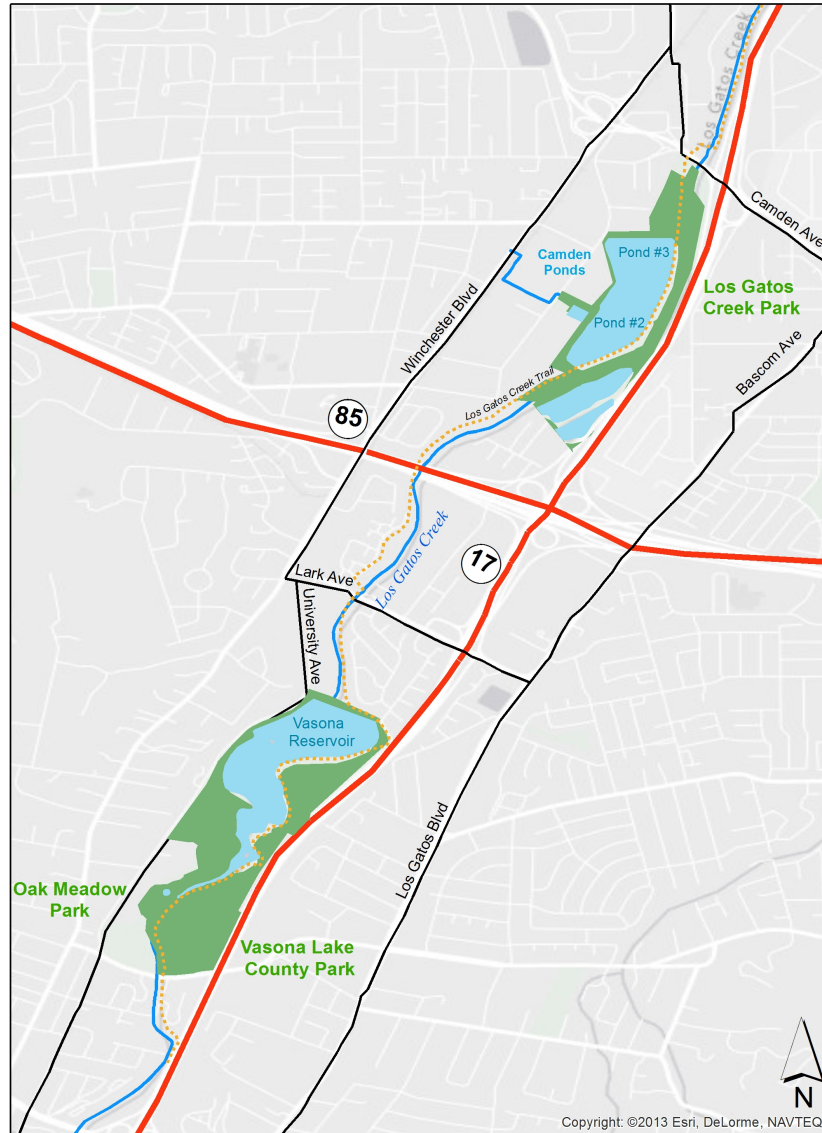
FIGURE 1. LOCATION OF VASONA LAKE AND CAMDEN PONDS IN CALIFORNIA



Vasona Lake County Park is a popular 150-acre park that connects to the Los Gatos Creek Parkway. The Los Gatos Creek Trail, which follows the creek, leads to an 80-acre urban park, Los Gatos Creek County Park. This park contains six percolation ponds. The largest and most northern pond, Pond #3 (Figure 2) is used for fishing and is stocked with rainbow trout. Black bass, catfish, bluegill, crappie, and carp also can

be caught in the pond. Pond #2 and Vasona Lake (Figure 2) are stocked with rainbow trout and catfish prior to annual Kids Fishing Days¹.

FIGURE 2. VASONA LAKE AND CAMDEN PONDS IN LOS GATOS, CALIFORNIA



¹ <http://www.ichthy.com/fw-vasona.shtml>; <http://www.sccgov.org/sites/parks/>; http://www.kidsfreefishing.org/Home_Page.html

In 2010, a report on a statewide lakes survey conducted under the Surface Water Ambient Monitoring Program (SWAMP) showed high concentrations of polychlorinated biphenyls (PCBs) in carp sampled at Vasona Lake (Davis et al., 2010). The San Francisco Bay Regional Water Quality Control Board (RWB-2) conducted a follow-up study in 2011 to characterize the extent of contamination in carp and other fish species at the lake and the nearby percolation ponds. The results of these studies provided data for the Office of Environmental Health Hazard Assessment (OEHHA) to develop this advisory and report.

The basic OEHHA process to develop consumption advice involves these steps:

- 1) Selection of the chemical data and fish species to be evaluated
- 2) Calculation of average chemical concentrations and other descriptive statistics as appropriate for the selected fish species
- 3) Comparison of the chemical concentrations with the OEHHA Advisory Tissue Levels (ATLs) for each chemical of concern

The ATLs are acceptable exposure levels in fish tissue, 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 (Klasing and Brodberg, 2008; Appendix I).

CHEMICALS OF POTENTIAL CONCERN

All fish samples from Vasona Lake and the two Camden Ponds that are fished were analyzed for mercury (as a measure of methylmercury). Channel catfish, carp, and goldfish samples were also analyzed for PCBs. In addition, two of the carp samples were analyzed for the pesticides dieldrin, chlordane, and DDTs (dichlorodiphenyltrichloroethane and metabolites).

High levels of methylmercury can harm the brain, especially in fetuses and children as they grow. PCBs are man-made chemicals previously used in electrical transformers, lubricating oils, and plastics. PCBs can cause cancer and other health effects in humans. Chlordane, DDTs, and dieldrin are pesticides that were banned from use many years ago but have persisted and accumulated in some fish from certain water bodies in California. These pesticides may cause cancer or adverse effects on the nervous system. Detailed discussion of the toxicity of these chemicals is presented in Klasing and Brodberg (2008).

DATA SOURCES

The guidelines for eating fish from Vasona Lake and Camden Ponds #2 and #3 were based on chemical analysis of fish samples by the two studies described below. These two projects had adequate documentation of sample collection, fish preparation,

chemical analyses, and quality assurance, and detection limits were below levels of health concern.

SURFACE WATER AMBIENT MONITORING PROGRAM (SWAMP)

The SWAMP, operated by the State Water Resources Control Board, monitors water quality in California's surface waters. In 2007 and 2008, the program performed a statewide survey of inland water bodies. The survey included fish from 272 of California's more than 9,000 lakes and reservoirs (Davis et al., 2010). Carp and largemouth were collected from Vasona Lake in 2008. Largemouth bass were analyzed for mercury, and carp were tested for mercury, PCBs, and the pesticides, chlordane, dieldrin, and DDTs.

SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD STUDY (RWB-2 STUDY)

The RWB-2 conducted further sampling in 2011 to provide data adequate for advisory development. In addition to sampling fish from Vasona Lake, Camden Ponds #2 and #3 were included in the sampling, and the number of fish species collected was increased. Carp, goldfish, catfish, and rainbow trout were analyzed for PCBs in addition to mercury.

Table 1 shows the type and number of fish sampled from Vasona Lake, Pond #2, and Pond #3, and the year sampled. The fish samples shown in Table 1 either met CDFW's legal size requirements (for largemouth bass), (CDFW, 2013), or OEHHA's criteria for minimum "edible" size based on species size at maturity and professional judgment (Gassel and Brodberg, 2005).

TABLE 1. FISH SAMPLES FROM VASONA LAKE AND CAMDEN PONDS

Location	Common Name	Number of Fish Collected	Year Sampled
Vasona Lake	Bluegill	10	2011
	Carp	10	2008
	Carp	10	2011
	Channel catfish	10	2011
	Goldfish	3	2011
	Largemouth bass	8	2008
	Largemouth bass	10	2011
Pond #2	Carp	10	2011
	Largemouth bass	8	2011
	Rainbow trout	9	2011
Pond #3	Bluegill	10	2011
	Carp	10	2011
	Largemouth bass	9	2011

CHEMICAL CONCENTRATIONS

Fish samples were prepared as skinless fillets and analyzed either as individual fish (largemouth bass) or composite samples (other fish species). Composite samples are made from equal amounts of tissues from several individual fish of the same species. Analysis of composite samples is done for cost savings. The results represent average concentrations for the group of fish in the sample. The total length of the smallest fish in each composite sample was at least 74% of the length of the largest fish in the composite.

Samples were combusted and analyzed for total mercury by DMA (direct mercury analyzer), a combination of thermal decomposition and atomic absorption, at the CDFW Moss Landing Marine Laboratories. Results were reported in wet weight, and the detection limit was 12 parts per billion (ppb). Total mercury analyzed was assumed to be 100% methylmercury because almost all mercury present in fish is the more toxic form methylmercury (Bloom, 1992).

OEHHA used the arithmetic mean (average) of the mercury concentrations for each fish species to represent average human exposure. The means were weighted by the number of fish in each sample. Results for each species from all water bodies sampled (Vasona Lake and the two ponds) were combined because of the common source of water. The lake and ponds are also located near each other in the same watershed. Table 2 shows the mercury concentrations and total lengths in fish species sampled from Vasona Lake and Camden Ponds #2 and #3.

TABLE 2. MERCURY CONCENTRATIONS IN FISH FROM VASONA LAKE AND CAMDEN PONDS

Species	Number of Samples Analyzed	Total Number of Fish ^a	Mean Total Length (mm)	Range of Lengths (mm)	Mean Mercury (ppb wet weight)	Range of Mercury (ppb wet weight)
Bluegill	4	20	133	120-160	109	98-132
Carp	7	40	612	199-851	77	32-116
Catfish	2	10	561	510-625	36	154-167
Goldfish	1	3	403	NA	101	NA
Largemouth bass	35	35	390	306-542	165	50-500
Rainbow trout	2	9	338	301-375	20	19-21

^a The number of fish can be greater than the number of samples because composite samples contain more than one fish.

NA Not applicable because there was only one sample

PCBs (54 congeners) and the pesticides were analyzed by gas chromatography at the CDFW Water Pollution Control Laboratory. The results for samples analyzed for PCBs are shown in Table 3. The concentrations presented are the sum of the detected PCB congeners. Because the detection limits were relatively low, ≤ 3 ppb, individual

congeners with concentrations reported as non-detects were assumed to have no residue. This is a standard method of handling non-detect samples for PCBs and other chemicals with multiple congeners when detection limits are adequate (U.S. EPA, 2000a).

TABLE 3. CONCENTRATIONS OF PCBs IN FISH FROM VASONA LAKE AND CAMDEN PONDS

Species	Number of Samples Analyzed	Total Number of Fish ^a	Mean Total Length (mm)	Range of Lengths (mm)	Mean PCBs (ppb wet weight)	Range of PCBs (ppb wet weight)
Carp	7	40	612	199-851	109	5-204
Catfish	2	10	561	510-625	36	27-45
Goldfish	1	3	403	NA	173	NA
Rainbow trout	2	9	338	301-375	2	1.7-2.5

^a The number of fish can be greater than the number of samples because composite samples contain more than one fish.

NA Not applicable because there was only one sample

The concentrations of chlordane, dieldrin, and DDTs in carp (the only species analyzed for pesticides) were 22 ppb, 0.75 ppb, and 27 ppb, respectively. These results are below the ATLS for daily consumption and, therefore, were not considered further for developing consumption advice.

DEVELOPMENT OF GUIDELINES FOR EATING FISH FROM VASONA LAKE AND CAMDEN PONDS

GENERAL INFORMATION

OEHHA used the average concentrations of mercury and PCBs in fish from Vasona Lake and the Camden Ponds to compare to the ATLS. The chemical resulting in the lowest recommended consumption frequency was considered the chemical of concern. There are two sets of ATLS for exposure to methylmercury in fish because of age-related toxicity. The ATLS for the sensitive population, women 18–45 years and children 1–17 years, are lower than for women over 45 years and men (Appendix I). This lower value is to protect the brain and nervous system of the young during growth and development. Women ages 18–45 years are included in the sensitive population to protect the fetus because these women are of childbearing age. For the sensitive population, OEHHA also assessed the potential additive toxicity when both mercury and PCBs were detected in the fish tissues of the same species because both chemicals can affect the developing nervous system.

OEHHA's advisory process and ATLS also consider the health benefits from fish consumption. There is much evidence and scientific consensus that eating fish promotes significant health benefits. Reported health benefits include reduced rates of

heart disease and stroke, decreased inflammation, and improvements in mental and visual functions (IOM, 2007). The potential beneficial effects are thought to result largely from specific omega-3 fatty acids found in significant quantities in fish:

- docosahexaenoic acid or “DHA”
- eicosapentaenoic acid or “EPA”

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, 2008). Further discussion on the benefits and risks of fish consumption can be found in Klasing and Brodberg (2008).

SAMPLE EVALUATION

Sample sizes were sufficient for bluegill, carp, catfish, largemouth bass, and rainbow trout. Only one sample of (three) goldfish was collected; therefore, this species did not meet OEHHA’s criterion for at least nine fish of a species to represent the population in the water body. Goldfish are related to (in the same family as) carp, however, and the levels of contamination in the goldfish were within the range of concentrations found in carp. Therefore, OEHHA included goldfish with carp in the advisory for Vasona Lake and Camden Ponds. Crappie were not collected at Vasona Lake or the percolation ponds, so this species could not be included in the advisory.

After evaluating the chemical concentrations in each fish species sampled, OEHHA developed advice based on mercury or PCB levels, or both chemicals for the sensitive population. The maximum recommended numbers of servings per week for fish from Vasona Lake and the Camden Ponds are shown in Table 4.

Rainbow trout had low levels of mercury and PCBs and also are high in omega-3 fatty acids, making them a healthy choice to eat. Bluegill and bass were analyzed only for mercury, which is typically the chemical of concern in these species. As noted above, the advice for bluegill and bass differs between the sensitive population and women over 45 years and men because of the effort to protect the fetus and children. For channel catfish, the mercury concentration resulted in the lowest recommended consumption frequency for the sensitive population. For women over 45 years and men, however, PCBs resulted in the lowest recommended number of servings per week. The recommendation for no consumption of carp and goldfish by the sensitive population is due to the combination of PCBs and mercury levels. Women over 45 years and men can eat one serving of carp or goldfish per week based on PCBs.

TABLE 4. RECOMMENDED NUMBER OF SERVINGS PER WEEK

Fish Species	Women 18–45 years and Children 1–17 years	Women over 45 years and Men
Rainbow trout <i>or</i>	7	7
Bluegill <i>or</i>	2	6
Largemouth bass <i>or</i>	1	3
Catfish <i>or</i>	1	2
Carp <i>or</i> goldfish	0	1

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APPENDIX I. ADVISORY TISSUE LEVELS

Advisory Tissue Levels (ATLs) guide the development of advice for people eating sport fish. ATLs show maximum numbers of recommended fish servings that correspond to the chemical levels found in fish. OEHHHA uses ATLs to provide advice to prevent consumers from being exposed to:

- more than the average daily reference dose² 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 U.S. 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 three servings per week. Exposure to chemicals in fish from Vasona Lake and Camden Ponds would be at or below the average daily reference dose or the cancer risk probability of one in ten thousand if the guidelines for eating fish from Vasona Lake and Camden Ponds are followed.

Advisory Tissue Levels (ATLs) Based on Cancer or Non-Cancer Risk Using an 8-Ounce Serving Size				
Chemical	Consumption Frequency Categories^a and ATLs^b (in ppb)			
	Three Servings per Week	Two Servings per Week	One Serving per Week	No consumption
Chlordanes	>140-190	>190-280	>280-560	>560
DDTs	>390-520	>520-1,000	>1,000-2,100	>2,100
Dieldrin	>11-15	>15-23	>23-46	>46
Methylmercury (Women 18 to 45 years and children 1 to 17 years of age)	>55-70	>70-150	>150-440	>440
Methylmercury (Women over age 45 years and men)	>160-220	>220-440	>440-1,310	>1,310
PCBs	>15-21	>21-42	>42-120	>120

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

^b When residue data are compared to this table, they should also first be rounded to the second significant digit.

² 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
Vasona Lake and Camden Ponds Advisory