Contaminants in Green River Basin Sediments

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King County Science Seminar
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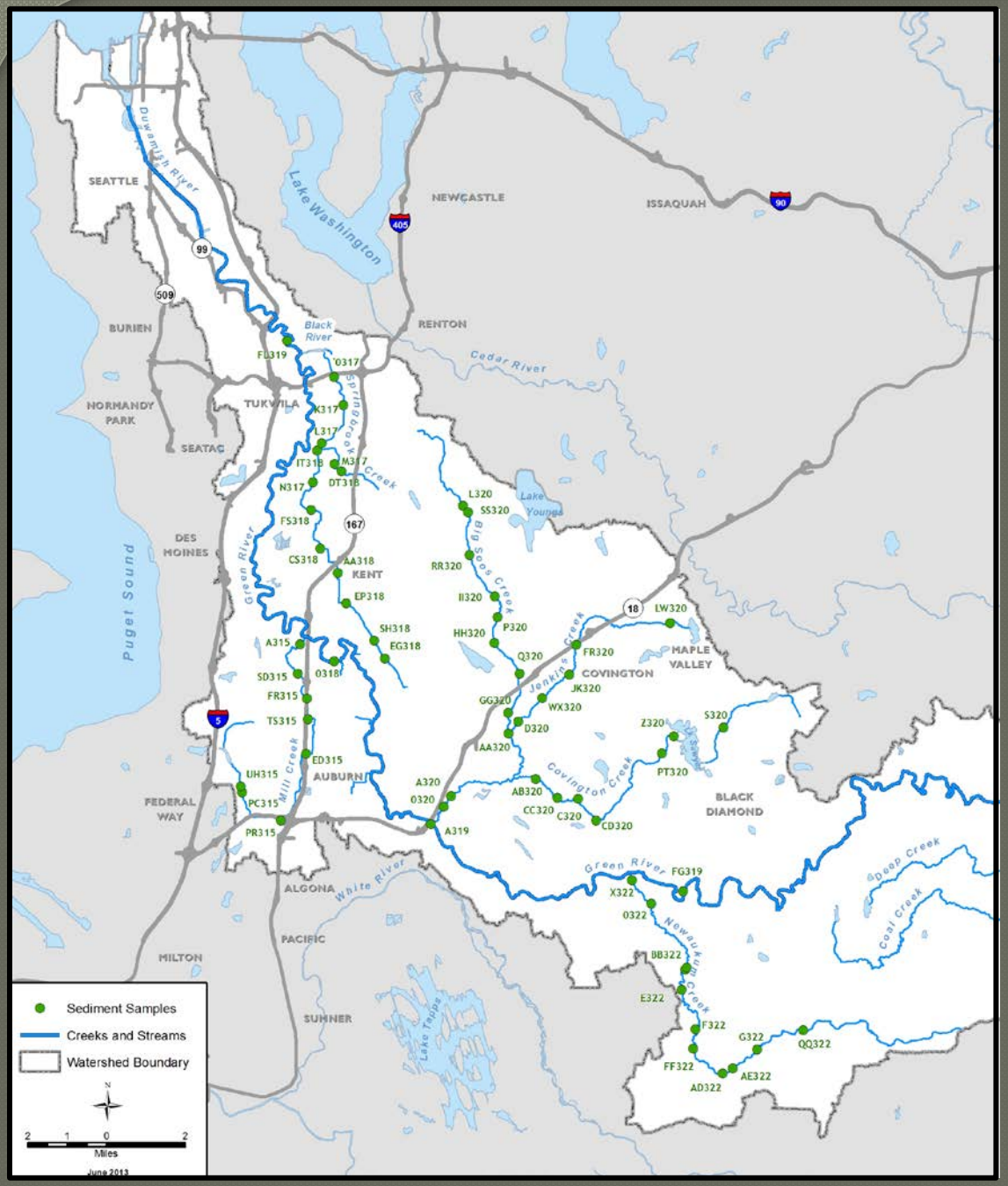
Study Goals

- Evaluate sediment quality in the Green River Basin
- Evaluate relative differences in sediment quality between streams
- Better understand upstream contaminant sources to the Lower Duwamish Waterway



Study Area

Sampling Locations

2008-2010

- Soos Creek
- Newaukum Creek
- Springbrook Creek

August 2012

- Mill (Hill) Creek -Auburn
- Mill Creek – Kent
- Jenkins Creek
- Covington Creek
- Green River Mainstem

Sample Collection Methods

- Goal of sampling every mile along tributaries
- Depositional areas targetted
- Composite samples:
  - Tributaries and three Green River Locations
    - 5 hand core grabs
  - Green River – Foster Links
    - 3 Ponar grabs
- Sediment Depth: 5 – 10 cm

Laboratory Analysis

- Metals (including mercury)
- PCB Aroclors
- Dioxin/furans (subset of locations)
- PAH, phthalates and other semi-volatile organics
- Chlorinated pesticides
- Four endocrine disrupting compounds
- Total organic carbon, grain-size, AVS/SEM

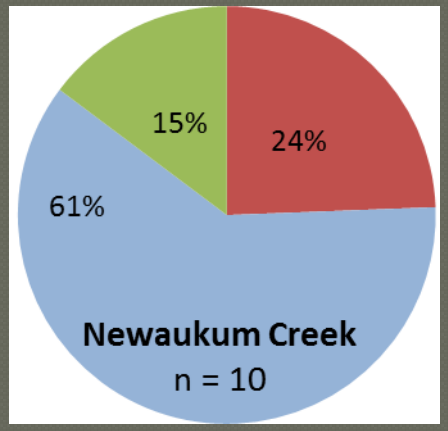
Data Analyis

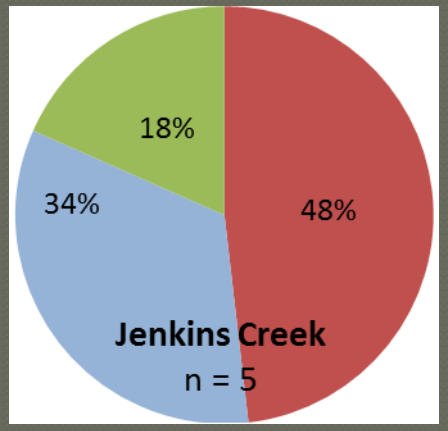
- General summary statistics
- AVS/SEM: indicates metals bioavailability
- Sediment Quality Assessment:

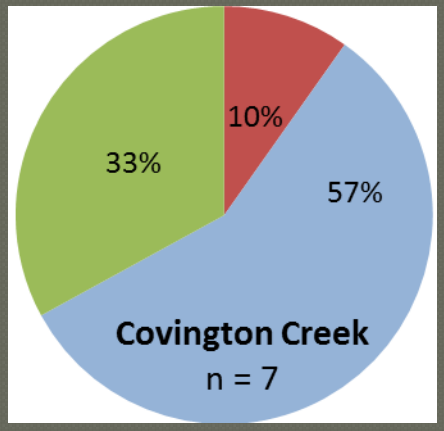
Freshwater Sediment Management Standards (WAC 173-204-563)

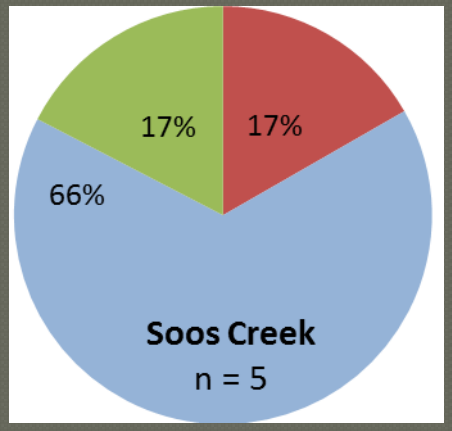
- Benthic Sediment Cleanup Objective (**SCO**)
  - Below this level, no adverse effect to benthic community are expected
- Benthic Cleanup Screening Level (**CSL**)
  - Above this level, minor adverse effects to benthic community are expected

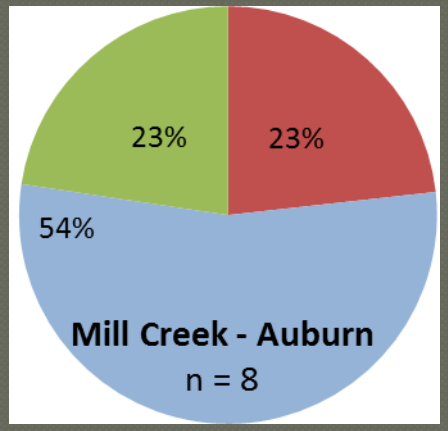
Results: Mean Grain Size

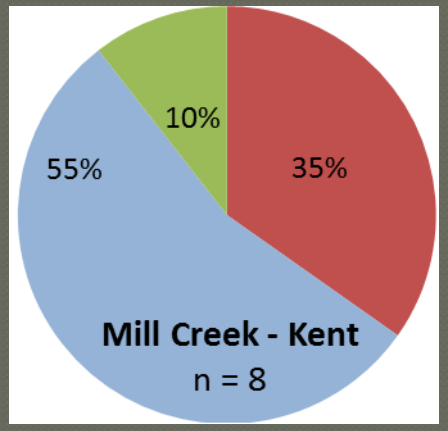


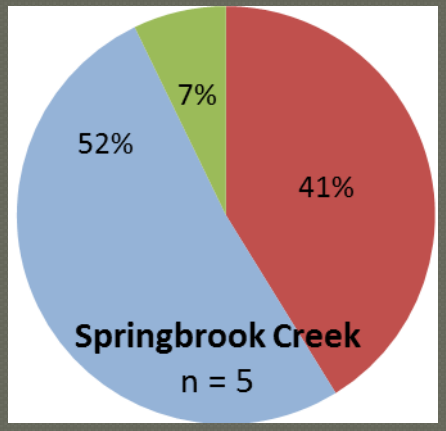


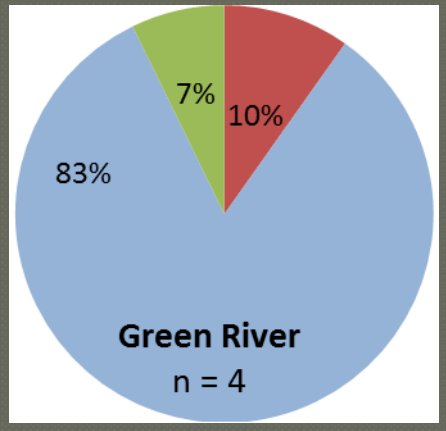




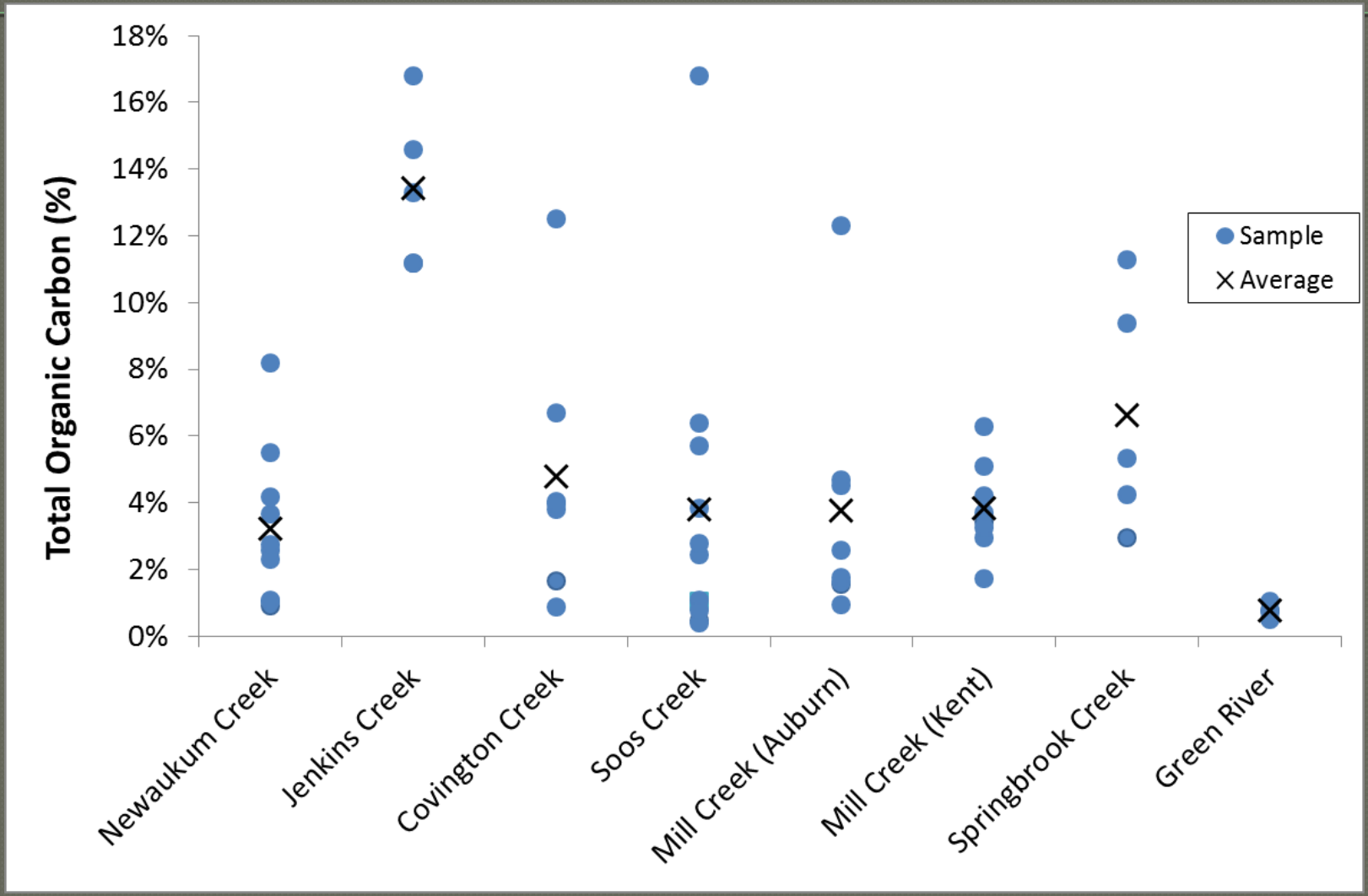




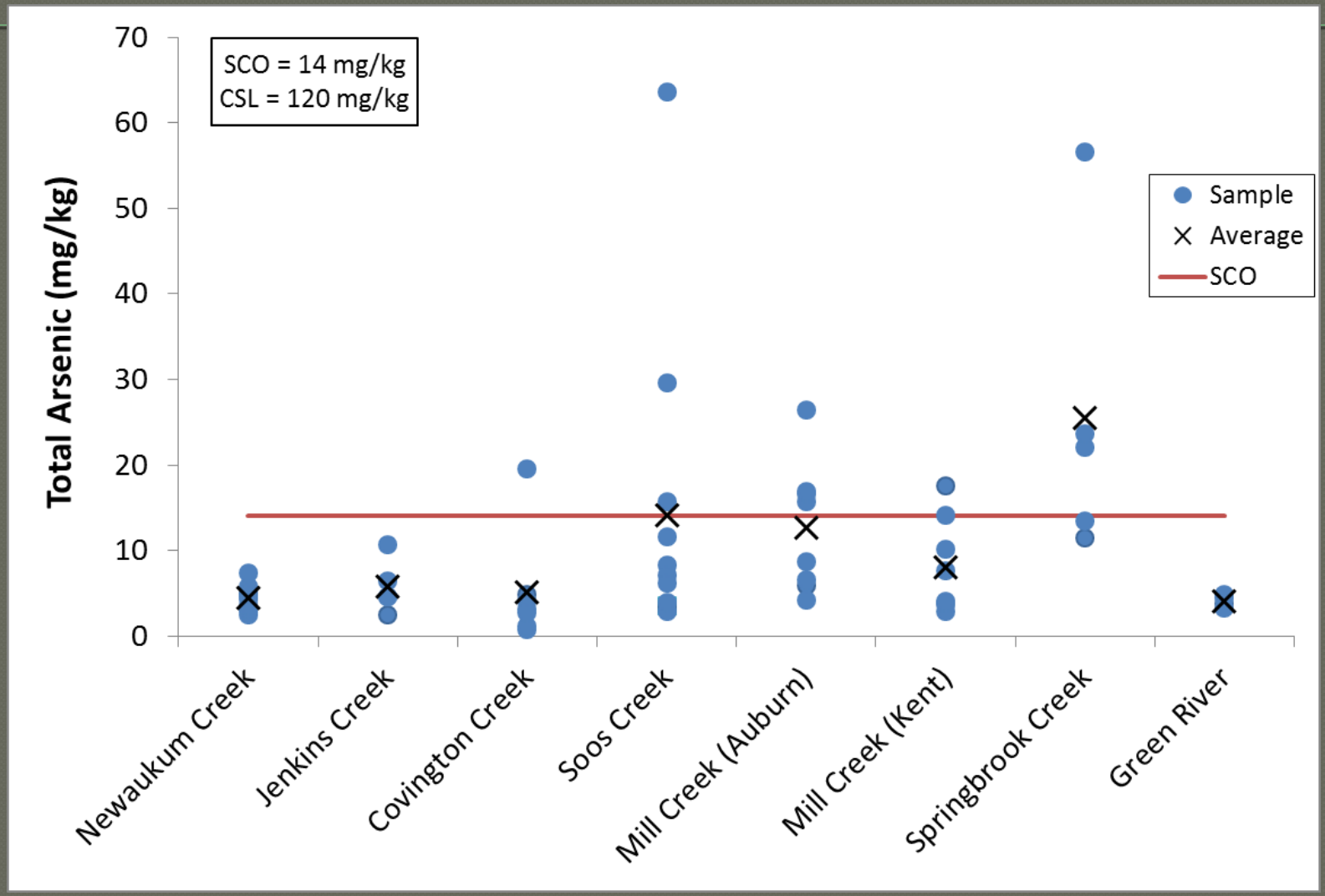




Results: Total Organic Carbon

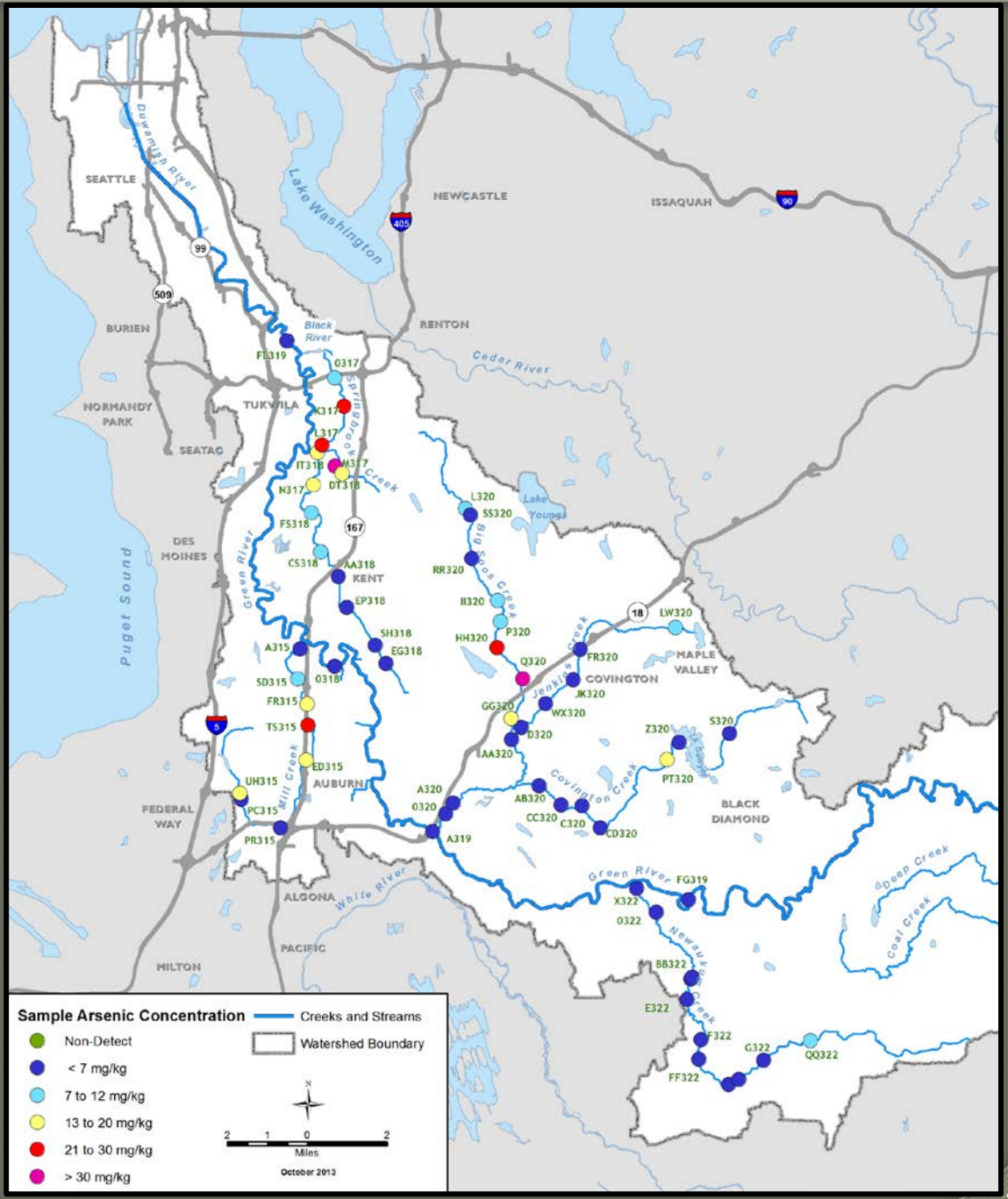


Results: Arsenic

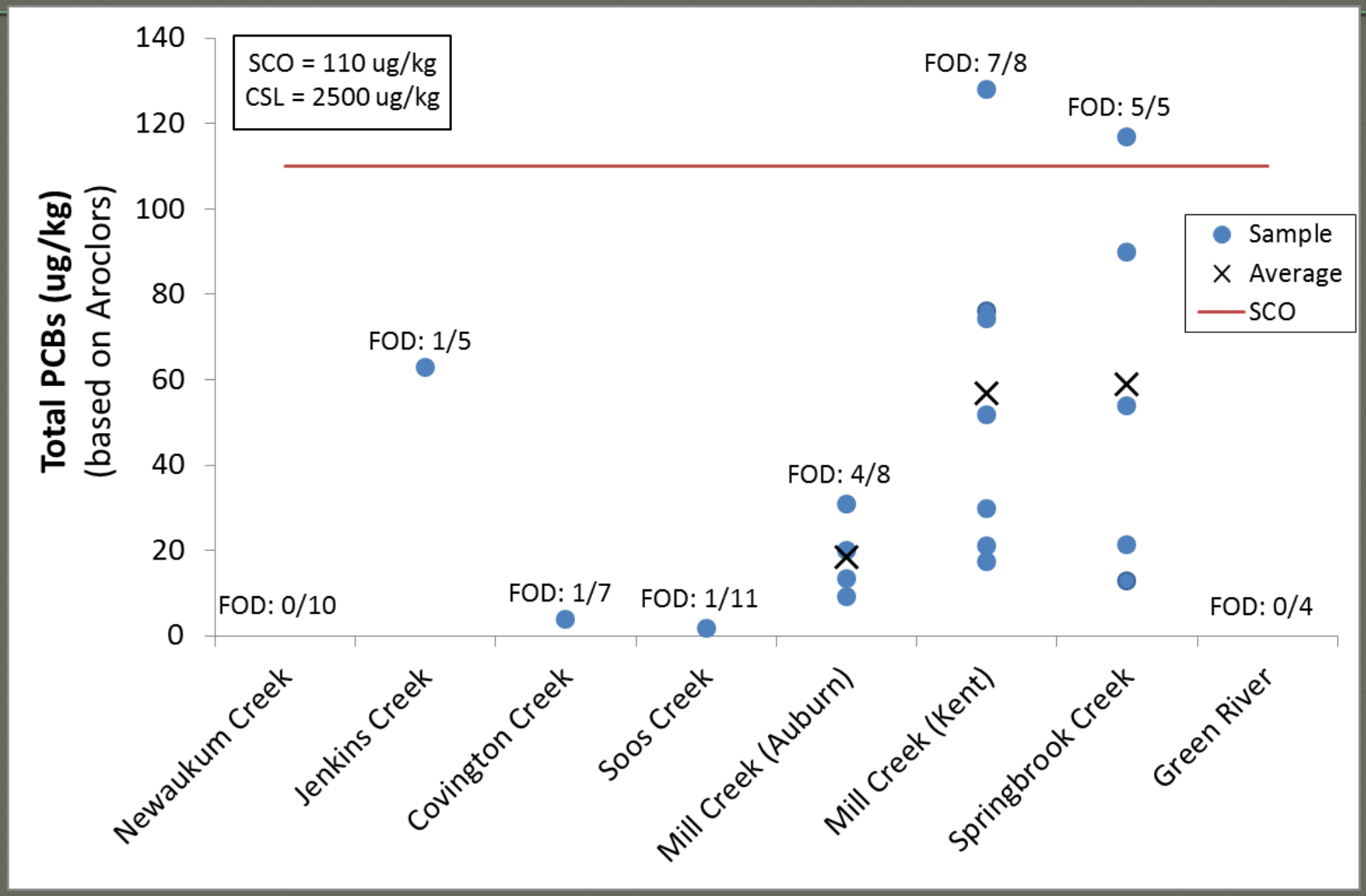


100% Frequency of detection

Spatial Distribution of Arsenic

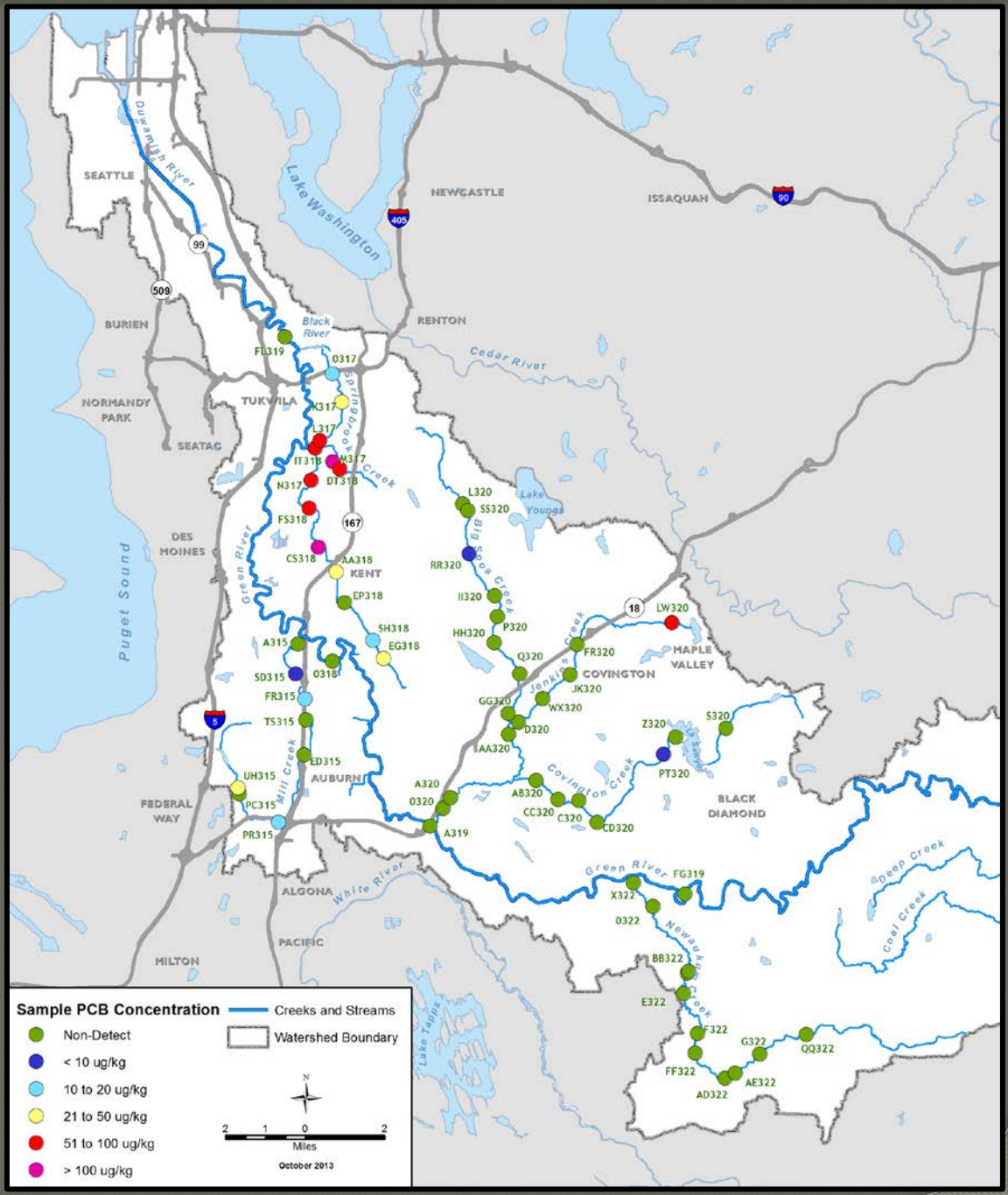


Results: Total PCB

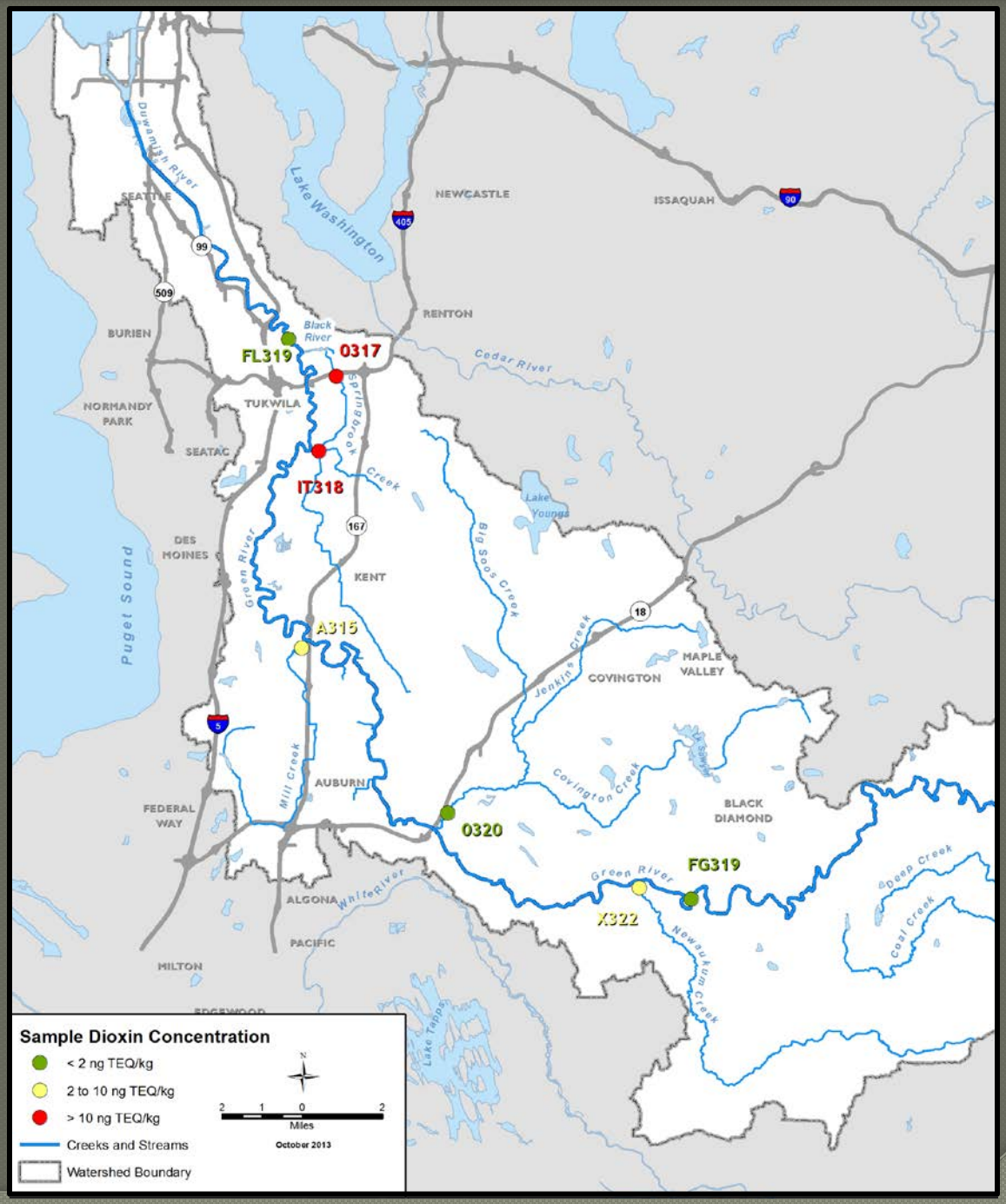


Detection limit range: 1.1 to 20 µg/kg dw

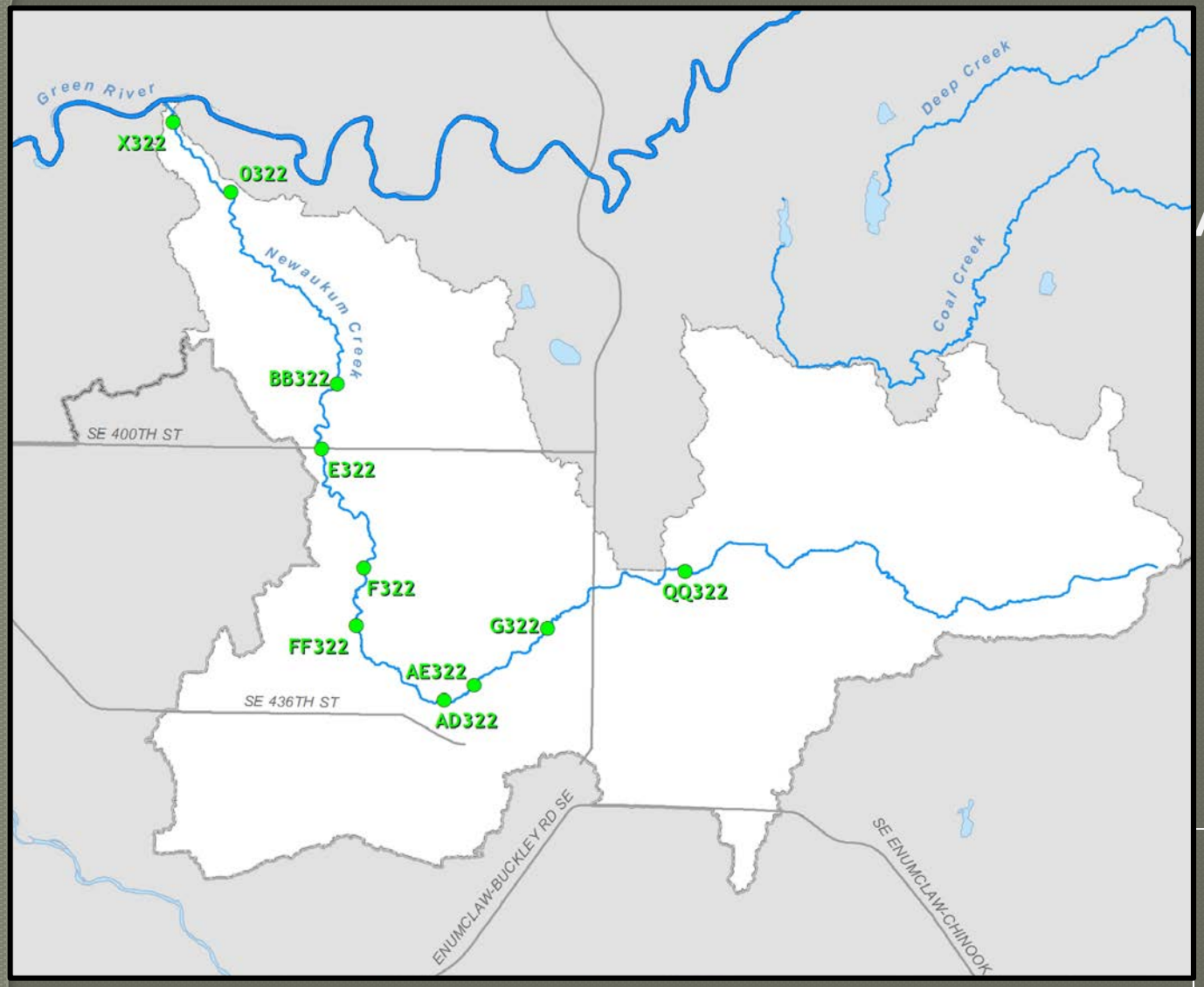
Spatial Distribution of Total PCBs



Spatial Distribution of Dioxin TEQs

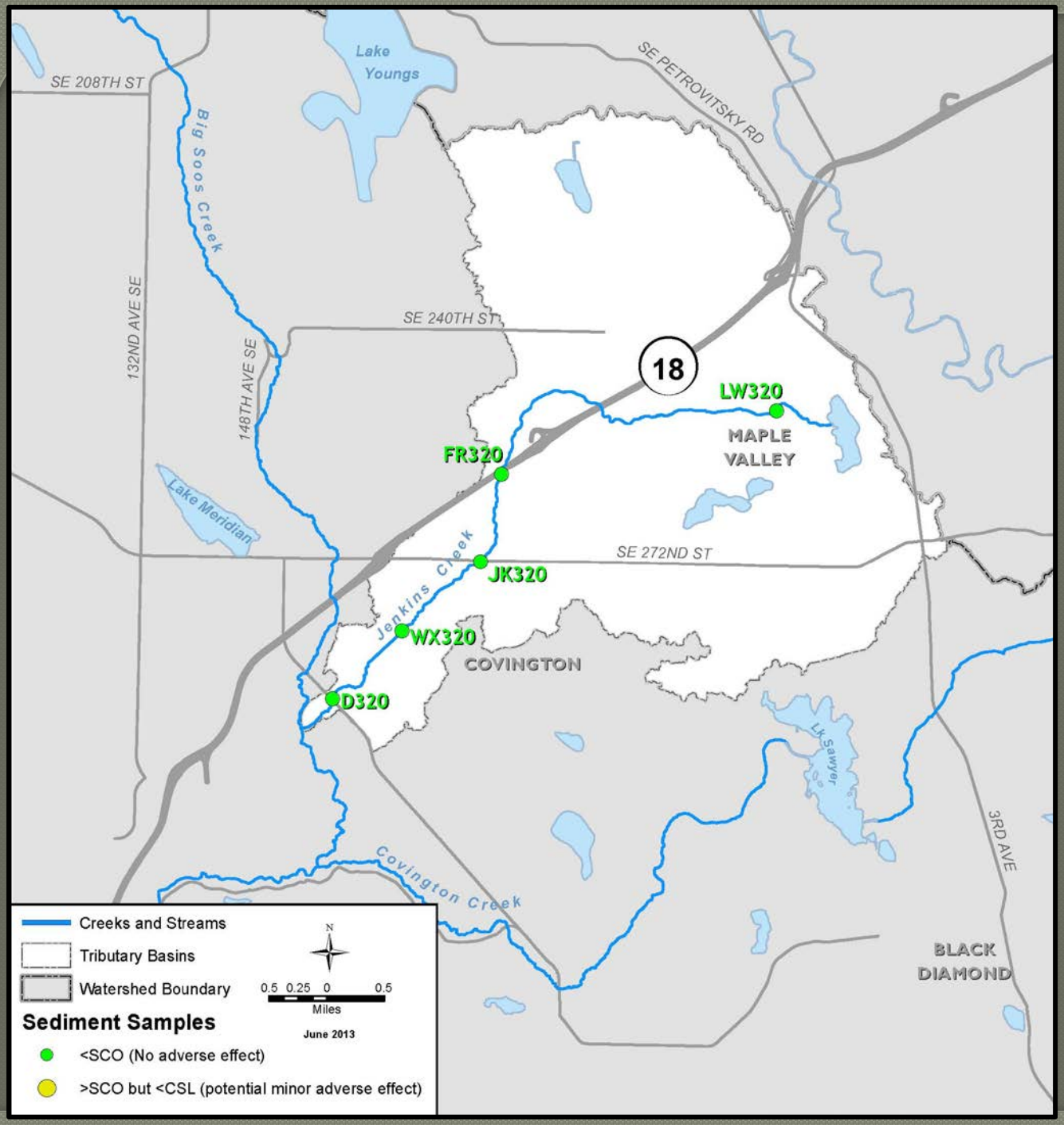


Sediment Quality Assessment: **Newaukum Creek**



Less than or equal to the Sediment Cleanup Objective (SCO) means no adverse effects to the benthic community.

Sediment Quality Assessment: **Jenkins Creek**



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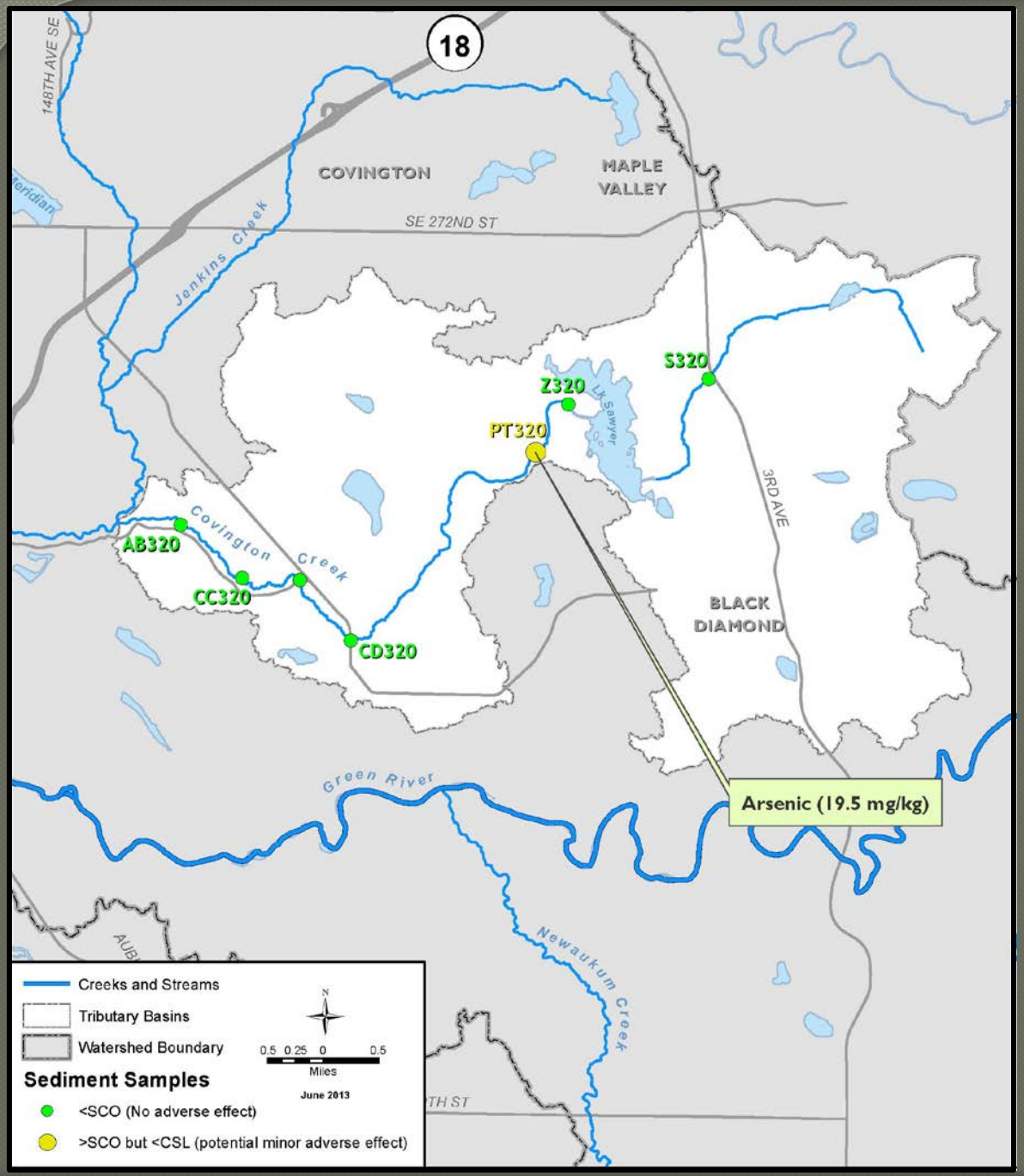
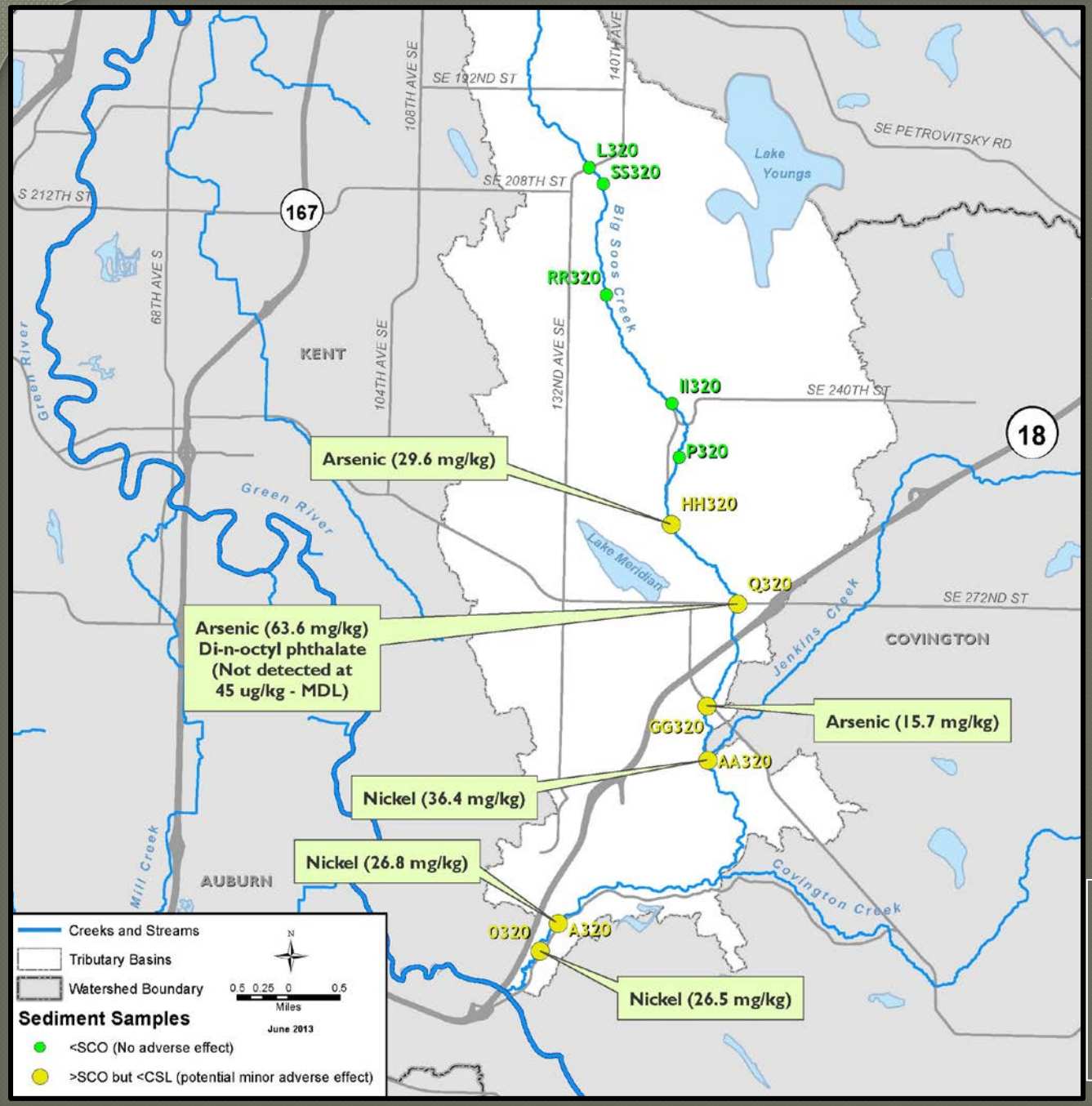


Sediment Quality Assessment: **Covington Creek**

AVS/SEM suggests metals are not bioavailable at PT320.

Less than or equal to the Sediment Cleanup Objective (SCO) means no adverse effects to the benthic community.

Sediment Quality Assessment: **Soos Creek**



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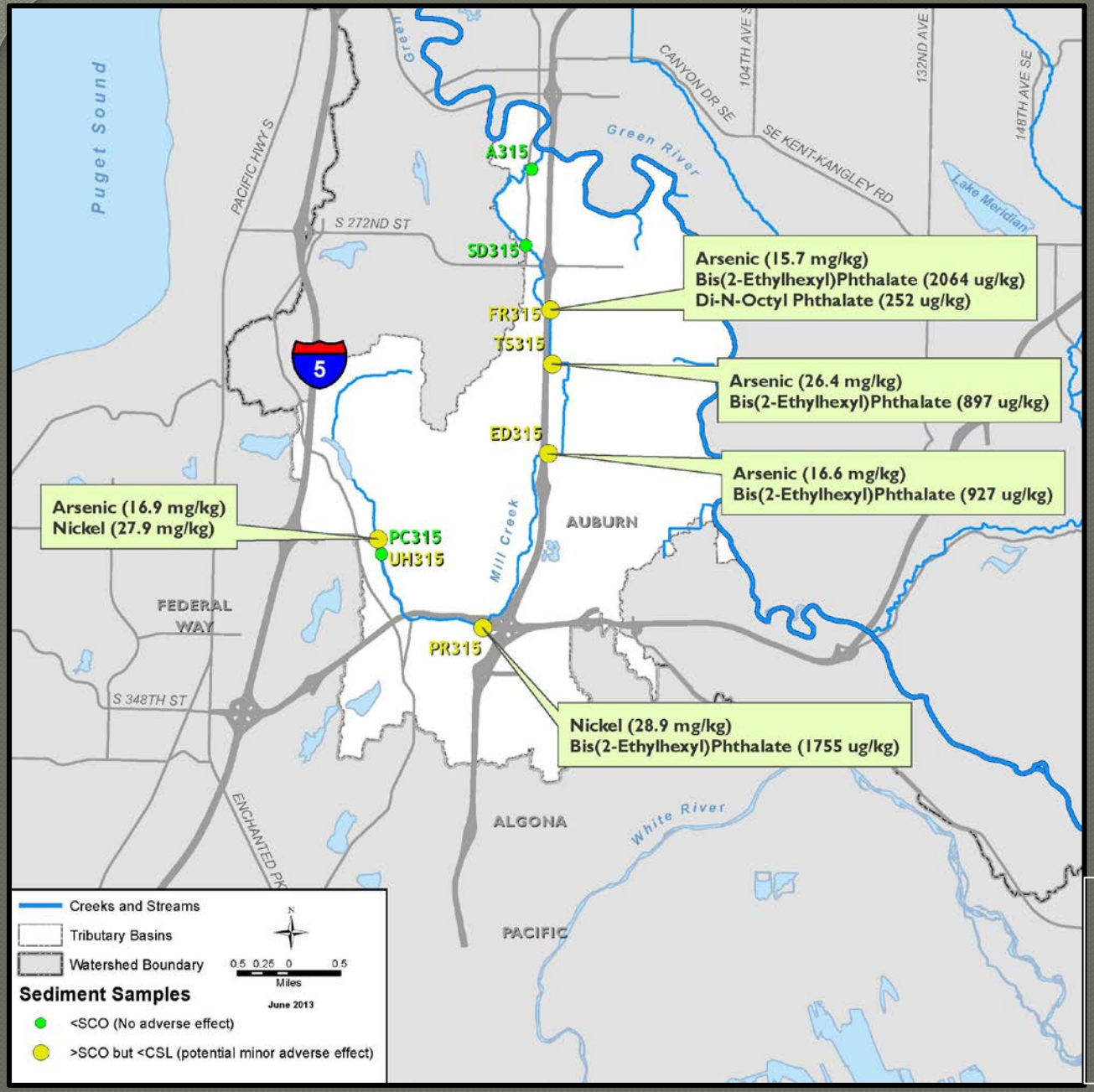
Sediment Quality Assessment: **Mill Creek - Auburn**



AVS/SEM suggests metals are not bioavailable at TS315, ED315 and UH315.

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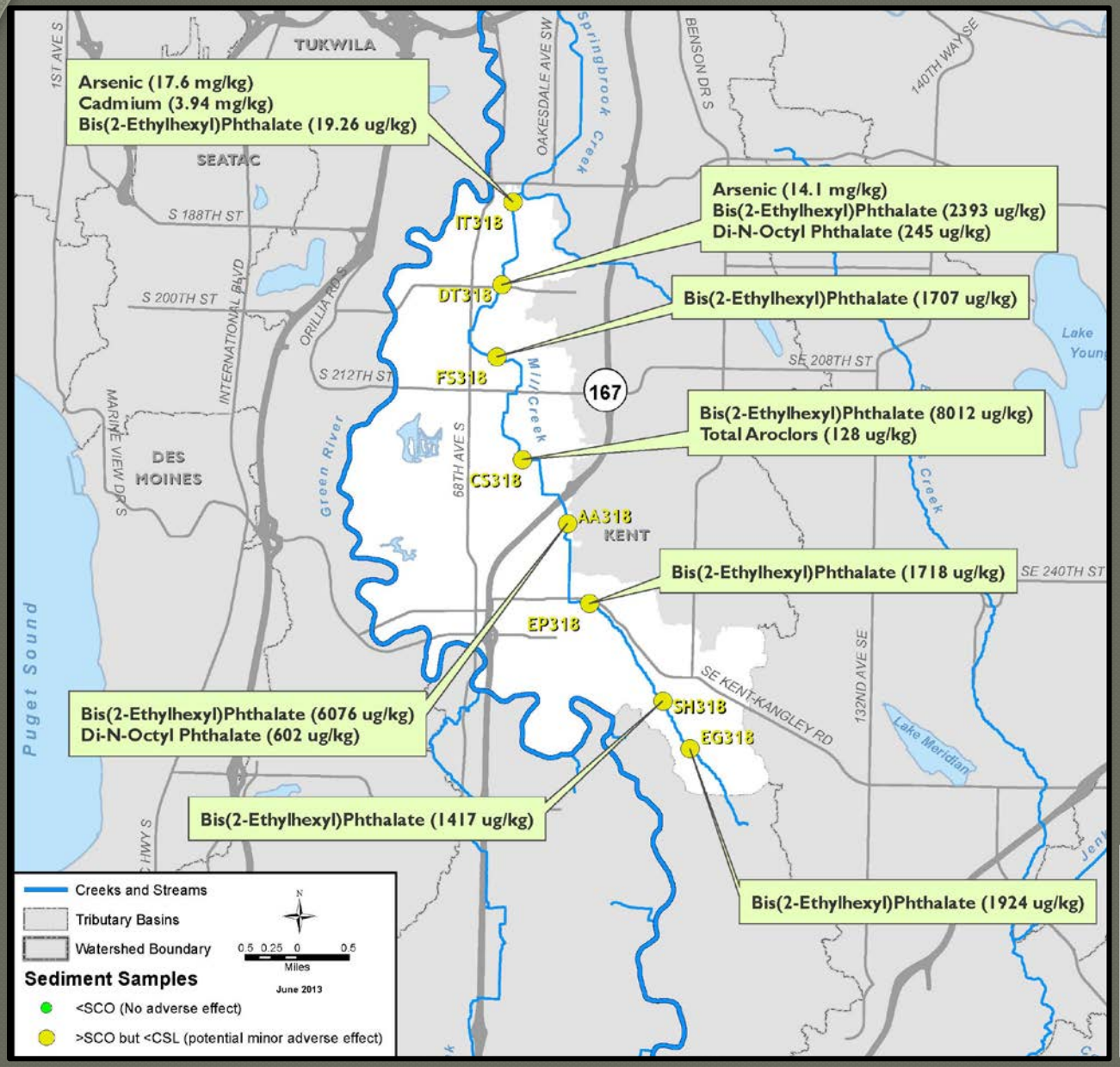
Sediment Quality Assessment: **Mill Creek - Kent**



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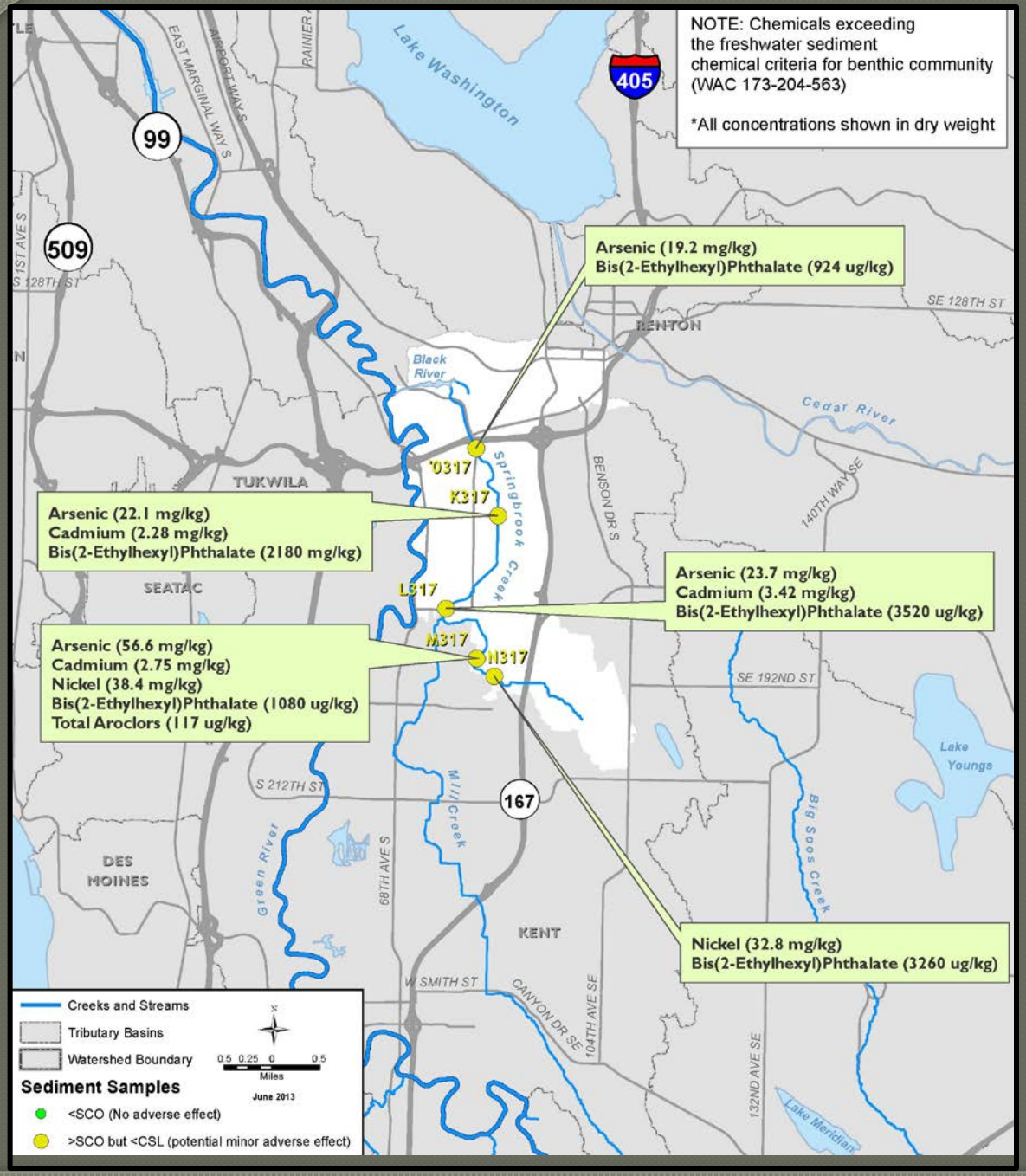
Sediment Quality Assessment: **Springbrook**



AVS/SEM suggests metals are not bioavailable at 0317 and N317.

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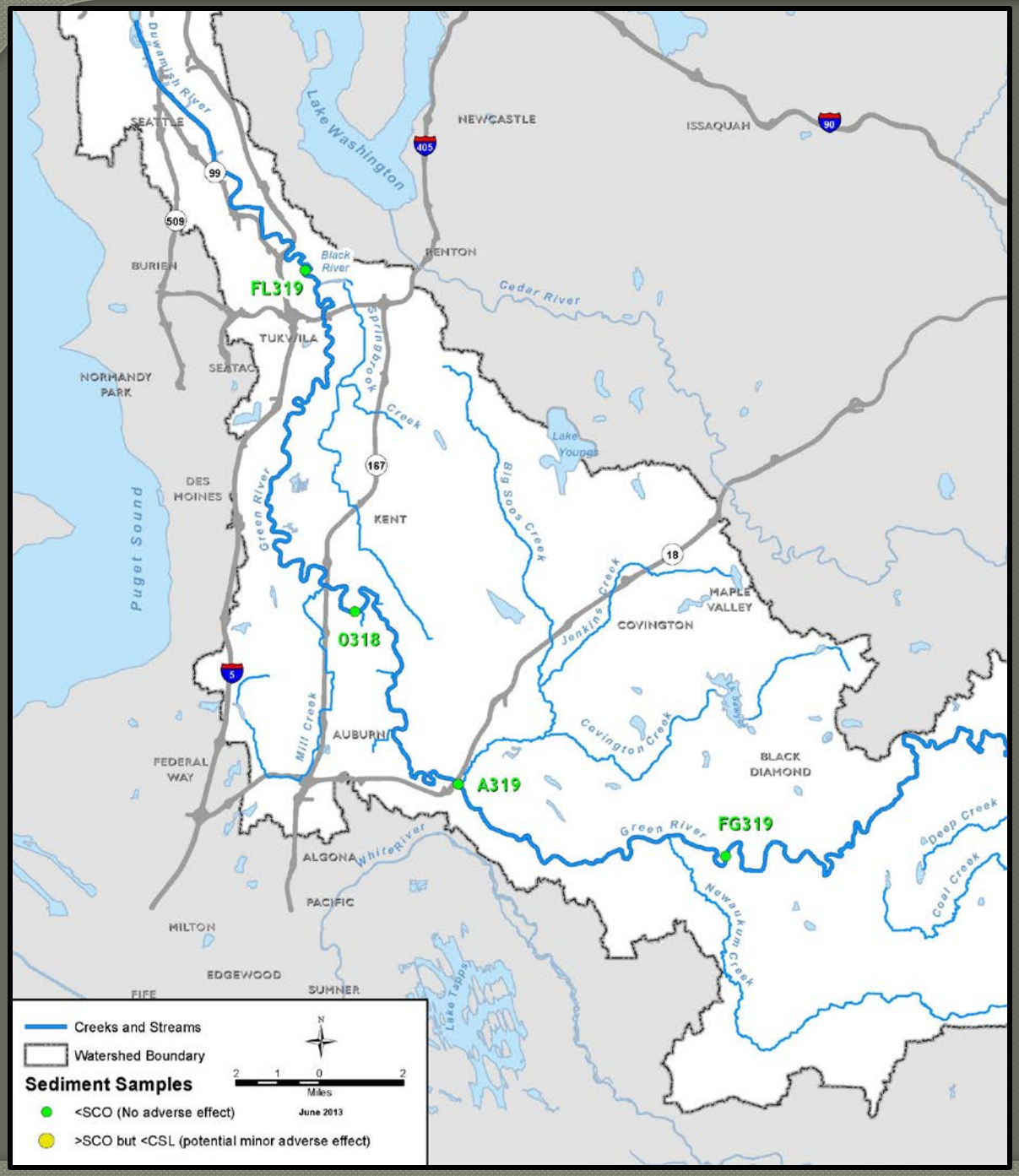

Sediment Quality Assessment: **Green River Samples**

Less than or equal to the Sediment Cleanup Objective (SCO) means no adverse effects to the benthic community.

Key Findings-Relative Comparisons

- Green River mainstem samples
  - Very few chemicals detected
  - ~ 80% sand, < 1% TOC
- Highest metals:
  - Springbrook Creek
- Highest PCBs and Dioxins:
  - Springbrook Creek, Mill Creek – Kent

Key Findings – Sediment Quality

- All concentrations below Benthic CSL
- Relatively few concentrations above Benthic SCO
- Tributaries with most SCO hits:
  - Springbrook Creek, Mill Creek – Kent
- Contaminants with most SCO hits:
  - Arsenic, bis(2-ethylhexyl)phthalate
- AVS/SEM Analysis
  - Where SCO exceeded, AVS/SEM indicate metals may not be bioavailable in almost half the cases

CSL = Cleanup Screening Level
SCO = Sediment Cleanup Objective
AVS/SEM = Ratio of Acid Volatile Sulfides and Simultaneously Extractable Metals

Acknowledgments

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- AXYS Analytical Services