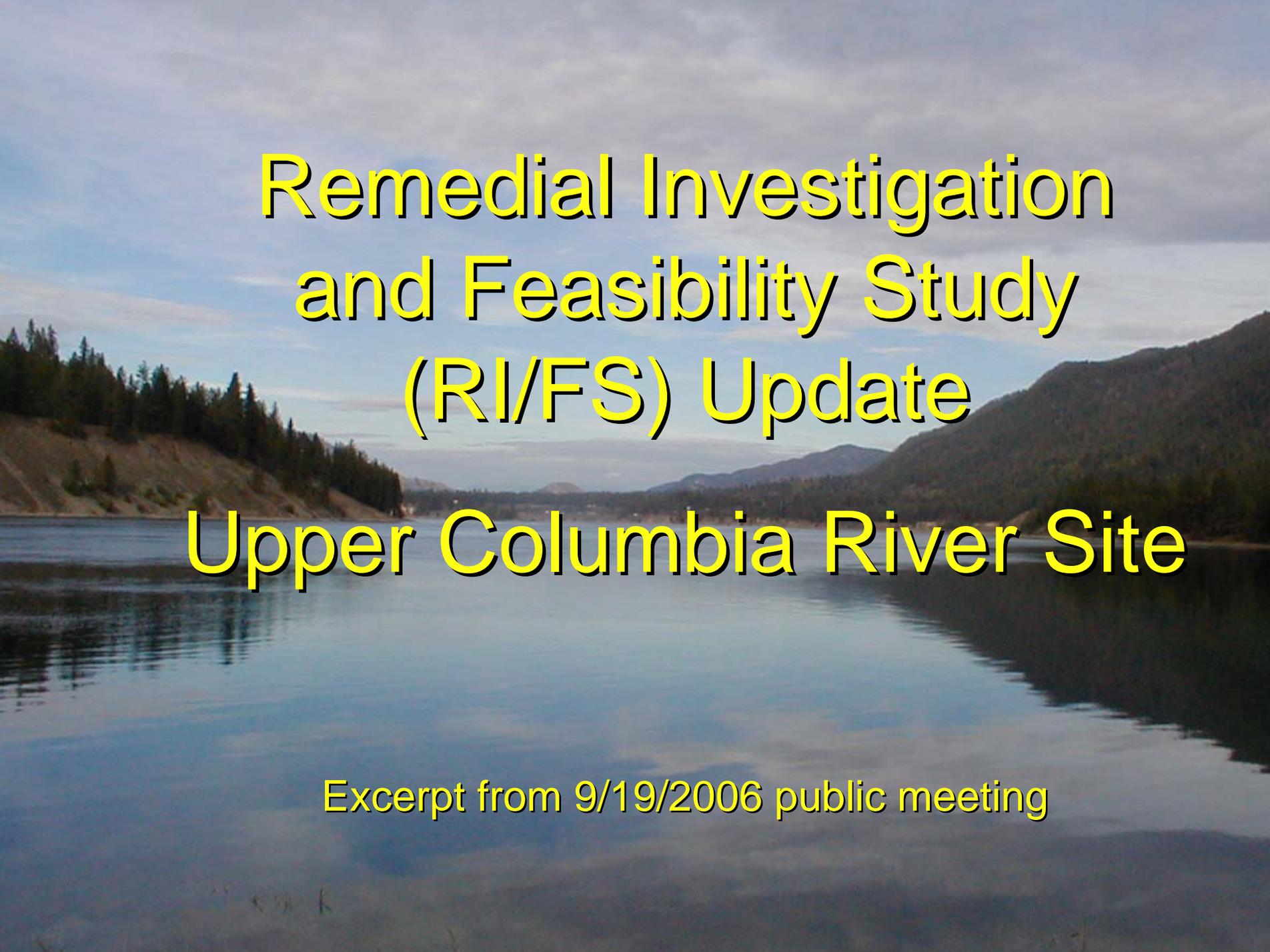


# Remedial Investigation and Feasibility Study (RI/FS) Update Upper Columbia River Site

Bruce Duncan  
Senior Ecologist, Risk Evaluation Unit  
U.S. Environmental Protection Agency

Presented April 9, 2007

Excerpt from 9/19/2006 public meeting

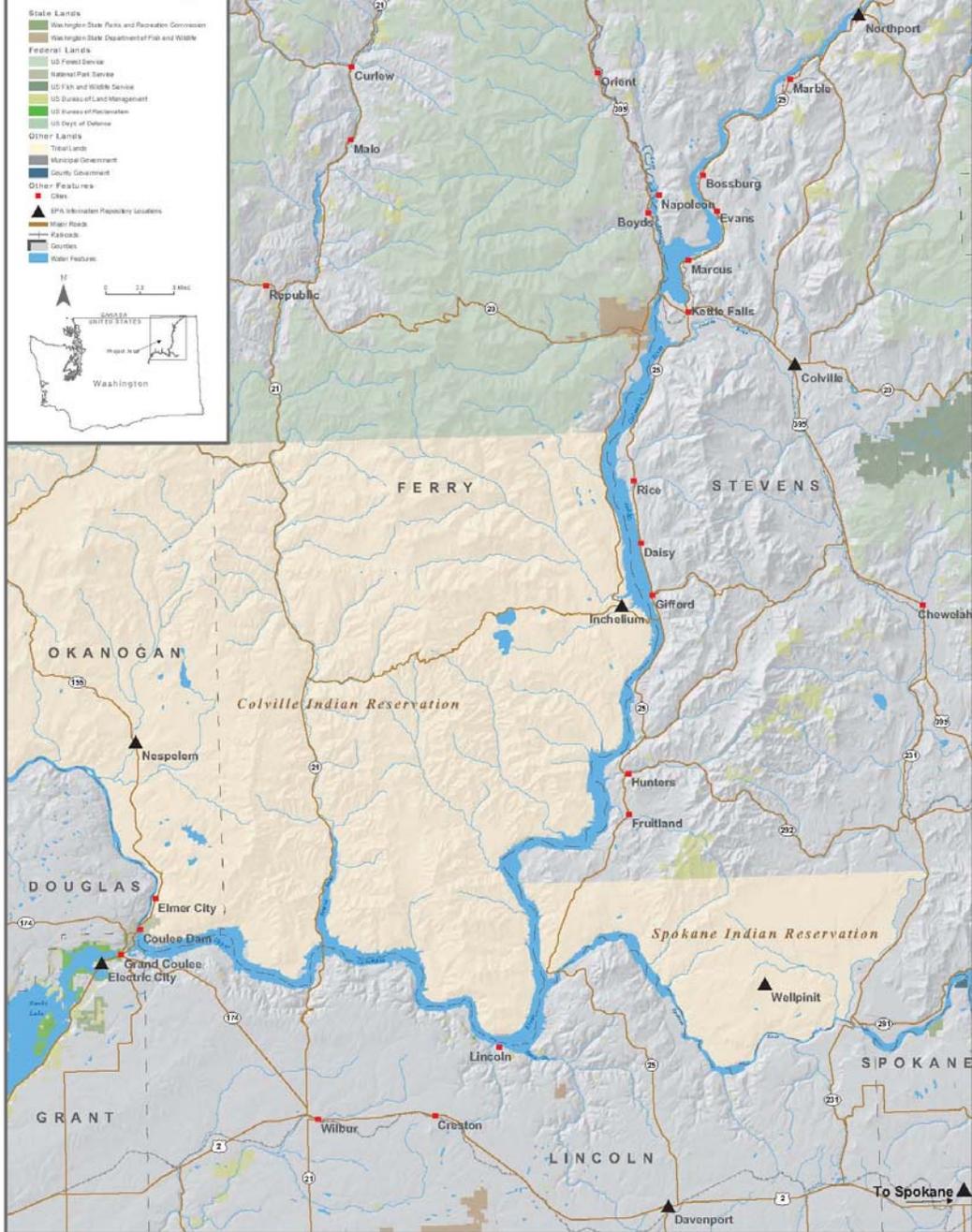


# Remedial Investigation and Feasibility Study (RI/FS) Update

## Upper Columbia River Site

Excerpt from 9/19/2006 public meeting

**Figure 1  
Upper Columbia  
River and Vicinity**



# Remedial Investigation and Feasibility Study (RI/FS) Update

## Upper Columbia River Site

# 2005 RI/FIS Field Work

Data collected used for both Human Health  
and Ecological Risk Assessment

- Sediment Sampling – April thru May
- Fish Sampling – September thru November

# Sediment Sampling

## 300+ sediment samples

250 transect samples (right bank, left bank, and mid-channel samples taken at locations from Canada to the dam)

10-15 subsurface cores

15 beaches to be sampled (stakeholder selected)

50 bioassay samples

11 tributary mouth samples

Focus area samples – increased sample density

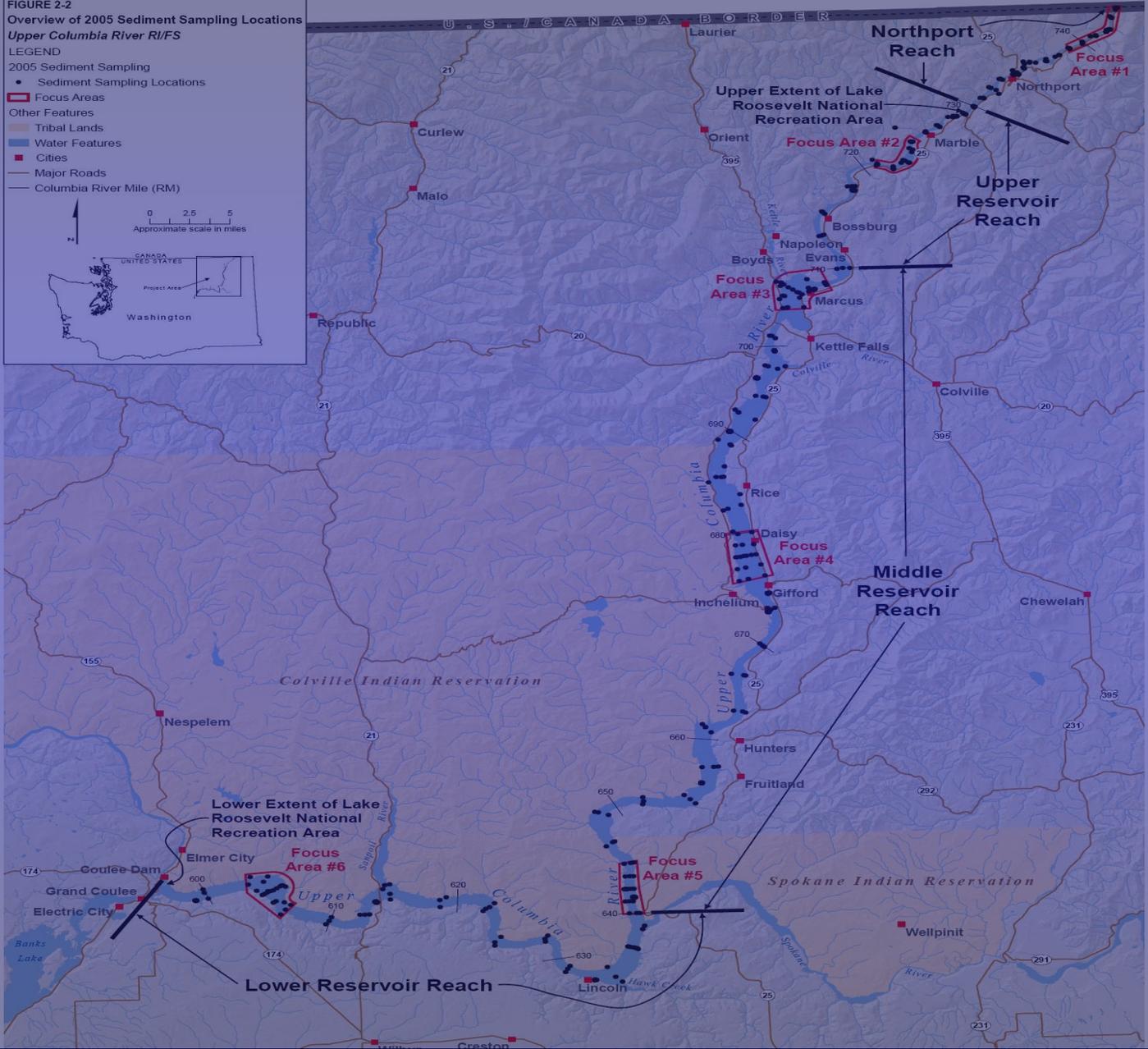
# Phase I Sediment Sampling Results

## *Upper Columbia River Site CERCLA RI/FS*

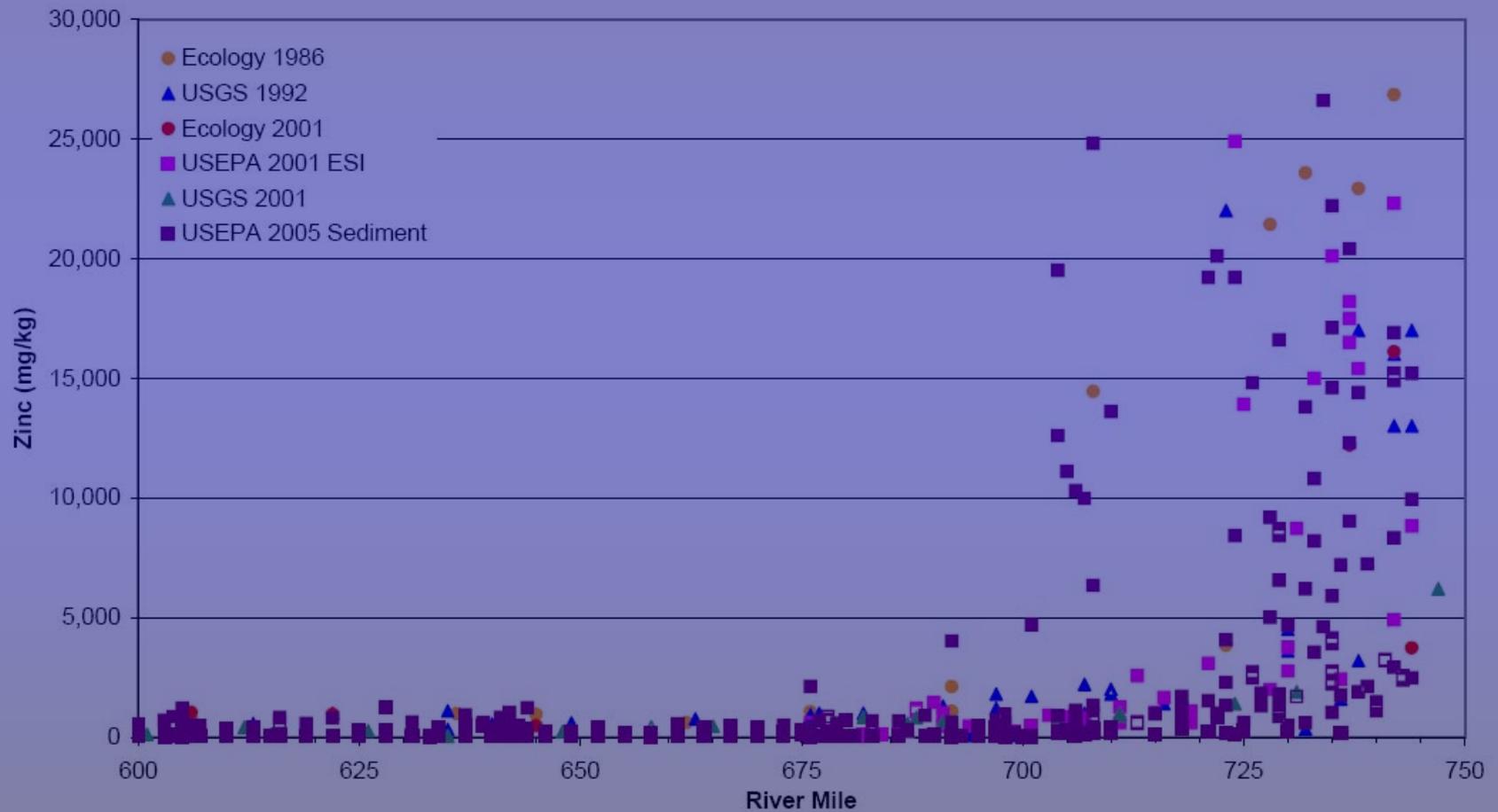
### **Analytes**

- Metals
- Dioxins/Furans
- PCBs (Aroclors and selected congeners)
- SVOCs
- Pesticides
- TOC
- Particle size

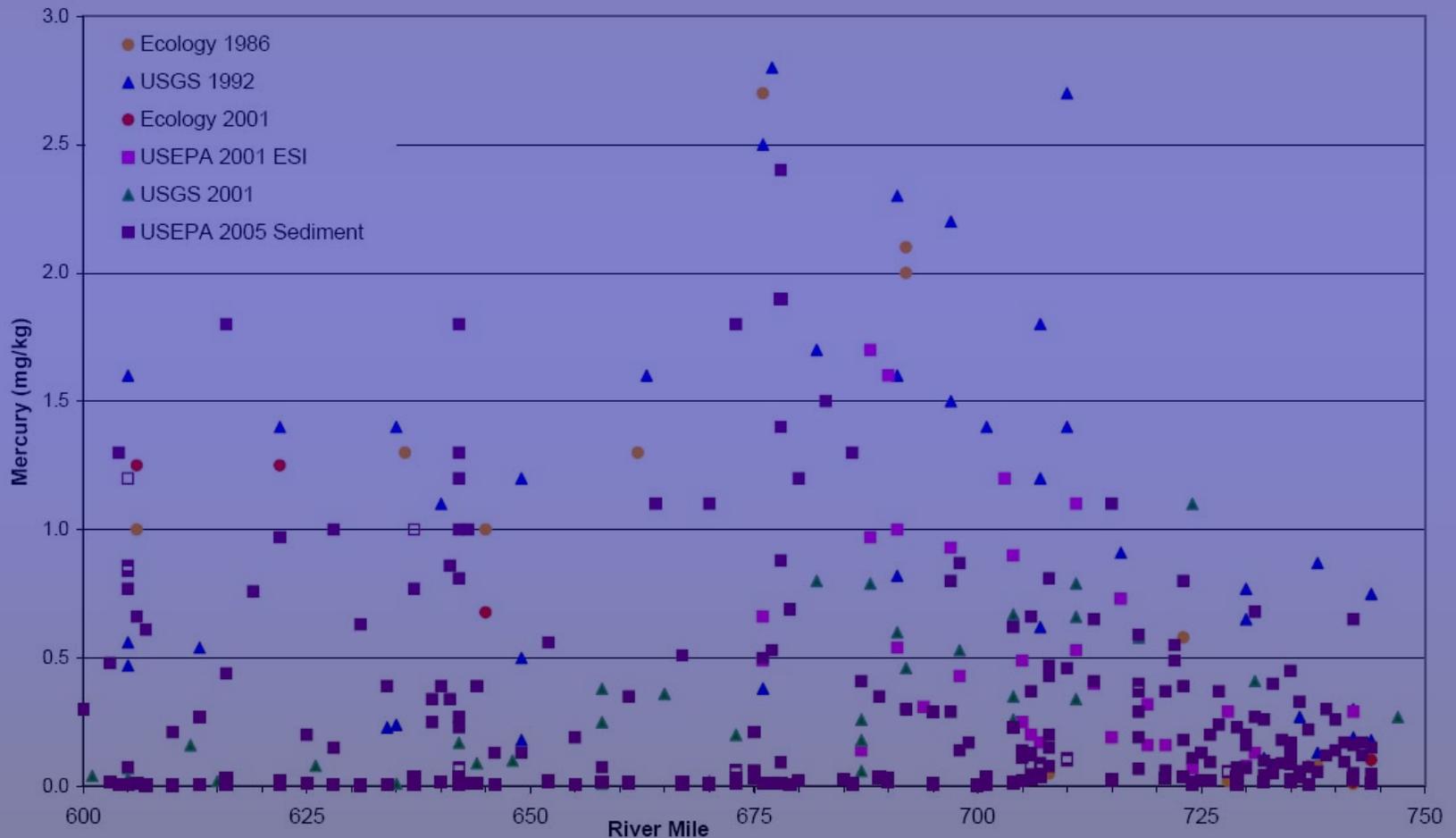
**FIGURE 2-2**  
**Overview of 2005 Sediment Sampling Locations**  
**Upper Columbia River R/FS**  
**LEGEND**  
 2005 Sediment Sampling  
 • Sediment Sampling Locations  
 Focus Areas  
 Other Features  
 Tribal Lands  
 Water Features  
 Cities  
 Major Roads  
 Columbia River Mile (RM)



# New and Old Zinc Sediment Data



# New and Old Mercury Sediment Data



# Bioassay Testing

Bioassays directly measure sediment toxicity  
(Growth, survival, reproduction)

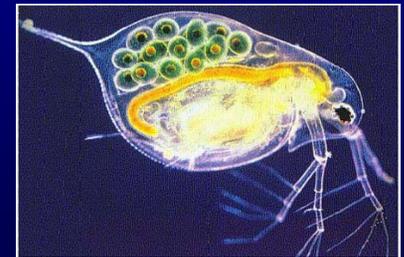
- 28-Day Amphipod (*Hyaella azteca*)



- 10-Day Midge (*Chironomus tentans*)



- 7-Day Cladoceran (*Ceriodaphnia dubia*)

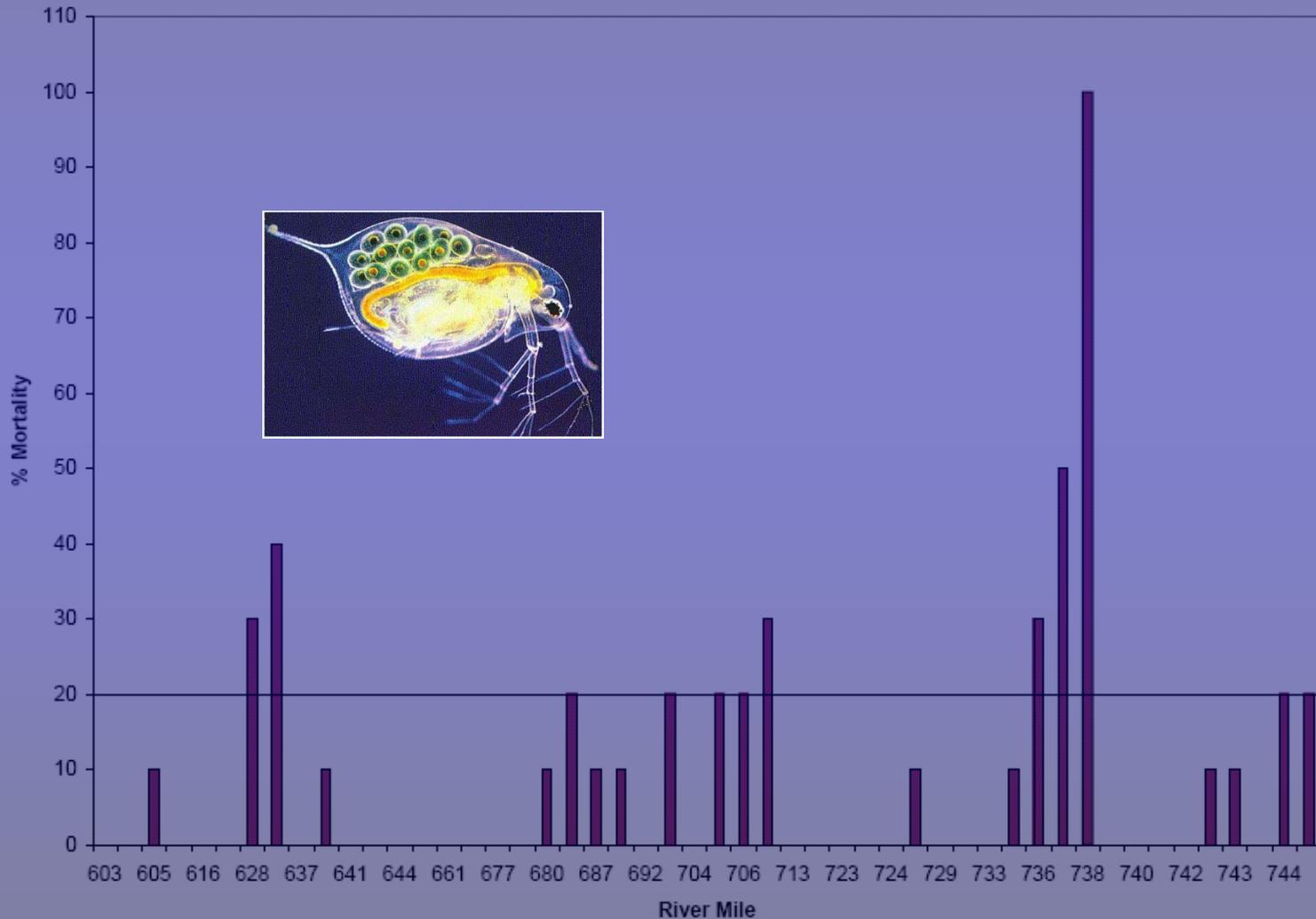


<http://www.usask.ca/biology/skabugs/Candlelakebugs/CLcrustacea/Hyaellalla.JPG>

[http://zoology.okstate.edu/zoo\\_affl/ewqrl/Chironomid.JPG](http://zoology.okstate.edu/zoo_affl/ewqrl/Chironomid.JPG)

<http://www.envtox.ucdavis.edu/GraniteCanyon/GraniteCanyonSSHHigh/images/Ceriodaphnia.jpg>

# Ceriodaphnia Mortality



# Fish

**FIGURE 2-1**  
**Fall 2005 Actual Fish Tissue**  
**Sampling Areas**  
**Upper Columbia River R/WFS**

**LEGEND**

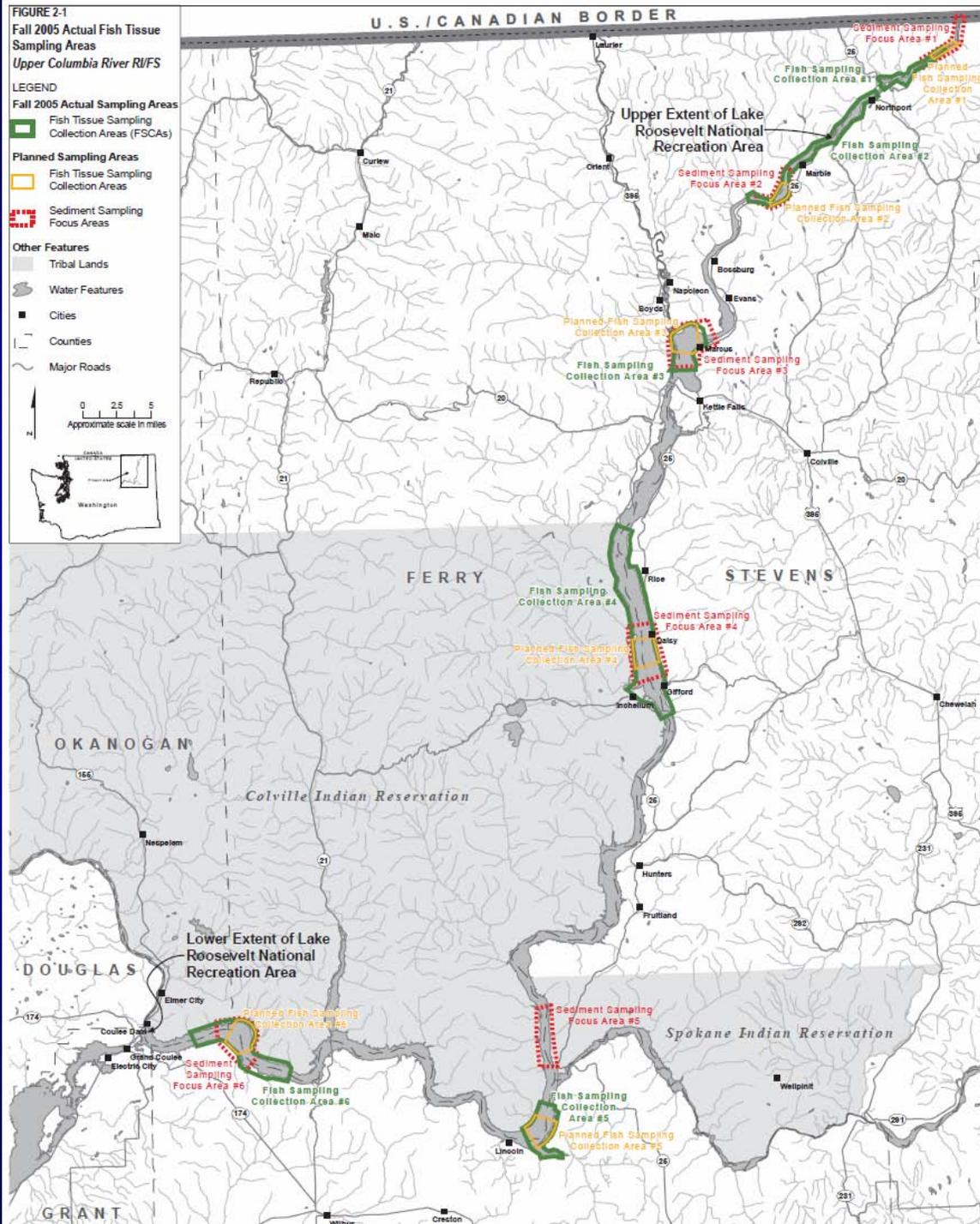
**Fall 2005 Actual Sampling Areas**

- █ Fish Tissue Sampling Collection Areas (FSCAs)
- █ Planned Sampling Areas
- █ Sediment Sampling Focus Areas

**Other Features**

- Tribal Lands
- Water Features
- Cities
- Counties
- Major Roads

0 2.5 5  
 Approximate scale in miles



# Phase I Fish Tissue Preliminary Results

## *Upper Columbia River Site CERCLA RI/FS*

### Target Species

- Walleye (*Sander vitreus*)
- Rainbow trout (*Oncorhynchus mykiss*)
- Lake whitefish (*Coregonus clupeaformis*)
- largescale sucker (*Catostomas catosomas*)
- Burbot (*Lota lota*)

# Phase I Fish Tissue Preliminary Results

## *Upper Columbia River Site CERCLA RI/FS*

### **Tissue Types**

- Walleye – Fillet and offal at three sites and whole body at three sites
- Rainbow trout – Fillet and offal at three sites and whole body at three sites
- Lake whitefish – Whole body only
- largescale sucker – Whole body only
- Burbot – Whole body only

# Phase I Fish Tissue Preliminary Results

## *Upper Columbia River Site CERCLA RI/FS*

### Target Analytes

- Metals
  - Arsenic (organic and inorganic)
  - Cadmium
  - Copper
  - Lead
  - Mercury
  - Zinc
- Dioxins/Furans
- PCBs (Aroclors and selected congeners)
- Percent lipids
- Percent moisture

# Phase I Fish Tissue Preliminary Results

## *Upper Columbia River Site CERCLA RI/FS*

### Summary of Fish Tissue Composite Samples Submitted for Chemical Analysis

FSCA	Walleye		Rainbow Trout			Lake Whitefish		Mountain Whitefish		Largescale Sucker		Largescale Sucker Gut <sup>5</sup>		Burbot	
			Planned	Wild	Hatchery										
	Planned	Actual	Planned	Actual	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
FSCA1	5F/5O	5F/5O	5F/5O	5F/5O	0	5WB	0	0	5WB <sup>4</sup>	5WB	3WB	0	2	5WB	0
FSCA 2	5WB	5WB	5WB	5WB <sup>1</sup>	0	5WB	5WB	0	0	5WB	4WB	0	0	5WB	3WB <sup>6</sup>
FSCA 3	5F/5O	5F/5O	5F/5O	2F/2O	3F/3O	5WB	5WB	0	0	5WB	4WB	0	1	5WB	5WB
FSCA 4	5WB	5WB	5WB	0	5WB	5WB	5WB	0	0	5WB	5WB	0	0	5WB	4WB
FSCA 5	5WB	3WB	5WB	1WB	5WB	5WB	5WB	0	0	5WB	5WB	0	0	5WB	5WB
FSCA 6	5F/5O	5F/5O + 2WB	5F/5O	1F/1O <sup>2</sup>	4F/4O	5WB	2WB <sup>3</sup>	0	0	5WB	4WB	0	1	5WB	5WB
Total	45	45	45	22	24	30	22	0	5	30	25	0	4	30	22
QA Rep	2	2	2	3	3	2	2	0	1	2	3	0	1	2	2

<sup>1</sup> Four 5-fish composites and one 3-fish composite were formed.

<sup>2</sup> One 4-fish fillet composite and one 4-fish offal composite were formed.

<sup>3</sup> A 3-fish composite from each collection period (Sept and Oct) was formed.

<sup>4</sup> Mountain whitefish were used as a substitute for lake whitefish at this FSCA because of habitat limitations.

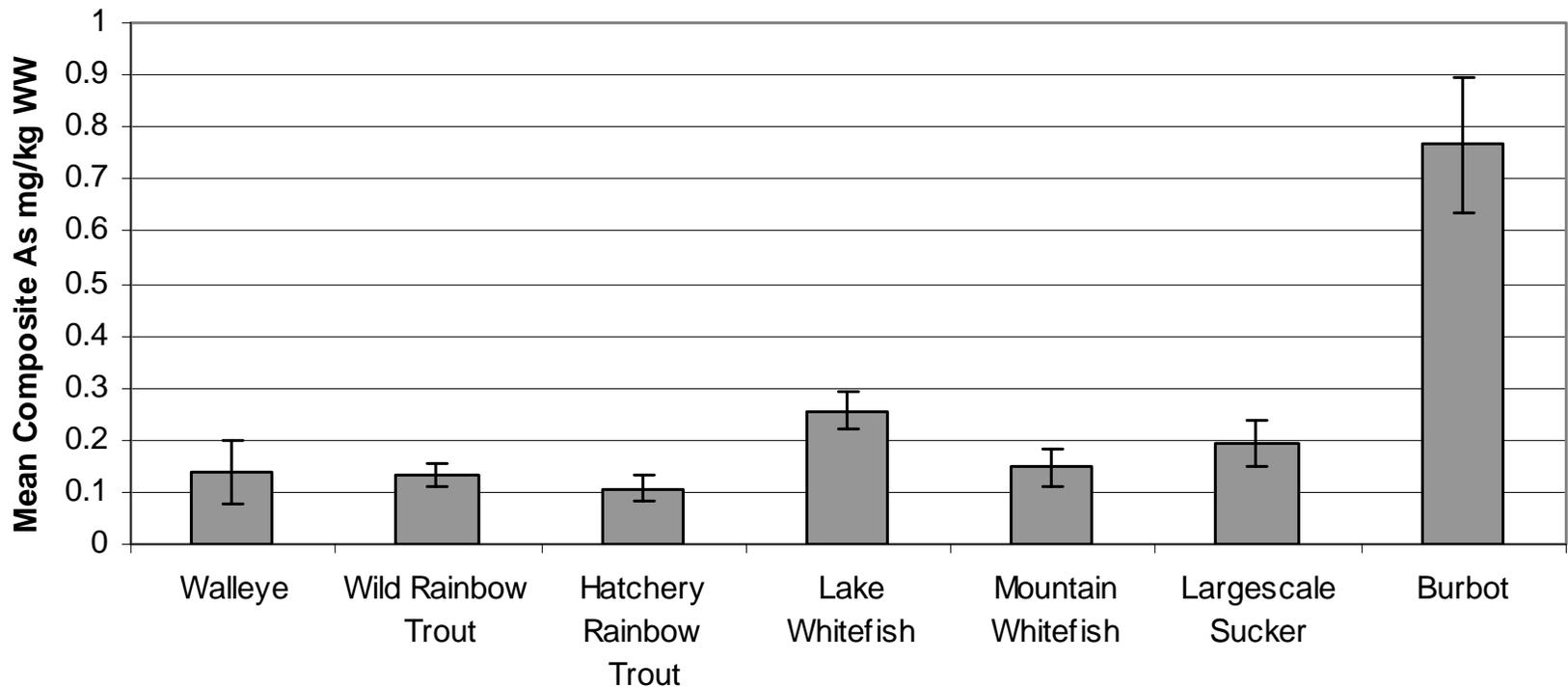
<sup>5</sup> Individual largescale suckers from a randomly selected composite were dissected to remove the gut and gut contents. The gutless whole body and gut samples were analyzed individually.

<sup>6</sup> Three 3-fish composites were formed.

# Phase I Fish Tissue Preliminary Results

## Upper Columbia River Site CERCLA RI/FS

### Comparison of Mean Arsenic Concentrations in Whole Body Samples from Target Species Across all FSCAs

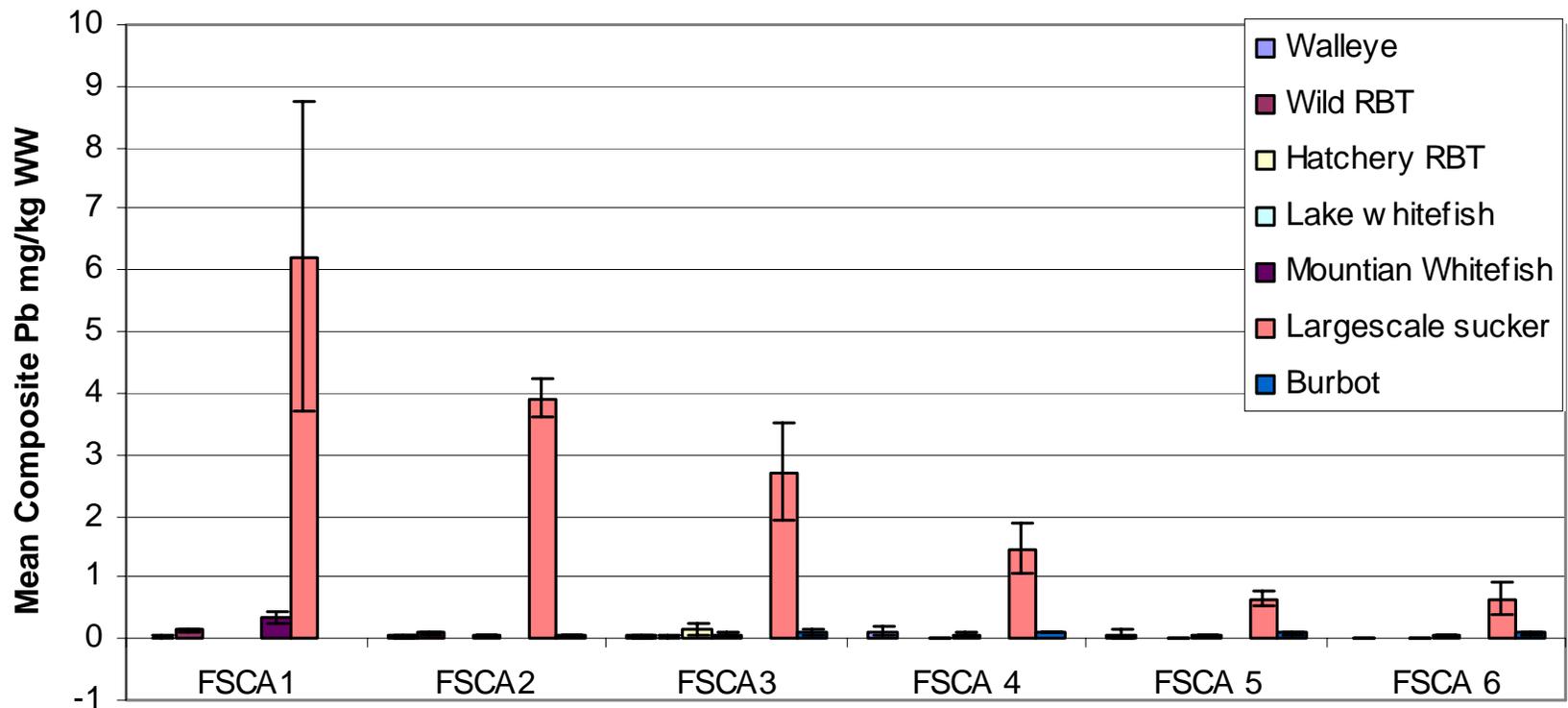


Error bar equals  $\pm 1$  SD

# Phase I Fish Tissue Preliminary Results

## Upper Columbia River Site CERCLA RI/FS

### Comparison of Lead Concentrations in Whole Body Samples from Target Species by FSCA



Error bars equal  $\pm 1$  SD

# Risk Assessment

# Human Health





[www.wa.ecy.gov](http://www.wa.ecy.gov)



# Types of Human Exposure

## Risk Scenarios (Activities)

- Residential
- Recreational
- Construction or Park Workers
- Tribal Subsistence

# Potential Sampling Media

- More Sediment
- More Fish or Shellfish
- Game
- Riparian or Aquatic Plants
- Dust in air
- Groundwater/Surface Water/Pore Water

# Eco

# Sediment data can help us understand risk and management issues related to contaminants:

Source ID – Example: Can we recognize slag?

Exposure:

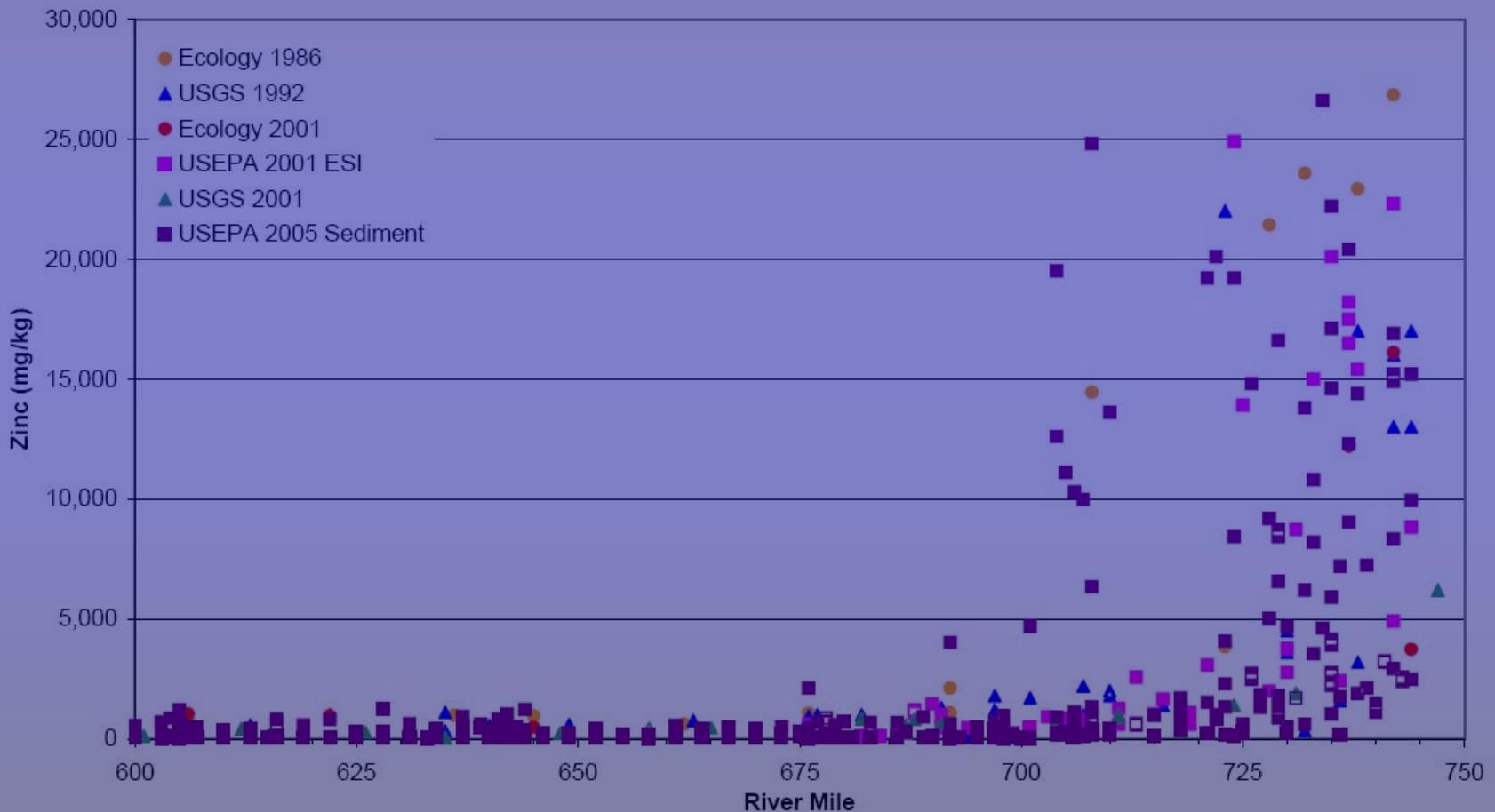
- Fate and Transport - How does the slag move through the river? Is there a change in size, nature?
- Nature and Extent - Where does the slag settle out? Delineate the areas exposed during drawdown
- Receptors: Which terrestrial and aquatic receptors are exposed and via which pathways?
- Bioavailability: Is the Cominco slag any less bioavailable than default assumptions? Is there accumulation in the food web?

# Sediment data can help us understand risk and management issues related to contaminants (continued):

Effects: Whether we see slag-related effects in the field? What do toxicity tests suggest about effects levels for the slag?

- Examples of how we use sediment data
  - Patterns & Relationships (sources, fate/transport)
  - Exposure of organisms

# Patterns: e.g., Zinc Sediment Data



# Next Steps

- EPA Prepares Human Health Risk Assessment Work Plan
- EPA & Tribes Conduct Tribal Exposure Survey
  - Exposure Survey will help define data needs
- Teck Prepares Ecological Objectives [ERA]
- Identify Data Needs
- Additional Field Sampling
- Data Evaluation
- Risk Assessments
- Feasibility Studies
- EPA Prepares Proposed Plan and Record of Decision

# Division of Labor

U.S. EPA and  
Dept. of Interior  
Colville Tribe  
Spokane Tribe  
Washington State

## Prepare

- Human Health Risk Assessment
- Proposed Cleanup Plan
- Record of Decision

## Oversee Teck Work

- Eco RA and RI/FS

## Teck Cominco Prepares

- Ecological Risk Assessment
- Remedial Investigation
- Feasibility Study

## Public and Teck Cominco

- Review and Comment on All Reports

<http://yosemite.epa.gov/R10/CLEANUP.NSF/sites/UpperC>