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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QUESTIONS FOR THE WORKGROUP

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

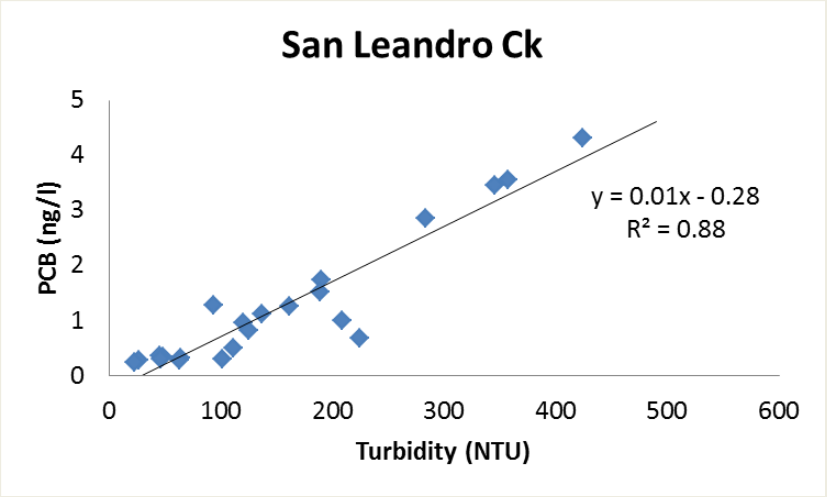
PREVIOUS METHODS

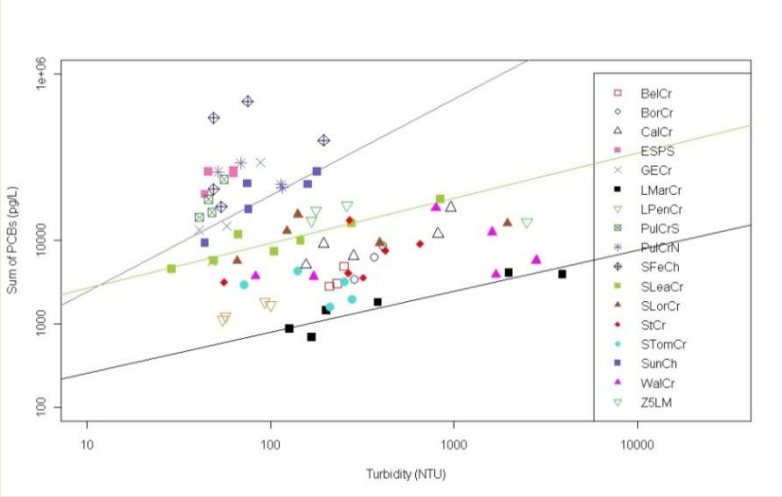
Long-Term Loads Monitoring

- Continuous flow, turbidity
- Annual loads from continuously estimated POCs

Stormwater Characterization

- Regressions of grab sample data with turbidity or flow
- Average Particle Ratios for each hydrophobic POC

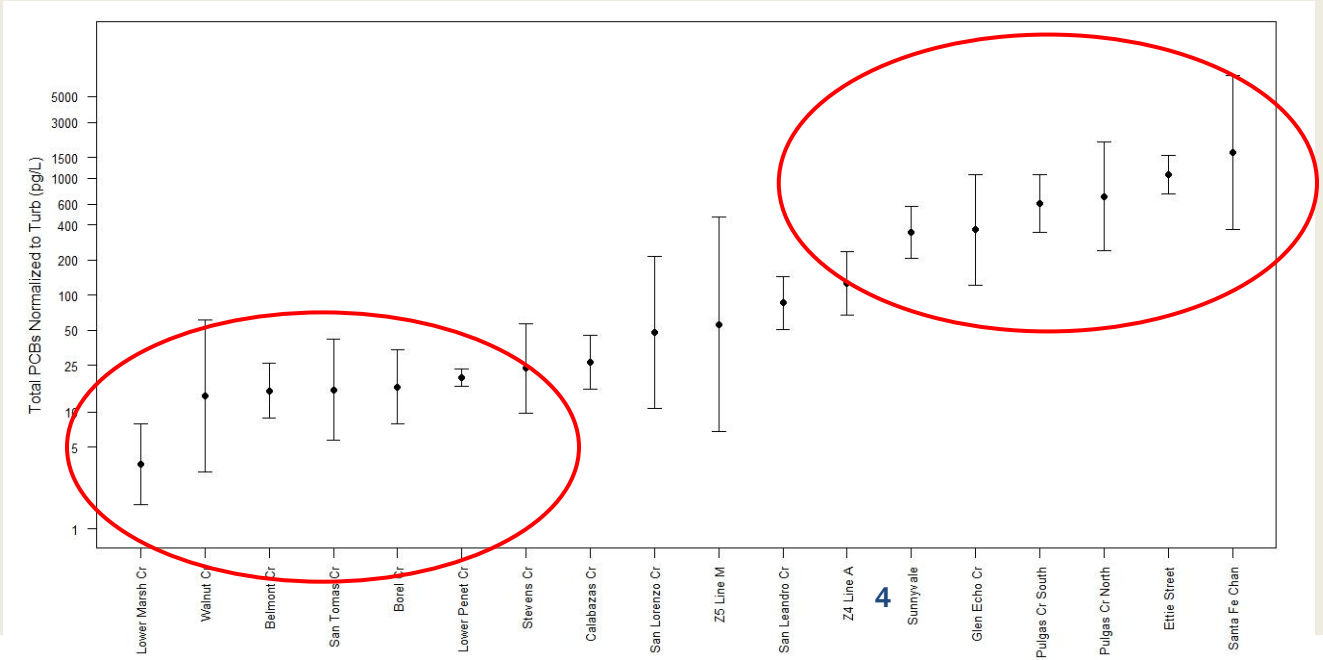




WY 2015 MONITORING DESIGN: PROPOSED METHOD CHANGES

GOAL: Identify high leverage watersheds; develop input data for RWSM.

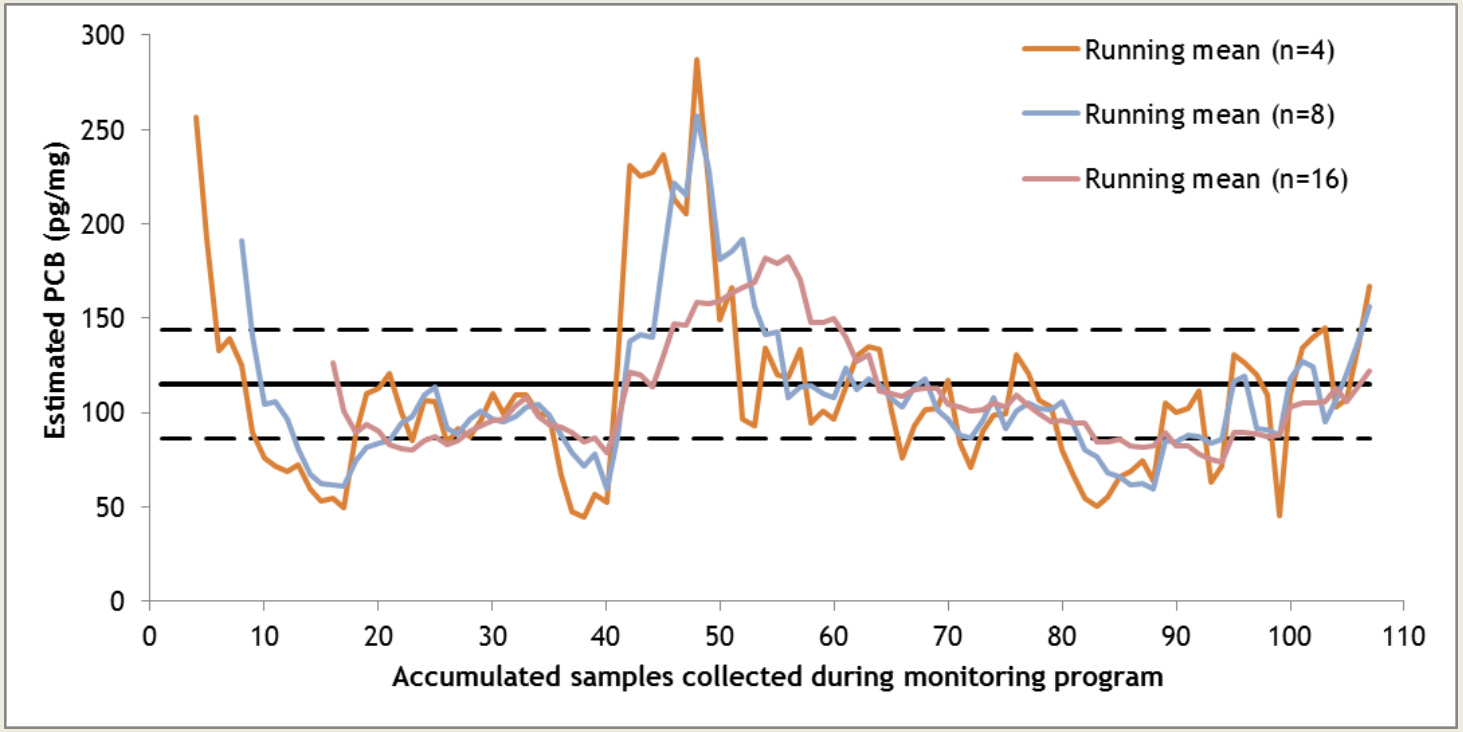
- Remote Sampling Exploration
- Composite collection instead of discrete grabs
  - Benefit: Decreases lab costs



Graph of WY 2011 results and intended as a reminder that we are trying to identify high from low leverage watersheds. In 2011 we ranked watersheds based on their avg, akin to moving to a composite sample. But if we move to a composite design we lose information about the variability – is that tradeoff okay given our information needs?

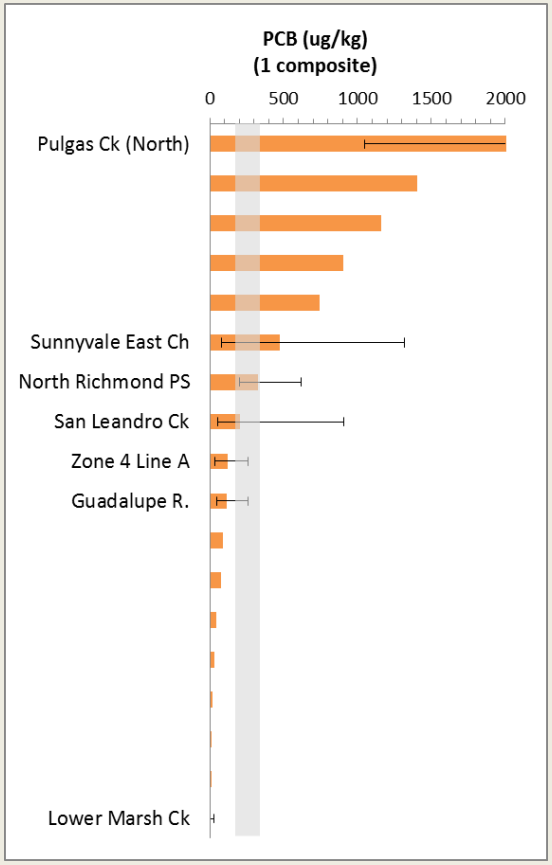
PARTICLE RATIO DATA VARIABILITY

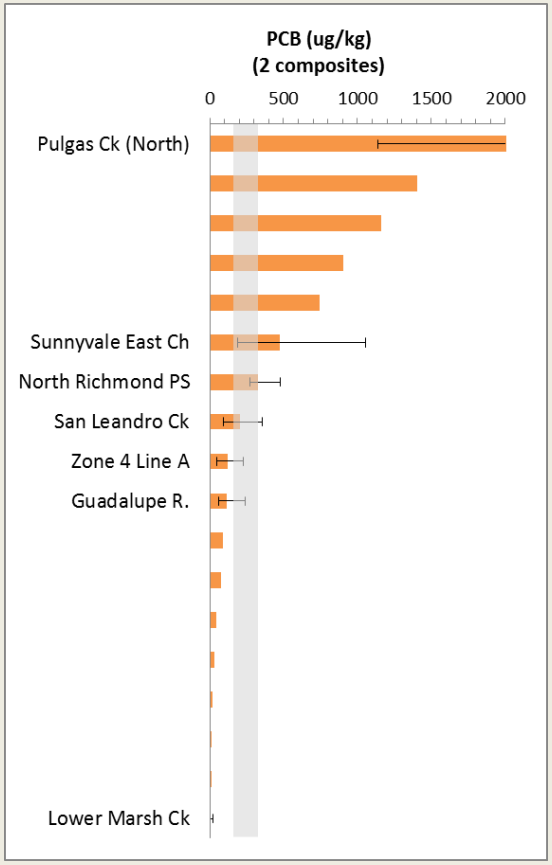
Guadalupe R. at Hwy 101



This graph shows the running mean of 4, 8, and 16 DISCRETE samples collected in Guadalupe River at Hwy 101. The graph shows concentration variability over time and facilitates discussion about how many composite samples per sites would be ideal and the tradeoffs between number of samples and the quality of information gained.

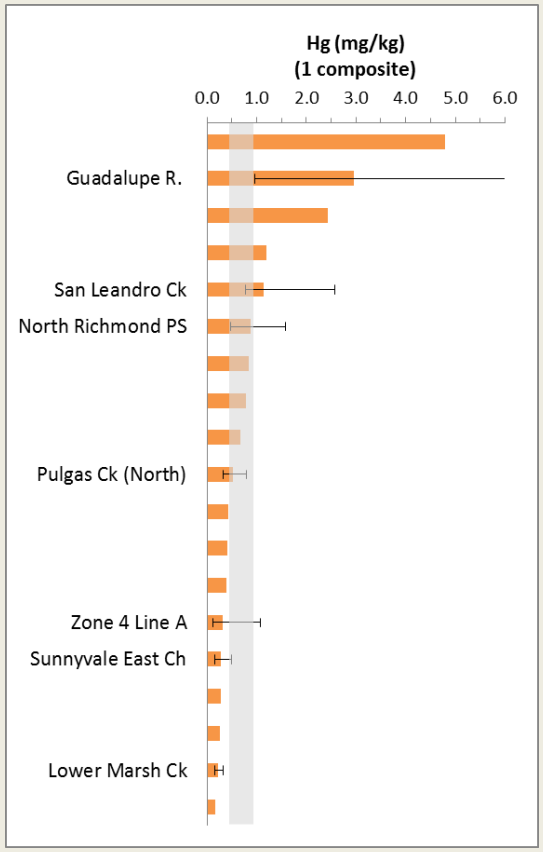
PARTICLE RATIO DATA VARIABILITY

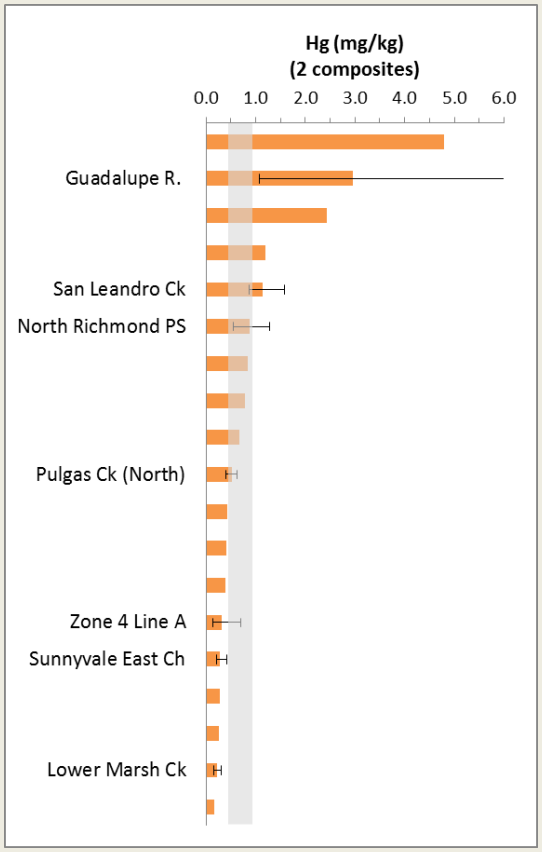




Whiskers are range of cleanest and dirtiest (1 or 2 consecutive) storms sampled at each location. Grey bar approximate magnitude of elevated concentrations. Graph intended to demonstrate likelihood of sampling a false negative or positive by collecting in only a single event, or two events.

PARTICLE RATIO DATA VARIABILITY





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 to use in developing input data to the RWSM or for other management questions?

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?

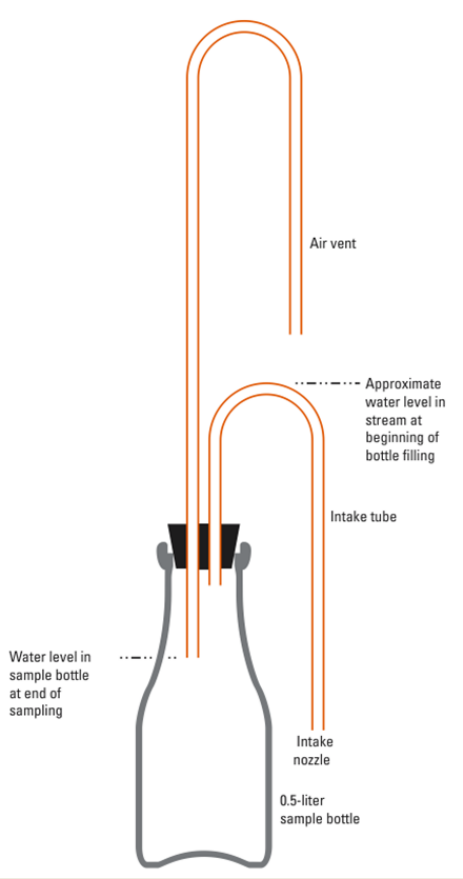
REMOTE SAMPLERS: QUESTIONS

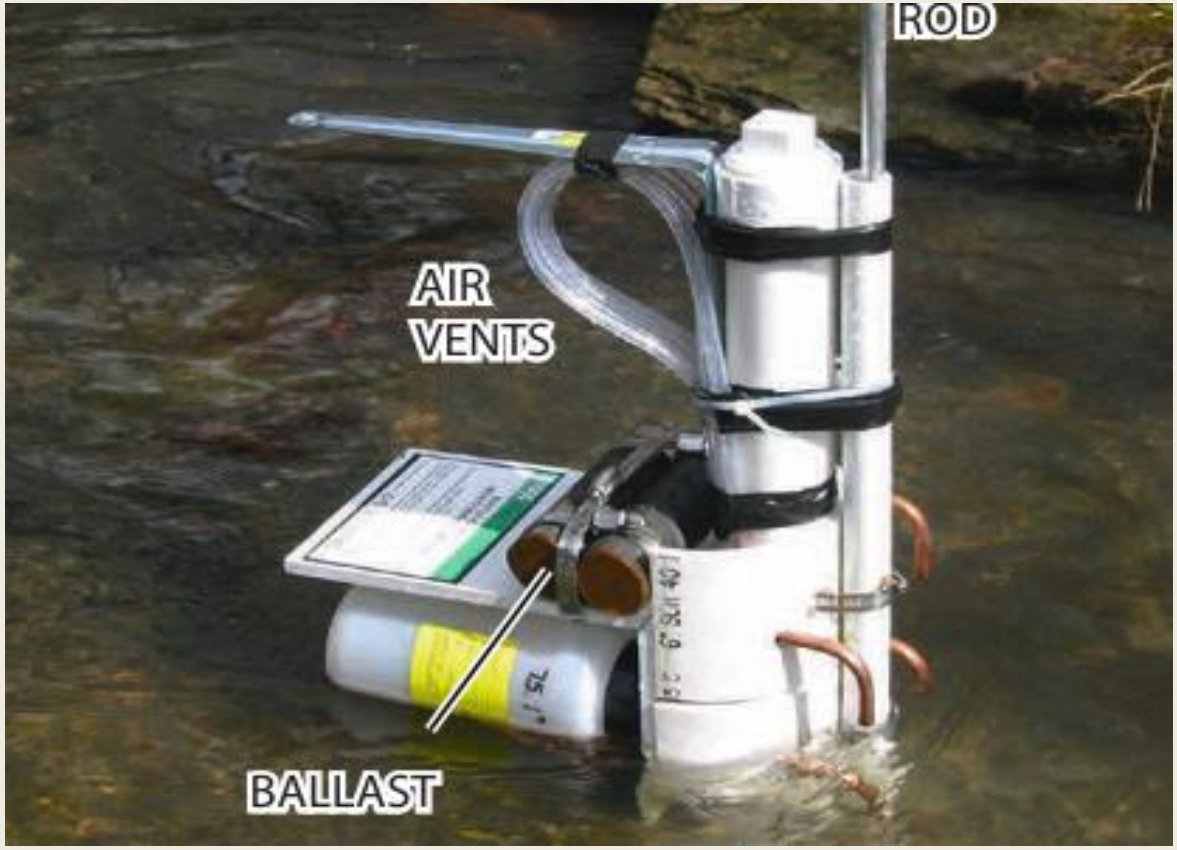
- Goal: Identify a remote sampling method that reproduces similar results in ranking watersheds in terms of pollutant concentrations

- 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)

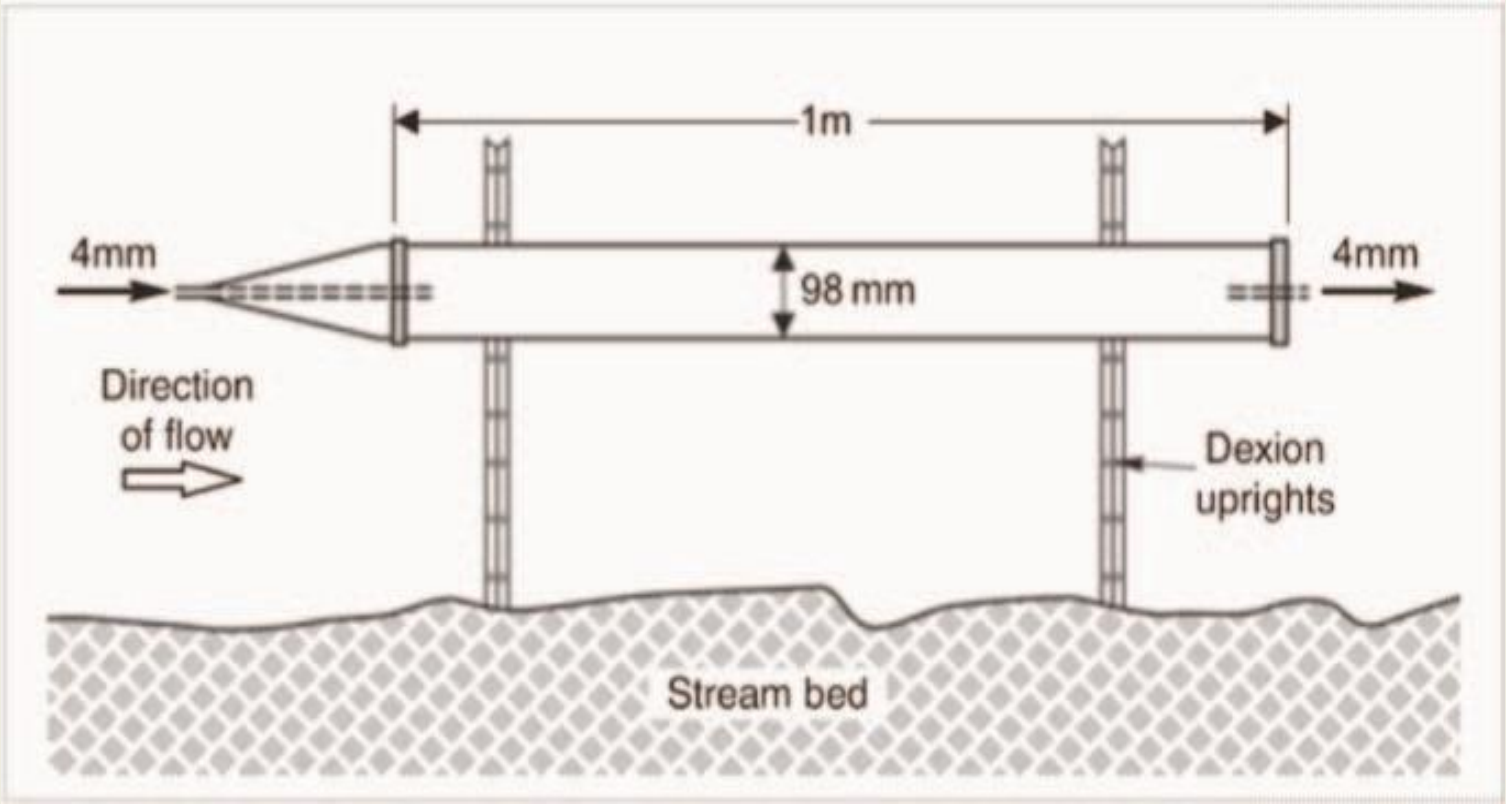
Single-stage siphon sampler





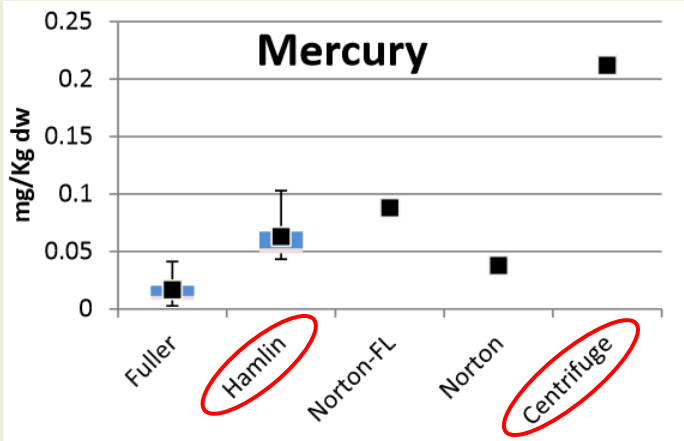
REMOTE SAMPLER OPTIONS
(SEE HANDOUT)

Walling Tube Sediment Trap



REMOTE SAMPLER OPTIONS
(SEE HANDOUT)

Hamlin Sediment Trap



METHODS INTER-COMPARISON

Question:
What components of study inter-comparison should be done and at what level?

Average of 8 discrete grab samples

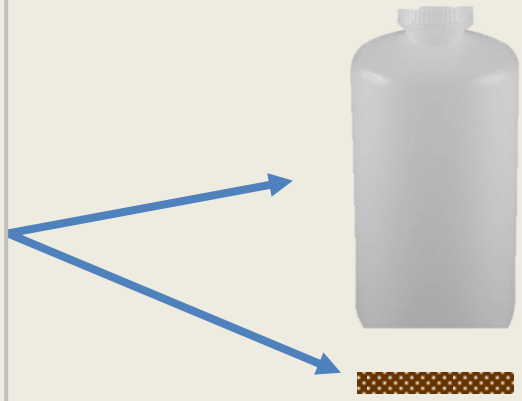
Our recommendation:

6

VS

Which analytes? SSC and Hg, or are PCBs also necessary?

8-aliquot composites



Particulate and dissolved PCB and Hg concentrations in water

VS

Our recommendation:

12

Particulate PCB and Hg concentrations in sediment

REMOTE SAMPLERS: QUESTIONS

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MONITORING DESIGN: QUESTIONS

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

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

Monitoring combinations approximately equivalent in cost (Option 2 is our recommendation)

	Option 1	Option 2	Option 3	Option 4	Option 5
	Discrete Sampling (4-8 samples)	1 comp 1 remote sampler IC Study*	2 comps 1 remote sampler IC Study*	3 comps 1 remote sampler IC Study*	1 comp 2 remote samplers IC Study*
Number of Sites	15	22	14	9	15
Number of storms	1	1	2	3	1

*If no IC study, could sample 3 more sites for water, or 5 sites with remote samplers, or some combination.
** Addition of TMs to analyte list decreases number of sites sampled by 2 or 3.

SITE SELECTION: QUESTIONS

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 that might ensure the data are useful for other management questions?

SITE SELECTION RATIONALE

Based on a hypothetical number of sites: 22

	Rationale	Sites #
Sites are representative of broad environmental gradients (e.g. size, imperviousness) (may not be fully addressed in WY 2015)		22
1	Identifying high leverage watersheds (distributed across Phase I permittees)	15/22
	• Watersheds with suspected high pollution	
	• Sites with ongoing or planned management actions	
	• Identify sources (nested sampling design)	
2	Specific source areas that by chance are still missed (may not be fully addressed in WY 2015)	3/22
3	Selected large watersheds (n=4) with USGS gauges	1/22
4	Validating false negative findings or unexpected concentrations	3/22

- Two phased site selection process likely
- Rationale in blue were also rationale for WY 2011, black rationale are proposed
- Percentages are our recommended distribution across rationale.

SITE SELECTION: QUESTIONS

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