Item #5

WY 2015 MONITORING DESIGN

SUPPORT FOR MQ1: IDENTIFICATION OF HIGH LEVERAGE WATERSHEDS AND SUB-WATERSHEDS

SOURCES PATHWAYS AND LOADINGS WORKGROUP MEETING
SPRING 2014

May 29, 2014

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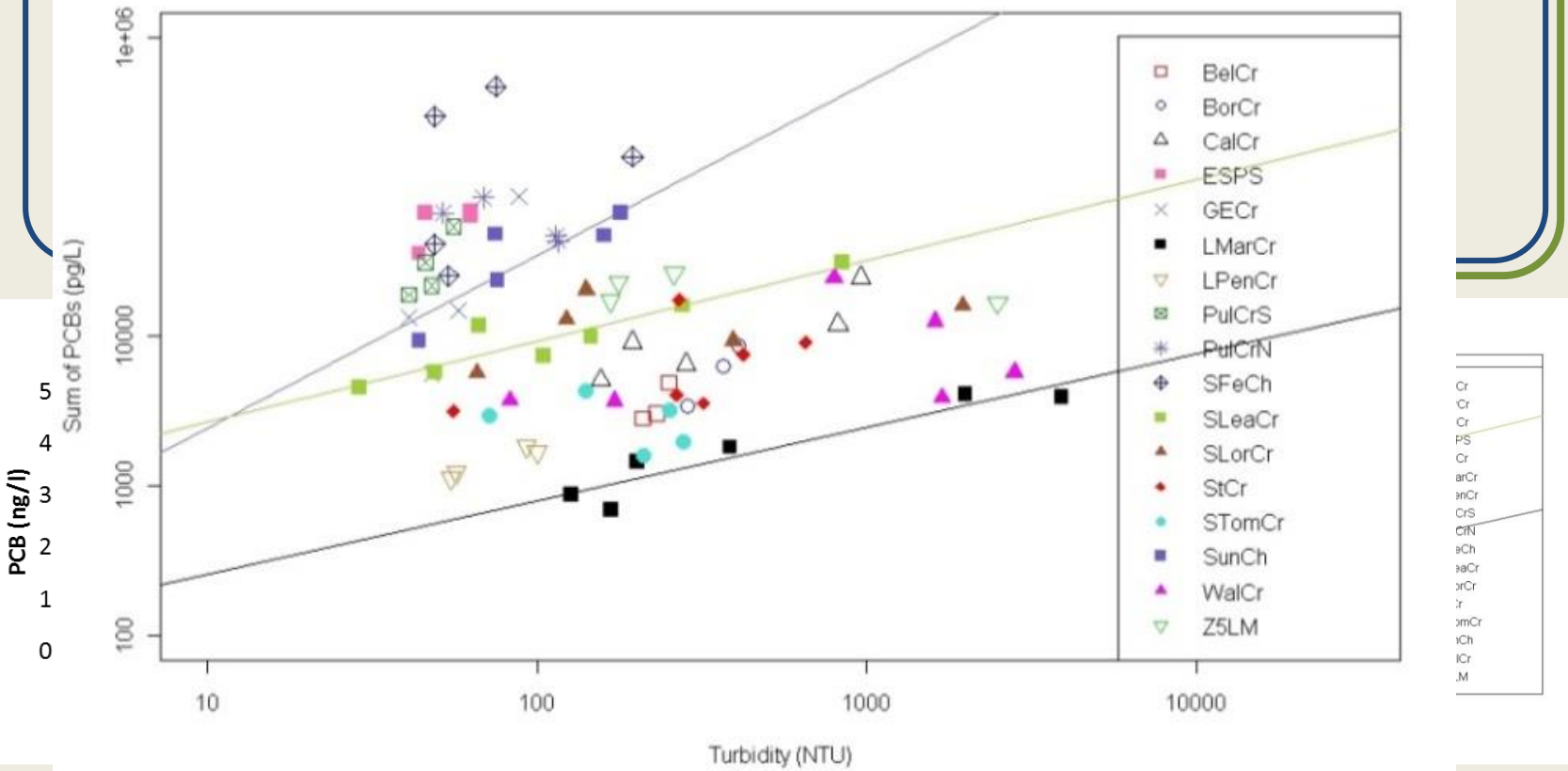
J. Hunt
L. McKee

PREVIOUS METHODS



QUESTIONS FOR THE WORKGROUP

Primary question: What is the most cost effective monitoring design scenario for MQ1: Identifying and ranking (high/medium/low) polluted drainages?

Q1. Monitoring Design Scenarios: Which scenario provides the best trade-off between scientific rigor (# samples, method inter-comparison), number of sites visited (maximum identification of leverage areas), and analytes included?

- Should other monitoring scenarios be considered to ensure data are useful for other management questions?
- Should the trace metals suite be added to the analyte list as an indicator of urbanization or source areas (generally, and specifically in association with PCBs/Hg)?

Q2. Remote Sampler Methods: Which method is likely to provide the most comparable results for PCBs and Hg? Are there other samplers we should use?

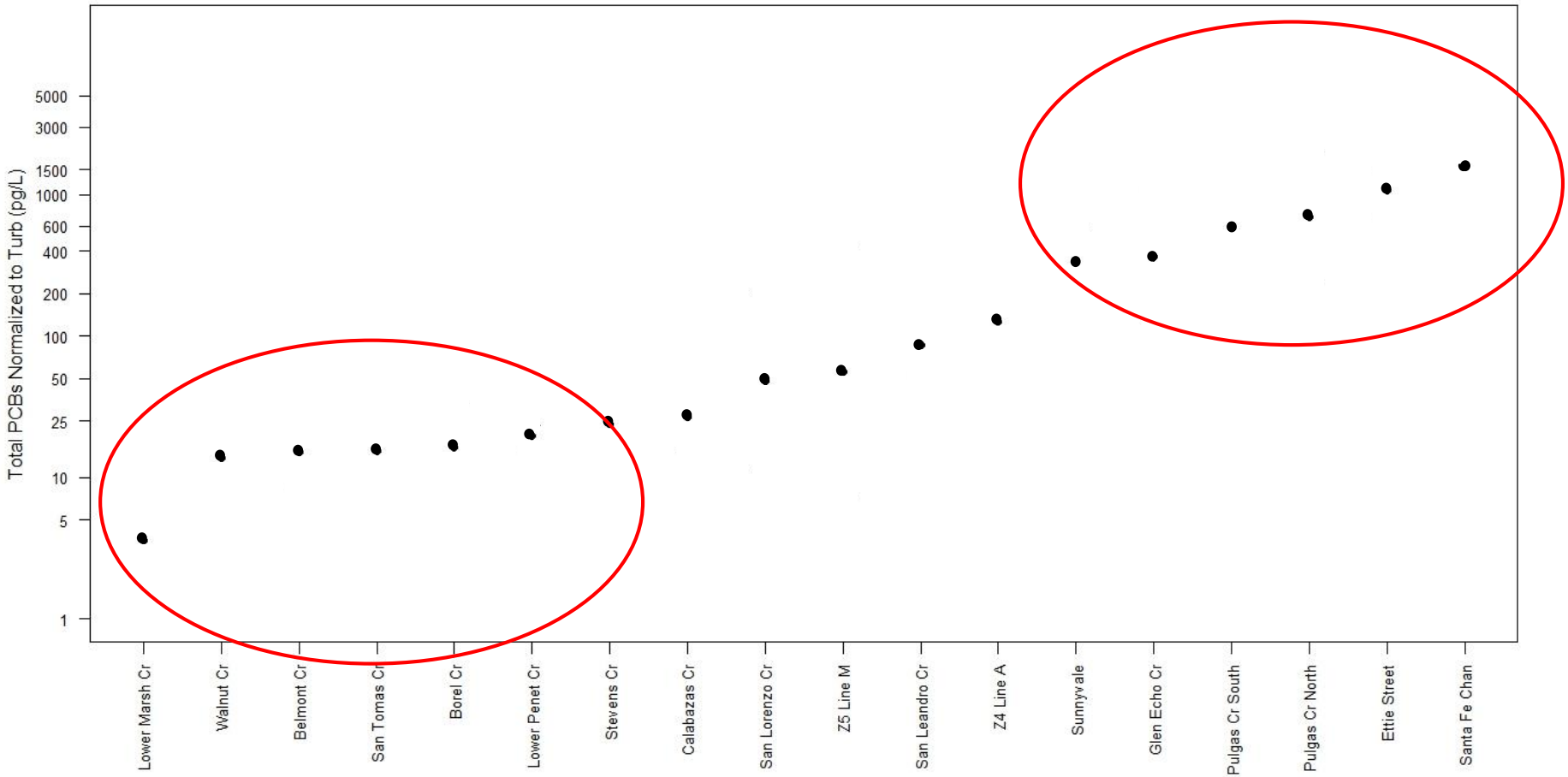
- To provide comparison between manual and passive designs?
- To provide comparison between sites of differing watershed characteristics?

Q3. Site Selection Rationale: What is the right balance of sites chosen based on each rationale in relation to the primary question?

- Are there other rationale that could be considered to ensure data are useful for other management questions?

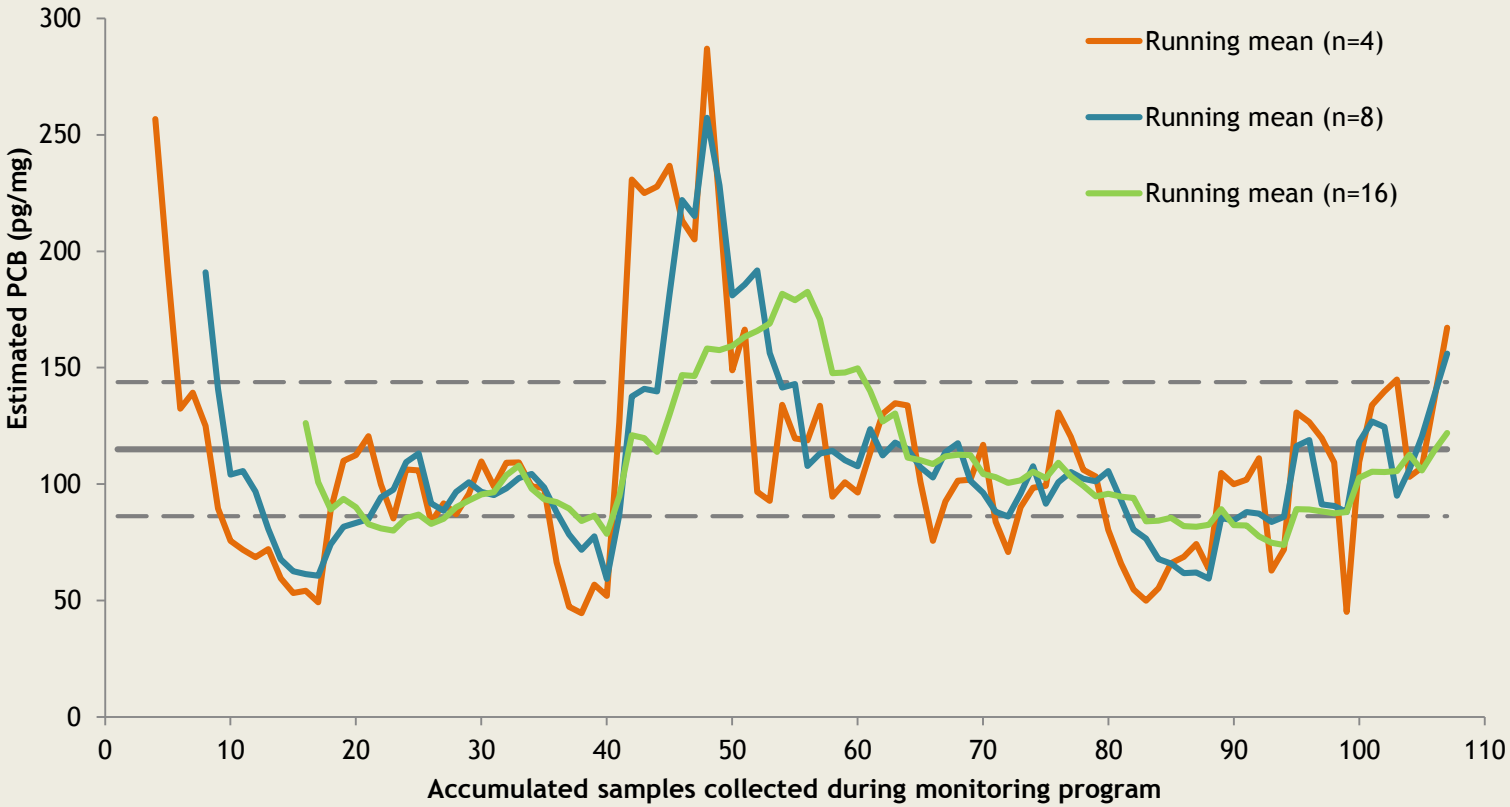
WY 2015 MONITORING DESIGN: PROPOSED METHOD CHANGES

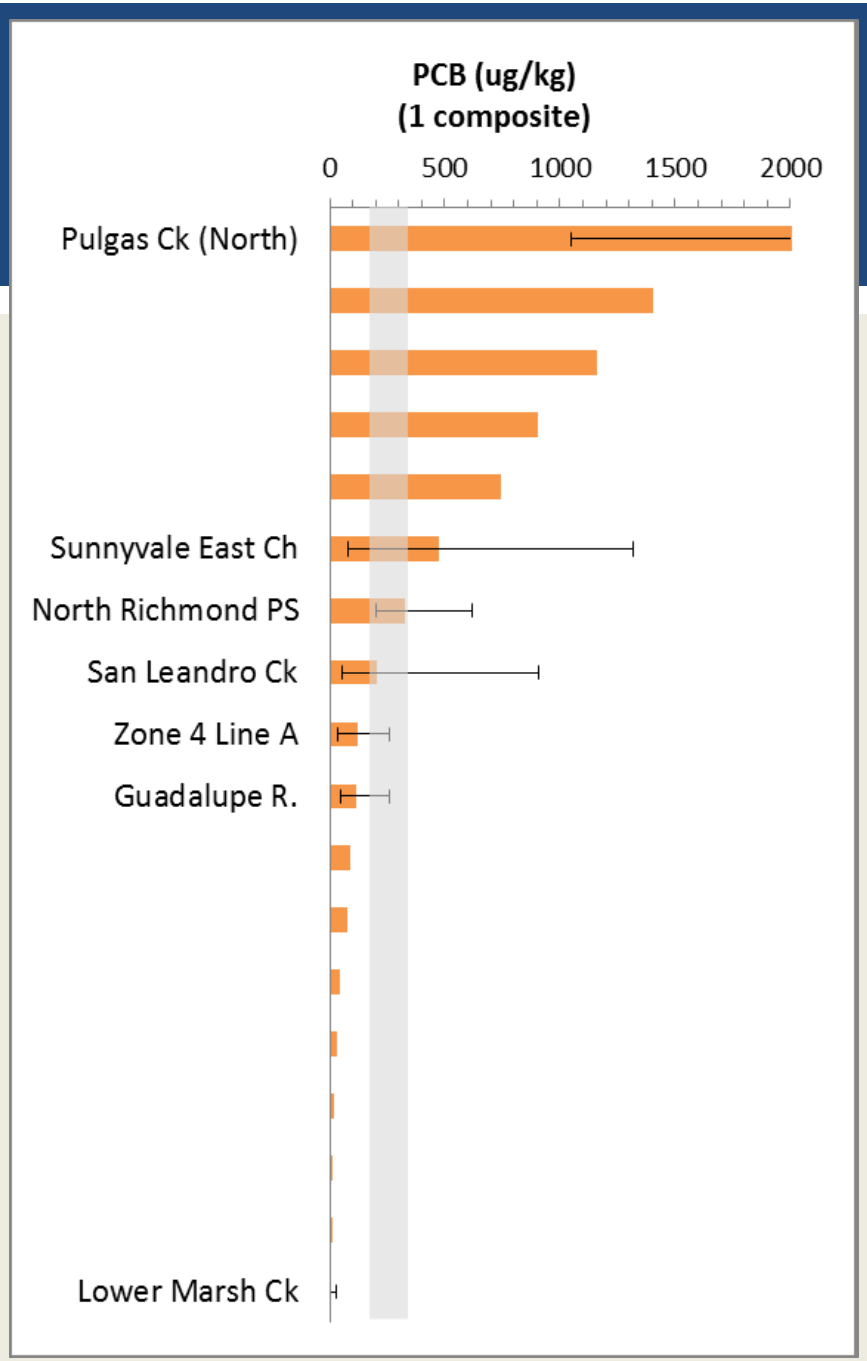
GOAL: Identify high leverage watersheds; develop input data for other management questions.

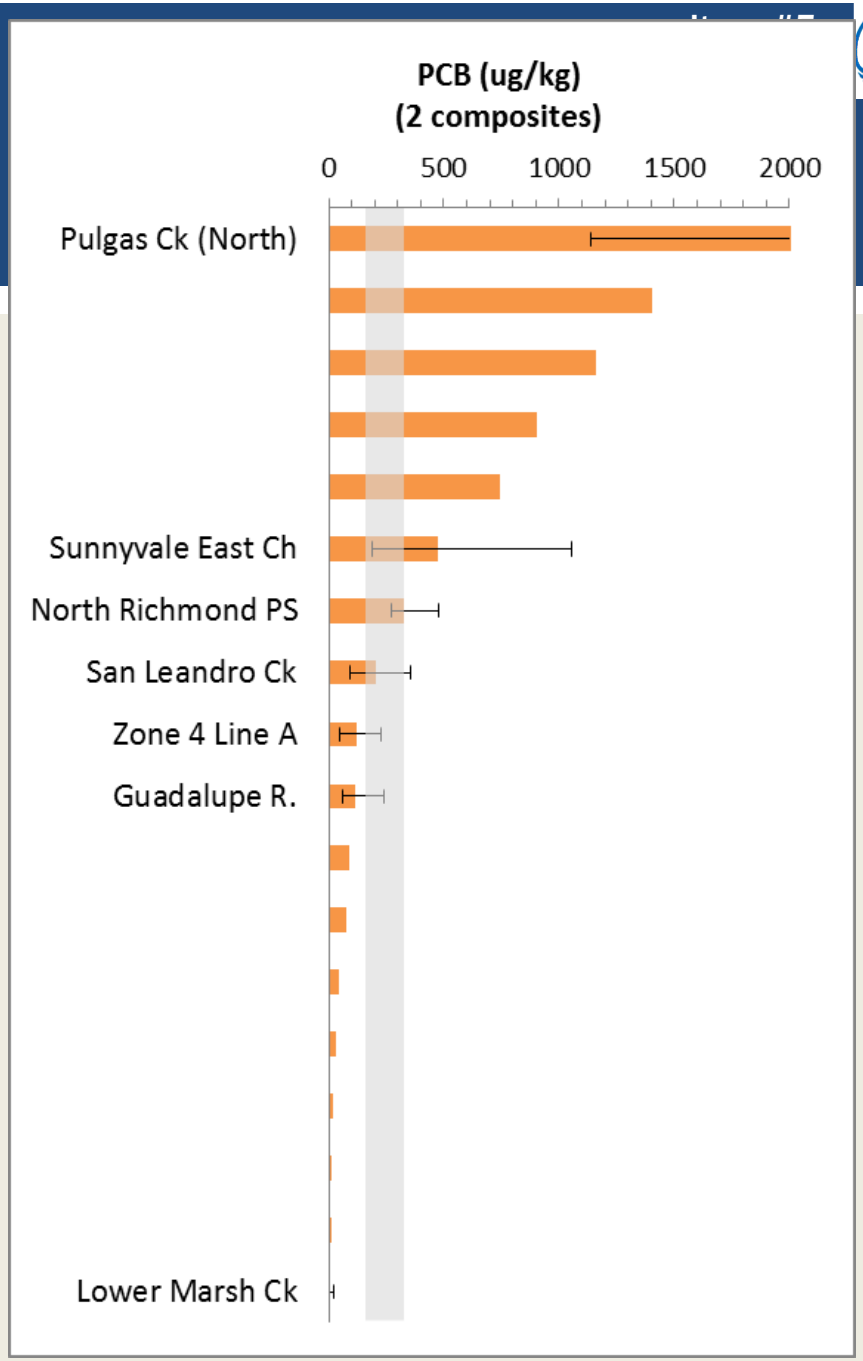


PARTICLE RATIO DATA QUALITY

Guadalupe R. at Hwy 101




PCB (ug/kg)
(1 composite)
0
500
1000
1500
2000
Pulgas Ck (North)
Sunnyvale East Ch
North Richmond PS
San Leandro Ck
Zone 4 Line A
Guadalupe R.
Lower Marsh Ck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(2 composites)
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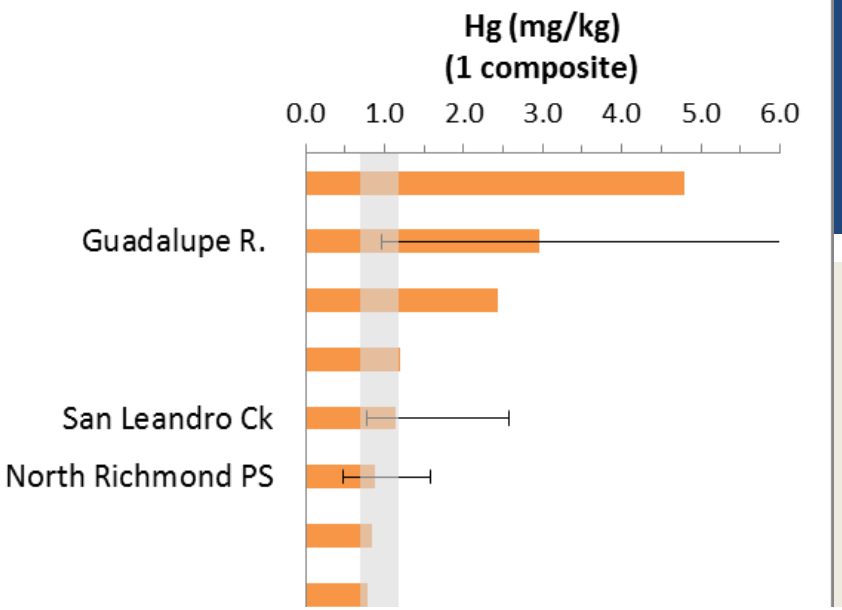
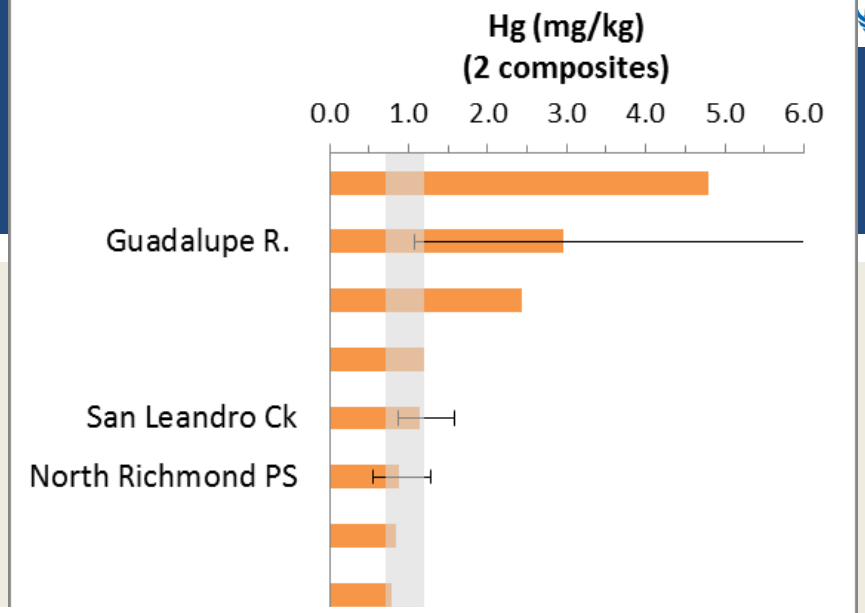
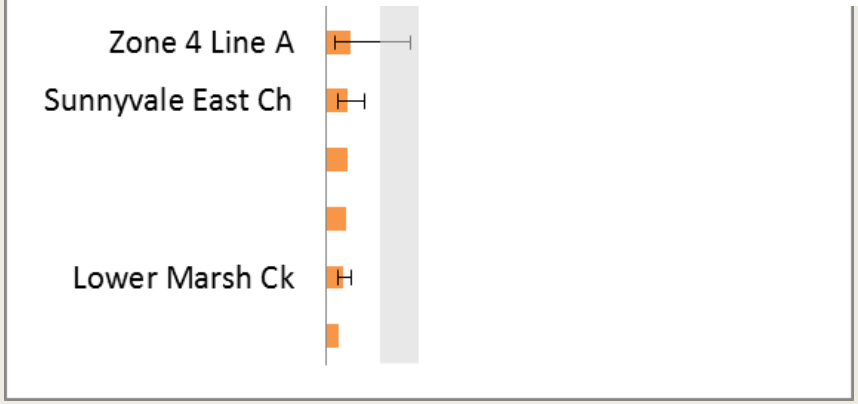
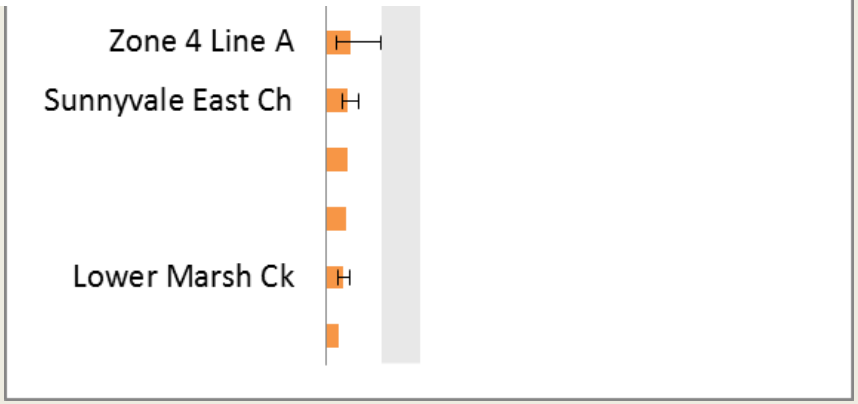
North Richmond PS
San Leandro Ck
Zone 4 Line A
Guadalupe R.
Lower Marsh Ck





Trade-off: More sites, or more certainty about each site?





QUESTIONS TO THE WORKGROUP

Is one composite sample per site sufficient to distinguish high vs low polluted watersheds?

Does one composite provide sufficient certainty for developing input data to the RWSM or for other management questions?

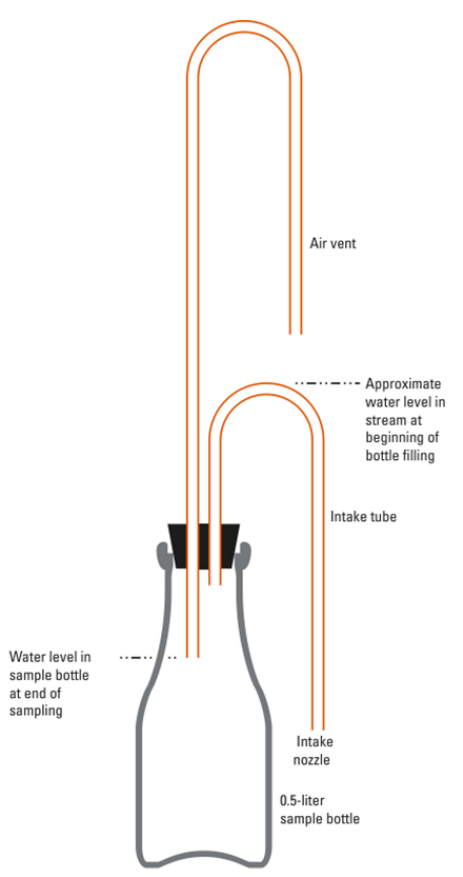
REMOTE SAMPLERS: QUESTIONS

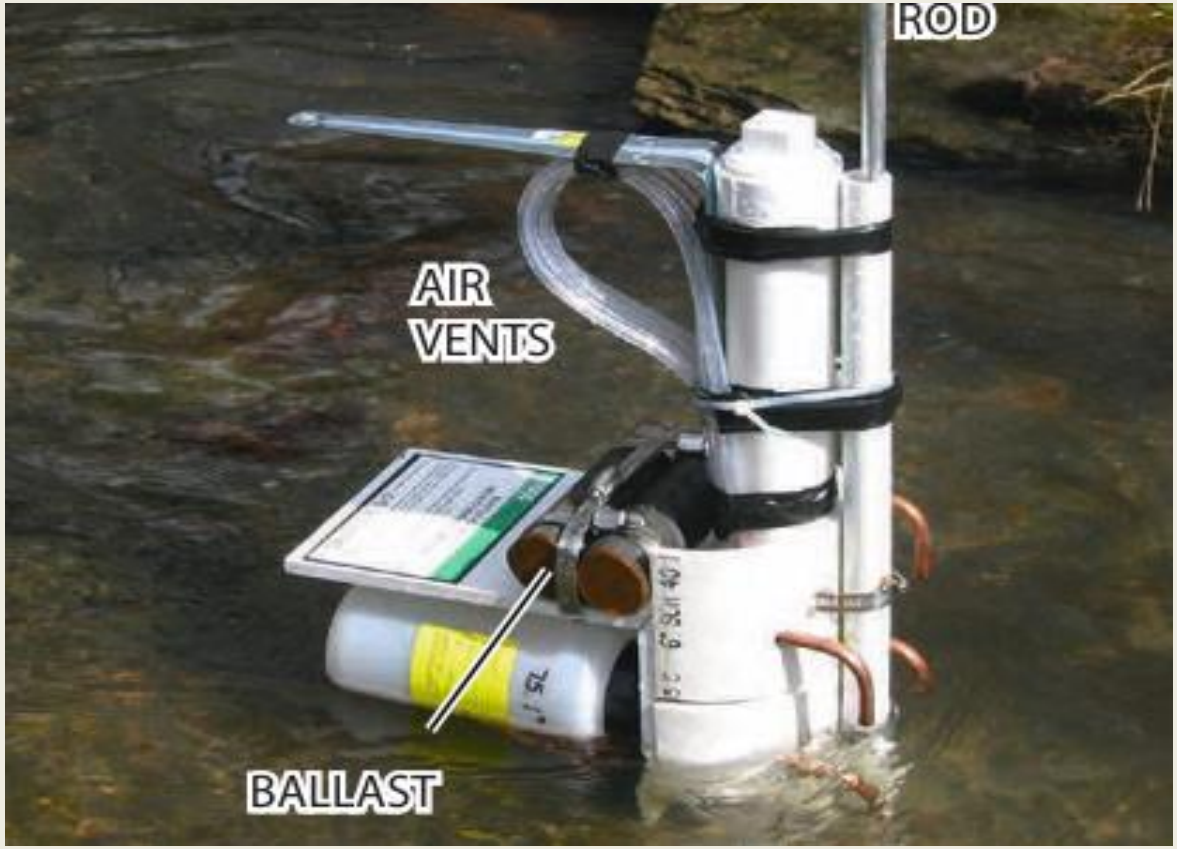
- Goal: Identify a remote sampling method that reproduces similar results in ranking watersheds in terms of pollutant concentrations

- Questions for workgroup:
  - Are there other remote samplers we should consider?
  - Which sampler is likely to produce the most useful PCB and Hg information relative to our management questions?
  - How many sites and samplers per site should we test?

REMOTE SAMPLER OPTIONS
(SEE HANDOUT)

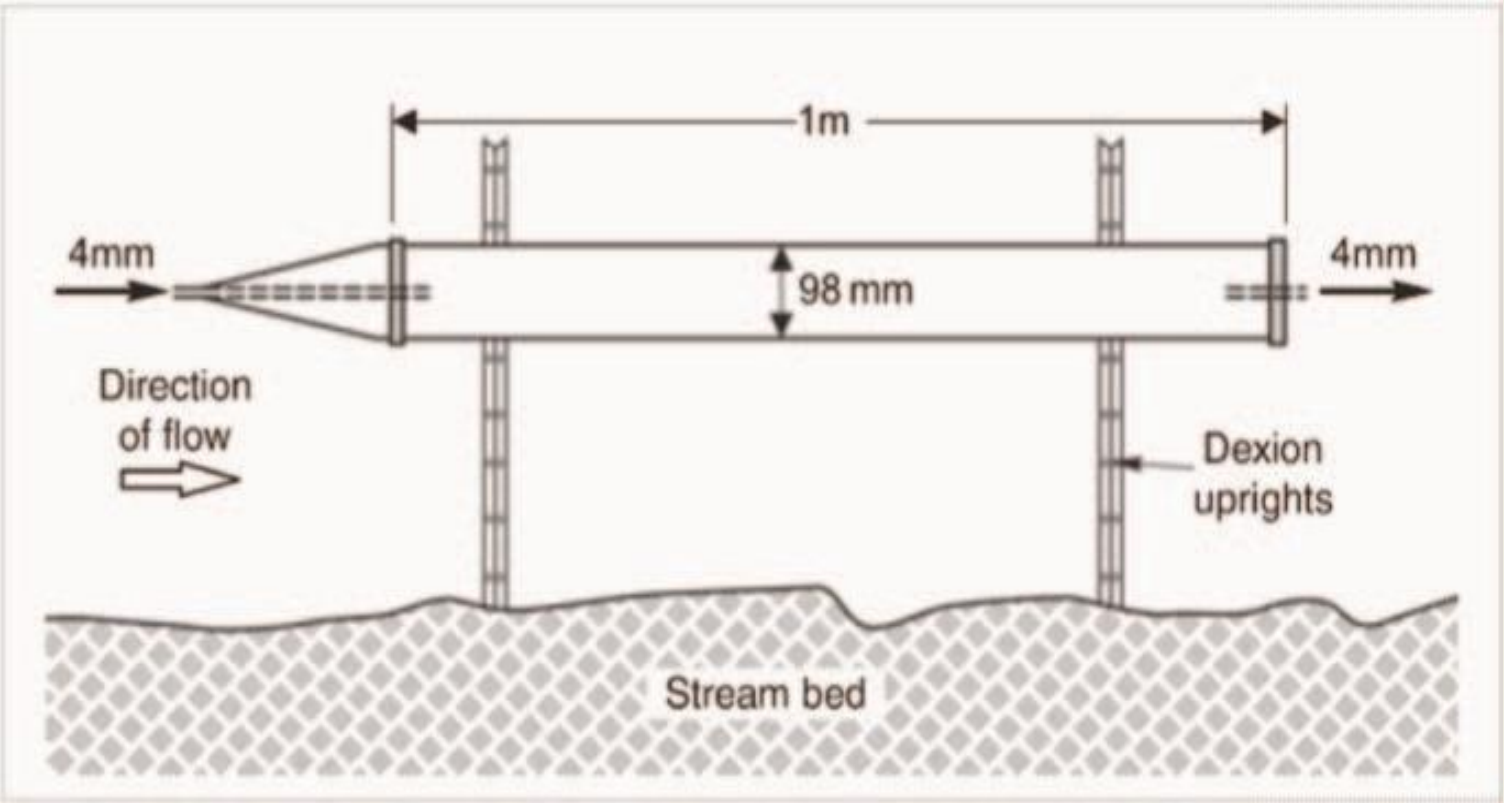
Single-stage siphon sampler





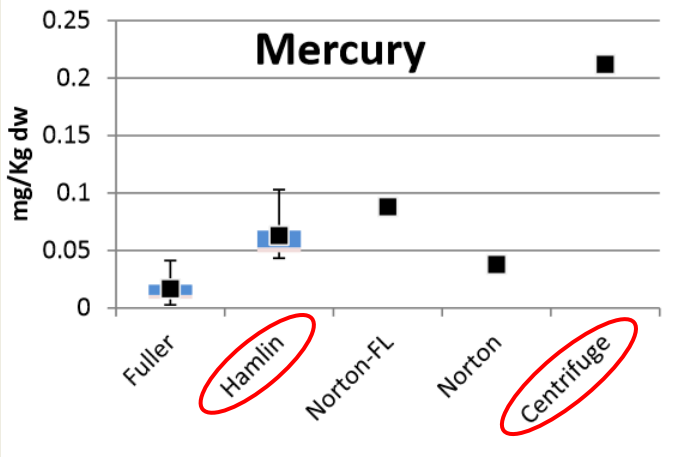
REMOTE SAMPLER OPTIONS
(SEE HANDOUT)

Walling Tube Sediment Trap



REMOTE SAMPLER OPTIONS
(SEE HANDOUT)

Hamlin Sediment Trap



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METHODS INTER-COMPARISON

Question:
What inter-comparison componenets should be done and at what level?

Our recommendation:

6

8 discrete grab samples

VS

8-aliquot composites

Which analytes?
SSC and Hg, and PCBs?

Particulate and PCB and Hg concentrations in water

VS

Our recommendation:

6

Particulate PCB and Hg concentrations in sediment

MONITORING DESIGN: QUESTIONS

Q1. Monitoring Design Scenarios: Which scenario provides the best trade-off between scientific rigor and number of sites visited?

- Should other monitoring scenarios be considered that might ensure the data are useful for other management questions?

MONITORING OPTIONS

Sampling design	Composite Sites	Number of Remote Sampler Types/Site	Remote Sampler Sites	Remote Sampler Only Sites	Total Sites	Option
Composite-1	24	1	6	6	30	A
	20	2			26	B
Composite-2	12	1	6	6	18	C
	10	2			16	D
Composite-3	8	1	6	6	14	E
	7	2			13	F

*All options assume inter-comparison study at allocations presented previously.

TRACE METALS SUITE

Question:

Should the trace metals suite be added to the analyte list as an indicator of urbanization or source areas (generally, and specifically in association with PCBs/Hg)?

		Cd	Zn	Cu	Pb	As	Ag	Cr	Ni	Fe	Al	Mn	Se
PCBs	Z4LA	0.62	0.61	0.55	0.49	-0.19	0.47	0.22	-0.03	0.07	0.39	-0.05	-0.26
		***	***	***	**	-	**	-	-	-	-	-	-
	Guadalupe	0.75	0.76	0.74	0.82	0.55	0.44	0.26	0.24				
		***	***	***	***	***	*	-	-				
HgT	Z4LA	0.74	0.72	0.82	0.81	-0.16	0.32	0.08	0.1	0.64	0.37	-0.02	-0.3
		***	***	***	***	-	-	-	-	***	*	-	-
	Guadalupe	-0.06	-0.03	0.066	0.06	-0.12	0.09	0.35	0.44				
		-	-	-	-	-	-	***	***				

A dash (-) indicates $p>0.05$; * $p<0.05$; ** $p<0.01$; *** $p<0.001$

Are there any specific Hg and PCB source areas that are also characteristically sources of trace metals?

SITE SELECTION: QUESTIONS

Site Selection Rationale: What is the right balance of sites selected for characterization based on each rationale in relation to the primary question?

- Are there other rationale that could be considered that might ensure the data are useful for other management questions?

SITE SELECTION RATIONALE

Based on a hypothetical number of sites: *20*

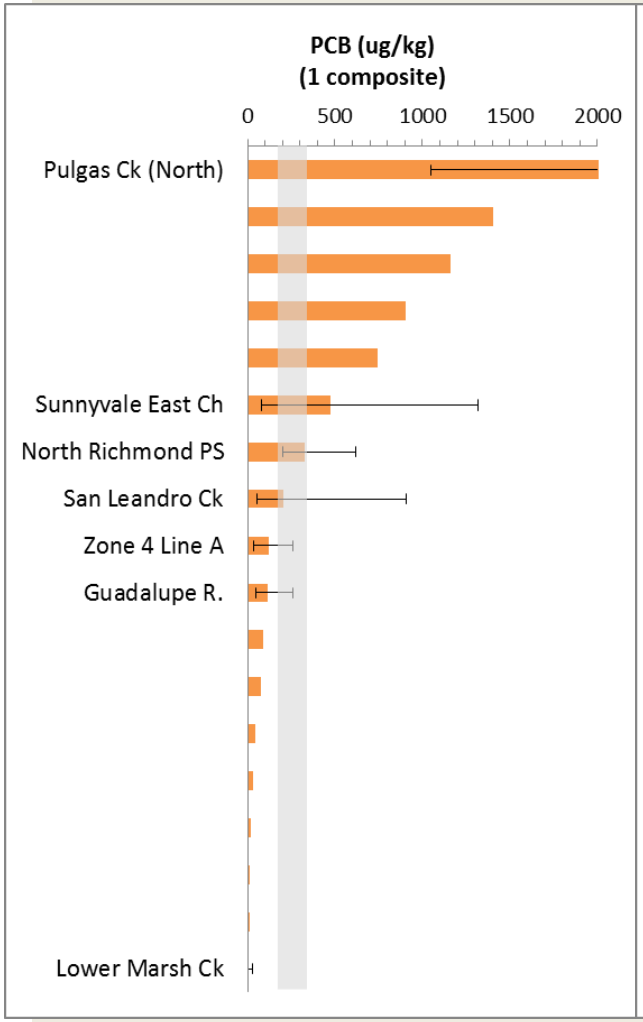
	Rationale	% Allocation	Sites #
Sites representative of broad environmental gradients (e.g. size, imperviousness)			20
1	Identify high leverage watersheds (distributed across Phase I permittees)	60-70%	14
	• Watersheds with suspected high pollution		
	• Sites with ongoing or planned management actions		
	• Identify sources (nested sampling design)		
2	Strategic large watersheds (n=4) with USGS gauges	1 site/yr	1/20
3	Validating false negative findings or unexpected concentrations	10-15%	
4	Sites to fill gaps along environmental gradients or source areas	10-15%	

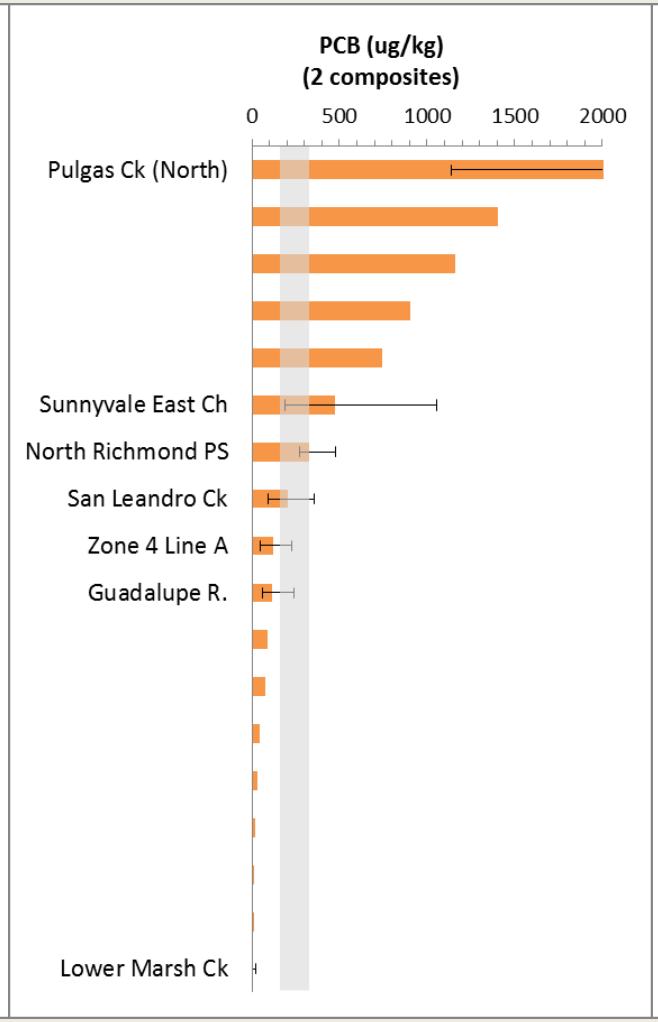
End

MONITORING OPTIONS

	Sampling design	Number of Storms/Site/Year	Number of Sites	Uncertainty Level
Equivalent Costs	Composite-1	1	21	High
	Composite-2	2	11	Medium
	Composite-3	3	7	Lower

Passive Sampler	Number of Sampler Types/Site	Number of Sites
Options	1	6
	2	6
	?	?


PCB (ug/kg)
(1 composite)
0
500
1000
1500
2000
Pulgas Ck (North)
Sunnyvale East Ch
North Richmond PS
San Leandro Ck
Zone 4 Line A
Guadalupe R.
Lower Marsh Ck


PCB (ug/kg)
(2 composites)
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North Richmond PS
San Leandro Ck
Zone 4 Line A
Guadalupe R.
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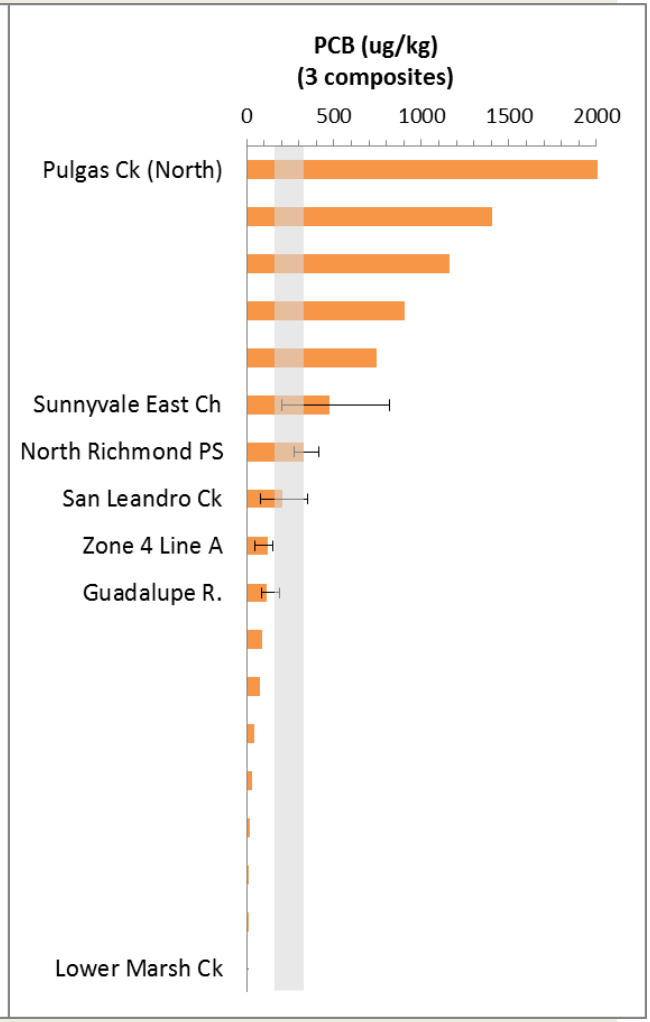
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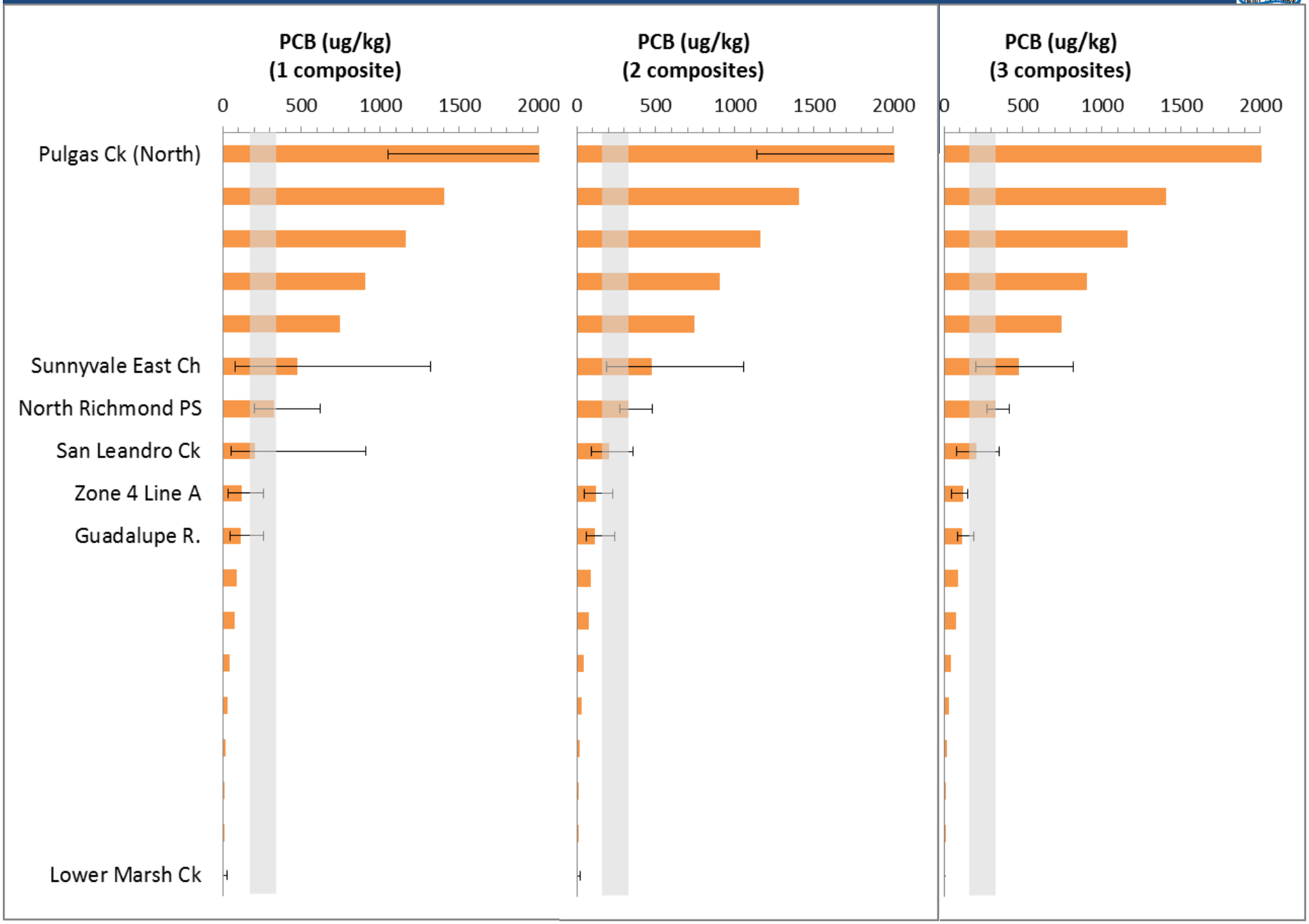
Zone 4 Line A
Guadalupe R.
Lower Marsh Ck


PCB (ug/kg)
(1 composite)
PCB (ug/kg)
(2 composites)
PCB (ug/kg)
(3 composites)
0
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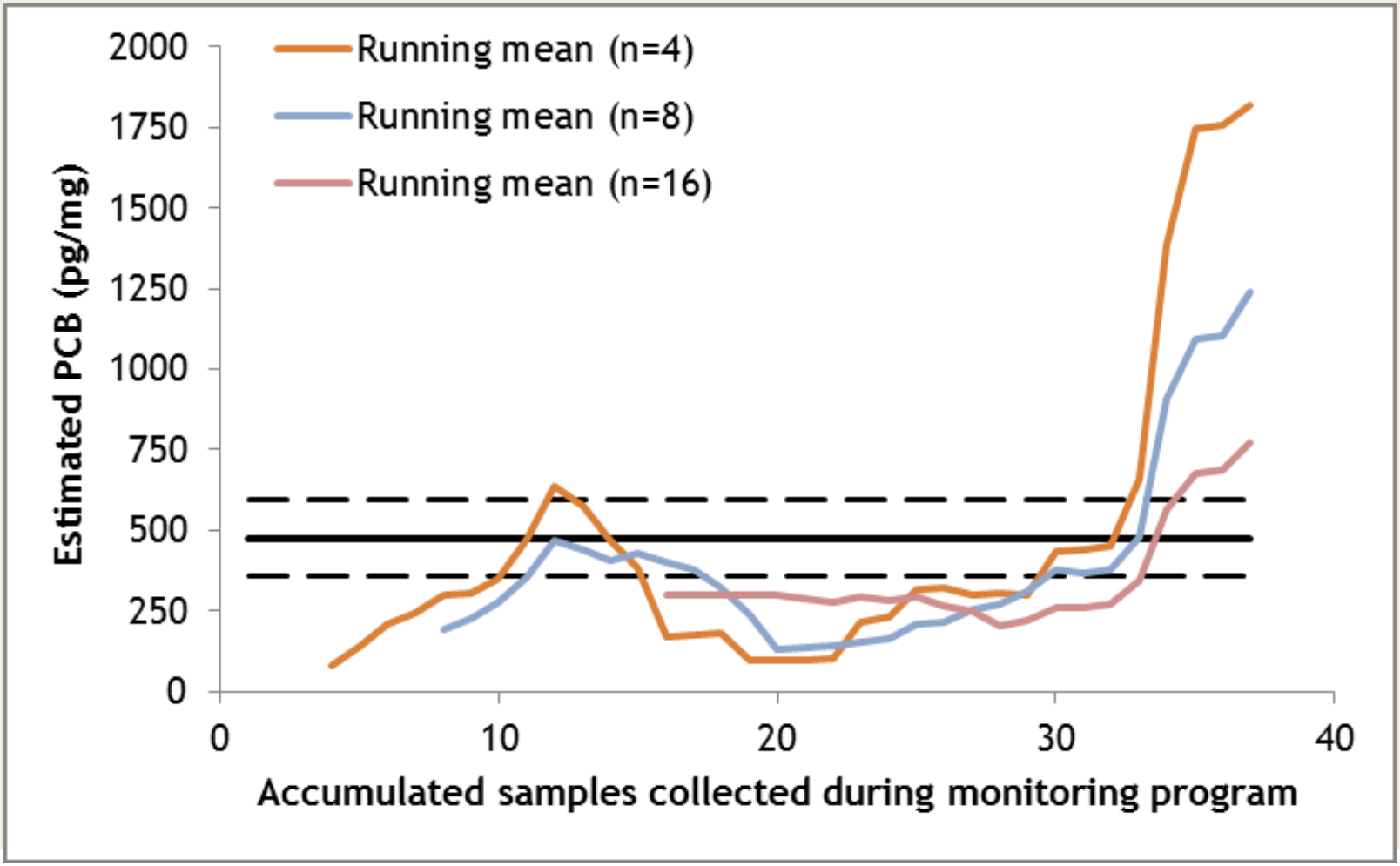
1000
1500
2000
Pulgas Ck (North)
Sunnyvale East Ch
North Richmond PS
San Leandro Ck
Zone 4 Line A
Guadalupe R.
Lower Marsh Ck

PARTICLE RATIO DATA QUALITY

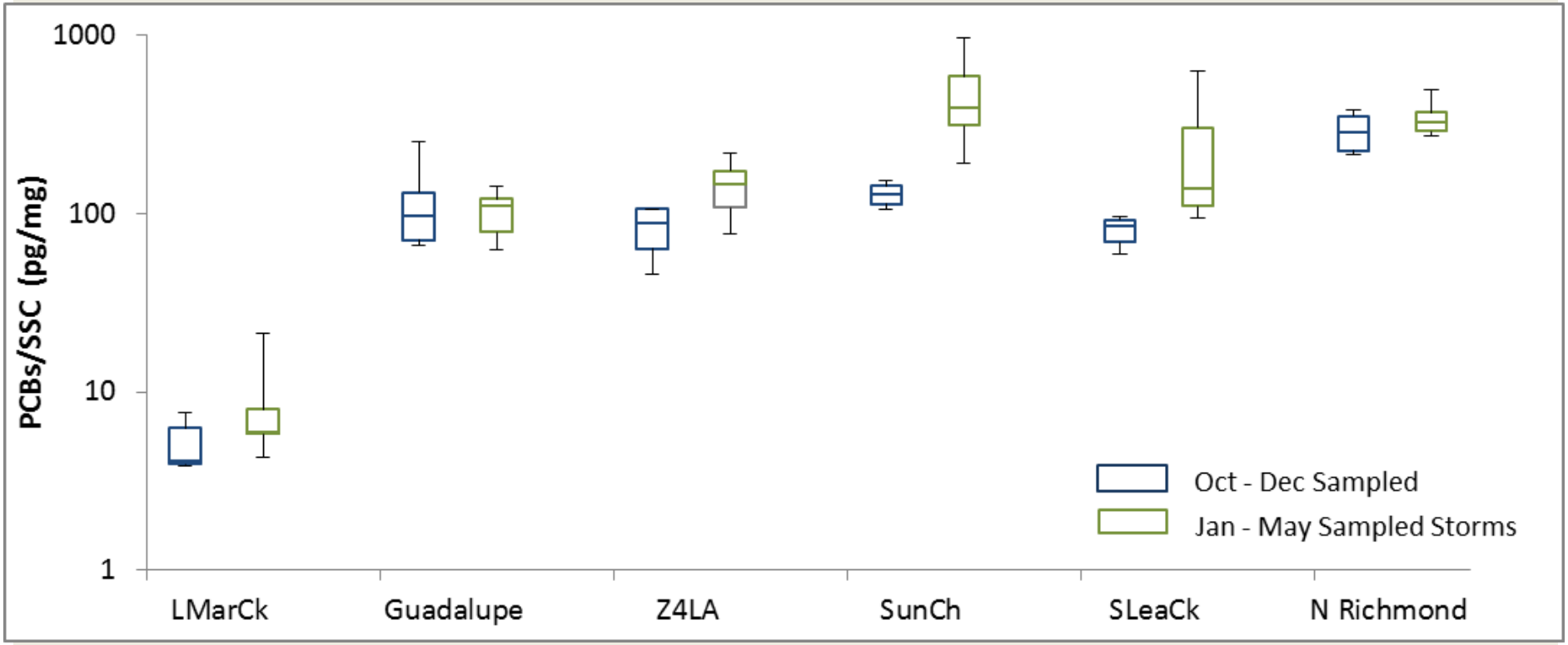
Sunnyvale East Channel



SEASONAL EFFECTS

Question:

Are the results biased due to seasonal effects on antecedent moisture, storm magnitude, and mobilization processes?



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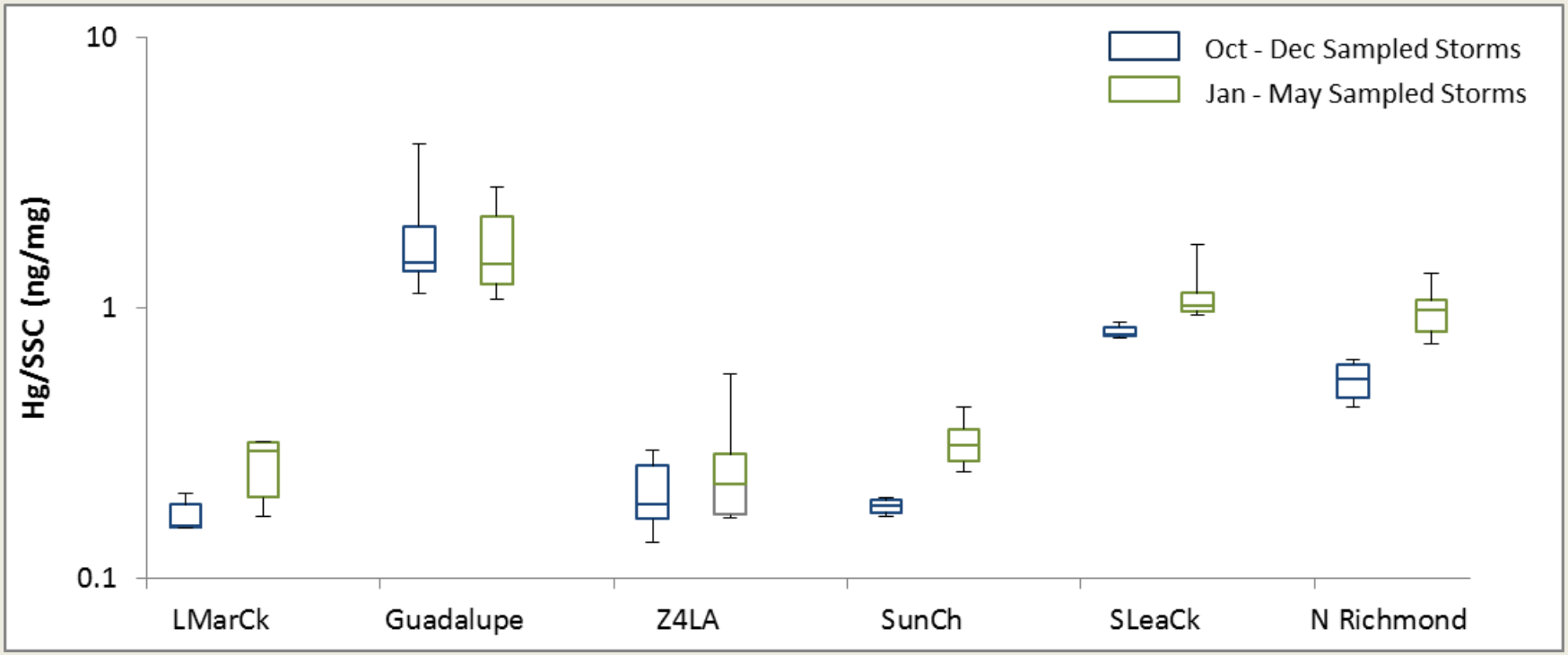
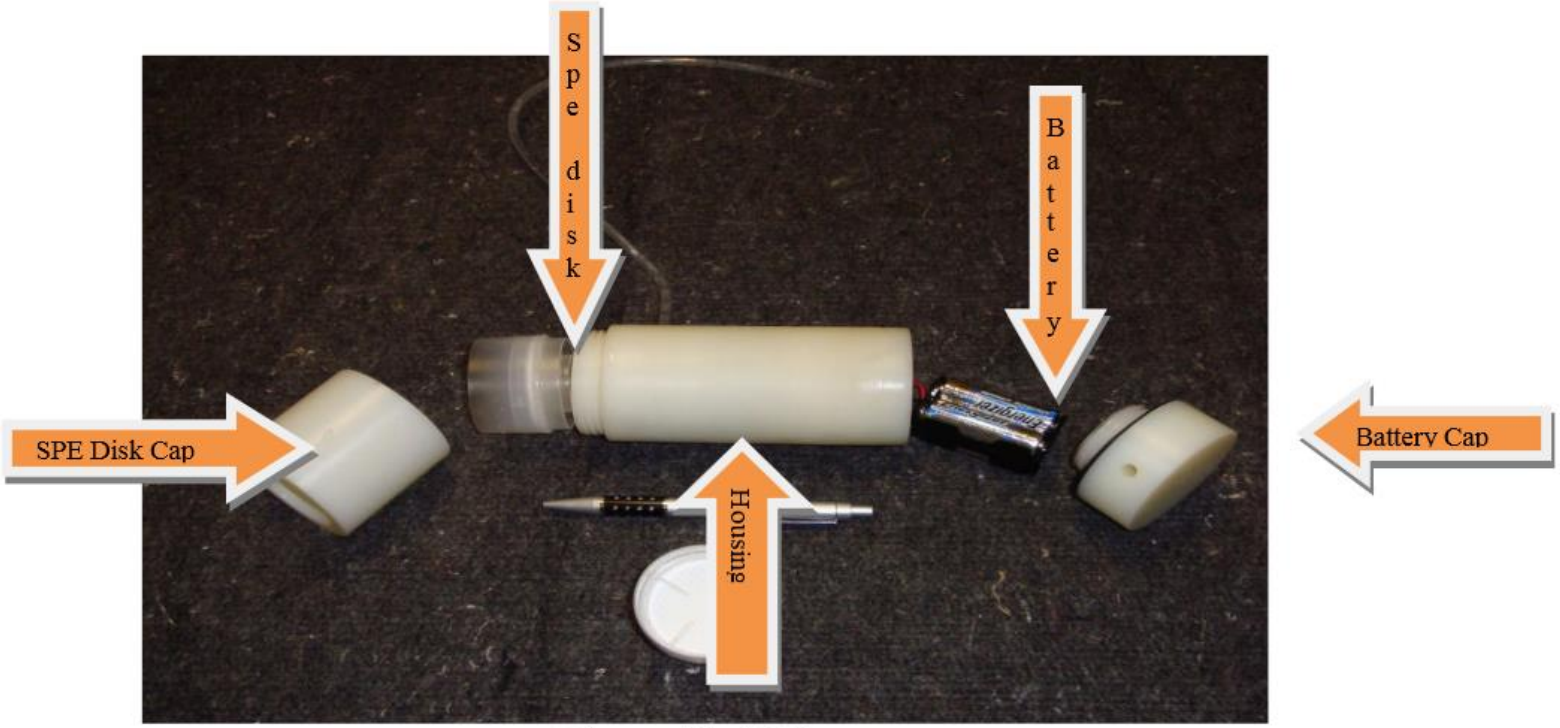


REMOTE SAMPLER OPTIONS
(SEE HANDOUT)

Screened Inline Flow Through Sediment Trap (SIFT)

REMOTE SAMPLER OPTIONS
(SEE HANDOUT)

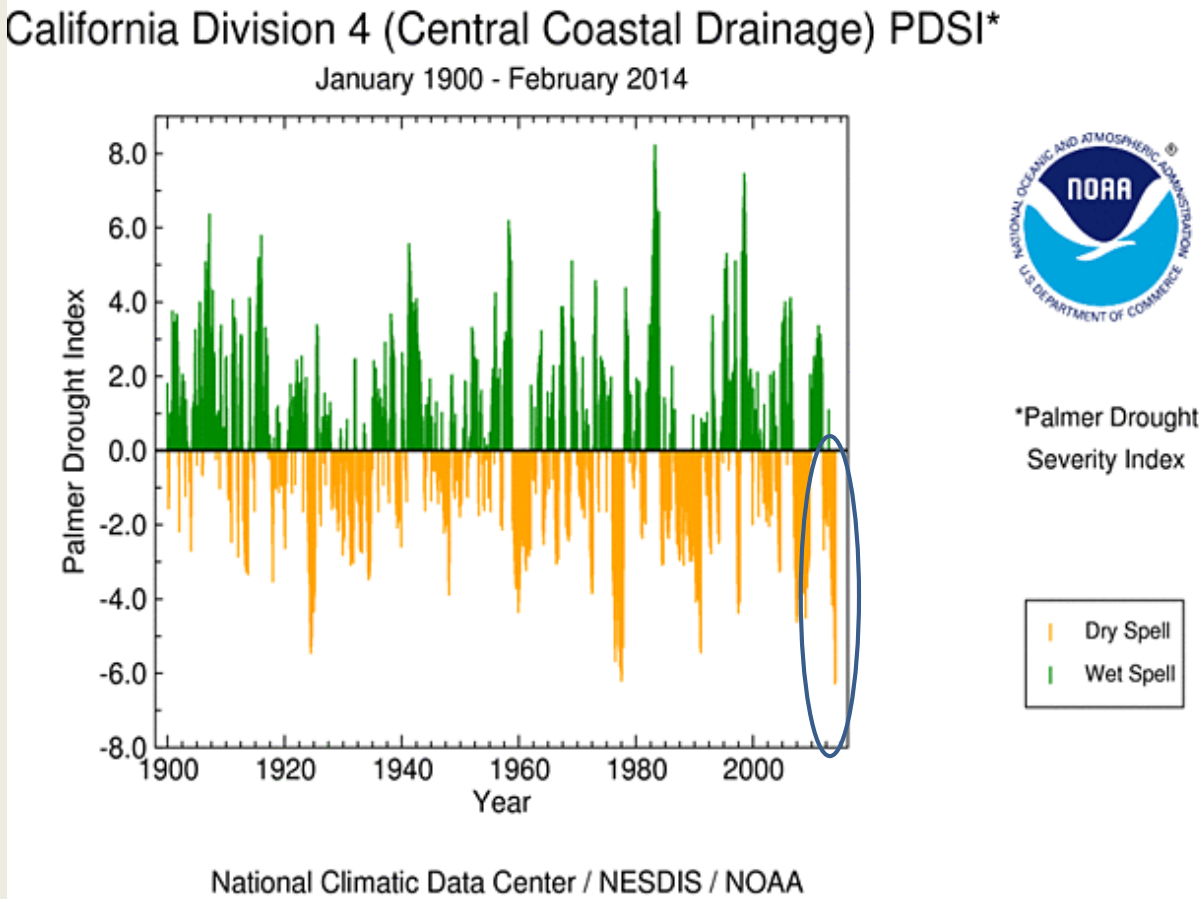
Continuous low-level aquatic monitoring sampler (CLAM)



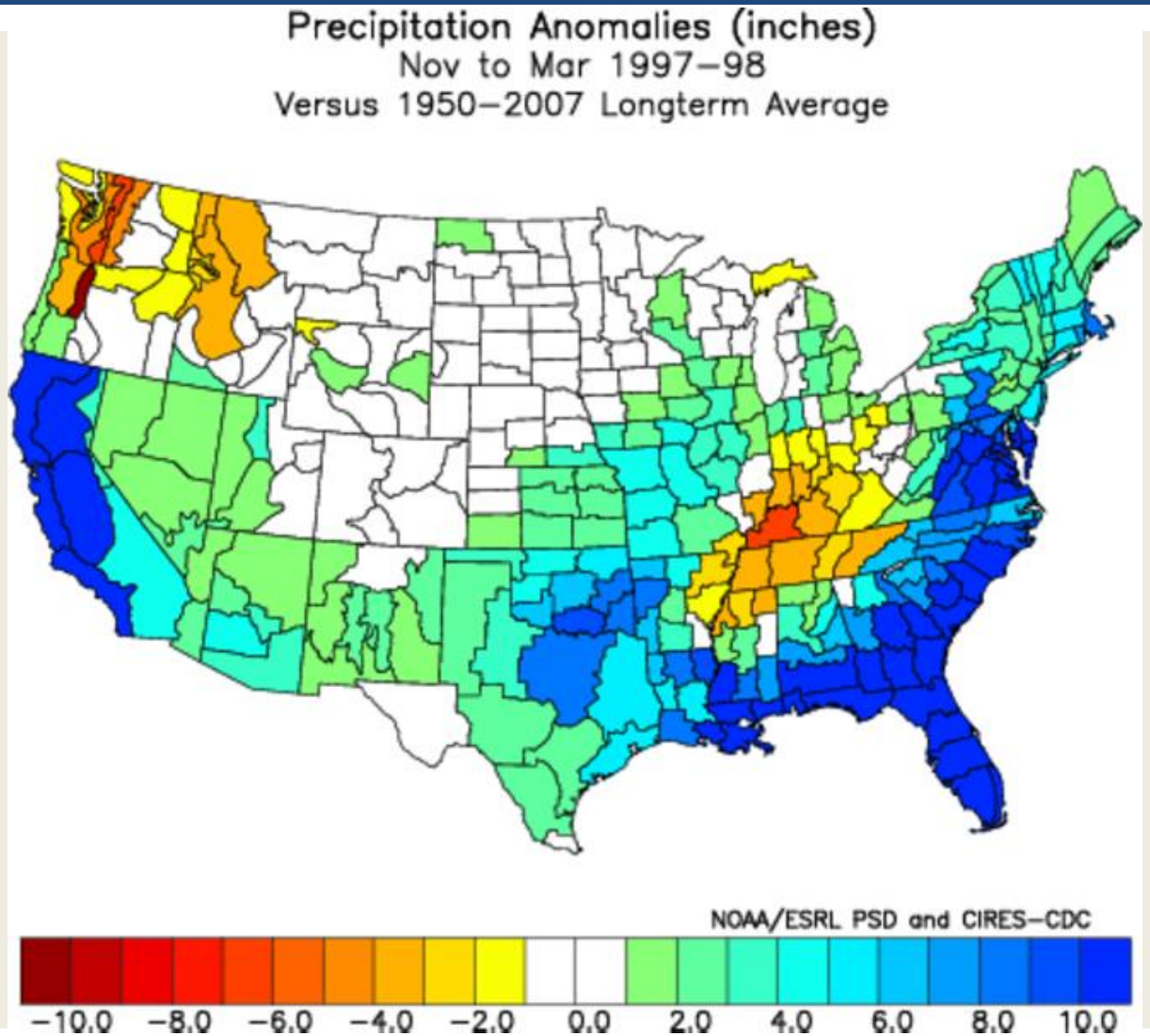
Dissembled View

CONTINGENCY PLAN?

WHAT TO DO IF DROUGHT CONTINUES?

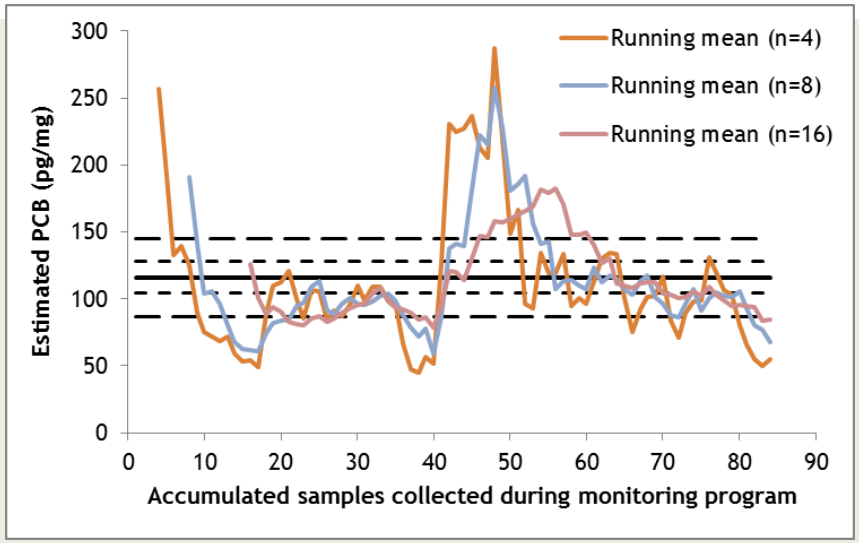


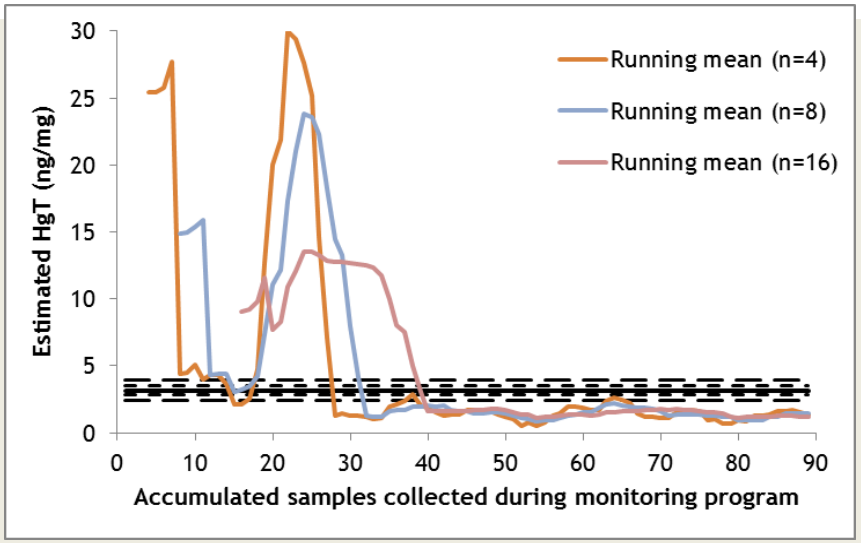
EL NIÑO PREDICTED



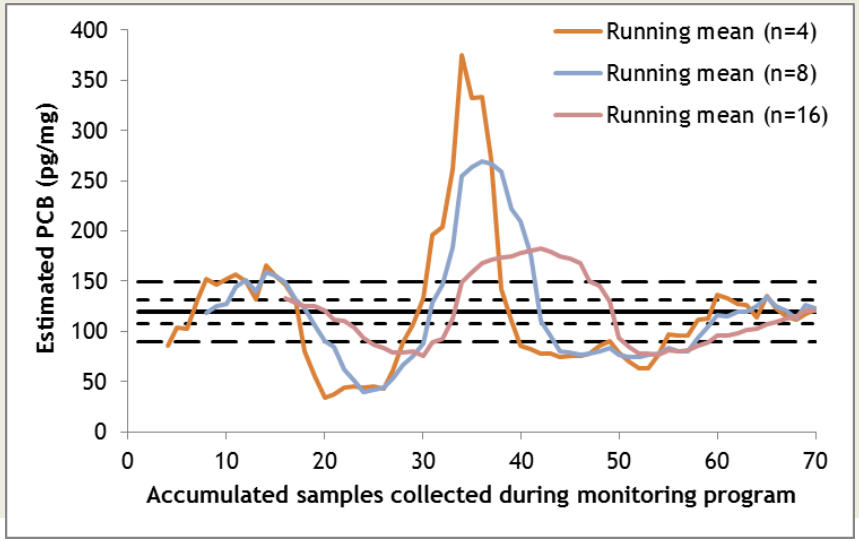
PARTICLE RATIO DATA QUALITY

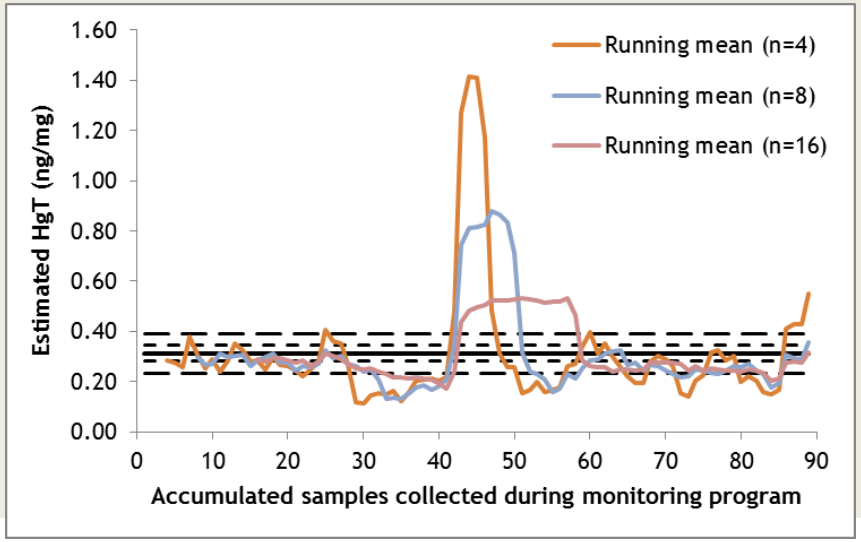
Guadalupe R. at 101





Zone 4 Line A





METHODS AND MANAGEMENT QUESTIONS