

why?

***Bacteria Investigations in
Thornton Creek***

***Jonathan Frodge,
Seattle Public Utilities***



***2006 Routine Monitoring Sites
in Thornton Creek***

200 0 200 400 Feet 
King County Department of Natural Resources and Parks



Water Quality Bacteria Standards

For water contact:

Washington State Water Quality Standards WAC 173-201A-030

fecal coliform levels in freshwater should not exceed a geometric mean of

50 colonies/100 ml,

and not have more than

10% of all samples exceeding 100 colonies / 100

(for Class A excellent - 100 colonies/100 ml and <10% of all samples exceeding 200 colonies/100 ml)

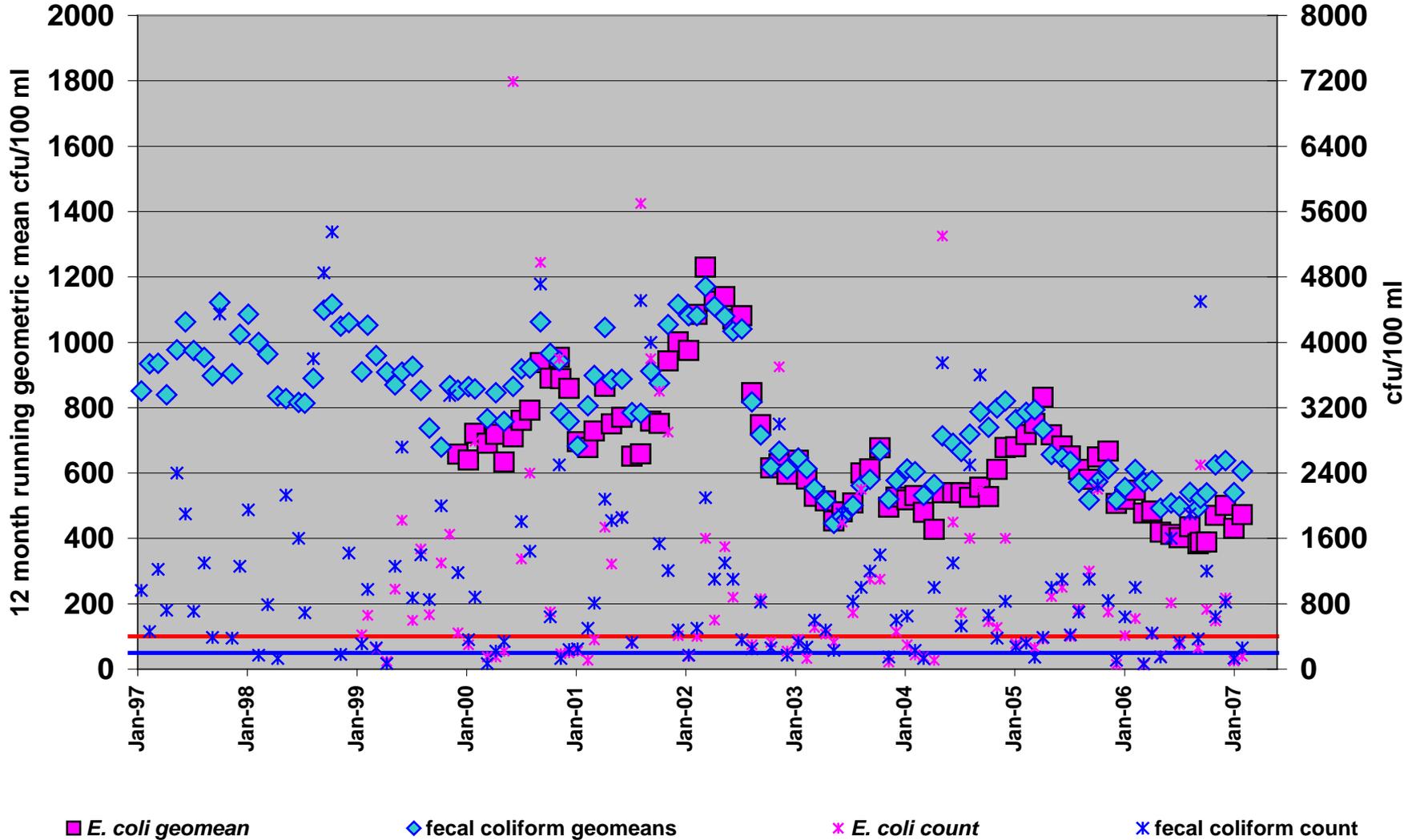
The ***State Department of Health*** has not developed pollution standards for bathing beaches, but use either:

≤ geometric mean of **200 cfu/100 ml,**

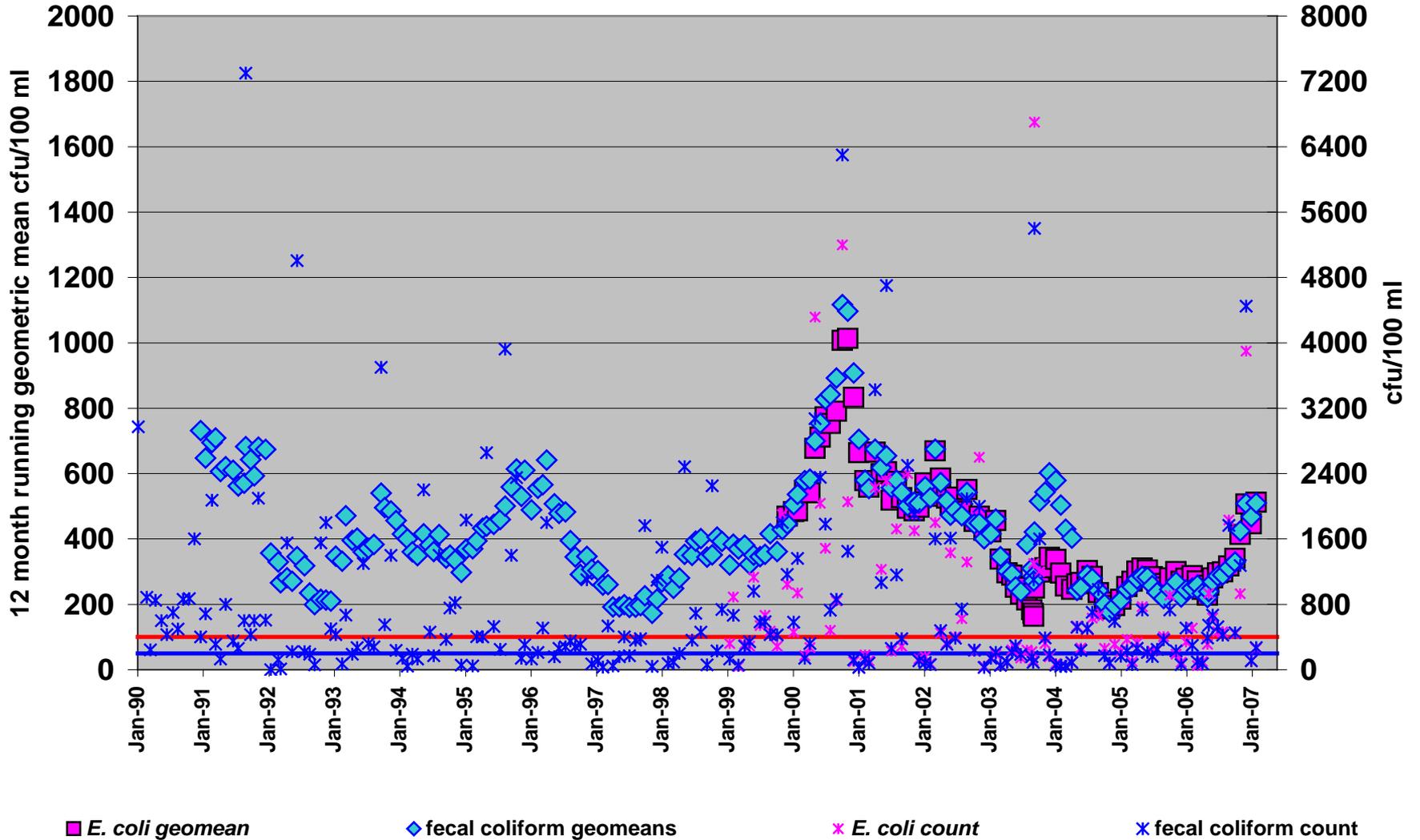
with not more than 10% exceeding 400 colonies/100 ml, or

2) “**TEN STATE STANDARD**” – ≤ geometric mean of **200 cfu/100 ml** with no single sample exceeding **1000 colonies/100 ml.**

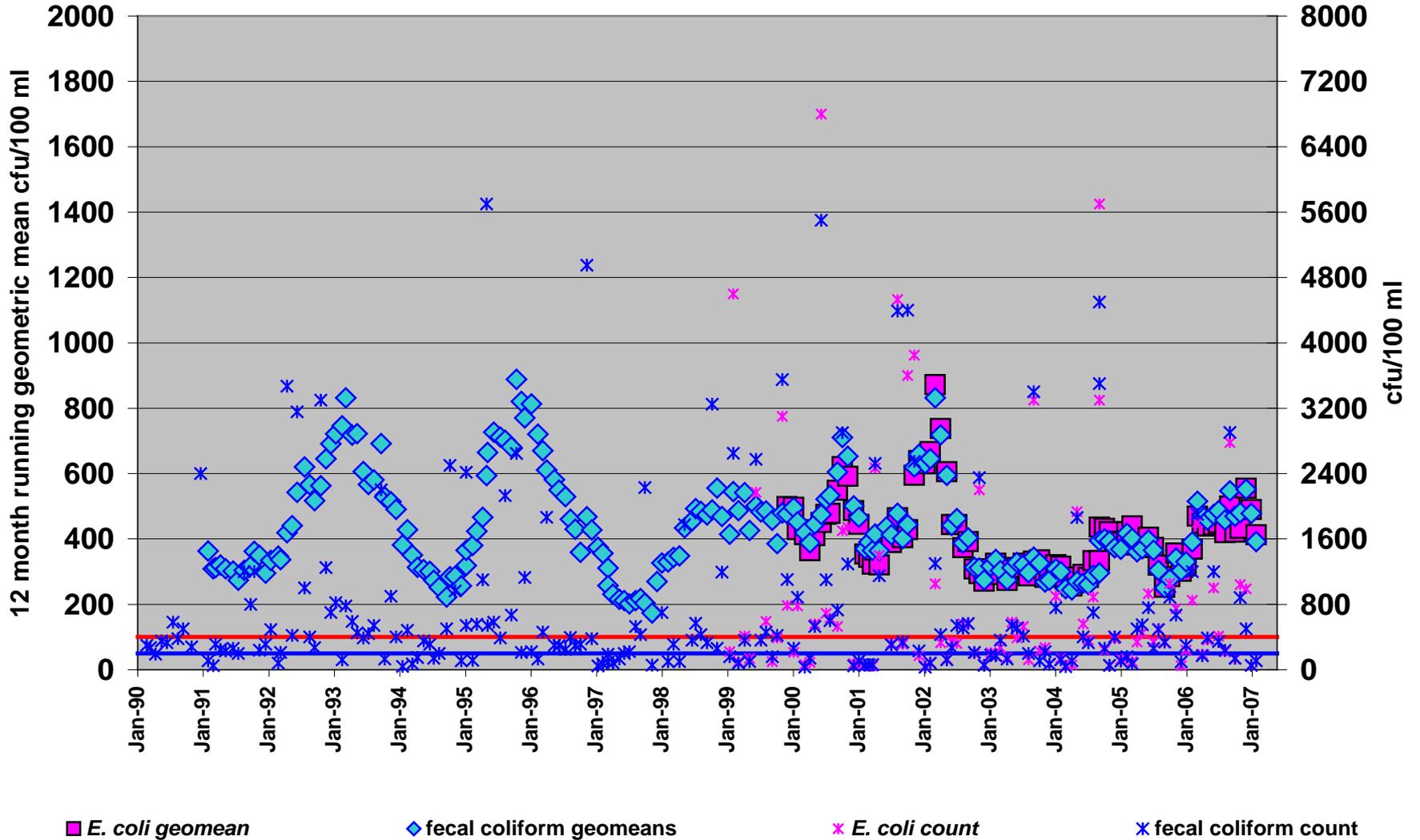
Thornton Creek (0434)



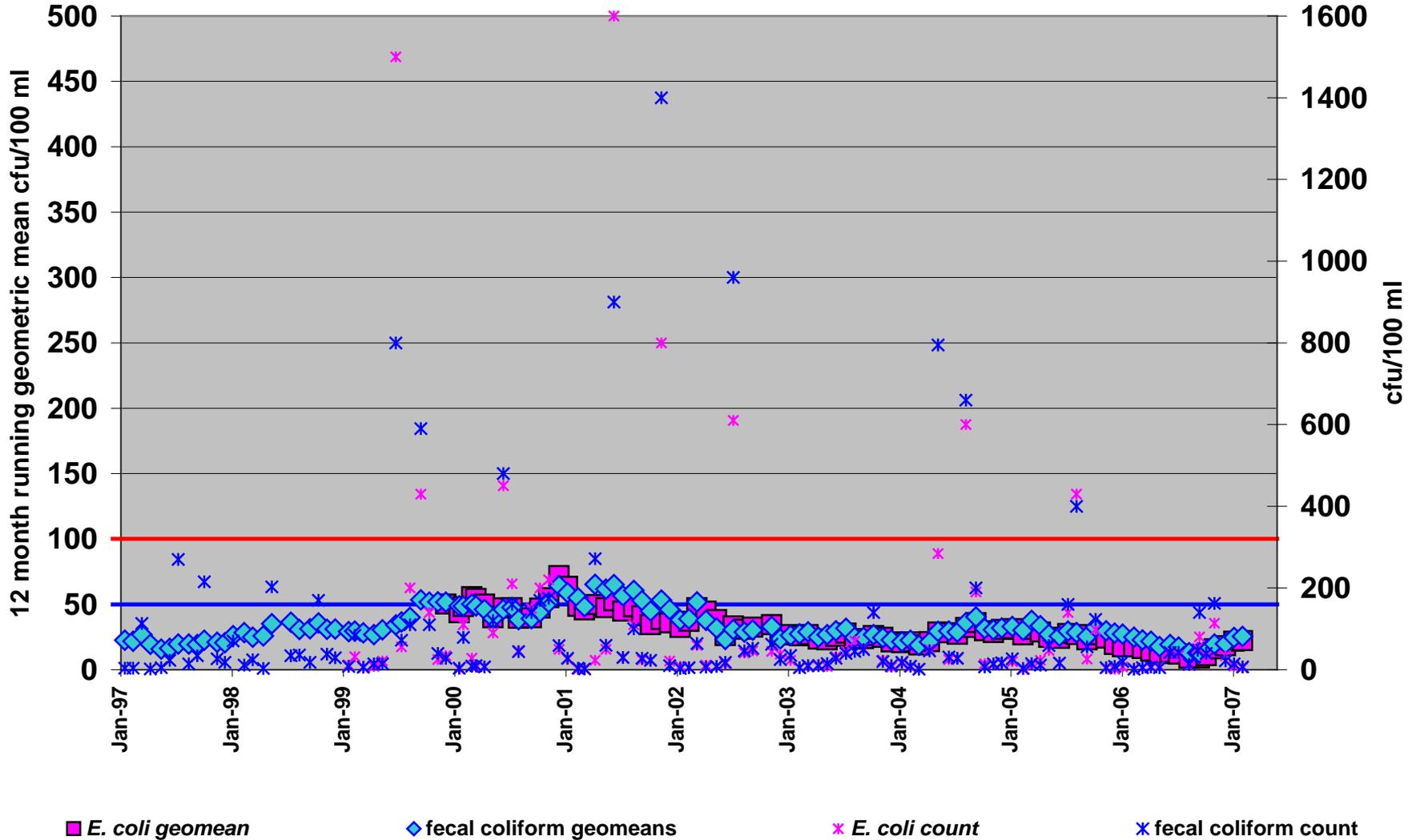
Juanita Creek (0446)



Lyon Creek (0430)

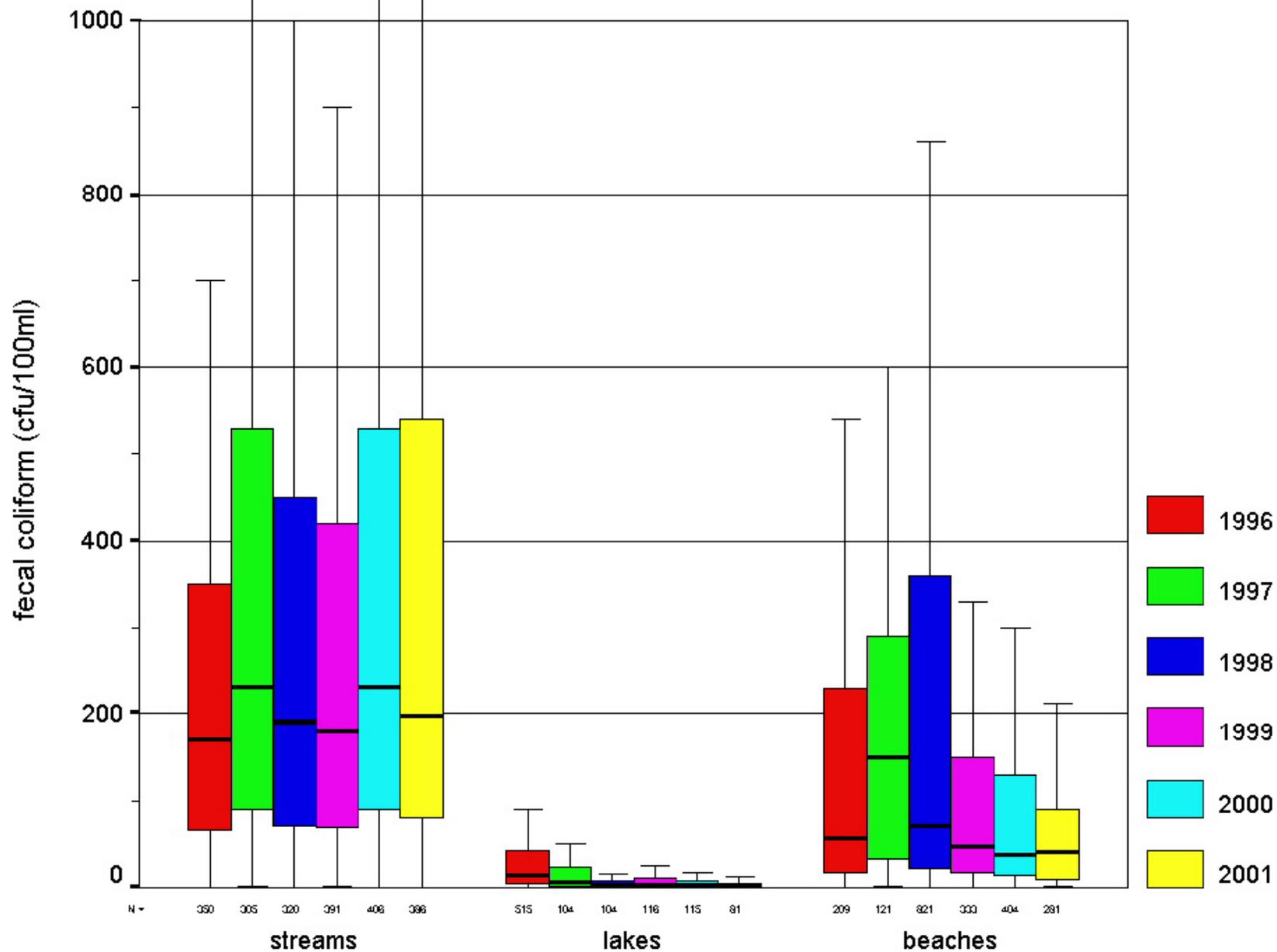


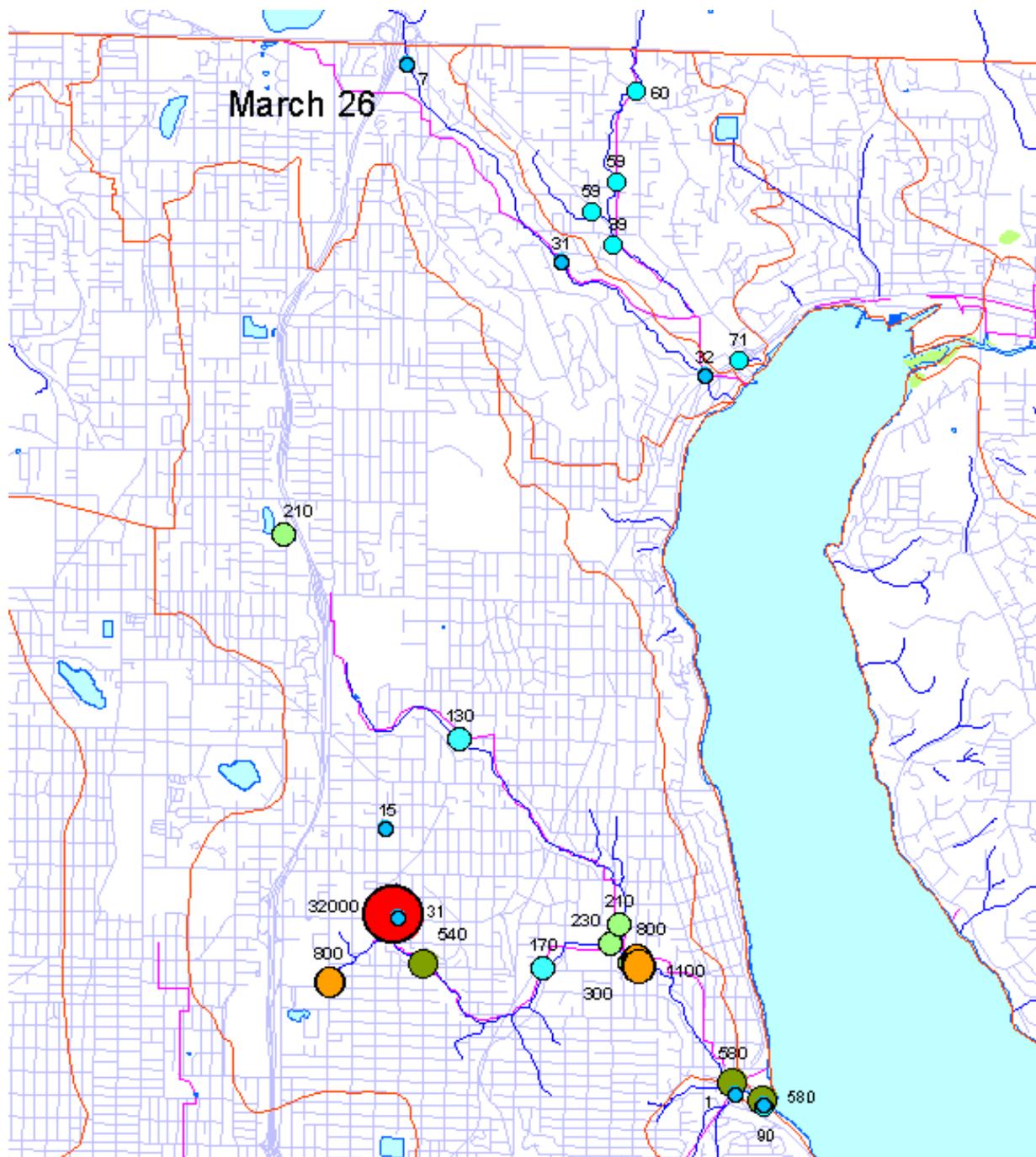
Cedar River at Jones Rd Bridge (A438)





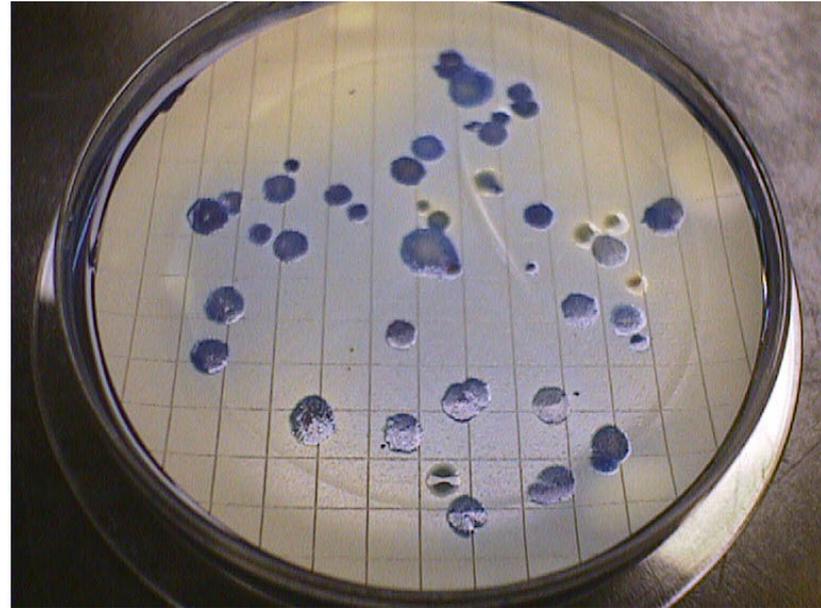
WRIA 8 fecal coliform







BACTERIAL PLATES *and analysis*



COLONY

of **cfu** (*colony forming unit*)
or

ORGANISM

(which forms a colony) of **orgs**

per 100 ml of sampled water

Oregon Department of Environmental Quality

criteria are as follows:

- Freshwaters and estuarine waters other than shellfish growing waters
(340-041-0009(1)(a))

- o ***E. coli***

30-day log mean of **126 organisms per 100 ml**, based on a minimum of five (5) samples

No single sample may exceed **406 organisms per 100 ml**

- Marine waters and estuarine shellfish growing waters
((340-041-0009(1)(b))

- o **Fecal Coliform**

Median concentration of 14 organisms per 100 ml

Not more than 10% of the samples may exceed 43 organisms/100 ml

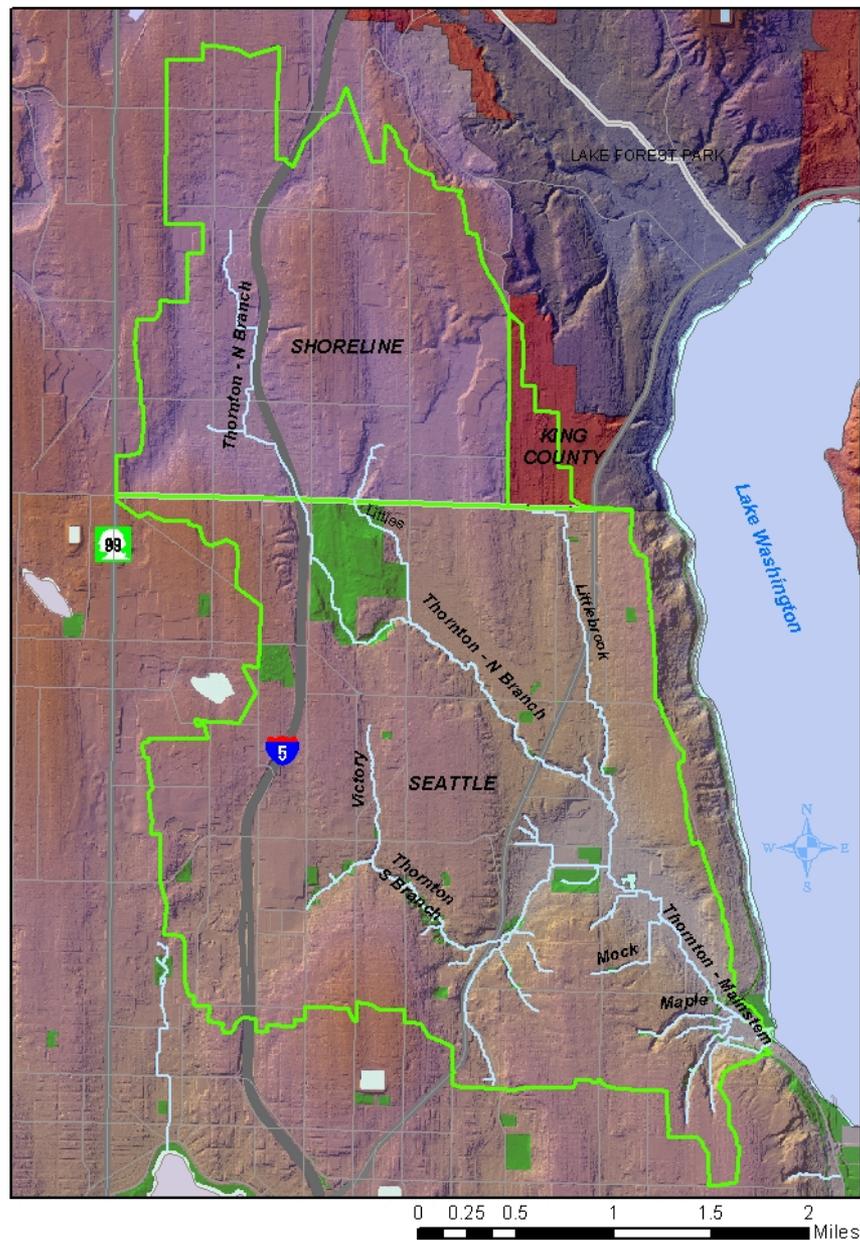


Figure 1. Thornton Creek watershed in the cities of Seattle (4695 acres 67% of the watershed), Shoreline (2205 acres, 31% of the watershed) and unincorporated King County (118 acres, 2% of the watershed).



Distribution of New Zealand mud snail (*Potamopyrgus antipodarum*) near Thornton Creek outlet, Lake Washington

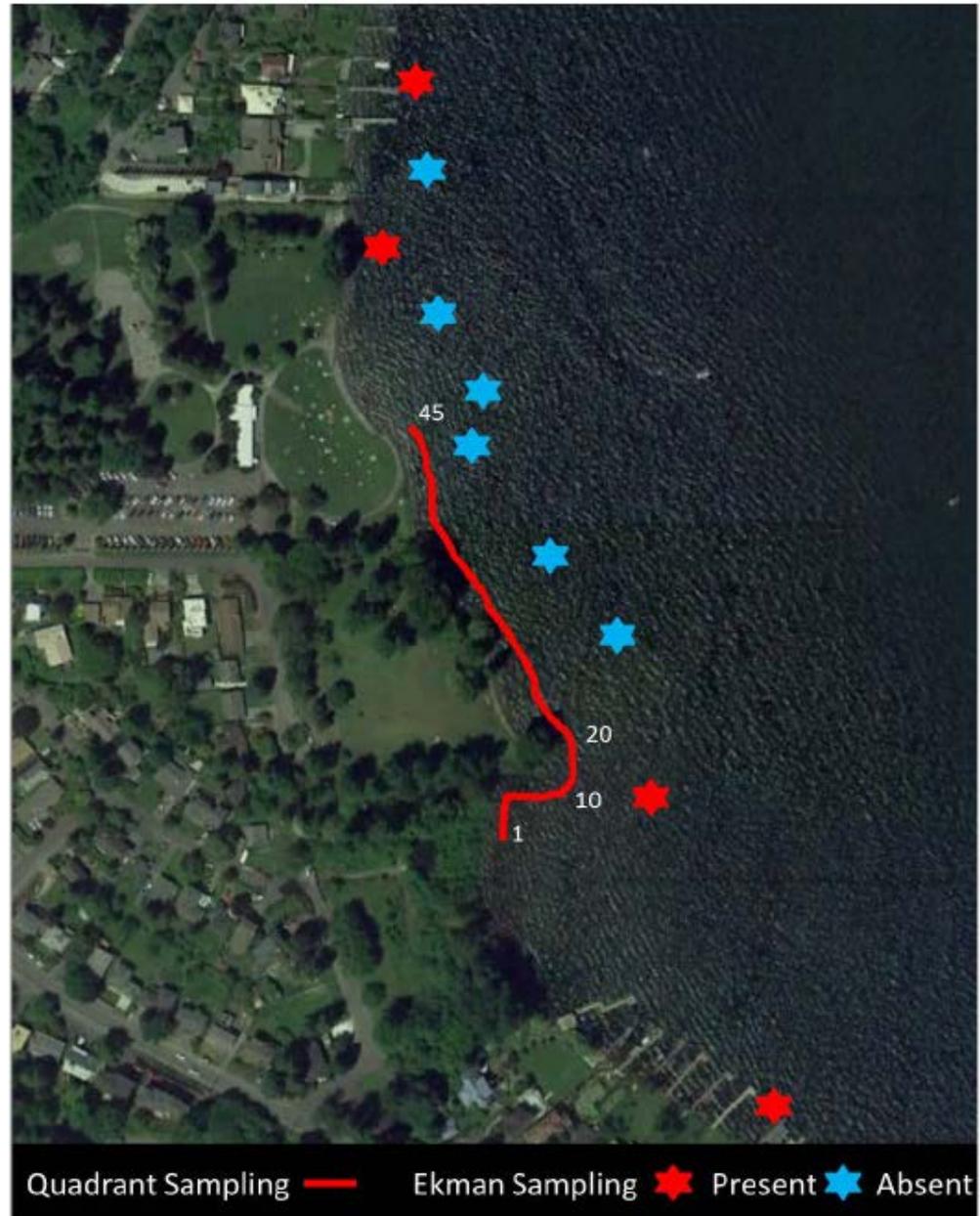
Julian Olden
Laura Twardochleb

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Sampled May
23, 2011

Figure 1

Distribution of New Zealand mud snail near Thornton Creek outlet, Lake Washington – Conducted by Olden Lab, University of Washington

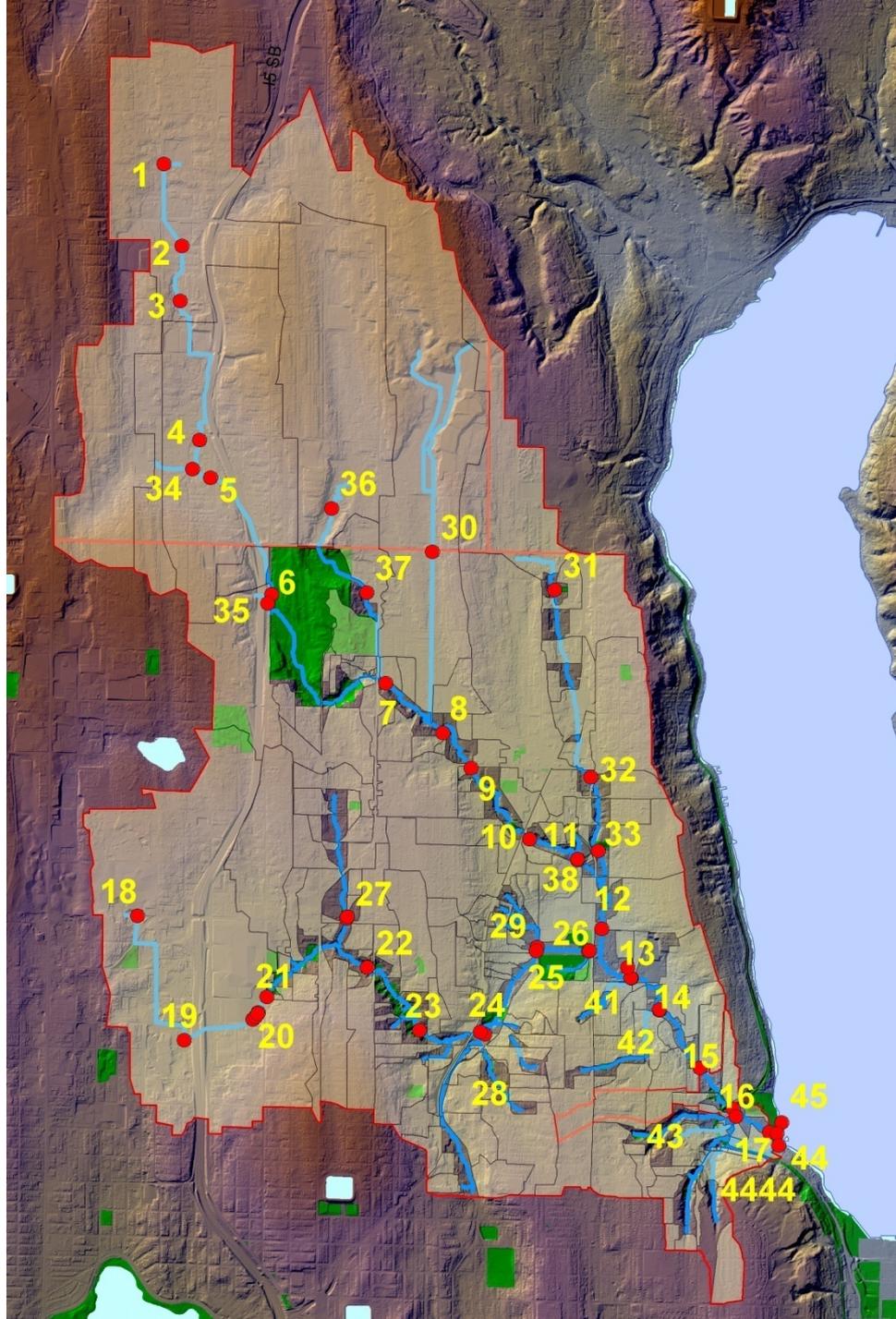


Sampling density based on budget and laboratory capacity

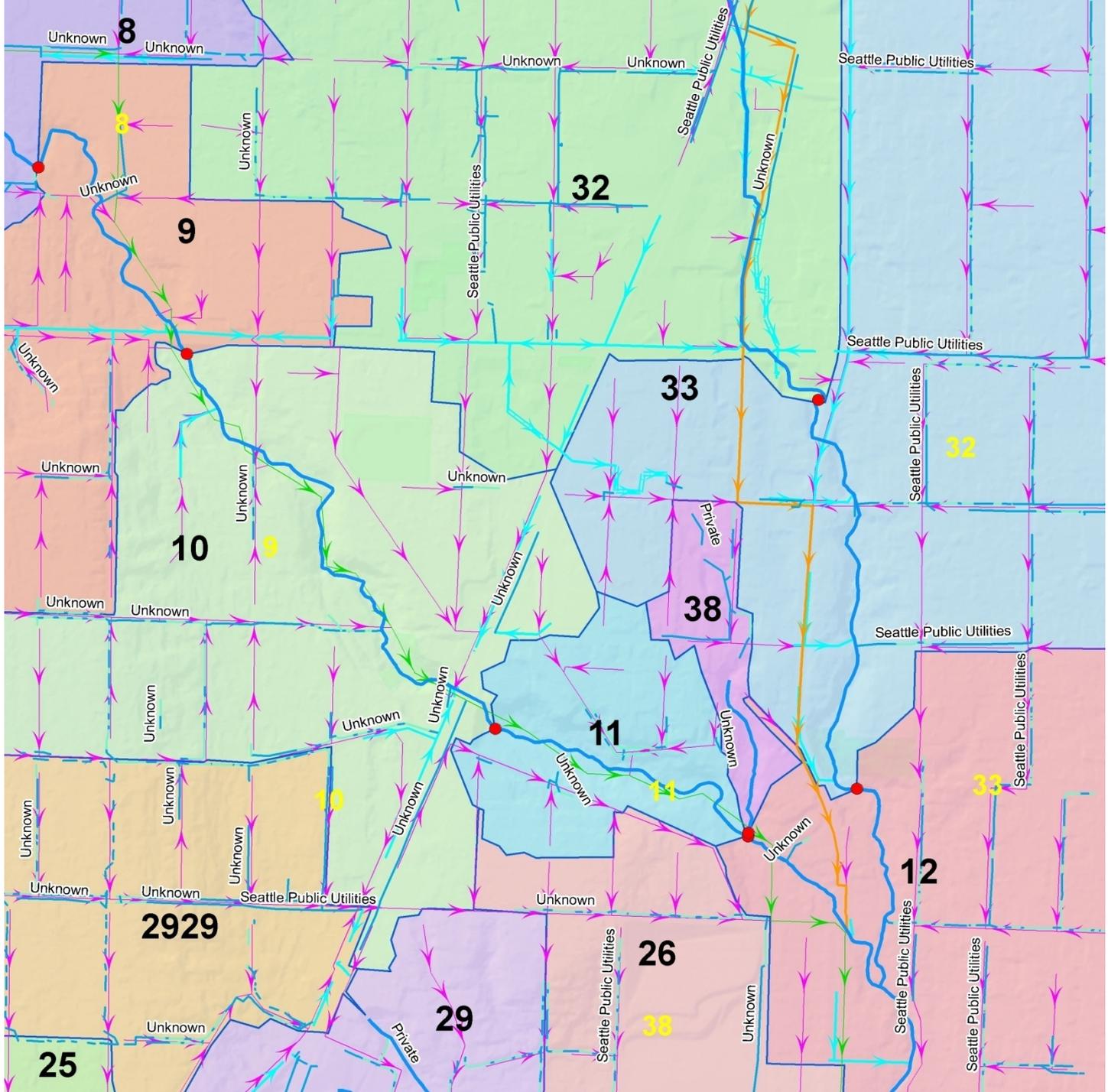
Stream channel is segmented into short segment

Sampling is from downstream to upstream following NZMS protocols

Same sites sampled in the AM and again in the PM



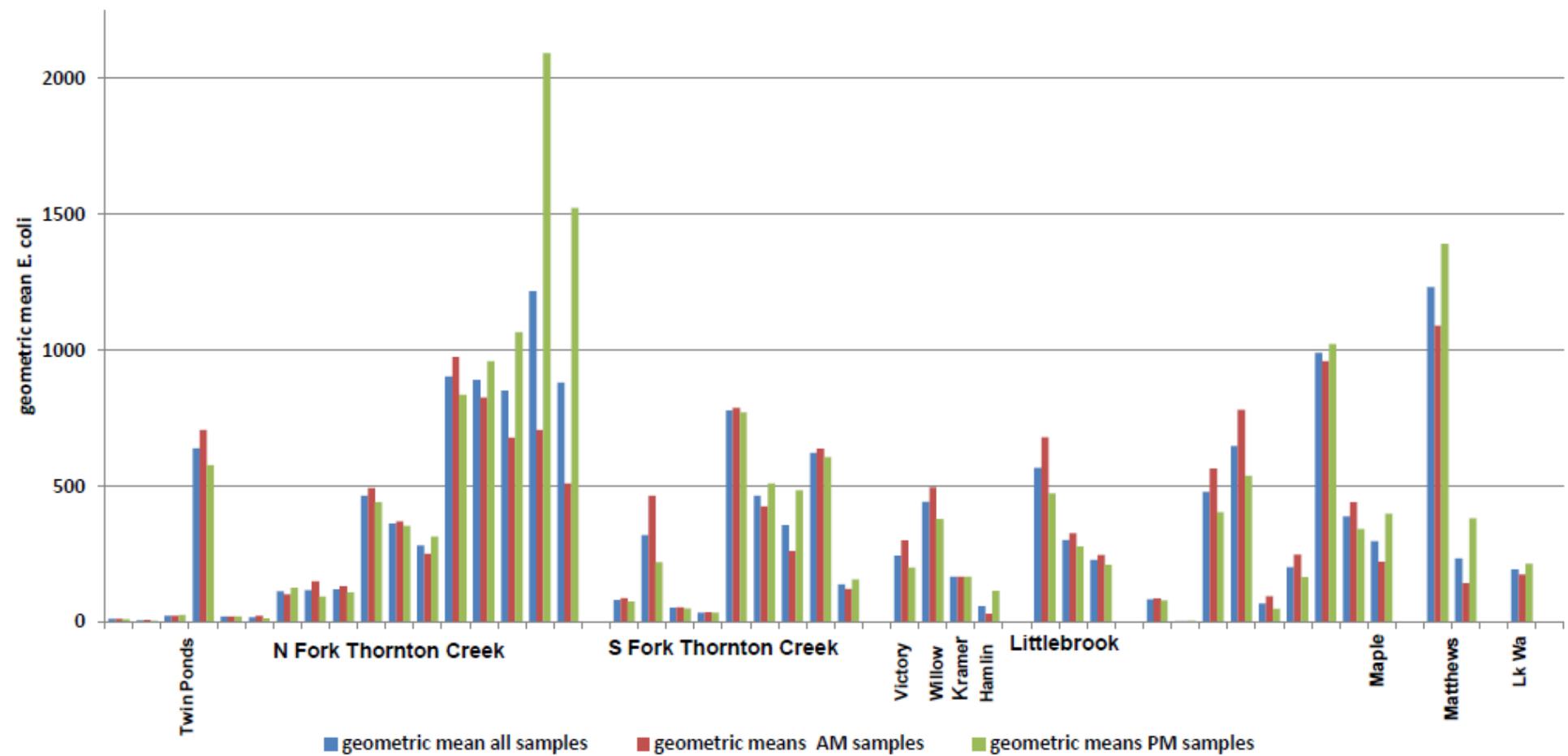
smaller basin delineations are designed to focus source ID investigations in as small a geographic area as possible to increase probability of locating bacterial sources



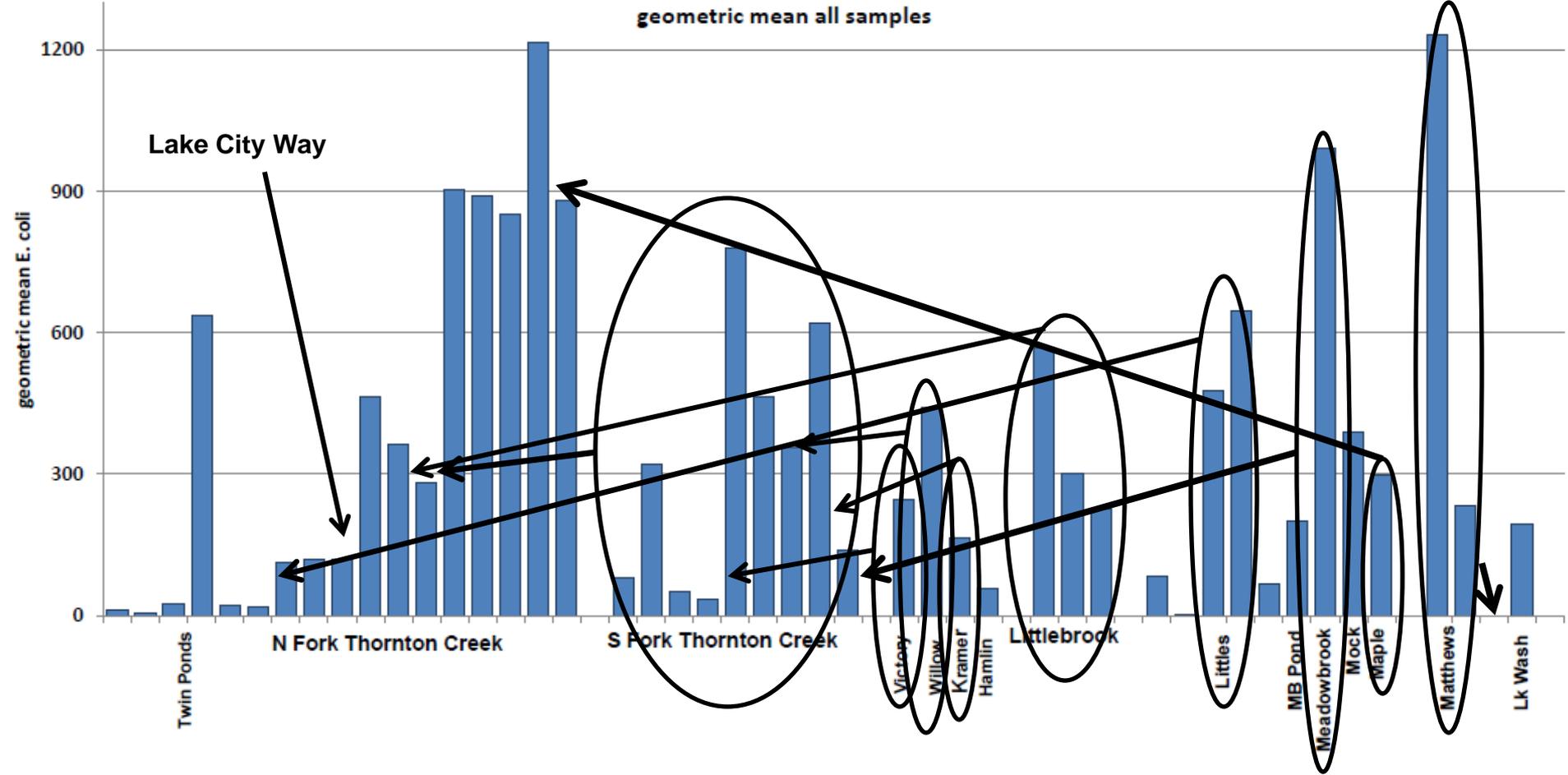
GIS layers of surface drainage

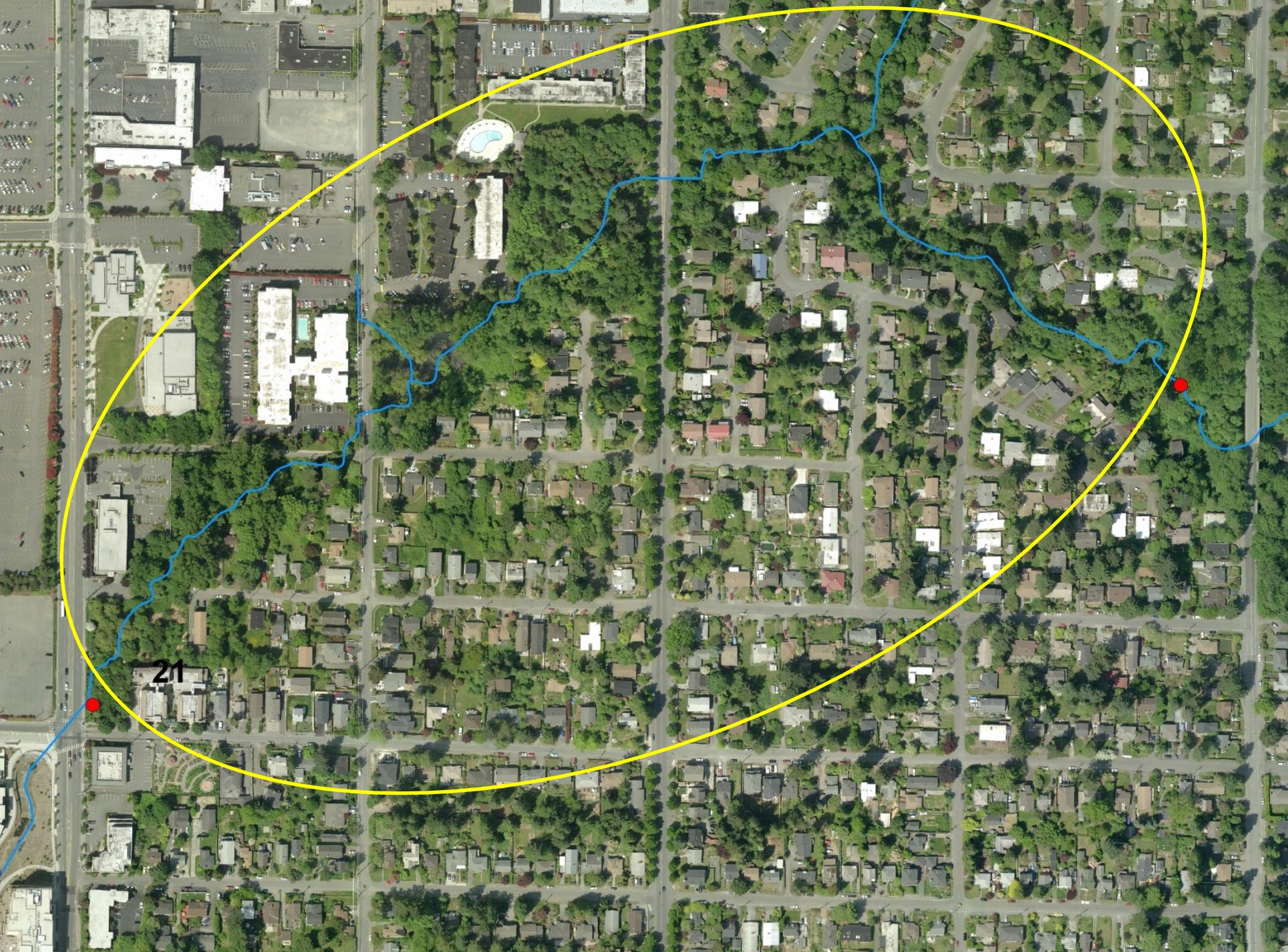
GIS layer of sanitary system

combined with topography delineate basins that contribute to sample points



geometric mean all samples





21

*below Lake City
Way bacteria
counts increase,
benthic
invertebrates
decrease, and
every time it rains,
the creek suds up*



geometric means

n = 45

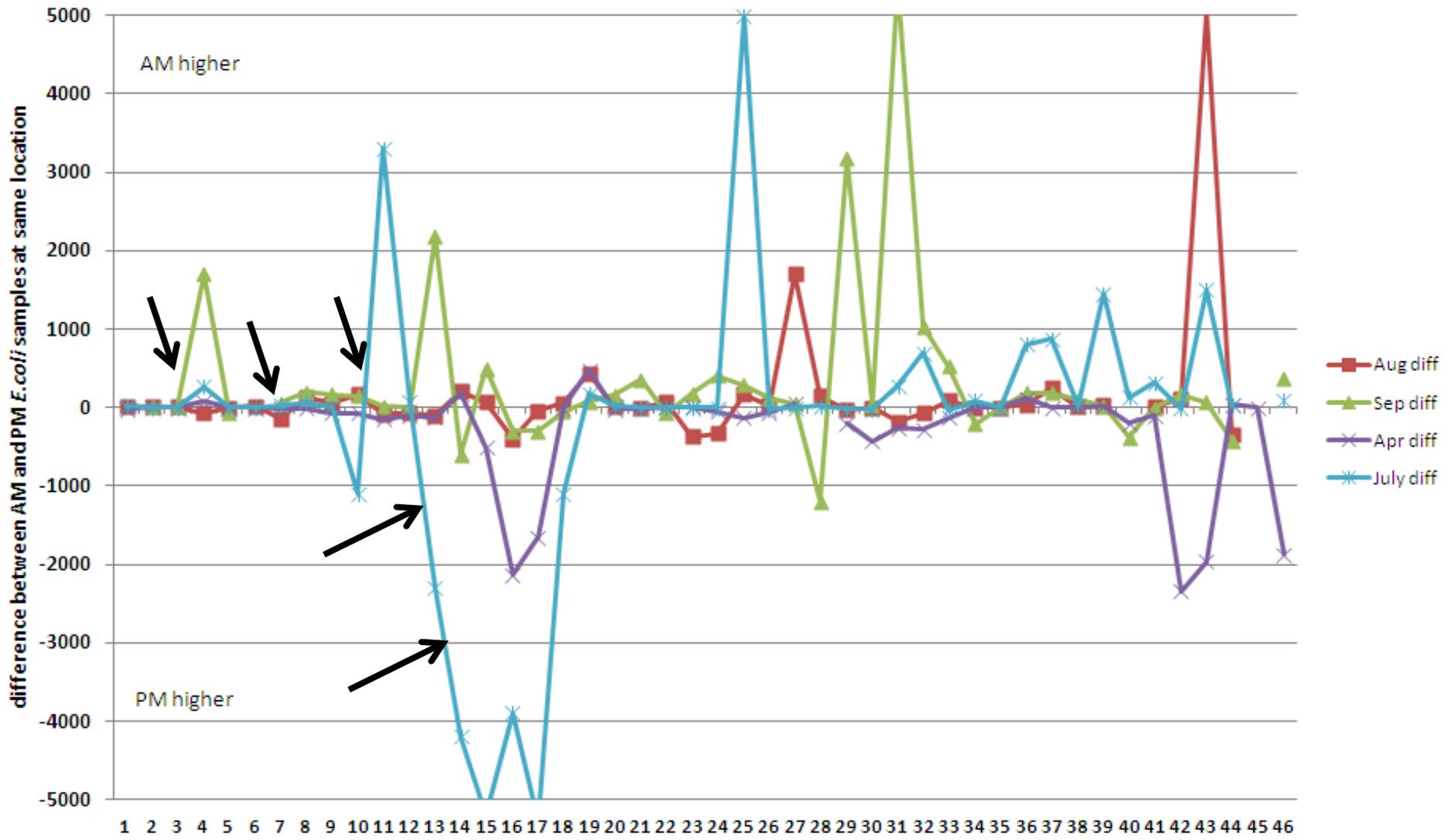
***Bacterioides
counts ?***

***obligate anaerobes in an
oxygenated environment***

sample dates	E. coli cfu/100ml		fecal coliform cfu/100ml		Bacterioides count		temp		DO mg/l		pH		conductivity µsiemens	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
28-Aug-11	141	121	101	107	633	1437	16.2	17.2	6.1	6.3	7.7	7.7	222	227
11-Sep-11	476	378	451	261	1596	925	14.9	15.3	7.0	7.1	7.4	7.6	181	187
28-Sep-11	476	378	451	261	1596	925	14.9	15.3	7.0	7.1	7.4	7.6	181	187
11-May-12	60	111	59	78	nd	210	10.7	11.8	9.3	10.4	7.2	7.5	232	181
10-Jul-12	258	235	186	373	4220	2788	14.8	15.7	7.2	7.6	7.3	7.4	215	215

***3 sampling events actually met the E. coli
criteria (Oregon DEQ)!***

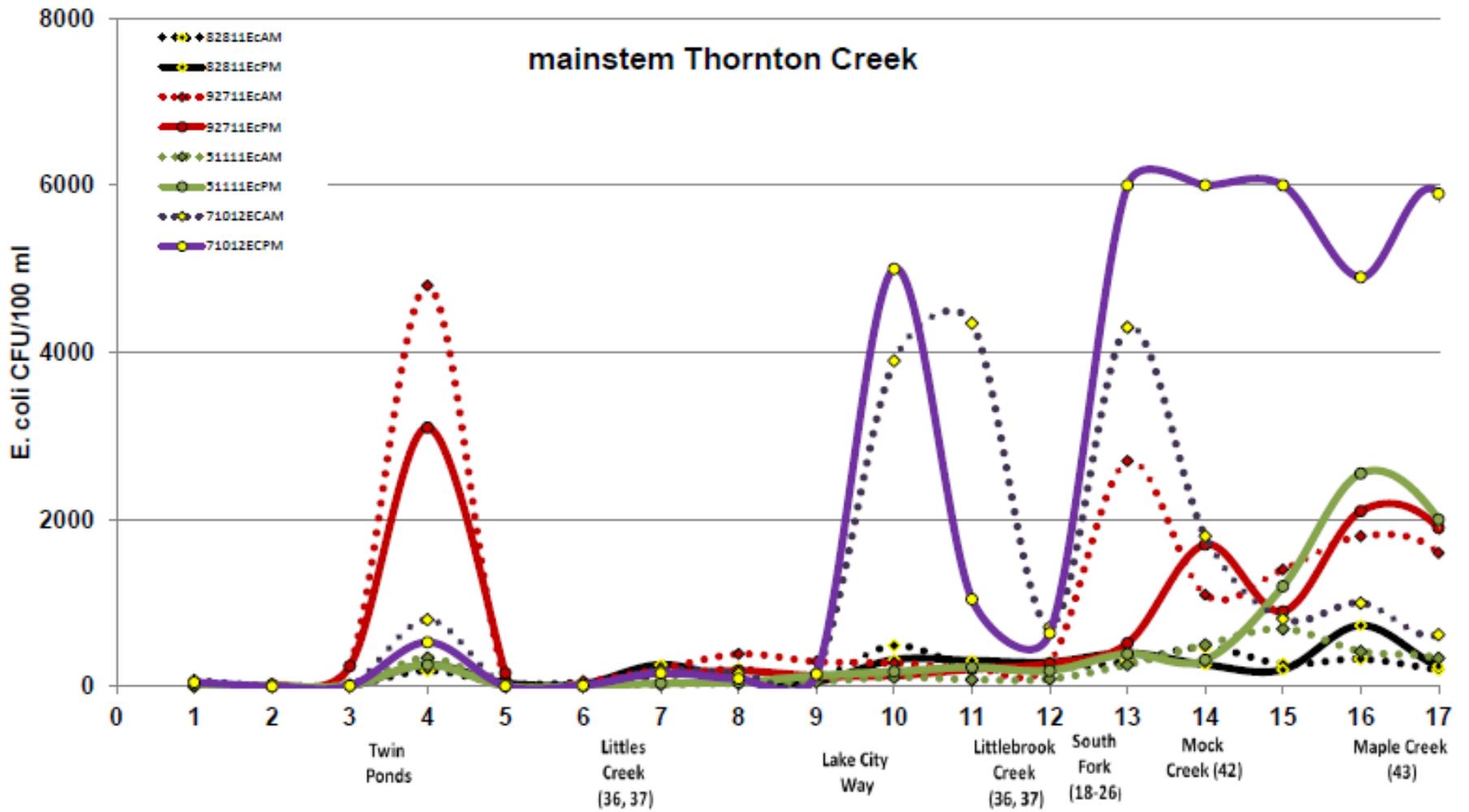
***conventional data provides good
secondary evaluation of non-point vs. point
sources***

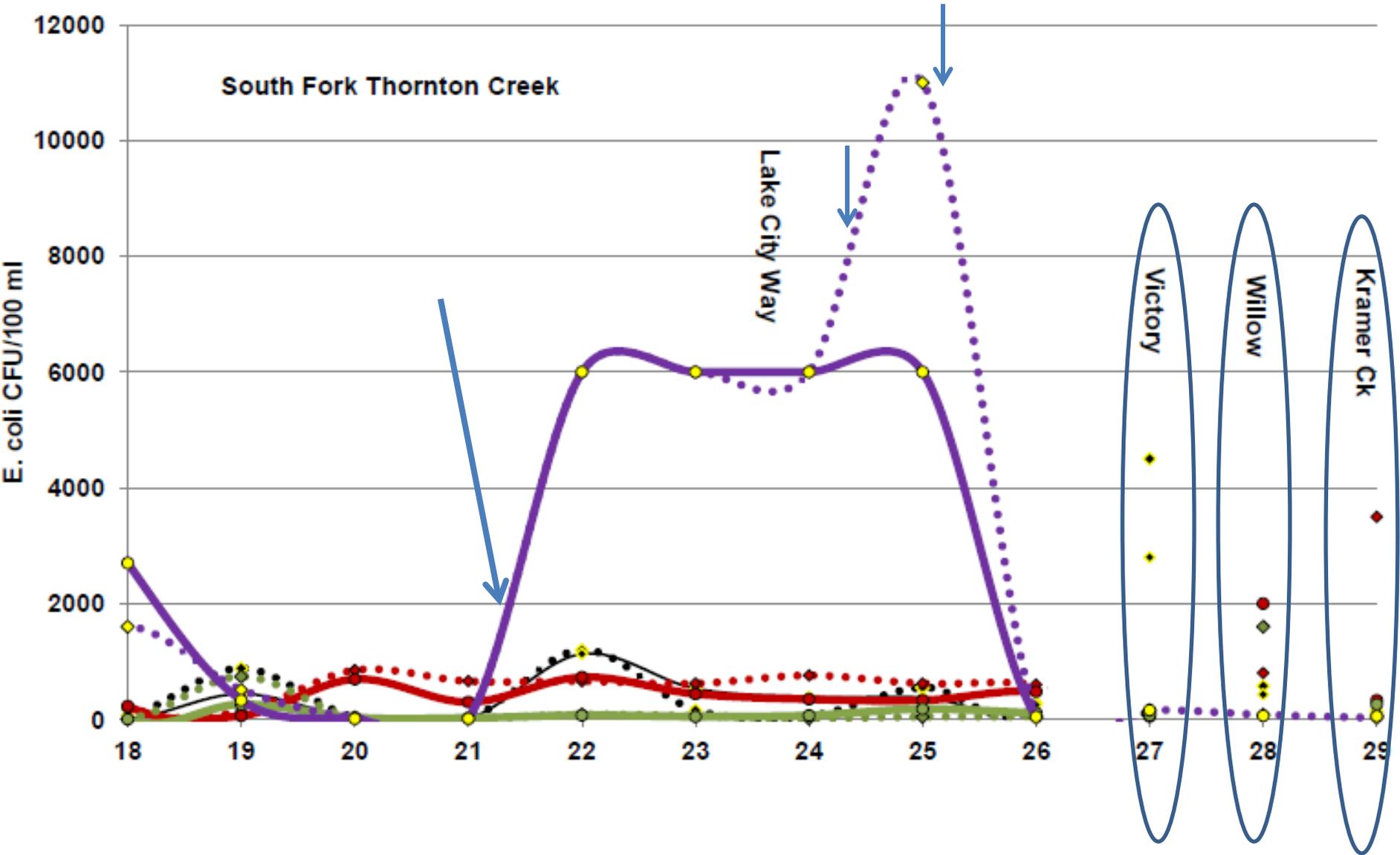


Twin Ponds Lake City Way South Fork Thornton Creek
 Little's Creek Littlebrook Creek

assumption is larger differences occur with episodic events

mainstem Thornton Creek

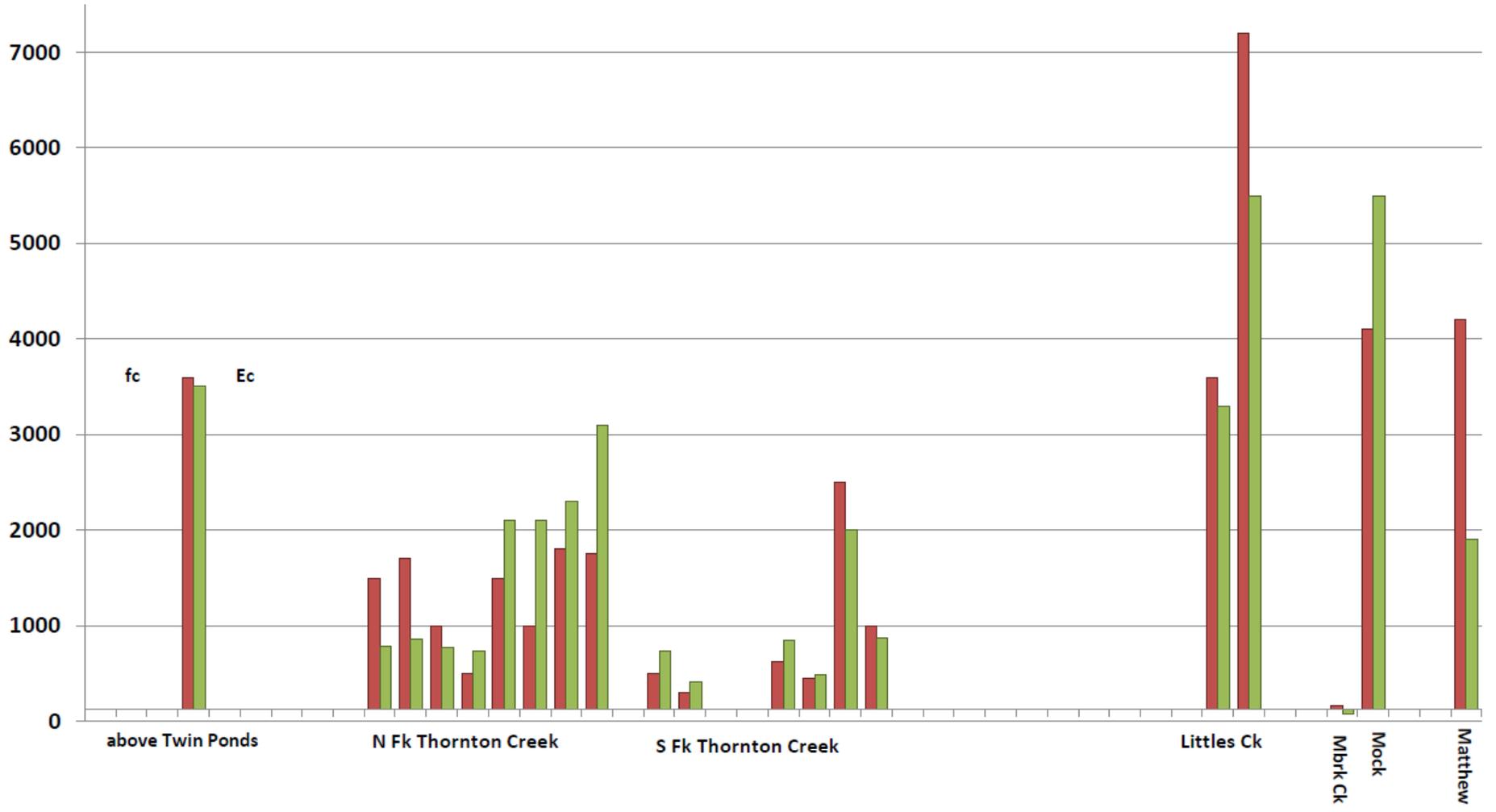






Victory Creek Park 2003

draft 'first flush' from Oct 13, 2012





STILL The Usual Sources

