



Apr 5th, 10:25 AM - 10:30 AM

## PCBs in Lower Green River juvenile Chinook salmon

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# PCBs in Green-Duwamish Juvenile Chinook

By Jenée Colton, Chris Gregersen, Kollin  
Higgins, and Richard Jack

2018 Salish Sea Environmental Conference

April 4-6

Seattle, WA



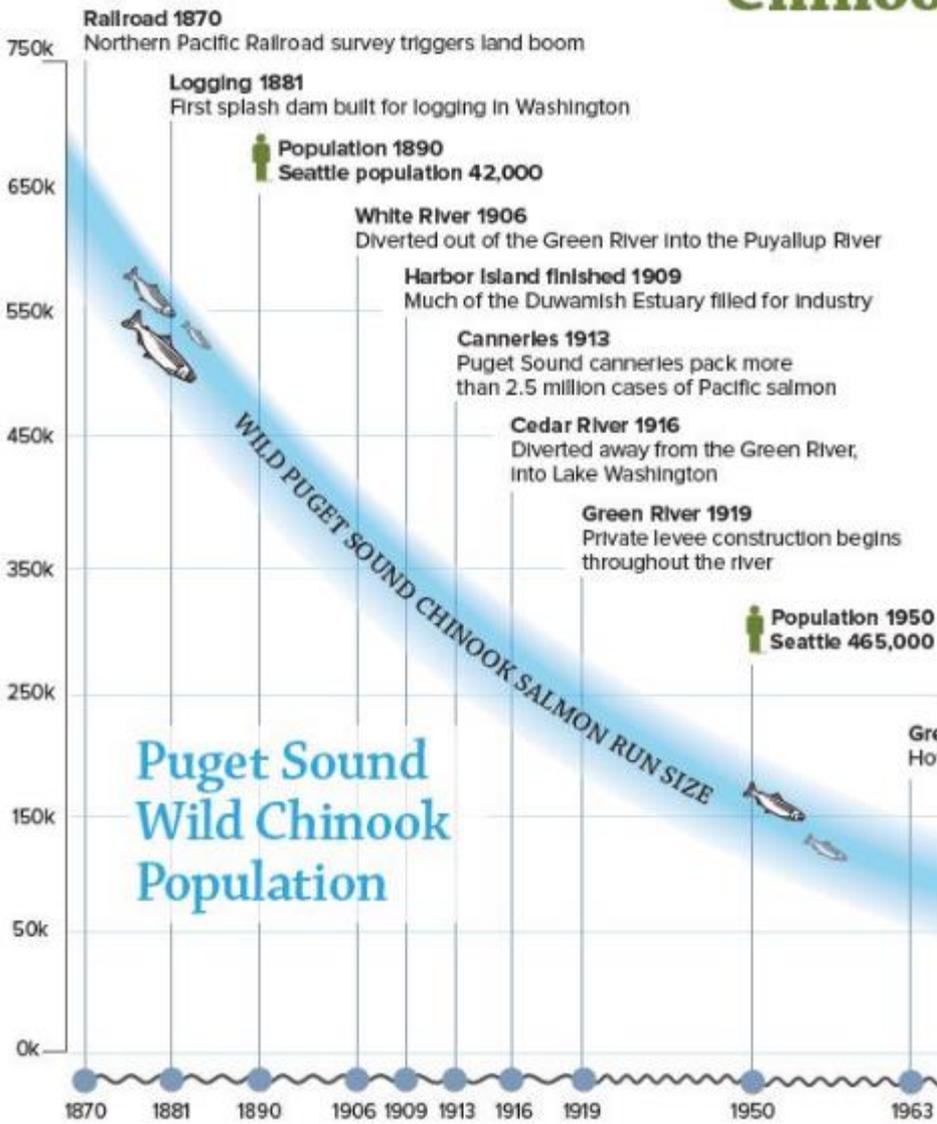
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# Chinook Salmon Recovery Timeline



**Railroad 1870**  
Northern Pacific Railroad survey triggers land boom

**Logging 1881**  
First splash dam built for logging in Washington

**Population 1890**  
Seattle population 42,000

**White River 1906**  
Diverted out of the Green River into the Puyallup River

**Harbor Island finished 1909**  
Much of the Duwamish Estuary filled for industry

**Canneries 1913**  
Puget Sound canneries pack more than 2.5 million cases of Pacific salmon

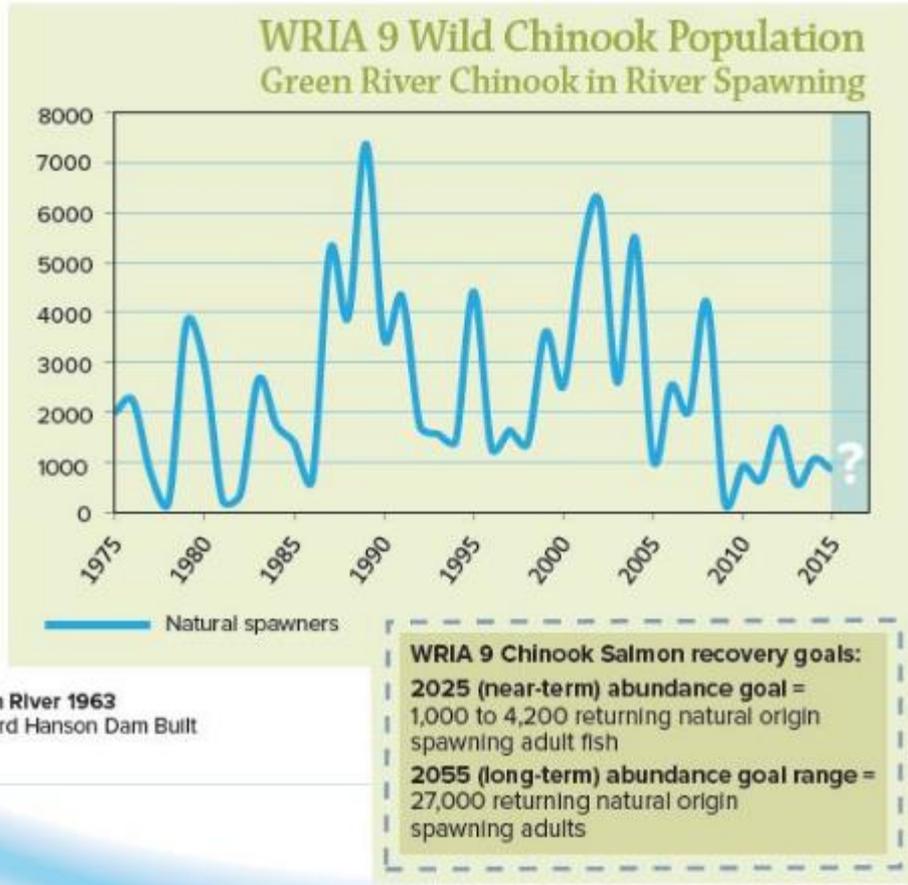
**Cedar River 1916**  
Diverted away from the Green River, into Lake Washington

**Green River 1919**  
Private levee construction begins throughout the river

**Population 1950**  
Seattle 465,000

**Green River 1963**  
Howard Hanson Dam Built

**Puget Sound Wild Chinook Population**



**Why does the data on salmon abundance begin to improve in 1975?**  
 The quality of data on annual salmon population runs improves starting in 1975, when the Washington Department of Fisheries (predecessor to Department of Fish and Wildlife) initiated data collection in response to the federal court mandate to develop and share annual abundance of salmon returning to individual rivers in Puget Sound.

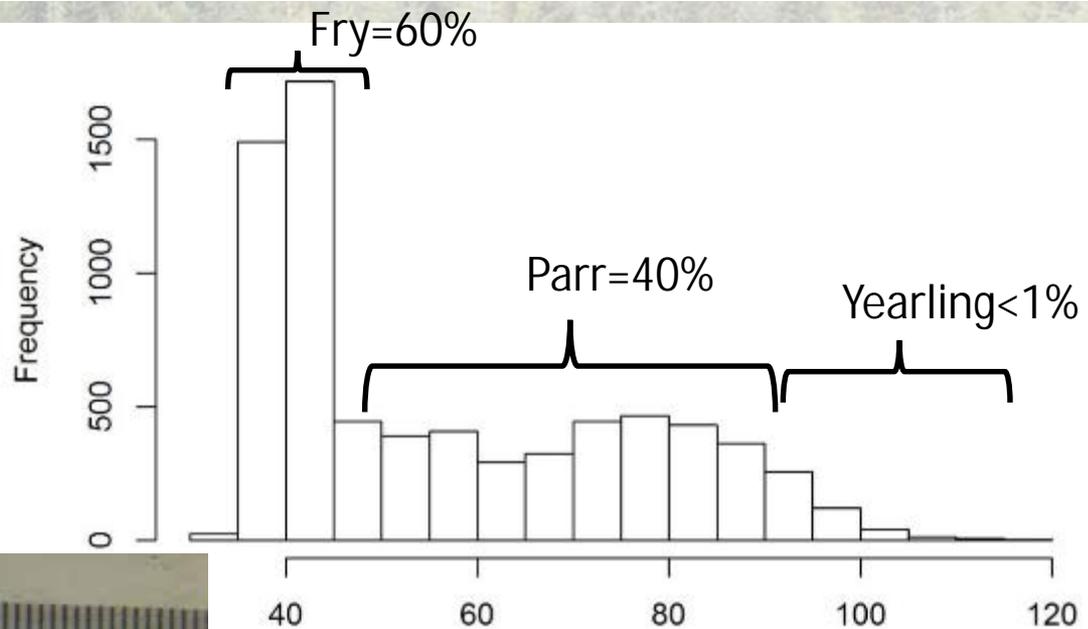
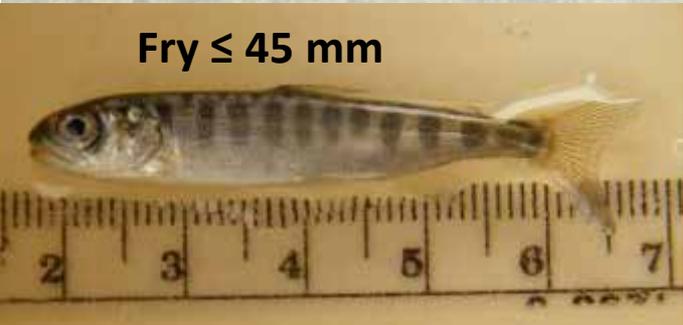
Puget Sound Chinook listed as threatened species

Lowest number of natural origin spawners (182 fish) recorded in the Green River

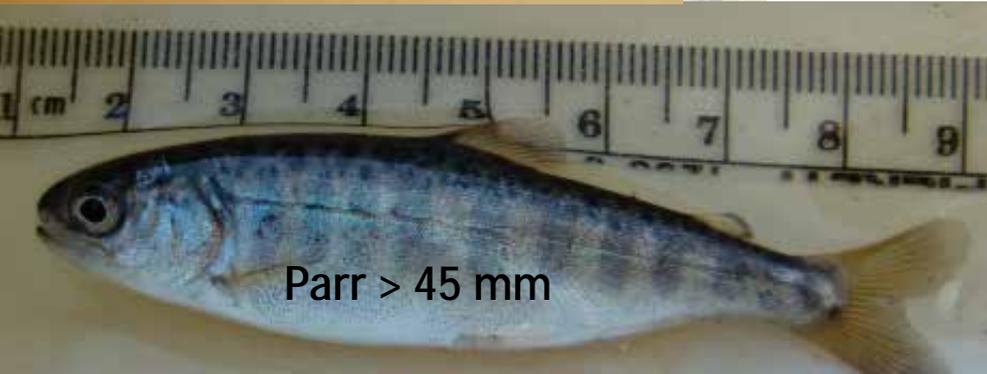
**Population 2016**  
Seattle 689,000

# Green Juvenile Chinook Lifestages

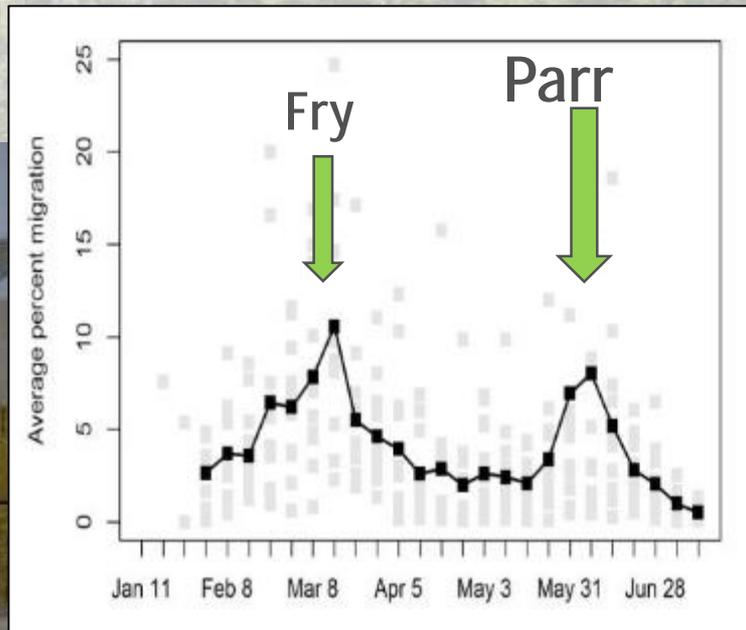
Fry  $\leq 45$  mm



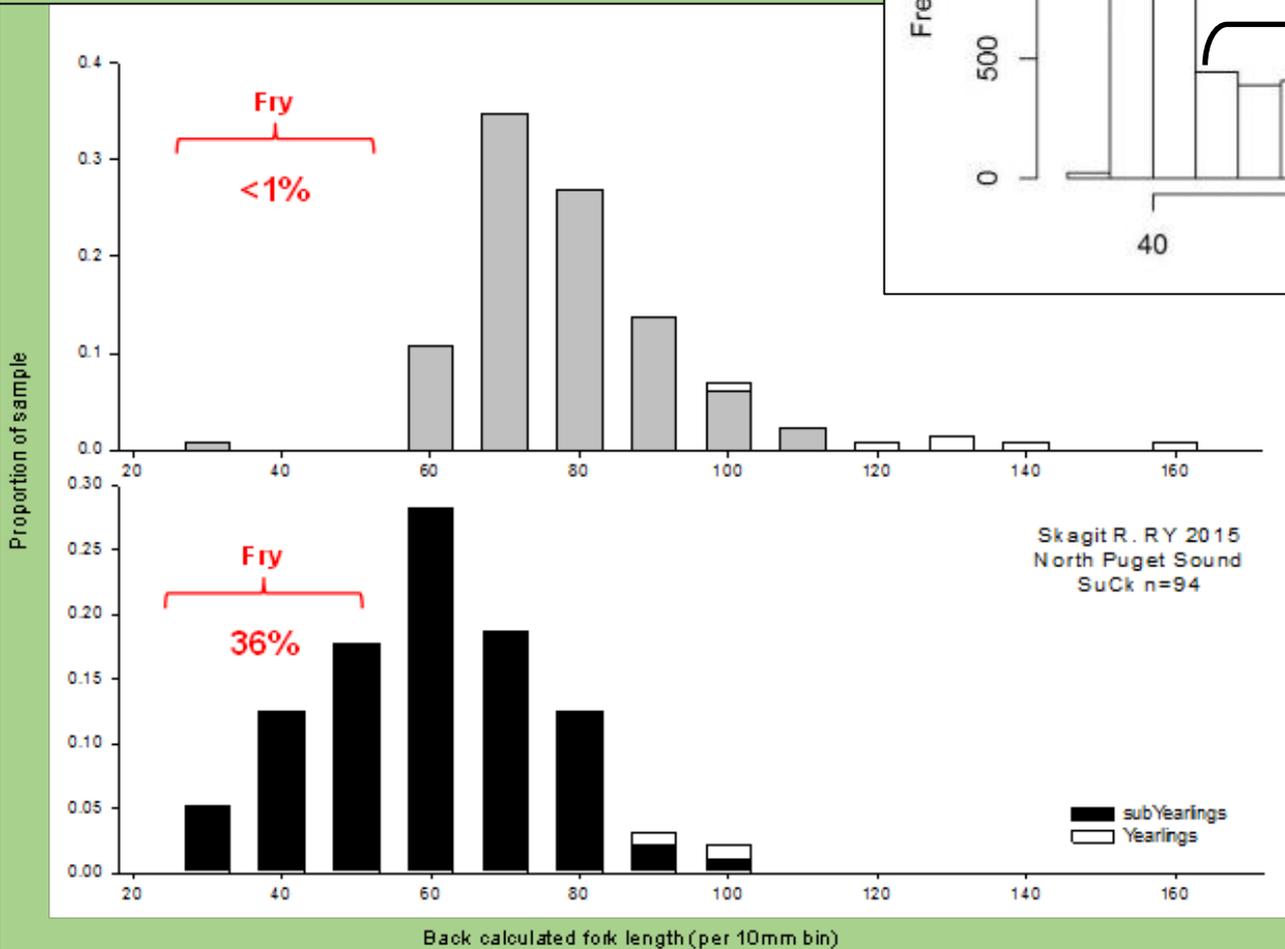
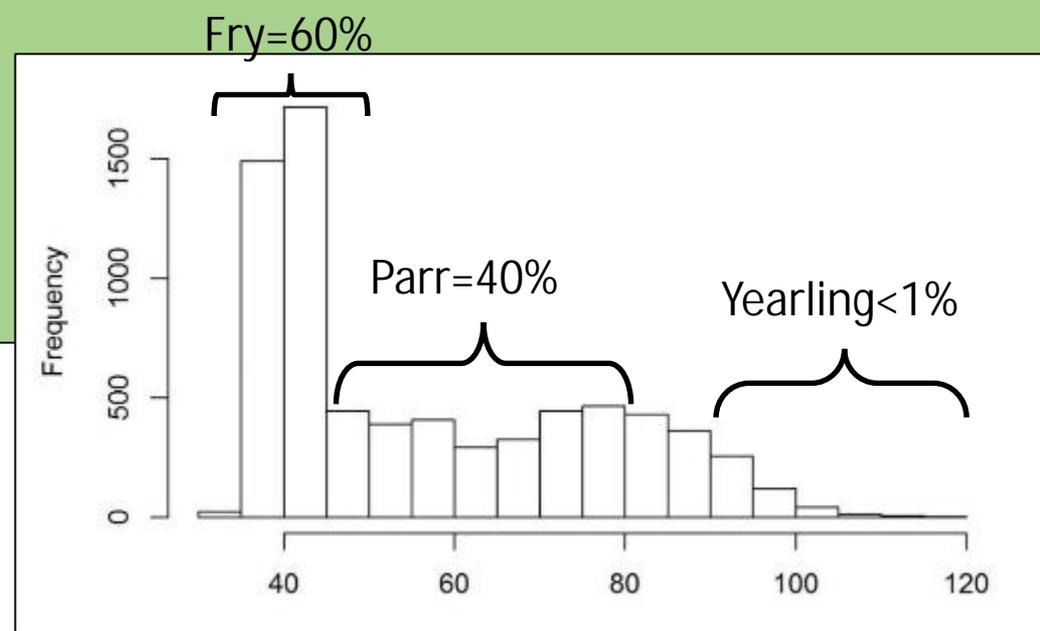
Parr  $> 45$  mm



Yearling  $> 80$  mm



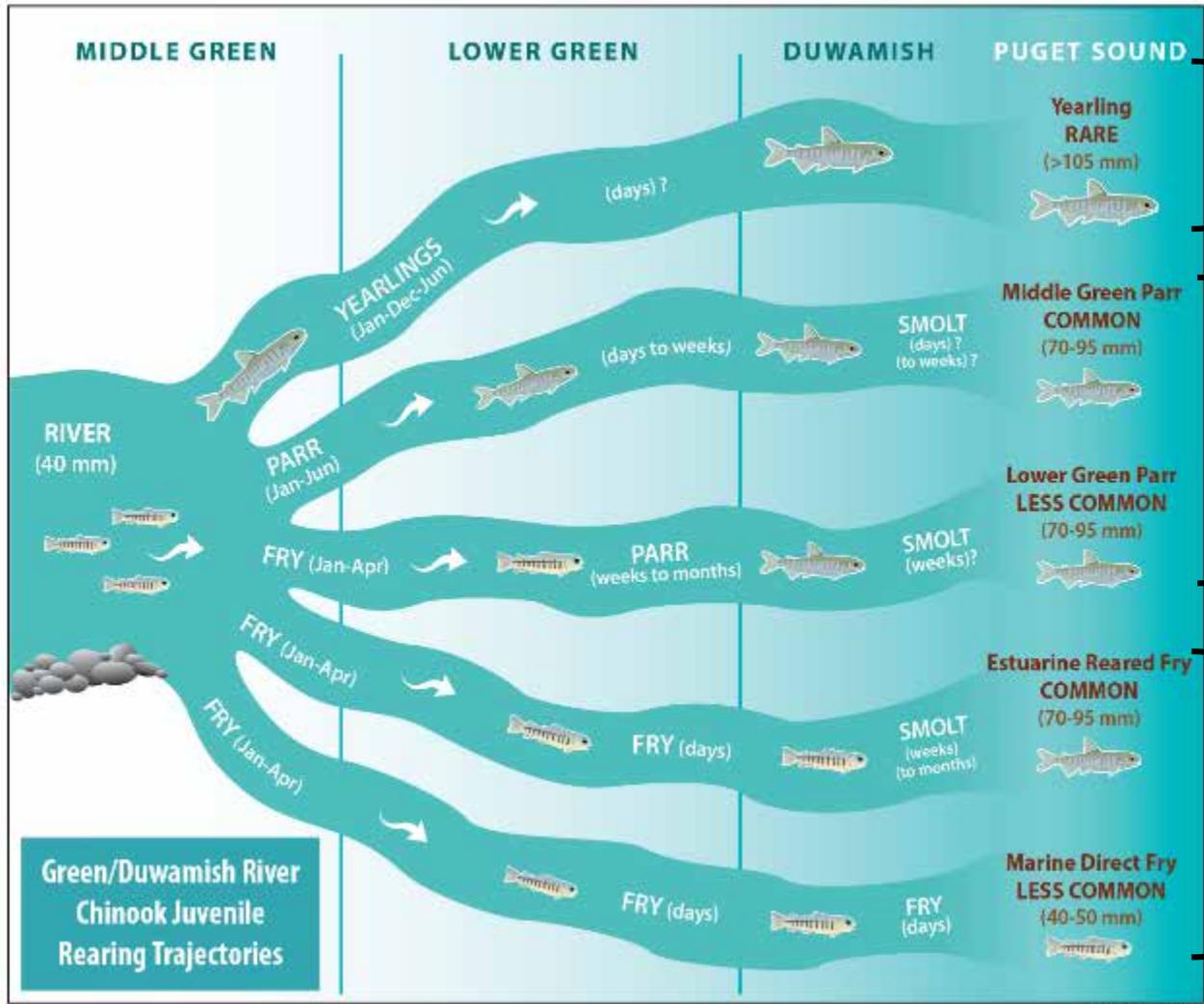
# Productivity and Survival



Green River

Skagit River

Figure 4.1.2. Length frequency histogram of back calculated size (fl-mm) at estuary/ocean entrance of returning adult Chinook salmon from the Green River (gray bars) and Skagit River (black bars). Yearlings from each population in clear bars.



Least abundant juvenile, but highest survival to adulthood

2<sup>nd</sup> most abundant juvenile, high survival to adulthood

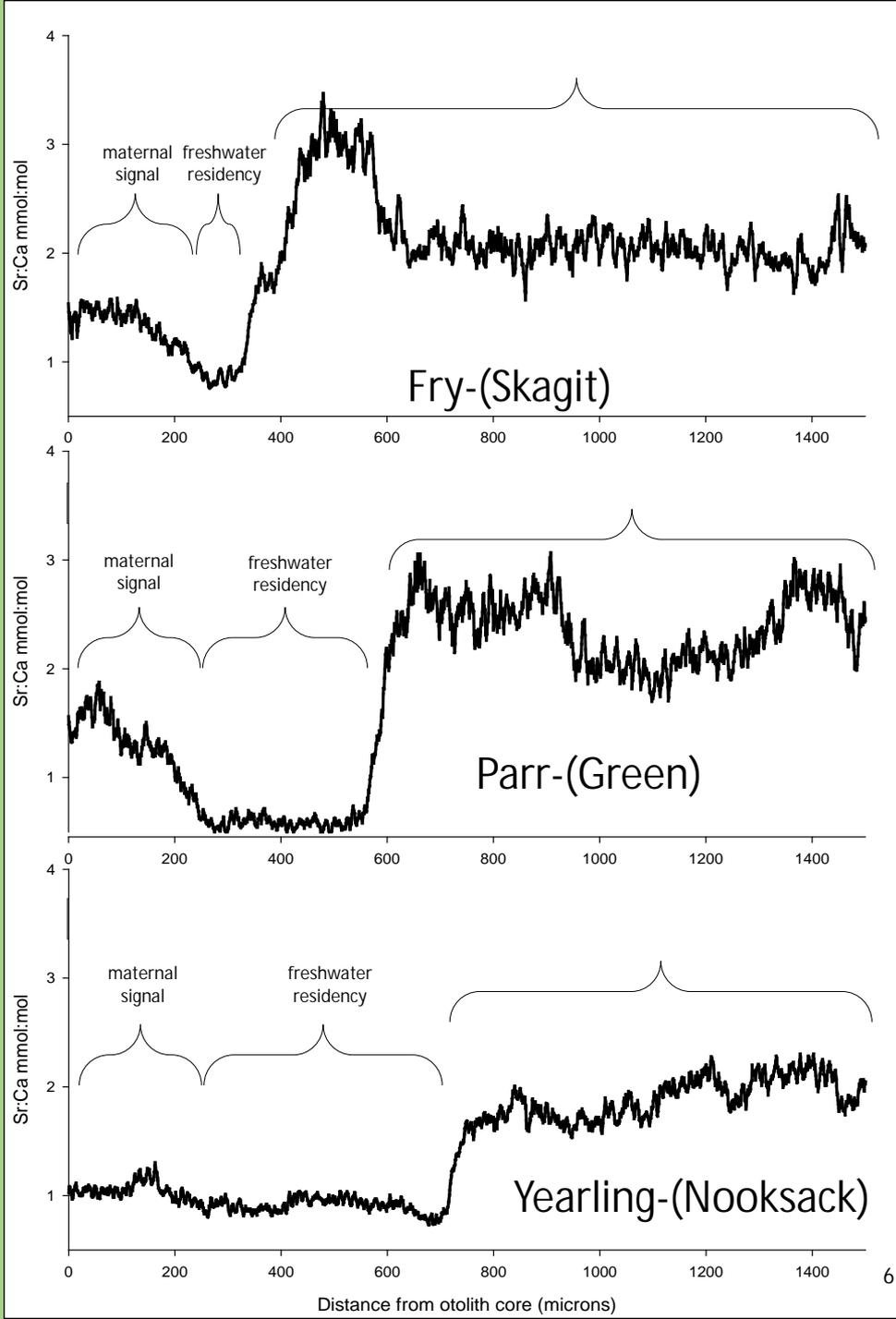
Most abundant juvenile, but extremely low survival to adulthood

Last updated Feb 2017

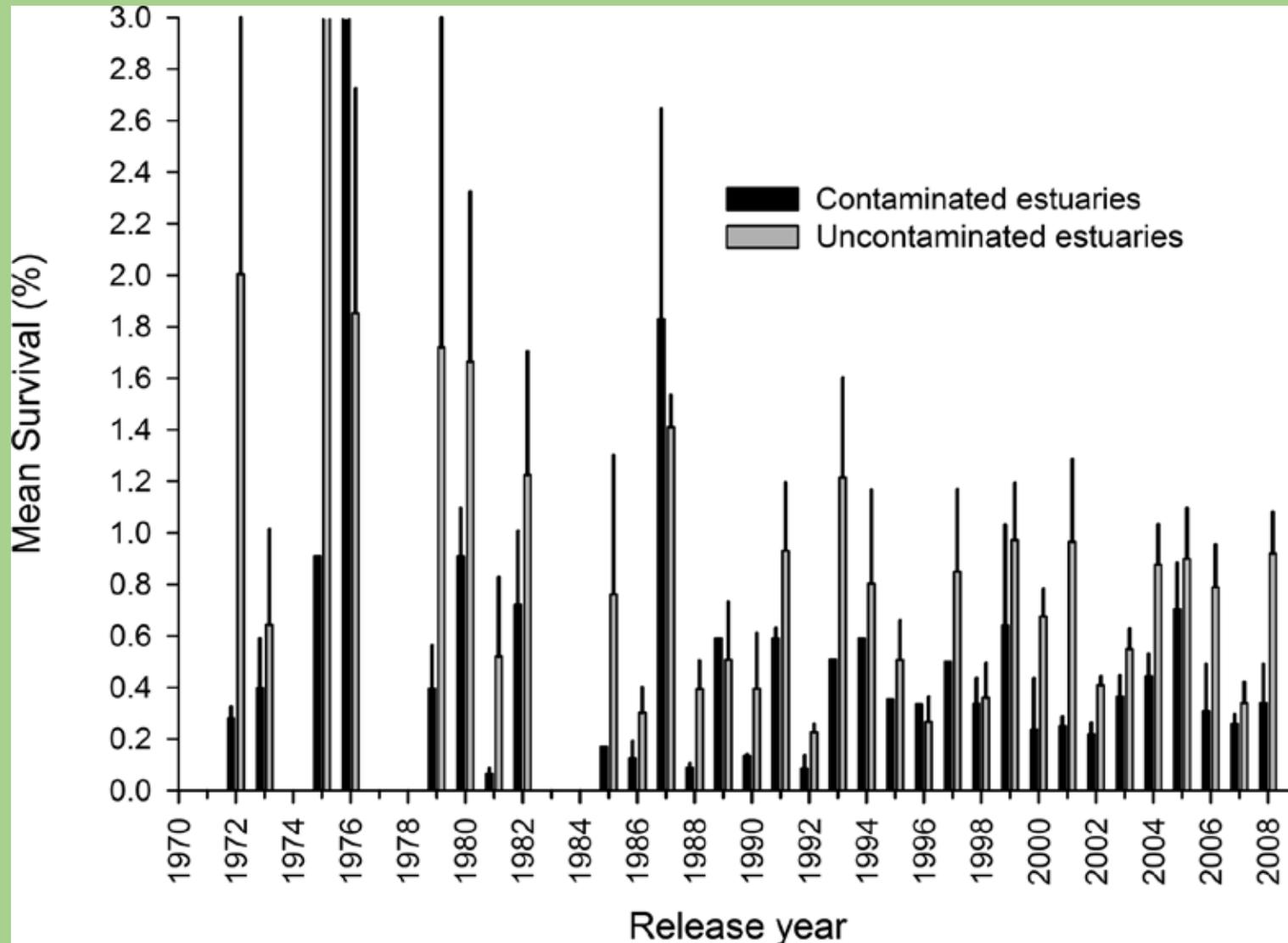
# Identifying Life History with Otoliths



Courtesy of Lance Campbell WDFW



# Smolt – Adult – Returns

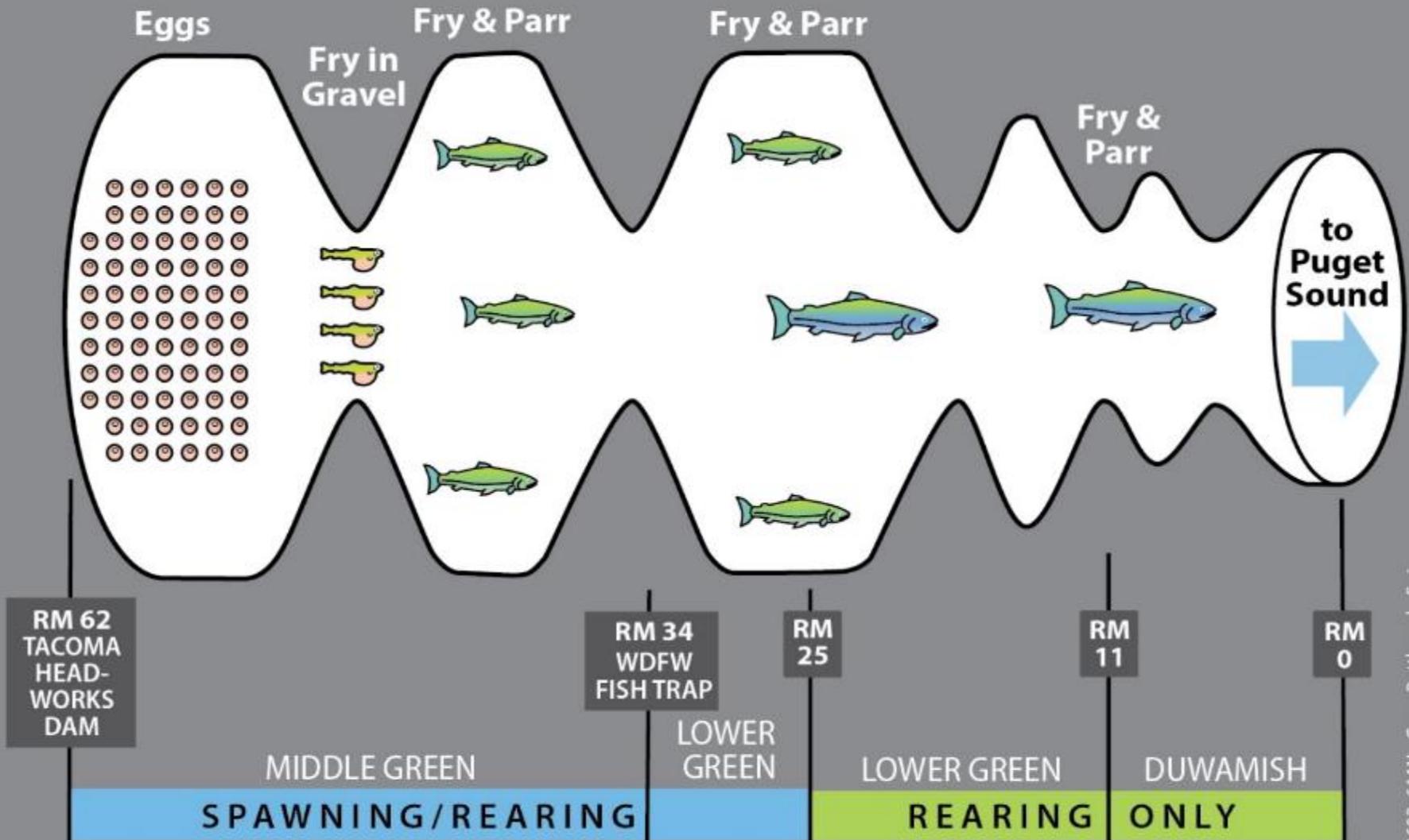


45% Lower Adult Return Rates for Chinook from Contaminated (including Duwamish) vs Uncontaminated Estuaries

Meador (2014)

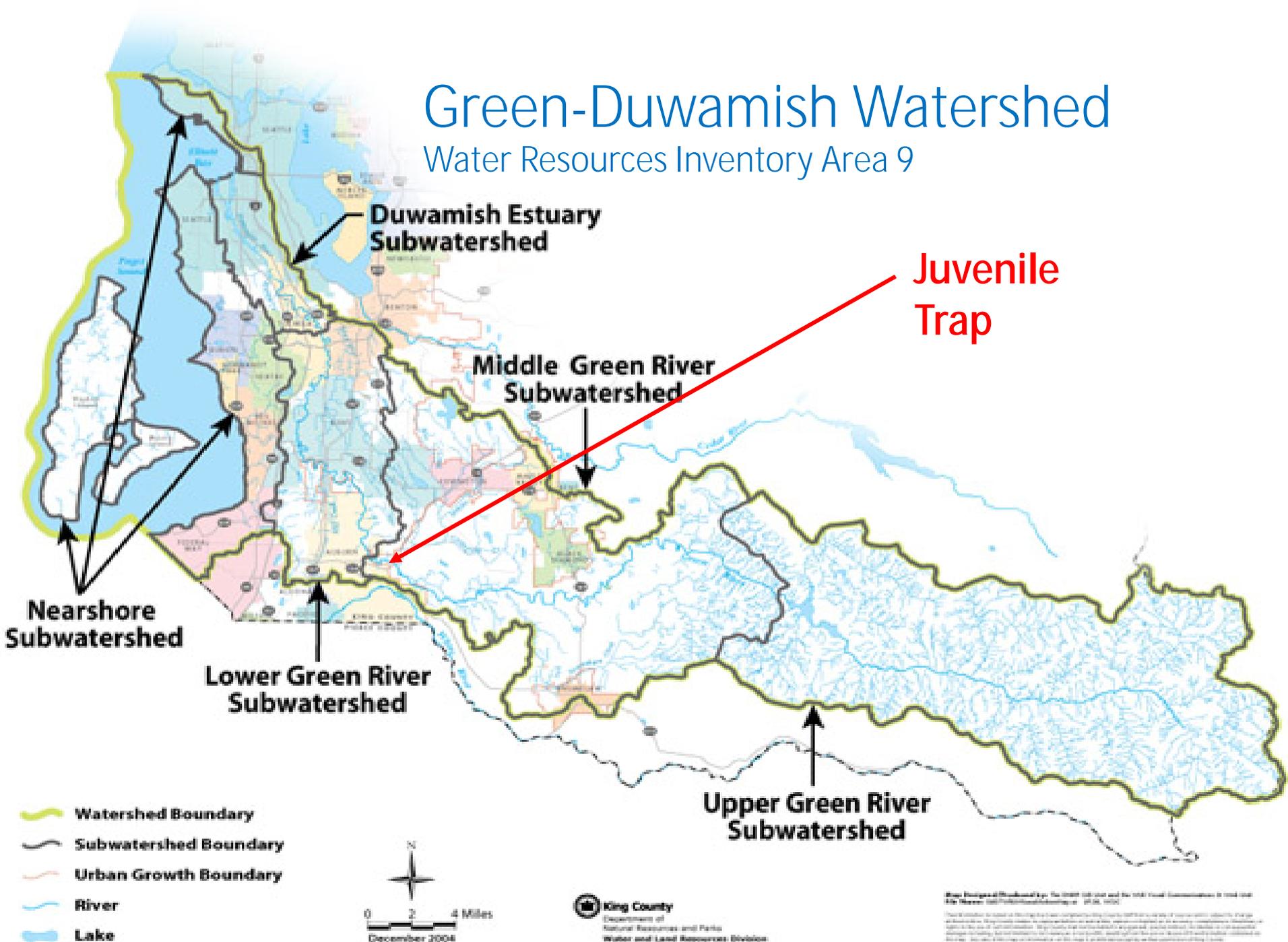
# CONTAMINANT AND/OR

# HABITAT BOTTLENECKS ?



# Green-Duwamish Watershed

Water Resources Inventory Area 9



Duwamish Estuary Subwatershed

Middle Green River Subwatershed

Juvenile Trap

Nearshore Subwatershed

Lower Green River Subwatershed

Upper Green River Subwatershed

- Watershed Boundary
- Subwatershed Boundary
- Urban Growth Boundary
- River
- Lake



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Map prepared by the King County Department of Natural Resources and Parks, Water and Land Resources Division, in cooperation with the Washington Department of Ecology, in 2004. The map is a product of the Washington Department of Ecology, in cooperation with the King County Department of Natural Resources and Parks, Water and Land Resources Division. The map is a product of the Washington Department of Ecology, in cooperation with the King County Department of Natural Resources and Parks, Water and Land Resources Division.

# 2017 King County Analysis

- What are [PCBs] in Chinook entering Lower Green River?
- WDFW screw trap
  - Hatchery Chinook = 1 composite of 18 fry (28-30 mm)
  - Wild Chinook = 2 composite samples
    - 69 fry and parr (35-62 mm)
    - 13 parr (62-97 mm)



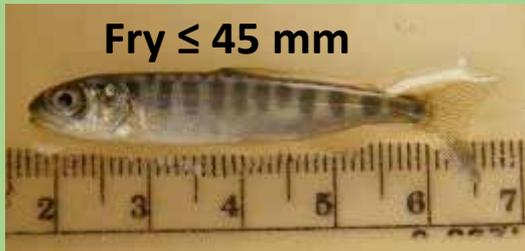
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# PCBs in juvenile Chinook leaving Middle Green 2017



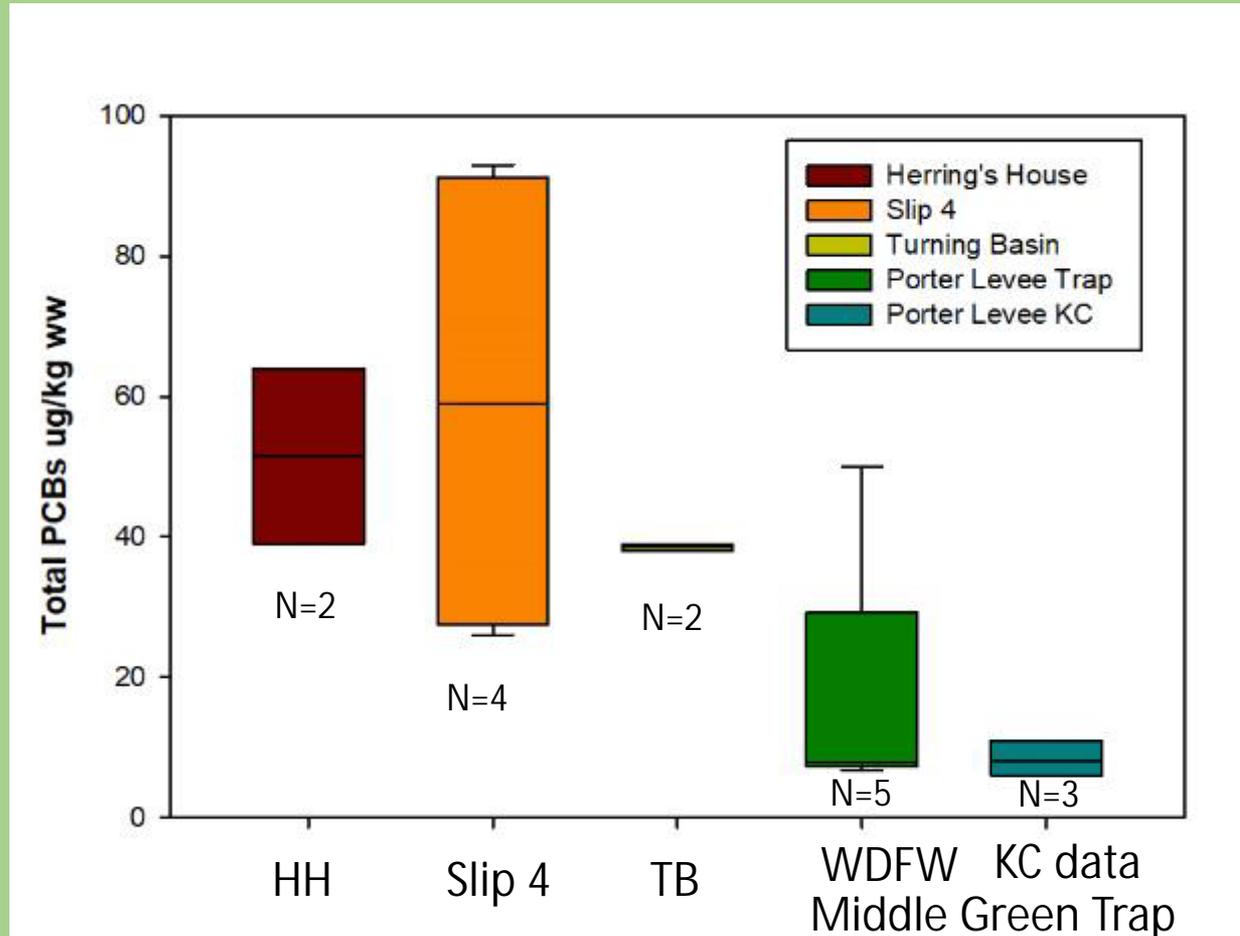
11 ppb (hatchery fry 28-30 mm)  
Hatchery food?

8 ppb (wild 35-62 mm)  
Maternal transfer?

5.9 ppb (wild 62-97 mm)  
Growth dilution?



# PCBs in juvenile Chinook – Comparison with 2016 WDFW



Elliott Bay



Middle  
Green River

WDFW Data:  
Sandie O'Neill

# To Be Continued...

- Further Chinook tissue sampling in 2018
  - Led by WDFW
  - Collaboration with WRIA 9, Muckleshoot Tribe, King County, NOAA
- Other contaminants impacting survival?



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