Water Quality Policy Forum #3

February 8, 2013

Overview of the Policy Forum

- Design of the timing and content for Forums
- The subject matter is meant to build upon itself.
- Previous meetings focused on:
  * The Human health Criteria Equation.
  * The scope and influence of the Clean Water Act.
  * Describing the scenarios used each meeting to illustrate potential effects of new rule language.

Updates on:

- Fish Consumption Rate Technical Support Document
- SMS revisions 173-204 WAC

February 8, 2013

Martha Hankins
Toxics Cleanup Program

Fish Consumption Rates

- Technical Support Document final draft published January 2013
- Final addressed concern from public comments received in Fall 2012
- Intended to support ongoing dialog
  - Site specific cleanup determinations
  - Policy discussions for water quality issues
- Statistical calculation report due March

FCR Technical Support Document

https://fortress.wa.gov/ecy/publications/summarypages/1209058.html

Publication Summary

TITLE	**Fish Consumption Rates Technical Support Document - Version 2.0 FINAL**

Publication number	Date Published	Date Revised
12-09-058	August 2012	January 2013

VIEW NOW:

Acrobat PDF format (Number of pages: 194) (Publication Size: 2717KB)
Note: VERSION 2.0 FINAL (January 2013)

Acrobat PDF format (Number of pages: 192) (Publication Size: 2MB)
Note: VERSION 2.0 PUBLIC REVIEW DRAFT (August 27, 2012)

Attachment A - Supplemental Information to Support the Fish Consumption Rates Technical Support Document (5 technical issue papers compiled July 20, 2012) (*titles of papers below)
(210 pages) (3MB)

Attachment B - Information Regarding the Release of Raw Data (August 2012)
(7 pages) (326KB)

Attachment C - Statistical Analysis of National and Washington State Fish Consumption Data - Draft (September 18, 2012)
(53 pages) (1MB)

Attachment D - Review of Polissar (et al) by Dr. Casey Olives, University of Washington, Dept. of Biostatistics (September 25, 2012)
(7 pages) (433KB)

Attachment E - Director of Ecology Transmittal Letters (July 2012-Jan 2013)
(10 pages) (1MB)

Attachment F - Summary of Changes Made from Version 2.0 Public Review Draft to Version 2.0 Final (January 11, 2013)

RELATED PUBLICATIONS	Fish Consumption Rates Technical Support Document - [Version 1.0] Responses to Public Comments on Fish Consumption Rate Issues

Finalizing the TSD

Issues & Concerns

- Policy and context
- Terminology
- Per capita vs consumer only
- Risk levels
- Population being protected
- Data gaps

Summary of Changes

- Minor organizational changes
- Technical corrections
- Clarifications
- Enhanced discussion of uncertainty

Sediment Management Standards

- Rule language was proposed Fall 2012
- Public comment period ended October 29, 2012
- Ecology made modifications based on comments
  - Final EIS
  - Final CBA, LBA, SBEIS
  - Response to Comments
- Adopt rule by March 2013
- Effective date September 1, 2013

SMS Rule Human Health

- No default fish consumption rate
- Risk to human health evaluated based on a tribal exposure scenario
- Details will be in the updated Sediment Cleanup Users Manual (SCUM)

Useful links & Contact Info

- Reducing Toxics in Fish, Sediments and Water
  http://www.ecy.wa.gov/toxics/fish.html

- SMS Rule Making Info
  http://www.ecy.wa.gov/programs/tcp/regs/2011-SMS/2011-SMS-hp.html

- Proposed SMS Rule Amendments
  http://www.ecy.wa.gov/programs/tcp/regs/SMS/2012/proposedRule.html

  - Martha Hankins
    martha.hankins@ecy.wa.gov 360.407.6864

Toxics Reduction Strategy Work Group White Paper

Presentation to the Water Quality Policy Forum

February 8, 2013

Carol Kraege

TRS Problem Statement

- Avoidable exposures to toxic chemical are common
- Current system is doesn't always work well to address distributed sources
- Toxics in products are often unregulated or are regulated unevenly
- Incentives to design toxics out of products or manufacturing processes are weak
- Information on toxicity of many chemicals is lacking
- Federal law is outdated and deficient

TRS Principles

- Shared responsibility
- Prevention
- Set priorities
- Chemical safety
- Chemical information
- Disclosure
- Account for all costs
- Effective laws and regulations

Recommendations

1. Washington should establish a policy that safer alternatives are better
2. Ecology should work with partners to develop a more comprehensive system for establishing priorities
3. Ecology should continue to take actions to reduce releases and exposures to priority chemicals that are already identified and should add endocrine disrupting chemicals to its priorities

Recommendations

4. Washington should become a national leader in green chemistry
5. Washington should establish targeted education campaigns for priority toxics
6. Washington should evaluate a voluntary, simple, positive label
7. The Legislature should study whether and how the producers, manufacturers and retailers should be responsible for harm caused by toxics on products

Recommendations

8. The Legislature should study the feasibility and effectiveness of a tax on priority products
9. Ecology should consider the dilemma of distributed sources in developing tools to protect water quality
10. Dischargers should take an active role in promoting efforts to reduce distributed sources
11. Ecology should have authority to ban priority chemicals
12. Washington should independently inventory and evaluate the state's toxic reduction efforts

Links

Toxics Reduction Strategy Web page:

http://www.ecy.wa.gov/toxics/policy_trs.htm

White Paper:

http://www.ecy.wa.gov/toxics/docs/trs_ToxicsPolicyReformWA.pdf

An Assessment of the Chlorinated Pesticide Background in Washington State Freshwater Fish and Implications for 303(d) Listings

This document provides context for:

- Background levels of toxic pollutants that drive 303(d) listings for human health criteria
- Fish tissue chemical concentrations (FTEC) used as thresholds for 303(d) listings
- The ability for dischargers to meet current and potential human health criteria concentrations for some pollutants

Assessment of Chlorinated Pesticides and PCBs in Washington Fish

Human Health Criteria Policy Forum
February 8th 2013
Dale Norton
Washington State Department of Ecology
Environmental Assessment Program
Olympia, WA.

DEPARTMENT OF ECOLOGY
State of Washington

Overview

- Clean Water Act 303(d) list
- Fish Tissue Equivalent Concentration (FTEC)- threshold for 303(d) listing trigger
- Background levels in freshwater fish
- Chlorinated Pesticide and PCB assessments

  Source control examples and trends in fish

  Yakima and Spokane Rivers

303 (d) Listing Categories

- Water quality assessment results are placed into five different categories (one with three subcategories).
- All will be submitted to EPA and the public, but only the 303(d) list requires EPA approval

Category 1: Meets Tested Standards	**Not impaired, or not known to be impaired**	**No TMDL required**
Category 2: Waters of Concern		
Category 3: No Data		
Category 4 **a: Has a TMDL** **b: Has a Pollution Control Program** **c: Impaired by a Nonpollutant**	**Impaired**	
Category 5: The 303(d) List		**TMDL required**

Current Washington 303(d) listings

Listing Triggers ppb, wet

Chemical	Fish Tissue Equivalent Concentration
Dioxin	0.00007
HCH, alpha	0.51
Aldrin	0.61
Dieldrin	0.65
Heptachlor Epoxide	1.1
HCH, beta	1.8
Heptachlor	2.4
HCH, gamma	2.5
PCBs	5.3
Hexachlorobenzene	6.5
Chlordane	8.0
Toxaphene	9.6
4,4'-DDT	32
4,4'-DDE	32
4,4'-DDD	44
alpha-Endosulfan	251
beta-Endosulfan	251
Endosulfan Sulfate	251
Endrin	3,017
Endrin Aldehyde	3,017

6.5 g/day, Risk Factor= 10^{-6}

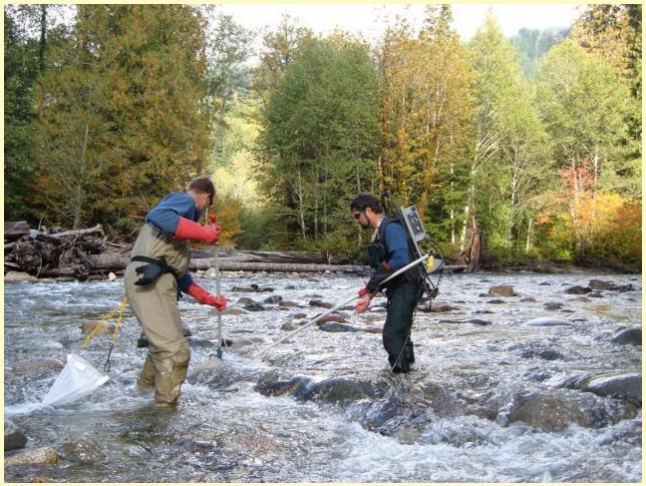
Category 5 Freshwater Fish Tissue 303(d) listings

Chemical	Number of Tissue Listings	Percent of Total
PCBs	113	48%
4,4'-DDE	42	18%
Dieldrin	25	11%
Dioxins	16	7%
4,4'-DDD	10	4%
Chlordane	8	3%
4,4'-DDT	9	4%
HCH, alpha	6	3%
Toxaphene	3	1%
Aldrin	2	<1%
Hexachlorobenzene	2	<1%
Heptachlor	1	<1%
Total Listings =	237	

Total Category 5 FW Tissue Listings= 287

Total Category 5 Tissue= 543

Fish Tissue Equivalent Concentration (FTEC)- 303(d) listing trigger



Fish Tissue Equivalent Concentration

FTEC-303(d) listing trigger

$$C_t = BCF \times C_w$$

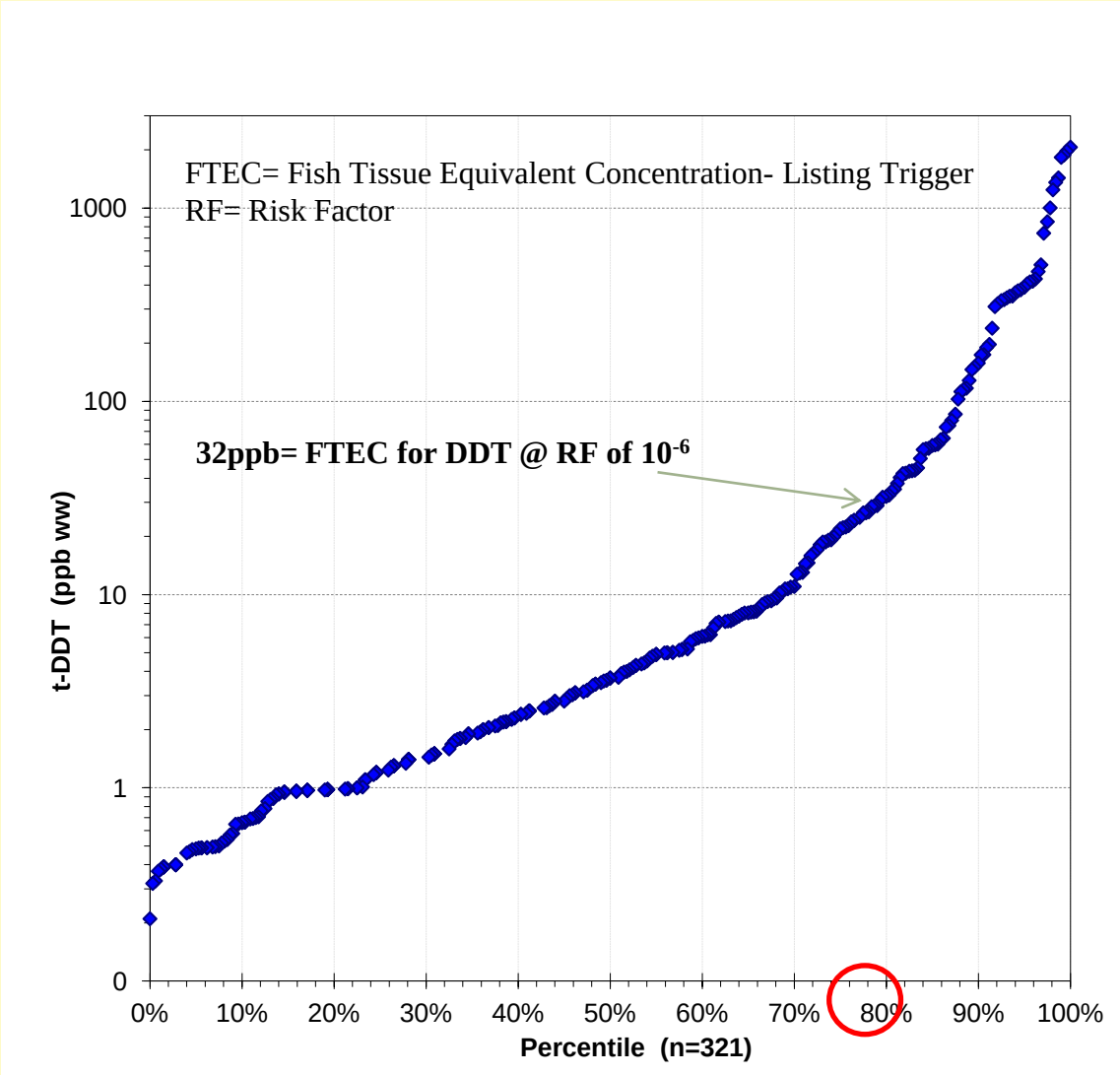
C_t =	Concentration in tissue
BCF=	Bio-concentration Factor
C_w=	Human health water quality criteria for water

PCB FTEC Example

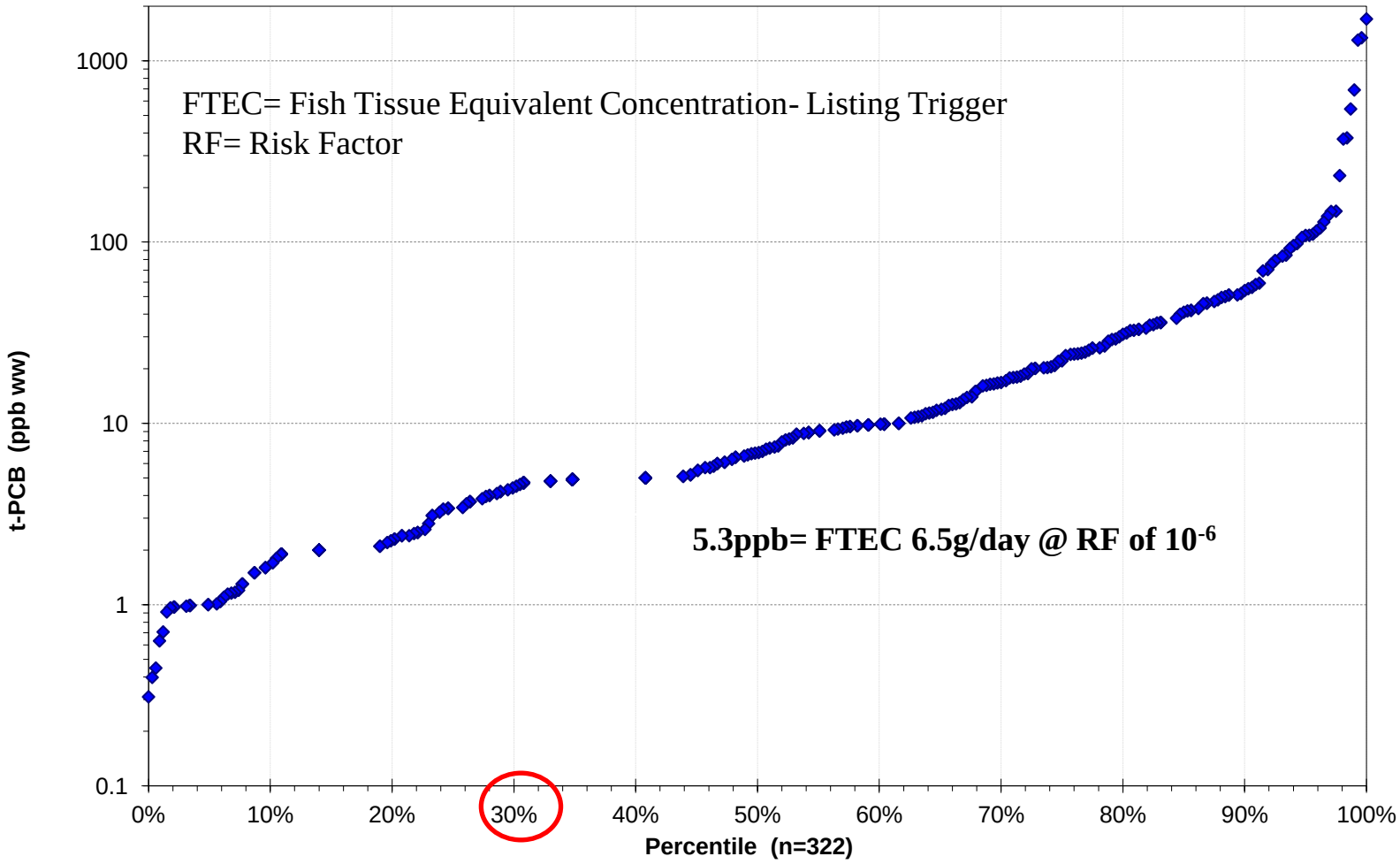
Human Health for PCBs (EPA National Toxics Rule)

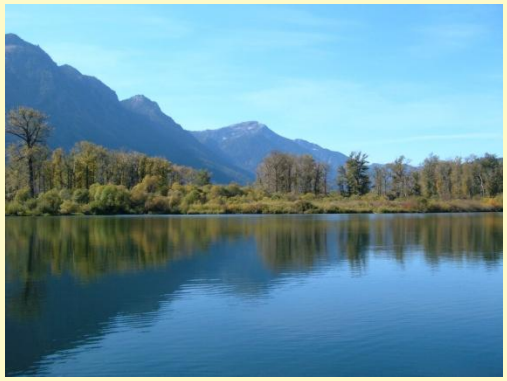
- –170 ppq (parts per quadrillion) in water
  - 6.5 grams per day consumption rate
  - Risk Factor of 10^{-6}
  - Translates to 5.3 ppb (parts per billion) for fish tissue equivalent concentration

T-DDT in All Freshwater Fish Statewide



Total PCBs in All Freshwater Fish Statewide





Background

Background Definition and Waterbody Selection Criteria

- Background – "*Only known or likely significant source of contaminants is atmospheric deposition" (primarily sampled lakes)*
- Elevation approximately <3000 ft
- Undisturbed watershed or logging only
- At least two non-planted fish species
- Good accessibility

Background Freshwater Fish Studies Conducted by Ecology

Statewide

- PCBs and Dioxins (24 sites)- 2007-2008
- Chlorinated Pesticides (28 sites)- 2011

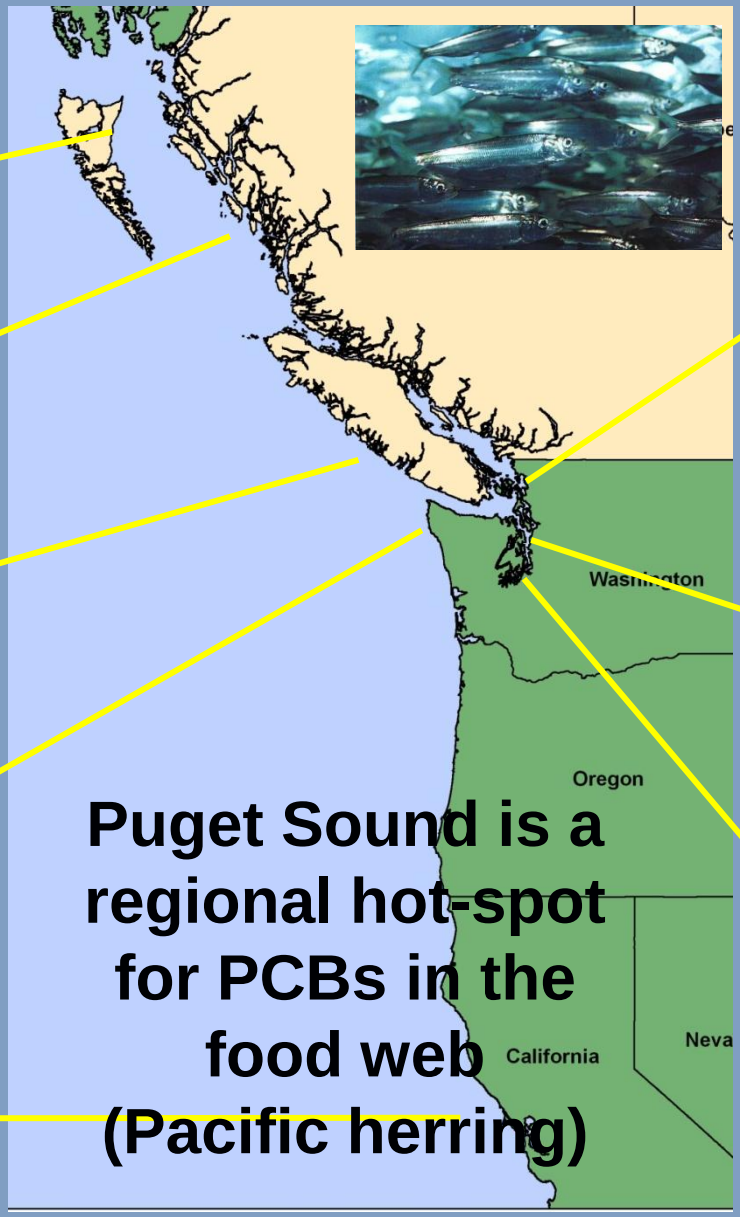
Regional

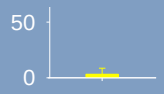
- NE Washington Metals and Organics (15 sites)- 2010-2011

PCB and Dioxin Background Summary Statistics (freshwater edible fish fillet)

	Total PCBs ug/kg, wet (ppb)	Dioxin 2,3,7,8-TCDD ng/kg, wet (ppt)
Number of Samples	52	52
Detection Frequency	98%	27%
Minimum	0.044	0.0075
Maximum	88	0.12
Median	1.4	<0.03
90th Percentile	6.5	0.041
FTEC	**5.3**	**.065**

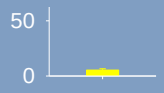
PCBs in Pacific Herring (Marine)





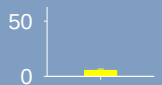
4ppb

Queen Charlottes



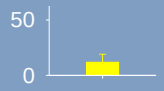
5ppb

BC Central



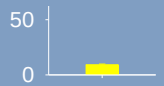
9ppb

Vancouver Is.



12ppb

WA Coast



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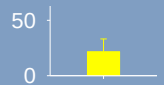
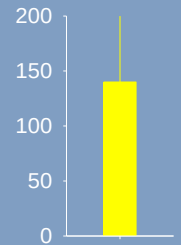
San Francisco



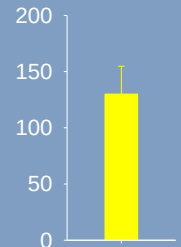
22ppb

Northern PS



140ppb

Central PS

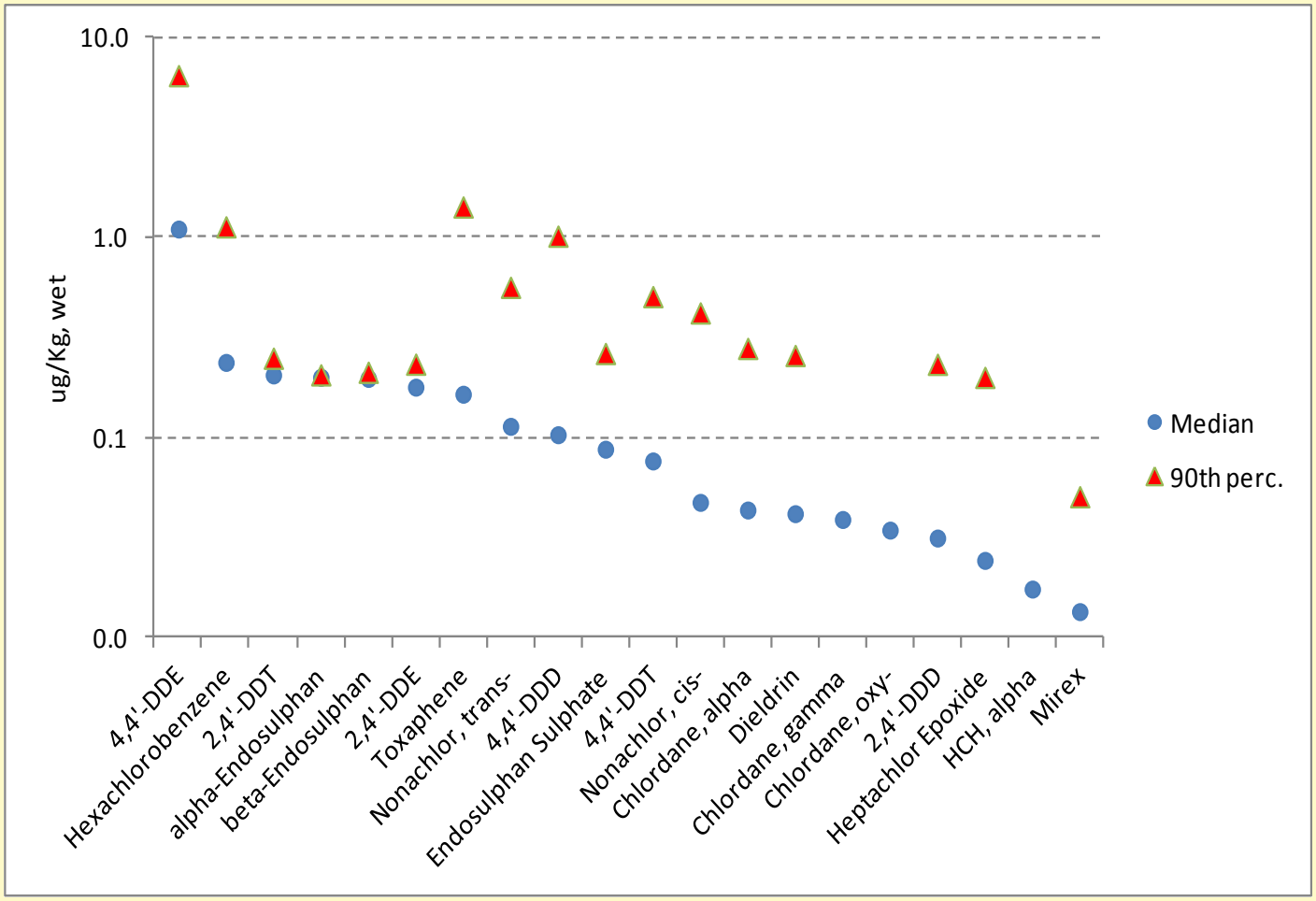


130ppb

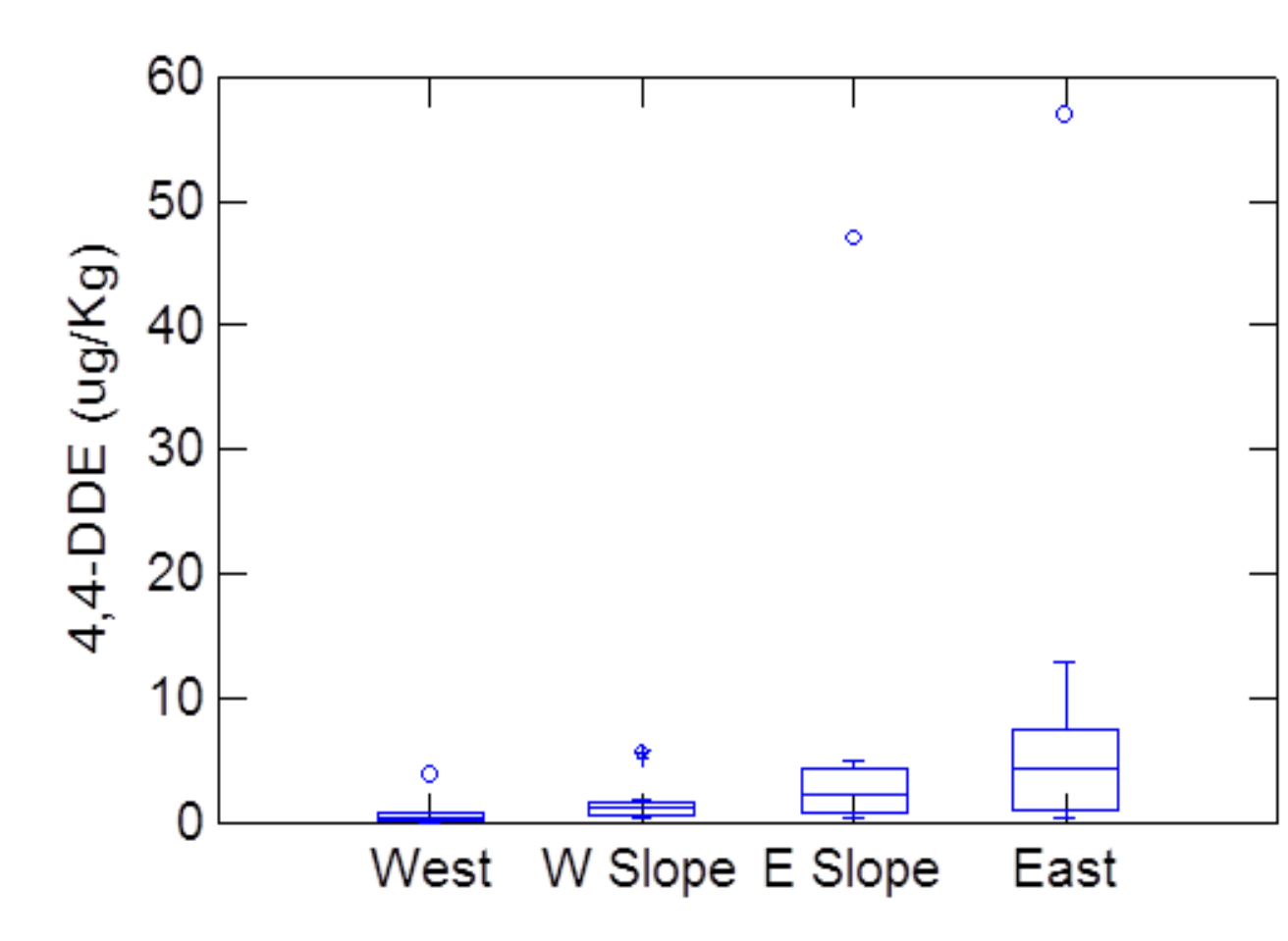
South PS

Puget Sound is a regional hot-spot for PCBs in the food web (Pacific herring)

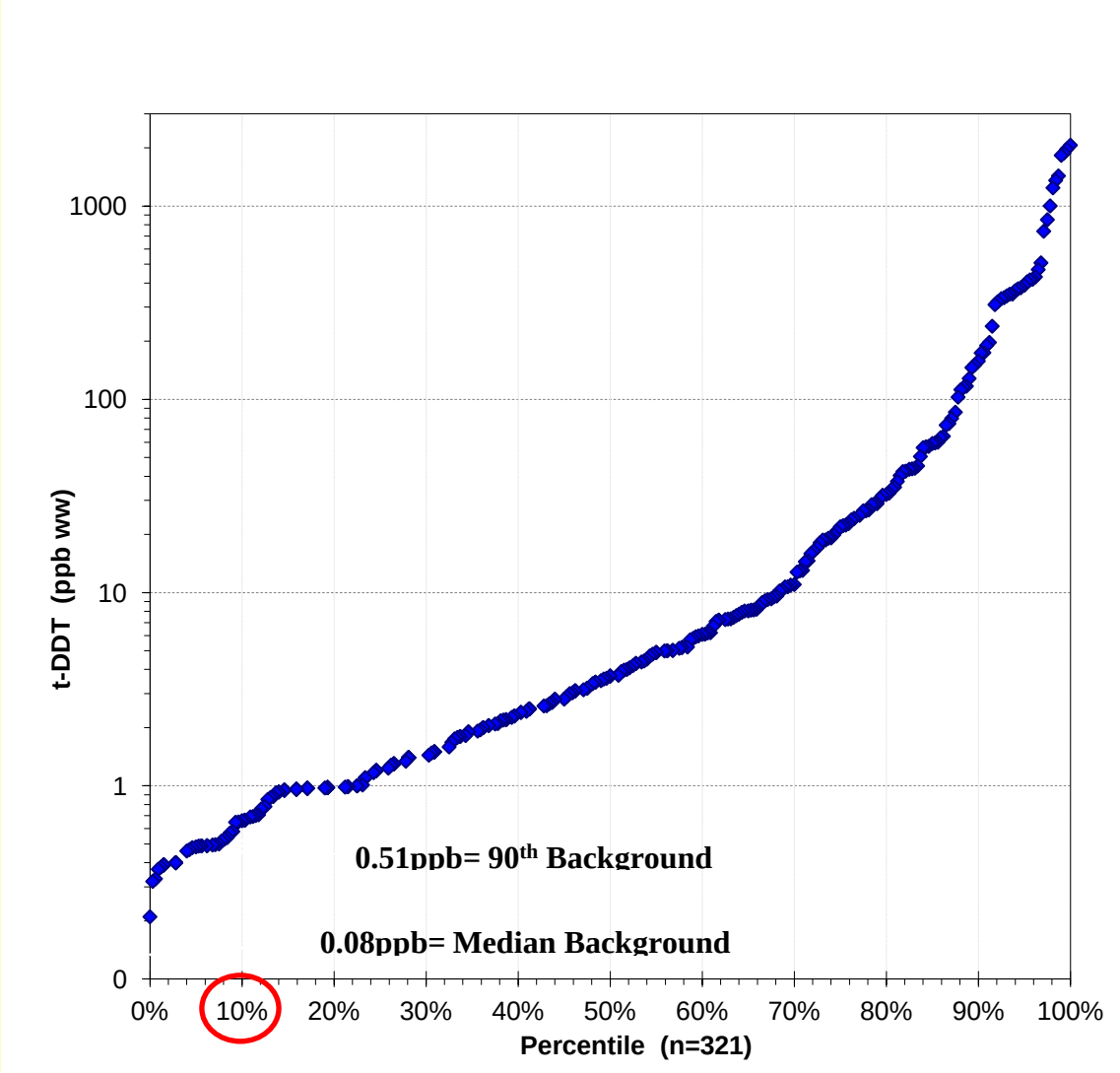
Background Levels of Chlorinated Pesticides in Freshwater Fish Fillets from Washington



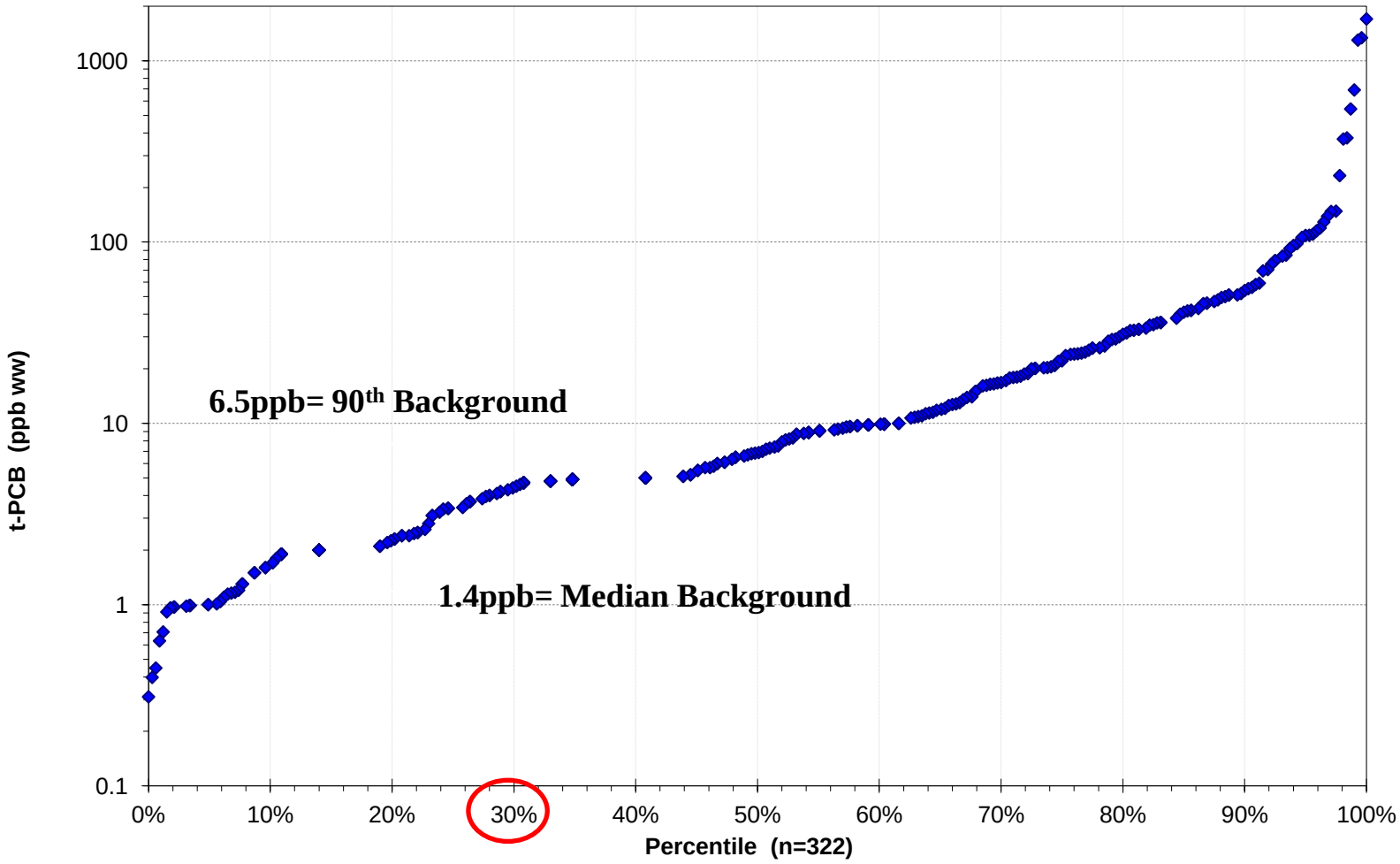
DDE Regional Differences in Background



T-DDT in All Freshwater Fish Statewide



Total PCBs in All Freshwater Fish Statewide

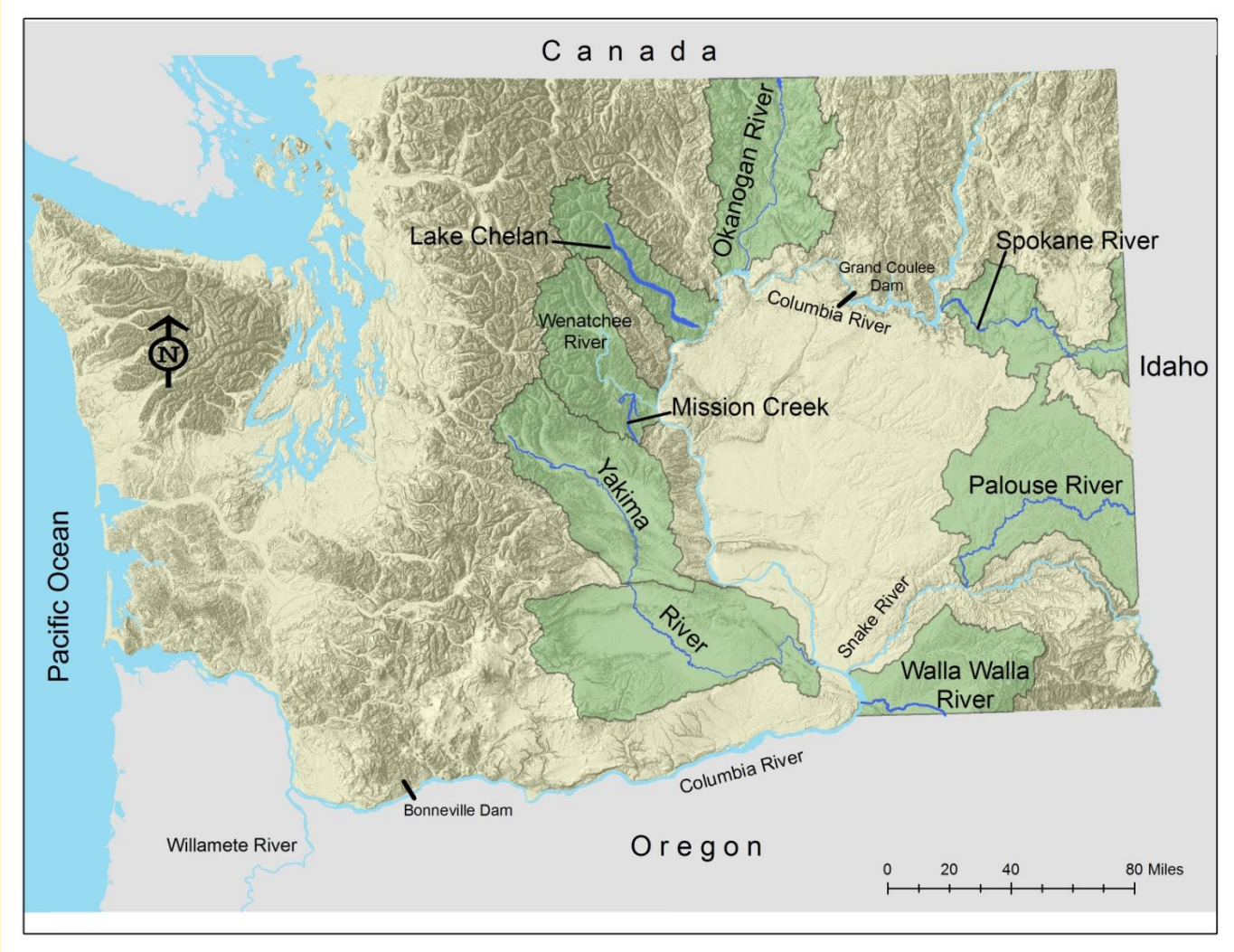


Background Freshwater Fish Fillet Samples Exceeding Listing Trigger for Selected Chemicals

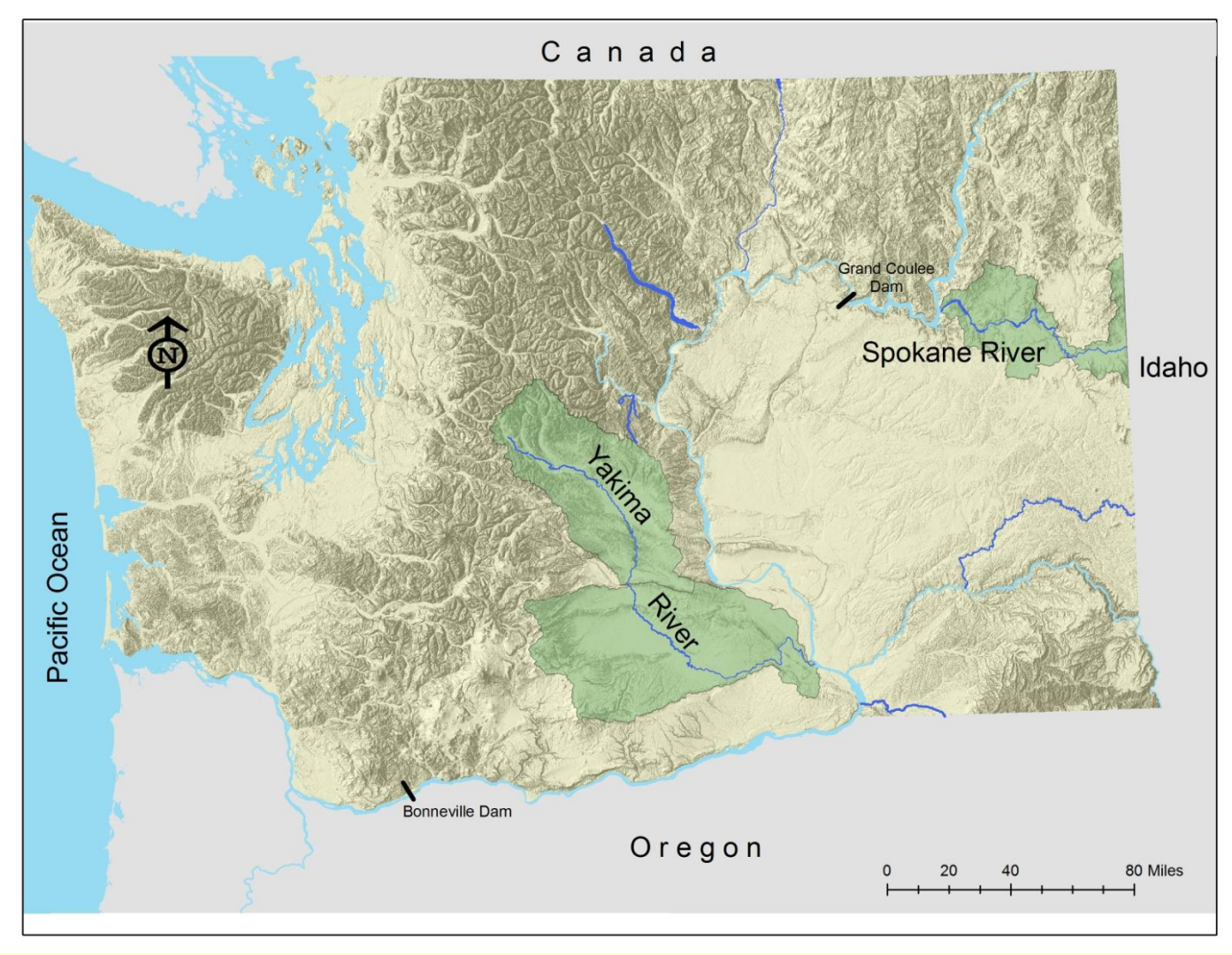
Chemical	No. Samples	Percent above listing trigger
Total PCBs	**52**	**15**
Dieldrin	**48**	**6**
DDE	**48**	**4**

Source Control Examples

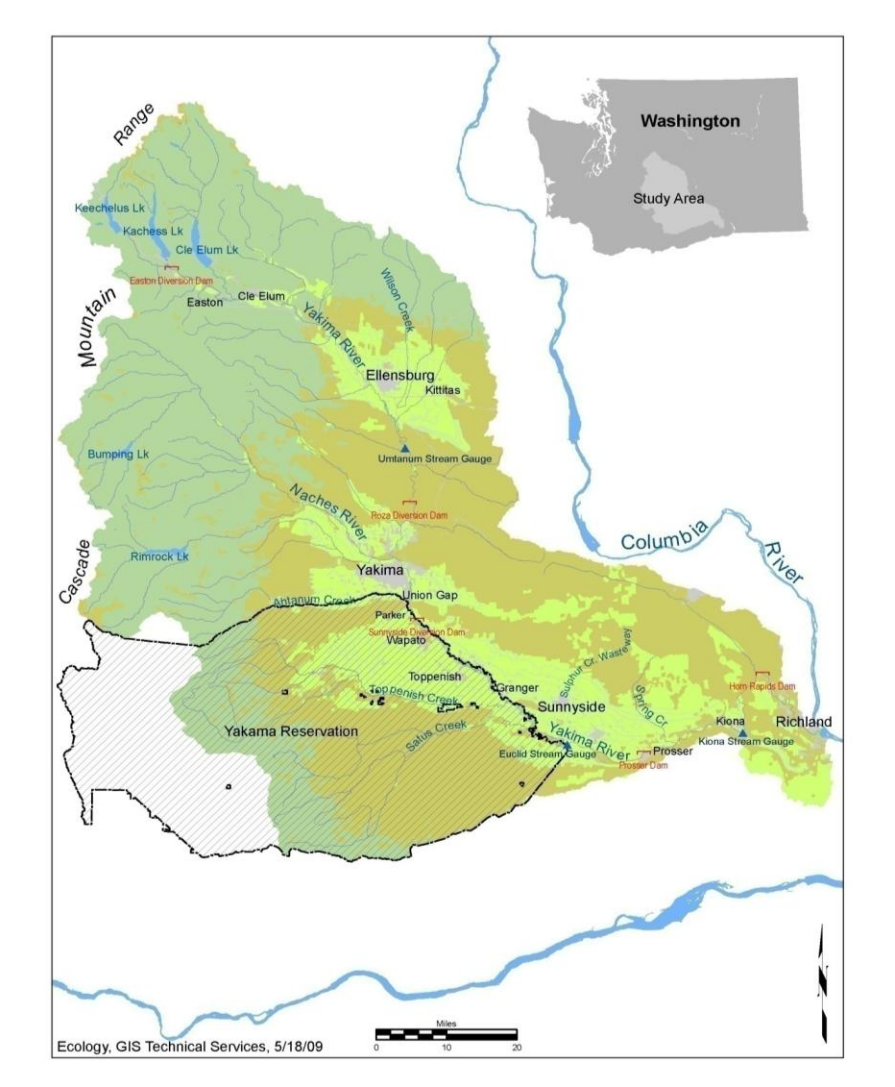
Washington Chlorinated Pesticide and PCB Assessments (1990 -2010)



Yakima and Spokane River Studies



Yakima River DDT



Issues

- Flows from Cascade Range over 200+ miles to the Columbia River
- Lower Yakima one of the most intensely irrigated and agriculturally diverse farming areas in United States
- DDT widely used in basin until being banned in 1972
- In 1985 fish had T-DDT concentrations of up to 3,000 ppb (Johnson et.al., 1988)
- Fish consumption advisory issued in 1993

Source Control Strategy for DDT

- Primarily agricultural sources

  Erosion of soils (300 tons of sediment during irrigation season)

- TMDL established reduction targets using inexpensive surrogate measure (turbidity) for TSS and DDT (implementation began in 1998)

- Irrigation districts took ownership of implementation (set specific on-farm turbidity targets)

- Conversion of irrigation practices from

  rill and furrow to sprinkler and drip irrigation

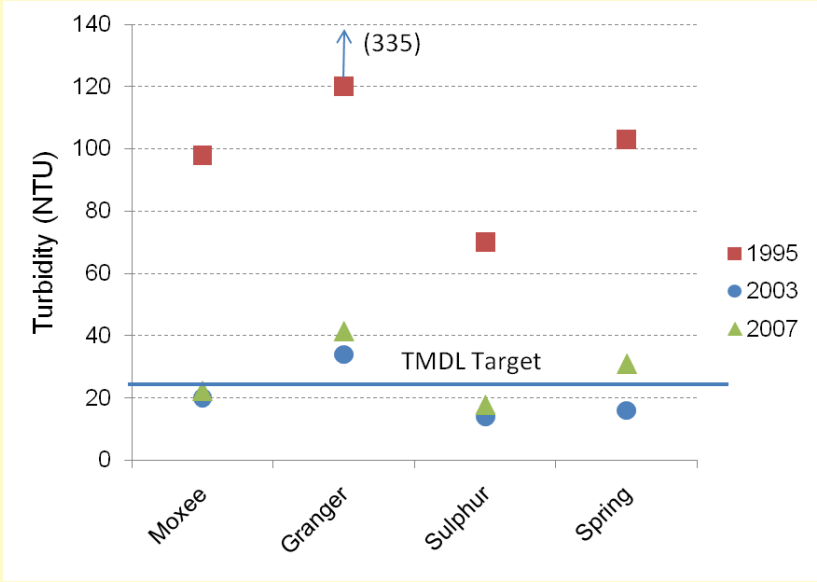
Suspended Sediment Reductions

Sulphur Creek 1997

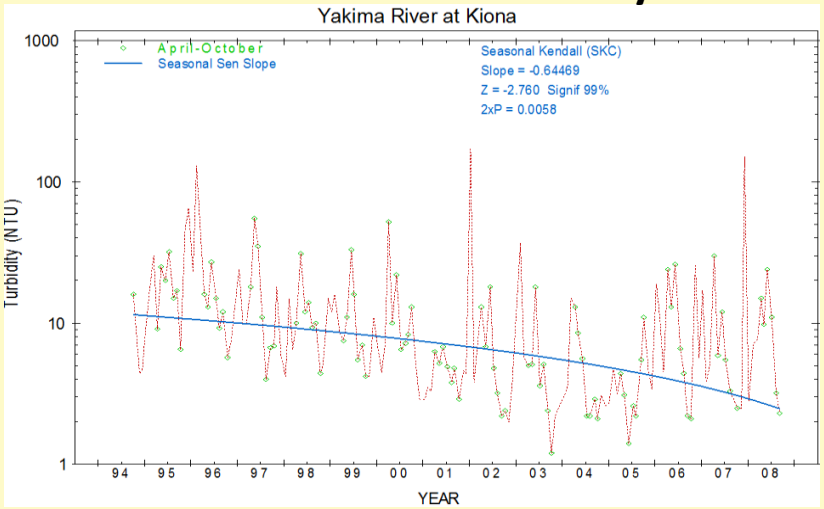
Sulphur Creek 2000

Total suspended solids in mainstem have decreased by 50 to 70% (2003)

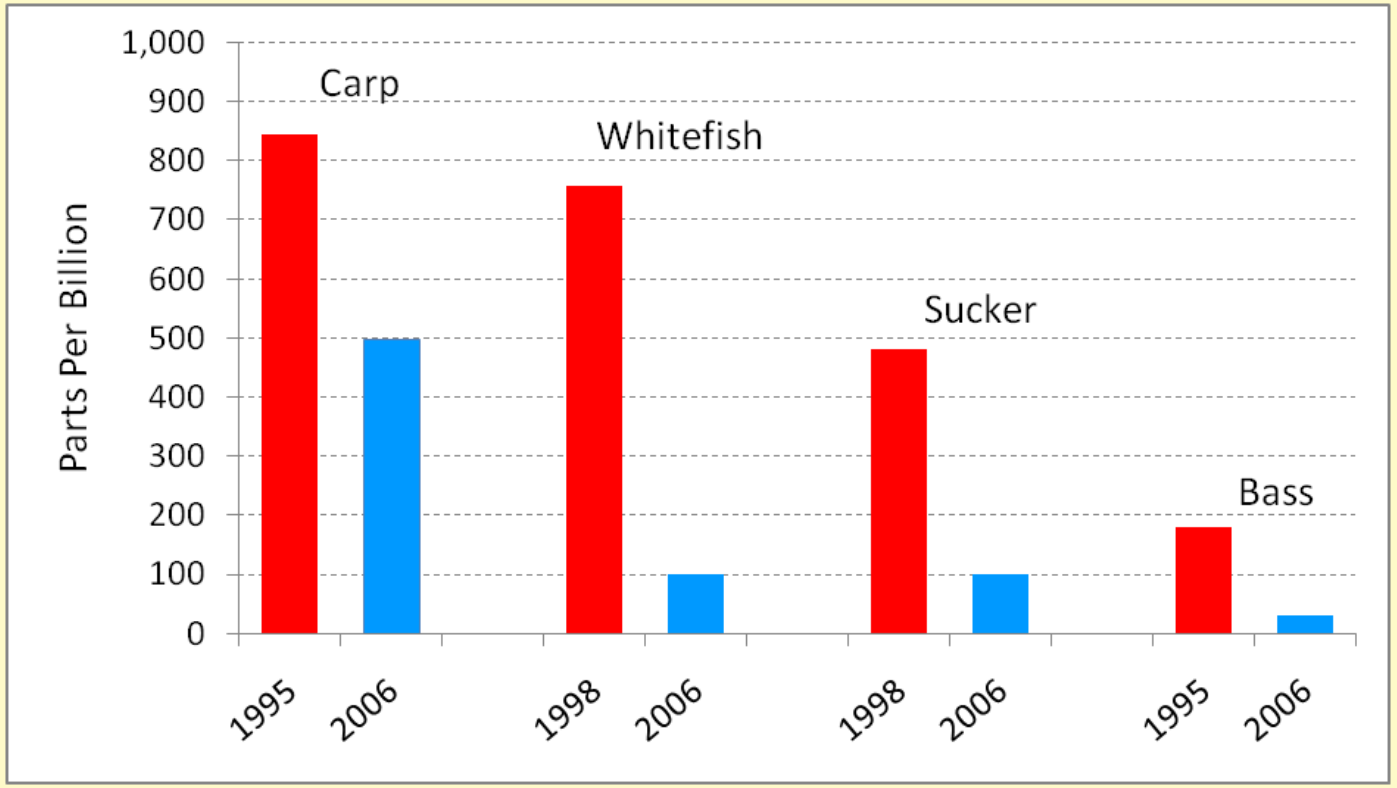
Tributary Turbidity



Mainstem Turbidity



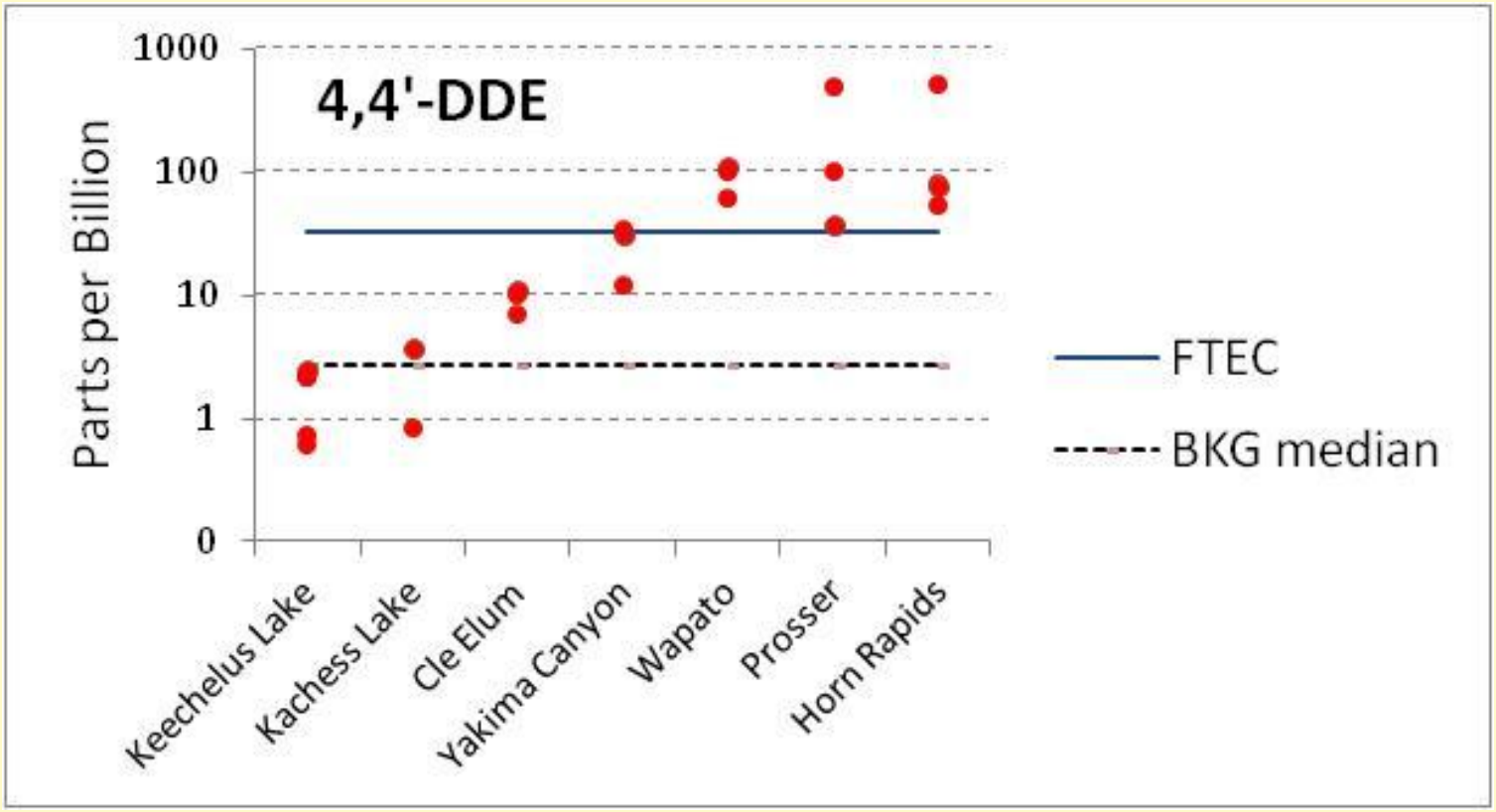
DDE in Fish from the Toppenish-Prosser Reach of Lower Yakima River



Fish advisory lifted in 2009 due to drop in DDT levels (16 years)

1st fish advisory for DDT in nation to be lifted based on TMDL and subsequent reduction measures

Yakima Fish DDE Levels in 2005 Compared to Fish Tissue Equivalent Concentration

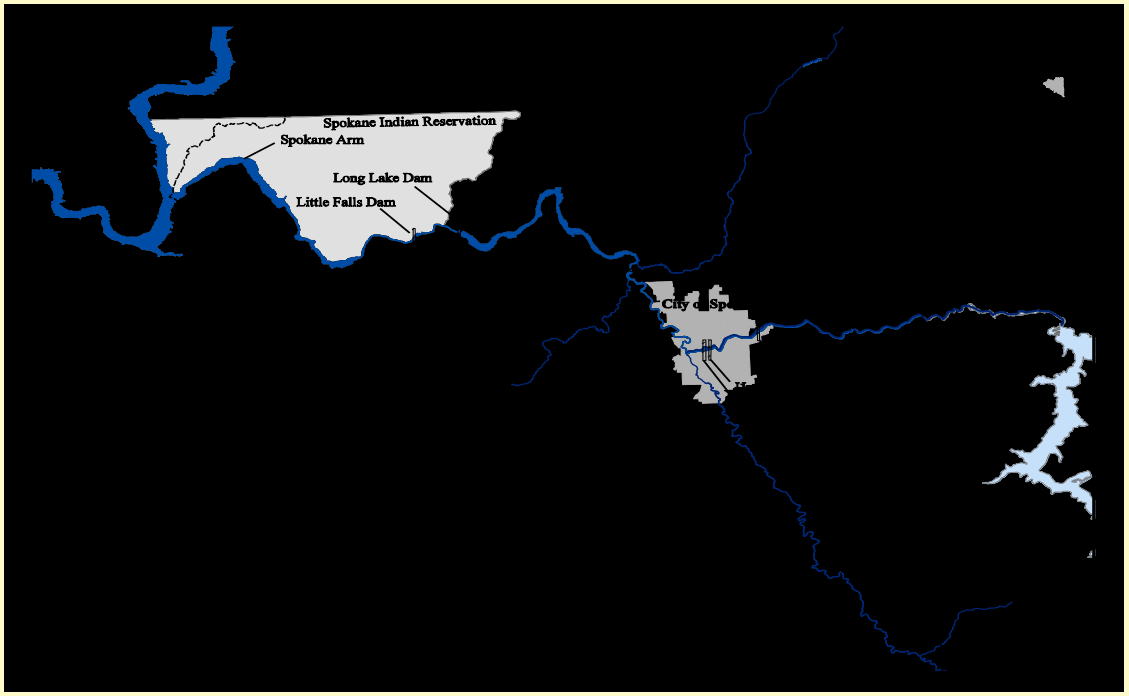


Spokane River PCBs

Spokane River PCBs

Issues

- PCB levels in fish from some reaches over 2,000 ppb in 1993
- Other contaminants (metals, PBDEs and dioxins)
- Heavily urbanized areas with diffuse sources- industrial, municipal, stormwater
- Interstate waterway (ID /WA)
- Lack of fine sediment deposits
- Dams



Source Control Strategy

- Need integrated approach to reduce PCB levels

- Point source controls

  Industrial discharges (treatment, cleanup and process changes)

  WWTP (source tracing and treatment technologies)

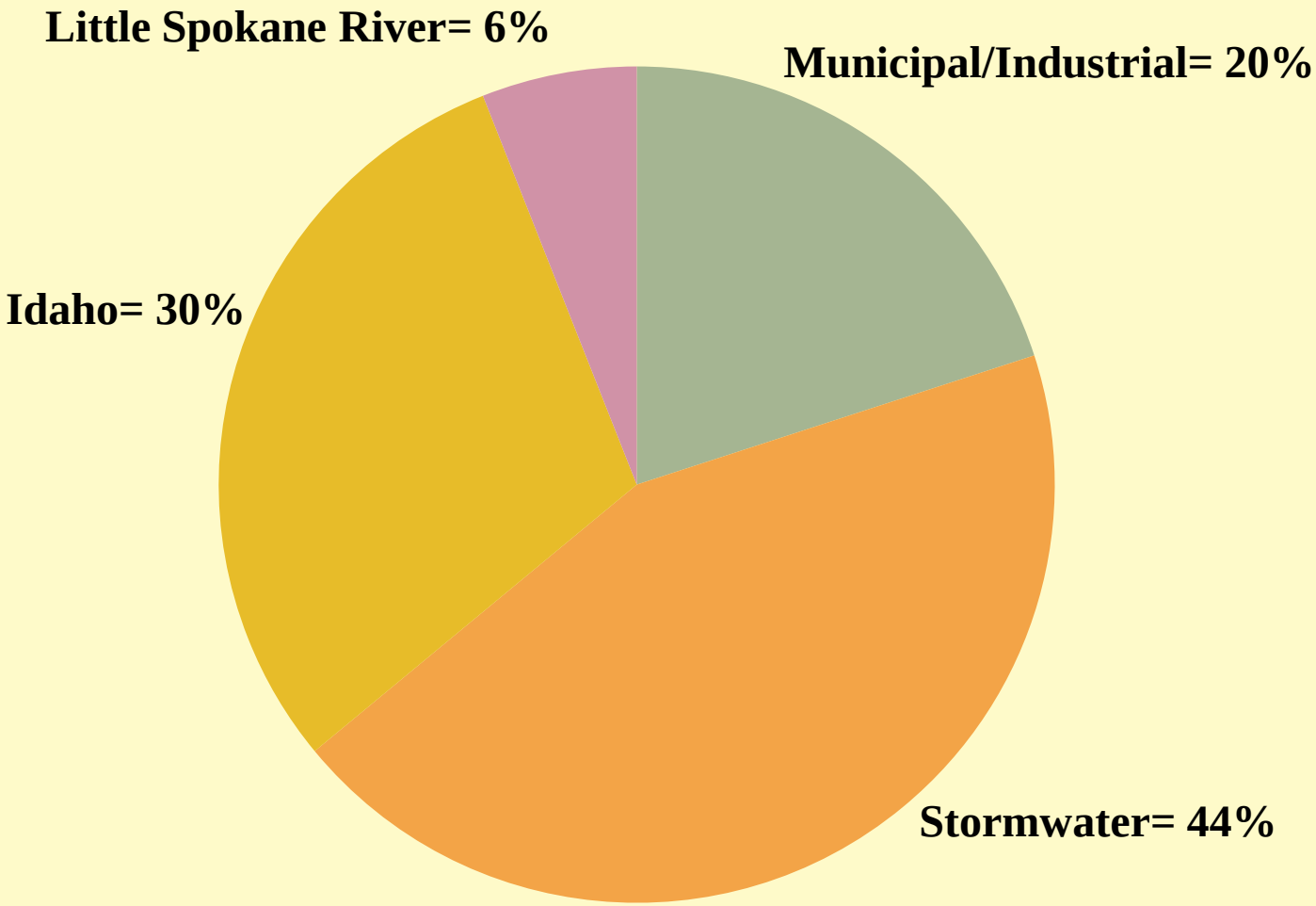
- Sediment removal

- Urban Waters Initiative

  Collaboration of Dept. of Ecology and Spokane Regional Health District

  Upstream source tracing which includes sampling and inspections

Distribution of Measured PCB Sources 2003-2004

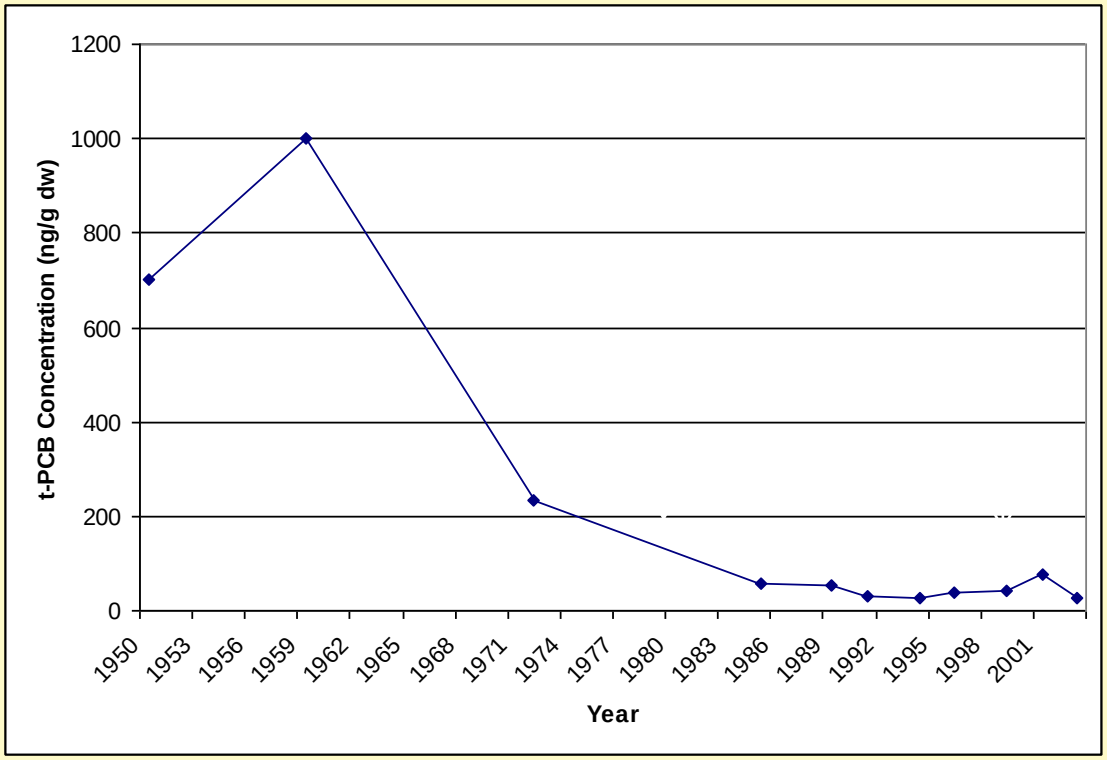


PCB Effluent Loading Data 1994-2004 mg/day

Discharge	1994	1995	2000	2001	2002	2003-04
Kaiser Trentwood	2300	2600	2400	480	140	65
Spokane WWTP	-	-	-	260	-	194
Inland Empire Paper	-	-	-	40	94	45
Liberty Lake WWTP	-	-	-	4.3	-	2.9
City of Spokane Stormwater	-	-	-	-	-	690

-= No data

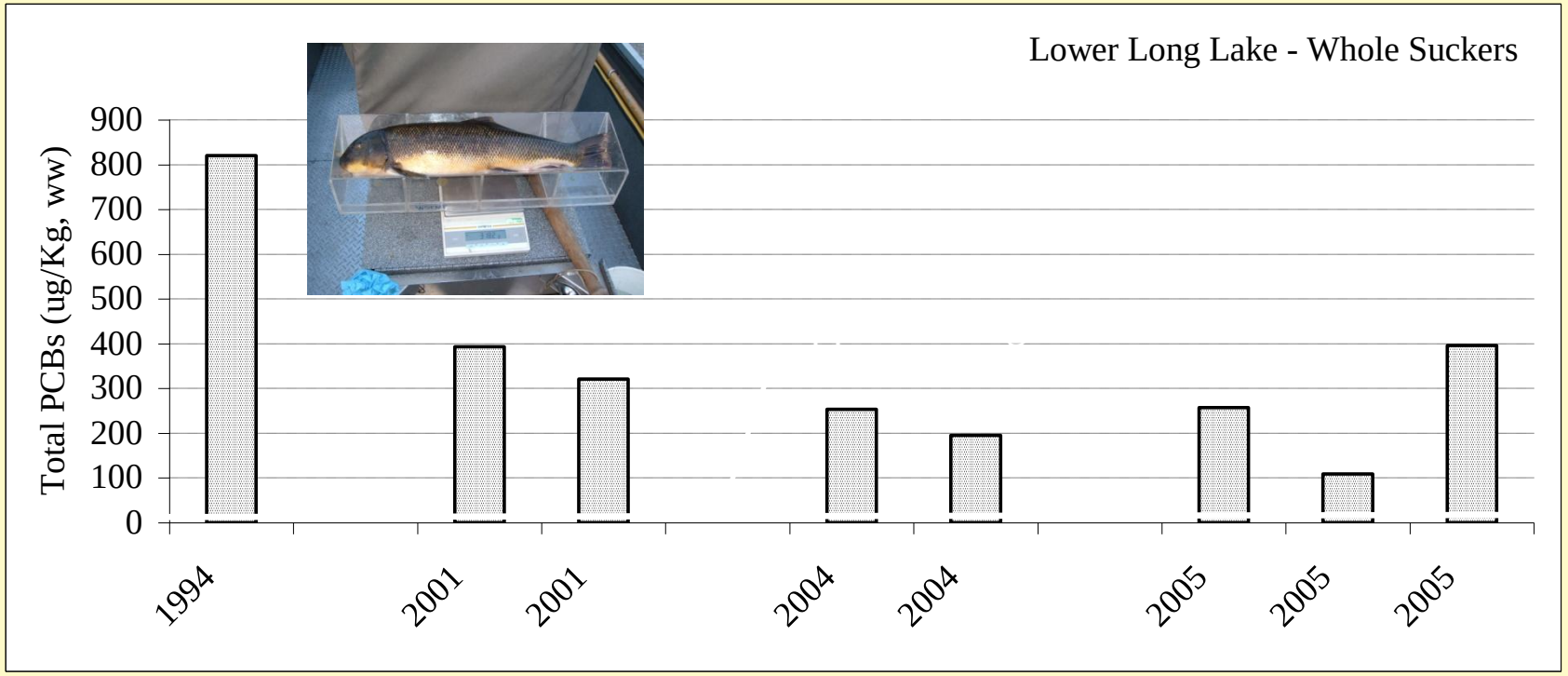
PCBs History from Sediment Record Lower Lake Spokane



Total PCBs in Age Dated Sediment Core (2003)

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

Total PCBs in Whole Suckers from Lower Lake Spokane 1994 to 2005



Summary

- PCBs, DDE and dieldrin represent 63% of the freshwater tissue listings on Category 5 of the 303(d) list
- Background levels for several bioaccumulative chemicals in fish tissue can exceed current fish tissue listing triggers

Summary

- Need to customize source control strategy for each watershed
- It **is** possible to achieve reductions for legacy pollutants like chlorinated pesticides and PCBs, however…
- Need to have an understanding of what targets are achievable for some persistent and bioaccumulative toxic chemicals like PCBs and DDT
- Can take decades for tissue levels to reach targets

Related Links

- PCB and Dioxin Background
- https://fortress.wa.gov/ecy/publications/SummaryPages/1003007.html
- NE WA Lakes Fish
- https://fortress.wa.gov/ecy/publications/SummaryPages/1103054.html
- Spokane PCB Assessment
- https://fortress.wa.gov/ecy/publications/SummaryPages/1103013.html
- Yakima River TMDL
- https://fortress.wa.gov/ecy/publications/SummaryPages/1003018.html

"Acceptable" risk levels for carcinogens: their history, current use, and how they affect surface water quality criteria

Policy Forum #3

February 8, 2013

Human Health Criteria and Implementation Tools Rule-makings

Cheryl Niemi

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360-407-6440

What we'll cover in this presentation:

Short review of where this process sits in the WQS

Differentiate between **non-threshold** and **threshold** effects for HHC chemicals (between carcinogenic and non-carcinogenic HHC) **– Remember: Very simplified discussion**

Why this difference is important in HHC development

What are the risk ranges used in several environmental regulations?

Where did the risk ranges used in HHC come from?

What flexibility does the EPA 2000 HHC guidance on risk ranges contain?

How does changing the risk level change the criteria?

Some of the future policy questions that will need to be answered.

Later today we'll discuss how the modified criteria could change the permitting requirements in the scenarios

Special thanks to the toxicologists/risk assessors who helped with today's material on risk. (Any mistakes are not theirs!)

Abbreviations frequently used in this presentation:

HHC = Human health-based criteria for surface waters
SWQS = Surface Water Quality Standards (WAC 173-201A)
FCR = Fish consumption rate
NTR = National Toxics Rule (40CFR131)

What are WQS?

WQS are the foundation of state/tribal water quality-based pollution control programs under the Clean Water Act.

WQS are to protect public health or welfare, enhance the quality of the water and serve the purposes of the Clean Water Act.

See 40 CFR 131.2

WQS are composed of three main parts

1. Designated uses – include aquatic life, drinking water, recreation, etc…

2. Criteria – levels of water quality that fully protect the uses
- Numeric *
- Narrative

3. Antidegradation Policy - ensures existing and designated uses are maintained and protected, and that waters of a higher quality than the criteria assigned in the standards are not degraded unless necessary and in the overriding public interest (WAC 173-201A-300).

Also: Other policies affecting application and implementation, such as mixing zones, low flows, and variances (40 CFR 131.13).

Where do HHC fit in?

EPA publishes two types of **numeric** recommended criteria

1. Aquatic life -based
2. Human health-based (HHC)

HHC Example:
Endrin (EPA 2002)
Water + Organisms = 0.76 µg/L

Organisms only = 0.81 µg/L

The two types of EPA recommended HHC:

1. Criteria to protect individuals consuming **fish/shellfish and water**; and
2. Criteria to protect individuals consuming **fish/shellfish** only.

What uses do HHC protect?

1. The "**fishable**/swimmable" goal of the CWA
2. The **drinking water** designated use

A human health criterion is the highest concentration of a pollutant in surface water that is not expected to pose a significant risk to human health.

EPA's Recommended Criteria

EPA's recommended criteria are for states to use as needed. They are developed for nation-wide use.

EPA uses **default exposure assumptions** that are based on national data in its recommended HHC:

- A drinking water intake of 2 liters per day;
- An average body weight of 70 kg;
- A fish intake rate of 17.5 g/day

Washington's current HHC are in federal rule

1992 National Toxics Rule

Currently contains criteria for 85 chemicals

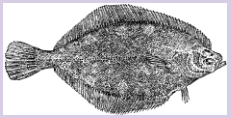
Criteria are based on the national default assumptions used in early 1990's:

Assumption	National 1992 value
Drinking water intake	2 liters per day (= approx. 2 qts)
Average body weight	70 kg (= 154 lbs.)
Fish consumption rate	6.5 g/day (=0.23 oz./day = approx. 5.2 lbs/year

NTR found at 40 CFR Part 131

Calculating HHC

Each chemical has 2 criteria associated with it

	Exposure pathway: fish/shellfish and drinking water   **These criteria apply to freshwaters**	**Exposure pathway: fish/shellfish only**   **These criteria apply to marine waters**
Carcinogenic chemicals Example: DDT	Fish and Shellfish ingestion Water ingestion Cancer effects	Fish and Shellfish ingestion Cancer effects
Non-carcinogenic chemicals Example: Mercury	Non-cancer effects Fish and Shellfish ingestion Water ingestion	Non-cancer effects Fish and Shellfish ingestion

What chemicals are we focusing on today?

Carcinogens: chemicals that cause cancer

•These are the chemicals with the "Risk Level" (RL) input in the HHC equations

We are talking specifically about those carcinogens with responses (effects) that are assumed to be linear at low doses.

This includes the chemicals designated as carcinogens in the National Toxics Rule and EPA's list of recommended human health criteria .

HHC for a Carcinogen (very simplified equation – "organism only"):

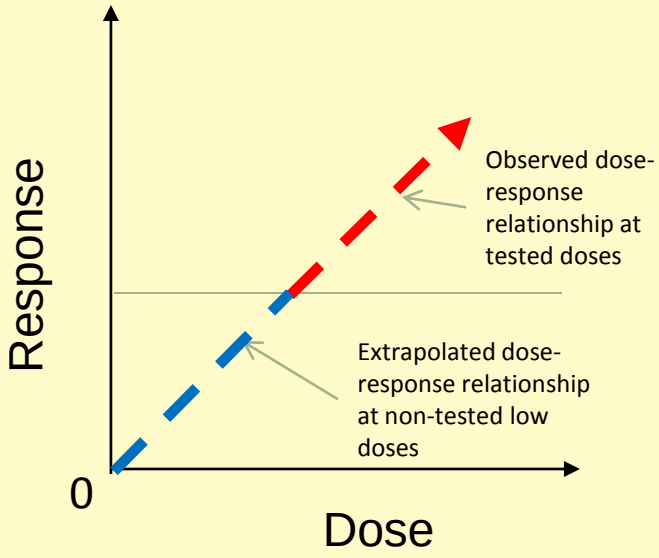
$$HHC = \frac{RL \times BW}{CSF \times FCR \times BCF}$$

<u>What does "linear responses at low doses" mean?</u>

These chemicals are assumed to have **no** threshold for effects, and even one molecule of the substance is assumed to confer some increase in the risk of contracting a cancer.

So – when you draw out the observed dose-response curve and then extend the line to ground it at "zero" for "zero effects at zero dose", you extrapolate a dose-response line that is linear for very low doses.

Why is this important? Because the linear low dose assumption drives the development of the type of incremental "risk level" used for carcinogens



More about non-threshold responses

Again – These are the chemicals we are focusing on today

All levels of exposure pose some probability of an adverse response

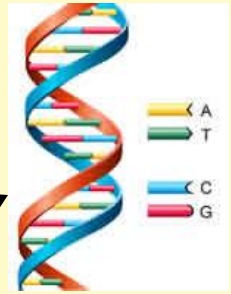
There is an assumed linear response at low doses

The linear approach is used for direct-acting carcinogenic agents, those that cause chemical changes (mutations) to DNA.

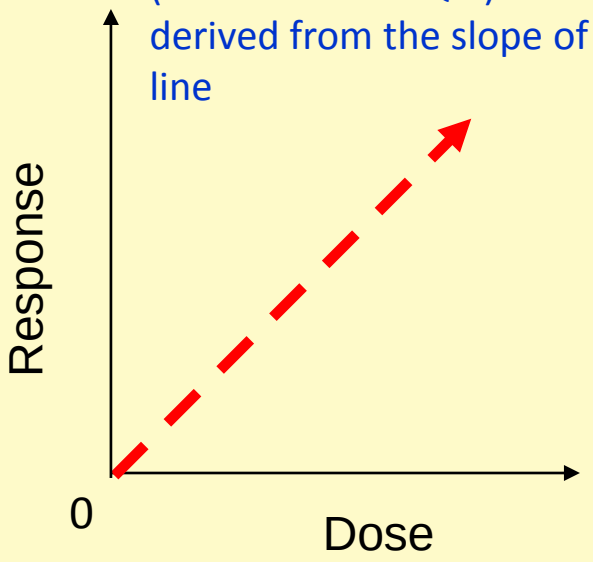
The linear approach is the default choice for carcinogens when there are insufficient data to demonstrate that the mode of action of the chemical is nonlinear.

All of the current EPA recommended criteria for carcinogens are linear carcinogens.

EPA targets a risk level of one in one million (10^{-6}) when it calculates it's national recommended human health criteria for these chemicals



Cancer Slope Factor (CSF) (also called the Q1*) is derived from the slope of the line



Notes: 1. We will talk more about the details of carcinogens and non-carcinogens at Policy Forum # 5.
2. The CSF is part of the criteria equations for linear low dose carcinogens.

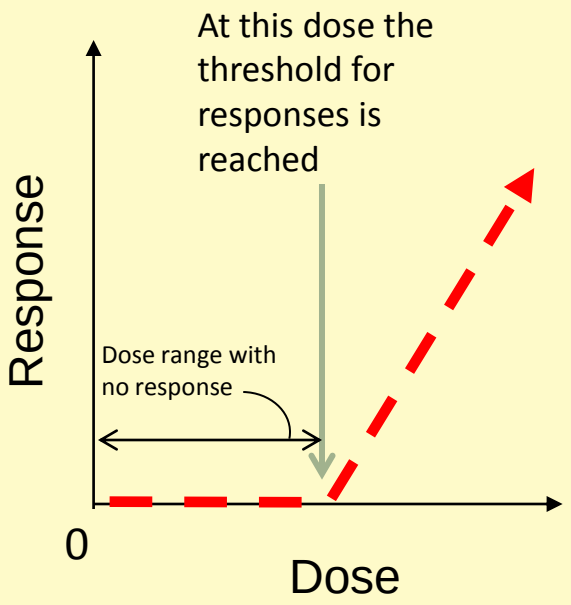
Chemicals with threshold responses

(These are not the chemicals we are focusing on today)

For purposes of HHC development - these are the **non-carcinogens**

Examples: cyanide, zinc, endrin, mercury

In very simplified terms: These chemicals are assumed to have safe exposure levels up to a certain threshold concentration - below a certain threshold level, no ill effects (responses) are measured.

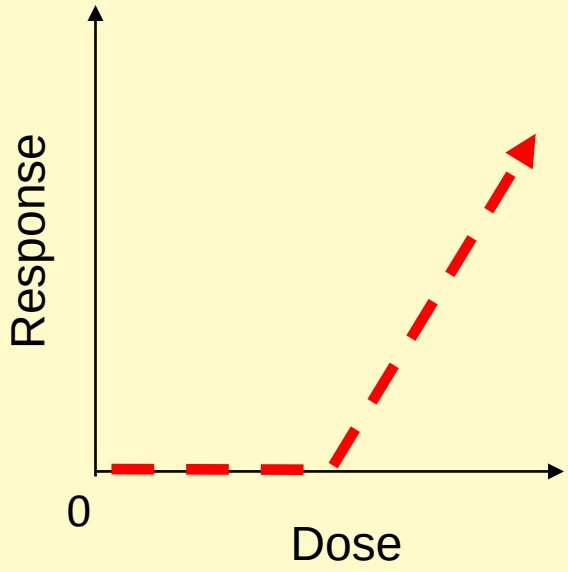


Note: Some carcinogens have a threshold (non-linear) response. EPA's 2000 Methodology has equations that can be used to calculate HH criteria for both linear and non-linear carcinogens. However, all of the current EPA recommended criteria for carcinogens are linear carcinogens. EPA has not calculated any threshold carcinogen values. Very few threshold carcinogens exist in IRIS and those have not been used by EPA for criteria calculation.

EPA's *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000)*: http://water.epa.gov/scitech/swguidance/standards/upload/2005_05_06_criteria_humanhealth_method_complete.pdf

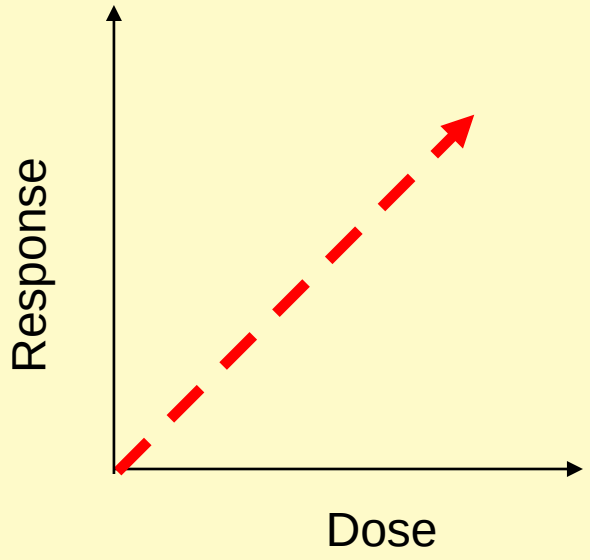
Threshold Responses

These are the non-carcinogens – we are **not** talking about these today



Non-threshold, and, linear response at low doses

These are the carcinogens – we **are** talking about these today



Why the continued reinforcement about today's focus on carcinogens (and not the non-carcinogens)? One reason is because the risk level we are talking about today applies **only** to the carcinogens – EPA's list of current recommended HH criteria has approximately **51** criteria for noncarcinogens and **60** criteria for carcinogens.

Criteria calculation for the non-carcinogens has its own details and decisions, related to threshold responses, that are important and will be discussed at Policy Forum #5. These include relative source contributions (RSCs) (which were discussed briefly at Policy Forum #3) and the unit of risk associated with non-carcinogens (called the Hazard Quotient).

The language about level of protection in the laws and regulations varies, but encompasses similar concepts

Examples:

Laws and regulation	Levels of Protection
Federal Insecticide, Fungicide, and Rodenticide Act	*".. function **without unreasonable and adverse effects on human health** and the environment"*, §3
National Contingency Plan	*". . . provide the basis for the development of **protective exposure levels**,"* § 300.430(d)
Clean Water Act	*". . . standards shall be such as to **protect the public health or welfare**, enhance the quality of water and serve the purposes of this Act."* §303(c)(2)(A) (water quality standards language)
Clean Air Act	*"Emission standards promulgated under this subsection shall provide **an ample margin of safety to protect public health**."* §112
Toxic Substances Control Act	*". . . assure chemical substances and mixtures **do not present an unreasonable risk** of **injury to health** or the environment,"* §2(b)(3)

How do regulatory agencies deal with the different guiding language?

In general, **default** approaches are used for carcinogens:

- For risks calculated to be **linear at low doses**, agencies use acceptable risk levels ranging from **10^{-6} to 10^{-4}**
- In some cases the risks from multiple chemicals are addressed, but in many cases only individual risk is calculated (e.g., CWA : EPA's recommended human health criteria)

Review: What do 10^{-6} and 10^{-4} mean?

10^{-6} means there is a risk of one additional occurrence of cancer, in one million people, at the given exposure assumptions (this is compared to an unexposed population).

For **Washington's NTR HHC**, the exposure assumptions are:

- **Daily exposure over 70 years**, at a given fish consumption rate (currently **6.5 g/day**), and **2 liters/day** of untreated surface waters for a **154 lb.** person.

Numeric	What it means, under specified exposure assumptions
10^{-6}	…risk of one additional occurrence of cancer, in one million people…
10^{-5}	…risk of one additional occurrence of cancer, in one hundred thousand people
10^{-4}	…risk of one additional occurrence of cancer, in ten thousand people…

Increasing protection

History of the 10^{-6} risk level – part of the story…

Two important events in the 1970's:

1. US Food and Drug Administration

10^{-6} appeared in FDA regulation in **1977**.

10^{-6} was considered a screening level of "essentially zero" or *de minimus* risk

10^{-6} was used for the evaluation of residues in food-producing animals.

- Diethylstilbestrol (DES) was the chemical at issue, for which no permissible residue was allowed. (DES was used as a growth promoter in cattle)
- Reaching this *de minimus* risk level could be accomplished by banning use of the chemical.

2. Consent Decree in NRDC v. Train, 1976

USEPA – the 1980 Water Quality Criteria development documents followed the direction given in the **Consent Decree**

Next two slides show the language from the Consent Decree in NRDC v. Train and from the USEPA 1980 Criteria document for Hexachlorocyclohexane.

NRDC v. Train, 1976 – this consent decree influenced EPA's published CWA HHC and risk levels

"I. Additional Protection of Public Health

11. Not later than June 30, 1978, after opportunity for public comment, the Administrator shall publish under § 304(a) of the Act water quality criteria accurately reflecting the latest scientific knowledge on the kind and extent of all identifiable effects on aquatic organisms and human health of each of the pollutants listed in Appendix A. Such water quality criteria shall state, *inter alia,* for each of the pollutants listed in Appendix A, the recommended maximum permissible concentrations (**including where appropriate zero**) consistent with the protection of aquatic organisms, human health, and recreational activities."

Natural Resources Defense Council, Inc. v. Train; Environmental Defense Fund v. Train; Citizens for a Better Environment v. Train; Natural Resources Defense Council, Inc. V. v. Agee, Civ. A. No. 2153-73; Civ. A. No. 75-172; Civ. A. No. 75-1698; Civ. A. No. 75-1267, UNITED STATES DISTRICT COURT FOR THE DISTRICT OF COLUMBIA, 6 ELR 20588, June 9, 1976

1980 Criteria document example: Hexachlorocyclohexane

"Under the Consent Decree in NRDC v. Train, criteria are to state recommended maximum permissible concentrations (including where appropriate, zero) consistent with the protection of aquatic organisms, human health, and recreational activities." α-HCH, β-HCH, γ-HCH and t-HCH are suspected of being human carcinogens. Because there is no recognized safe concentration for a human carcinogen, the recommended concentration of α-HCH, β-HCH, γ-HCH and t-HCH in water for maximum protection of human health is zero."

"Because attaining a zero concentration level may be infeasible in some cases and in order to assist the Agency and States in the possible future development of water quality regulations, the concentrations of α-HCH, β-HCH, γ-HCH and t-HCH corresponding to several incremental lifetime cancer risk levels have been estimated. A cancer risk level provides an estimate of the additional incidence of cancer that may be expected in an exposed population..."

"In the Federal Register notice of availability of draft ambient water quality criteria, EPA stated that it is considering setting criteria at an interim target risk level of 10^{-5}, 10^{-6}, or 10^{-7} as shown..."

USEPA 1980. Ambient Water Quality Criteria for Hexachlorocyclohexane, October 1980, EPA 440/5-80-054, (pages C-36 to C-37;
http://water.epa.gov/scitech/swguidance/standards/upload/2001_10_12_criteria_ambientwqc_hexachlorocyclohexa80.pdf

How is 10^{-6} currently used?

10^{-6} has come into broad usage

10^{-6} is currently part of many state and federal environmental programs, for example:

- CWA – Clean Water Act
- CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
- CAA – Clean Air Act

10^{-6} is expressed in guidance and regulation as a target for acceptable risk or as part of a range of acceptable risk

- **Guidance examples:** CWA EPA recommended human health criteria
- **Regulation examples:** WA SWQS risk level of 10^{-6}, Oregon's water quality standards, CERCLA's National Contingency Plan, the National Toxics Rule as applied to Washington
  - **Law:** Have not found any environmental protection laws that specify a risk level (does not mean they are not there – if you know of an example please let us know)

General status: 10^{-6} and associated risk ranges are fully embedded in current regulations and guidance, and practiced at sites throughout the nation.

Main message: Use of 10^{-4} to 10^{-6} risk levels is with us now, and is probably with us into the foreseeable future.

Specific examples: Federal programs and risk levels for low dose linear response chemicals

Federal program	Acceptable Risk Level	Other Information
Clean Water Act	304(a) criteria are published at a 10^{-6} risk level EPA 2000 guidance recommend that States and Tribes set criteria at 10^{-5} or 10^{-6} Most highly exposed populations should not exceed 10^{-4} risk level	EPA 2000 guidance recommends using data for fish/shellfish consumers only (do not include non-consumers).
CERCLA	Excess upper bound lifetime cancer risk to an individual of between 10^{-4} to 10^{-6}	Decisions made within a risk range for excess cancer of 10^{-4} to 10^{-6}. If cancer risk is greater must take action, and if it is lower no action can be taken.
Clean Air Act	For Hazardous Air Pollutants (HAPs): Limit Maximum Individual Risk (MIR) for cancer to no higher than about 10^{-4} (MIR is the person exposed to maximum lifetime HAP concentrations) – Protect the greatest number of persons to less than 10^{-6} lifetime cancer risk	Under the acceptable risk level for the Clean Air Act row, this applies to risk posed by a single facility's or source category's emissions. Background sources are not considered when evaluating risks. If risks from hazardous air pollutants are determined to be unacceptable, then EPA may choose to derive a more stringent emission standard for that particular source category.
Safe Drinking Water Act	No increase in cancer	Non-regulatory level - Maximum contaminant Level Goal (MCLG)
Safe Drinking Water Act	Risk-based approach overlain by analytical/economic considerations	Regulatory level – Maximum contaminant Level (MCL)
National Toxics Rule (1992, contains Washington's current HHC) (40 CFR 131)	10^{-6} for general population.	Paired with the FCR for the general population in the criteria equation, average of consumers and nonconsumers

What about risk levels and current CWA HH criteria?

1992 NTR (Washington's current HHC):

"In submitting criteria for the protection of human health, States were not limited to a 1 in 1 million risk level (10^{-6}). EPA generally regulates pollutants treated as carcinogens in the range of 10^{-6} to 10^{-4} to protect average exposed individuals and more highly exposed populations."

- Washington chose 10^{-6} and EPA applied their general population FCR

Washington SWQS:

"WAC 173-201A-240(6) *Risk-based criteria for carcinogenic substances shall be selected such that the upper-bound excess cancer risk is less than or equal to one-in-one million."*

EPA 2000 guidance on risk levels for HHC:

"EPA believes that both 10^{-6} or 10^{-5} may be acceptable for the general population and that highly exposed populations should not exceed a 10^{-4} risk level."

(Note: cancer ranges of 10^{-6} and 10^{-5} have been chosen by states and received CWA approval from EPA)

NTR : 40CFR part 131. Vol. 57, No. 246, Tuesday December 22, 1992, p.60855.
EPA's *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000), page 2-6*:
http://water.epa.gov/scitech/swguidance/standards/upload/2005_05_06_criteria_humanhealth_method_complete.pdf
Also, see full discussion in the EPA 2000 guidance document, pages 2-6 and 2-7 : *2.4 Cancer Risk Range*.

How does changing the risk level change the criteria?

Assumed here: FCR (general population) = 6.5 g/day (used here because this is the rate in the NTR)

Chemical(s)	Criteria calculated at 10^{-6} (Washington's NTR criteria) (ug/L)		Criteria calculated at 10^{-5} (ug/L)		Permit limit compliance assessment level (EPA Sec. 136-approved method) (ug/L)
	Water + Organisms	Organisms only	Water+ Organisms	Organisms only	(Quantitation level = QL)
Total PCBs (BCF =31,200)	1.71E-04	1.71E-04	1.71E-03	1.71E-03	0.5 (EPA Method 608)
	0.00017	**0.00017**	**0.0017**	**0.0017**	
DDT (BCF =14,100)	5.88E-04	5.91E-04	5.88E-03	5.91E-03	0.05 (EPA Method 608)
	0.000588	**0.000591**	**0.00588**	**0.00591**	
Inorganic Arsenic (BCF = 44)	1.75E-02	1.40E-01	1.75E-01	1.40E+00	0.5 Total As (EPA Method 200.8) No approved method for inorganic arsenic.
	0.0175	**0.14**	**0.175**	**1.4**	

Monitoring for PCBs: Infrequent permit requirements for EPA Method 1668C (used for monitoring, **not** compliance assessment):

QL = 10 pg/L/congener in a fairly clean matrix .

10 pg/L = 0.00001 ug/L

1668C is not 40CFR136-approved. 1668C **can** measure the criteria concentrations as calculated in the table above. Method 608 cannot.

If the HHC for PCBs was calculated using 142 g/day at a 10^{-6} risk level, the resulting criteria would be 0.0000079. This value is below the QLs for EPA Methods 608 and 1668.

How do the QLs used for compliance assessment measure up against criteria calculated at a higher FCR and at different risk levels?

FCRs used in this example are:
17.5 g/day (the EPA 2000 recommended FCR for the general population)
175 g/day (the FCR recently adopted by Oregon for HHC calculation)

Chemical(s) and QLs (QLs in ug/L)	Criteria calculated for "Organisms only," not "Water + Organisms."			
	Criterion at 10^{-6} and FCR = 17.5	Criterion at 10^{-6} and FCR = 175	Criterion at 10^{-5} and FCR = 17.5	Criterion at 10^{-5} and FCR = 175
PCBs	6.4×10^{-5}	6.4×10^{-6}	6.4×10^{-4}	6.4×10^{-5}
	0.000064	0.0000064	0.00064	0.000064
Method 608 QL	0.5	0.5	0.5	0.5
Method 1668 QL (per individual congener)	0.00001*	0.00001	0.00001*	0.00001*
DDT	2.2×10^{-4}	2.2×10^{-5}	2.2×10^{-3}	2.2×10^{-4}
	0.0002	0.00002	0.002	0.0002
Method 608 QL	0.05	0.05	0.05	0.05

* Indicates that compliance can be measured by this method

What levels of protection were the NTR HHC for carcinogens calculated to provide? How does that compare to the EPA 2000 guidance?

EPA 2000 guidance on risk levels for HHC:

> *"EPA believes that both 10^{-6} or 10^{-5} may be acceptable for the general population and that highly exposed populations should not exceed a 10^{-4} risk level."*

10^{-6} means there is a risk of one additional occurrence of cancer, in one million people, at the given exposure assumptions (this is compared to an unexposed population).

For **Washington's NTR HHC**, the exposure assumptions are:
70 years of daily exposure to **6.5 g/day** of fish and shellfish, and **2 liters/day** of untreated surface waters, for a **154 lb.** person.

Numeric	What it means, under specified exposure assumptions
10^{-6}	…risk of one additional occurrence of cancer, in one million people…
10^{-5}	…risk of one additional occurrence of cancer, in one hundred thousand people
10^{-4}	…risk of one additional occurrence of cancer, in ten thousand people…

Increasing protection

For the "organism-only" criteria: A criterion calculated at 10^{-6} risk level and 6.5 g/day fish consumption rate means that individuals who fit the exposure assumptions in the criterion equation and eat 65 g/day are protected at a 10^{-5} level, and at 650 g/day are protected a 10^{-4} level at that criterion concentration (with all other inputs held constant).

So - what levels of protection are afforded for linear carcinogens under the EPA's NTR criteria?

The blue box below shows the relationship between the risk level and FCR for the "organisms-only criteria." This is a direct relationship. The relationship between the risk level and FCR in the "organisms + water" criteria is not so direct: it is complicated by the water exposure and each criteria chemical's propensity to bioaccumulate. For the "organisms + water" criteria, the fish consumption rate that corresponds to a specific risk level is equal to or higher than the FCR in the "organisms-only" calculation made at the same risk level and with all other criteria calculation inputs held constant.

Levels of Protection for Linear Carcinogens – how the "sliding scale" for each order of magnitude of change works for the "organism only" criteria,
(criteria concentrations and all other inputs held constant)

Risk Level	Fish Consumption Rate
If: 10^{-6}	And: 6.5 g/day, and if criterion values are held equal,
Then: 10^{-5} →	Applies to: 65 g/day
Then: 10^{-4} →	Applies to: 650 g/day

Reality check: Is anyone talking about keeping the current FCR of 6.5 g/day and making the risk level less protective? Not that we have heard. If the risk level were 10^{-5} and the FCR were 6.5 g/day, then 10^{-4} would apply at 65 g/day. This means that FCR of 65 g/day or less would have to represent the most highly exposed population in WA.

Does this mean that the NTR HHC meet the levels of protection, specified in current EPA guidance, for both the general population and more highly exposed populations in Washington?

We can answer yes for the following situation only:

carcinogenic chemicals only
+
exposed populations with a FCR of 650 g/day or less
+
meets the other exposure assumptions

We still need to examine that question for the non-threshold chemicals (non-carcinogens). Non-threshold chemicals present a different set of issues that may be more challenging to address in criteria calculation than those associated with carcinogens.

What about non-carcinogens?

There are 51 different non-carcinogens on EPA's current recommended HHC list.

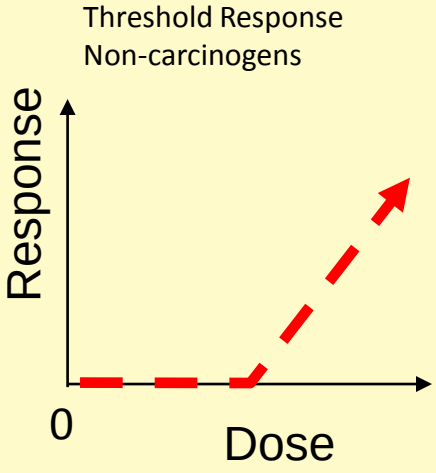
Non-carcinogens are regulated differently because they exhibit threshold responses.

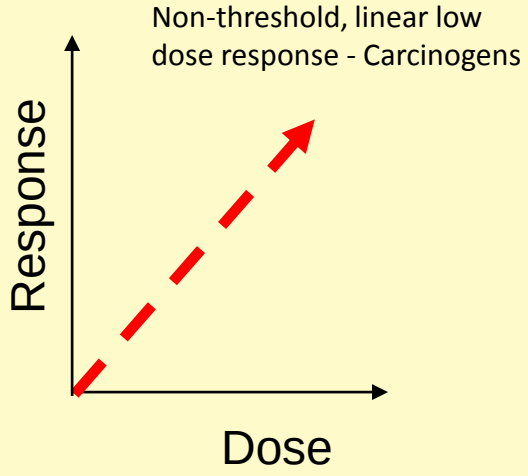
Because non-carcinogens exhibit threshold responses, effects levels can be observed and "safe" doses calculated.

Example chemical:

→ Mercury is a non-carcinogen. The effects of mercury occur over shorter exposure periods (not a 70-year lifetime). The effects last a lifetime. Everyone goes through the developmental period when the effects occur. (We have widespread WDOH fish advisories in WA for mercury in fish.)

The threshold effects exhibited by non-carcinogens will be discussed at PF #5, and at that time we will look at levels of protection for non-carcinogens.





Wrap-up: today's policy and risk management questions for the linear low dose criteria carcinogens include:

1. Should the risk level for linear low dose chemicals for Washington's general population stay at 10^{-6}? This the state's current risk level and is specified in the WQS and the NTR.

- Corollary question - Policy Forum #7 – what metric on the fish consumption rate distribution represents the general population?

2. If the policy decision is made to change the risk level, should any changes that are examined be for **all** the criteria carcinogens, or for a smaller subset? (e.g., the arsenic risk level was changed to 10^{-4} in Maine and Oregon).

3. Should 10^{-6} risk level for linear low dose chemicals be applied to a population other than the general population? If so, what population?

- Corollary question - Policy Forum #7 – what metric on the fish consumption rate distribution represents this alternative population?

What will guide how Ecology develops draft alternatives and recommendations on the policy and risk management questions? We will look to EPA guidance to start with…

Science, science policy, and *risk management*

Risk Management example from EPA (2000):

"Risk management is the process of selecting the most appropriate guidance or regulatory actions by integrating the results of risk assessment with engineering data and with social, economic, and political concerns to reach a decision. In this (EPA 2000) methodology, the choice of a default fish consumption rate which is protective of 90 percent of the general population is a risk management decision. The choice of an acceptable cancer risk by a State or Tribe is a risk management decision."

USEPA. 2000. *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000)*, EPA-822-B-00-004, page 2-3

As we pursue development of new HHC for Washington :

Continue to emphasize *Transparency* in science, science policy, and risk management

"…conclusions drawn from the science are identified separately from policy judgments and risk management decisions, and that the use of default values or methods, as well as the use of assumptions in risk assessments, are clearly articulated."

USEPA. 2000. *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000)*, EPA-822-B-00-004, page 2-3

Also: we look to state and federal legislation and regulation to set requirements and boundaries…

Questions/Comments/Discussion

Discharge scenarios: Does changing the risk level of the criteria change the scenarios?

Policy Forum #3

February 8, 2013

Human Health Criteria and Implementation Tools Rule-makings

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What we will cover today:

Carry over from PF #2 – questions, comments

Implementation Tools: Review variances and compliance schedules

What types of discharges can these tools be applied to? We will cover the situations for:

- Existing dischargers
- New dischargers
- Expanding dischargers

Short review of the context of scenarios

Outcomes of scenarios with criteria that are calculated at different risk levels

- Possible permit limits
- Permit compliance assessment levels (quantitation levels)
- 303(d) listed waters – there will be more of them

Stormwater discussion.

Bill Moore will be with us to answer questions about stormwater permits and the scenarios.

Carry over from Policy Forum #2

- More discussion about discharges into 303(d) listed waters – new and expanding
- Stormwater permit requirements (specific questions from last meeting are at the end of this talk)

Review – Variances and Compliance schedules

What about a variance adopted (1) after new human health criteria are adopted and approved by EPA and (2) under the current WAC language on variances?

If Washington adopts new state-specific criteria, then Washington's human health criteria would no longer be found in federal rule and Ecology could propose a 5-year variance for the water body based on 40CFR131.10(g), 40CFR131.10(g), and WAC 173-201A-420 (https://fortress.wa.gov/ecy/publications/publications/0610091.pdf) .

If supportable, Ecology could formally revise the WQS to incorporate the variance, and submit the revised standards to EPA for CWA approval.

If the variance is approved by EPA, and under the current regulations, Ecology would need to repeat this rule-making process every 5 years as each variance expires.

Under the current water quality standards, language in WAC 173-201A would help guide the permitting requirements for the specific pollutant for which the variance is adopted:

- Current WAC 173-201A-420(1)(c) states that *"Variances may be approved by the department when: … (c) Reasonable progress is being made toward meeting the original criteria."*

Compliance schedules (WAC 173-201A-510(4))

- Only for existing discharges
- Limited to 10 years.

Variances and compliance schedules – where can they be granted?

Draft

Discharge/r type	No 303(d) listing		303(d) with no TMDL		303(d) with a TMDL	
	Can this discharger be granted a Variance?	Can this discharger be granted a Compliance schedule?	Can this discharger be granted a Variance for the pollutant causing the impairment?	Can this discharger be granted a Compliance schedule for the pollutant causing the impairment?	Can this discharger be granted a Variance for the pollutant causing the impairment?	Can this discharger be granted a Compliance schedule for the pollutant causing the impairment?
Existing Discharger	Yes	Yes	Yes	Yes	Yes	Yes
New Discharge	No	No	No	No	No	No
Expanding Discharge = existing discharger + new discharge	Depending on the circumstances: Yes for the existing capacity. No for the expansion. (Expansion treated as a new discharge)		Depending on the circumstances: Yes for the existing capacity. No for the expansion. (Expansion treated as a new discharge)		Depending on the circumstances: Yes for the existing capacity. No for the expansion. (Expansion treated as a new discharge)	

Draft

Variances and compliance schedules – Focus on new and expansions

Discharge/r type	No 303(d) listing		303(d) with no TMDL		303(d) with a TMDL	
	Can this discharger be granted a Variance?	Can this discharger be granted a Compliance schedule?	Can this discharger be granted a Variance?	Can this discharger be granted a Compliance schedule?	Can this discharger be granted a Variance?	Can this discharger be granted a Compliance schedule?
Expanding Discharge = existing discharger + new discharge	Depending on the circumstances: Yes for the existing capacity. No for the expansion. (Expansion treated as a new discharge)		Depending on the circumstances: Yes for the existing capacity. No for the expansion. (Expansion treated as a new discharge)		Depending on the circumstances: Yes for the existing capacity. No for the expansion. (Expansion treated as a new discharge)	
Question: Could a new discharge or an expansion of an existing discharge, that will discharge the pollutant causing the impairment, be permitted in a 303(d) listed waterbody segment?			**Answer:** Yes. This could be permitted if it could be shown that the discharge would not cause or contribute to a violation of the WQS.		**Answer:** Yes. This could be permitted if it could be shown that (1) the TMDL indicates that there are sufficient remaining pollutant load allocations for the discharge of the pollutant causing the impairment, and (2) all discharges that need compliance schedules to get the waterbody segment back into compliance are under compliance schedules.	

Discharge Scenarios - Policy Forum #3

Hypothetical draft scenarios were developed to assist in discussions surrounding the development of new human health criteria and new implementation tools for Washington's Surface Water Quality Standards (WQS).

The scenarios are best estimates of likely permitting outcomes, but have not undergone thorough legal and technical review, thus in some cases alternative approaches or different approaches might be available. They are DRAFT.

As with all permitting decision, discharge-specific and location-specific information affects final requirements.

The scenarios were developed in large part to prompt discussion of *difficult* permitting situations (except Scenario 1a).

The majority of permitting situations in Washington are not as difficult as those highlighted here.

While the scenarios focus on only a few key parameters, most criteria parameters for the majority of dischargers are not found at levels that result in the need for effluent limits.

Scenarios using alternative criteria – how will we recalculate the criteria in the scenarios?

	Risk Level	FCR	Comment
Current Criteria (NTR) :	10^{-6}	6.5	This is the current situation in the scenarios (last meeting focus)
For this meeting's examination of the scenarios, criteria were recalculated at:	10^{-5}	17.5	Note: These examples are not proposals or recommendations. No risk management decisions surrounding use of these choices for criteria development or adoption has been considered or made (other then the decision to use them as examples to support discussion).
	10^{-6}	17.5	

Scenarios 1a and 1b – Recalculated criteria for PCBs, marine setting

FCR = 17.5 g/day (the EPA 2000 recommended FCR for the general population)
Risk Levels: 10^{-6}, 10^{-5}

Chemical(s) and QLs (QLs in ug/L)	NTR criteria	Criteria calculated for "Organisms only," because this is a marine scenario	
		Criterion at 10^{-6} and FCR = 17.5	Criterion at 10^{-5} and FCR = 17.5
PCBs	**0.00017**	0.000064	0.00064
Method 608 QL	0.5	0.5	0.5
Method 1668 QL (per individual congener)	0.00001*	0.00001*	0.00001*
Mercury	0.025 (chronic criterion)	The 303(d) listing in Scenario 1b is for the aquatic life-based criteria. HHC not recalculated here because mercury is a non-carcinogen – 10^{-6} and 10^{-5} risk levels do not apply to this chemical	

* Indicates that criteria levels can be measured by this method. Method 1668 C is not approved for 40CFR136 use.

Scenario 3– Recalculated criteria for DDT, freshwater setting

FCR = 17.5 g/day (the EPA 2000 recommended FCR for the general population)
Risk Levels: 10^{-6}, 10^{-5}

Chemical(s) and QLs (QLs in ug/L)	NTR criteria	Criteria calculated for "Water + Organisms."	
		Criterion at 10^{-6} and FCR = 17.5	Criterion at 10^{-5} and FCR = 17.5
DDT	0.00059	0.0002	0.002
Method 608 QL	0.05	0.05	0.05

Scenarios 1a and 1b

Scenarios 1a and 1b show the same waterbody and discharger information, but differ in whether a 303(d) listing exists and TMDL has been required.

West side marine scenario with PCBs and mercury at issue.

Scenario #	Waterbody and Discharge Situation	
1a	303(d) listings:	None
	TMDL status:	NA
	Discharges:	POTW Stormwater – municipal and industrial permits 5 Industries
1b	303(d) listings:	Mercury and PCBs
	TMDL status:	Completed and loads allocated, the water is no longer on the 303(d) list
	Discharges:	POTW Stormwater - municipal and industrial permits 5 Industries Contaminated sites

Industrial stormwater was added to these scenarios since the last meeting.

Scenario 3

East-side scenario with DDT at issue.

Scenario #	Waterbody and Discharge Situation	
3	303(d) listings:	DDT
	TMDL status:	Completed and loads allocated, the water is no longer on the 303(d) list
	Discharges:	POTW 1 Industry

Scenarios 1a and 1b – the picture

Waterbody:

- Marine shoreline area with healthy shellfish beds located nearby and active sport fishing for both fish and shellfish in the area.
- Rainfall is heavy and generally confined to the fall/winter/spring months.

Human Development and Discharges:

- Urban area with one municipality (approximately 100,000 people)
- Secondary treatment plant (POTW) and several stormdrains. Municipal and industrial permitted stormwater.
- One contaminated site located along the shoreline where clean-up levels are being developed to address historic contamination of PCBs and mercury.
- Three industries (Industries A-C) discharge directly to the water.
- Growth projections for this area indicate that populations will increase and there will be growth both within and outside the service area of the POTW.
- Two new industries (Industry D and Industry E) from outside the state are considering locating facilities in this city.
- The POTW is running close to design capacity, and the city expects that it will need to expand the POTW in the near future to handle additional population growth.
- The natural landscape and climate preclude removal of the discharge from the water and movement to land discharge.

Scenario 1a – waterbody and discharge information

Focus on PCBs and mercury
PPS = Priority Pollutant Scan

The permit requirements below apply to current criteria and recalculated criteria, with routine PPS's using Method 608

Waterbody – criteria and uses met so no 303(d) listing (if new criteria result in a 303(d) listing then this scenario shifts to Scenario 1b)		**Permit Requirements for PCBs/mercury**
Discharger	Effluent data	Permit requirements
POTW – w/ facility expansion	Meeting all permit limits, PPSs do not detect PCBs, mercury is detected	No PCB or mercury limit.
Stormwater - municipal	In compliance under the Phase 1 Municipal Stormwater general permit.	None.
Stormwater - industrial	In compliance under the Industrial Stormwater general permit.	None
Industry A – existing and expanding	Meeting all permit limits, PPSs do not detect PCBs, mercury is detected	No PCB or mercury limit.
Industry B - existing	PPSs do not detect PCBs or mercury	None
Industry C - existing	PPSs do not detect PCBs or mercury	None
Industry D - new	The facility will generate mercury in its processes, no detectable PCBs.	Mercury
Industry E - new	The facility will generate small concentrations of mercury in its processes, no PCBs.	None

Scenario 1b – TMDL information

PCBs:

- Tissues from resident sport fish were used to determine that the fishable use of the waterbody was impaired for PCBs (based on use of fish tissue equivalent concentrations).

- The Department of Health is evaluating fish tissue information to see is a fish advisory is needed.

- PCBs are present in sediments, tissues, and also in sources as diverse as storm drains, treated municipal and industrial effluent streams, upland and in-water contaminated sites, and atmospheric deposition (from out-of-state sources).

- Modeling indicates that after the measured sources (apart from atmospheric deposition) are accounted for (and are significantly reduced) it will likely take approximately 20 additional years for natural attenuation to remove PCBs from the aquatic system or otherwise make them unavailable to the food web (e.g., burial).

- Allocations for PCBs have been made in the TMDL. Because there is no assimilative capacity and only reductions are required, wasteload allocations for point sources are set to meet the PCB criteria at the end of the pipe.

Mercury – Not covered today because no changes to prior criteria or effluent limit situation

Scenario 1b – waterbody and discharge information

DRAFT

Waterbody segment – Segment was 303(d) listed, TMDL has been completed, water no longer on 303(d) list		Permit requirements for PCBs and mercury – current criteria	Permit requirements for PCBs and mercury – New 10^{-6} and 10^{-5} risk level criteria
Discharger	Effluent data – PCBs measured using Method 1668C – very sensitive	Post-TMDL Permit Requirements	Post-TMDL Permit Requirements
POTW, facility expansion in future	PCBs and mercury detected	PCB and mercury limits = criteria at the end of pipe, 10-year compliance schedule for existing	PCB and mercury limits = criteria at the end of pipe, 10-year compliance schedule for existing
Stormwater - municipal	No PCB or mercury limits	No immediate change – current permitting approach and actions	No immediate change - current permitting approach and actions
Stormwater-industrial	Mercury monitoring and **limits went into effect when the segment was 303(d) listed for mercury** (as per existing ISW general permit, Table 5)	No limits on PCBs. For mercury: additional requirements based on TMDL, issued via order (orders are appealable).	No limits on PCBs. For mercury: additional requirements based on TMDL, issued via order (orders are appealable).
Industry A – existing and expanding	PCBs and mercury detected	PCB and mercury limits = criteria at the end of pipe, 10-year compliance schedule for existing	PCB and mercury limits = criteria at the end of pipe, 10-year compliance schedule for existing

Yellow rows: These dischargers have PCB limits	The current municipal and industrial stormwater permits include specific approaches to address pollutants causing criteria exceedances.

Scenario 1b – waterbody and discharge information

DRAFT

Waterbody – Water was 303(d) listed, TMDL has been completed, water no longer on 303(d) list		Permit requirements for PCBs and mercury – current criteria	Permit requirements for PCBs and mercury – New 10^{-6} and 10^{-5} risk level criteria
Discharger	Effluent data – PCBs measured using Method 1668C – very sensitive	Post-TMDL Permit Requirements	Post-TMDL Permit Requirements
Industry B - existing	No PCBs, mercury is present	Mercury limits = criteria at the end of pipe, 10-year compliance schedule	Mercury limits = criteria at the end of pipe, 10-year compliance schedule
Industry C - existing	No PCBs or mercury present	No effluent limits	No effluent limits
Industry D - new	PCBs and mercury will both be present.	No permit issued. Cannot meet criteria-based effluent limits for PCBs at end-of-pipe.	No permit issued. Cannot meet criteria-based effluent limits for PCBs at end-of-pipe.
Industry E - new	Mercury will be present, no PCBs	Permit issued if criteria-based effluent limits for mercury can be met at end-of-pipe.	Permit issued if criteria-based effluent limits for mercury can be met at end-of-pipe.

Yellow rows: These dischargers have PCB limits

PCBs are not known to be present in these discharges, so no PCB limits.

Scenario 3– the picture

Waterbody:

- This is a mid-sized perennial stream in eastern Washington with reproducing native fish populations. The area supports a popular recreational fishery composed of resident fish and anadromous salmonids. The climate is generally dry with typical east-side snowmelt-driven high flows in spring and lower flows through the remainder of the year.

Human Development and Discharges:

- There is one town (4,000 population) located on the waterbody. The land uses along the stream are primarily agricultural uses.
- The town is served by a secondary treatment plant (POTW) and a few storm drains are located along the shoreline.
- The POTW and a fruit-packing plant are the only permitted discharges to the waterbody.
- It would be possible to remove the discharges from the waterbody and discharge to ground, but the cost to the town and the industry would be high.
- The effluents are currently providing flows to the stream that help maintain the stream's perennial flows and reproducing fish populations.

Scenario 3 – TMDL information

DDT:

- Tissues from resident sport-fish were used to determine that the fishable use of the waterbody was impaired for DDT.
- Fish showed high levels of the contaminant, and water column data indicate that significant reductions in DDT to the system will need to be made in order for WQS to be met.
- The Department of Health is evaluating fish tissue information to see is a fish advisory is needed.
- DDT is present in sediments, tissues, and also in sources as diverse as storm drains, treated municipal and industrial effluent streams, and agricultural drains.
- Modeling indicates that after the measured sources are accounted for (and are significantly reduced) it will likely take approximately 5-10 additional years for natural attenuation to remove most of the DDT from the aquatic system or otherwise make it unavailable to the food web (e.g., burial).
- Allocations for DDT have been made in the TMDL. Because there is no assimilative capacity and only reductions are required, allocations are set to meet the DDT criteria at the end of the pipe.

Scenario 3 – Community involvement

The local city government, the fruit-packing plant, the agricultural community, and residents in the area have been very involved with the TMDL development.

The major concerns with regard to required DDT reductions have been (1) the fear that requirements for DDT reductions will impact agricultural uses, and (2) that the POTW and fruit-packing plant have no economically feasible ways to meet end-of-the pipe limits for DDT set at the criterion level.

During the TMDL the local stakeholders, working with Ecology staff, developed a plan to focus on four DDT control strategies (following slide)

Scenario 3 – Community involvement

During the TMDL the local stakeholders, working with Ecology staff, developed a plan to focus on four DDT control strategies:

- Reduce DDT by reducing sediment in run-off waters entering the stream: Plant trees and other vegetation along the riparian corridor to filter out sediment. Because agriculture in this area is mostly crops the riparian corridor will need little fencing to exclude livestock. Local land owners agree to this approach and funds for purchase of plants and labor is provided by the town, Ecology grants, and local conservation district assistance. Local school and youth groups also provide volunteer labor to assist Ecology field crews in planting vegetation.
- Reduce DDT by removing sediment from agricultural drains. Different irrigation techniques will be investigated by the local community to determine effective approaches. Less erosive tillage and planting techniques will be investigated. Funding to help implement changes will be sought from state and federal sources.
- The POTW and municipality will work to reduce DDT entering the POTW collection system and also to reduce erosion into storm drains which drain to the stream. This will include BMPs for stormwater.
- The fruit-packing plant, which receives DDT into its system the fruit it processes, will work with its suppliers to reduce DDT on produce received at the plant, and will also investigate the possibility of discharge to land or to ground.

Scenario 3 – waterbody and discharge information

Permit limits equal criteria because the waterbody exceeds criteria.

Waterbody – Water was 303(d) listed, TMDL has been completed, water no longer on 303(d) list		**Permit requirements for DDT only – current criteria**	**Permit requirements for DDT– New 10^{-6} and 10^{-5} risk level criteria**
Discharger	Effluent data	Post-TMDL Permit Requirements	Post-TMDL Permit Requirements (**unchanged**)
POTW	DDT present in discharge and in storm drains	5-10-year compliance schedule, final limits = criteria at end-of-pipe. Work to control DDT into storm drains.	5-10-year compliance schedule, final limits = criteria at end-of-pipe. Work to control DDT into storm drains.
1 Industry - Fruit packing Plant	DDT present in discharge	5-10-year compliance schedule, final limits = criteria at end-of-pipe. Will investigate discharge to ground and work with suppliers.	5-10-year compliance schedule, final limits = criteria at end-of-pipe. Will investigate discharge to ground and work with suppliers.

Source	**Source data**	**Post-TMDL BMPs**
Agriculture	DDT present	This group will investigate BMPs and plant riparian vegetation

Summary of the changes to the scenario discharge requirements, based on calculating new criteria

The new PCB and DDT criteria resulted in new effluent limits for point source dischargers that already had effluent limits – effluent limits in all cases set equal to the criteria.

Will be able to measure compliance at the effluent limit (the criterion) for PCBs if Method 1668C is used. If Method 608 is used, then any detect will show a concentration above the limit. With Method 608 compliance assessment remains virtually unchanged.

All point source effluent limits for DDT will be based on meeting criteria at the end of the pipe. Any detected concentration using Method 608 will show a concentration above the limit. With Method 608 compliance assessment remains virtually unchanged.

The greatest effect on permitting could occur from additional 303(d) listings, which would move waters from the Scenario 1a to the 1b situation, and add more waters to the Scenario 3 situation.

Municipal stormwater questions:

Question 1: What would the potential impacts of new HHC be on permittees in both Eastern and Western WA?

Response: The most immediate impact would likely be additional 303(d) listed waterbody segments as criteria are implemented (under the current 303(d) listing policy). The current permits contain requirements for discharges to 303(d) listed waterbody segments for which Total Maximum Daily Load (TMDL) studies have been completed and approved by EPA. These requirements contain a series of actions for permittees to take if the TMDL identifies municipal stormwater discharges as a cause of or contributor to the impairment, and if the actions for the stormwater system go beyond the regular permit requirements. Ecology incorporates them when reissuing the permit, unless there is a compelling reason to bring them in sooner.

Question 2: Permits require compliance with all approved water quality standards in accordance with RCW 90.48.520. The Permit does not authorize a discharge which would be a violation of Washington State Surface Water Quality. Would this requirement of the Municipal Stormwater Permits make any changes to water quality standards immediately applicable under the permits?

Response: There is an unambiguous requirement that permittees not cause or contribute to exceedances of water quality standards. This condition is already in the permits for the current standards. Actions required in the permits provide a path for permittees to address situations where criteria are exceeded in waters. Permittees that follow this path are not in violation of the permit.

Municipal stormwater general permits: http://www.ecy.wa.gov/programs/wq/stormwater/municipal/index.html

"303(d) listing policy": Ecology Policy 1-11: http://www.ecy.wa.gov/programs/wq/303d/policy1-11.html. **Chapter 1: Assessment of Water Quality for the Clean Water Act Sections 303(d) and 305(b) Integrated Report** (PDF)

Industrial stormwater questions:

Question 1: What about industrial stormwater discharges to 303(d) listed waterbody segments, pre-TMDL (this means Category 5)?

Response: The industrial stormwater general permit currently contains specific language addressing discharges to 303(d) listed waterbody segments. At present Table 5 (page 32) contains monitoring requirements and limits applicable to 303(d) listed waters for the following parameters:

Turbidity	TSS	Copper	Pentachlorophenol
pH	Phosphorus (total)	Lead	Mercury
Fecal coliform bacteria	Ammonia	Zinc	

Question 1: How would industrial stormwater permits be changed by new HHC?

Response: There would be no immediate change. The current industrial stormwater permit expires 1/1/2015 at which time the requirements may change.

Industrial stormwater general permits:
http://www.ecy.wa.gov/programs/wq/stormwater/industrial/permitdocs/iswgpfinal051612.pdf. See section 6.

Next Policy Forum

Focus on specific chemicals:

Criteria development and implementation issues surrounding arsenic, PCBs, and mercury.

Questions/Comments/Discussion

Thank you!