RMP
REGIONAL MONITORING
PROGRAM FOR WATER QUALITY
IN SAN FRANCISCO BAY

sfei.org/rmp

Pollutants of Concern Monitoring: A low-intensity, budget conscious stormwater sampling method to identify highly polluted areas for potential management action

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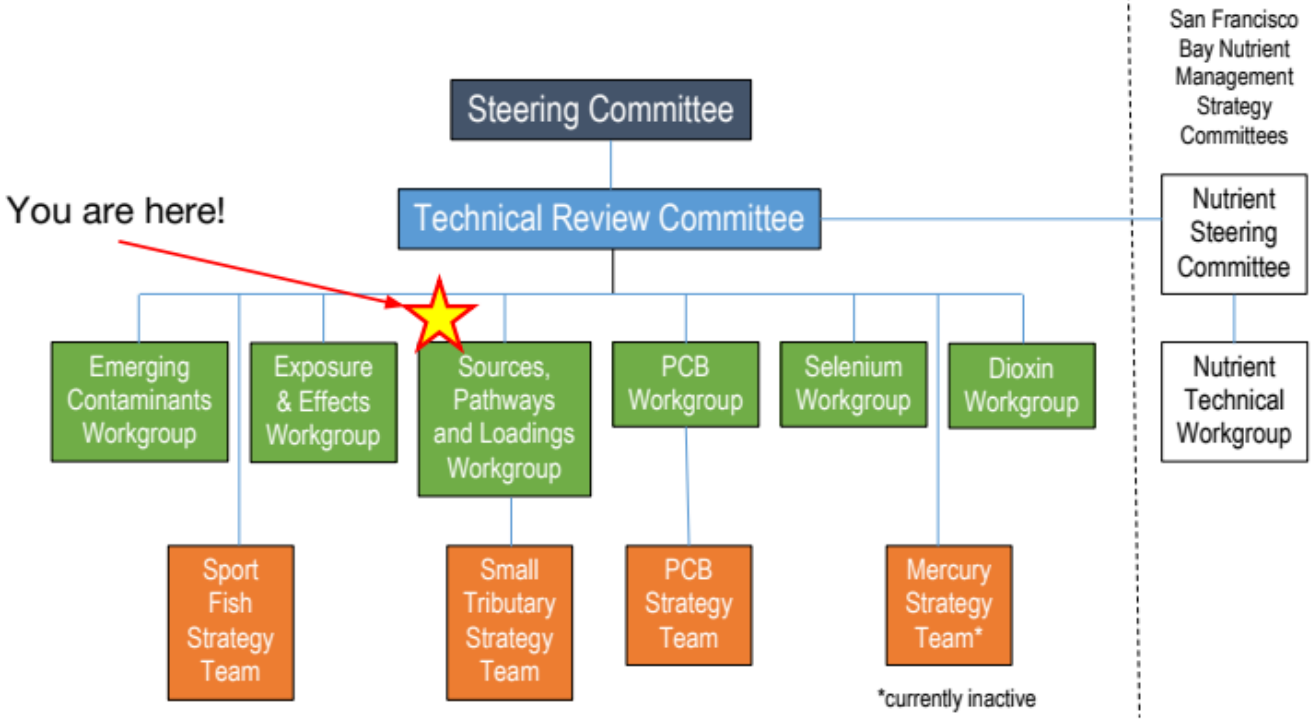
Governance Structure for the Regional Monitoring Program for Water Quality in San Francisco Bay



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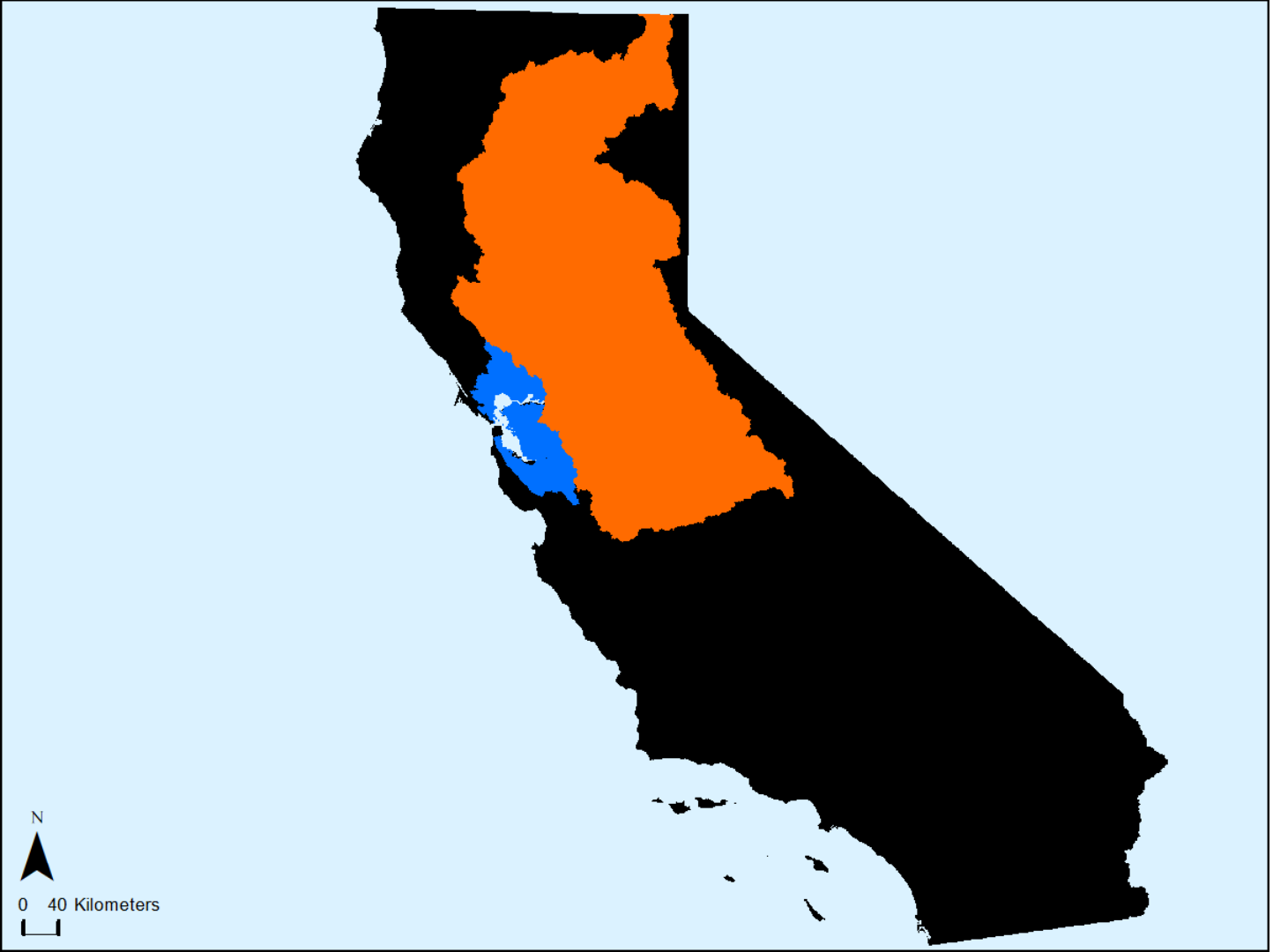
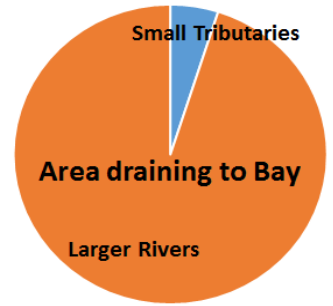
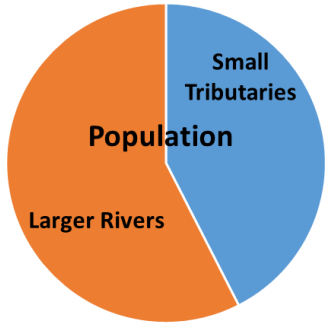
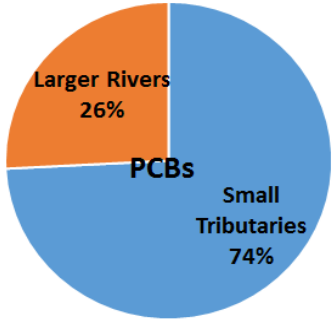
Main Take-Aways (and outline)

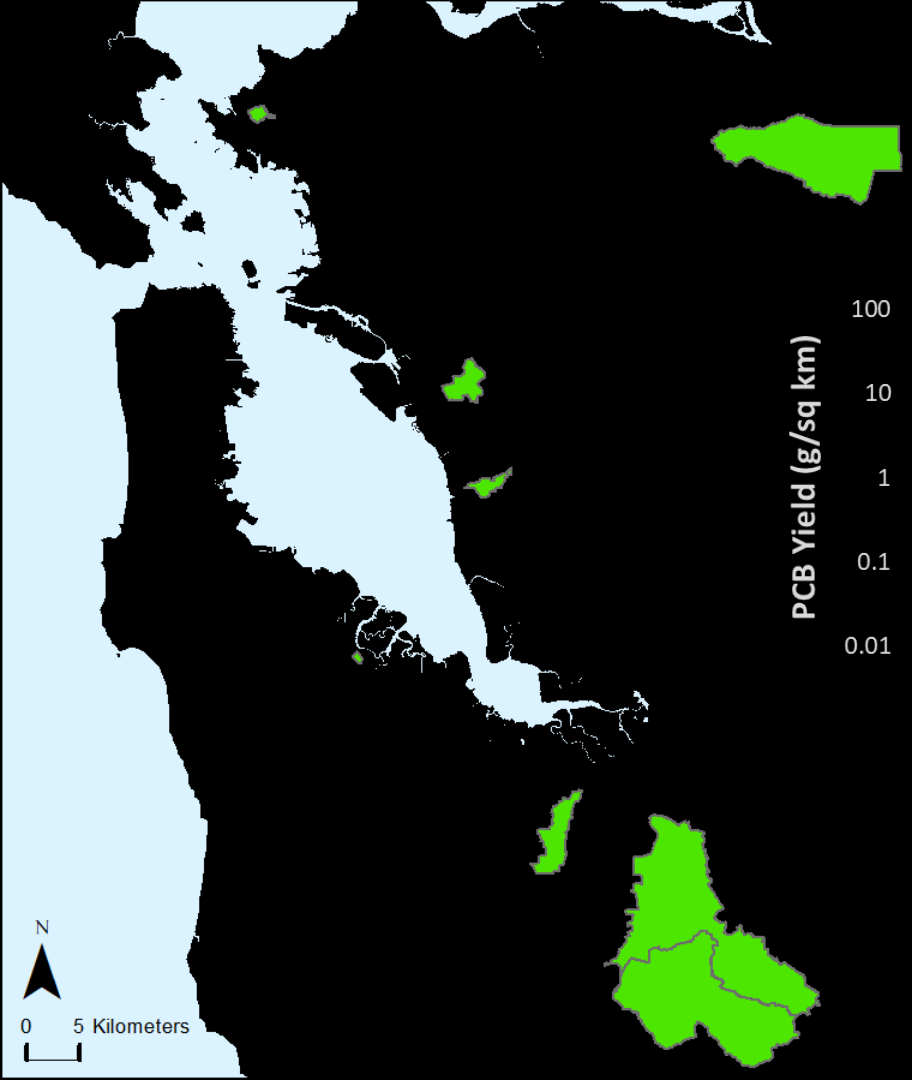
- Needed a low cost sampling method to identify polluted watersheds
- Our long-term sampling datasets justified using a single storm composite
- 2-step method: desktop analysis followed by sampling just one storm
- This method has indicated numerous new watersheds for further investigation
- Promising results for pilot experiment of remote samplers


N
0 40 Kilometers


Small Tributaries
Area draining to Bay
Larger Rivers

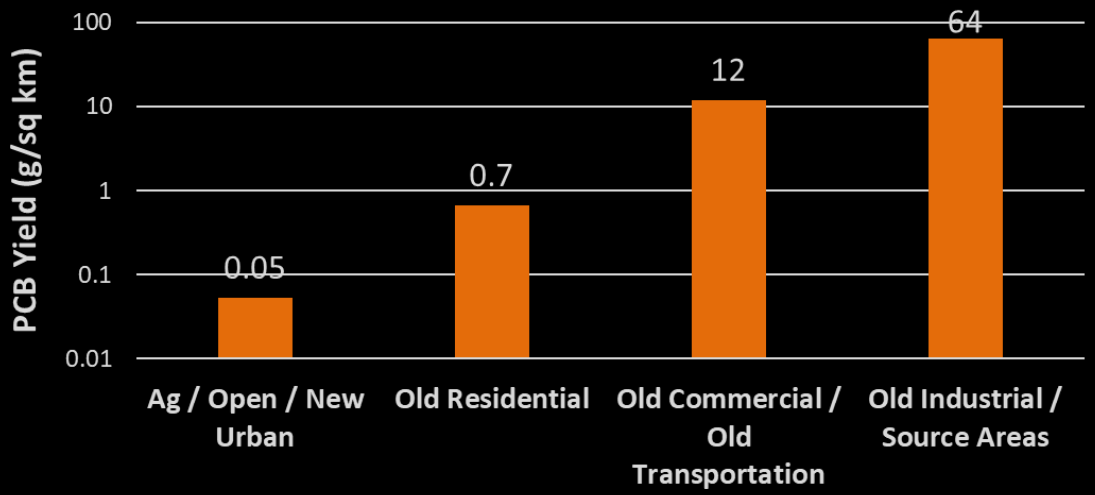

Small Tributaries
Population
Larger Rivers


Larger Rivers 26%
PCBs
Small Tributaries 74%

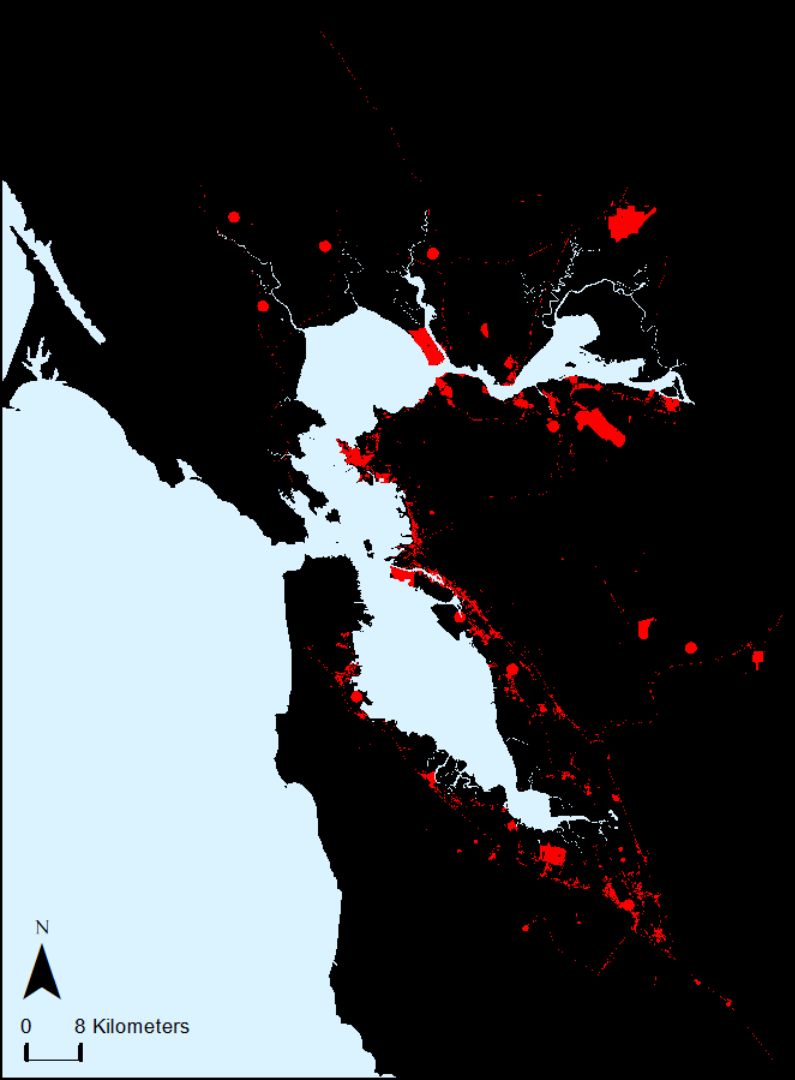


Regional Watershed Spreadsheet Model (RWSM)

* Available from SFEI early 2018



Reference: Wu, J., Gilbreath, A.N., McKee, L.J., 2016. Regional Watershed Spreadsheet Model (RWSM): Year 5 Progress Report. A technical report prepared for the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP), Sources, Pathways and Loadings Workgroup (SPLWG), Small Tributaries Loading Strategy (STLS). Contribution No. 788. San Francisco Estuary Institute, Richmond, California. http://www.sfei.org/sites/default/files/biblio_files/RWSM%202015%20FINAL.pdf



Old Industrial and Source Areas

3.5 % of the landscape
64% of the PCB load

Equivalent to > 35,000 city blocks

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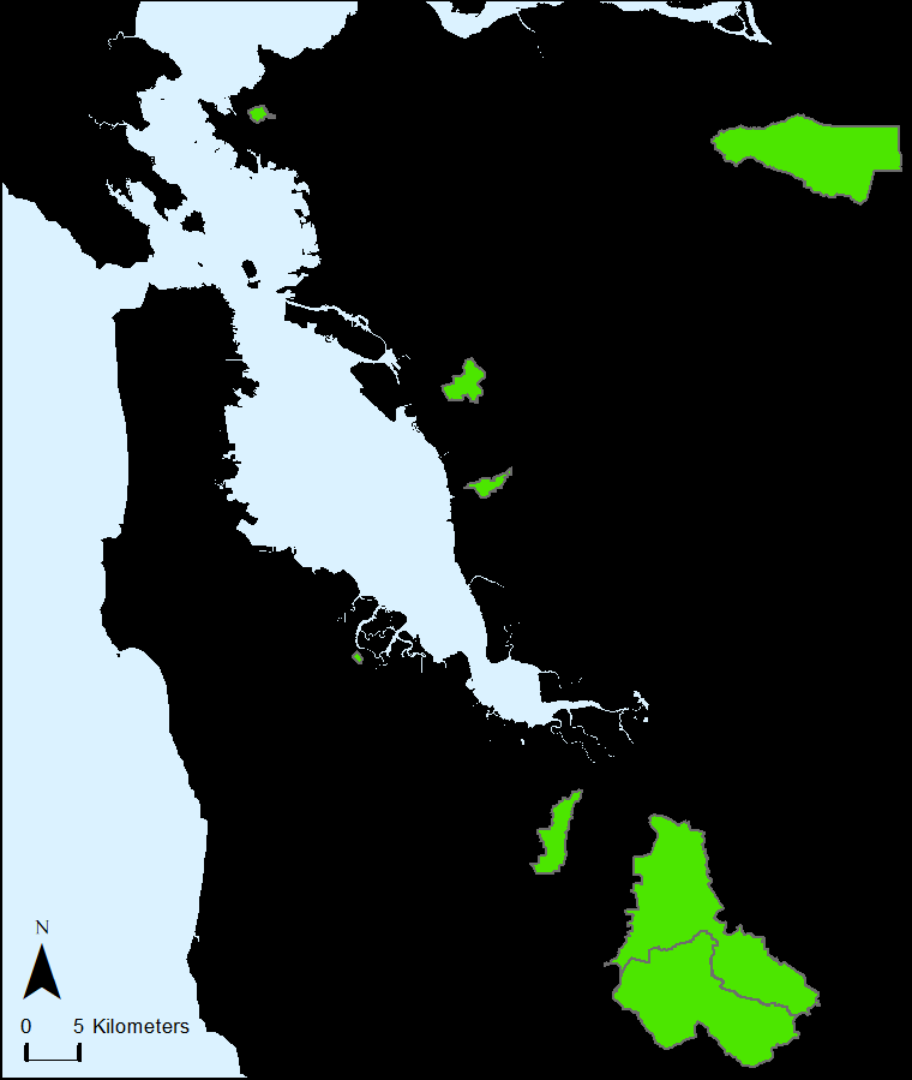

Intensive sampling too expensive to meet goals

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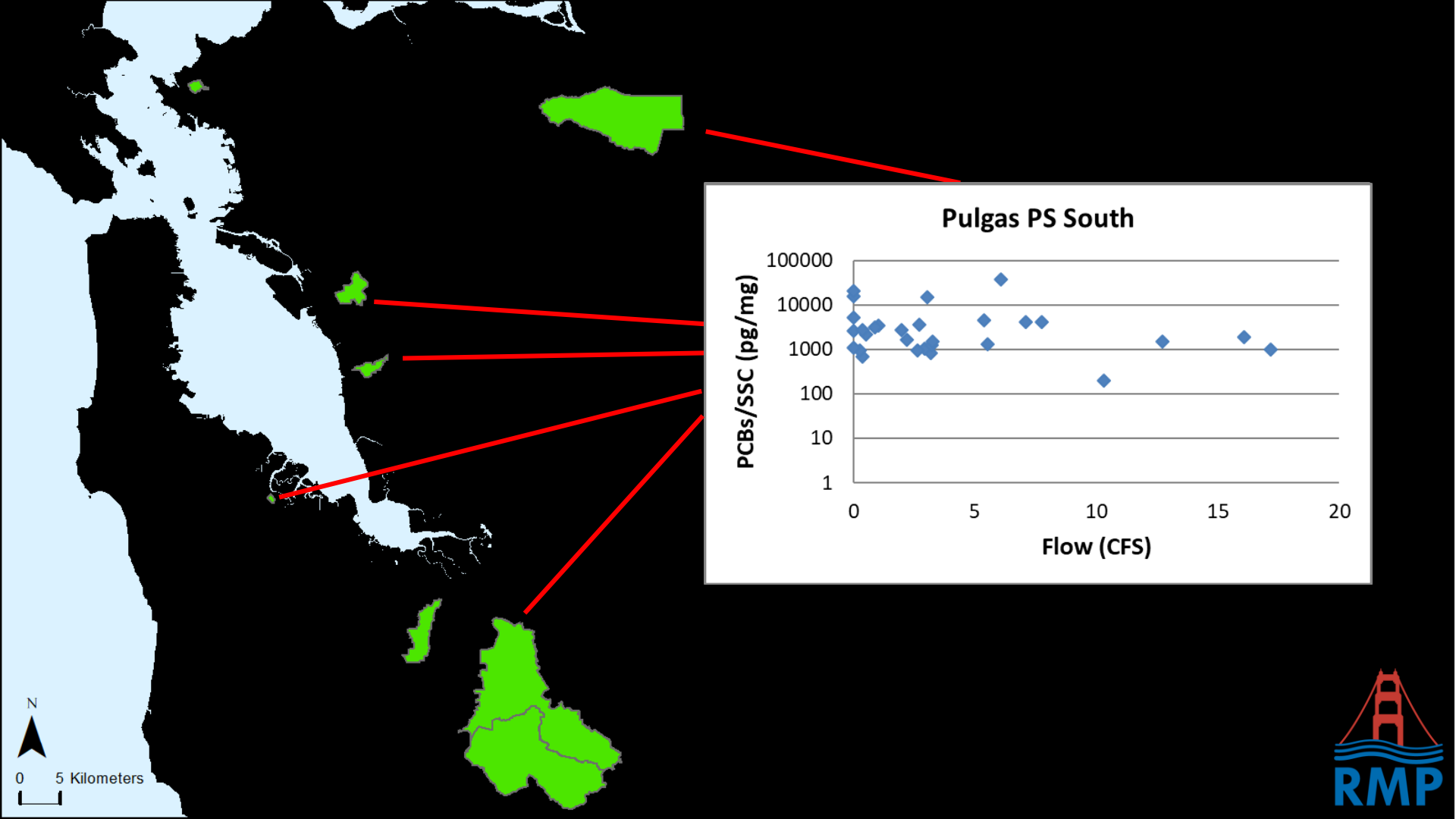
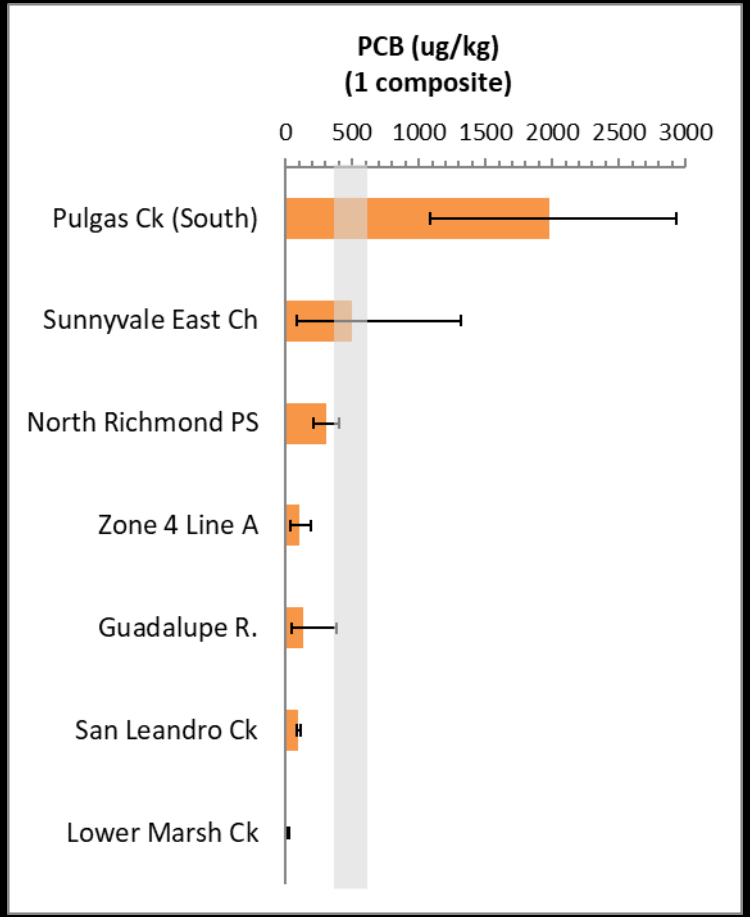
Soil/sediment sampling too limited in location and too prone to false negatives to be effective for reconnaissance


Pulgas PS South
PCBs/SSC (pg/mg)
100000
10000
1000
100
10
1
0
5
10
15
20
Flow (CFS)
N
0
5 Kilometers
RMP


PCB (ug/kg)
(1 composite)
0
500
1000
1500
2000
2500
3000
Pulgas Ck (South)
Sunnyvale East Ch
North Richmond PS
Zone 4 Line A
Guadalupe R.
San Leandro Ck
Lower Marsh Ck

Reconnaissance Method

1. Desktop analysis to identify sites

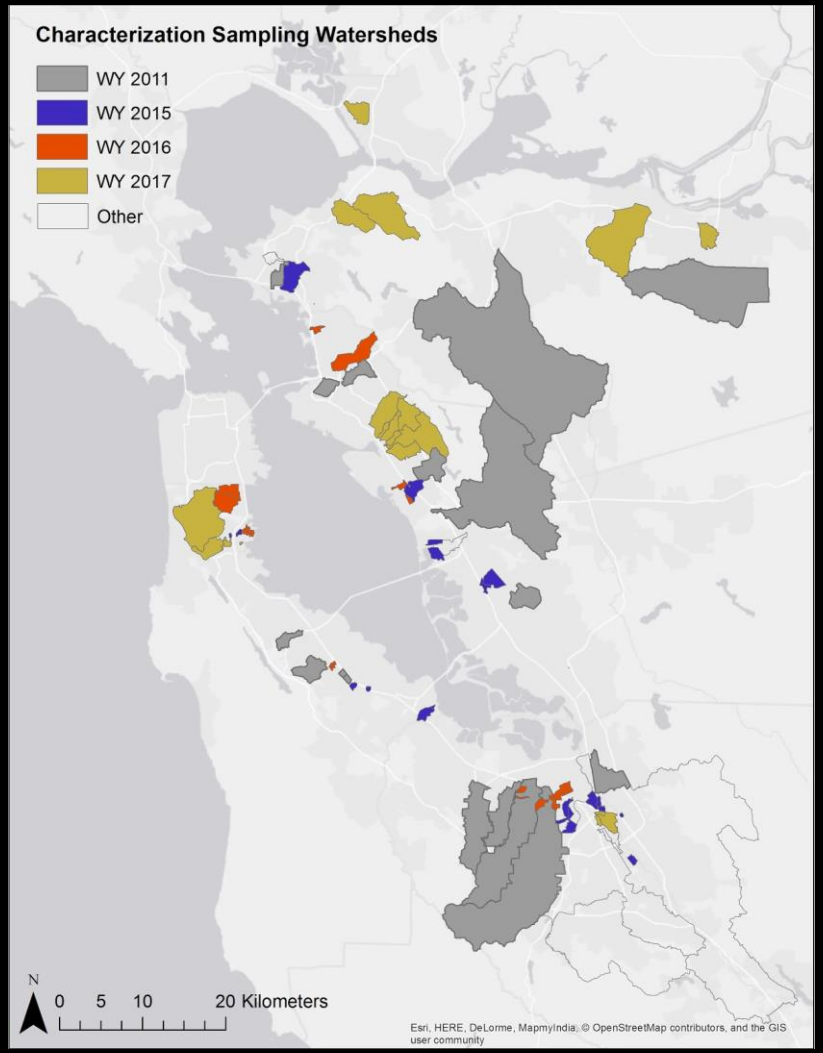
2. Manual sampling during just one storm event at each site

Flexible

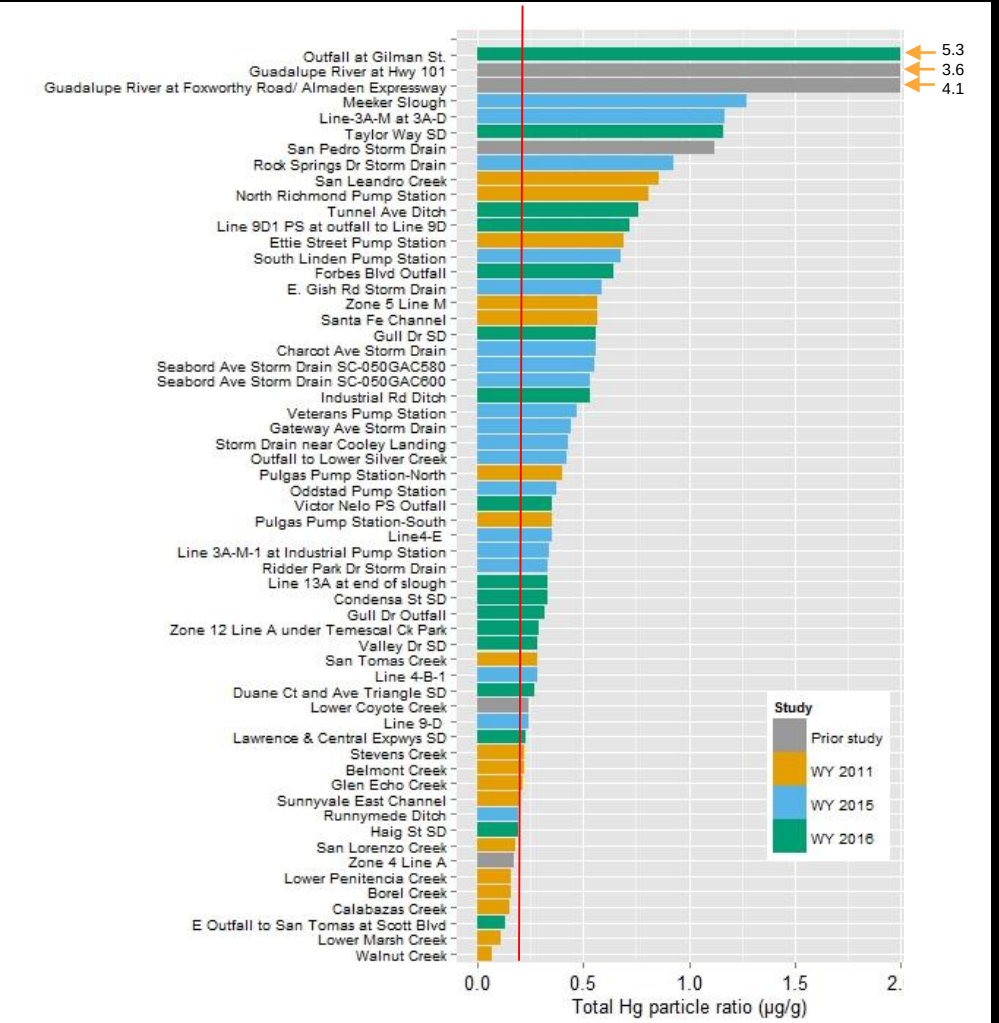
- Can sample a wide variety of flow paths (storm drains, outfalls, creeks, pump stations)
- Can sample in tidal areas (with luck)

Relatively Low Cost

- No permanent equipment installation
- Sample multiple sites per team per storm

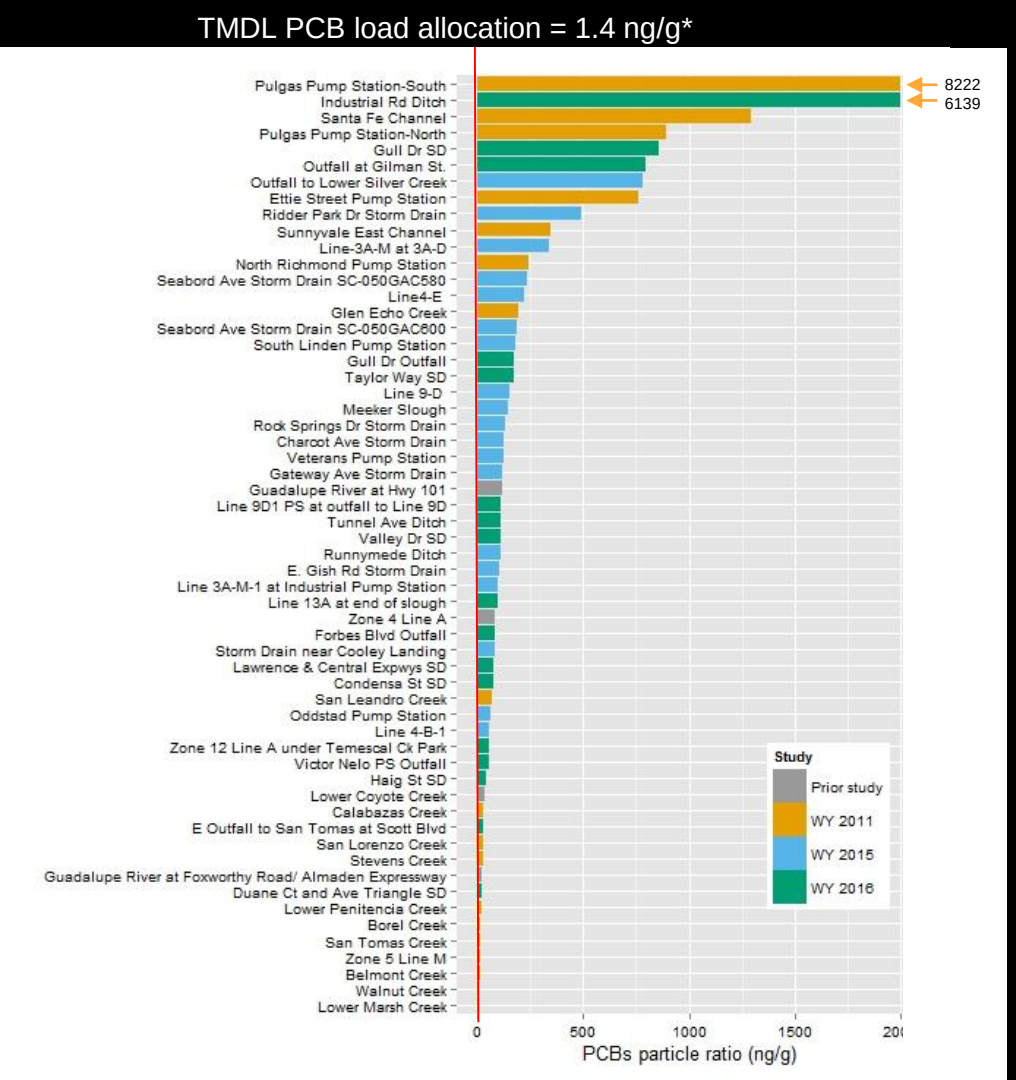

Characterization Sampling Watersheds
WY 2011
WY 2015
WY 2016
WY 2017
Other
N
0 5 10 20 Kilometers
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

TMDL Hg load allocation = 0.2 ug/g



Results - Hg

- Most watersheds above the TMDL target.
- Some urban systems nearly as or more polluted than historic mining impacted Guadalupe River!



Results - PCBs

- Almost every watershed above the TMDL target (even the rural ones), and some are very high.

- About one quarter of the watersheds are very low in concentration.

Remote Sampling Pilot Study

Walling Tube sampler adapted for urban waterway sampling

- Cheap construction
- Easiest to deploy in natural channels

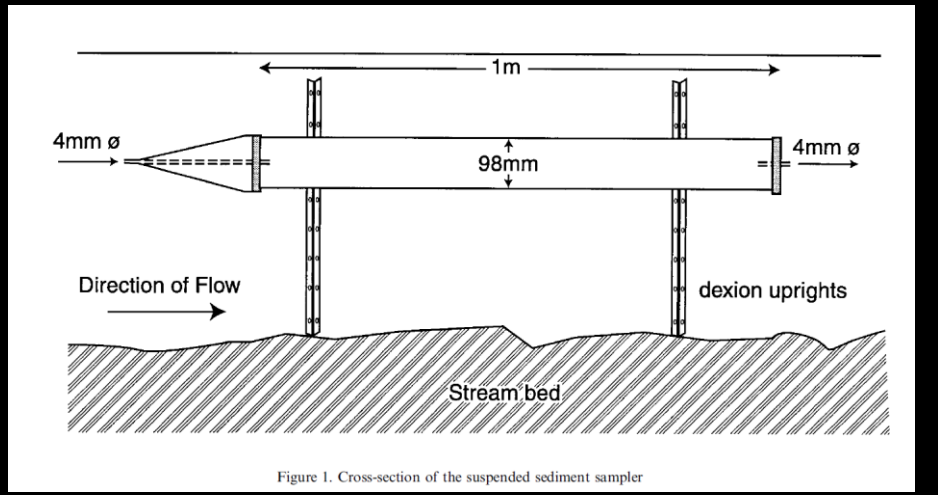


Figure 1. Cross-section of the suspended sediment sampler

Reference: Phillips, J.M., Russell, M.A., and Walling, D.E. 2000. Time-integrated sampling of fluvial suspended sediment: a simple methodology for small catchments. Hydrological Processes. 14, 2589-2602.

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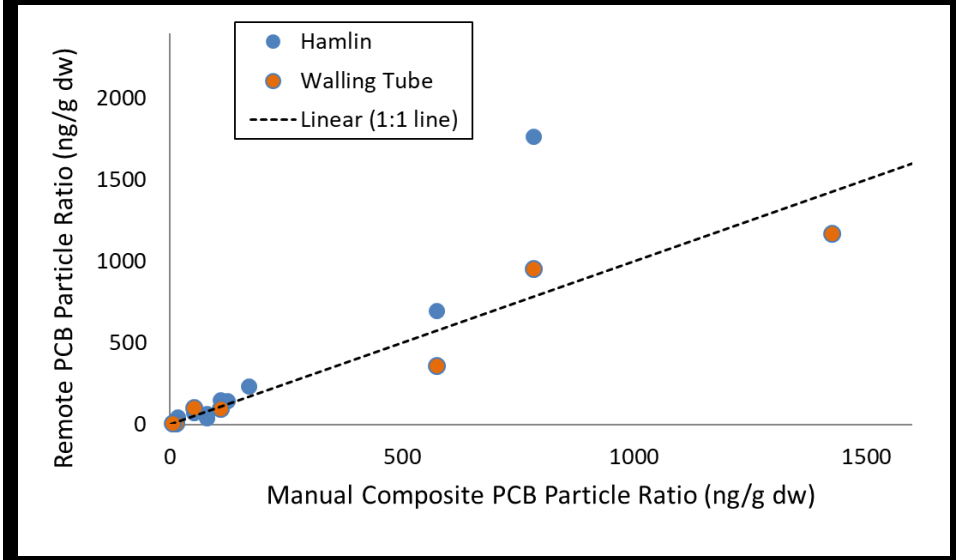
Remote Sampling Pilot Study

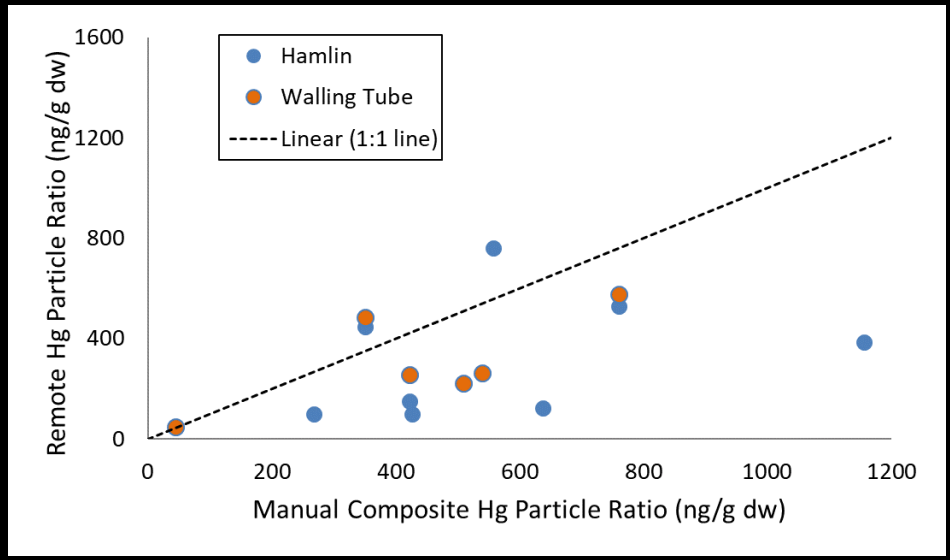
Hamlin sampler designed by Department of Ecology, Washington, for stormdrain monitoring

- Fabricator must construct
- Easiest to deploy in stormdrains

Photos above and far lower left provided courtesy of Department of Ecology, Washington. In stream photo taken by SFEI.

Remote Sampling Pilot Study Results





Samplers are promising for use in PCB sampling.

No clear advantage of one sampler over the other.

Correlation not as strong for Hg.

The Walling Tube may have an advantage over the Hamlin sampler for Hg, which may be due to Hg adsorption to finer grain sizes.

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Next steps

- BASMAA uses results to identify areas of management interest
- WY 2018: RMP is continuing to collaborate with BASMAA to complete wet season stormwater sampling (10-12 sites); focusing on re-sampling in watersheds where false negatives are suspected
- RMP will continue to test remote stormwater samplers (4-6 sites)
- RMP to complete an Advanced Data Analysis to explore current dataset

Main Take-Aways (and outline)

- A low cost stormwater sampling method was needed to identify watersheds with high PCB pollution
- Characteristics of long-term sampling datasets for 7 stations justified a single storm composite for this reconnaissance purpose
- The method involves a desktop analysis followed by sampling just one storm; it has advantages of being flexible and low-cost
- This method has indicated numerous new watersheds for follow up investigation of PCBs and Hg
- A pilot experiment of remote suspended sediment samplers has yielded promising results for possibly an even lower cost method