

Green-Duwamish Pollutant Loading Assessment Interested Parties Meeting

May 28, 2015
10:00 a.m. – 3:00 p.m.
Tukwila Community Center

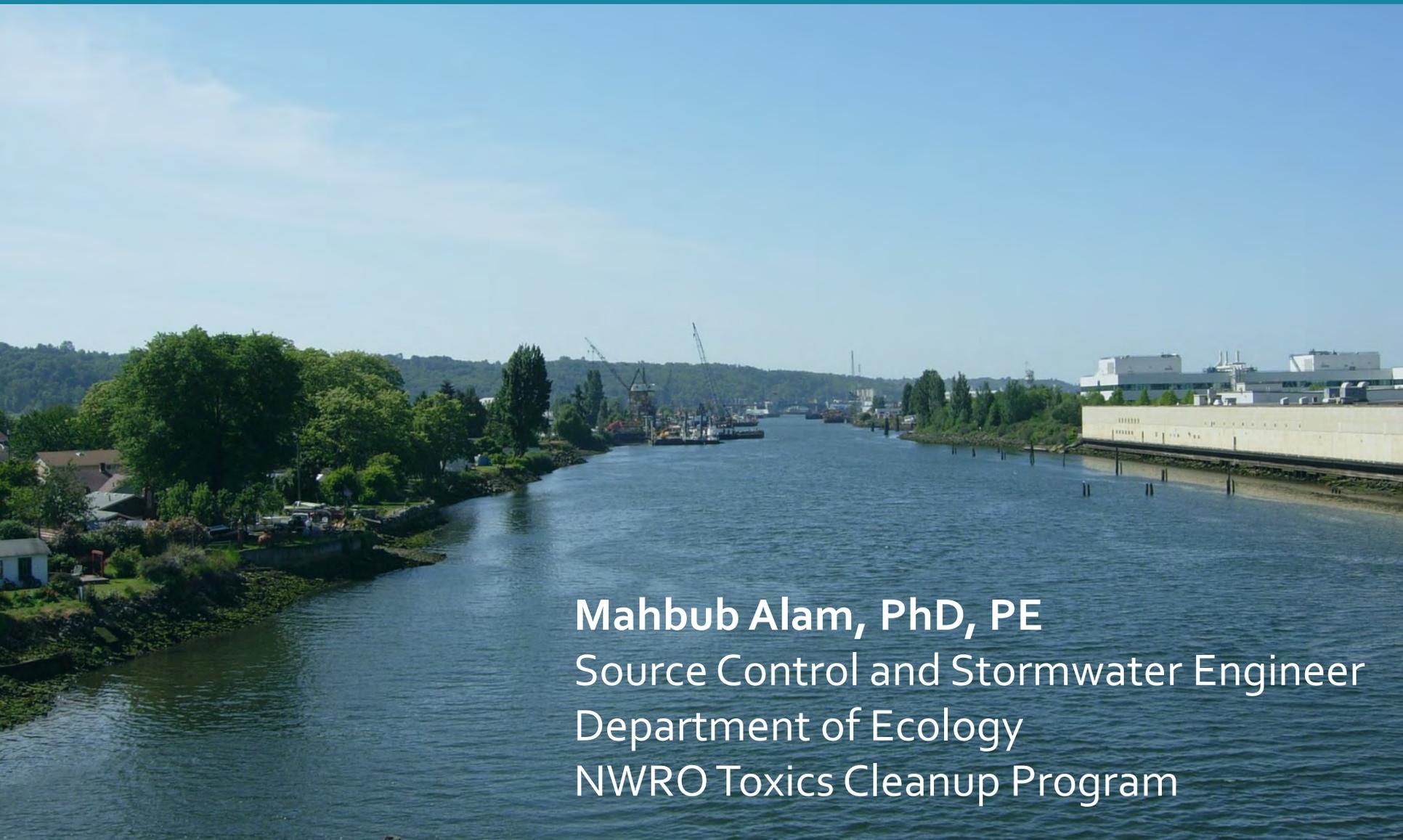


DEPARTMENT OF
ECOLOGY
State of Washington

Agenda

Time	Topic
10:00 am	Welcome & opening remarks
10:10 am	Presentation: Status of Green-Duwamish Watershed
10:45 am	Presentations: Restoring the Green-Duwamish
12:30 pm	Lunch
12:45 pm	Presentation: An introduction to the PLA
1:45 pm	Small group discussions
2:30 pm	Small group report-out
2:45 pm	Next steps
3:00 pm	Adjourn

Status of the Green-Duwamish Watershed



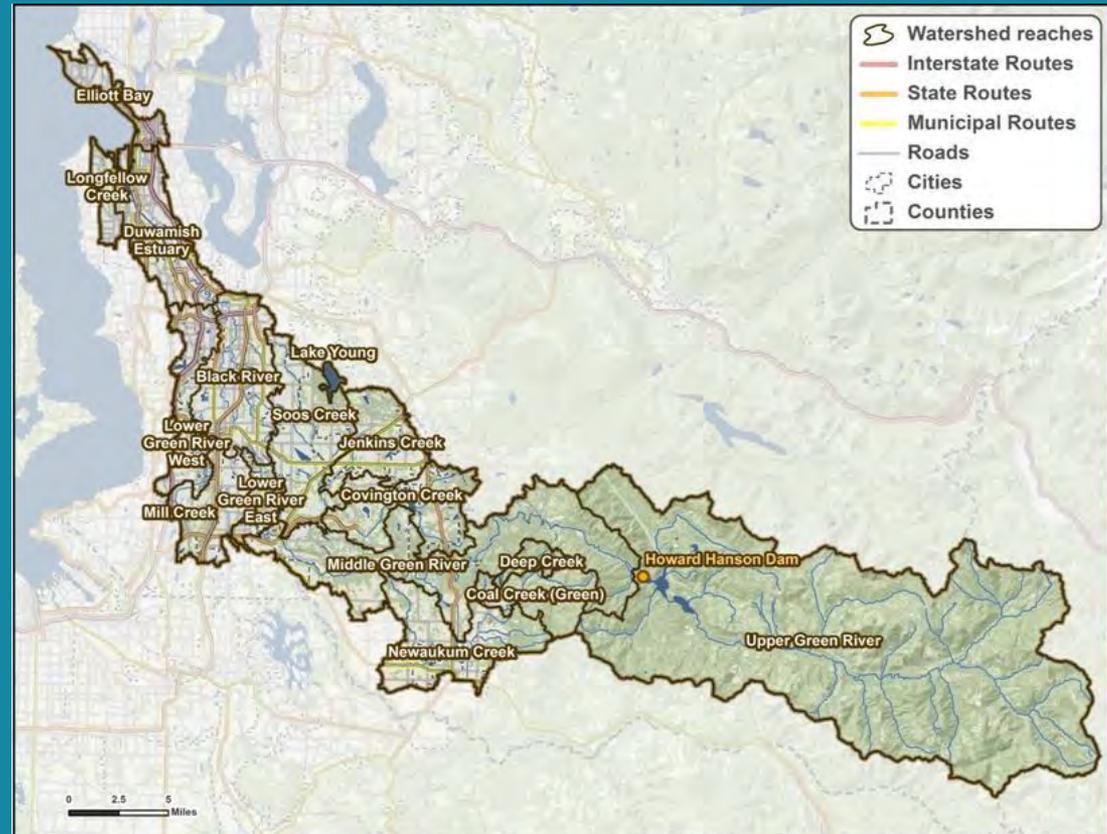
Mahbub Alam, PhD, PE
Source Control and Stormwater Engineer
Department of Ecology
NWRO Toxics Cleanup Program

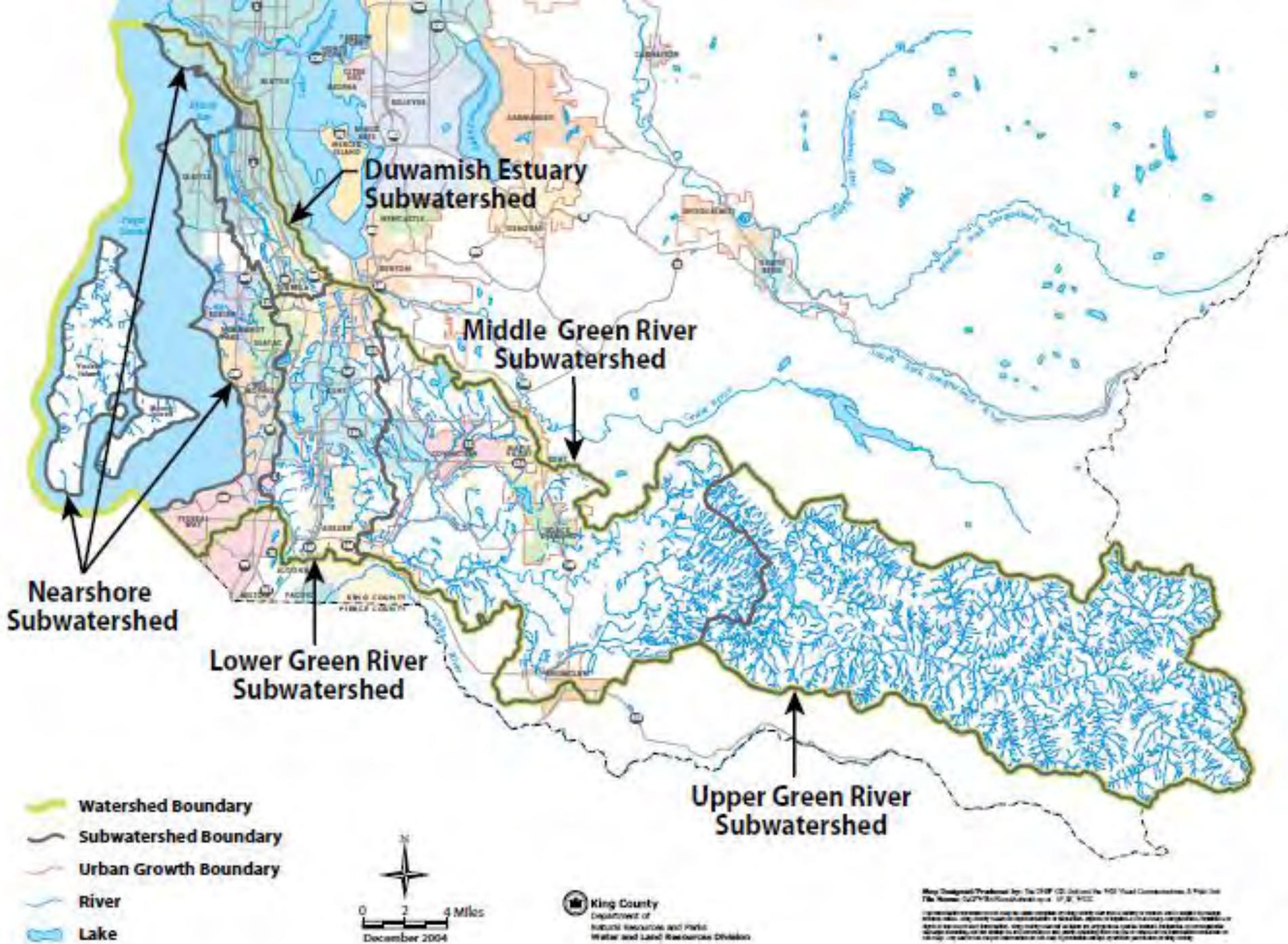
Overview

- Introduction to Green Duwamish Watershed
- Lower Duwamish Waterway (LDW)
 - Brief history
 - Sediment, Water, and Tissue Quality
- Watershed above LDW (Upper Watershed)
 - Sediment and Water quality
- Why is it a problem?
 - Existing 303(d) listings in the watershed
- Summary and transition to current efforts in the watershed

Green-Duwamish Watershed Basics

- 480+ square miles
- 95+ miles long
- Duwamish River
 - Stratified salt wedge
 - 2,000 cfs annual mean flow
 - 99% of LDW sediment load comes from upstream





Map Designed/Produced by: The DWP GIS Unit for the 400 Year Commemoration & Plan for the River (2004) by King County Department of Natural Resources and Parks, Water and Land Resources Division.

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Lower Duwamish Waterway

1900-1935



1935-1955



1955-Present



Major Human Health Chemicals of Concern (COCs) in LDW Sediment

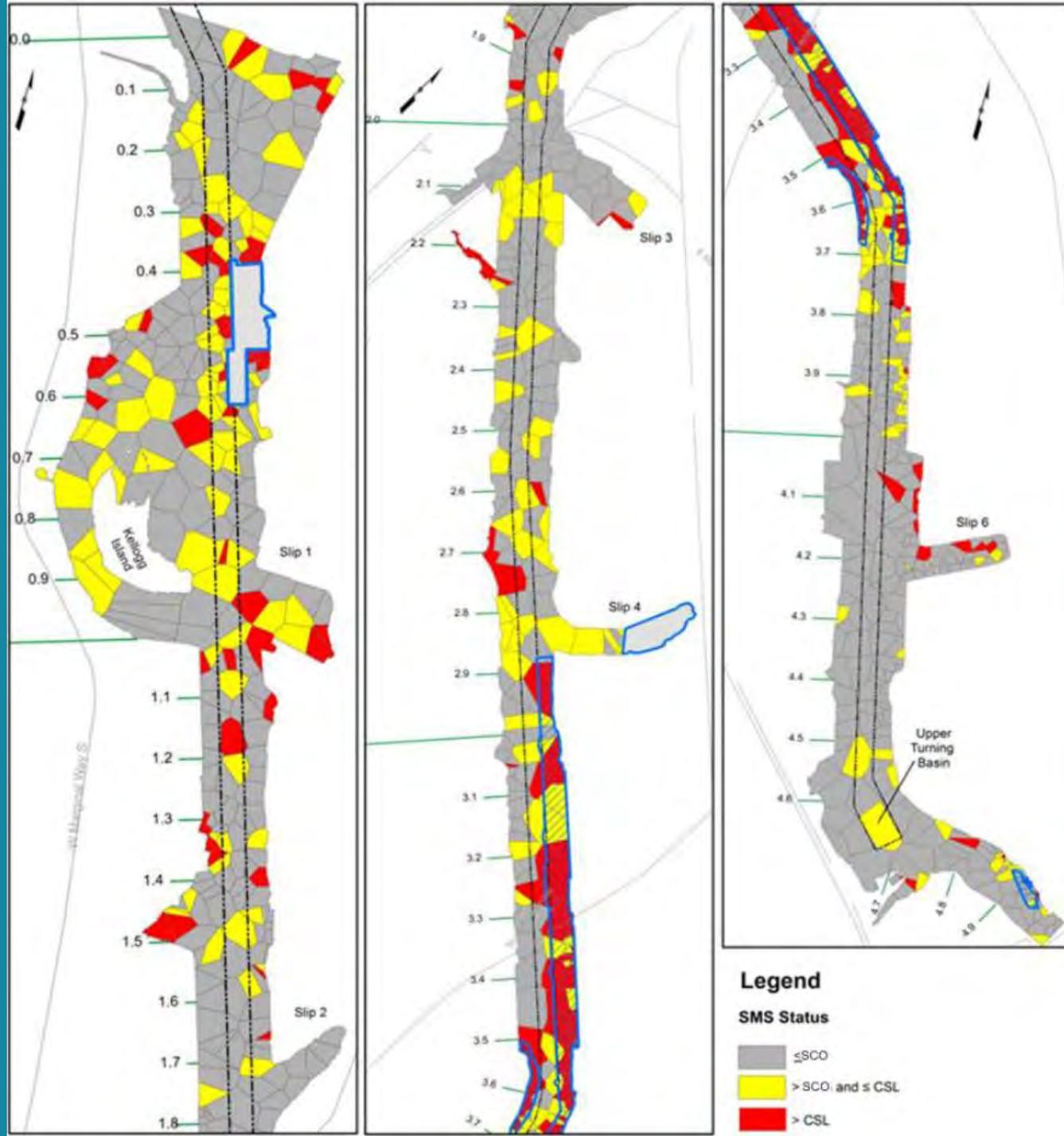
Data Type/Contaminant	Summary Statistics for Sediment in the LDW (RM 0 to 5.0)				Total Number of Sediment Samples in FS Baseline Dataset	
	Minimum Detect	Calculated Mean	Maximum Detect	Spatially-Weighted Average Concentration (SWAC)	Total	With Detected Values
<i>Surface Sediment</i>						
PCBs ($\mu\text{g}/\text{kg dw}$)	2.2	1,136	220,000 ^a	346	1,392 (1,390) ^a	1,309
Arsenic ($\text{mg}/\text{kg dw}$)	1.2	17	1,100	15.6	918	857
cPAHs ($\mu\text{g TEQ}/\text{kg dw}$) ^b	9.7	459	11,000	388	893	852
Dioxins/Furans ($\text{ng TEQ} / \text{kg dw}$) ^c	0.25	42	2,100	25.6	123	119
<i>Subsurface Sediment</i>						
PCBs ($\mu\text{g}/\text{kg dw}$)	0.52	1,953	890,000	n/a	1,504	1131
Arsenic ($\text{mg}/\text{kg dw}$)	1.2	29	2,000	n/a	531	453
cPAHs ($\mu\text{g TEQ}/\text{kg dw}$) ^b	1.2	373	7,000	n/a	542	449
Dioxins/Furans ($\text{ng TEQ} / \text{kg dw}$) ^c	0.15	17	194	n/a	64	64

Source: Table 1, LDW ROD, 2014

Benthic Chemicals of Concern (COCs) in Surface Sediments

41 Chemicals
pose risk to
benthic
community

Source: Figure 5, LDW ROD,
2014



Summary of Selected Pollutants in Surface Water of LDW

Pollutant	Unit	Frequency of Detection	Range of Detections	Water Quality Standards
Arsenic, Dissolved	µg/L	168 / 168	0.0095 – 0.116	36*
Copper, Dissolved	µg/L	152 / 155	0.37 – 1.89	3.1*
Zinc, Dissolved	µg/L	166 / 166	0.75 – 5.39	81*
Mercury, Total	ng/L	15 / 29	0.13 – 0.71	0.025*
BEHP	µg/L	19 / 94	0.14 – 23.8	5.9**
Chrysene	ng/L	4 / 4	0.17 – 0.4	31**
2,3,7,8-TCDD	pg/L	0 / 0	<0.6	0.013**
Total PCBs	pg/L	15 / 15	131.8 – 3211	170**

*Chronic aquatic life criteria

**NTR human health criteria (organism only)



Tissue (Fish/Shellfish) Quality in LDW

Contaminant	Maximum/Weighted Average								Comparison Value ^b
	Chinook Salmon	Coho Salmon	English Sole	Quillback Rockfish	Red Rock Crab	Dungeness Crab	Perch ^c	mussels	
Arsenic (mg/kg)	1.4/ 1.0	1.6 0.8	15/ 10	NA	NA	12.5/ 9.9	1.4/ 1.3	1.1/ 0.8	0.003
Cadmium (mg/kg)	NA	NA	<0.05	NA	NA	<0.02	NA	0.7/ 0.4	0.5
Chlordane (ug/kg)	15/ 1.2	2.5/ 0.9	3.4/ 1.1	NA	NA	NA	NA	<7	14
cPAHs (ug/kg) ^d	<50	<47	<49	NA	NA	<29	NA	62/ 42	0.7
DDE (ug/kg)	33.8/ 19.3	17.4/ 8.3	5.3/ 2.7	<0.1	NA	NA	NA	<1.3	14
PCBs (ug/kg)	160/ 51	97/ 36	640/ 267	428/ 292	204/ 110	177/ 130	228/ 111	73/ 29	2
Mercury (ug/kg)	150/ 102	52/ 42	83.0/ 53.6	567/ 408	130/ 63	111/ 90	60/ 15.4	16/ 11	49

Fishing for the Safest Seafood from the Duwamish River? Eat Salmon.

Salmon are the Healthiest Choice

Fishing is important for physical, mental, and cultural health. Fish are part of a healthy diet.

But the Duwamish River is polluted with chemicals that get into resident fish, shellfish, and crab that spend their entire lives in the river.

Salmon are the healthiest choice because they spend only a short time in the river. They are nutritious and full of Omega-3s which are good for your heart and brain.



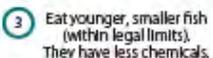
Healthy Tips:



Remove skin, fat, and internal organs.



Grill, bake, broil, or steam so fat drips off. DON'T use fat drippings for sauces or soups.



Eat younger, smaller fish (within legal limits). They have less chemicals.

Meal Size



Adult Child
One meal size is about the size and thickness of your hand.

SAFE TO EAT
2-3 MEALS
per week

- Chum
- Coho
- Pink
- Sockeye

OR

LIMIT
1 MEAL
per week

- Chinook (King)

OR

CAUTION
2 MEALS
per month

- Blackmouth (Resident Chinook caught during winter)

EVERYONE - DO NOT EAT RESIDENT FISH, SHELLFISH, or CRAB

Especially **WOMEN** who are or may become **PREGNANT, NURSING MOTHERS, and CHILDREN**. They have chemicals that can harm the growth and brain development of babies and children.



Crab



Starry flounder



Perch



Clams



Rockfish



Mussels



Sole

LOWER DUWAMISH RIVER

ADVISORY

EAT SALMON. It's the healthiest choice.

12 meals per month.

Opción saludable: 12 comidas por mes. ...
健康選擇：每月12次。 ...
건강에 안전한 분량: 한달 식사 12회. ...
Sử dụng lựa chọn lành mạnh: Mỗi tháng 12 bữa. ...
பேரீழ்வுமற்ற - மீது 12 உணவுகளும் ...
உணவுகளில்/உணவுகளில்: அல்லது 12 உணவுகளும் ...
Правильный выбор: 12 порций в месяц. ...
Doorasho Caafimaad Leh: 12 cunis bishii. ...

Serving/Meal Size

Adult: 160 lbs. - 8 oz. uncooked fish

Child: 90 lbs. - 4 oz. uncooked fish

OR

Limit: 4 meals per month.

Limitar el Chinook: 4 comidas por mes. ...
限食帝王鱈：每月4次。 ...
제한 분량: 한달 식사 4회. ...
Giới Hạn ăn cá Chinook: Mỗi tháng 4 bữa. ...
கிடைக்கக்கூடிய மீது: மீது 4 உணவுகளும் ...
பெரிசுமூலியு/சின்கோ: அல்லது 4 உணவுகளும் ...
Yano Chinook: 4 cunis bishii. ...
Ha cunin znoynopraibimn chashono: 4 porqiyi bmochi. ...



Chinook (King)
Chinook have a dark mouth and black gills. The upper and lower tail is covered with spots, and silver is prominent.

OR

Avoid: 2 meals per month.

Avoid: 2 comidas por mes. ...
避免：每月2次。 ...
금지 분량: 한달 식사 2회. ...
Tránh: Mỗi tháng 2 bữa. ...
விழித்தல் - மீது 2 உணவுகளும் ...
Избегайте: 2 порции в месяц. ...
Tránh: Mỗi tháng 2 bữa. ...
Iska Ibaali: 2 cunis bishii. ...

Blackmouth Salmon

Blackmouth are in season resident Chinook (King) caught during winter.

DO NOT EAT crab, shellfish, or bottom-feeding fish due to pollution.

Debido a la contaminación, **NO CONSUMA** cangrejos, mariscos o pescados que se alimenten en el fondo.

개, 조개 또는 바닥에서 서식하는 생선류는 오염의 문제가 있으니 절대로 먹지 마십시오.

由於水質的污染，切勿食用在水底覓食的魚、螃蟹或貝類。

Không nên ăn cua, nghêu sò hoặc loài cá sinh sống hay ăn những thức ở đáy nước vì bị nhiễm bẩn.

В связи с загрязнением воды нельзя употреблять в пищу крабов, моллюсков и рыбу, которая обитает или питается у дна.

සමූහිකව, ඔබගේ ජීවිතයට, වයසට සහ වෛද්‍ය උපදෙස්වලට අනුව ඔබට අනුමතව නොමැති වස්තූන් භාවිතයෙන් වැළකී සිටීමට අවශ්‍ය වේ.

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Ha cunin suulgoys; alaaxeyda badda, ama kaluunka badda boosteeda wax ka cuna sababta oo ah wasakheysanka badda.



Crab

Clam



Mussels

Perch



Sole

Rockfish

Starry Flounder

Watershed above the LDW

- Water from the upper watershed needs to meet water and sediment quality standards.
- Upstream pollutant sources need to be addressed to:
 - Complement cleanup efforts in the LDW
 - Improve overall watershed health



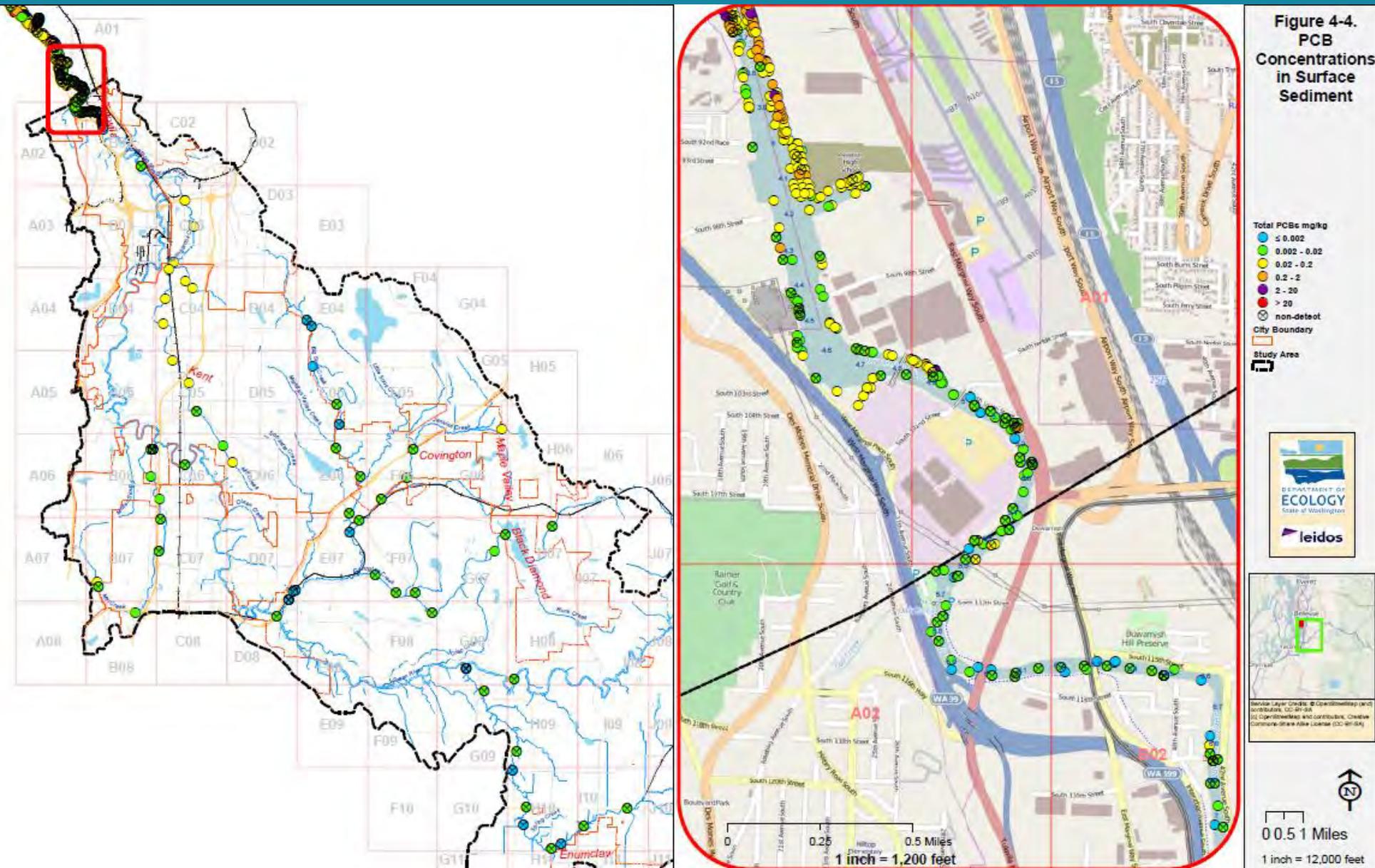
Summary of Pollutants in Surface Sediment in the Watershed above LDW

Pollutant	Unit	Frequency of Detection	Range of Detections	LDW Remedial Action Level	LDW wide Cleanup Level
Arsenic	mg/kg DW	189 / 192	0.71 – 166	57	7
Total PCBs	µg/kg DW	80 / 202	0.73 – 770	240*	2
Total cPAH	ug TEQ/kg DW	150 / 179	2 – 9,300	1000	380
Dioxin/Furan	ng TEQ/kg DW	16 / 16	0.12 – 20	25	2
BEHP	µg/kg DW	41 / 147	20 – 118,000	1,880*	940*

*These numbers assumes 2% organic carbon in sediment (Typical of LDW)



PCB Levels in Surface Sediment

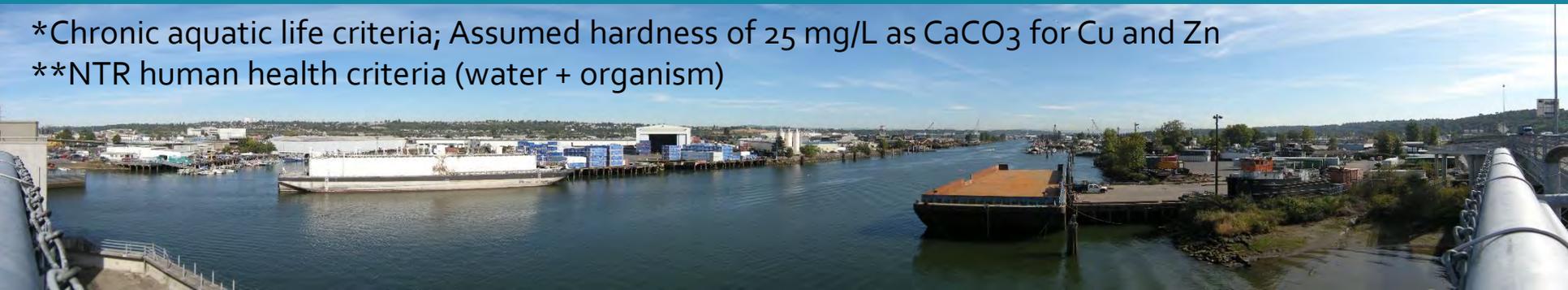


Summary of Pollutants in Surface Water in the Watershed above LDW

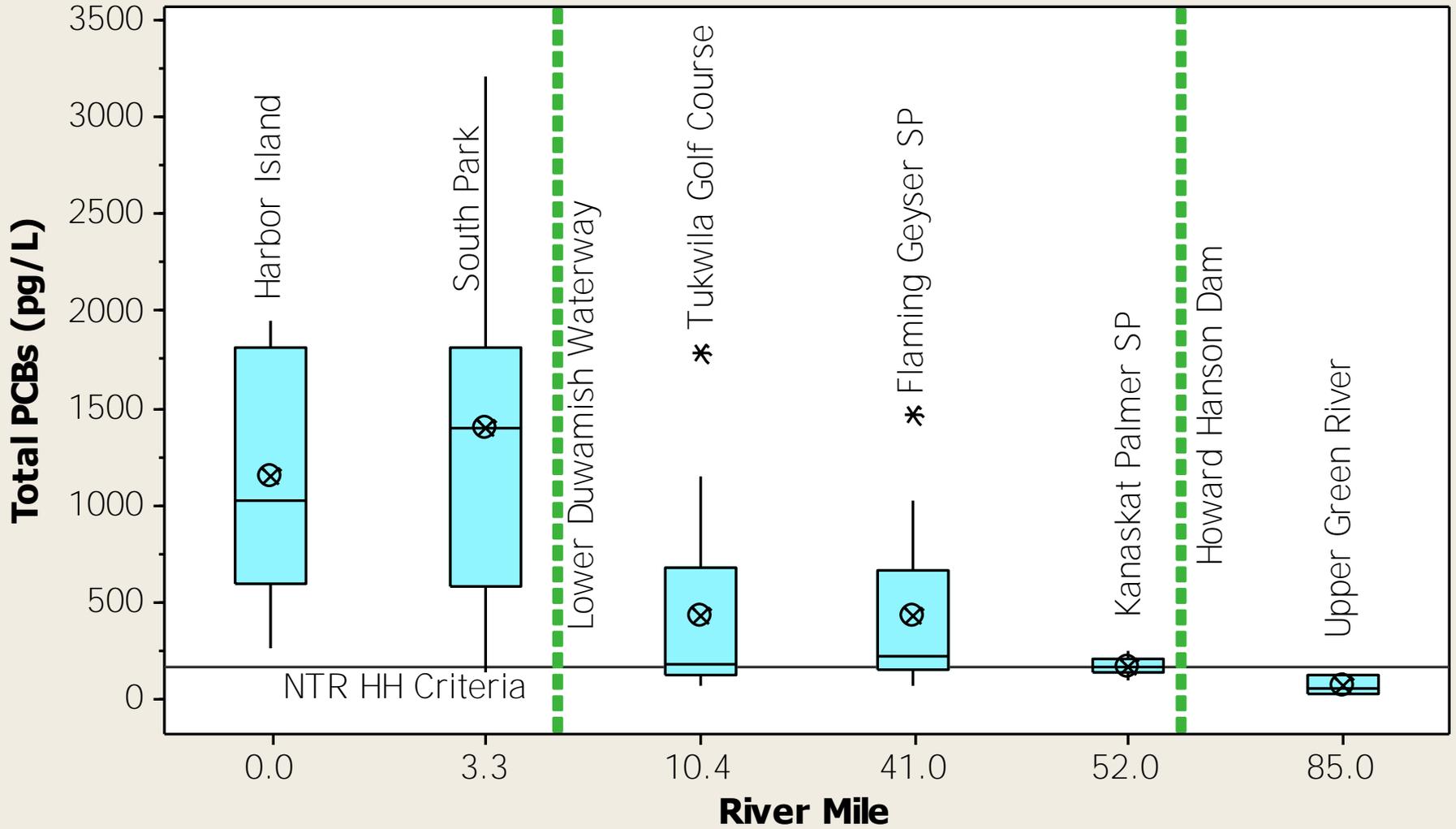
Pollutant	Unit	Frequency of Detection	Range of Detections	Water Quality Standards
Arsenic, Total	µg/L	131 / 161	0.10 – 2.7	36*
Copper, Total	µg/L	103 / 140	0.13 – 31	3.5*
Zinc, Total	µg/L	33 / 85	0.22 – 28	32*
Mercury, Total	ng/L	28 / 84	0.22 – 21.2	0.012*
BEHP	µg/L	1 / 23	2.9 – 2.9	1.8**
Chrysene	ng/L	43 / 95	0.24 – 29	2.8**
2,3,7,8-TCDD	pg/L	0 / 13	<0.6 – <0.6	0.013**
Total PCBs	pg/L	43 / 43	16.2 – 6800	170**

*Chronic aquatic life criteria; Assumed hardness of 25 mg/L as CaCO₃ for Cu and Zn

**NTR human health criteria (water + organism)



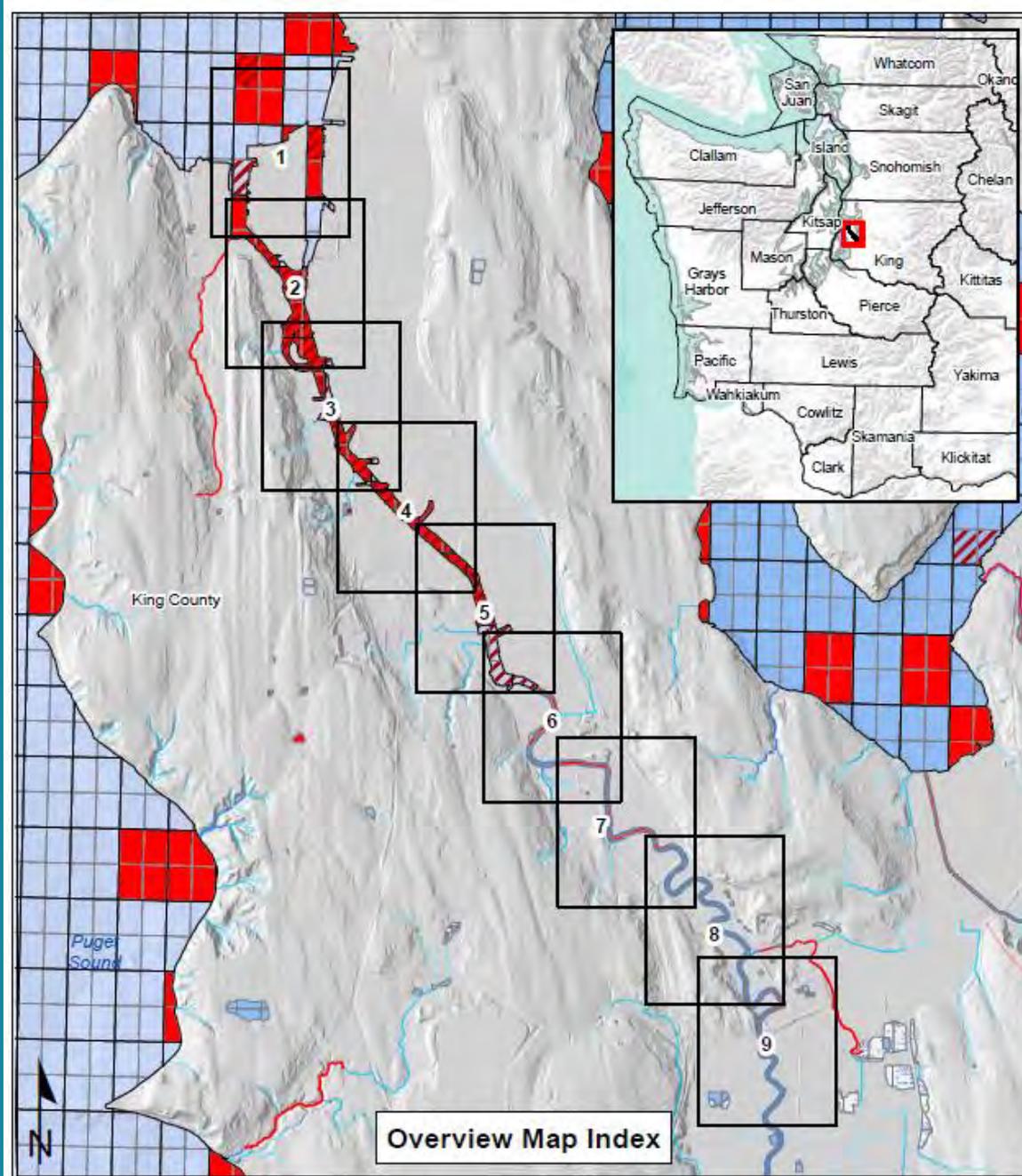
Boxplot of Total PCB Concentrations Along the River



Cross hair with circle represents mean and star represents potential outlier

Clean Water Act 303(d) listings

- 267 Total in Cat. 5
 - 117 Sediment
 - 89 Water
 - 61 Tissue
- 50 plus pollutants
 - Conventional
 - Total PCB
 - PAHs (19 different)
 - Metals (8)
 - Pesticides (6)
 - 2,3,7,8-TCDD
 - Phthalates (5)
 - Other SVOCs (5)



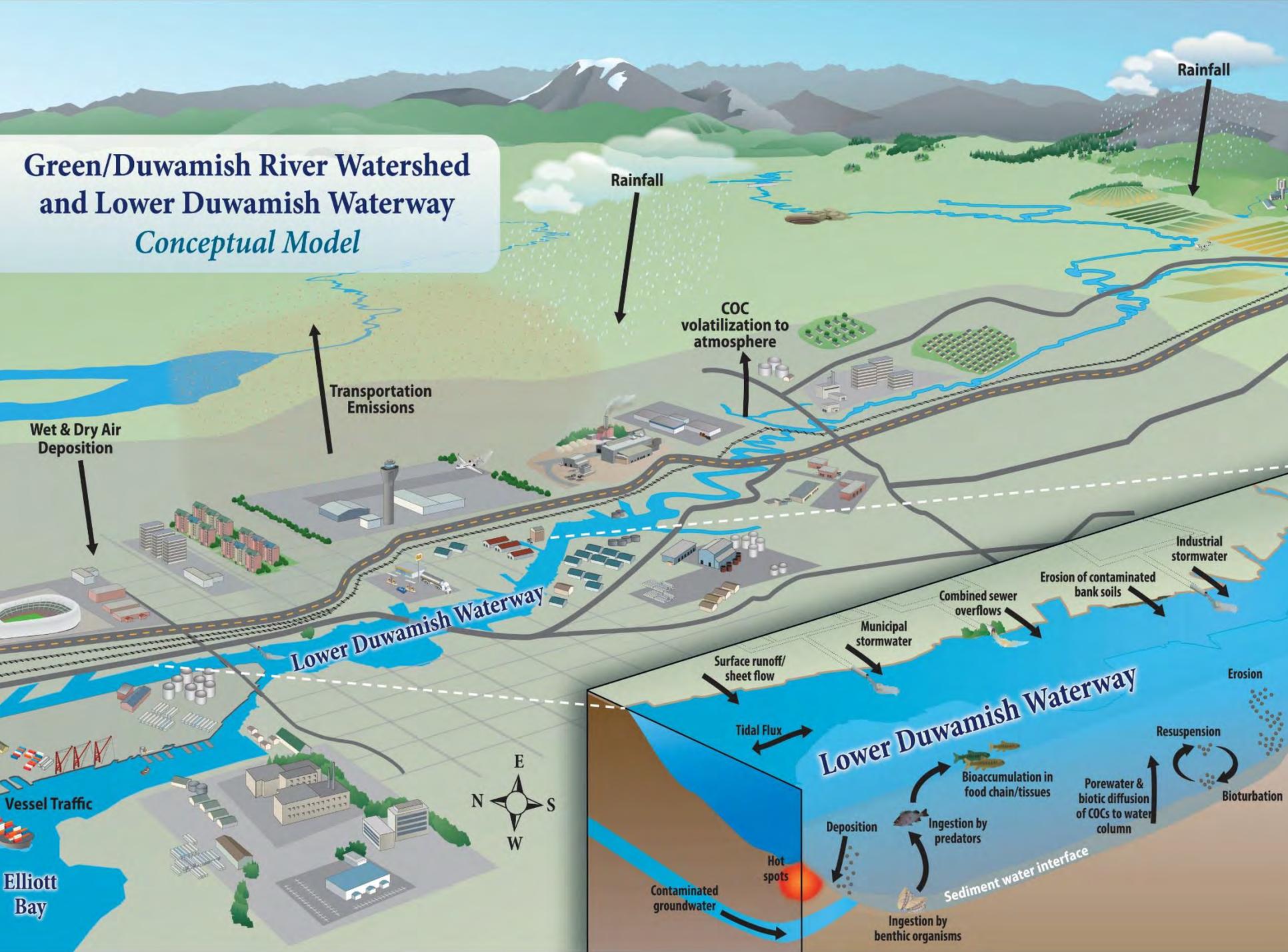
The following maps represent the 303(d) List of impaired waters for Washington State based on the Water Quality Assessment 303(d) List approved by EPA, December 21, 2012.

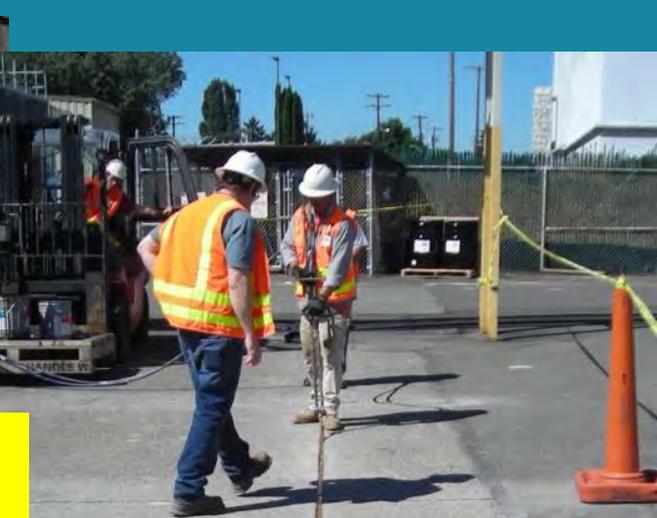
Toxics in the Watershed – Where do they come from?

- Historical Sources
 - Past industrial activities
 - Inappropriate waste disposal systems
 - Spills
- Ongoing Sources
 - Current industrial and urban activities
 - Building and recycled materials
 - Toxics in the products we use
 - Inadvertent production



Green/Duwamish River Watershed and Lower Duwamish Waterway Conceptual Model





What do PCB sources look like?



Waste Piles containing PCB'S



Summary

- LDW sediment is contaminated with 43 different benthic and human health risk driver chemicals
- Lack of water column data in LDW; limited data suggests PCBs above human health standards
- Fish Advisory exists for Duwamish River
- Watershed above LDW is less characterized with water, sediment, and tissue data
- Limited data in the upper watershed shows evidence of pollutants above screening levels

Current Efforts in the Watershed

- EPA is leading in-waterway sediment cleanup
- Ecology is leading source control efforts such that in-waterway cleanup remains effective

Status of the Green-Duwamish Watershed



Questions?