

Surface Water Contaminants in the Green River and Major Tributaries



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Presentation Overview

- Study Objectives and Questions
- Study Area
- Sampling and Analytical Methods
- Results
- Key Findings



Study Objectives

- To estimate the relative contributions of Arsenic, Polycyclic Aromatic Hydrocarbons (PAHs) and Polychlorinated Biphenyls (PCBs) from the major tributaries to the Green River and the Lower Duwamish Waterway (LDW)
- To provide information to assist in understanding potential upstream contaminant sources to the LDW

The information collected from this effort is not intended to be a comprehensive characterization of the water quality in the Basin and will not be sufficient to estimate total contaminant loading to the Lower Duwamish Waterway

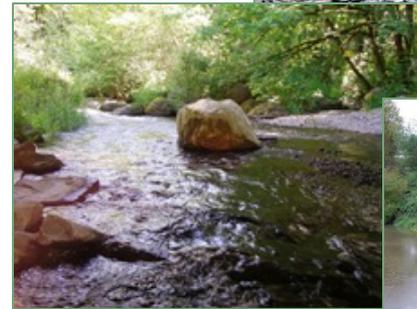
Study Questions

- How do relative contributions of contaminants differ between dry season/baseflow and wet season/storm conditions?
- What are the relative spatial differences in contaminant concentrations in the Green River and its major tributaries?



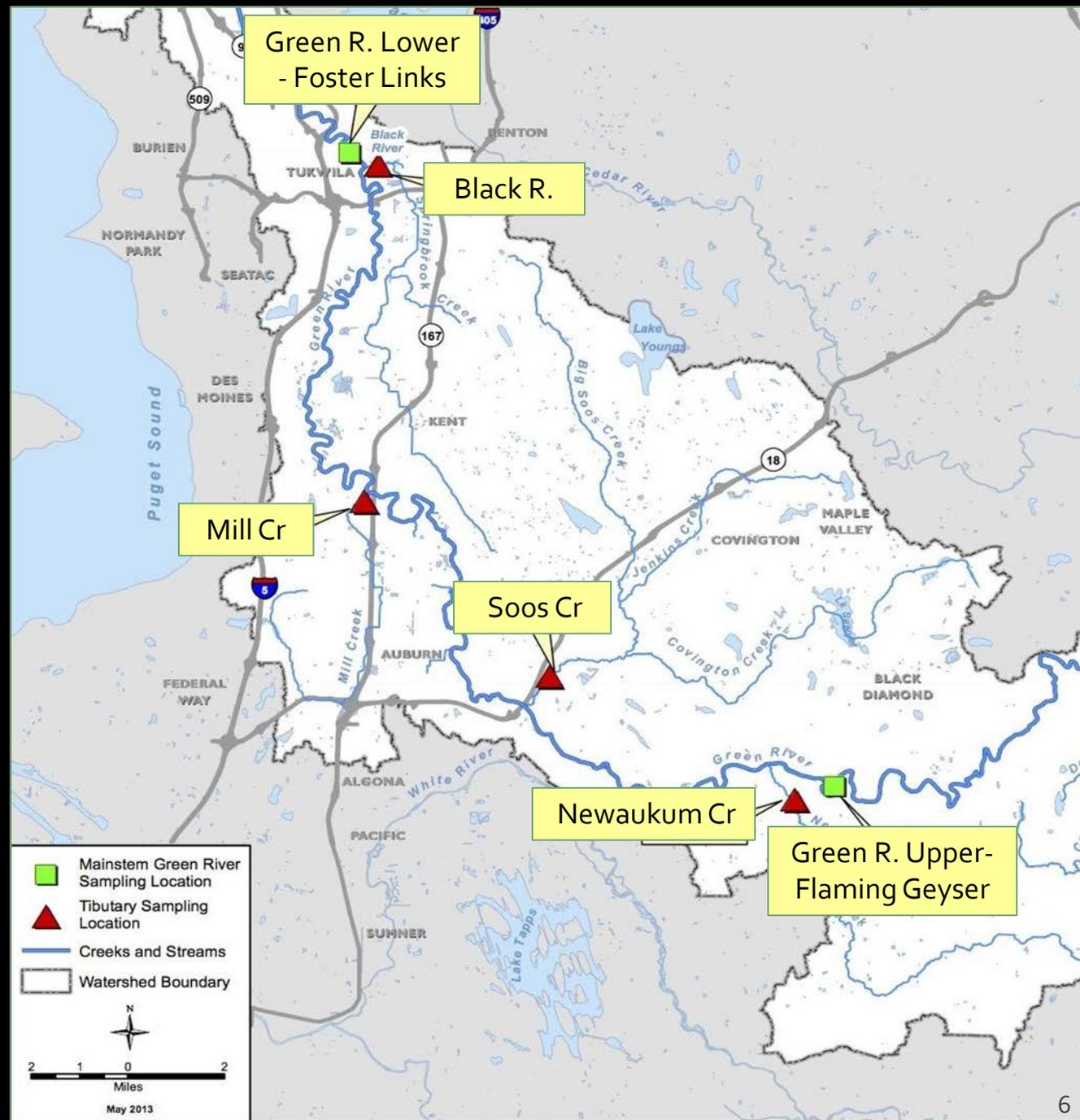
Study Area – Sampling Locations

- Main Stem Green River
 - Upper - Flaming Geysers State Park (RM 41)
 - Lower- Foster Links Golf Course (RM 10)
- Tributaries
 - Newaukum, Soos, and Mill Creeks
 - Black River Pump Station/ Springbrook Creek



Study Area

Sampling Locations



Sampling Methods

■ Sampling Events

- 3 dry baseflow
 - Min. 3-day antecedent dry period
- 6 storm events
 - Predicted $\geq 0.25''$ event

■ Collection Methods

- Composite Samples
- ISCO[®] auto-samplers

■ Flow

- Measured/estimated at all locations



Sampling Methods

- **Dry Baseflow** (Sept 2011)
 - 24-hr time-weighted composites (30 min. intervals)
- **Storm Events** (Nov 2011-Nov 2012)
 - *Tributaries: 12-24 hr flow-weighted composite*
 - *Green River Main Stem and Black River Pump Station: 24 hr time-weighted (30 min. intervals)*

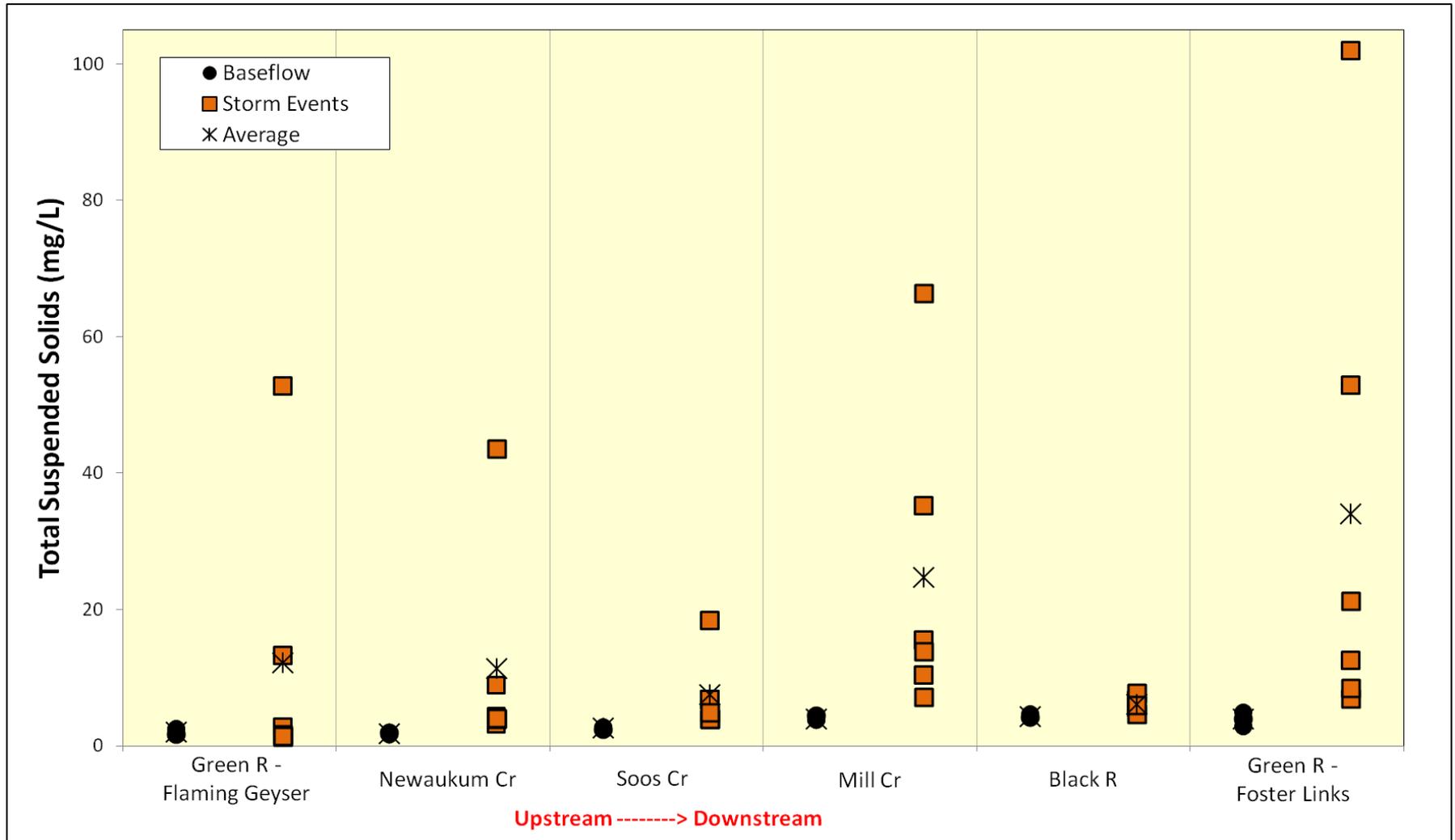


Measured Analytes

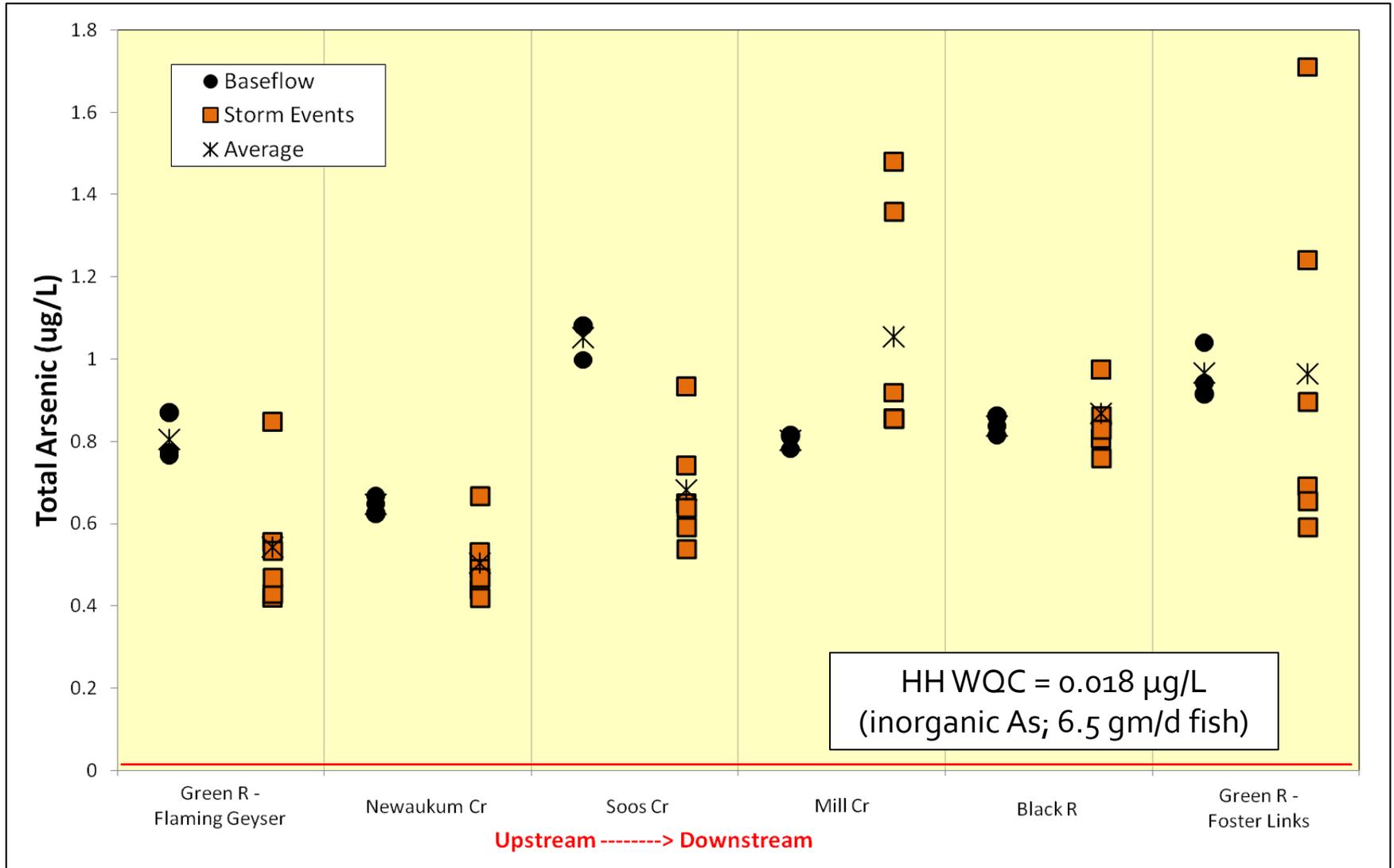
- Polychlorinated Biphenyl Congeners (PCBs)
(presented as total PCBs)
- Polycyclic Aromatic Hydrocarbons (PAHs)
(presented as total LPAH and HPAHs)
- Total & Dissolved Arsenic
- Total & Dissolved Organic Carbon
- Total Suspended Solids (TSS)



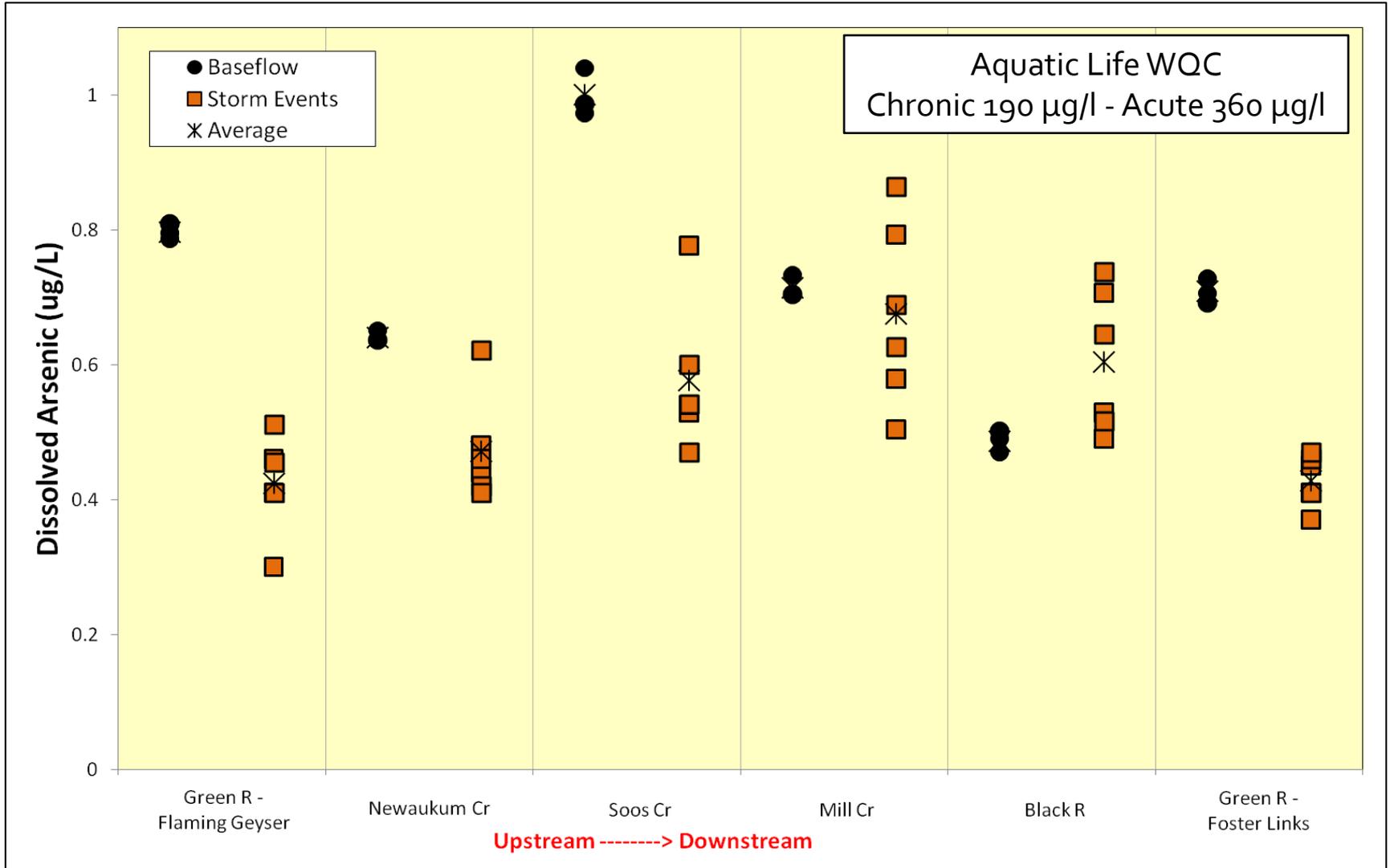
Results: Total Suspended Solids



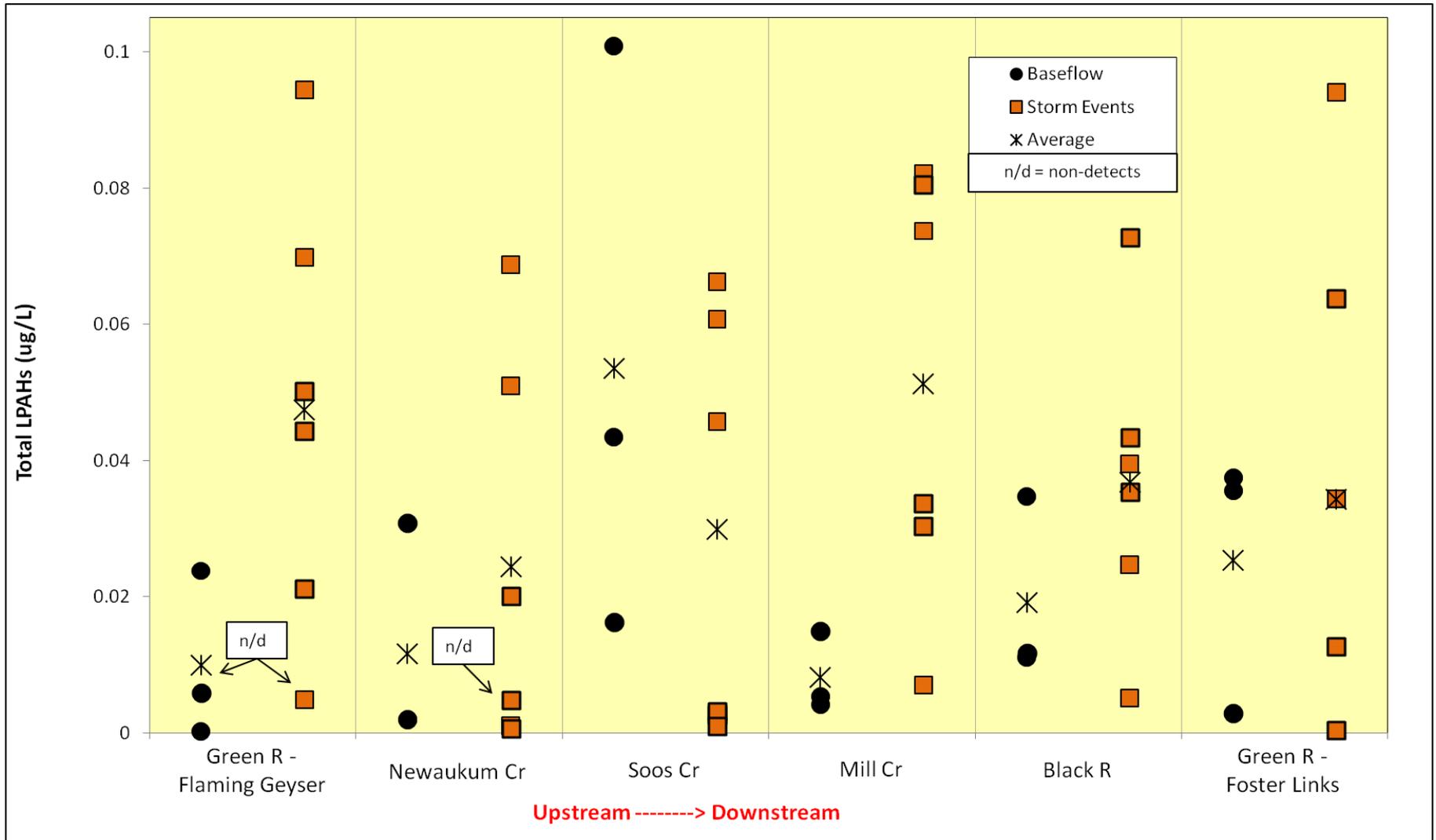
Results: Total Arsenic



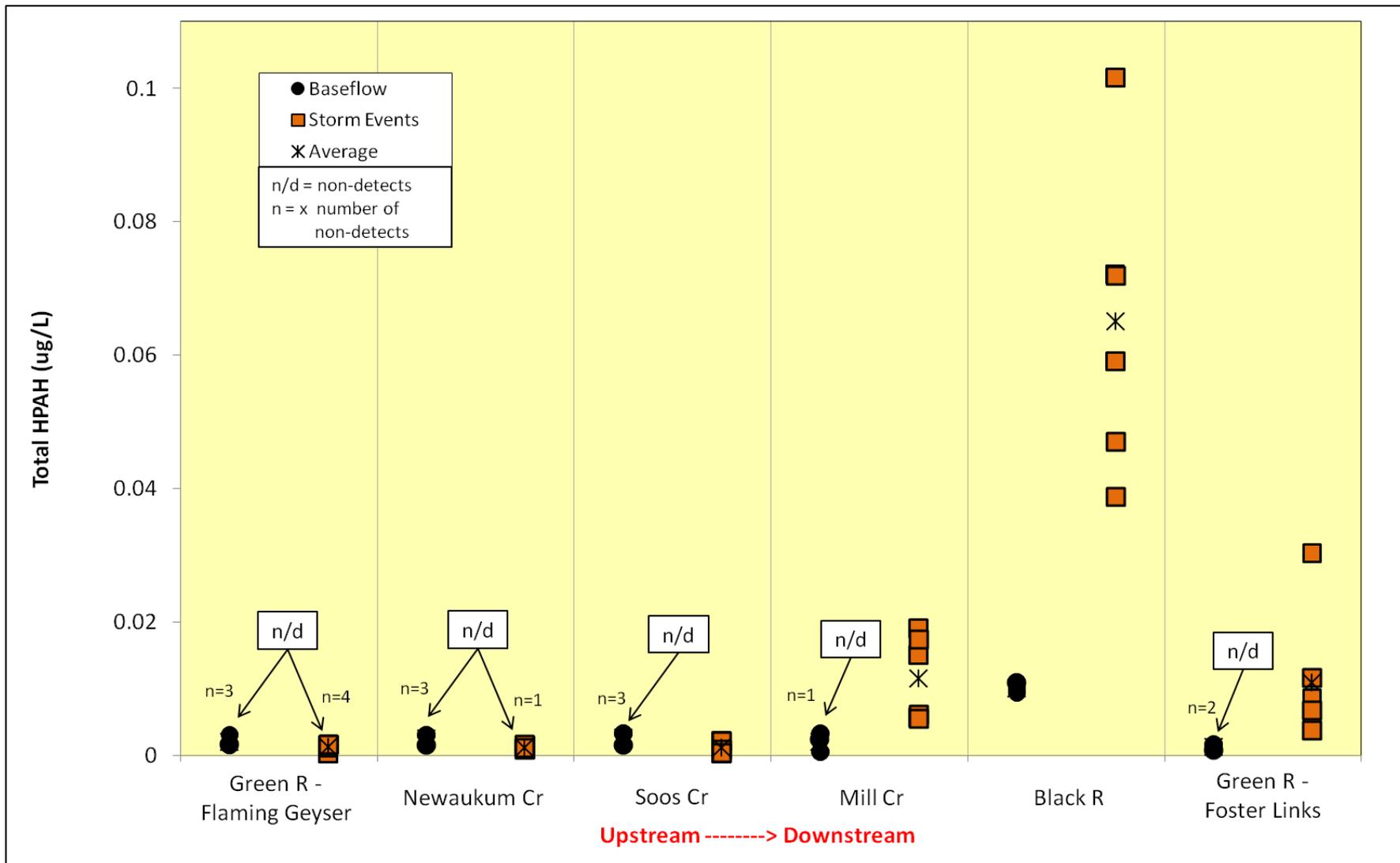
Results: Dissolved Arsenic



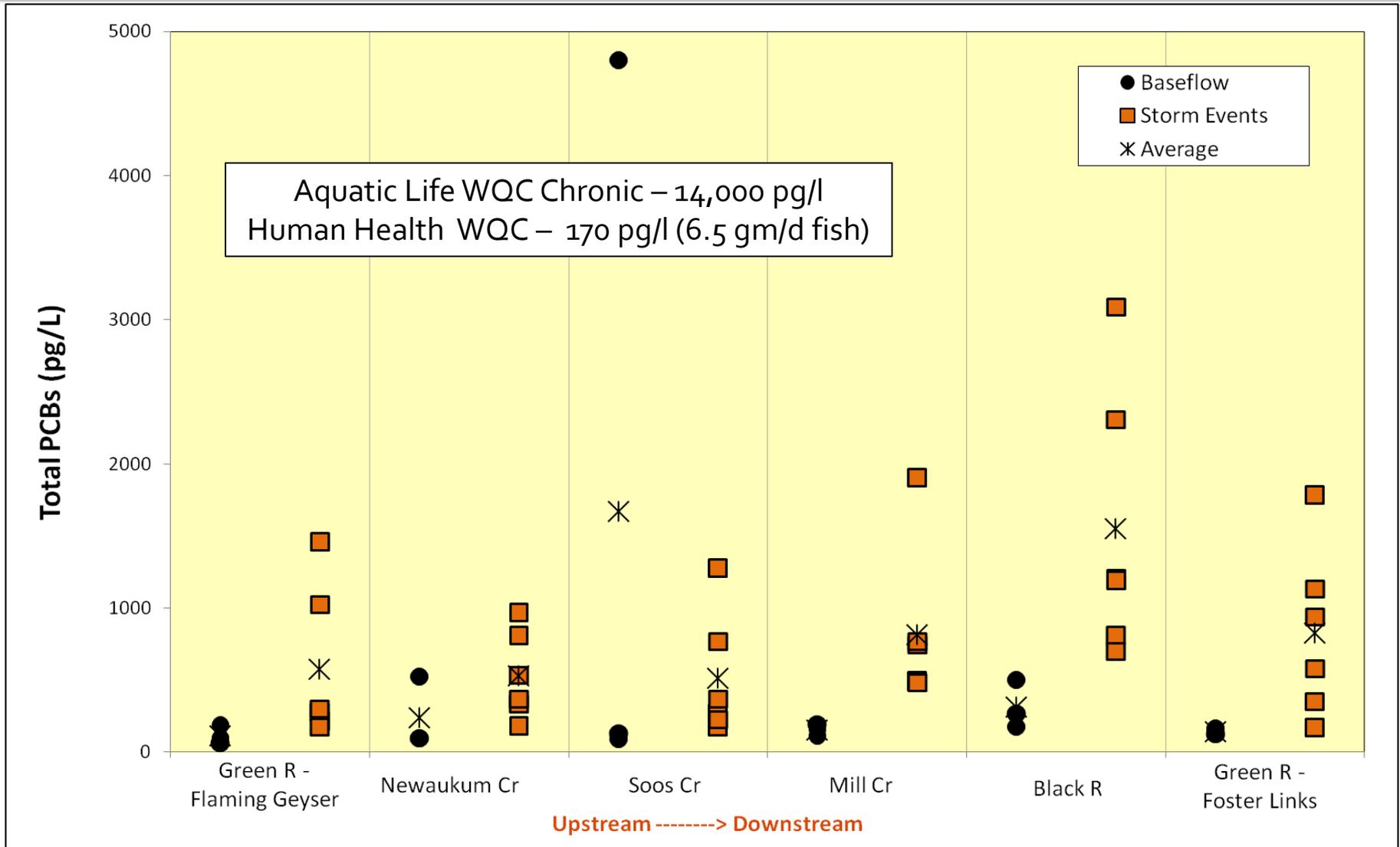
Results: Total LPAHs



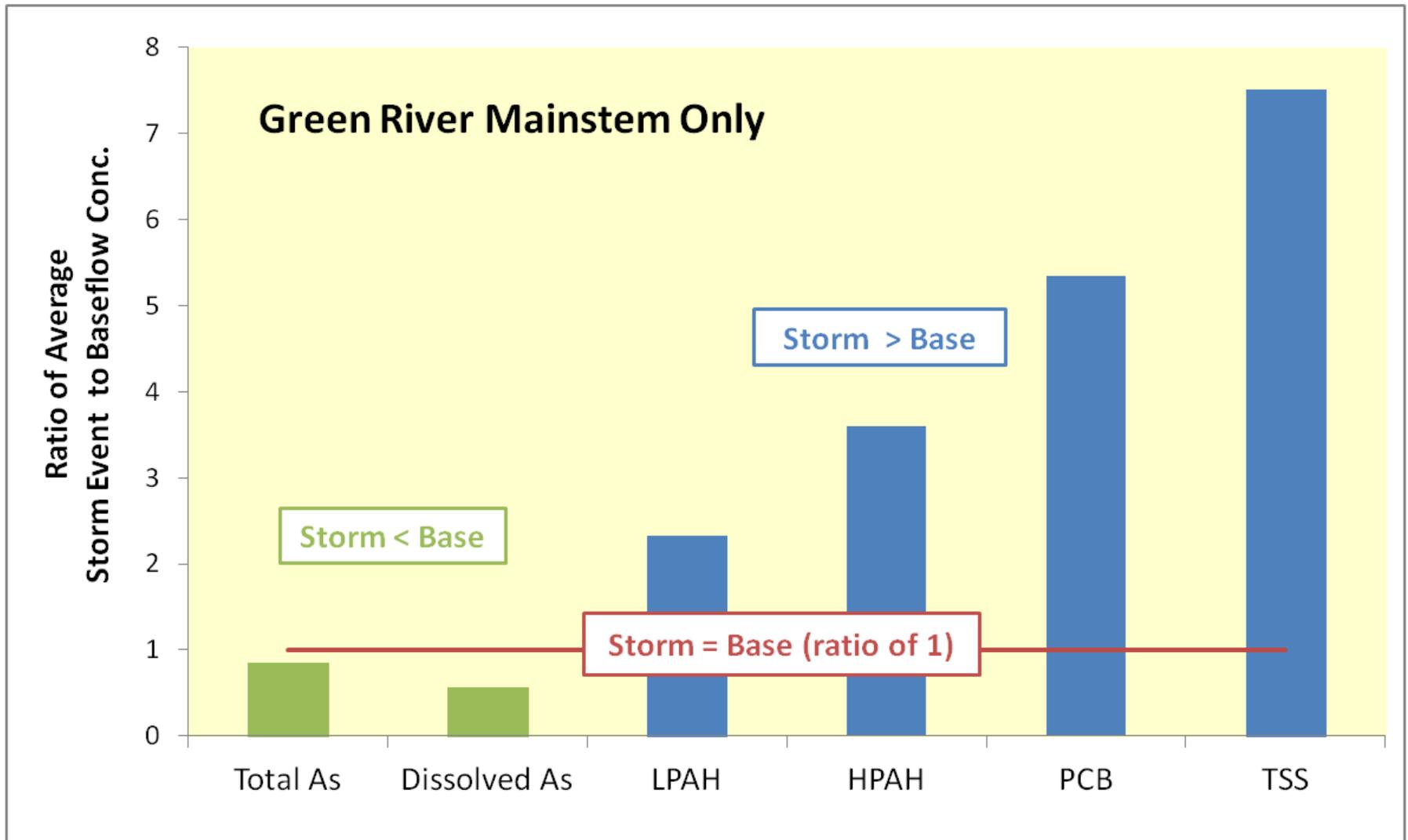
Results: Total HPAHs



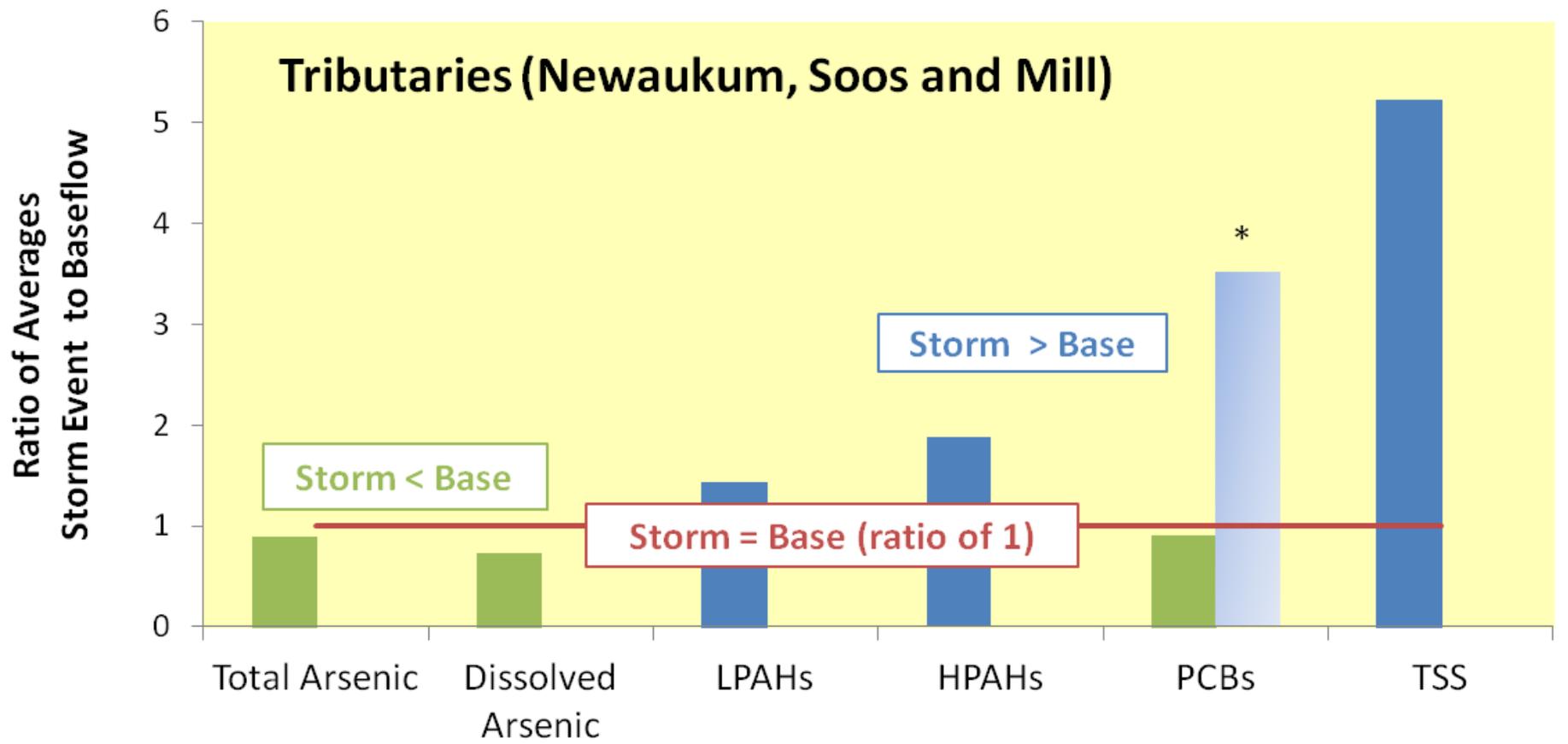
Results: Total PCBs



Results: Storm vs. Baseflow

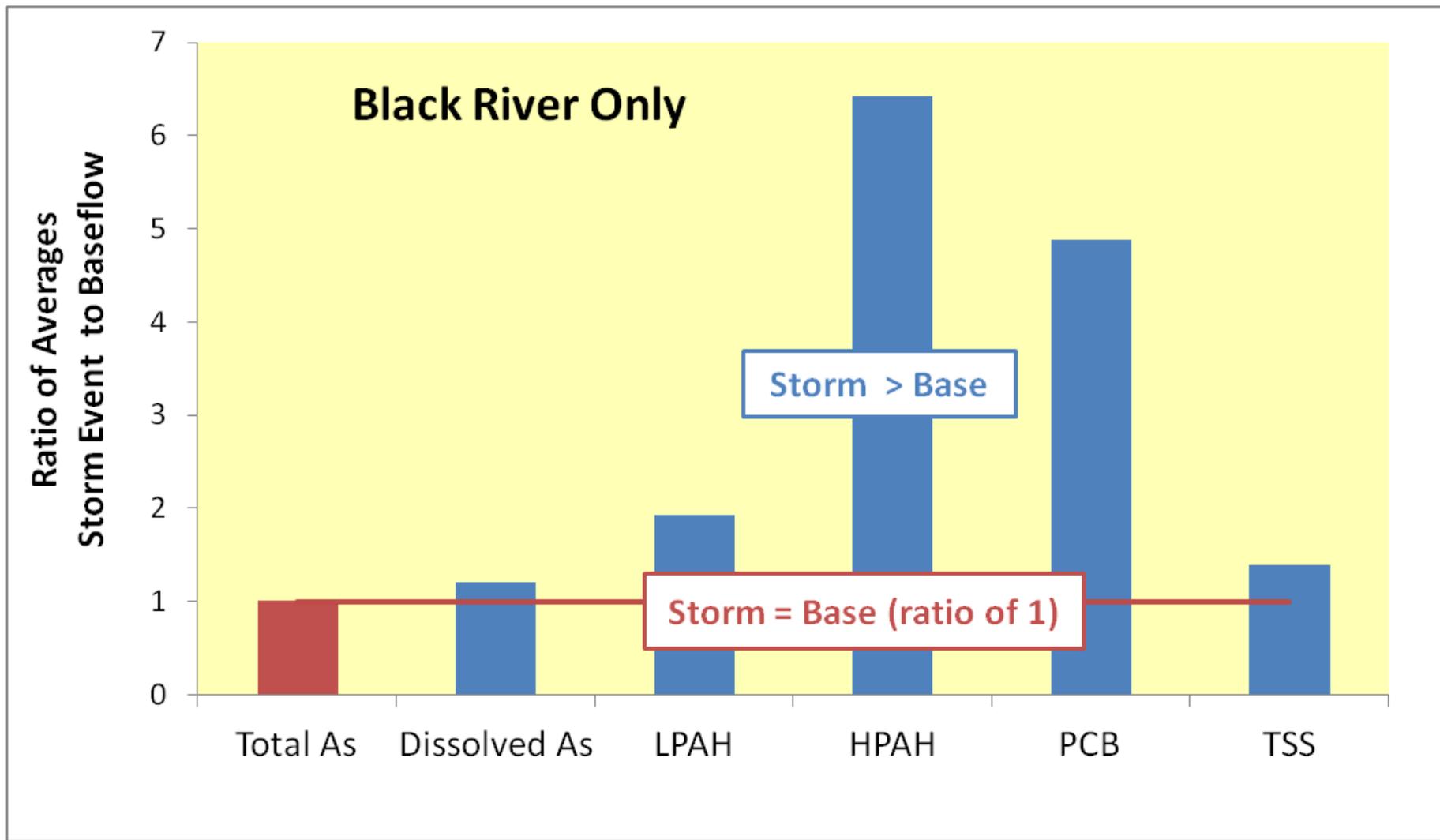


Results: Storm vs. Baseflow

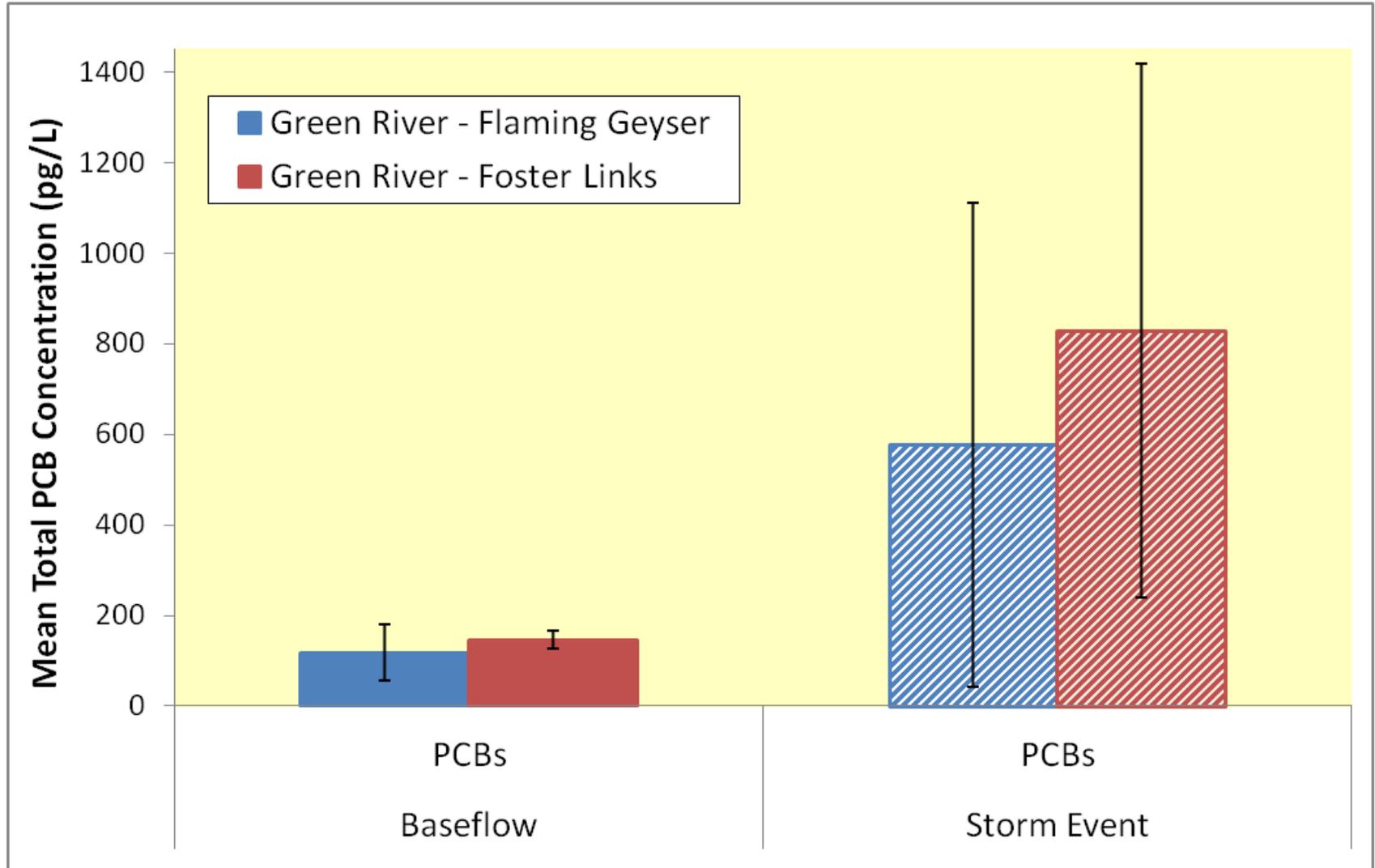


* Total PCB ratio without baseflow maximum value (4,801 pg/L at Soos Creek)

Results: Storm vs. Baseflow



Results: Green River - Upstream vs. Downstream



Key Findings: Relative Comparison Between Sites

- **Arsenic**
 - Highest in Soos Cr during baseflow conditions
 - Highest at 3 most downstream sites during storm events
- **LPAHs**
 - Variable across sites
- **HPAHs**
 - Higher at 3 most downstream sites
- **PCBs**
 - Storm event conc. higher at 3 most downstream sites
- **TSS**
 - Storm event TSS conc. highest in Green River at Foster Links

Key Findings: Baseflow vs. Storm Events

- On average:
 - PAH, PCB & TSS conc. higher during storm events
 - Dissolved & total arsenic conc. higher under baseflow conditions (except Black River PS)



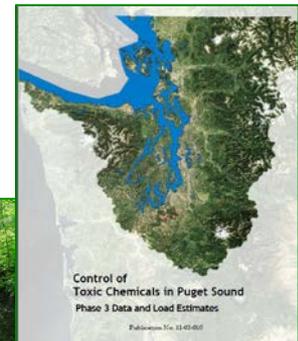
Key Findings: Up vs. Downstream Main Stem Green River

- During storm events, total arsenic, HPAH, PCB & TSS conc. higher downstream
- During baseflow conditions, LPAH conc. higher downstream
- During storm events, LPAH conc. higher upstream



Key Findings: Comparison to other Watersheds

- Data compared to Ecology's Surface Runoff Study (Herrera 2011)
 - Collected baseflow and storm event samples in sub-basins representing different land uses in Puyallup & Snohomish basins
- On average, Green River basin Arsenic, PAH and PCB conc. are within range of levels observed in these other basins.



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- *AXYS Analytical Services*

