



OEHHHA's Fish Advisory Program

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FISH, ECOTOXICOLOGY, AND WATER SECTION

OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

PFAS IN SAN FRANCISCO BAY FISH

FEBRUARY 4, 2022



The Office of Environmental Health Hazard Assessment (OEHHA) issues consumption advisories for recreationally-caught fish from water bodies throughout California, including state waters of the Pacific Ocean.

Fish advisories:

- are guidelines that recommend how often you can safely eat fish that you catch – from no consumption to 7 meals per week.
- use the best available science to balance the benefits and risks of eating fish.
- are based on thorough data review and best professional judgement.
- consider local/cultural practices, regulations, local fishing pressure, and environmental justice.



Fish Advisories

Good Catch California is the OEHHA fish advisory program.

We provide advice so that you can make healthy choices about eating the fish you catch.

Fish Advisories are guidelines that recommend how often you can safely eat fish caught from water bodies in California. The Office of Environmental Health Hazard Assessment (OEHHA) offers over 100 site-specific advisories for lakes, rivers, bays, reservoirs, and the coast. For water bodies without site-specific advice, look for the appropriate statewide advisory [below](#).

OEHHA provides two sets of guidelines for eating fish, one for each of the following populations:

- Women 18-49 years and children 1-17 years
- Women 50 years and older and men 18 years and older

General Information

- ▶ [Fish Advisory Fact Sheet \(PDF\) English | Spanish \(Español\)](#)
- ▶ [How to Follow Advisories](#)
- ▶ [Women & Children](#)
- ▶ [General Tips](#)

Statewide Advisories

- ▶ [Statewide Advisory for Eating Fish from **California's Lakes and Reservoirs** without site-specific advice](#)
- ▶ [Statewide Advisory for Eating Fish from **California Coastal Locations** without site-specific advice](#)
- ▶ [Advisory for Fish that Migrate](#)



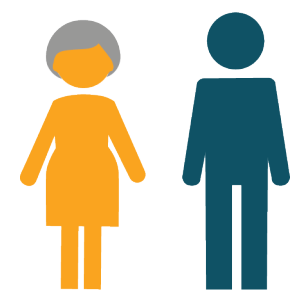
How to Use the Fish Advisories
How to read and use the safe fishing advisories for California waterbodies issued by OEHHA.

OEHHA provides two sets of guidelines for eating fish, one for each of the following populations:

- Women 18-49 years and children 1-17 years (“Sensitive population”)



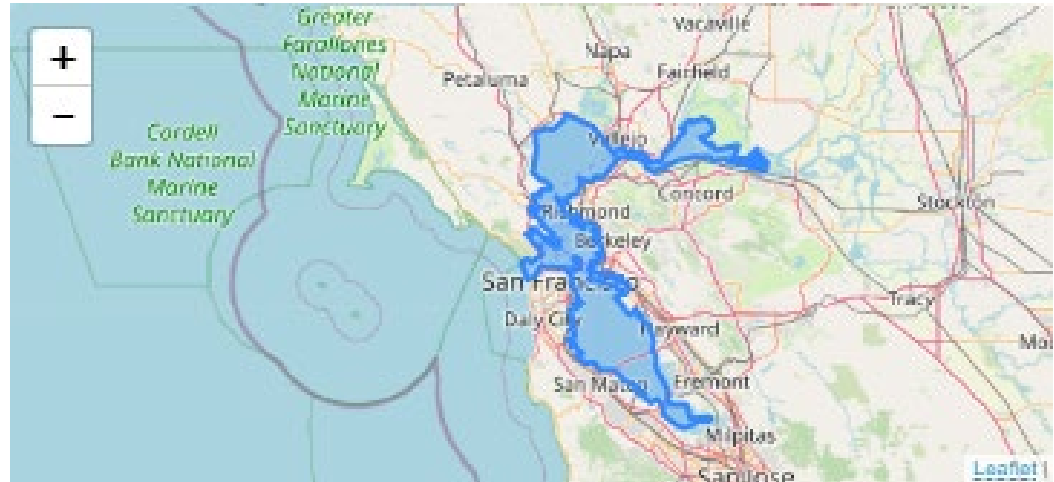
- Women 50+ years and men 18+ years (“General population”)



OEHHA has two types of Advisories:

1) Site-specific advisories (132 and counting)

- Require at least 3 species and 9 fish per species
 - Legal size to take
 - Adult size for species without legal size limits
- Use a measure of central tendency for each species (usually the mean concentration)
- Consider the range of concentrations



San Francisco Bay Advisory

2) Statewide advisories

Statewide Advisory for Eating Fish from California's Coastal Locations without Site-specific Advice

- Provides consumption advice for 36 species based on levels of mercury and/or PCBs

Statewide Advisory for Eating Fish from California's Lakes and Reservoirs without Site-specific Advice

- Provides consumption advice for 14 species based on levels of mercury and/or PCBs

Advisory for Fish that Migrate

- Provides consumption advice for 5 species based on levels of mercury and/or PCBs

Women
(18-49 Years)

Children
(1-17 Years)

A GUIDE TO EATING FISH from the CALIFORNIA COAST

ADVISORY FOR AREAS WITHOUT SITE-SPECIFIC ADVICE

WOMEN 18 - 49 YEARS AND CHILDREN 1 - 17 YEARS

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.

6 TOTAL SERVINGS A WEEK

OR

2 TOTAL SERVINGS A WEEK

OR

1 TOTAL SERVING A WEEK

OR

0 DO NOT EAT

Small Flatfish: Diamond Turbot, Longfin Sanddab, Speckled Sanddab, and Spotted Turbot

Queenfish

Craker: White and Yellowfin

Low-PCB Surfperch: Shiner, Silver, and Walleye

Very Low-PCB Surfperch: Barred, Black, Pile, Rainbow, Spottin, and White

Topsmelt

Barred Sand Bass

Cabezon

California Corbina

Kelp Bass

Lingcod

Medium-Mercury Rockfish: Black, Blue, Brown, Kelp, Olive, Rosethorn, and Vermillion

High-Mercury Rockfish: Black and Yellow, China, Copper, and Gopher

Sharks

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

For Adults

For Children

Eat only the skinless fillet

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

Eat only the meat

California Office of Environmental Health Hazard Assessment
web: www.oehha.ca.gov/fish
email: fish@oehha.ca.gov
phone: (916) 324-7572

OEHA 02042022

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2) Statewide advisories

Statewide Advisory for Eating Fish from California's Coastal Locations without Site-specific Advice





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Statewide Advisory for Eating Fish from California's Lakes and Reservoirs without Site-specific Advice

- Provides consumption advice for 14 species based on levels of mercury and/or PCBs

Advisory for Fish that Migrate


- Provides consumption advice for 5 species based on levels of mercury and/or PCBs

 Women (18-49 Years) Children (1-17 Years)	 Women (50+ Years) Men (18+ Years)
2 TOTAL SERVINGS A WEEK	6 TOTAL SERVINGS A WEEK
OR	
1 TOTAL SERVING A WEEK	2 TOTAL SERVINGS A WEEK
OR	
0 DO NOT EAT	1 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 


A GUIDE TO EATING FISH

from CALIFORNIA LAKES AND RESERVOIRS WITHOUT SITE-SPECIFIC ADVICE


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Avoid the Bad Fish
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Choose the Right Fish
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Rainbow Trout
♥ high in omega-3s




Catfish




Bullhead




Sunfish Species




Brown Trout
16 inches or less
♥ high in omega-3s




Black Bass Species




Common Carp




Brown Trout
over 16 inches

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- Provides consumption advice for 5 species based on levels of mercury and/or PCBs

<p>Women (18-49 Years)</p> <p>Children (1-17 Years)</p>	<p>Women (50+ Years)</p> <p>Men (18+ Years)</p>	<h3>A Guide to Eating American Shad, Chinook Salmon, Steelhead Trout, Striped Bass, and White Sturgeon in California Rivers, Estuaries, and Coastal Waters</h3> <p>Eat the Good Fish Eating fish that are low in chemicals may provide health benefits to children and adults.</p> <p>Avoid the Bad Fish Eating fish with higher levels of chemicals like mercury or PCBs may cause health problems in children and adults.</p> <p>Choose the Right Fish Chemicals may be more harmful to unborn babies and children.</p>	
<p>3 TOTAL SERVINGS A WEEK</p> <p>OR</p> <p>2 TOTAL SERVINGS A WEEK</p>	<p>7 TOTAL SERVINGS A WEEK</p> <p>OR</p> <p>7 TOTAL SERVINGS A WEEK</p>		<p>American Shad ♥ high in omega-3s</p>
<p>0 DO NOT EAT</p>	<p>2 TOTAL SERVINGS A WEEK</p> <p>OR</p> <p>1 TOTAL SERVING A WEEK</p>		<p>Chinook (King) Salmon ♥ high in omega-3s</p> <p>Steelhead Trout ♥ high in omega-3s</p>
<p>0 DO NOT EAT</p>	<p>Serving Size A serving of fish is about the size and thickness of your hand. Give children smaller servings.</p> <p>For Adults </p> <p>For Children </p>		<p>Striped Bass</p> <p>White Sturgeon</p>
<p>California Office of Environmental Health Hazard Assessment</p> <p>web www.oehha.ca.gov/fish email fish@oehha.ca.gov phone (916) 324-7572</p>		<p>Eat only the skinless fillet </p> <p>Eat only the meat </p> <p>Some chemicals are higher in the skin, fat, and guts.</p>	

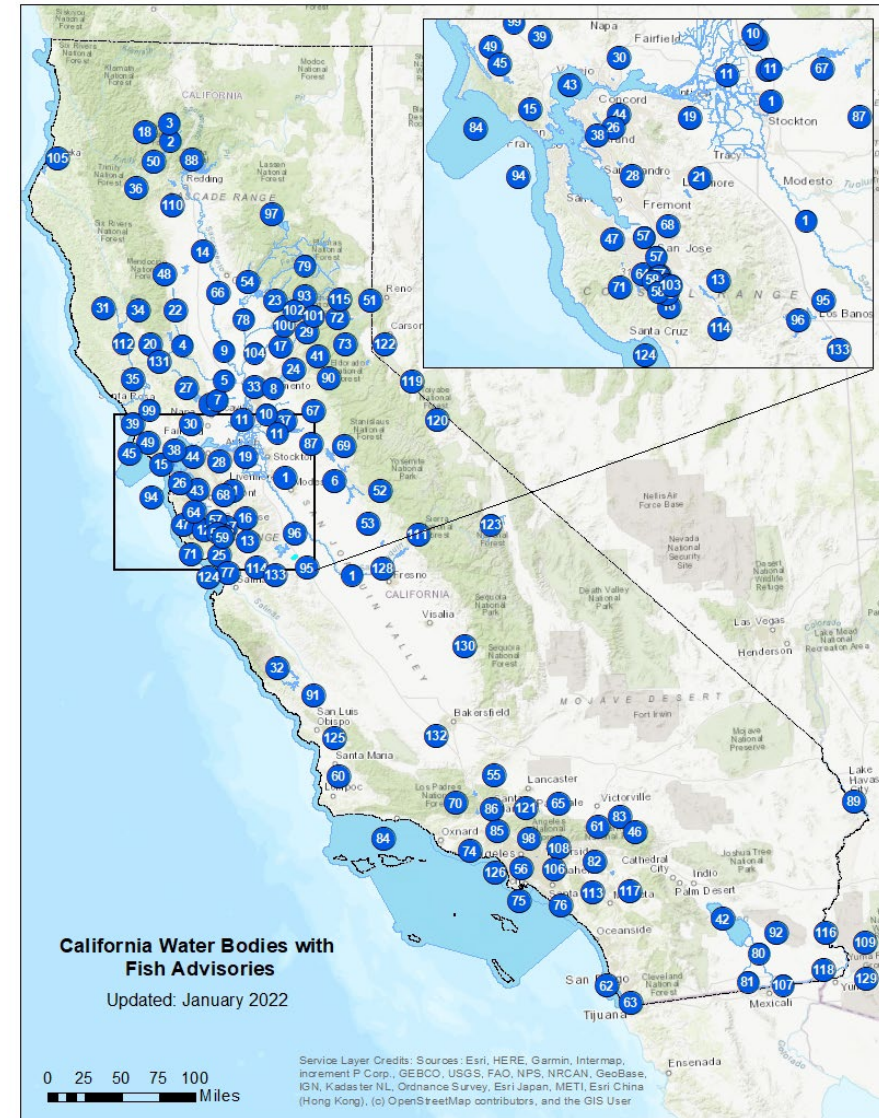


Current Fish Consumption Advisories

Risk Driver*	Percent of Advisories
Mercury	97
PCBs	40
Selenium	8
DDTs	5
Dieldrin	4
PBDEs	1

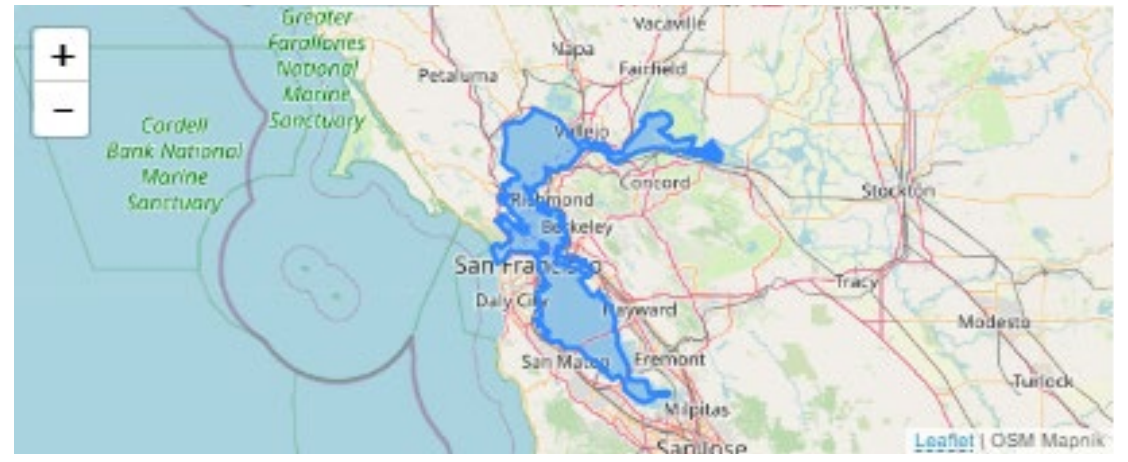
*Consumption advice is based on the chemical with the lowest allowable number of servings per week (“risk driver”). More than one risk driver may affect advice in a single advisory.

Total number of advisories – 135



San Francisco Bay

- Fish Advisory Posters in the following languages
 - Simplified and Traditional Chinese
 - Japanese
 - Khmer
 - Korean
 - Laotian
 - Russian
 - Samoan
 - Spanish
 - Tagalog
 - Vietnamese
- Brochures
- Fact Sheets
- Technical Report



San Francisco Bay Advisory



Women
(18-49 Years)

Children
(1-17 Years)

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OR

1 TOTAL SERVING A WEEK

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A GUIDE TO EATING FISH *from* SAN FRANCISCO BAY

(ALAMEDA, CONTRA COSTA, MARIN, NAPA, SAN FRANCISCO, SAN MATEO, SANTA CLARA, SOLANO, SONOMA COUNTIES)

**WOMEN 18 - 49 YEARS AND
CHILDREN 1 - 17 YEARS**

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.



Brown rockfish



Chinook (King) Salmon

♥ high in omega-3s



Jacksmelt



Red rock crab



California halibut



White croaker



Sharks



White sturgeon



Surfperches



Striped Bass

Serving Size

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

For Adults



For Children



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

Eat only the skinless fillet



Eat only the meat





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(18-49 Years)

Children
(1-17 Years)

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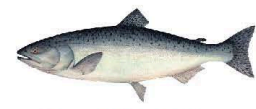
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(50+ Years)

Men
(18+ Years)

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7 TOTAL SERVINGS A WEEK

OR

5 TOTAL SERVINGS A WEEK

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2 TOTAL SERVINGS A WEEK

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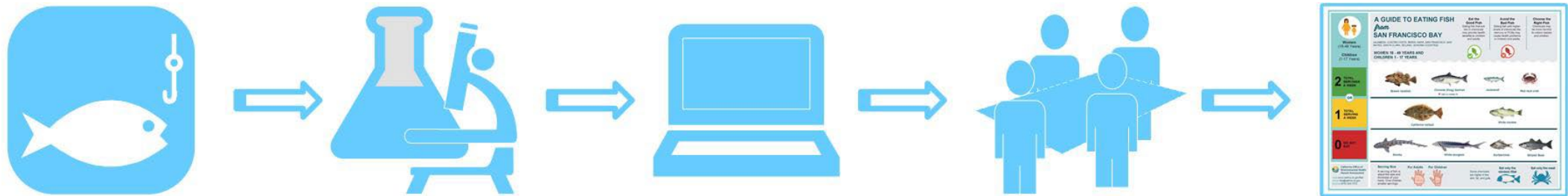
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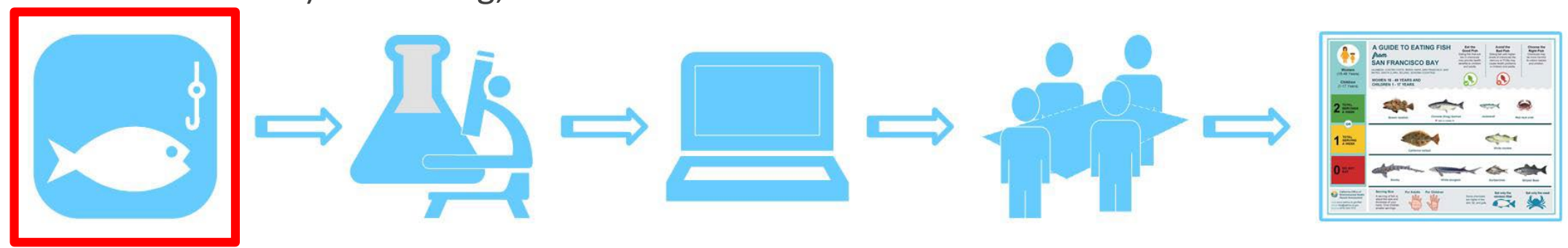
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Advisories are developed through a multi-step process:



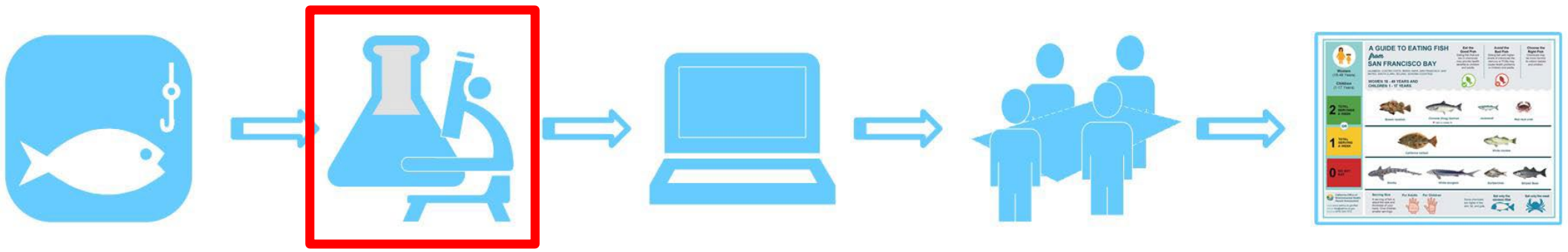
Advisories are developed through a multi-step process:

- Fish samples are collected
 - The Safe to Eat Workgroup (STEW) arranges the collection for the majority of fish samples used in advisory development
 - Additional samples are collected by water utilities, FERC (Federal Energy Regulation Commission) relicensing, and other GOs and NGOs



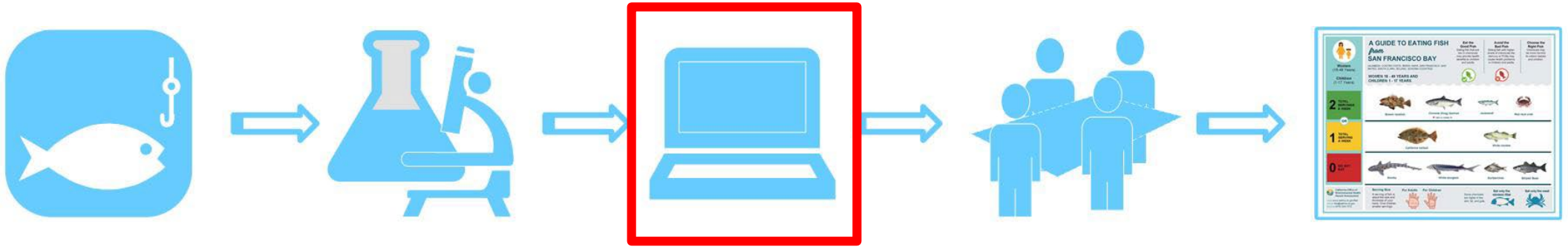
Advisories are developed through a multi-step process:

- Fish samples are generally analyzed at Moss Landing Marine Laboratories and/or contracted to other certified laboratories



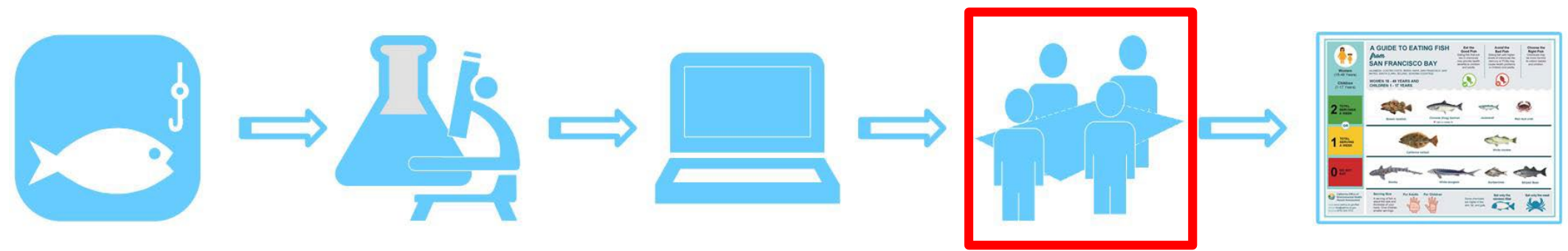
Advisories are developed through a multi-step process:

- Most fish contaminant data are uploaded to the California Environmental Data Exchange Network (CEDEN) and retrieved by OEHHA for use in fish advisory development.



Advisories are developed through a multi-step process:

- Data that meet our criteria (minimum length, sample size, and quality) are reviewed, analyzed, and interpreted before a final data set is confirmed and used to calculate a **tissue concentration** for each chemical in each species at a water body.



Tissue concentrations are compared to **Advisory Tissue Levels (ATLs)** that have been developed for each chemical.

ATLs:

- provide a number of recommended servings (0-7 per week) based on the range of contaminant concentrations found in fish.
- are designed to encourage consumption of fish that can be eaten in quantities likely to provide health benefits (8 ounces per week or 32 grams per day, prior to cooking).
- are designed to discourage consumption of fish that should not be eaten in amounts recommended for improving overall health.
- are not “bright lines” but part of a complex decision-making process.
- can be based on cancer or non-cancer endpoints.



How does OEHHA develop ATLs?

- ATLs are developed using risk assessment equations for cancer and non-cancer endpoints.
- The following terms use default assumptions for both equations:
 - Body weight (BW) – assumed adult body weight of 70 kg (154 lbs);
 - Consumption Rate (CR) – corresponding to 1 – 7 eight ounce servings per week;
 - Cooking Reduction Factor (CRF) – a factor of 0.7 is used to account for the loss of organic contaminants during cooking.

**DEVELOPMENT OF
FISH CONTAMINANT GOALS
AND ADVISORY TISSUE LEVELS (ATLs)
FOR COMMON CONTAMINANTS
IN CALIFORNIA SPORT FISH:**

**CHLORDANE, DDTs, DIELDRIN,
METHYLMERCURY, PCBs,
SELENIUM, AND TOXAPHENE**

June 2008
(Updated ATL Table November, 2017)

Arnold Schwarzenegger
Governor
State of California

Linda Adams
Agency Secretary
California Environmental Protection Agency

Joan E. Denton, Ph.D.
Director
Office of Environmental Health Hazard Assessment





Advisory Tissue Level (ATL) Equations: Non-cancer

Reference Dose (RfD)

- Chemical specific dose
- Adverse health effects are not likely to occur below this concentration

$$ATLs = \frac{RfD \times BW}{CR \times CRF}$$



Advisory Tissue Level (ATL) Equations: Cancer

Cancer Slope Factor (CSF)

- Cancer risk from lifetime exposure

Exposure Durations (ED)

- 30 years of exposure

Averaging Time (AT)

- 70 year average lifetime

Risk Level (RL)

- 1 in 10,000 (1×10^{-4}) is used to balance benefits and risks of eating fish.

$$ATLs = \frac{RL \times BW}{CSF \times (ED/AT) \times CR \times CRF}$$

ATLs have been developed for:

Natural elements

- Mercury – a global contaminant and legacy of California’s gold and mercury mining.
- Selenium – a micro-nutrient that can be redistributed and concentrated as a result of human activity.

Industrial chemicals

- Polychlorinated biphenyls (PCBs) – banned in the 1970s; still pervasive in some areas.
- Polybrominated diphenyl ethers (PBDEs) – flame retardants; some forms are no longer produced.

Pesticides

- DDTs – banned in the 1970s; still present in some environments.
- Dieldrin – banned in the 1970s; still present in some environments.
- Chlordane* – banned in the 1970s.
- Toxaphene* – banned in 1988.

*These chemicals are not currently found at levels of concern in California sport fish.



Contaminant	Consumption Frequency Categories (8-ounce servings/week) and ATIs (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
Mercury (Women 18-49 and children 1-17)	≤ 31	>31-36	>36-44	>44-55	>55-70	>70-150	>150-440	>440
Mercury (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	≤ 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



Contaminant	Consumption Frequency Categories (8-ounce servings/week) and ATLs (in ppb)							
	7	6	5	4	3	2	1	0
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DDTs	≤ 220	>220-260	>260-310	>310-390	>390-520	>520-1,000	>1,000-2,100	>2,100
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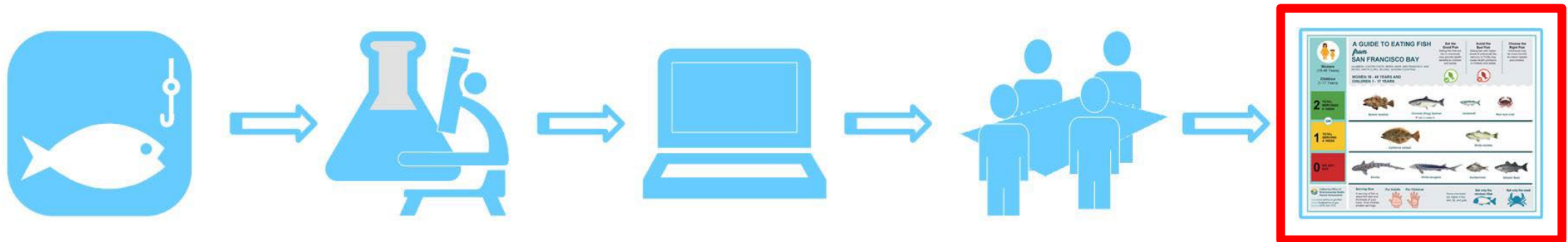
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Multiple Chemical Exposure

- Some chemicals, such as mercury and PCBs, are known to have similar adverse effects, and in such cases may be assessed using multiple chemical exposure methodology
- If two or more chemicals with similar adverse effects are present in fish tissue, multiple chemical exposure methodology is employed. This may result in advising fewer servings per week than would be the case for the presence of one chemical alone, in a similar concentration.

Advisories are developed through a multi-step process:

- A final report and posters are developed and posted at:
<https://oehha.ca.gov/fish/advisories>





Women
(18-49 Years)

Children
(1-17 Years)

A GUIDE TO EATING FISH from SAN FRANCISCO BAY

(ALAMEDA, CONTRA COSTA, MARIN, NAPA, SAN FRANCISCO, SAN MATEO, SANTA CLARA, SOLANO, SONOMA COUNTIES)

**WOMEN 18 - 49 YEARS AND
CHILDREN 1 - 17 YEARS**

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.



Brown rockfish



Chinook (King) Salmon
high in omega-3s



Jacksmelt



Red rock crab



California halibut



White croaker



Sharks



White sturgeon



Surperches



Striped Bass

Serving Size

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

For Adults



For Children



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

Eat only the skinless fillet



Eat only the meat



2 TOTAL SERVINGS A WEEK

OR

1 TOTAL SERVING A WEEK

0 DO NOT EAT

California Office of Environmental Health Hazard Assessment

web www.oehha.ca.gov/fish
email fish@oehha.ca.gov
phone (916) 324-7572



Women
(50+ Years)

Men
(18+ Years)

A GUIDE TO EATING FISH from SAN FRANCISCO BAY

(ALAMEDA, CONTRA COSTA, MARIN, NAPA, SAN FRANCISCO, SAN MATEO, SANTA CLARA, SOLANO, SONOMA COUNTIES)

**WOMEN 50 YEARS AND OLDER AND
MEN 18 YEARS AND OLDER**

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Jacksmelt



Sharks



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Eat only the meat



7 TOTAL SERVINGS A WEEK

OR

5 TOTAL SERVINGS A WEEK

OR

2 TOTAL SERVINGS A WEEK

OR

1 TOTAL SERVING A WEEK

0 DO NOT EAT

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Eat the Good Fish, Avoid the Bad Fish, Choose the Right Fish.

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