Greater Green-Duwamish Watershed Water Quality

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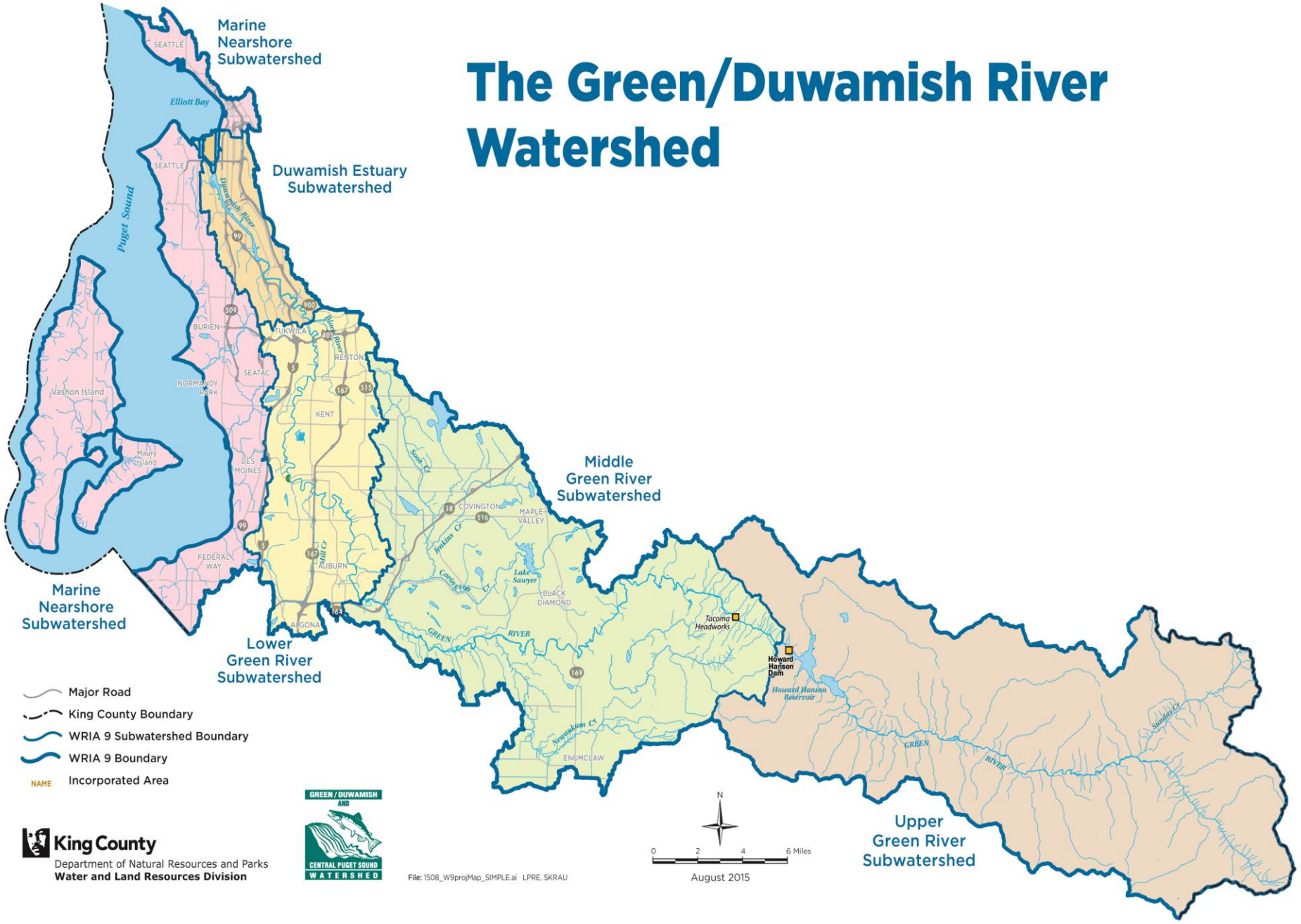
This talk

- A little background
- Flow flashiness
- Temperature
- Bacteria
- Copper
- PCBs
- Stream benthos
- Coho pre-spawn mortality
- Climate change
- Summary

The Green/Duwamish River Watershed



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Water and Land Resources Division

GREEN / DUWAMISH AND CENTRAL PUGET SOUND WATERSHED

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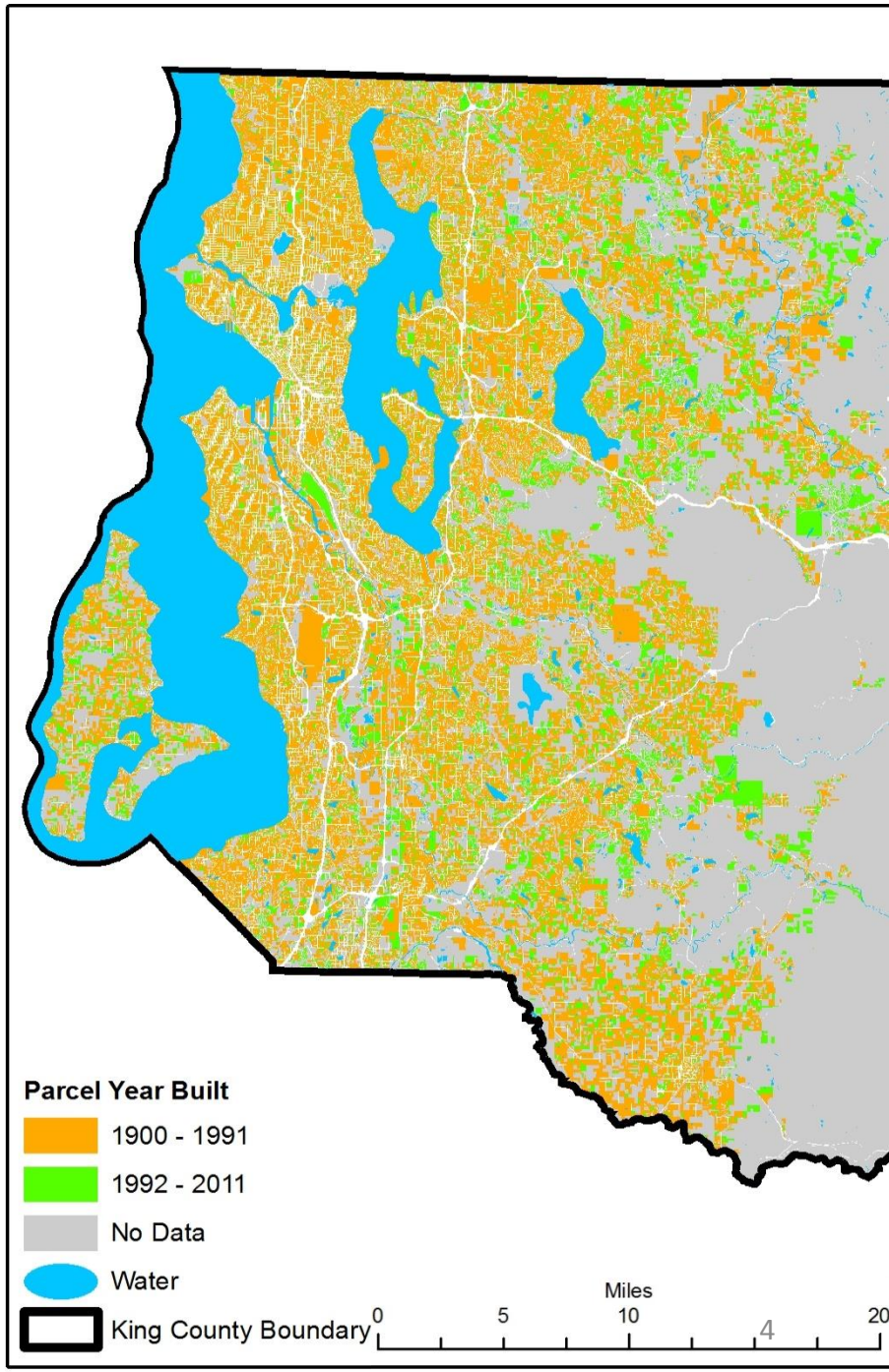
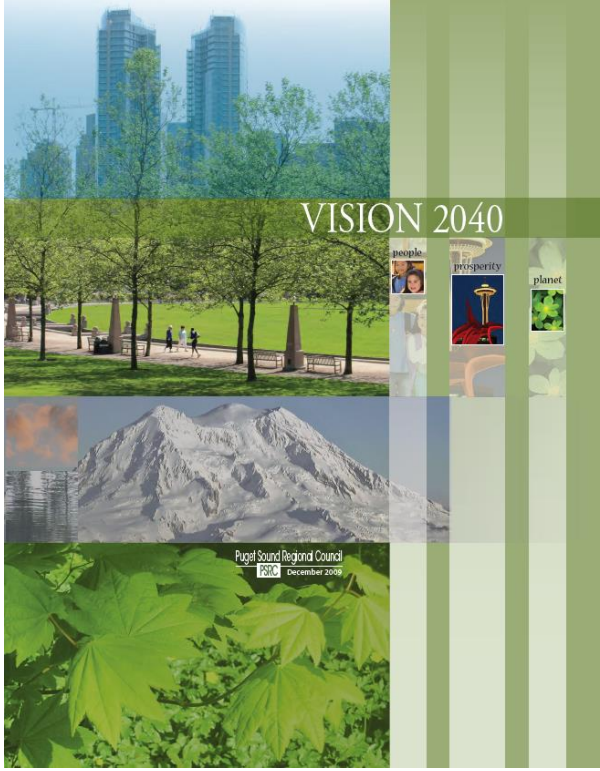
Parcels Built Before Stormwater Controls Required

About three-fourths of urban lands lack stormwater storage and treatment facilities



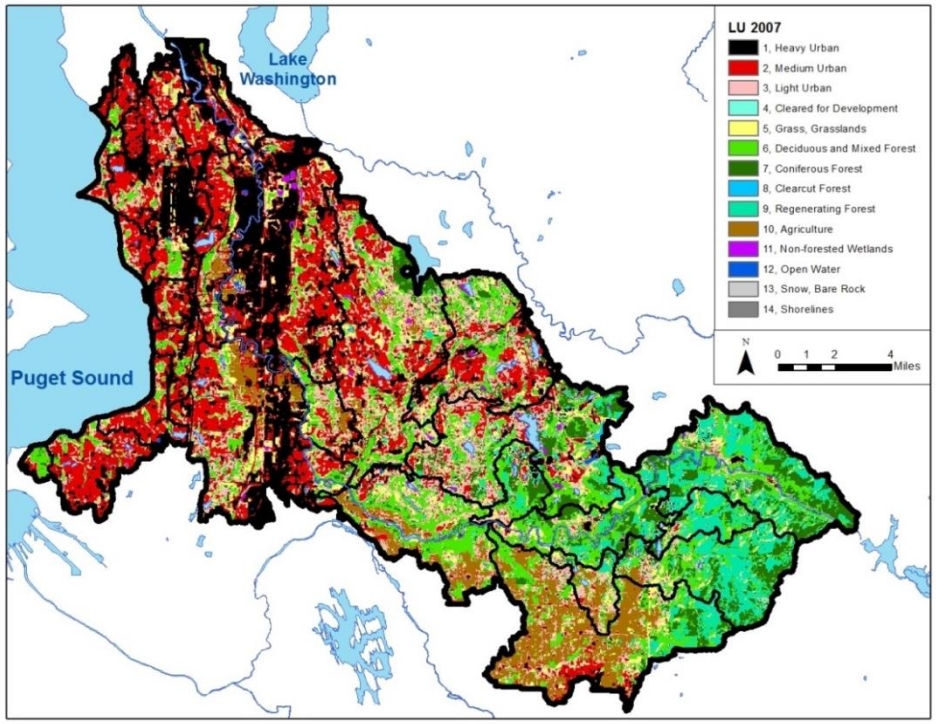
WRIA 9 Population (outside of Seattle)



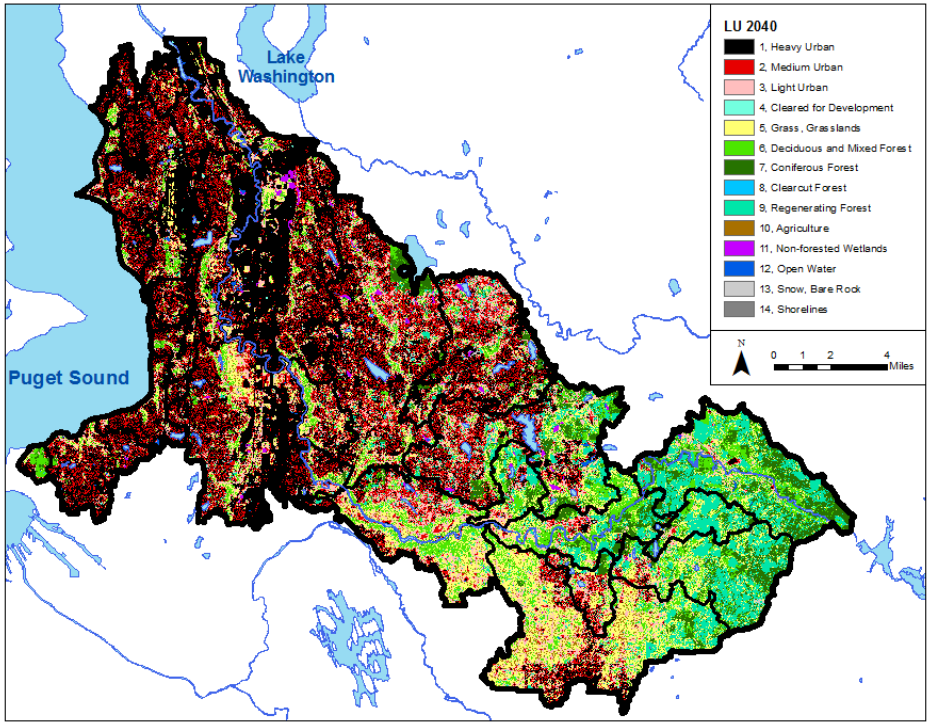
- 509,000 in 2010
- 637,000 in 2035
- Growth focused in cities
- Mostly urban redevelopment
- Nearly ½ of project area to have new or re-development by 2040 or ~ 1%/year
- More expected beyond 2040 – almost entire area redeveloped by 2100

Future Development

2007 Satellite-Derived Land Use (UW 2007)



2040 Simulated Land Use (Alberti 2009)



Urban Stream Syndrome

Stressor	Symptoms
Hydrology	↑ Peak flows, erosive flows, flashiness
	↓ Lag time between peak flows
Physical Habitat	↑ Channel hardening and straightening, scouring, blockages
	↓ channel complexity, native riparian cover
Pollutants	↑ Temperature, bacteria, toxics, nutrients
Biota	↓ Abundance and diversity

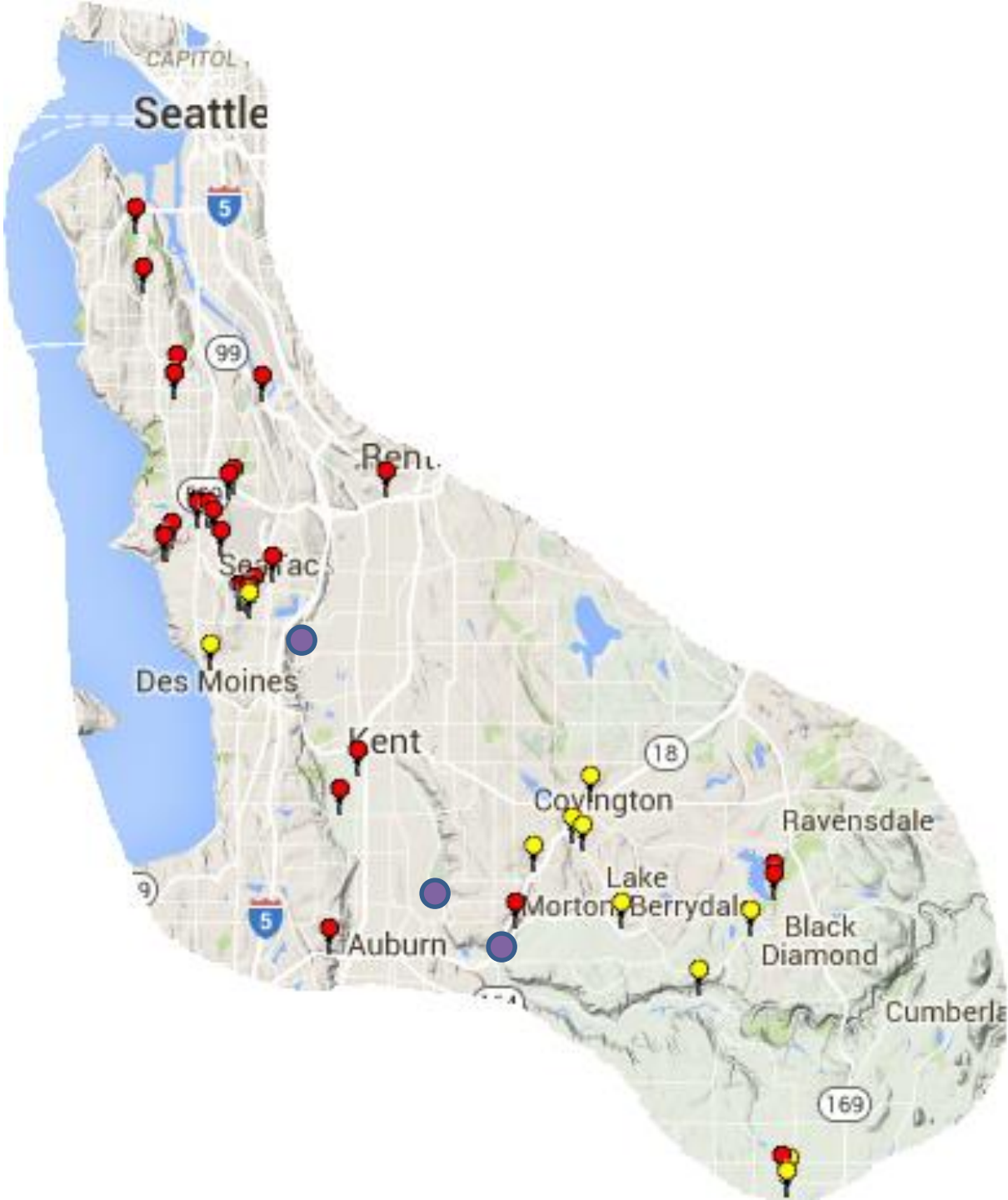
Causes of Urban Stream Syndrome

- Inadequate stormwater flow control and treatment
- Culverts, bridges, other physical changes
- Reduced riparian habitat

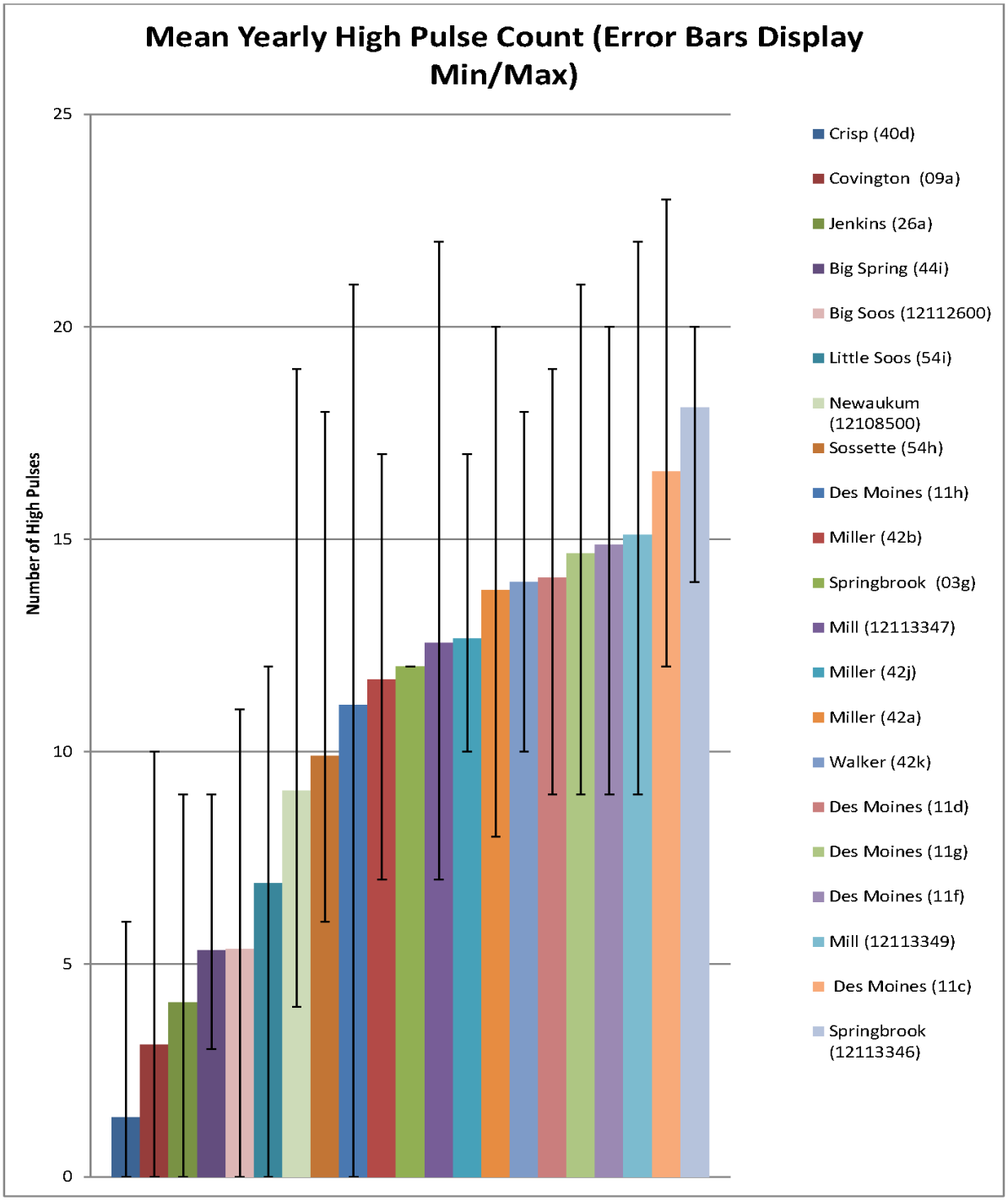
Stormwater Paradigm

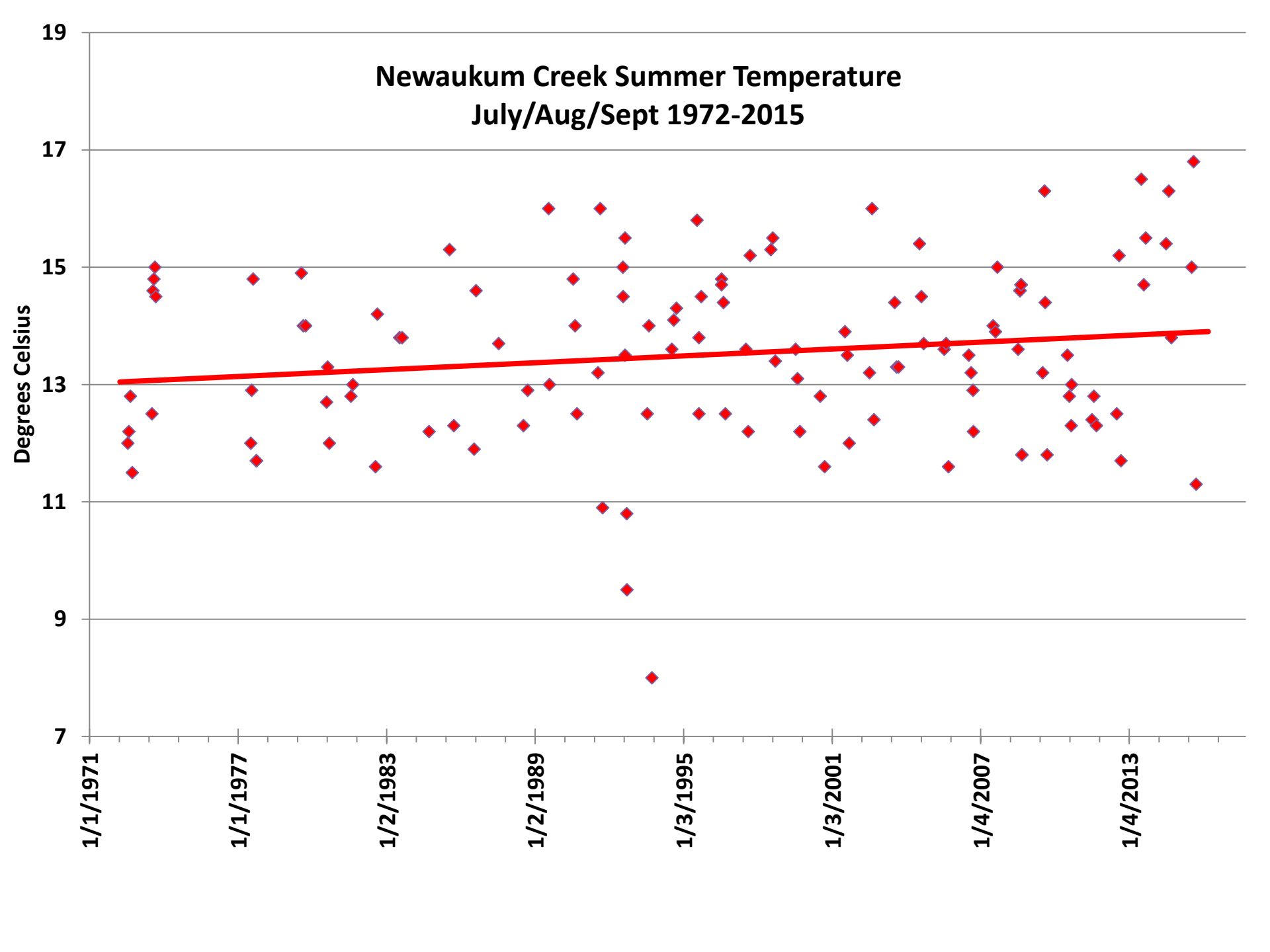
Time Period	Paradigm	Description
Prior to 1992	Drainage Efficiency	Convey water downhill as efficiently as possible
1992 – 2013	Reduce New Impacts	Reduce harm from new construction with flow control and treatment
Future	Reduce New and Existing Impacts	Capture, infiltrate, detain, and treat stormwater everywhere to protect and rehabilitate receiving waters

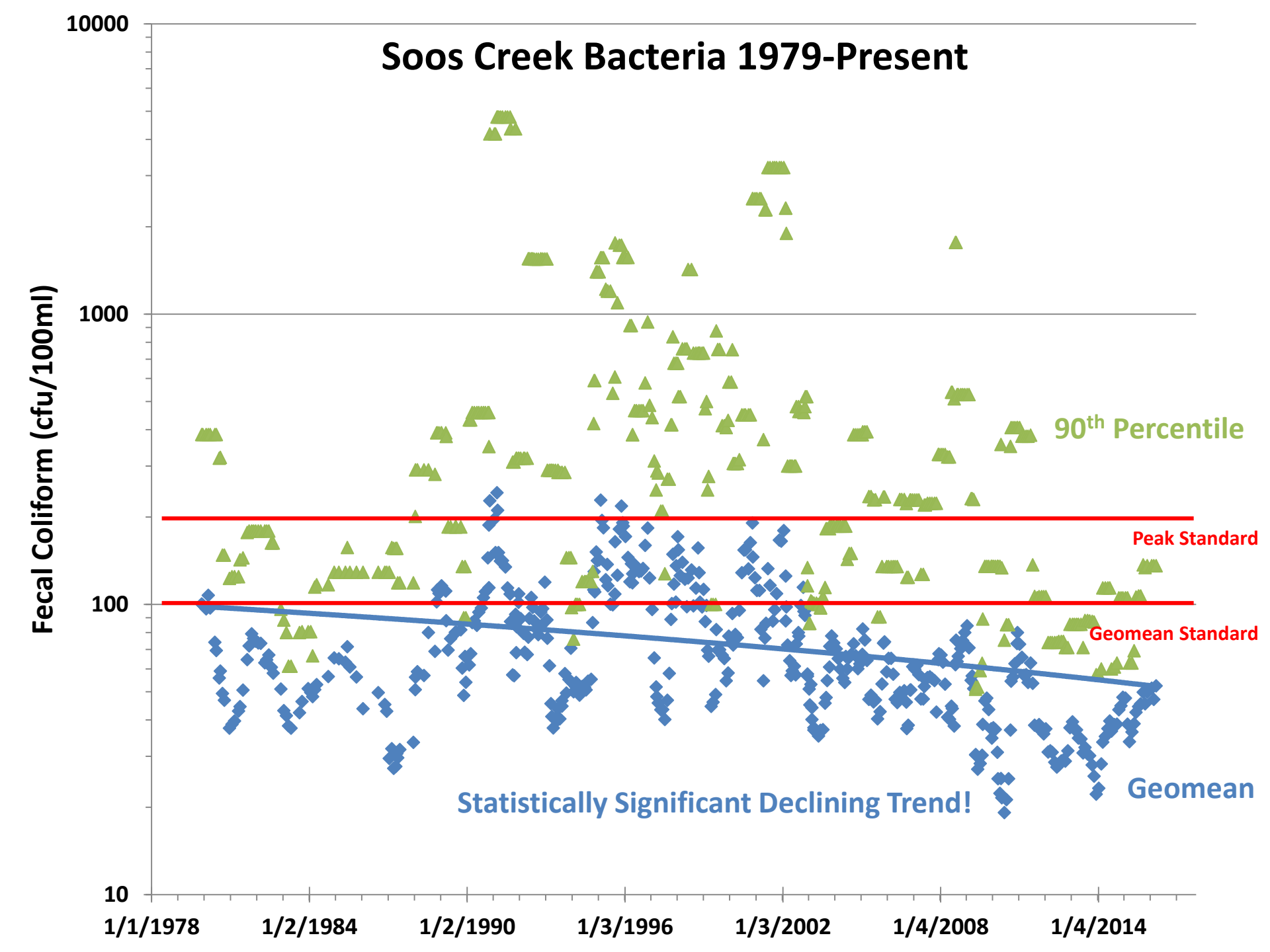
King County and USGS Stream Flow Gages



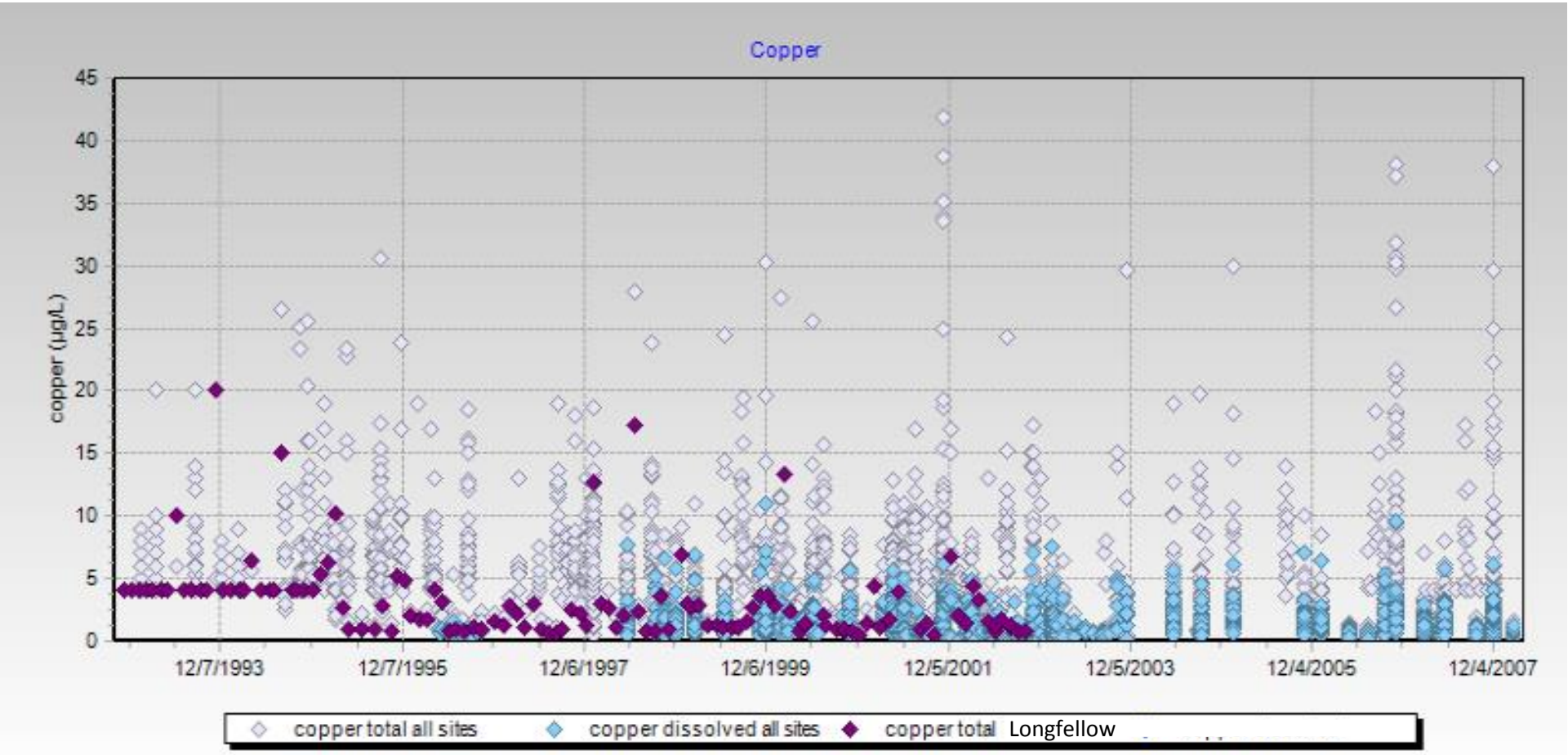
Urban Streams are "Flashier" than Forested Streams



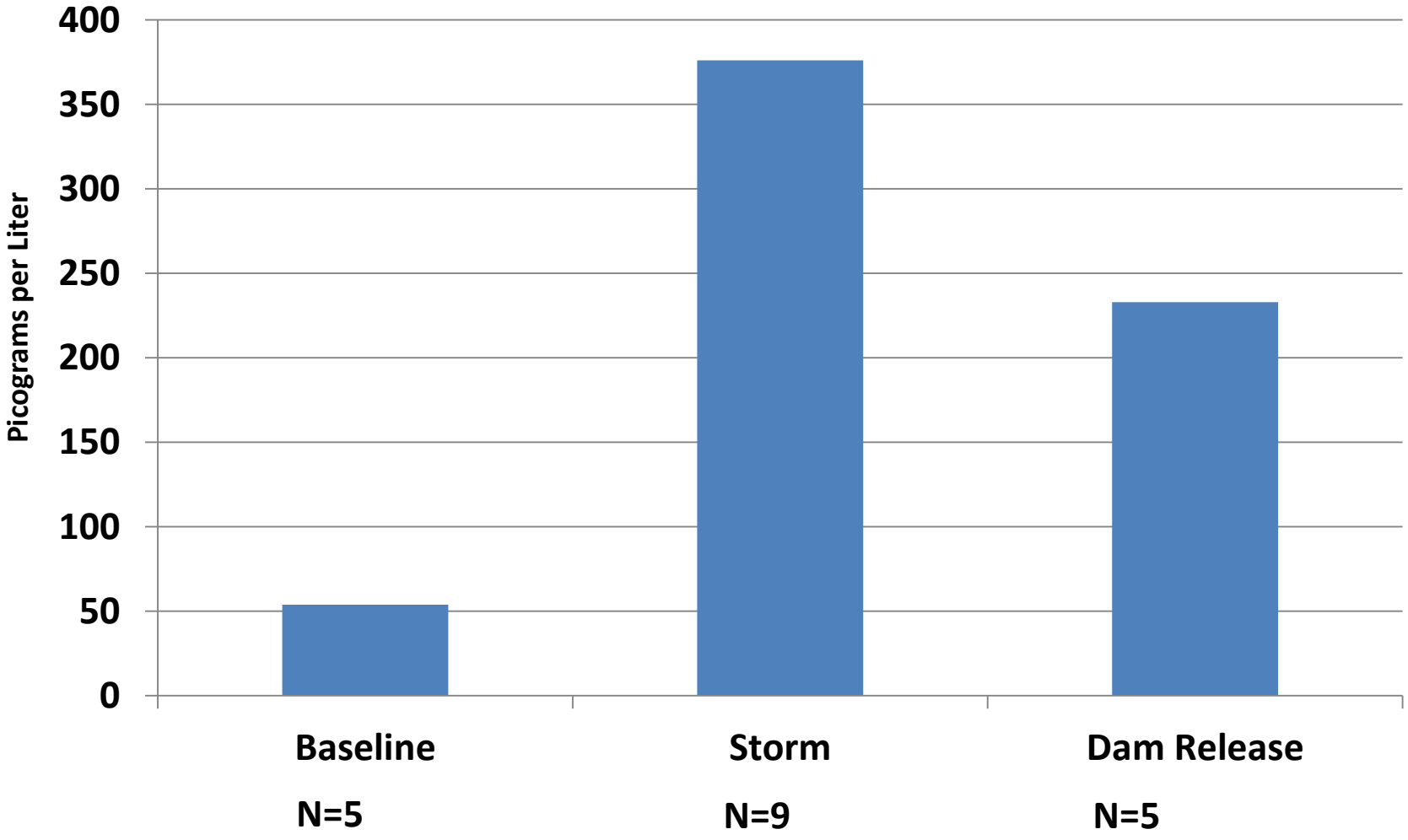

Newaukum Creek Summer Temperature
July/Aug/Sept 1972-2015
Degrees Celsius
19
17
15
13
11
9
7
1/1/1971
1/1/1977
1/2/1983
1/2/1989
1/3/1995
1/3/2001
1/4/2007
1/4/2013


Soos Creek Bacteria 1979-Present
Fecal Coliform (cfu/100ml)
10000
1000
100
10
1/1/1978
1/2/1984
1/2/1990
1/3/1996
1/3/2002
1/4/2008
1/4/2014
90th Percentile
Peak Standard
Geomean Standard
Geomean
Statistically Significant Declining Trend!

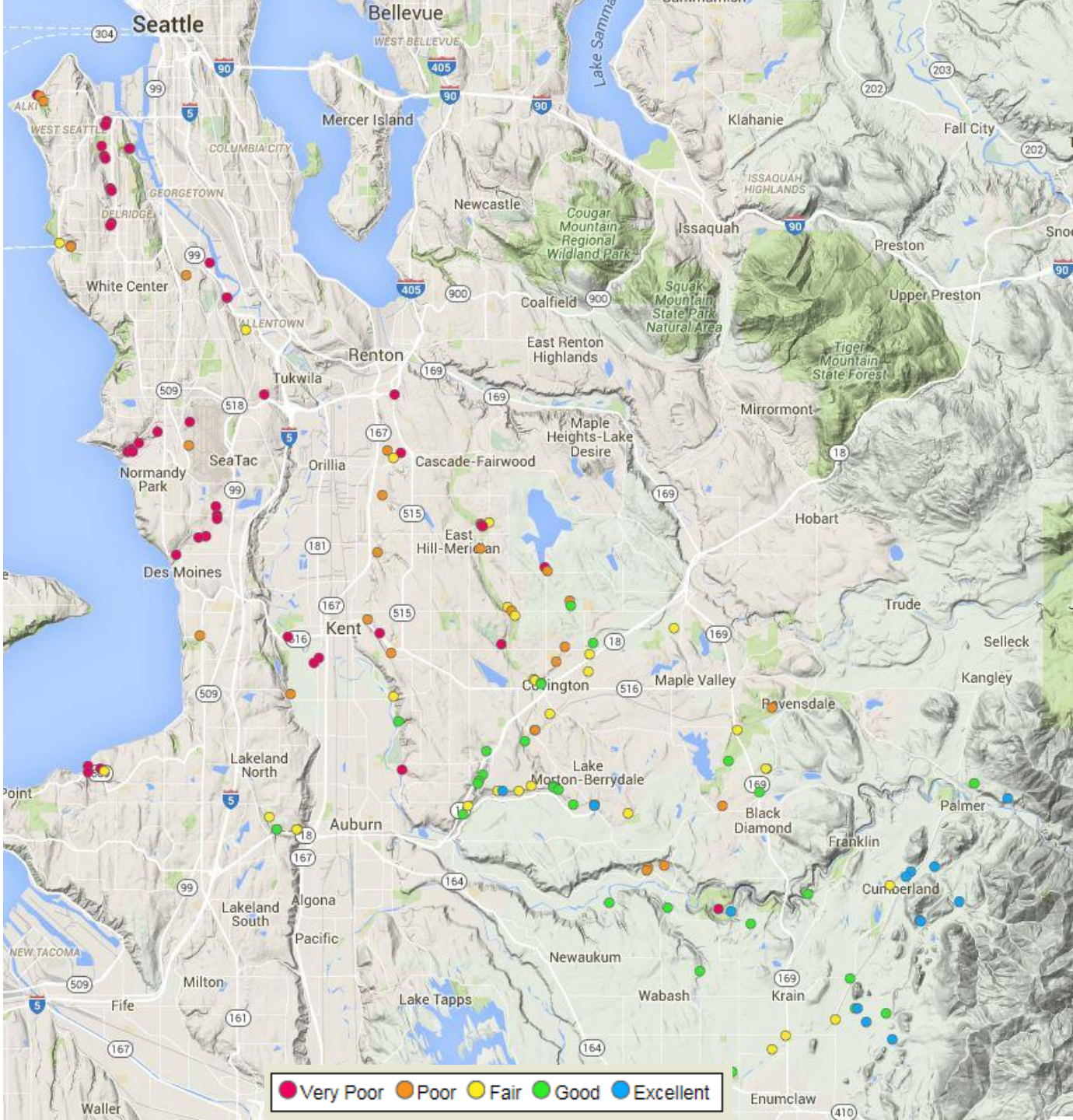
Copper in King County Streams, with Longfellow Creek Highlight



Total PCBs in Duwamish River Water at Tukwila 2013-2015 from USGS



WRIA 9 Stream BIBI Scores

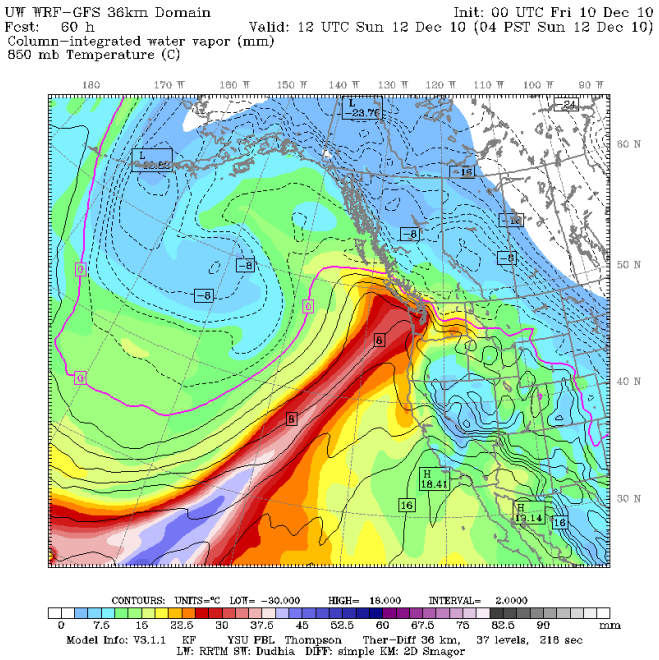


Increased Coho Prespawn Mortality

- Urban stream issue
- Well documented
- Ongoing volunteer monitoring in Miller/Walker
- Due to stormwater runoff

Photo by D. Bobanick, 10/24/2011

Climate Change: Bigger and More Frequent Large Storms



According to Cliff Mass, by the end of the century we are expected to see:

- 11-18% increase in amount of winter rain
- 290% increase in frequency of very large atmospheric rivers
- 15-39% increase in amount of rain during very large atmospheric rivers

King County Stormwater, King County Wastewater, and Ecology are funding a study at UW to assess changes in rainfall patterns and impacts on stormwater designs

Summary

- Historic development degraded urban streams
- Flow alteration highly variable
- Bacteria levels generally declining
- Temperatures generally warming up
- Copper and PCBs linked to stormwater
- Reduced benthos diversity and abundance
- Coho prespawn mortality in some streams
- Climate change might make things worse

Questions?