

Department of Ecology Water Quality Standards Policy Forum #4

March 28, 2013
Spokane Valley, WA



Helpful Hints for the Phone

- ▶ **How can I ask the presenter a question?**
 - To ask a question, press ***1** on your telephone keypad. This puts you in a question queue.
 - Press **#** to take yourself out of the question queue.
- ▶ **How can I increase/decrease the volume?**
 - Pressing ***4** will increase your listening volume in a conference, up to 3 levels. Pressing ***4** again will decrease the volume.
- ▶ **How do I mute my phone line?**
 - You can mute your phone line by pressing ***6** on the telephone keypad. Pressing ***6** again will un-mute your line.
 - *Remember to un-mute your line if you have a question for the speaker, please!*

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Status of rule-making process and Recap of Earlier Policy Forums

Policy Forum 1:

- ▶ Human Health Criteria Equation 101
- ▶ Cost and how it gets factored into the development of rules

Policy Forum 2:

- ▶ Scope of the Clean Water Act – what can really be influenced
- ▶ Factors that influence the Human Health Criteria equation

Policy Forum 3:

- ▶ Risk level 101
- ▶ Risk level aspect of the Human Health Criteria equation
- ▶ Chemicals Ecology sees in monitoring

Current and Future Policy Forum Topics

Policy Forum 4:

- ▶ Chemicals covered in this rule
- ▶ Challenges with pervasive and natural occurring chemicals (e.g. methylmercury and PCBs)
- ▶ How the Department of Health develops fish advisories

Policy Forum 5:

- ▶ Arsenic
- ▶ Risk factors for non-carcinogenic chemicals

Policy Forum 6:

- ▶ Discuss inputs to criteria calculations, and uncertainty and compounded conservatism

Policy Forum 7:

- ▶ Science and policy related to human health criteria
- ▶ What fish consumption rates mean
- ▶ How to handle salmon under the scope of the Clean Water Act and other states' fish consumption rates

Toxics Reduction Strategy Workgroup

- ▶ Ecology accepted comments on the Workgroup's white paper on Toxics Policy Reform for Washington State through March 11, 2013.
- ▶ Ecology received a number comments on the Toxics Reduction Strategy white paper.
- ▶ Ecology is currently reviewing the comments and will begin to outline next steps in April.

Toxics Reduction Strategy Workgroup, cont.

- ▶ Depending upon the scope of the comments, Ecology may reconvene the workgroup later this spring.
- ▶ If you are interested in following developments on this effort, please sign up for the listserv at <http://listserv.wa.gov/cgi-bin/wa?A0=TOXICS-REDUCTION-STRATEGY&X=07DB8102FF0C00F136&Y>.
- ▶ **Contact**
Carol Kraege
Reducing Toxic Threats coordinator
ckra461@ecy.wa.gov
(360) 407-6906



Chemical lists and the human health criteria

Policy Forum #4

March 28, 2013

Human Health Criteria and Implementation Tools
Rule-makings

Cheryl Niemi

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What we will discuss in this presentation

- Different chemical lists
- What toxics lists are addressed in the NTR?
- Compared the NTR chemical list to the list of current EPA recommended criteria – how many additional chemicals are we looking at?
- What are the regulations around choosing additional toxics for HHC development and adoption?
- “New” chemical categories/groups of interest – and what about criteria for these?

Much of the information in this presentation is directly from USEPA's web site (as indicated on individual slides)

Abbreviations frequently used in this presentation:

HHC = Human health-based criteria for surface waters

WQS = Surface Water Quality Standards (WAC 173-201A)

NTR = National Toxics Rule (40CFR131)

Chemical lists

General discussion of the following lists:

- EPA's List of Toxic Pollutants
- EPA 's Priority Pollutant List
- EPA's List of Recommended National Criteria

EPA's List of Toxic Pollutants (this list led to the Priority Pollutant List)

The list contains **65** entries. Many of the entries, such as "haloethers," are for **groups of pollutants**.

The list was negotiated among parties to a settlement agreement (NRDC et al. vs Train, 6 ELR 20588, D.D.C. June 9, 1976 – a.k.a. Toxics Consent Decree).

Congress subsequently ratified the Settlement Agreement and the list of toxic pollutants when they amended the CWA (Public Law 95-217) in 1977.

The list was first published on January 31, 1978 in the Federal Register (43 FR 4108).

All information/text on this slide taken from USEPA at: <http://water.epa.gov/scitech/methods/cwa/pollutants-background.cfm>

Further reading, as found at the EPA website above: <http://digital.library.unt.edu/ark:/67531/metacrs89/>

EPA's Priority Pollutant List

The Priority Pollutants are a set of chemical pollutants that EPA regulates and has published analytical test methods for.

The Priority Pollutant list is more practical for testing and for regulation than the List of Toxic Pollutants because **chemicals are described by their individual chemical names**.

Starting with the list of toxic pollutants, EPA used four criteria to select and prioritize specific pollutants:

- EPA included all pollutants specifically named on the list of toxic pollutants;
- There had to be a chemical standard available for the pollutant, so that testing for the pollutant could be performed;
- The pollutant had to have been reported as found in water with a frequency of occurrence of at least 2.5%, and
- The pollutant had to have been produced in significant quantities, as reported in Stanford Research Institute's 1976 Directory of Chemical Producers, USA.

Originally, there were **129** priority pollutants. When three pollutants were removed from the list of toxic pollutants in 1981, they were also removed from the Priority Pollutant list.

- Entry numbers 17, 49, and 50 were removed.
- The last number on the list is still 129, although there are **126** entries
- The Priority Pollutant list published at 40 CFR 423, Appendix A

EPA's List of Recommended National Criteria

Current list , regulations affecting WA	Number of chemicals with criteria
Current EPA recommended national criteria list	114 (includes priority pollutants and about 18 non-priority pollutants)
1999 NTR Revision (40CFR131.36 – as revised)	85 (new “Total PCBs” criterion drops the number of chemicals)
1992 NTR (40CFR131.36)	91 (PCBs regulated as Arochlor mixtures)

What are the regulations around choosing additional toxics for HHC development and adoption?

40CFR 131.11(a)(1) requires States to adopt water quality criteria to protect the designated use(s). The State criteria must be based on sound scientific rationale and must contain sufficient parameters or constituents to protect the designated use(s). For waters with multiple use designations, the criteria must support the most sensitive use.

CWA Sec. 303(c)(2)(B) Whenever a State reviews water quality standards pursuant to paragraph (1) of this subsection, or revises or adopts new standards pursuant to this paragraph, such State shall adopt criteria for all toxic pollutants listed pursuant to section 307(a)(1) of this Act for which criteria have been published under section 304(a), the discharge or presence of which in the affected waters could reasonably be expected to interfere with those designated uses adopted by the State, as necessary to support such designated uses. Such criteria shall be specific numerical criteria for such toxic pollutants.

CWA 307(a)(1) references the List of Toxic Pollutants/Priority Pollutants List

Other lists or groups of chemicals

#1 - Washington's PBT List

Adopted into state rule in 2006

Prioritizes **74** chemicals (18 individual chemicals and 8 groups of chemicals) as **Persistent, Bioaccumulative, and Toxic**

26 PBTs have HHC associated with them:

17 NTR HHC account for 23 individual PBTs

Additional: NTR HHC = total mercury, and PBT = methylmercury

Additional: Two new EPA recommended criteria for two other PBTs

**Total 26
PBTs**

23

1

2

PBT Rule: Chapter WAC 173-333, Persistent Bioaccumulative Toxins

Ecology PBT website: <http://www.ecy.wa.gov/programs/swfa/pbt/>

PBTs Chemical Action Plans (CAPs)

The PBT Rule defines a detailed and scientific process to periodically review and update the PBT list and to prioritize the order in which CAPs will be developed for chemicals on the PBT list.

What is a Chemical Action Plan (CAP)?

A CAP is a comprehensive plan to identify, characterize and evaluate all uses and releases of a specific PBT, a group of PBTs or metals of concern. A CAP is a plan, not legislation or a rule. It recommends actions to protect human health and the environment. Some of the recommendations may lead to new legislation or rules. These would go through the normal legislative or rulemaking process.

PBT Rule has led to development of CAPs for mercury, lead, PBDEs, and PAHs. (mercury CAP discussed later in the presentation)

Current CAP work: Draft PCB Chemical Action Plan is in early stages of development: <http://www.ecy.wa.gov/programs/swfa/pbt/caps.html>.

Other lists or groups of chemicals

#2 - Endocrine disruptors – EPA information

EPA has established the Endocrine Disruptor Screening Program

EPA 2009 list in the federal register: 67 chemicals identified for testing

At early screening phase of research to identify EDs

Criteria not yet developed for these chemicals as a group

What are EDs? Chemicals that disrupt the endocrine system.

What does the endocrine system do? The endocrine system **regulates all biological processes** in the body from conception through adulthood and into old age, including the development of the brain and nervous system, the growth and function of the reproductive system, as well as the metabolism and blood sugar levels. The female ovaries, male testes, and pituitary, thyroid, and adrenal glands are major constituents of the endocrine system.

Most information on EDs on this slide taken from: EPA Endocrine Disruptor site:
<http://www.epa.gov/scipoly/ospendo/index.htm>

Other lists or groups of chemicals

#3 - Pharmaceuticals and Personal Care Products - EPA information

What are "PPCPs"? Pharmaceuticals and Personal Care Products as Pollutants (PPCPs) refers, in general, to any product used by **individuals for personal health or cosmetic reasons** or used by **agribusiness to enhance growth or health of livestock**. PPCPs comprise a diverse collection of thousands of chemical substances, including **prescription and over-the-counter therapeutic drugs, veterinary drugs, fragrances, lotions, and cosmetics**.

Why are they of concern? Studies have shown that pharmaceuticals are present in our nation's waterbodies. Further research suggests that certain drugs may cause ecological harm. More research is needed to determine the extent of ecological harm and any role it may have in potential human health effects. To date, scientists have found no evidence of adverse human health effects from PPCPs in the environment.

EPA is responding to the issues of PPCPs in water with a four pronged strategy aimed at:

- improving science;
- improving public understanding;
- identifying partnership and stewardship opportunities; and
- taking regulatory action when appropriate.

Criteria not yet developed for these chemicals as a group

Most information/text on PPCPs on this slide taken from: EPA PPCP site: <http://www.epa.gov/scipoly/oscpendo/index.htm>

Managing Unused

Pharmaceuticals:

Publications and programs at

<http://www.epa.gov/scipoly/oscpendo/index.htm>

Criteria development for these other chemical groups

EPA develops national recommended numeric criteria for states to use in WQS, as appropriate (CWA Sec. 304(a)).

EPA is doing significant work to increase understanding of these newer categories/groups of chemicals, but is in early stages of work at this time.

Criteria have not been developed for these categories (although individual toxics might have been caught in EPA's current list of recommended criteria).

States most frequently depend on EPA to do much of the work of initial criteria development, including toxicity and bioconcentration/bioaccumulation research and data analysis.

Can a state develop their own criteria beyond EPA's list? Yes. But – there are limitations:

- Data can be insufficient
- The cost to develop new criteria can be very high, even if the data set is extensive.

Questions/Comments/Discussion

The next presentation will focus on a different type of assessment and program - WDOH fish advisories

Washington Department of Health - focus is on public health protection

Why is WDOH work of direct interest for criteria development?

1. CWA HHC are sometimes compared with WDOH fish advisories and SDWA standards –
 - different programs address the same chemicals and effects in different ways in order to fulfill the requirements of enabling legislation, regulations, and more local needs.
2. Fish advisories can help direct or prioritize efforts to control sources where they are of particular public health importance (e.g., fish advisories for DDT on the Yakima R. and for PCBs on the Spokane R.)

Note: Safe Drinking Water Act standards discussed at Policy Forum # 5



DOH's Fish Advisories and How they Intersect with Fish Consumption Rates

Dave McBride, Toxicologist
Office of Environmental Health, Safety,
& Toxicology
March 28, 2013



Public Health – Always Working for a Safer and Healthier Washington

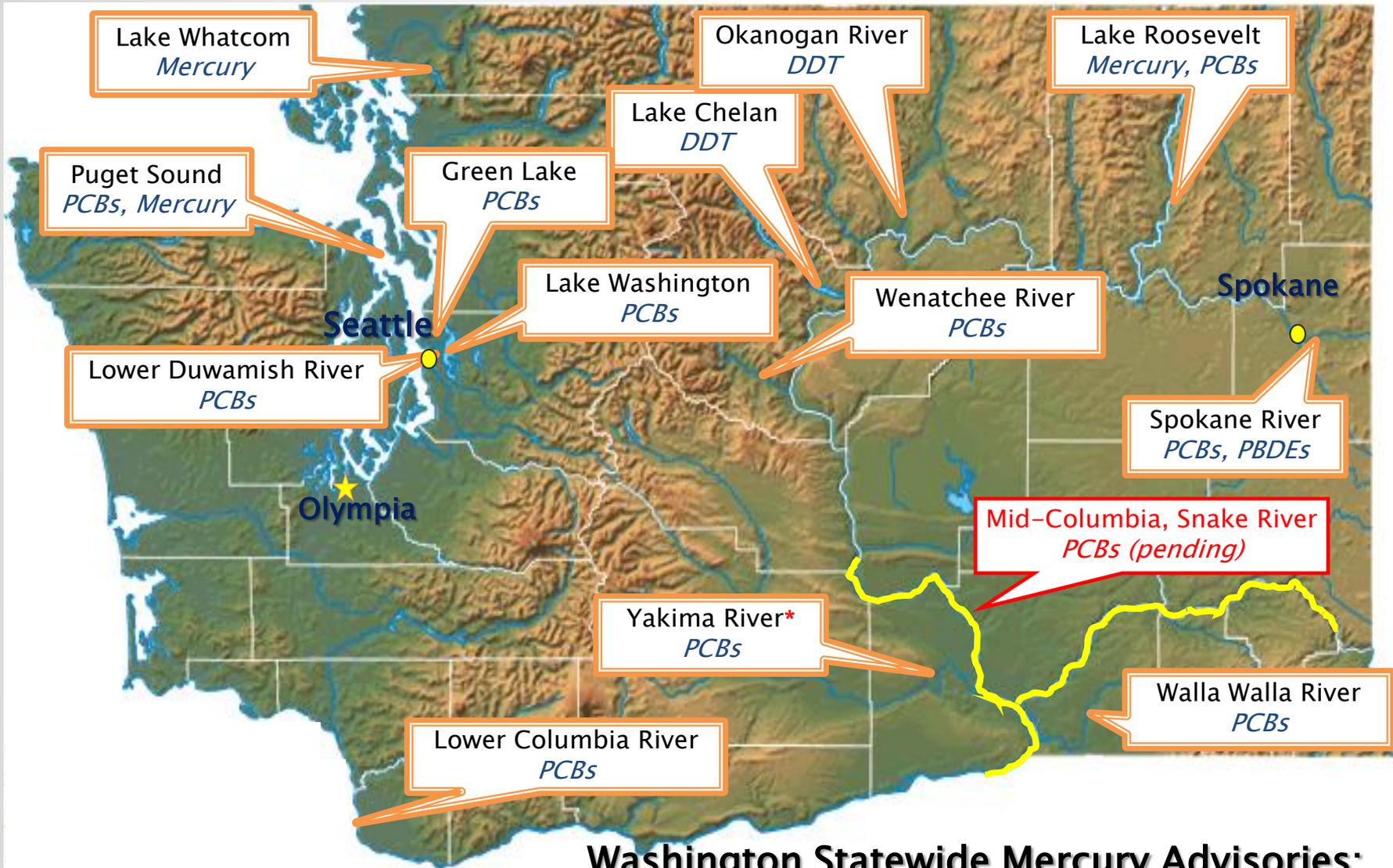
Overview

- ▶ Why fish?
- ▶ Fish advisories in Washington State
- ▶ Brief description of how we conduct an advisory
- ▶ How fish consumption rates are used by DOH
- ▶ Examples using PCBs & mercury
 - Health effects that drive fish advisories
 - What levels trigger an advisory
- ▶ Tying FAs with FCRs

Why the Focus on Fish?

- ▶ Persistent Bioaccumulative Toxics – PBTs (such as mercury, PCBs, DDT, PBDEs) can bioaccumulate in fish
- ▶ Fish consumption is the primary exposure pathway most people have to PBTs
- ▶ Variety of adverse health effects associated with PBTs
- ▶ Health benefits from consuming fish – Main source of omega-3s, protein, nutrients, and antioxidants

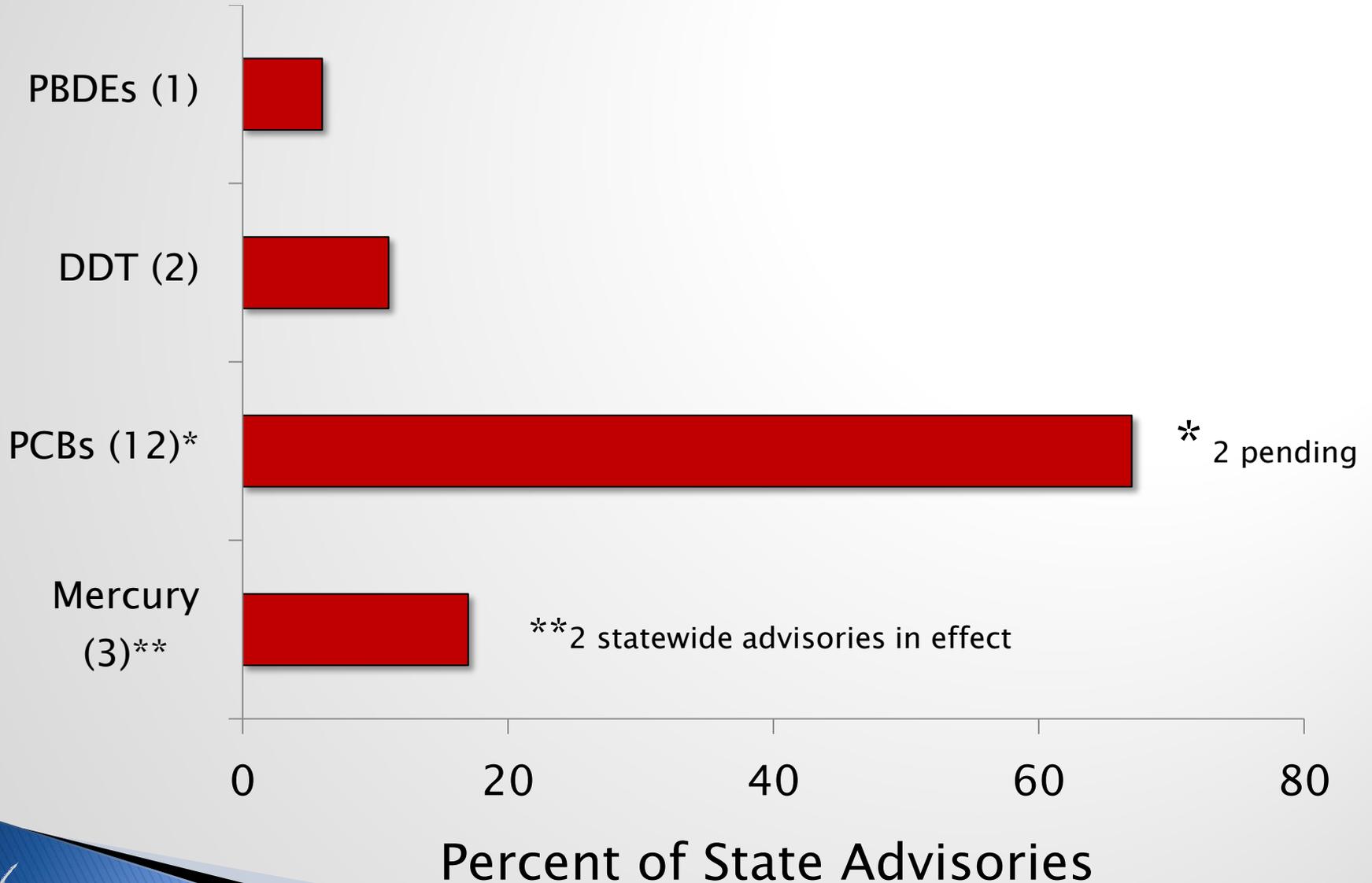
Current Fish Advisories in Washington State



Washington Statewide Mercury Advisories:

- Northern Pikeminnow: DO NOT EAT
- Largemouth and Smallmouth bass: 2 Meals per Month

Number of Waterbody-specific Advisories (in Parentheses) and Percentage Issued in Washington State



- Vol. 1: Sampling & analysis
- Vol. 2: Risk assessment
- Vol. 3: Risk management
- Vol. 4: Risk communication

United States
Environmental Protection
Agency

Office of Water
(4306)

EPA 823-B-00-007
November 2000

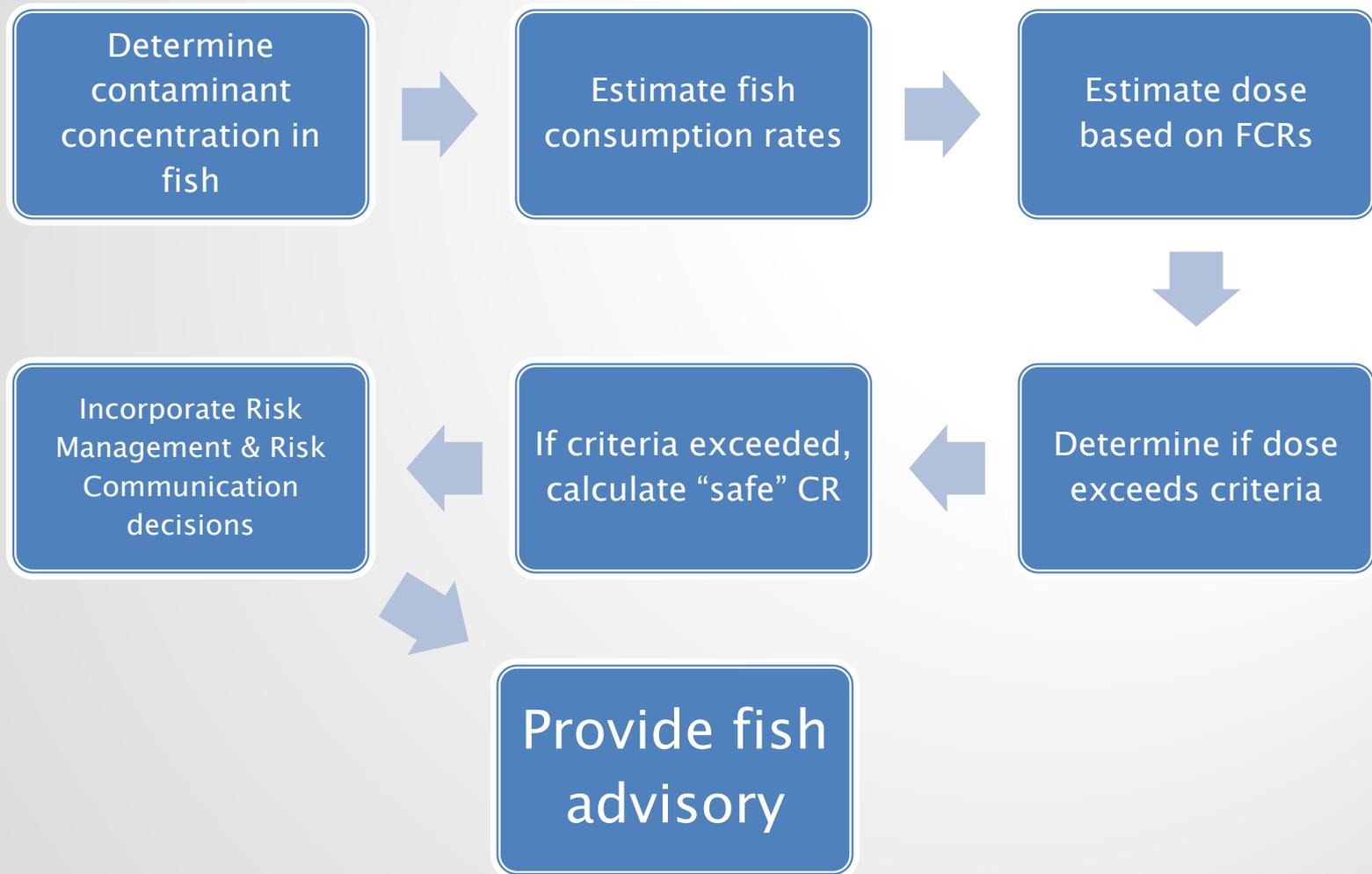
EPA **Guidance for Assessing
Chemical Contaminant
Data for Use in Fish
Advisories**

**Volume 1
Fish Sampling and Analysis
Third Edition**



<http://www.epa.gov/waterscience/fish/guidance.html>

Fish Advisory in a Nutshell



Where DOH uses Consumption Rates

Non-cancer Screening Evaluation

- ▶ Evaluation of non-cancer health effects involves comparison of daily exposure with established reference doses (RfD) –
 - expressed as a Hazard Quotient (HQ)
 - $HQ = \frac{\text{daily dose}}{RfD}$
- ▶ Evaluating multiple chemicals w/ similar health effects
 - Addition of HQ results in a Hazard Index (HI)
 - $HI \text{ (developmental)} = HQ \text{ PCBs (develop.)} + HQ \text{ Hg (develop.)}$

Where DOH uses Consumption Rates

- Cancer Screening Evaluation

- ▶ Estimated chemical-specific individual excess cancer risk
 - Risk = Daily Dose x Cancer Slope Factor
 - Cancer Risks added to estimate total risk

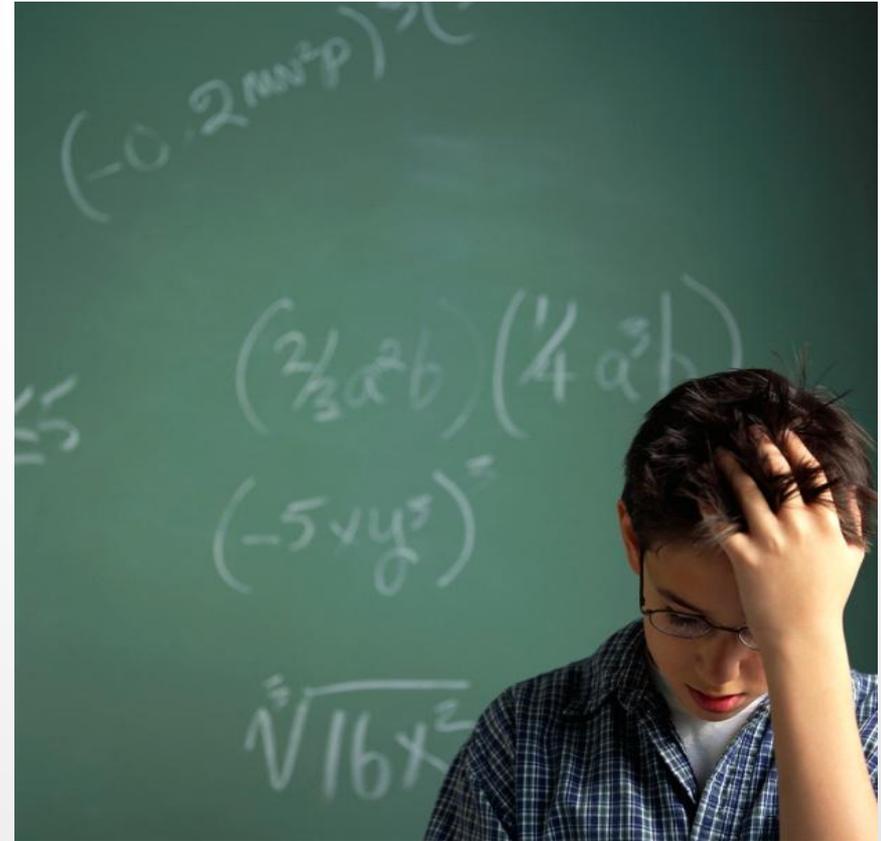
DOH Calculates Consumption Rates

- **Noncancer endpoint**

$$CR = \frac{RfD \times BW}{\text{conc. in fish}}$$

- **Cancer endpoint**

$$CR = \frac{ARL \times BW}{CSF \times \text{conc. in fish}}$$



Calculated Consumption Rates for Multiple Contaminants with same Health Endpoint

$$CR = \left(\frac{BW \cdot CF}{MS} \right) \cdot \left(\left(\frac{RfD_{Hg}}{Conc._{Hg}} \right) + \left(\frac{RfD_{PCBs}}{Conc._{PCBs}} \right) \right)$$

Parameter	Value	Units
RfD - Reference Dose		
PCBs	3.0x10 ⁻⁵	mg/kg-day
Mercury	1.0x10 ⁻⁵	
BW - body weight	60 (adult ♀)	kg
C – concentration	mean	mg/kg
MS – meal size	0.227	kg/meal
CF – conversion factor	30.4	days/month

Fish Advisory Information

▶ Meal limits

0, 1, 2, 4, 8 meals/month

▶ General advice

- Eating fish confers health benefits
- Encourage eating 2 fish meals per week
- Individuals may lower risk by choosing fish with lower Hg & PCB levels
- Preparation and cooking
- Eat a variety of fish
 - EPA recommendations 1 meal/wk when no data available

Eat Fish, Be Smart, Choose Wisely

Risk Communication: Healthy Fish Guide

Fishing for the Safest Seafood?



◀ Look for this symbol.

**SAFE TO EAT
2-3 MEALS
PER WEEK**



OR

**SAFE TO EAT
1 MEAL
PER WEEK**



**AVOID
DUE TO MERCURY**



Follow this advice to reduce your exposure to mercury, PCBs, and other toxics:

- ♥ Anchovies
- Butterfish
- Catfish
- Clams
- Cod *(Pacific) (Atlantic)*
- Crab *(Blue, King, Snow) (US, CAN) (imported King)*
- Crab-Imitation
- Crayfish *(imported farmed)*
- Flounder/Sole *(Pacific) (Atlantic)*
- ♥ Herring
- ♥ Mackerel *(canned)*
- ♥ Oysters
- Pollock/Fish sticks

- ♥ Salmon *(fresh, canned)*
- ♥ Chinook *(King) (coastal, AK)*
- ♥ Chum *(Keta)*
- ♥ Coho *(Silver)*
- ♥ Farmed *
- ♥ Pink *(Humpy)*
- ♥ Sockeye *(Red)*
- ♥ Sardines
- Scallops
- Shrimp/Prawns *(US, CAN) (imported)*
- Squid/Calamari
- Tilapia *(US, Central/South America) (China, Taiwan)*
- ♥ Trout
- Tuna *(canned light)*

- ♥ Black sea bass
- Chilean sea bass
- ♥ Chinook salmon *(Puget Sound)*
- Croaker
- Halibut *(Pacific) (Atlantic)*
- Lobster *(US, CAN) (imported Spiny Caribbean)*

- Mahi mahi *(imported longline)*
- Monkfish
- Rockfish/Red snapper *(trawl-caught)*
- ♥ Sablefish/Black cod
- ♥ Tuna, Albacore *(fresh, canned white) (WA, OR, CA troll/pole) (longline - except Hawaii)*



A seafood serving or "meal" is about the size and thickness of your hand, or 1 oz. for every 20 lbs. of body weight.

160 lb. Adult = 8 oz. / 80 lb. Child = 4 oz.

Women who are or may become **PREGNANT, NURSING MOTHERS, and CHILDREN** should **NOT** eat:

- Mackerel *(King)*
- Marlin *(imported)*
- Shark
- Swordfish *(imported)*
- Tilefish *(Gulf of Mexico, South Atlantic)*

- Tuna Steak
- Bluefin
- Bigeye *(imported longline)*
- Yellowfin *(imported longline)*

- ♥ Highest in healthy omega-3 fatty acids
- ORANGE TEXT:** Overfished, farmed, or caught using methods harmful to marine life and/or environment
- * For environmental and health information, visit www.doh.wa.gov/fish/farmedsalmon

Fish not listed? Call DOH: 1-877-485-7316

In Fish Advisories, Fish Consumption Rates are Calculated

- ▶ Fish Advisories are in response to environmental conditions
 - Answers the question “If fish contain X amount of contaminants, how much can I safely consume?”
 - Reactive – a necessary evil to address what’s in the environment



▪ **Consumption Rate** = $\frac{\text{RfD} \times \text{BW}}{\text{Concentration fish}}$

Populations of Concerns



- ▶ Native American populations
- ▶ Ethnic groups
- ▶ Subsistence fishers
- ▶ Recreational anglers
- ▶ Sensitive individuals
- ▶ General public

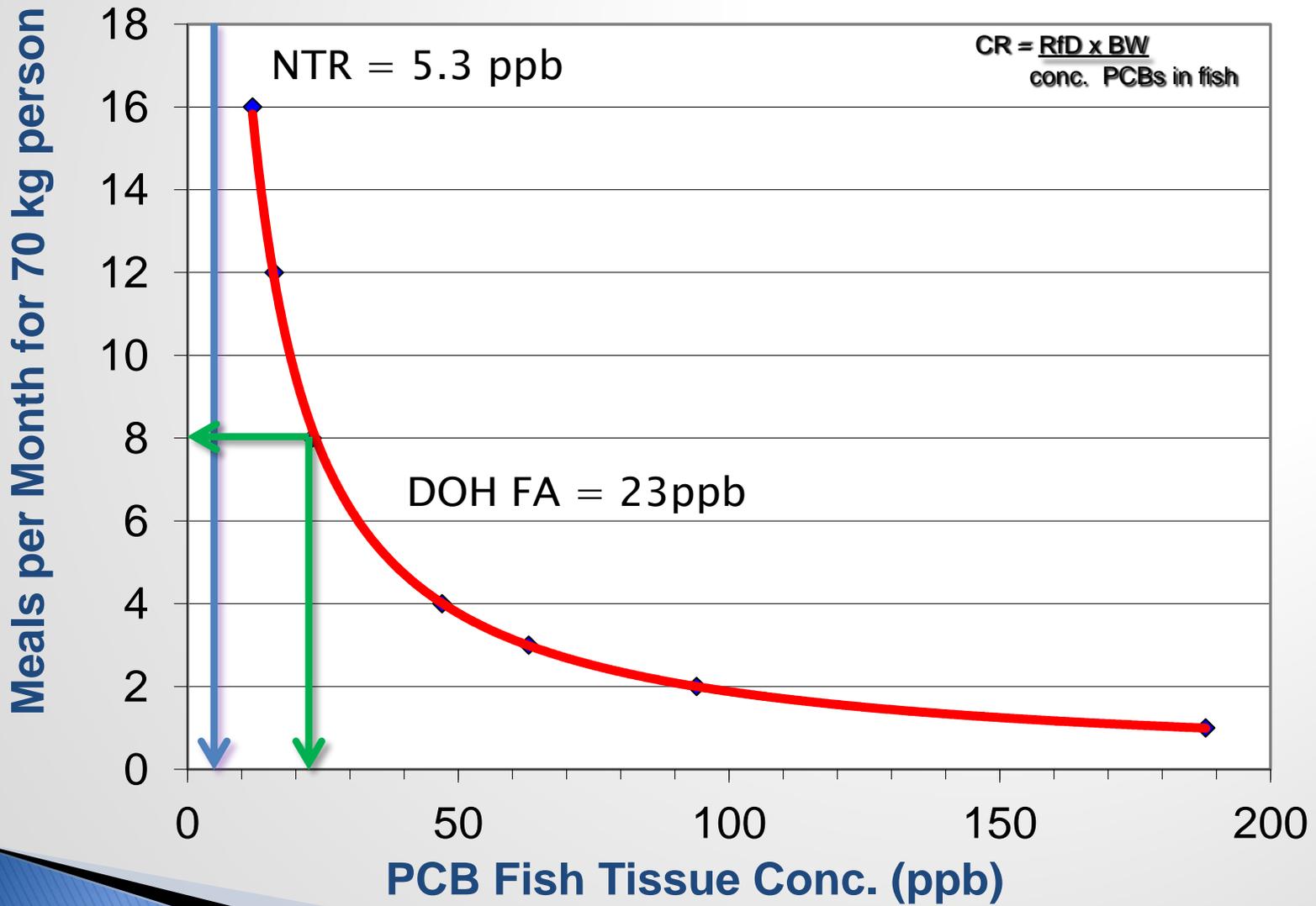
Health Effects of PCBs

- ▶ Shown to cause non-cancer health effects in humans. Includes effects to the:
 - Immune system
 - Reproductive system
 - Nervous system
 - Endocrine system
 - Other health effects
- ▶ Evidence for carcinogenicity in animals, potential carcinogen in humans

PCB Health Effects Studies in Fish Consumers

Study Pop	Michigan – consumers/non-consumers of Lake Michigan fish	Oswego – consumer/non-consumers of Lake Ontario fish
# of subjects	325 – prenatal exposures	309 – prenatal exposures
PCB analysis	packed-column GC, Aroclors 1016 & 1260 as references	cord blood: 68 congeners or congener pairs
Infant neurological status	NBAS: abnormal responses	NBAS: abnormal responses
Fagan test of recognition memory	impaired: lower preference for novel stimulus	impaired: lower preference for novel stimulus
Attention/response inhibition	vigilance task: increased errors mental rotation task: slower rxn time	vigilance task: increased errors
Cognitive effects 3-4 year olds	McCathy: lower IQ	McCathy: lower IQ
Cognitive effects in later childhood	WISC-R, 11 years: decrease full-scale and verbal IQ	NP
Language	word comprehension: impaired	NP
Memory	vocabulary & information scores: impaired	NP

PCB Fish Tissue Conc. used in FAs & NTR



Health Effects of Mercury

- ▶ High dose risks include:
 - Death, kidney toxicity, cardiovascular toxicity, immunotoxicity
- ▶ Lower doses linked to neurotoxicity in children exposed in utero:
 - Delayed developmental milestones
 - Attention disorders
 - Deficits in fine motor function
 - Visual spatial disabilities
 - Memory problems

Blood Hg Levels in Women Age 16-49

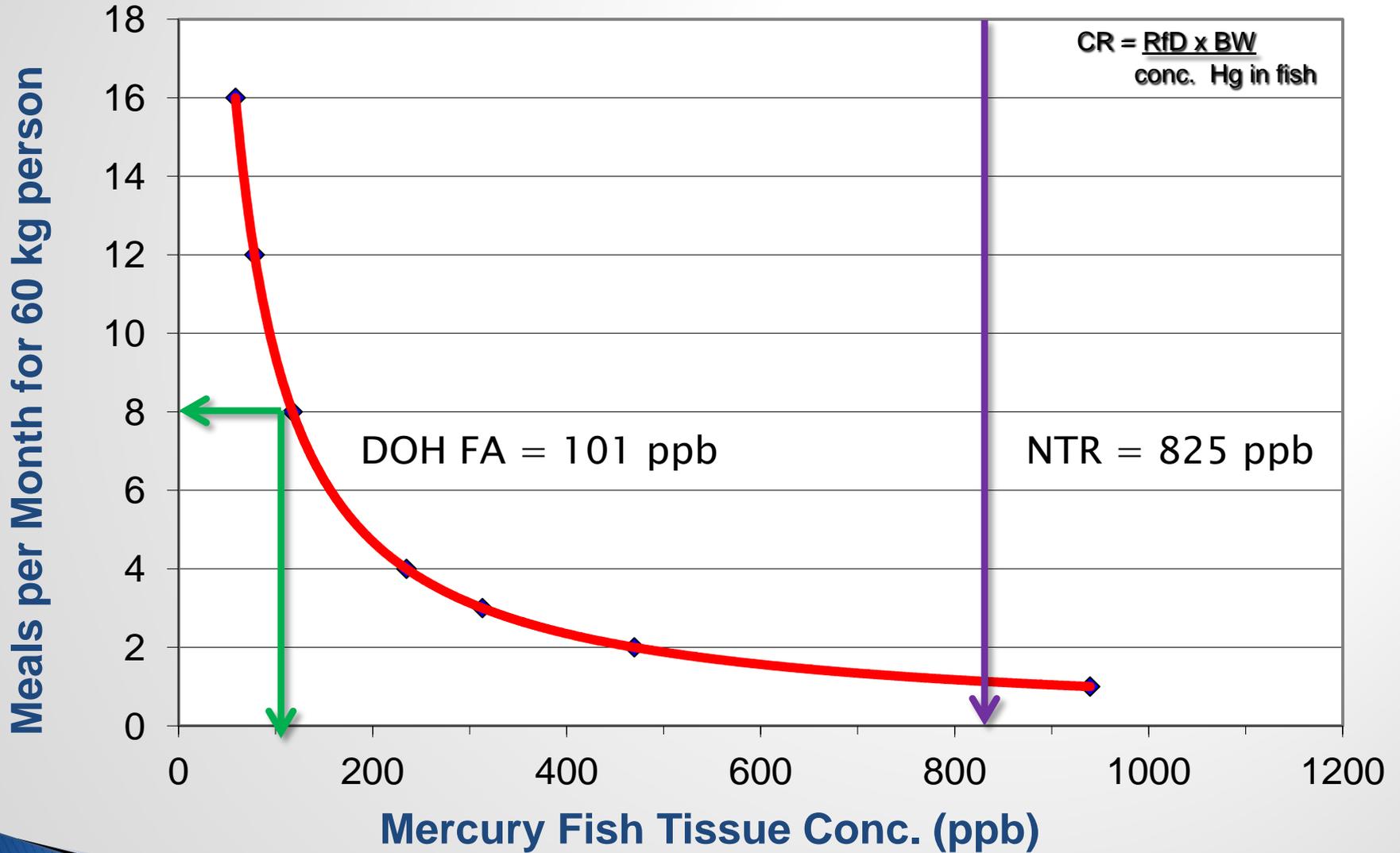
National Environmental Exposure Study

- ▶ Representative sample of the general U.S. population
 - 1709 women tested
 - Mean: 1.02 ug/l, 95th percentile: 7.13 ug/l
 - 8% of women of childbearing age were above recommended safety level (5.8 ug/l)

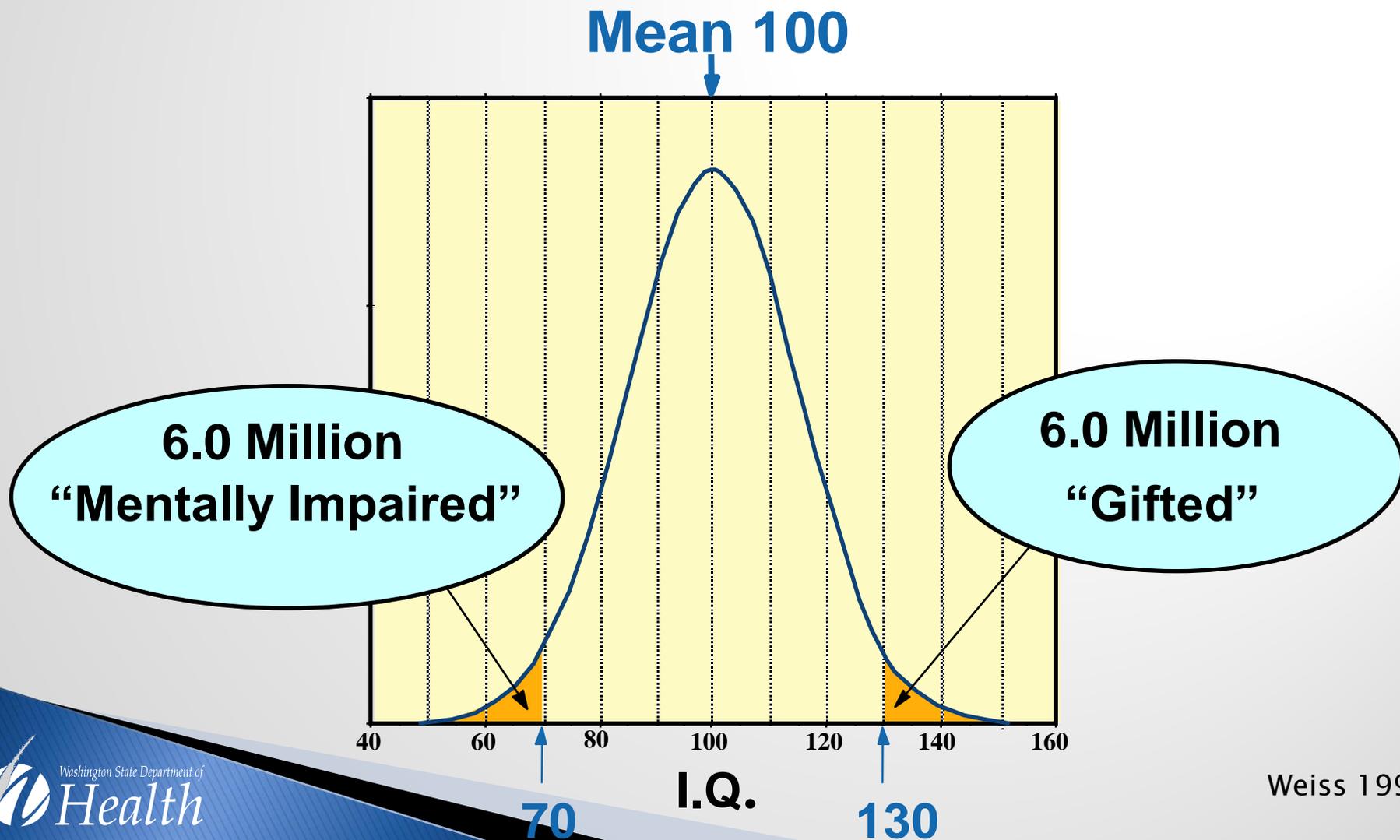
3.5 MILLION women 20–44 years of age (2000 census)
**430,000 infants born each year to mothers who had
blood concentrations > RfD**

- ▶ DOH BRFSS/Women's Health Study showed similar percentages in Washington

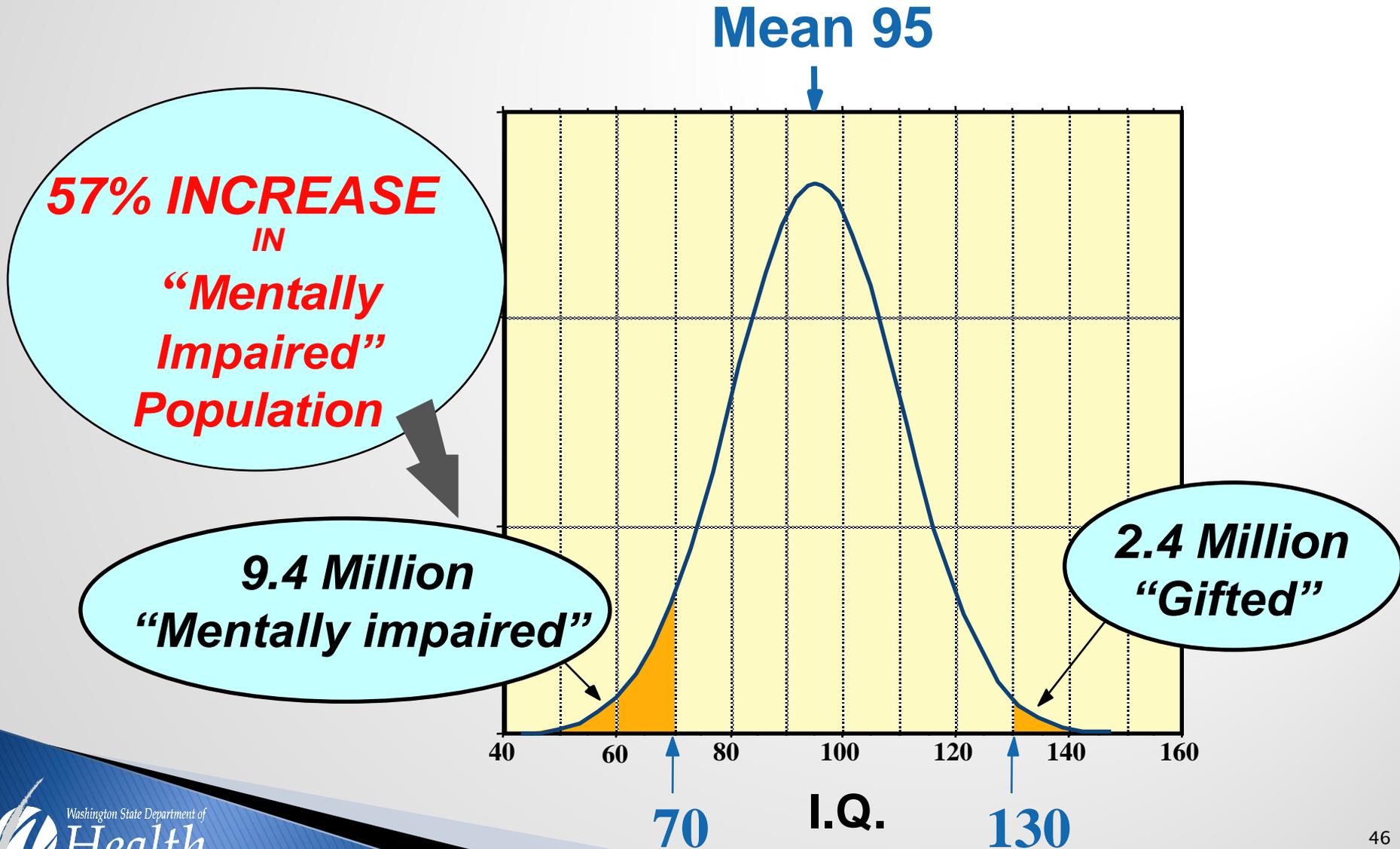
Mercury Fish Tissue Conc. used in FAs & NTR



The Significance of Small Effects: Effects of a Small Shift in IQ Distribution in a Population of 260 Million



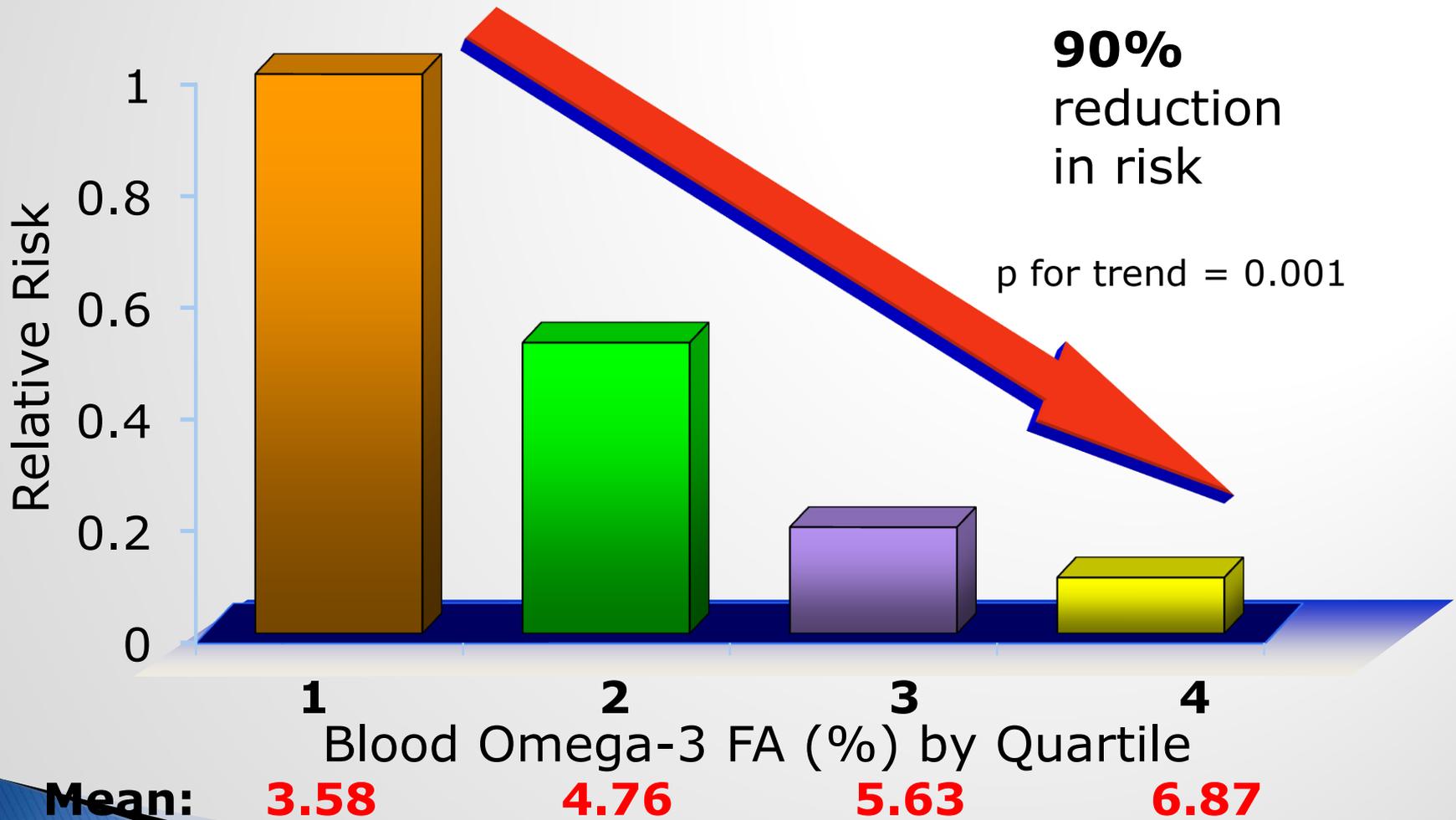
5 Point Decrease in Mean IQ



Other Considerations

- Eating fish confers health benefits
 - Source of high quality protein, fatty acids, and antioxidants
 - Important for brain/eye development
 - Protective effects of omega 3 fatty acids
 - Prevention of irregular heart contractions
 - Prevention of arteriosclerosis
 - Prevents inflammation
 - Lower blood pressure
 - Protective effects against dementia

Relative Risk of Sudden Cardiac Death and Blood Omega-3 Levels: *Physicians' Health Study*



Risk Management & Risk Communication

- ▶ Background or ambient levels
- ▶ Contaminants in other foods
- ▶ Reduction from preparation and cooking
- ▶ Simplifying message

Consumption Rates vs. Fish Advisories

NTR Concentration Fish = RfD x BW / CR	Fish Advisories CR = RfD x BW / Concentration Fish
Used to set Standards or Screening levels	Are the calculated end result
“How clean do the fish need to be”	“How much can I safely consume”
Ideally targets 90-95% consumers	Applies to everyone
Conservative (e.g. 1 in 1 million cancer)	Less conservative (use a range of cancer risks and non-cancer)
Does not consider health benefits	Attempts to balance risks and benefits and considers “background” and contaminant levels in other foods, etc.
Proactive – before contamination occurs (i.e. discharge standards)	Reactive – responding to what is in the environment
Can be used to determine Risk	Not intended to determine Risk
Used in TMDLs and 303d listing	TMDL standards not used in fish advisories
Trying to prevent the need for FAs	

Conclusion

- ▶ It matters – in terms of risks and benefits
- ▶ Currently, Washington uses one of the lowest consumption rates for setting water quality standards while we have some of the highest fish consuming populations in the U.S.
- ▶ In order to protect public health, DOH supports Ecology's effort to change the CRs to reflect realistic rates in Washington
- New CR will not result in more fish advisories
 - Over time, likely to prevent future advisories, particularly for new or emerging contaminants
- ▶ Not likely to have an impact on legacy contaminants

Thank you

Dave McBride

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<http://www.doh.wa.gov/CommunityandEnvironment/Food/Fish.aspx>



Public Health – Always Working for a Safer and Healthier Washington



Mercury & PCBs: some of the complex issues associated with their regulation in surface waters

Policy Forum #4

March 28, 2013

Human Health Criteria and Implementation Tools
Rule-makings

Cheryl Niemi

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360-407-6440

This presentation is set up as follows:

1. WQ Assessment information – 303(d) listings, information needs, etc..
2. Mercury discussion
3. PCB discussion
4. ***Spokane River, PCB, and the Regional Toxics Task Force-*** presentation by Adriane Borges, WA Dept. of Ecology

Abbreviations frequently used in this presentation:

HHC = Human health-based criteria for surface waters

WQS = Surface Water Quality Standards (WAC 173-201A)

NTR = National Toxics Rule (40CFR131)

PBT = Chemical listed as a persistent, bioaccumulative and toxic in Washington

FTEC = Fish Tissue Equivalent Concentration (FTEC = BCF x HHC)

Special thanks to:

Holly Davies, ECY Hazardous Waste Program, for info on the Hg CAP and subsequent actions to reduce Hg.

Adam Oestreich, ECY Water Quality Program, for maps of impaired waters and waters with WDOH fish advisories.

Waterbody segments listed as impaired under CWA Sec. 303(d)

How are impairment listings for the “fishable and drinking water” use determined?

The information needed to make a determination of impairment is specified in:

Water Quality Policy 1-11: Chapter 1: Assessment of Water Quality for the Clean Water Act Sections 303(d) and 305(b) Integrated Report

Policy 1-11 and subsequent WQ assessments are developed using a public process.

Policy 1-11 contains two approaches to make a determination of impairment for HHC:

1. **Tissue** concentration exceeds FTEC (FTEC = BCF x criterion concentration)
 - Resident fin fish (fillet tissue samples (skin on or off)), whole shellfish tissue samples, and/or edible shellfish muscle samples
 - At least three single-fish samples or a single composite sample made up of at least three separate fish of the same species
2. **WDOH fish advisory**
 - If FA based on less than or equally protective risk assessment assumptions than the tissue approaches above, then segment is listed on Category 5 (303(d) list.)

All listings that are based on numeric criteria must be based on samples collected within the segment.

Reminder: A listing ≠ a fish advisory

WQ Assessment Categories

Only one category, Category 5, represents the 303(d)-listed waters.

WQ Assessment Category	Status	Impairment status
Category 1	Segment Meets Tested Criteria	Not known to be impaired
Category 2	Segment is a Waters of Concern	
Category 3	Segment Lacks Sufficient Data	
Category 4	Segment Impaired But Does Not Require A TMDL because:	Impaired
4a	Segment Has a TMDL Approved by EPA	
4b	Segment Has a Pollution Control Program	
4c	Segment Impaired by a Non-Pollutant	
Category 5	Segment is on 303(d) List	

Mercury (Hg)

Hg is a WA **PBT chemical** and a **non-carcinogen**

We'll talk about the following issues surrounding Hg:

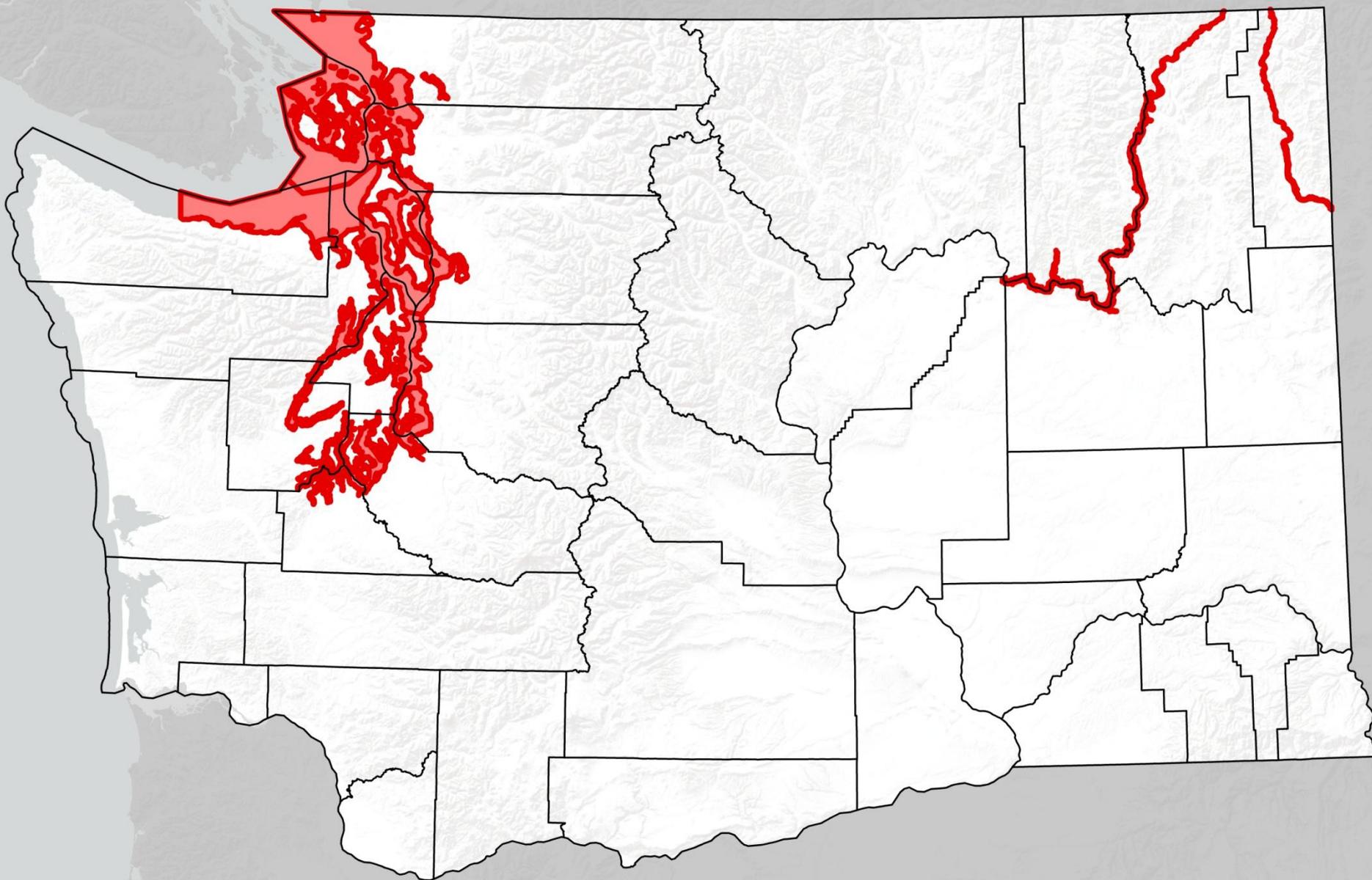
1. Current Category 5 (303(d)) listings
2. DOH fish advisories
3. Where is all the Hg coming from?
4. What actions can WA take?
5. What has WA done to respond to the Hg concern?

Mercury Category 5 listings

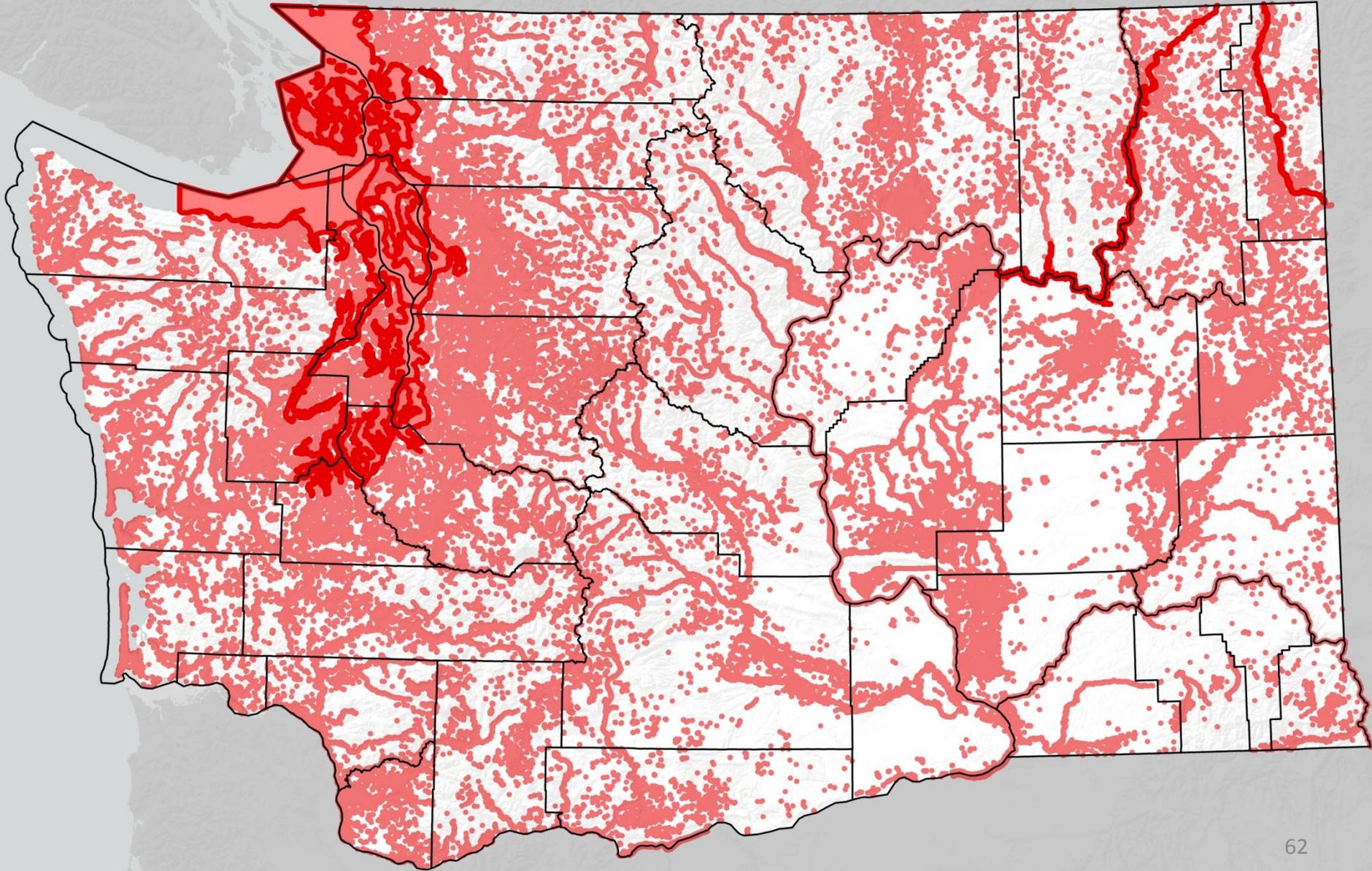
Category 5, represents the 303(d)-listed waters

Data type	Number of Category 5 listings for mercury
Tissue	16
Water	9 (aquatic life-based criteria)
WDOH fish advisories	0
Total for HHC	16

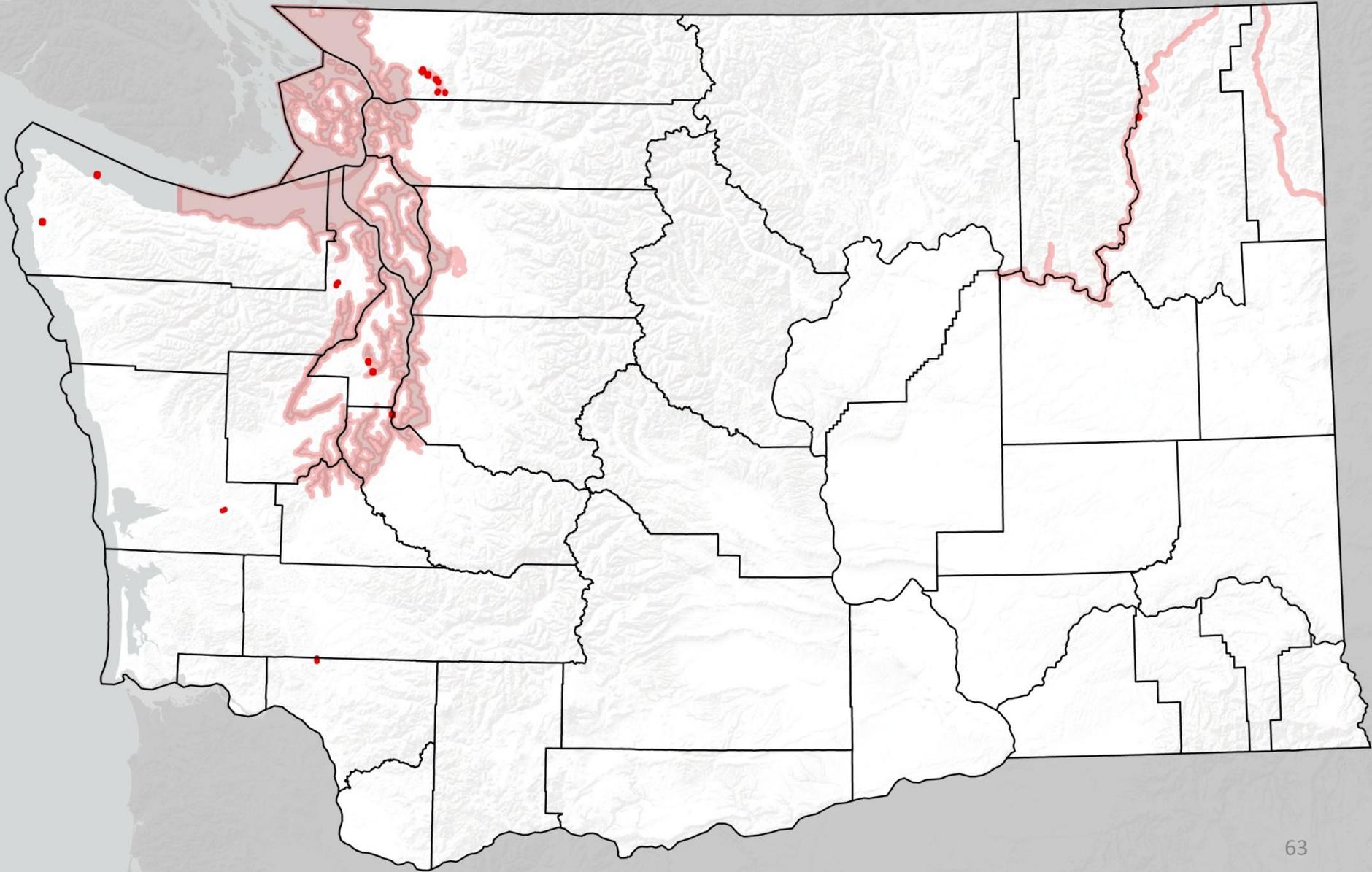
This map represents the Dept. of Health waterbody specific Fish Consumption Advisories



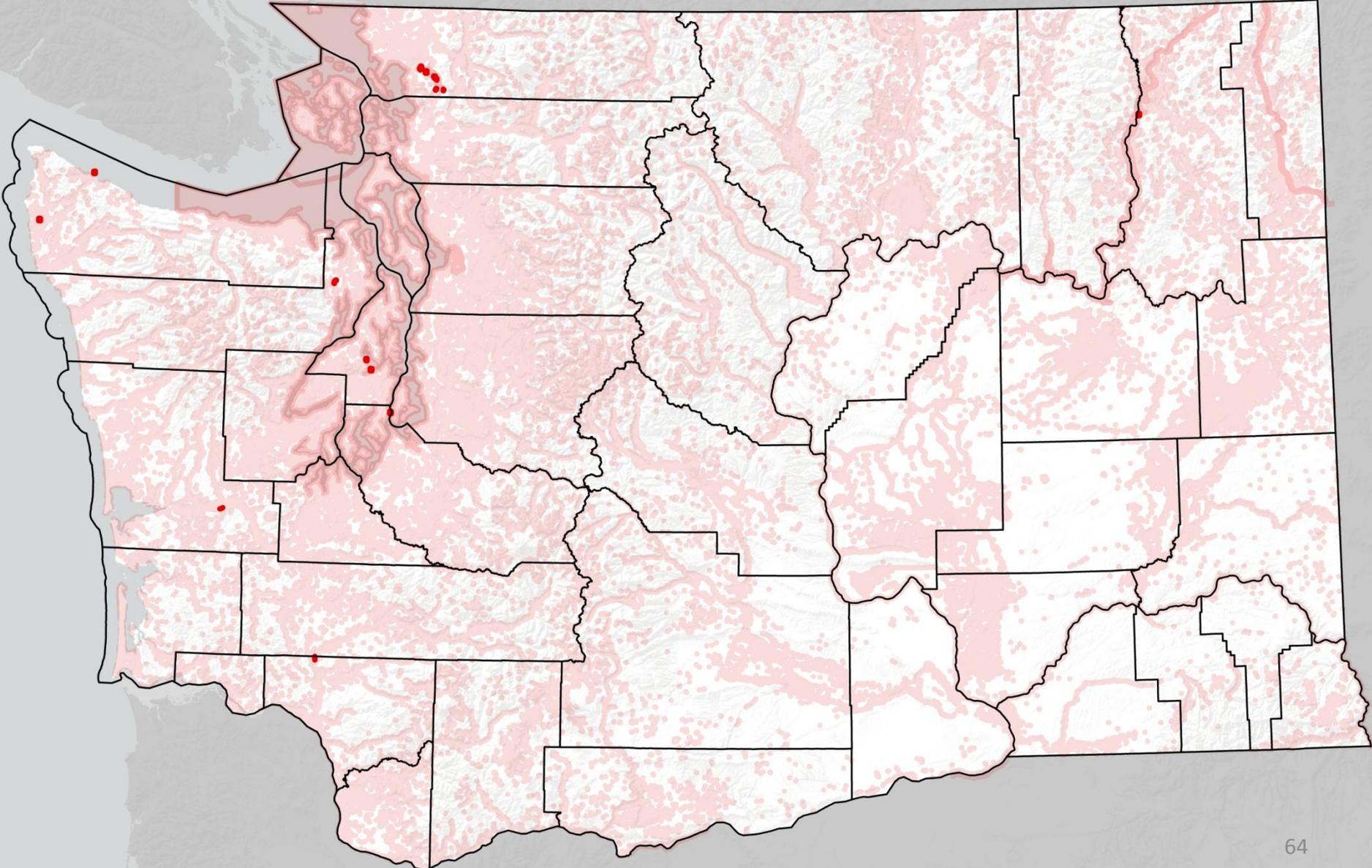
This map represents the Dept. of Health Fish Consumption Advisories for Mercury: Includes individual waterbody advisories and a representation of Statewide water advisories.



This map represents the **16 tissue-based Category 5 Listings** for Mercury from the 2012 Assessment and the Dept. of Health waterbody-specific Fish Consumption Advisories for Mercury



Map of the **16** Category 5, (303d) tissue-based Listings for Mercury overlying a representation of the statewide Dept. of Health Fish Consumption Advisories and the waterbody-specific Advisories for Mercury.



EPA's new recommended methylmercury criterion

- A methylmercury **tissue** criterion will replace the current total mercury water criteria.
- Will be challenging to implement in permits – will need to derive a “total mercury” effluent limit from a methylmercury tissue criterion
- EPA has developed guidance for implementation
- This criterion will result in added listings

Where is all the Hg coming from?

“Mercury (Hg) is released to the environment from both **natural** and **human-caused** sources. Although it is released to air, water, and land, most research focuses on mercury releases to the atmosphere.”

“Winds and weather systems entering Washington carry mercury associated with the global cycle. Wet deposition (in rain and other precipitation) and dry deposition (in dust and aerosols) transport mercury from **global and local atmospheric sources** to land, water, and vegetation.”

Quotes from *Washington State Mercury Chemical Action Plan*, January 2003, Department of Ecology Publication No. 03-03-001, Department of Health Publication No. 333-051, found at: <https://fortress.wa.gov/ecy/publications/publications/0303001.pdf>

What actions can Washington state take?

Address global sources

- Work on the national level (e.g., ECOS/ASTSWMO “Quicksilver Caucus”) to develop proposals for long-term mercury management infrastructure

In-state actions at many levels...

- Mercury Chemical Action Plan

What has WA done to respond to the Hg concern?

Mercury Chemical Action Plan (WDOE and WDOH publication)

Hg CAP Recommendations:

- Install amalgam separators in dental offices
- Safely dispose of mercury waste in households and small businesses
- Replace medical equipment containing mercury and improve waste separation in hospitals
- Reduce coal power emissions
- Provide technical and engineering assistance to manufacturers, oil refiners, wastewater treatment plants and waste recycling and disposal facilities

Washington State Mercury Chemical Action Plan, January 2003, Department of Ecology Publication No. 03-03-001, Department of Health Publication No. 333-051, found at: <https://fortress.wa.gov/ecy/publications/publications/0303001.pdf>

Actions Since the 2003 Mercury CAP: In-state controls for many media (beyond surface water...)

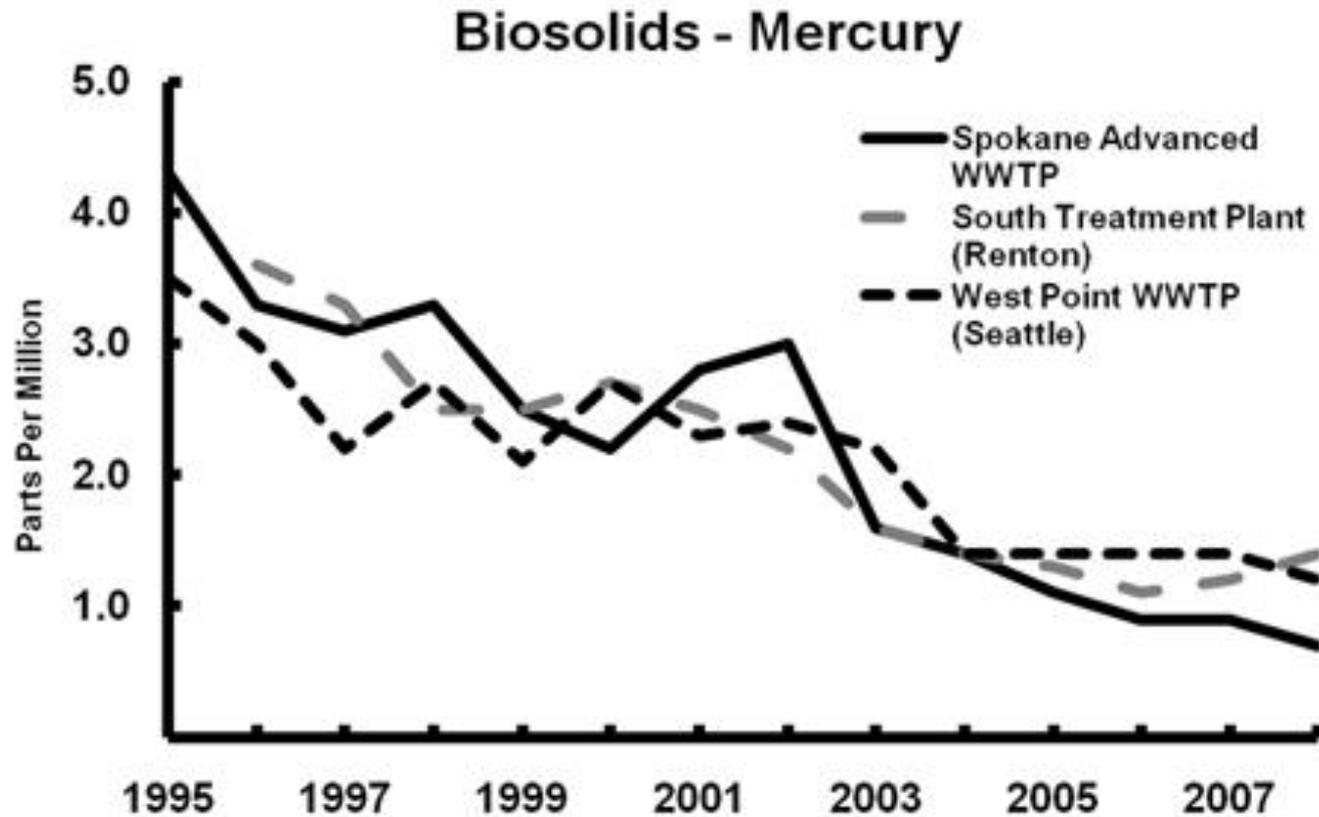
Legislation

- 2003 Mercury Education and Reduction Act (RCW 70.95M) **banned some uses**- thermometers, novelties, etc.
- 2010 Mercury lamp **recycling** and product stewardship
- 2011 Planned **closure** of coal fired power plant

State agency actions

- **Collection and proper disposal** of more than 14,000 pounds of mercury
- **Lowered the detection limit** for mercury in water discharge permits
- An agreement with dentists to **collect mercury amalgam waste**
- An agreement with Washington hospitals to **eliminate mercury products and waste**

Example of reductions since CAP: Hg concentrations in sewage sludge



“The amount of mercury measured in biosolids has significantly decreased since 2000. The second largest reduction occurred in 2003 - 2004, after mercury-reduction efforts began. These efforts include the introduction and use of **amalgam separators in dental offices**, as an alternative to sending the material down the drain. **The average concentration of mercury in biosolids has decreased by 50 to 70 percent since measurements began.** This trend is also apparent at the other facilities being tracked.”

This concludes mercury information

Polychlorinated Biphenyls (PCBs) - What are they?

- Mixtures of up to 209 individual chlorinated compounds (known as congeners).
- There are no known natural sources of PCBs.
- Either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.
- Used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators.
- The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects.
- Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

Some current sources of PCBs will be discussed in the later presentation by Adrian Borges

What happens to PCBs in the environment?

- Do not readily break down in the environment and thus may remain there for very long periods of time.
- Can travel long distances in the air and be deposited in areas far away from where they were released.
- In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.
- PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food.
- PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

Polychlorinated Biphenyls (PCBs)

PCB group is a WA **PBT chemical group** and the total PCBs HHC are based on **carcinogenic effects**

We'll talk about the following issues surrounding PCBs:

1. Current impaired waters listings
2. DOH fish advisories – based on non-cancer effects
3. Where are all the PCBs coming from?

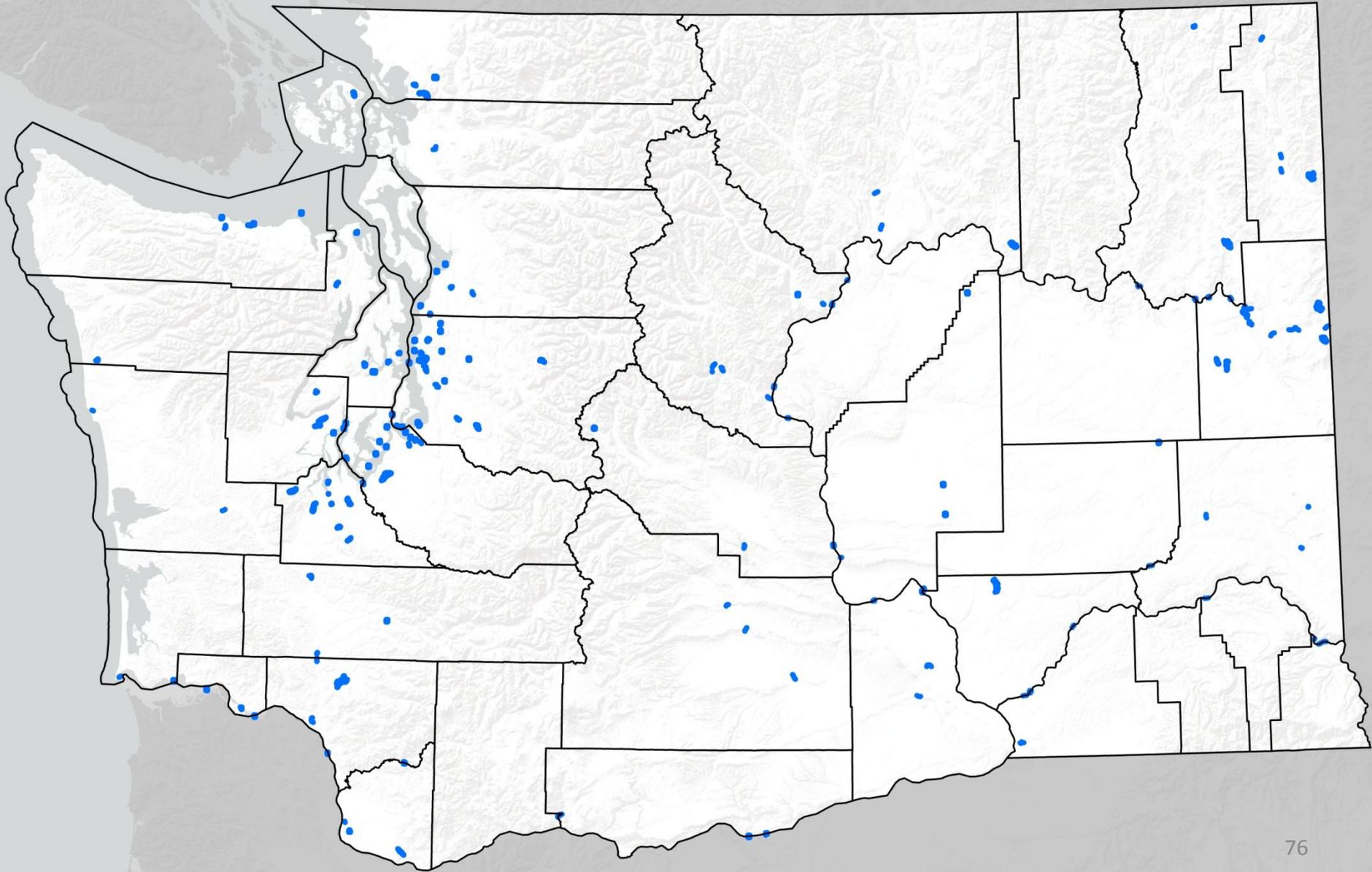
PCBs – numbers of impaired waters

Category 5: Water is on 303(d) List

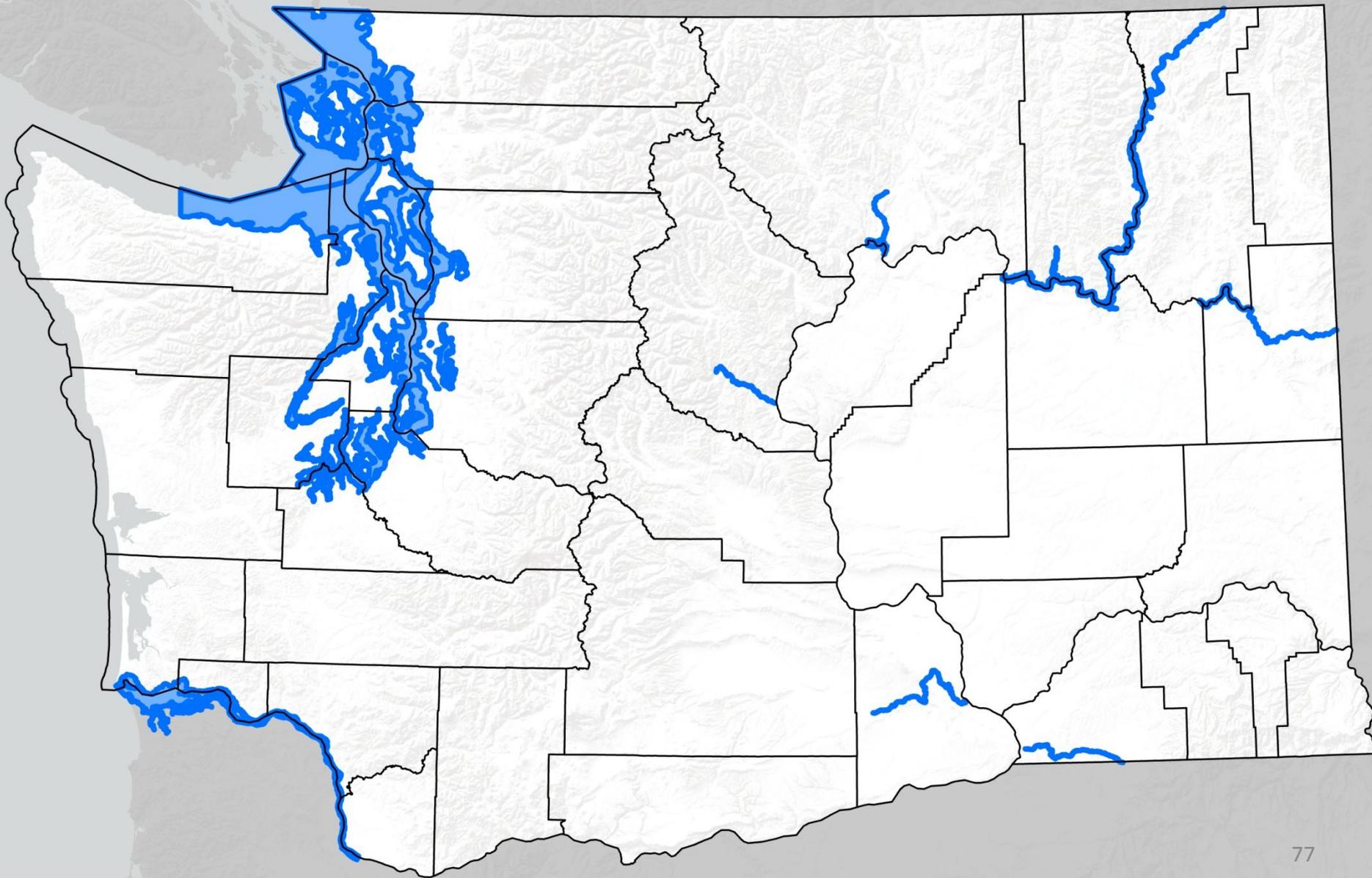
Category 4a: Water Impaired But Does Not Require A TMDL because Segment Has a TMDL Approved by EPA

2012 WQ Assessment	Category 5 listings
Data type	
Tissue	158
Water (AQL)	0
WDOH fish advisories	0
Total	158
Data Type	Category 4a listings
Tissue	10
Grand total impaired listings	168

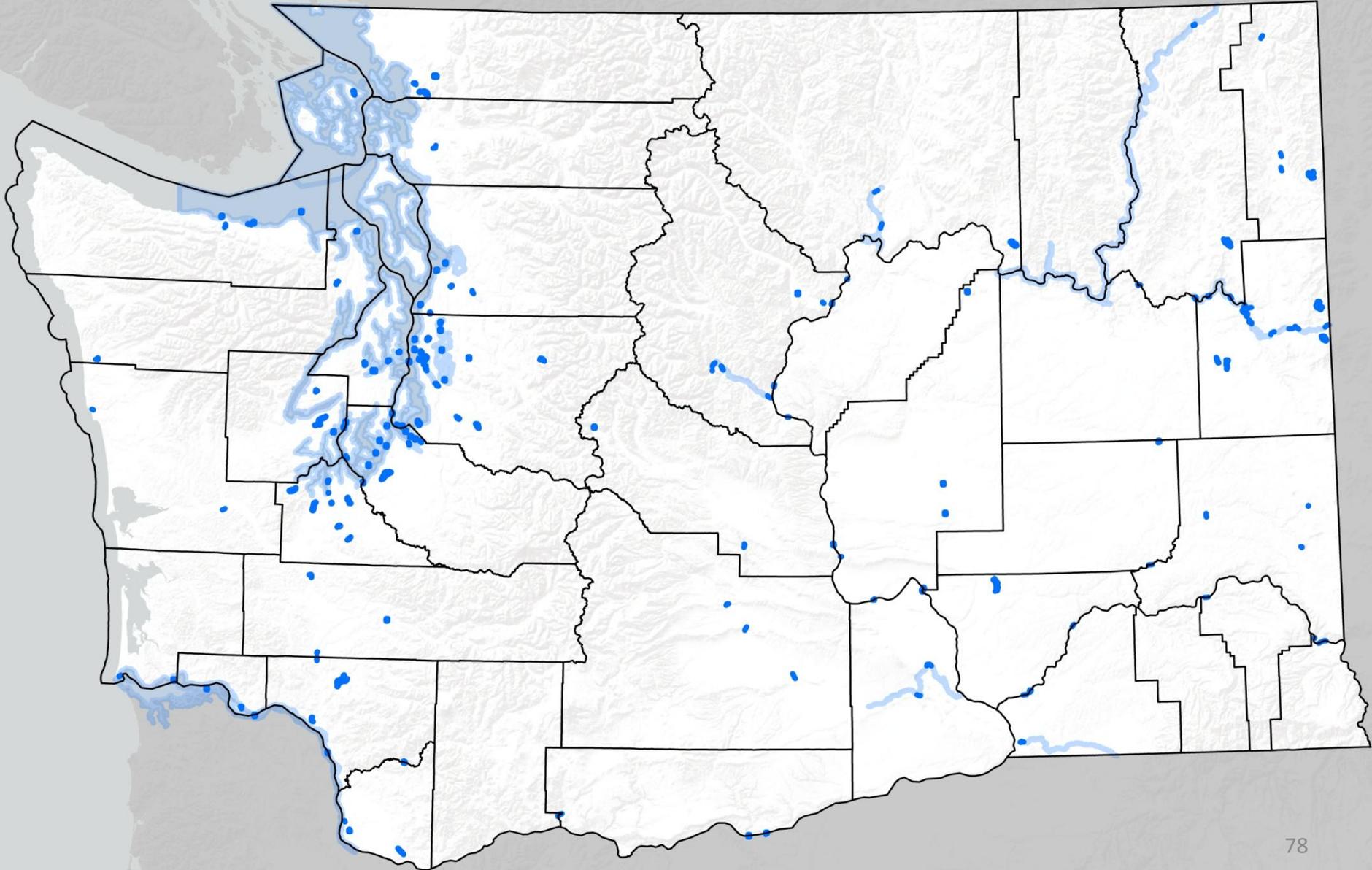
Map of all **168** tissue-based Impaired waterbody Listings for PCBs from the 2012 Assessment. (There are no water-based 303d listings)



Map of the Dept. of Heath waterbody-specific
Fish Consumption Advisories for PCBs.



Map of all **168** Impaired Waterbody Listings for PCBs (all tissue-based) overlying the Dept. of Heath waterbody-specific Fish Consumption Advisories for PCBs



PCB FTEC Example

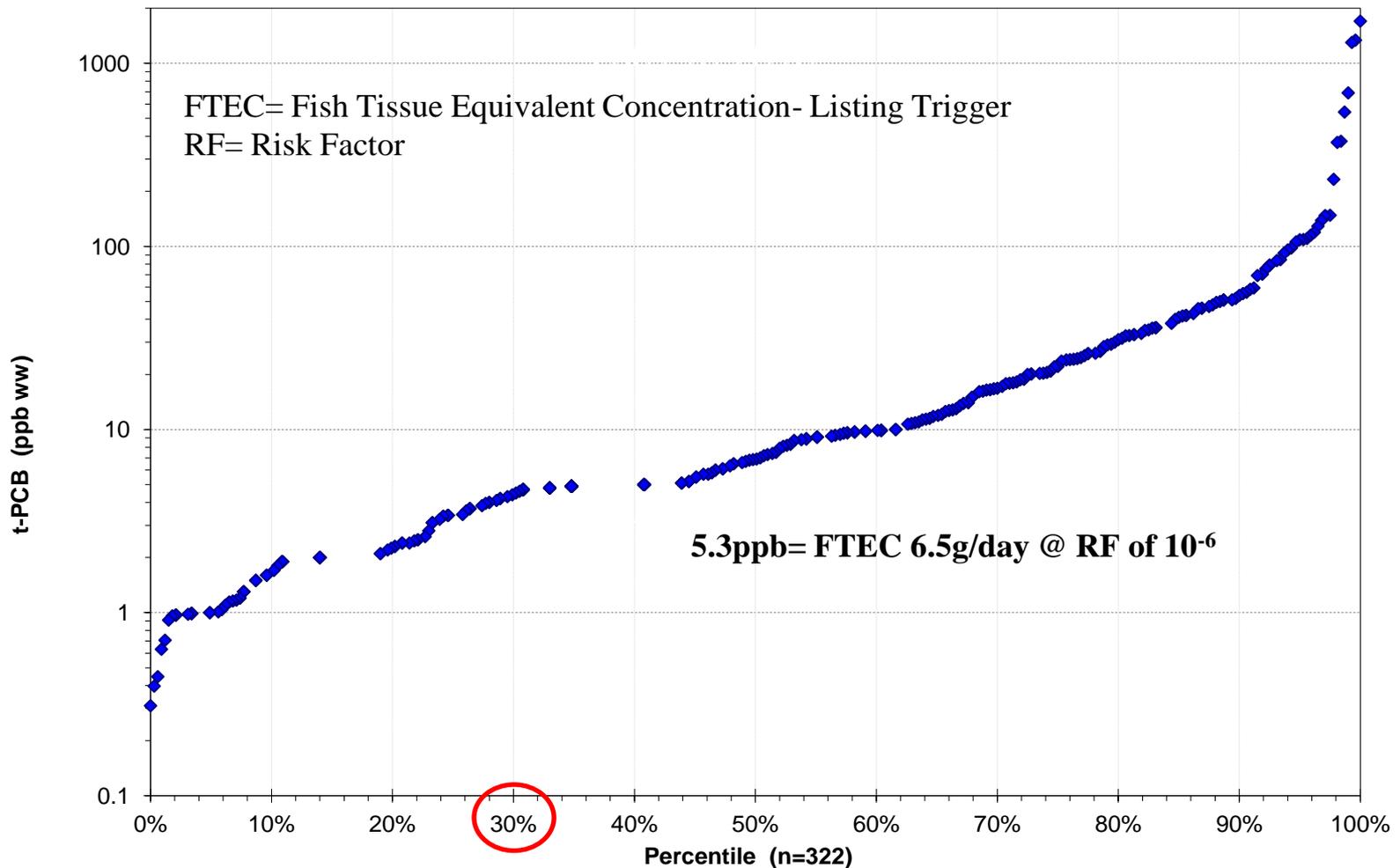
Human Health Criterion for total PCBs (EPA National Toxics Rule – 1999 revision)

170 ppq (parts per quadrillion) in water

- 6.5 grams per day consumption rate
- Risk Factor of 10^{-6}
- Translates to 5.3 ppb (parts per billion) for fish tissue equivalent concentration

From: Norton, *Human Health Criteria Policy Forum*, February 8th, 2013.

Total PCBs in All **Freshwater** Fish Statewide

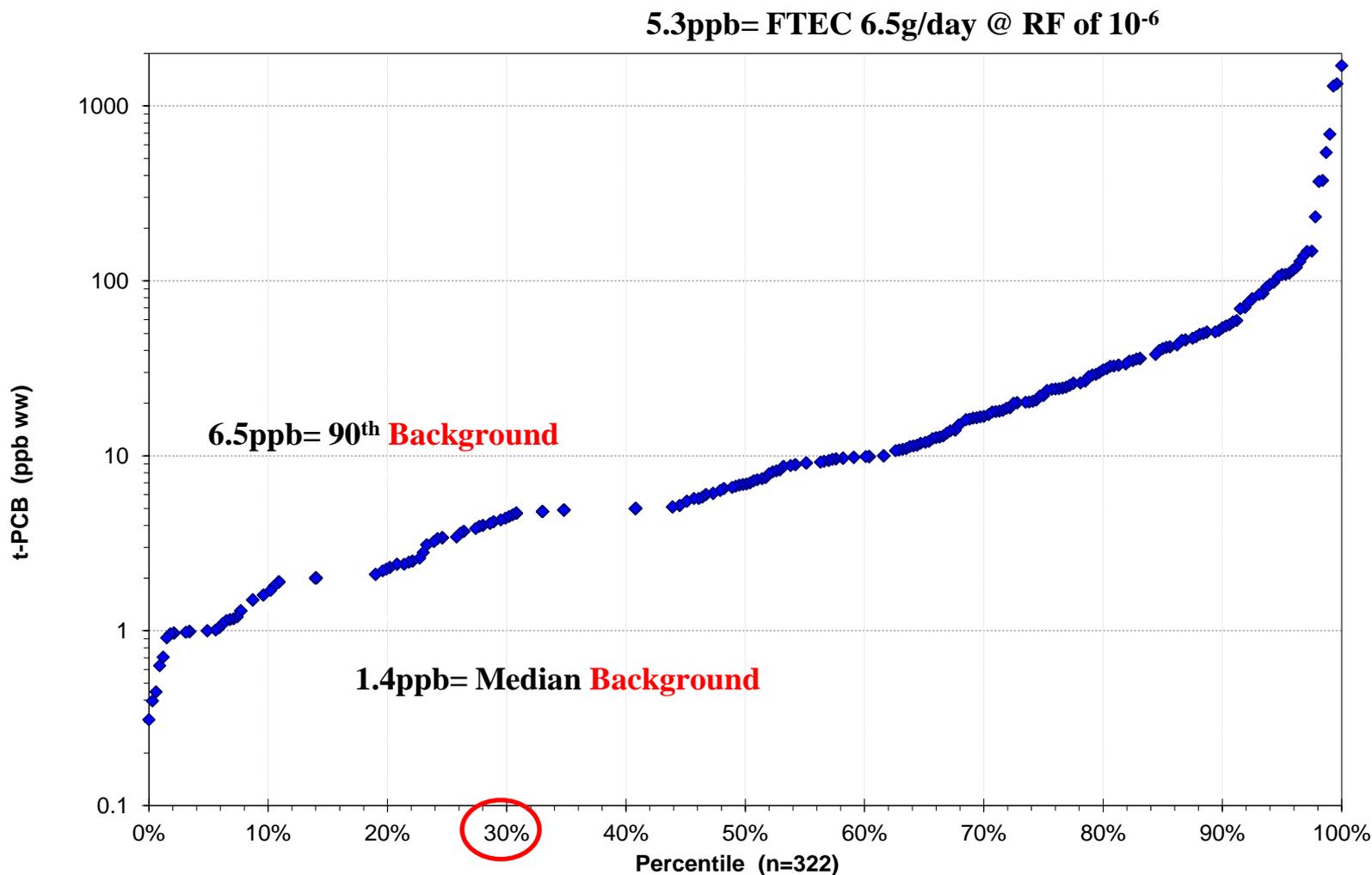


From: Norton, *Human Health Criteria Policy Forum*, February 8th, 2013.

Total PCBs in All Freshwater Fish Statewide

Note: emphasis here is on “background” data

Background – “Only known or likely significant source of contaminants is atmospheric deposition” (primarily sampled lakes)



Where do PCBs come from?

Global sources - atmospheric deposition (e.g. “grasshopper effect”)

Local sources – e.g., contaminated sites

Many controls across programs to reduce and regulate PCBs (e.g., CWA controls for wastewater dischargers)

Ecology PBT Chemical Action Plan:

Draft PCB Chemical Action Plan in early stages of development:

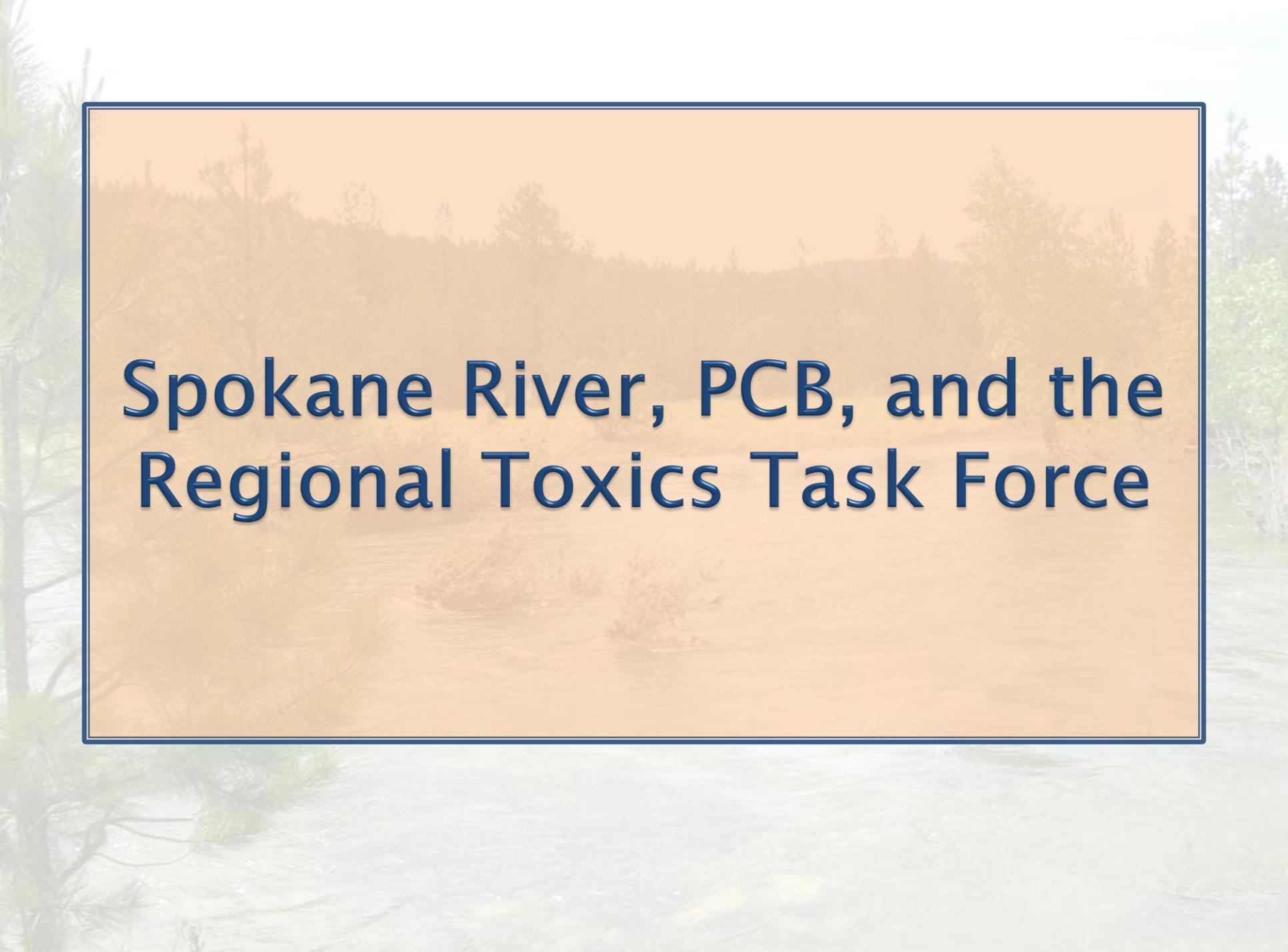
<http://www.ecy.wa.gov/programs/swfa/pbt/caps.html>.

More information on source controls in Washington:

Spokane River, PCBs, and the Regional Toxics Task Force -
presentation by Adriane Borges, WA Dept. of Ecology

Link to many EPA PCB control programs and other information: <http://www.epa.gov/epawaste/hazard/tsd/pcbs/index.htm>





Spokane River, PCB, and the Regional Toxics Task Force

A Daunting Task?

Before the “Industrial Revolution” environmental clean up was fairly simple.



Better Things for Better Living through Chemistry

PROTECT YOUR CHILDREN
Against Disease-Carrying Insects!

TRIMZ DDT
CHILDREN'S ROOM
WALLPAPER and Ceiling Paper

KILLS FLIES, MOSQUITOS, ANTS
... as well as moths, bedbugs, silverfish and other household pests after contact!

MEDICAL SCIENCE KNOWS many common insects breed in filth, live in filth and carry disease. Science also recognizes the dangers that are present when these disease-carrying insects invade the home. Actual tests have proved that one fly can carry as many as 6,600,000 bacteria! Imagine the health hazard—especially to children—from flies seriously suspected of transmitting such diseases as scarlet fever, measles, typhoid, diarrhea... even dread polio! Some types of mosquitos carry malaria and yellow fever. And any mosquito bite is painful and easily infected when scratched.

NON-HAZARDOUS to children or adults, to pets or clothes. Certified to be absolutely safe for home use. Tested and commended by *Parents Magazine*.

GUARANTEED effective against disease-carrying insects for 1 year. Actual tests have proven the insect-killing properties still effective after 2 years of use.

NO SPRAYS! NO LIQUIDS! NO POWDERS! So convenient, so safe because the DDT is fixed to the paper. It can't rub off!

BEAUTIFUL "Jack and Jill" or "Disney Favorites"—gay new patterns that protect as they beautify a child's room.

DDT CEILING PAPERS, TOO! Extra protection for your children's rooms—for every other room in the house. Choice of two tints.

TESTED AND COMMENDED BY PARENTS MAGAZINE CONSUMER SERVICE BUREAU

READY-PASTED! Just Dip in Water and Hang!
Anyone can put Trimz Wallpaper up without help or previous experience. Millions have done it—proved it's quick, clean, easy! Nothing to get ready—no tools, paste or muss. Just cut strips to fit, dip in water and hang. It's dry in 30 minutes! Guaranteed to stick—guaranteed to please or money back. And so **INEXPENSIVE!** You can protect your child for \$8 to \$12—depending on size of room.

Trimz DDT Children's Room Wallpaper, Trimz DDT Cedar Closet Wallpaper now available at Department, Chain, Hardware, Paint, and Wallpaper stores everywhere.

Many beautiful new patterns also available in regular Trimz Ready-Pasted Wallpaper at \$1.98, \$2.49, \$2.99 per box.

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© 1947, TRIMZ CO., INC.

Organic chemistry came of age in the early 20th century.

Many of today's "legacy toxics" were marketed as economic solutions to other problems:

- Insecticides: DDT (DDE)
- Agent Orange (2,3,7,8-TCDD)
- Flame resistance: PCB, PBDE

TSCA Inventory: > 80,000 chemicals

PCBs: The Early Years



Grand Coulee core and coils at destination courtesy of General Electric Company
[http://www.ieeeeghn.org/wiki/index.php/File:Blalock_-_page_102_\(bot\).jpg](http://www.ieeeeghn.org/wiki/index.php/File:Blalock_-_page_102_(bot).jpg)

Polychlorinated Biphenyls

1881

PCB first synthesized

1927

First commercial manufacture

1935

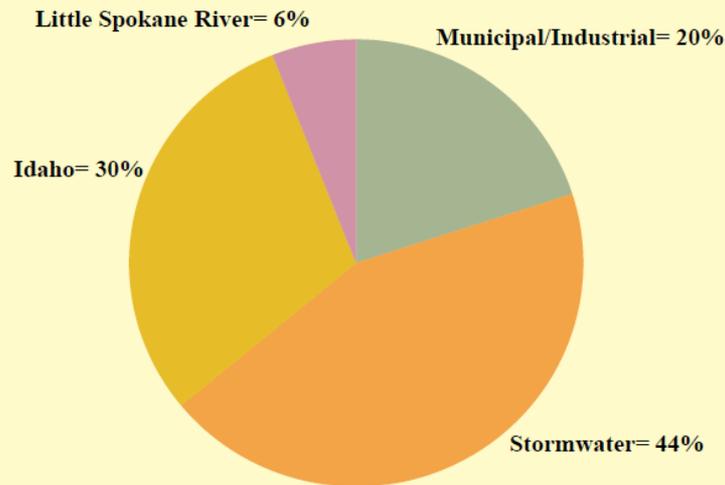
Monsanto increased production and distribution of the “**perfect industrial chemical**”

1970

85 million pounds of PCB produced

PCB in the Spokane River

Distribution of Measured PCB Sources
2003-2004



52

Norton, *Human Health Criteria Policy Forum*, February 8th, 2013.

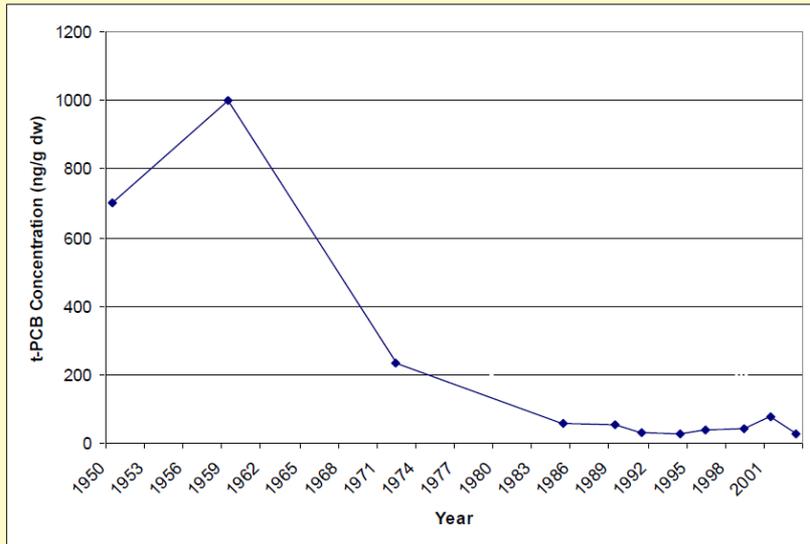
Water Quality Standard for PCB

- Fish consumption advisories since 2002
- The Spokane Tribe's 0.00337 ng/L is the **strictest water quality standard in the state**
- **98% reduction needed**
- Highest levels of PCB and PDBe in state
- **15% of "background" samples statewide exceed the state WQS of 0.17 ng/L**

What is a Part per Quadrillion?

- 1 part in 1,000,000,000,000,000
- Two 8.5 x 11 inch pieces of paper in Washington State
- 1 drop of water in a cube 102 stories tall
- About 10 million PCB molecules in a breath of air
- 2.5 minutes out of the age of the Earth
- **Not very much and not easy to measure!**

The Good News



Total PCBs in Age Dated Sediment Core (2003)

- Steep declines from 1960s through mid-1980s
- Approximately 50% decline in 20 years (1980-2000)

Norton, *Human Health Criteria Policy Forum*, February 8th, 2013.

There is good news

- **Substantial PCB reductions** have been made since 1979
- More action is needed to achieve the water quality standard.

Looking at the big picture can be overwhelming but . . .

Collaboration provides a leadership opportunity

Spokane River Regional Toxics Task Force

The Spokane River Regional Toxics Task Force

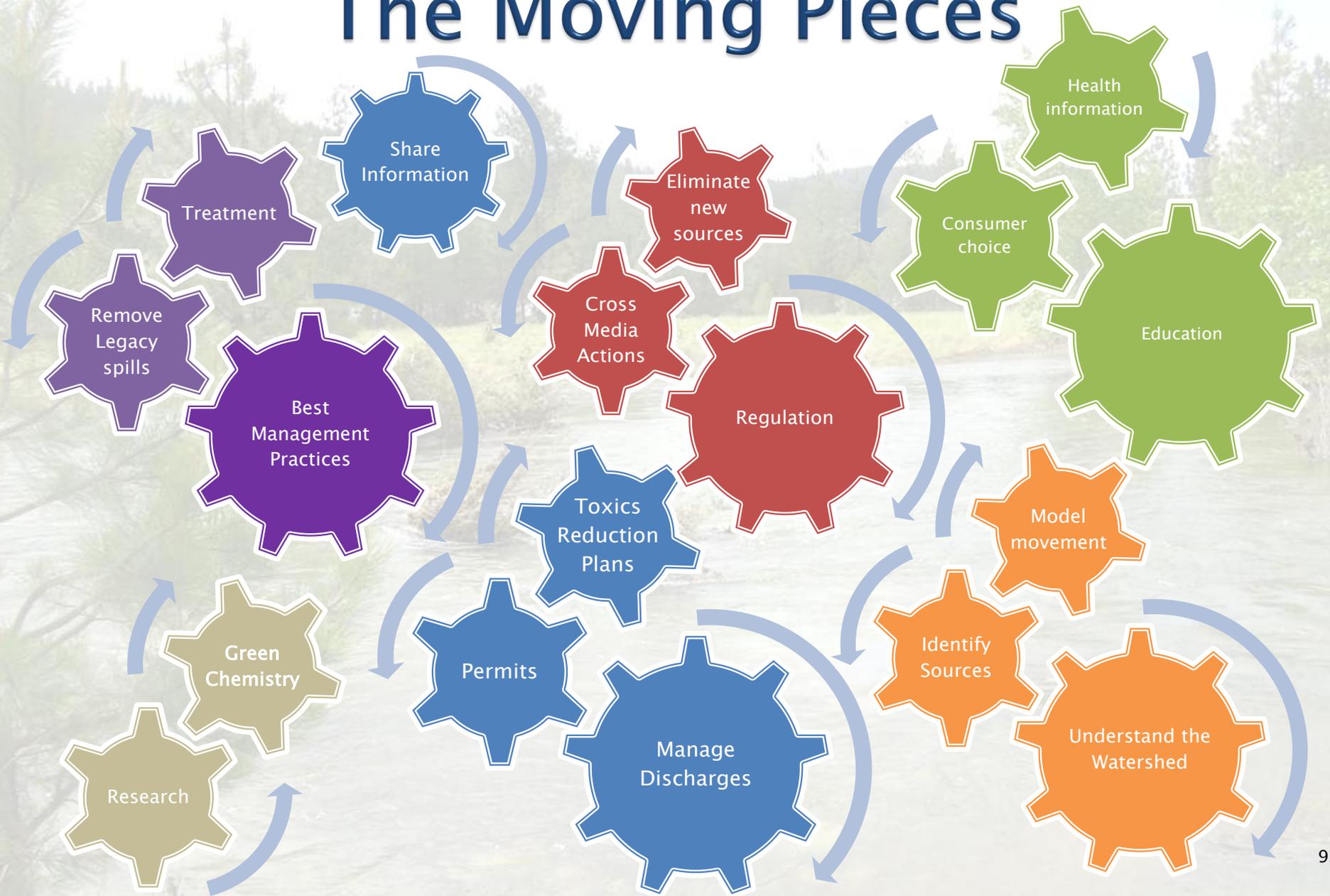
Formed in 2012 under a **Memorandum of Agreement**

- Diversity in membership and participation
 - Permittees (municipal, industrial)
 - Environmental groups
 - Local, state, federal agencies and Sovereigns
- Governance
 - Voting members
 - Advisors
 - Consensus based decisions

Tasked with reducing toxics in the Spokane River by

- Characterizing the sources
- Implementing appropriate actions
- Making measurable progress

The Moving Pieces



How Do We Reduce PCBs?

In a nutshell, we need to address all of these aspects:

- Don't make it
- Don't use it
- Use less of it
- Manage it properly
- Dispose of it properly
- End of pipe treatment

Specific Examples follow

Don't Make It

- ▶ EPA regulations still allow PCBs to be produced!
 - Inadvertent contaminants in pigments
 - Present in printed materials, paint colors, clothing
 - Found in yellow, orange, red, green, and blue pigments
 - **Can reach the environment through normal use**
 - Transported globally
 - Estimated 1.5 million pounds produced annually from yellow pigment production

Don't Use It/Use Less

Education, Labeling, Consumer Choice, and Market Incentives

Up to 50 ppm

- Pigments, inks, dyes
- Consumer products
- Paint pigments

Other allowable sources

- Motor oil (up to 2 ppm)
- Detergent bars (up to 5 ppm)
- Fish and animal feed (up to 2 ppm)
- Food wrappers (up to 10 ppm)
- Human food (0.2–3 ppm)

Some people will change what they purchase and use if they perceive it will lead to achieving the end goal.

Manage/Dispose of It Properly

- Follow the rules for PCB-containing equipment
- Develop and Implement Best Management Practices
- Identify legacy spills and remediate
- Work with small business to prevent releases
- Eliminate regulatory program conflicts and barriers

End of Pipe Treatment

Required by permittees under the Clean Water Act if the water quality standards are not met

- At the cutting edge of the technology
- More information is needed:
 - PCB is not produced in Spokane, but is an environmental contaminant
 - End of pipe treatment may not fully address the situation
 - Costs for end of pipe treatment borne by the communities and local industries

The Work Begins

Plan for the long term outcome: a fishable and swimmable Spokane River

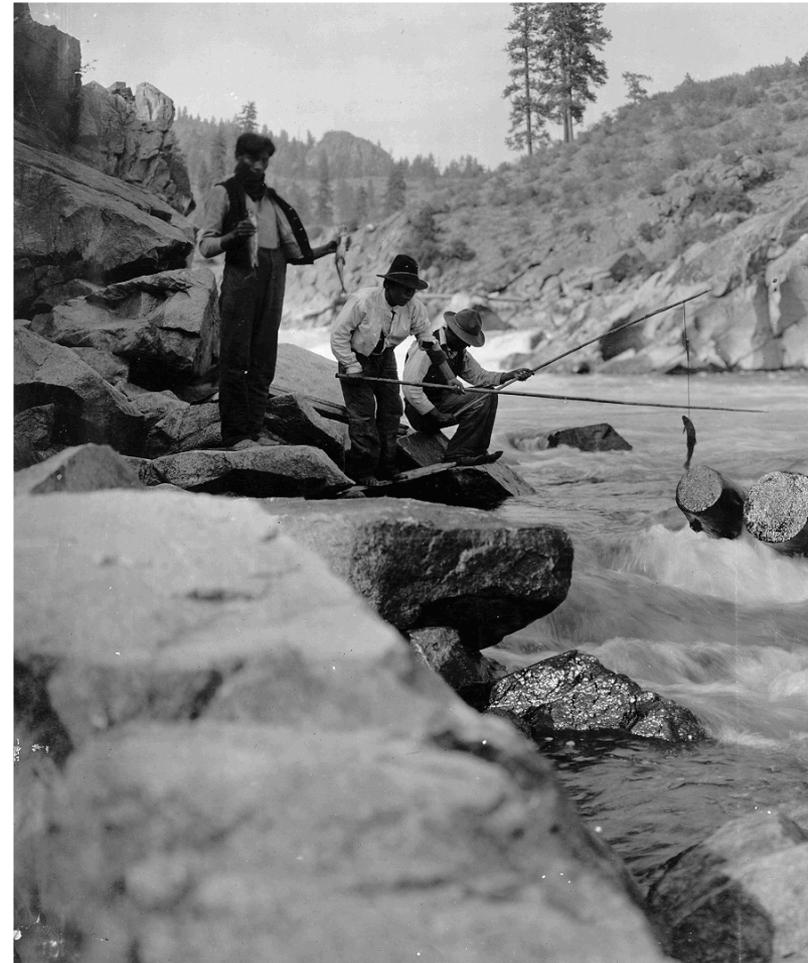
*The problem was **not created overnight** nor will it be solved in one night.*

Focus on the specific problem: PCB source reduction activities

*The best way to effect lasting results is to make **small changes** and **be consistent** over time.*

Trade “**end of pipe**” battles for “**watershed successes**”

*Our understanding of PCB movement in the watershed implies a **cross-program approach**.*



For More Information

Spokane River Regional Toxics Task Force

www.srrttf.org

Washington State Department of Ecology

Adriane Borgias

Spokane River Water Quality Lead

(509) 329-3551

ABOR461@ecy.wa.gov

Overview for Hg and PCBs

- Fish advisories: Public health concerns for non-cancer effects
- 303(d) listings: Concern for protection of designated uses
- Many local controls yet unknown
- There are sources out of WA's ability to control (atmospheric deposition from other states and countries)
- Sources span many media (e.g., products, solid waste and wastewater, hazardous waste, contaminated sites, atmospheric deposition, cycling in the environment.)

These two chemicals will be two of the most challenging chemicals to address in Washington surface water.

Questions/Comments/Discussion



Update on Implementation Tools

Policy Forum #4

March 28, 2013

Human Health Criteria and Implementation
Tools Rule-makings

Cheryl Niemi

cnie461@ecy.wa.gov

360-407-6440

Still looking at variances, compliance schedules, and most likely intake credits

Compliance schedules – intent to comply with legislative requirements to pursue adoption of 20-year compliance schedules

Intake credits – reviewing Oregon language and approach

Variances

- Discharge variances (most common approach)
- Waterbody variances (“stretches of waters” in current standards)

Variations

Will be working to define what these proposed tools would look like, and will ask EPA if it can give WA some assurance of whether or not it could approve them for CWA use.

Want to have this resolved, as much as possible, before the end of the Policy Forums (to help address interrelationship between economics and risk management decisions that are part of HHC development.)

Time frame	Discharger variations	Waterbody variations
5-year	Widely used across states, already allowed in WA WQS	Not widely used, if at all, allowed in WA WQS. EPA approval ?
Longer-term	EPA approval ?	EPA approval ?

Questions/Comments/Discussion

Thank you!