

PCBs in Portland Harbor What we're Learning

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PCB Workshop – July 2009





Wide Range of Sources

- Ship construction, repair and maintenance (metals, TBT, PCBs)
- Chemical manufacturing (pesticides, dioxins, perchlorate, Cr VI)
- Wood treating (PAHs, PCP, metals)
- Bulk petroleum storage (TPH, PAHs)
- Manufactured gas plant (PAHs, Benzene, Cyanide)
- Railroad yards (PAHs)
- Metals production, fabrication and recycling (metals, PCBs)
- Industrial and urban stormwater migration pathway (metals, PCBs, phthalates, pesticides)

1997 - 2001

Pre-RI/FS

- Site Investigation
- NPL Listing
- AOC
- MOU

2002/2003

Begin Round 1 Work Plan

- ROUND 1 SAMPLING:**
- Fish Tissue
 - Sediment
 - Bathymetry

Summer 2004

Approved Work Plan and Field Sampling Plan

- ROUND 2A SAMPLING:**
- Surface
 - Subsurface
 - Bioassays

Fall 2004

Round 1 Site Characterization Report

- ROUND 2A SAMPLING:**
- Surface Water
 - Groundwater pilot

Winter 2005

Step 1 Hydro Model Report

- ROUND 2A SAMPLING:**
- High Flow Surface Water

Spring 2007

Round 2 Report

- ROUND 3A SAMPLING:**
- Sturgeon
 - Storm Water

Fall 2006

Framework Issues

- ROUND 3A SAMPLING:**
- lamprey
 - Up & downstream
 - Surface Water

Fall 2005

Food Web Model Report

- ROUND 2B SAMPLING:**
- Benthic (clams)
 - Groundwater

Summer 2005

Round 2A Data Report

- ROUND 2B SAMPLING:**
- Sediment Cores
 - Subyearling Chinook

Summer/Fall 2007

F&T Model Report

- ROUND 3B SAMPLING:**
- Biota Tissue
 - FS (N&E)
 - Risk (bioassay)

2008

Round 2 Report Comments

- FS SAMPLING:**
- Side Scan Sonar
 - Leachate Testing
 - Sediment Traps
 - PRP Search

2009

Draft RI and Baseline Risk Assessment

2010

Draft FS Report

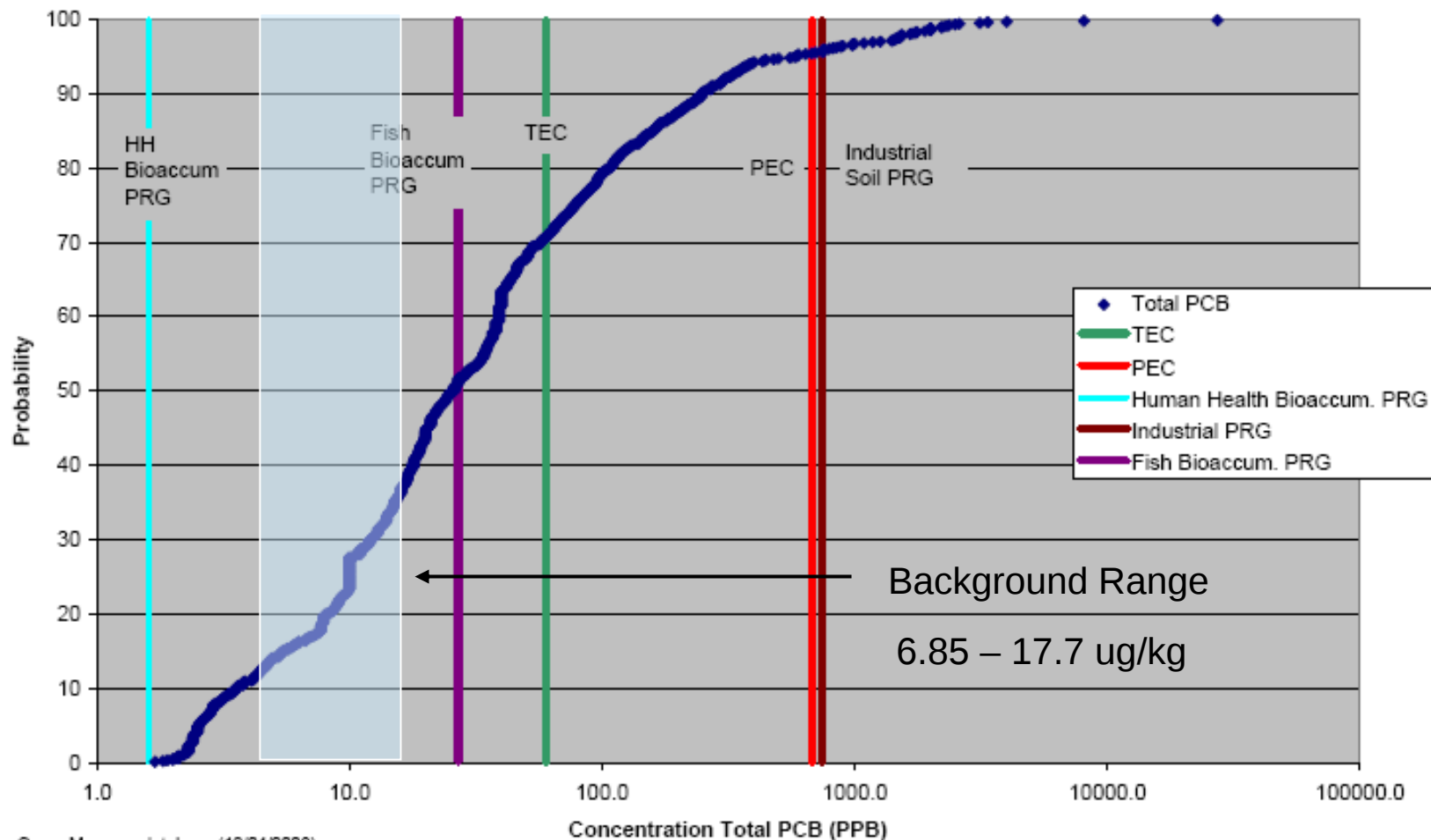
Portland Harbor Remedial Investigation and Feasibility Study

Portland Harbor RI/FS Data Collection

- 1900 Surface sediment chemistry samples
- 1800 Subsurface sediment chemistry samples
- 290 Sediment bioassays
- 375 tissue samples – 16 species or life stage
- Seven rounds of surface water sampling
- Nine sites with transition zone water sampling
- Comprehensive stormwater investigation
- Various other tests –
 - Bathymetry, SPI and grain size, radionuclides, SedFlume, sediment traps and leachate tests

PCB Sediment Data

Total PCB (PPB) calculated
Surface Sediment Cumulative Distribution

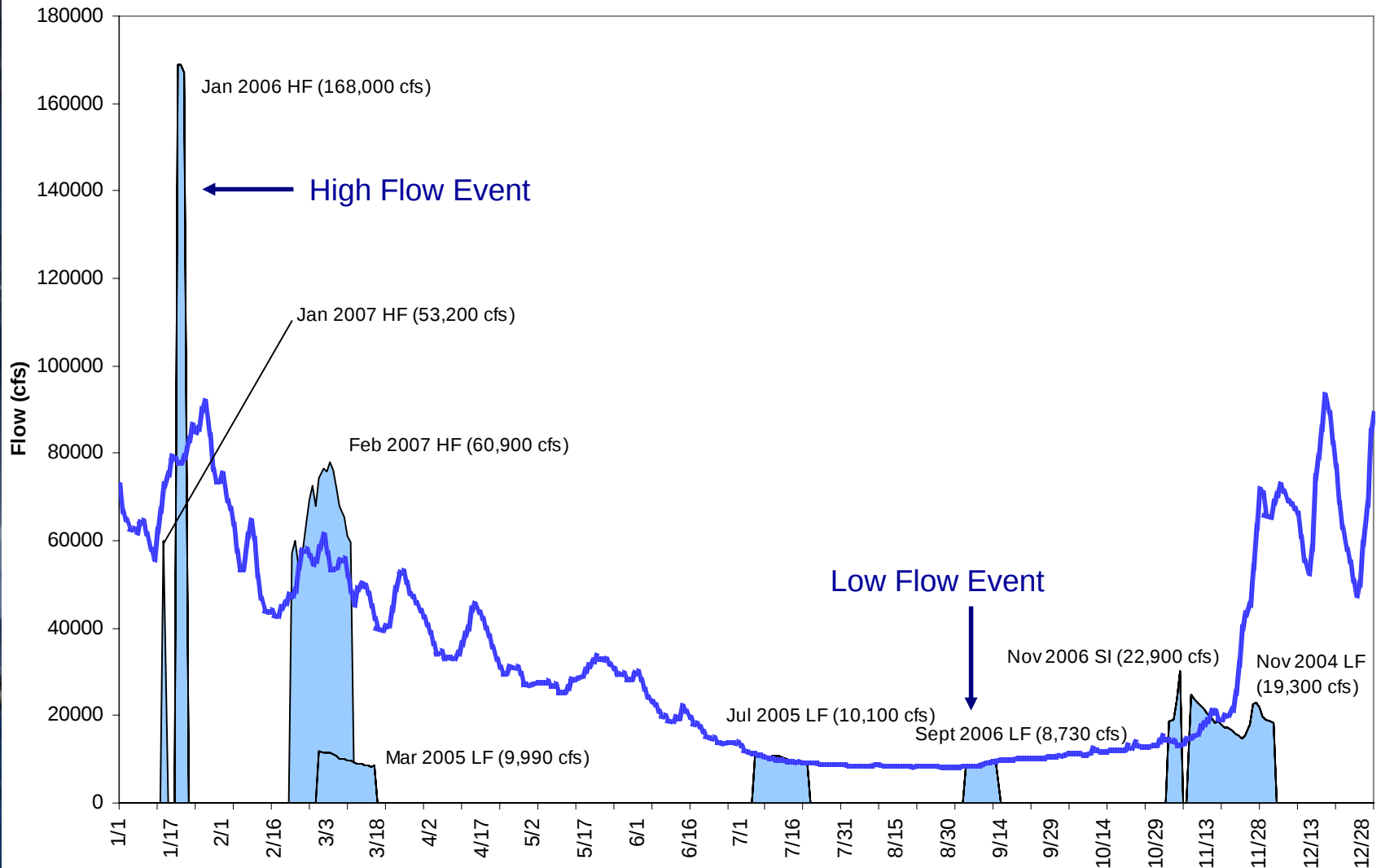


Query Manager database (12/04/2006)
Cat1Risk designation
Guidelines/Thresholds are for display only
and do not constitute NOAA or Trustee policy
<http://response.restoration.noaa.gov/watersheddownloads>

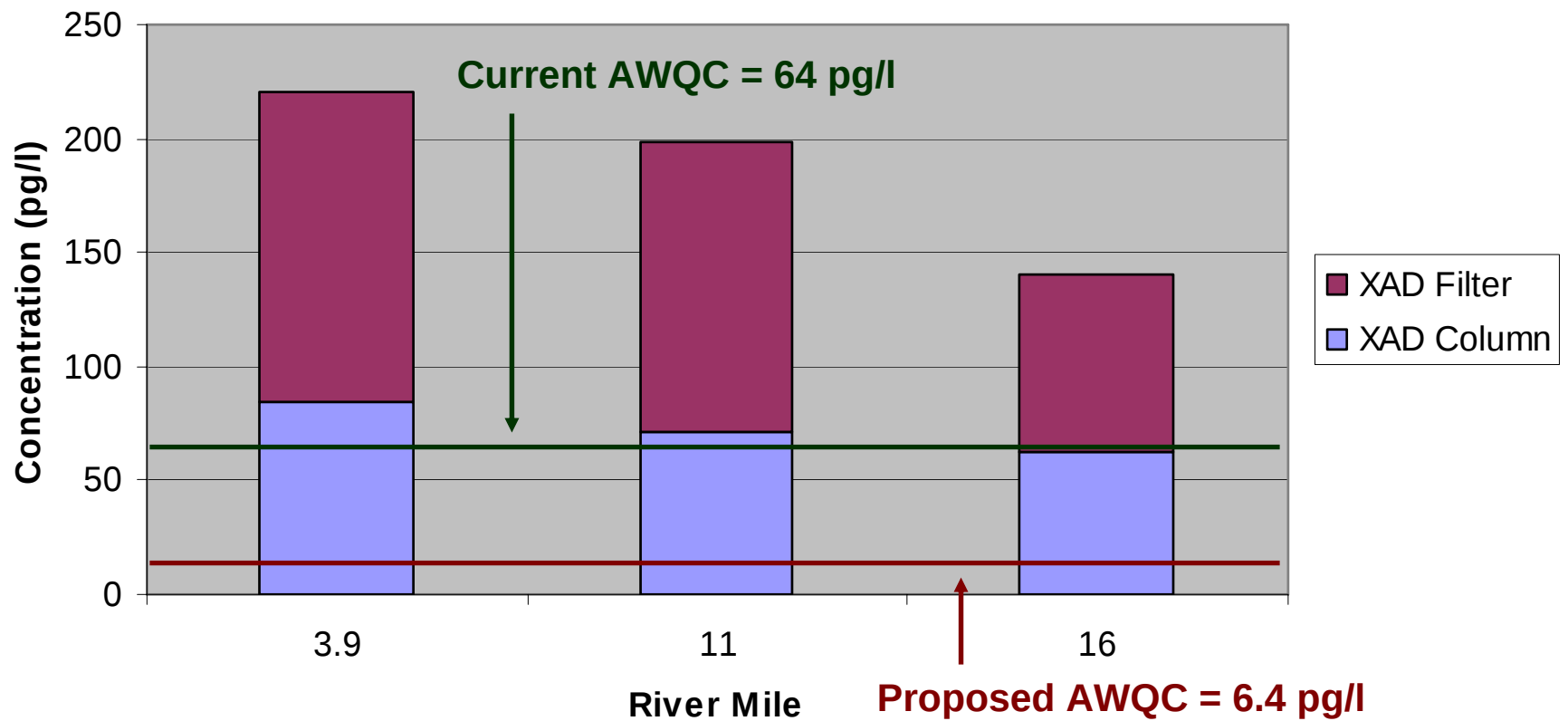
NOAA Office of Response & Restoration
Assessment & Restoration Division
B.Shorr

PCB Water Data

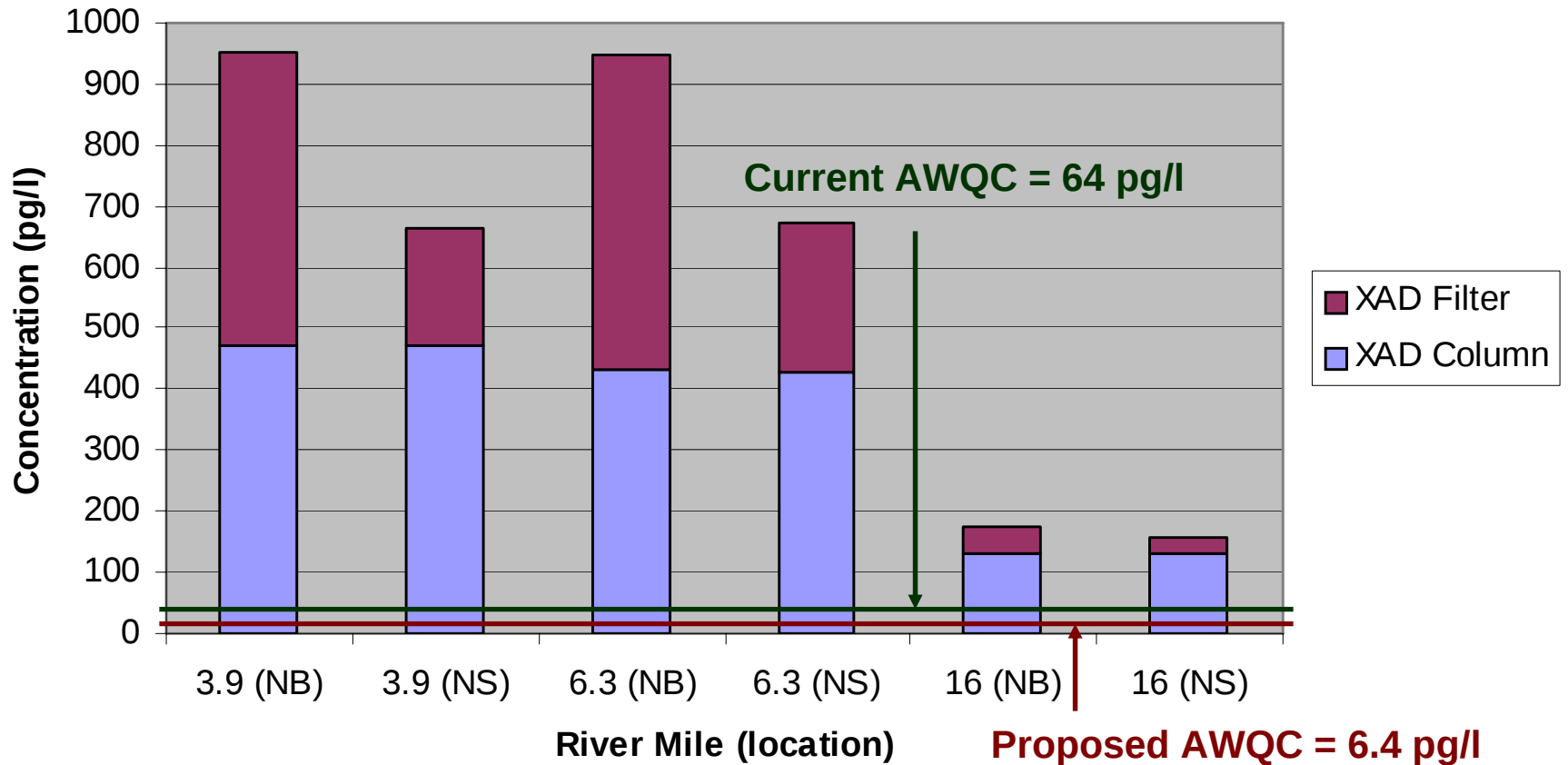
Surface Water Sampling Events and Average Flow Year



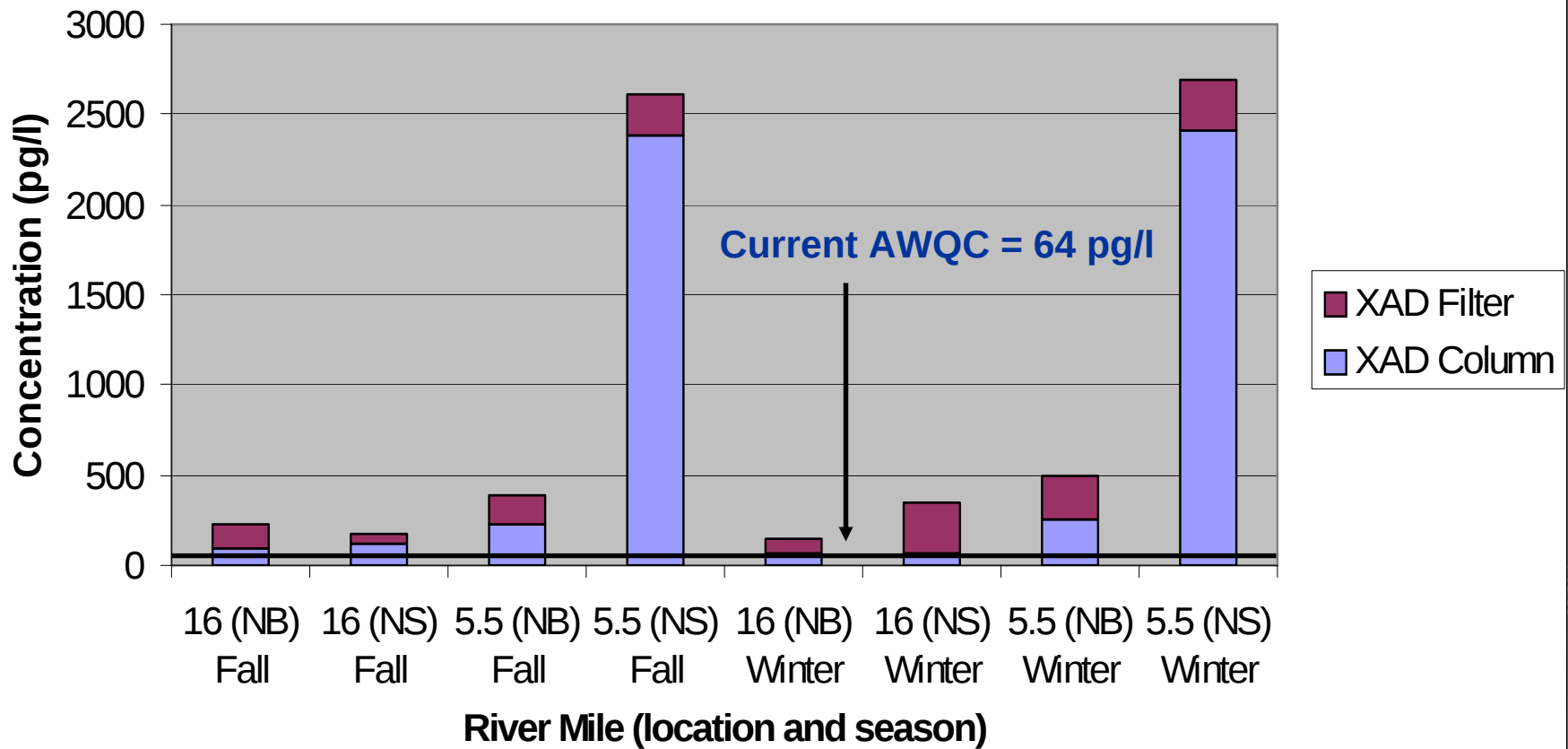
Total PCBs in Surface Water January 2006 (170,000 CFS)



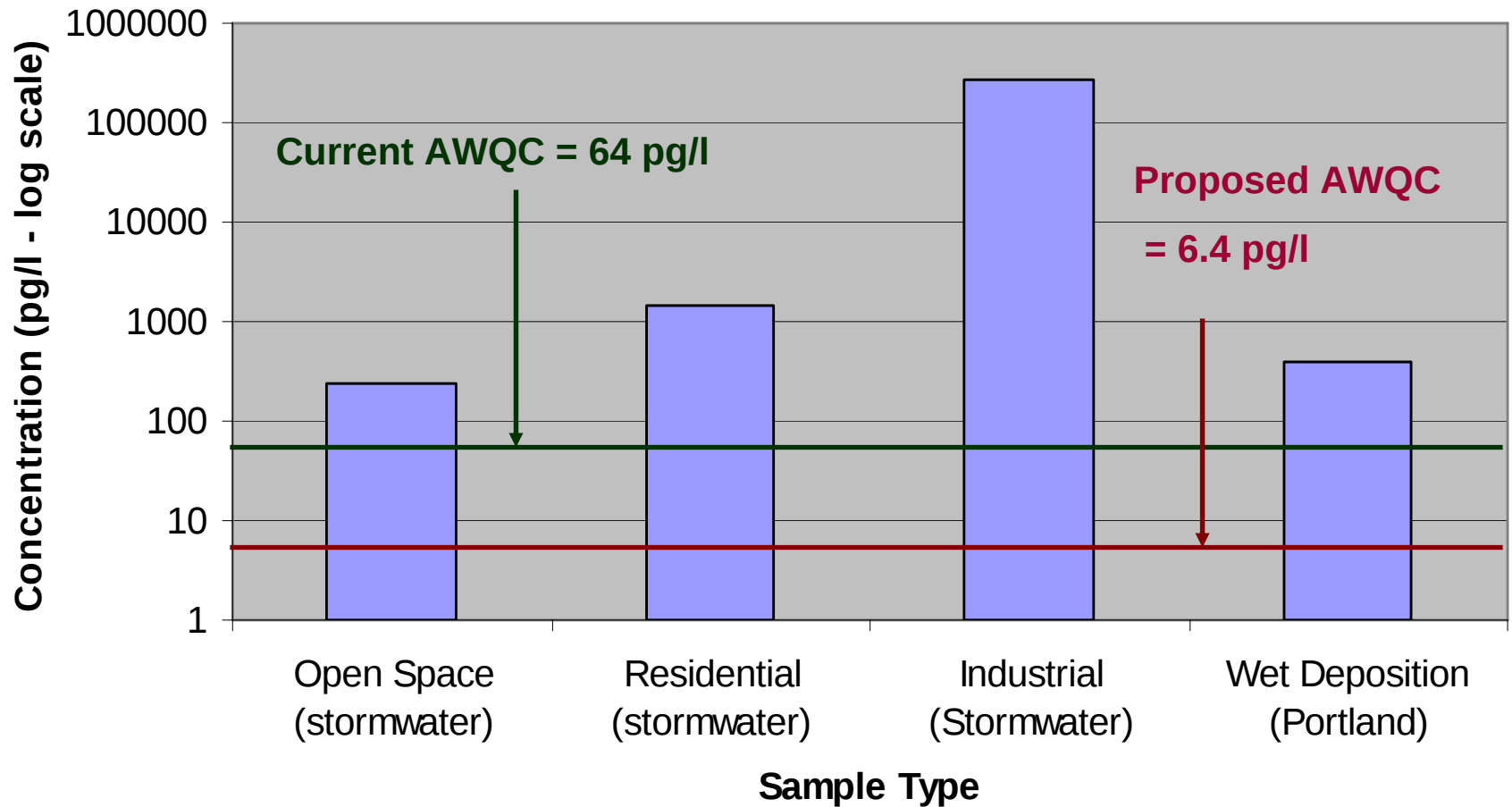
Total PCBs in Surface Water September 2006 (8730 CFS)



Total PCBs in Surface Water Source Specific - Fall and Winter

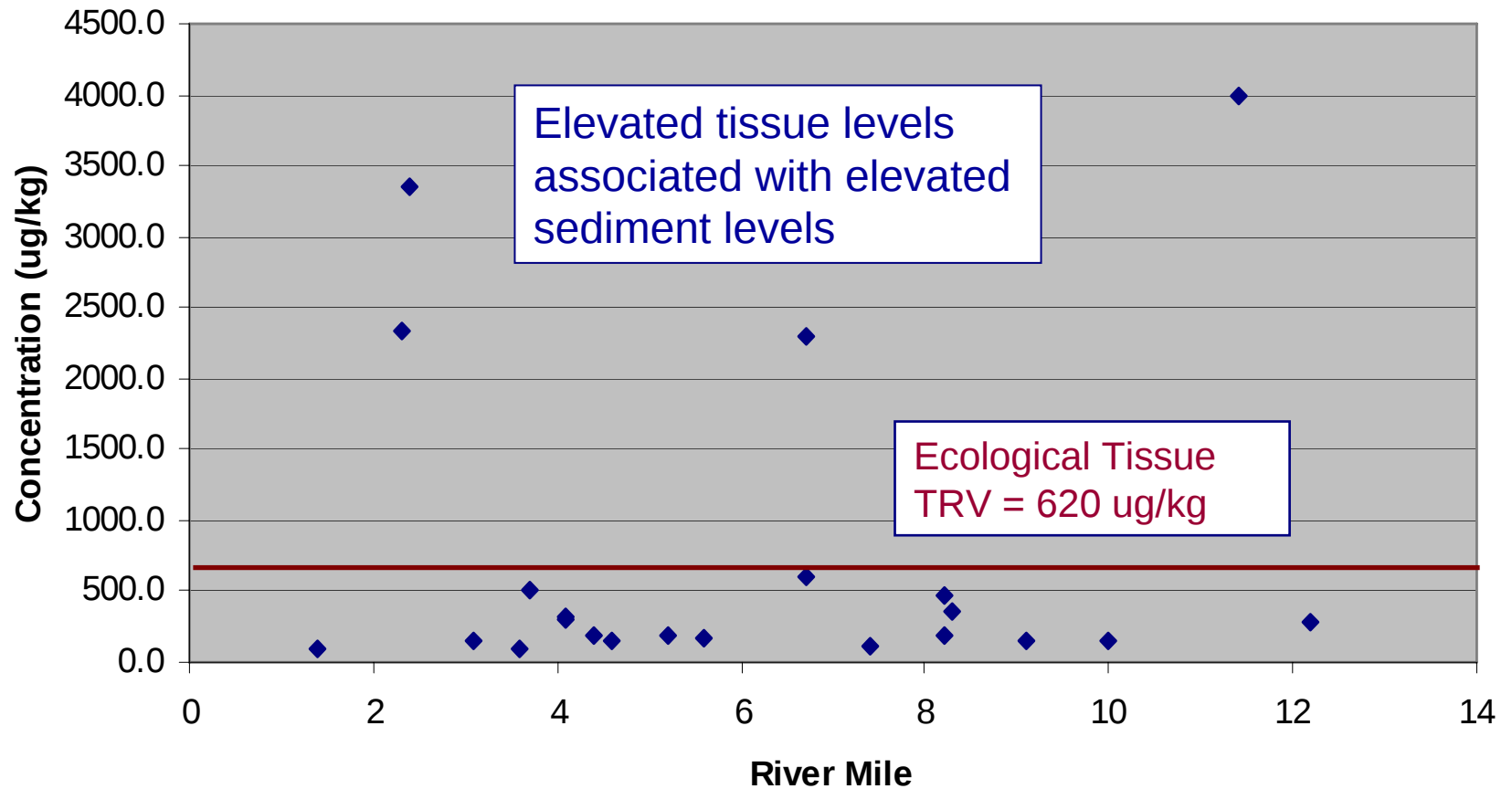


Total PCBs in Storm and Rain Water



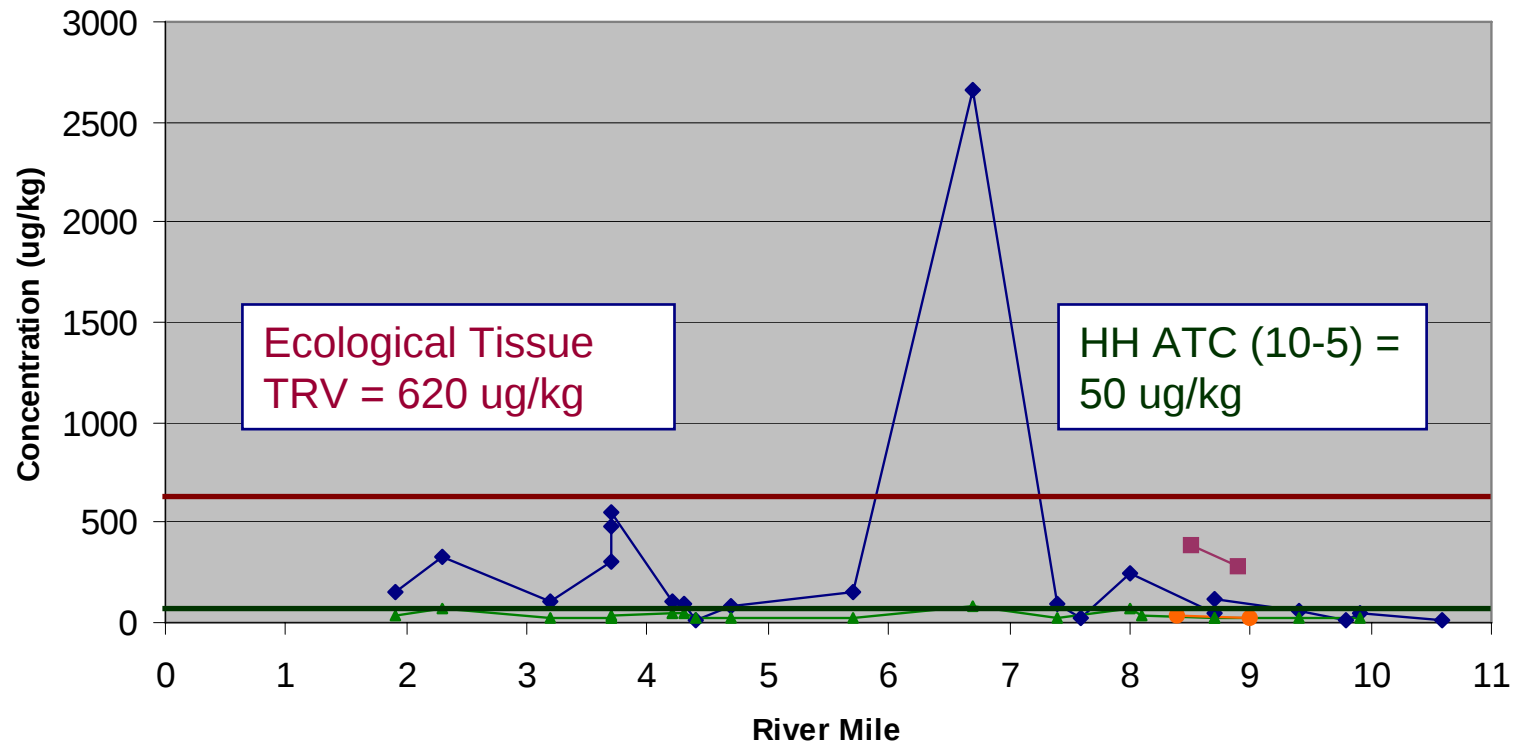
PCB Tissue Data - Sculpin

**Total PCBs in Sculpin by River Mile
East Side of River**



PCB Tissue Data - Clams

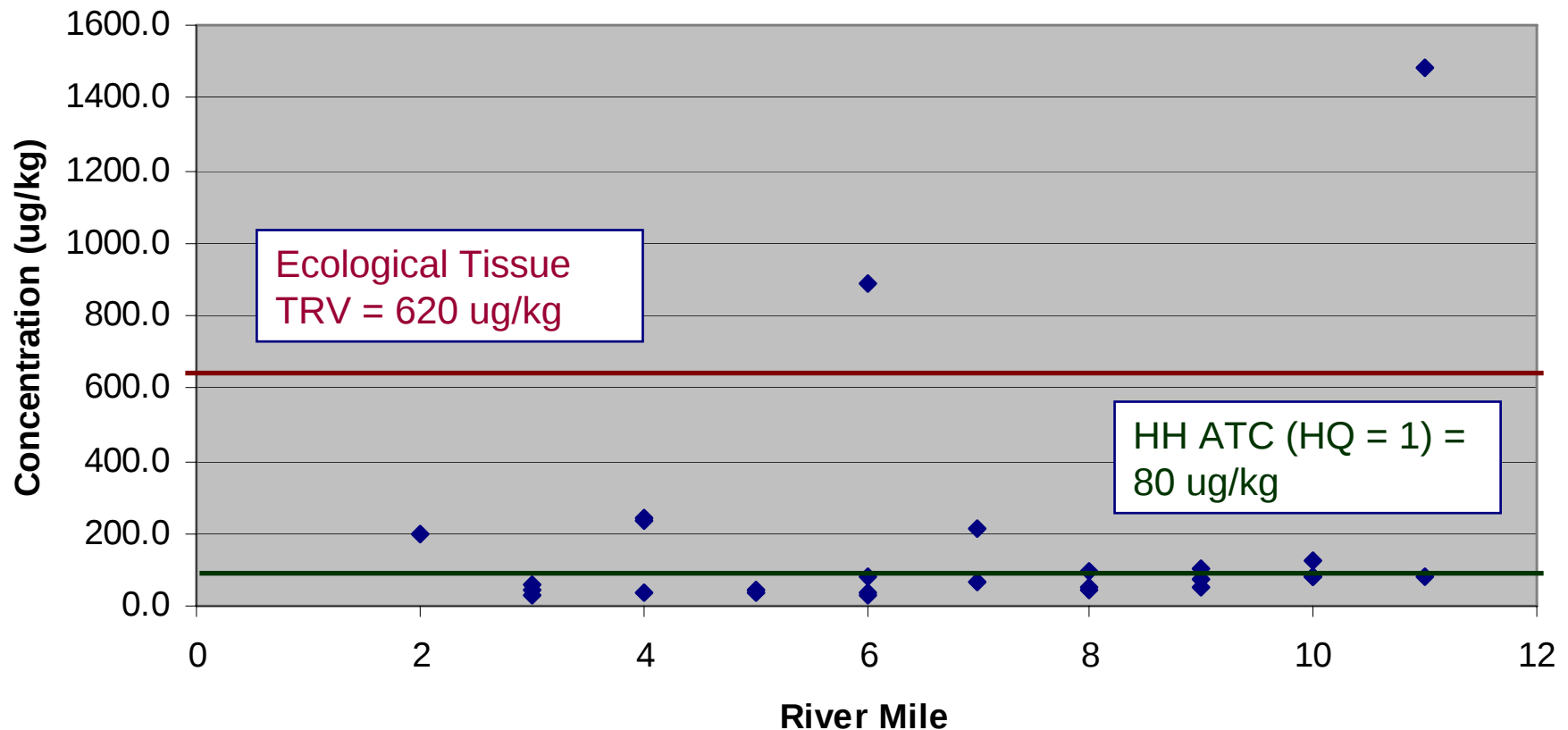
Total PCBs in Clam Tissue by River Mile
East Side of River



◆ Field ■ Field (SI Lagoon) ▲ Lab ● Lab (SI Lagoon)

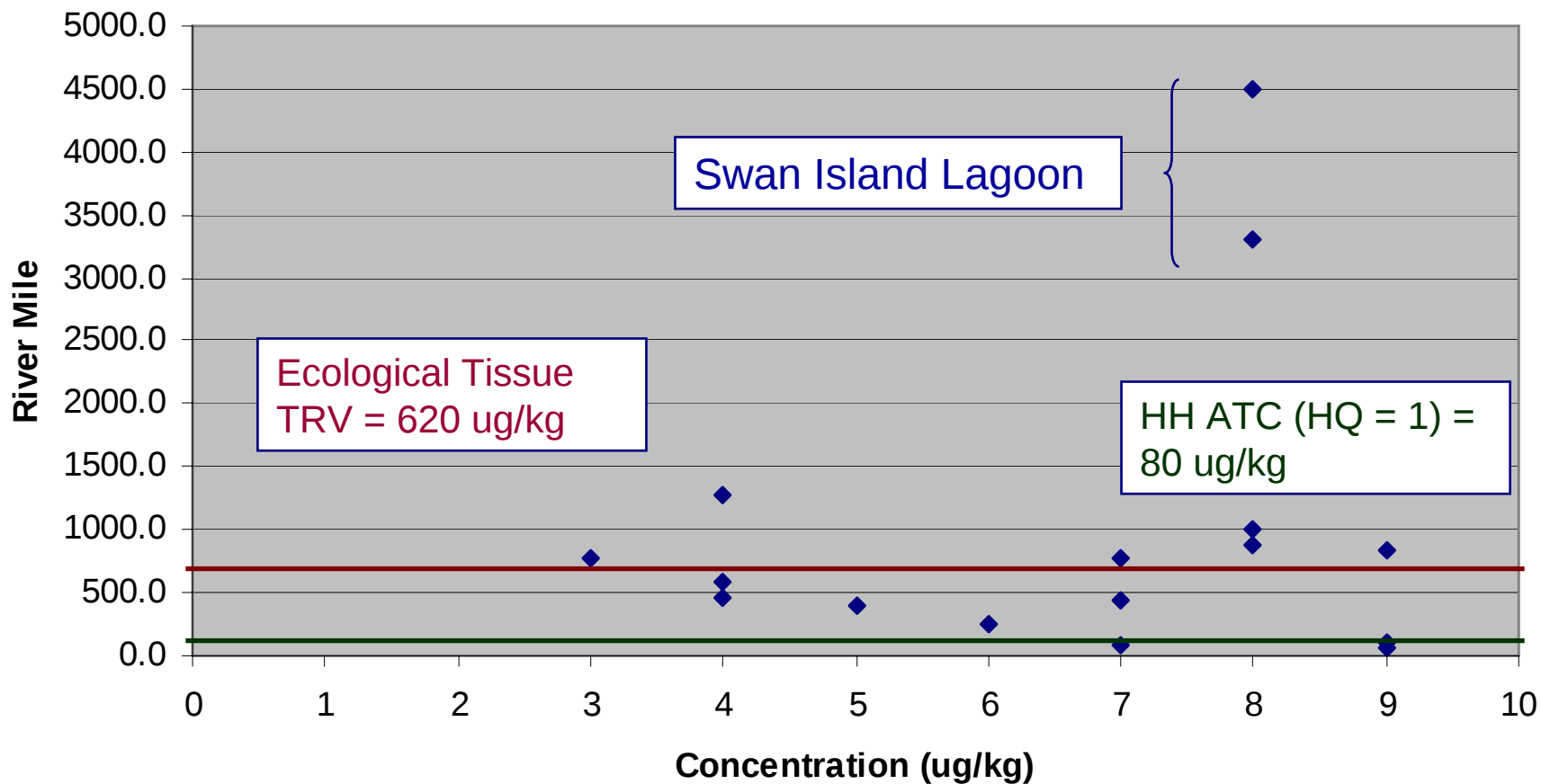
PCB Tissue Data - Bass

Total PCBs in Small Mouth Bass
(Fillet)

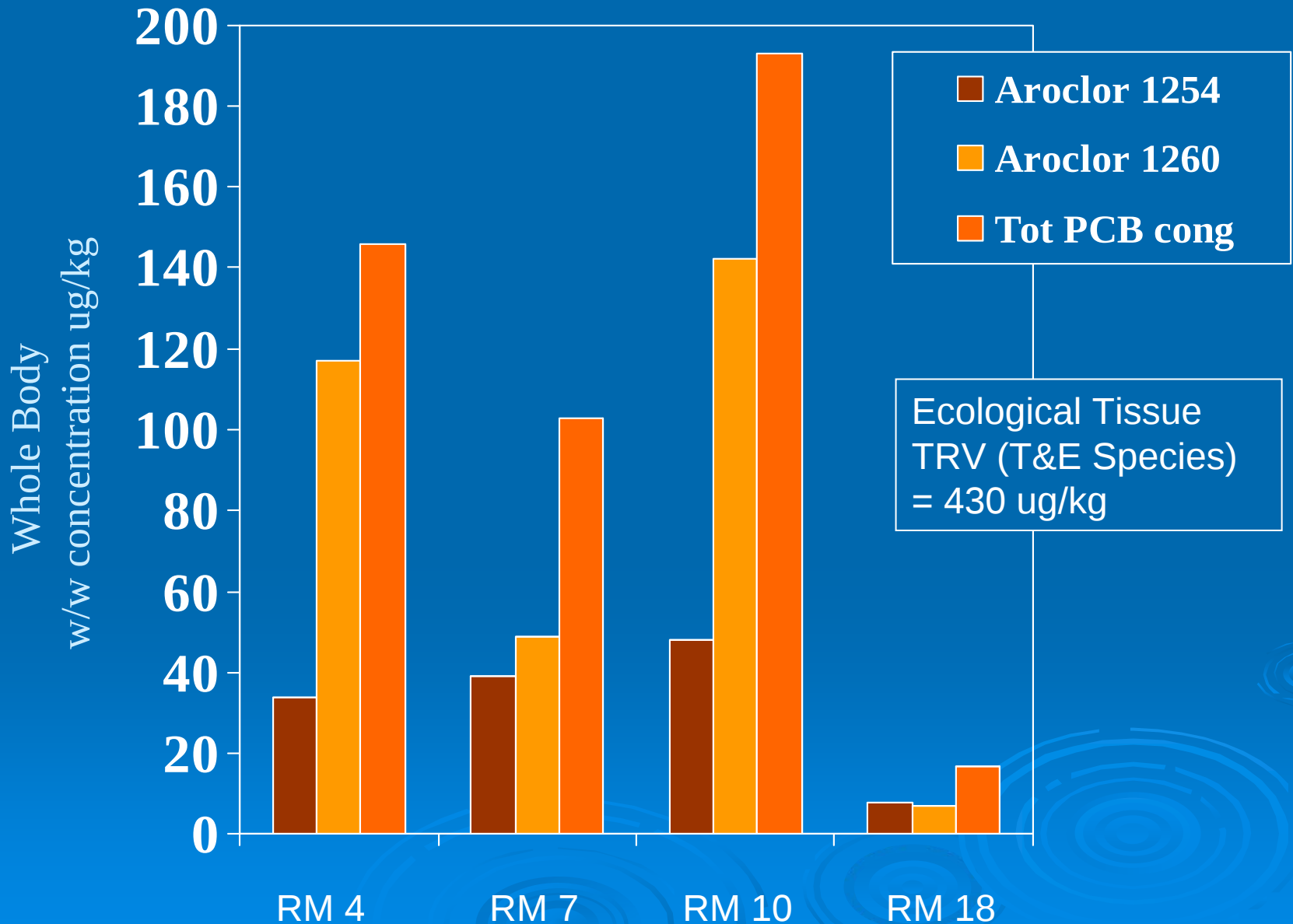


PCB Tissue Data - Bass

Total PCBs in Small Mouth Bass
(Whole Body)



Subyearling Juvenile Chinook



Preliminary Risk Evaluation

➤ Human Health Risks

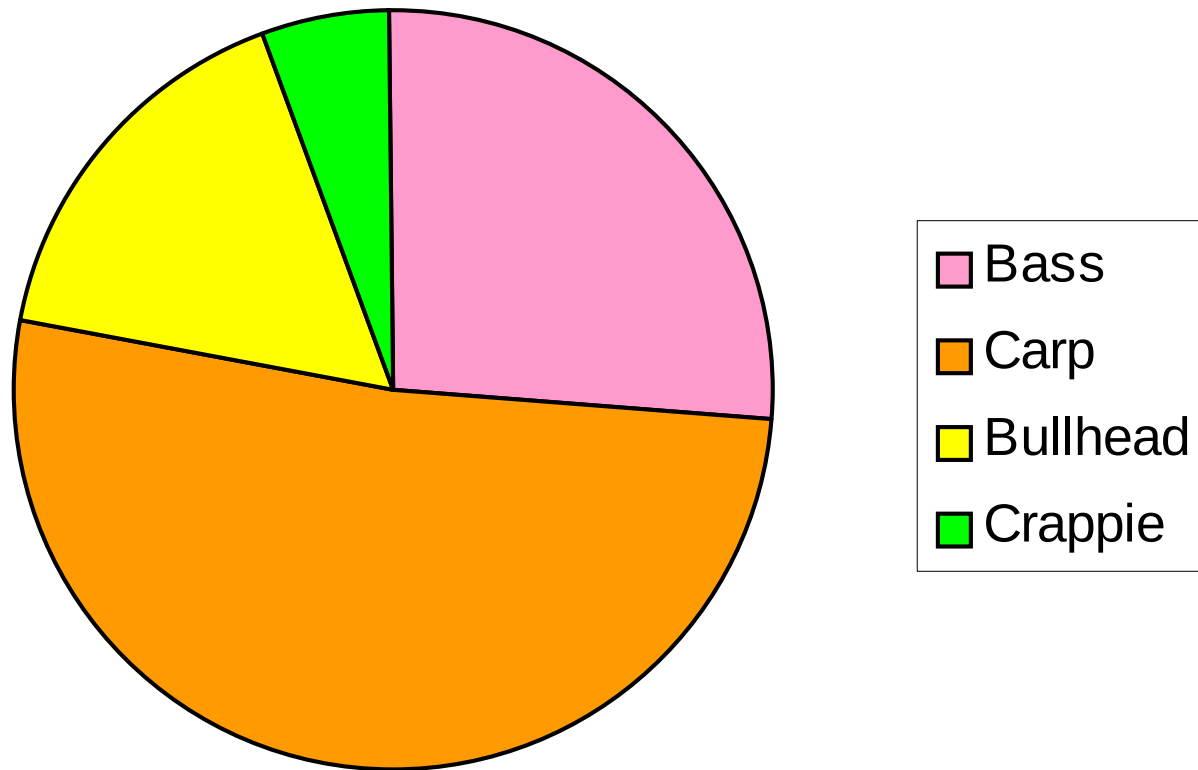
- Potential risks from fish consumption are significantly higher than other scenarios
- Some risks associated with direct contact with contaminated sediments (PAHs)
- Some exceedance of Region 6 Tap-water PRGs in surface water (As, PAHs, dioxin)

➤ Ecological Risks

- Fish Tissue Residue – PCBs and pesticides present highest risk to fish and shellfish
- Dietary Uptake – PCBs and pesticides present highest risk to birds and mammals
- Risks to benthic community – Key risk driver for ecological risk but not for PCBs and pesticides

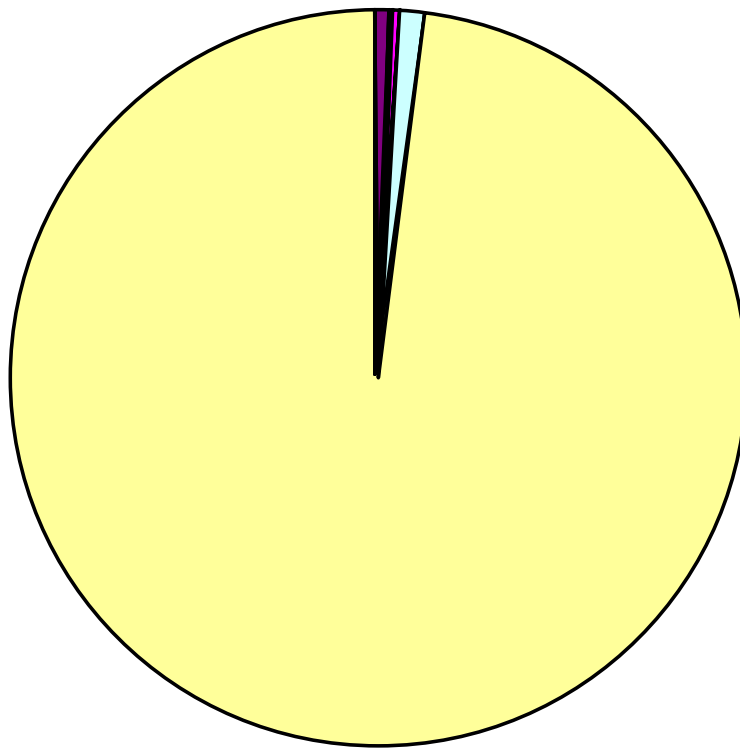
Human Health Risk

Contribution of Species to Overall Cancer Risk (Non-Tribal)



Human Health Risk

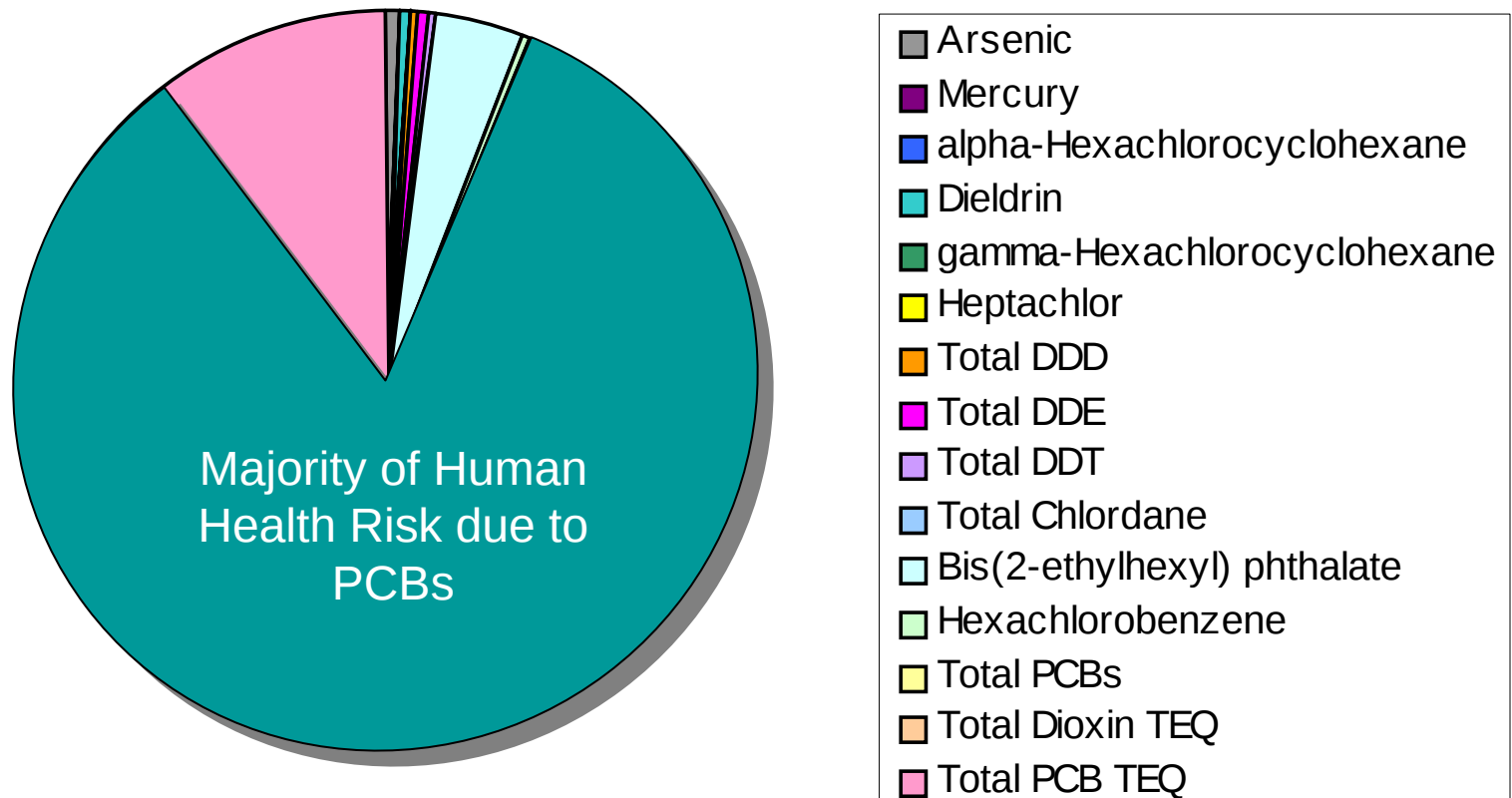
Contribution of Chemicals to Hazard Index* (Max/95% UCL Tissue Conc.)



- Arsenic
- Mercury
- alpha-Hexachlorocyclohexane
- Dieldrin
- gamma-Hexachlorocyclohexane
- Heptachlor
- Total DDD
- Total DDE
- Total DDT
- Total Chlordane
- Bis(2-ethylhexyl) phthalate
- Hexachlorobenzene
- Total PCBs
- Total Dioxin TEQ
- Total PCB TEQ

Human Health Risk

Contribution of Chemicals to Cancer Risk* (Max/95% UCL Tissue Conc.)



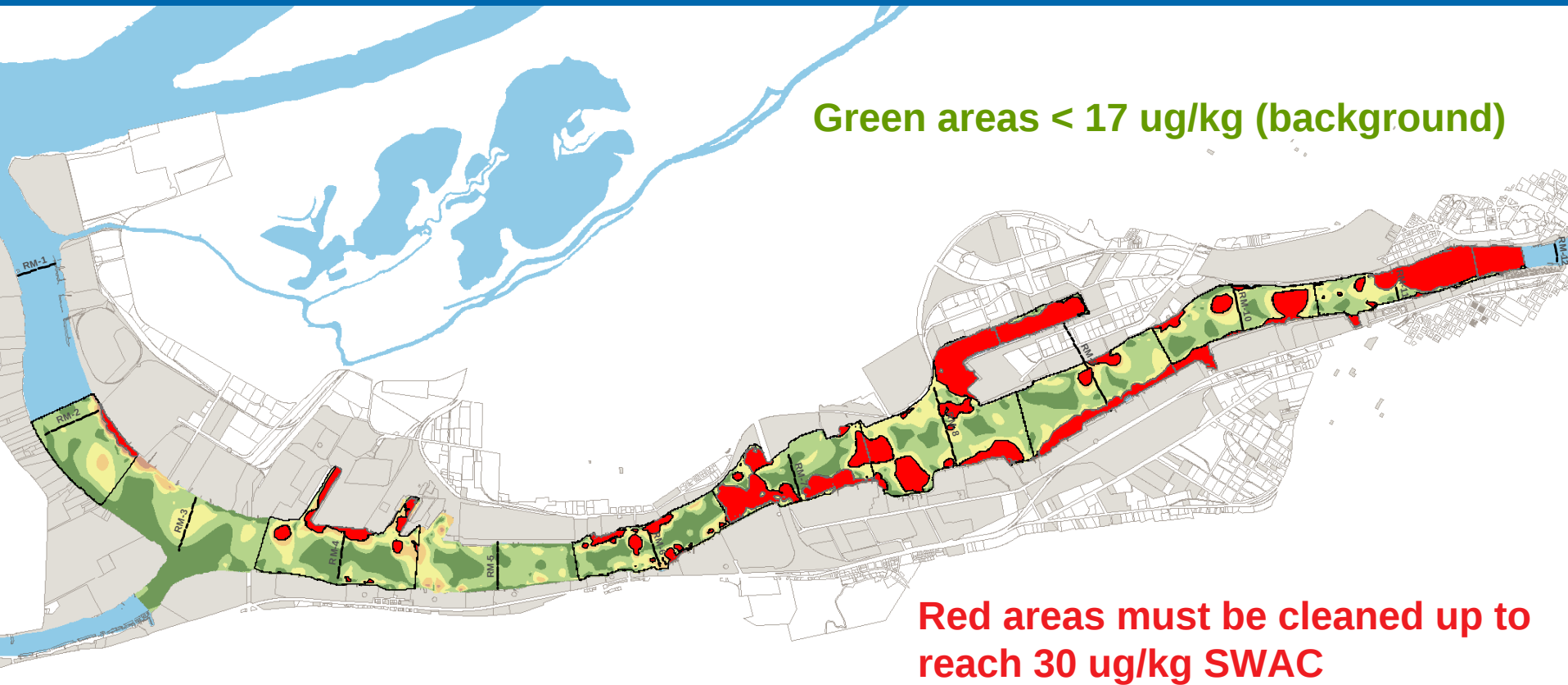
Fish Consumption PRG Development

- Food web model used to develop PRGs
 - PCBs, Dioxins and Furans, Pesticides
- Fish consumption AWQCs
 - Applied to pore water and/or surface water
- Contribution of Water
 - Upstream surface water ranges between 140 and 200 pg/l for total PCBs
 - Must assume water concentration is zero to develop PRGs for many risk scenarios
- Background
 - Upstream mean PCB sediment concentration range between 6.85 – 17.7 ug/kg
 - Exceeds PRG for most risk scenarios

Portland Harbor Fish Consumption PRGs -Total PCBs

Receptor	Fish Species	Rate (g/day)	Risk Level	ATC (ug/kg)	PRG Range (ug/kg)
Child	Large Home Range	7	10-4	1300	170 – 370
Adult	Large Home Range	17.5	10-4	470	60 - 140
Child	Bass	7	10-4	1300	87 - 92
Child	Large Home Range	7	10-5	130	32 - 39
Adult	Bass	17.5	10-4	470	30 - 34
Child	Large Home Range	60	10-4	150	15 - 43
Adult	Large Home Range	17.5	HQ = 1	80	6 - 24
Adult	Large Home Range	17.5	10-5	47	7 - 14
Adult	Large Home Range	142	10-4	57	8 – 12
Child	Bass	60	10-5	15	4 - 9
Adult	Fresh Water Clam	18	10-6	5	3 – 9
Adult	Bass	17.5	HQ = 1	80	1 - 6

Total PCBs in Sediment



Portland Harbor PCB

Conclusions

- PCBs drive risk at Portland Harbor despite wide range of chemicals and sources
- Elevated levels of PCBs detected in urban stormwater
- Elevated levels of PCBs in surface water associated with specific sources
- PCB sediment concentrations downstream of Portland Harbor approach background levels
- Background levels exceed risk based levels for sediment and surface water
- Forest Park run-off and rainfall approach background surface water levels

Are PCBs Leaving Portland Harbor?

**Total PCBs in Surface Water
September 2006 (8730 CFS)**

