OCTOBER 5, 2010

A PRESENTATION of the Regional Monitoring Program for Water Quality in the San Francisco Estuary

2010 RMP ANNUAL MEETING

SFEI

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RECENT ADVANCES IN BAY AREA STORMWATER SCIENCE

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Take home messages

- Sediment information is improving and remains the basis for estimation and tracking contaminants
- Sediment grainsize influences the quality of the sediment resource and our ability to manage contamination
- Monitoring takes different tools and effort and each watershed scale
- Mercury is found on small particles and in dissolved phase under lower flow conditions
- Source control show promise for PCBs (and Hg) - treatment control may be more suitable for PCBs

The need for information

- The Bay is listed as impaired
- “Create a functional connection between beneficial uses of the Bay and efforts to identify, eliminate, and prevent sources of pollution”
- Cu/Ni, Hg Total Maximum Daily Loads (TMDL) clean up plans began to be developed in the late 90s
- 1999 – The Sources Pathways and Loading Workgroup established

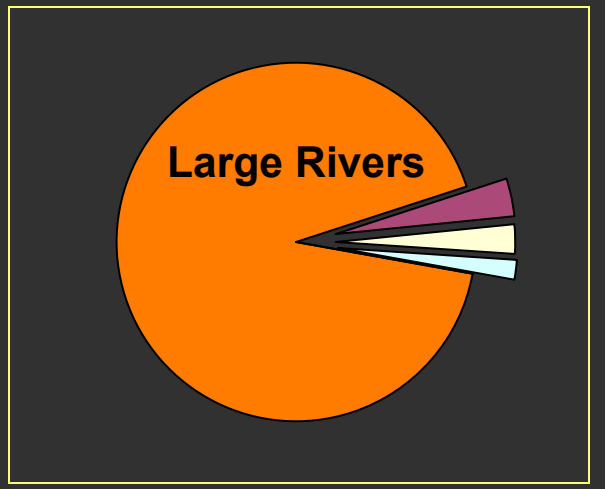
Some things don't change

- Atmospheric Deposition Pilot Study
  - Relatively small magnitude established

- Wastewater treatment quantification
  - Improved analyte list and detection limits
  - Relatively small magnitude established

- Water Budget for San Francisco Bay

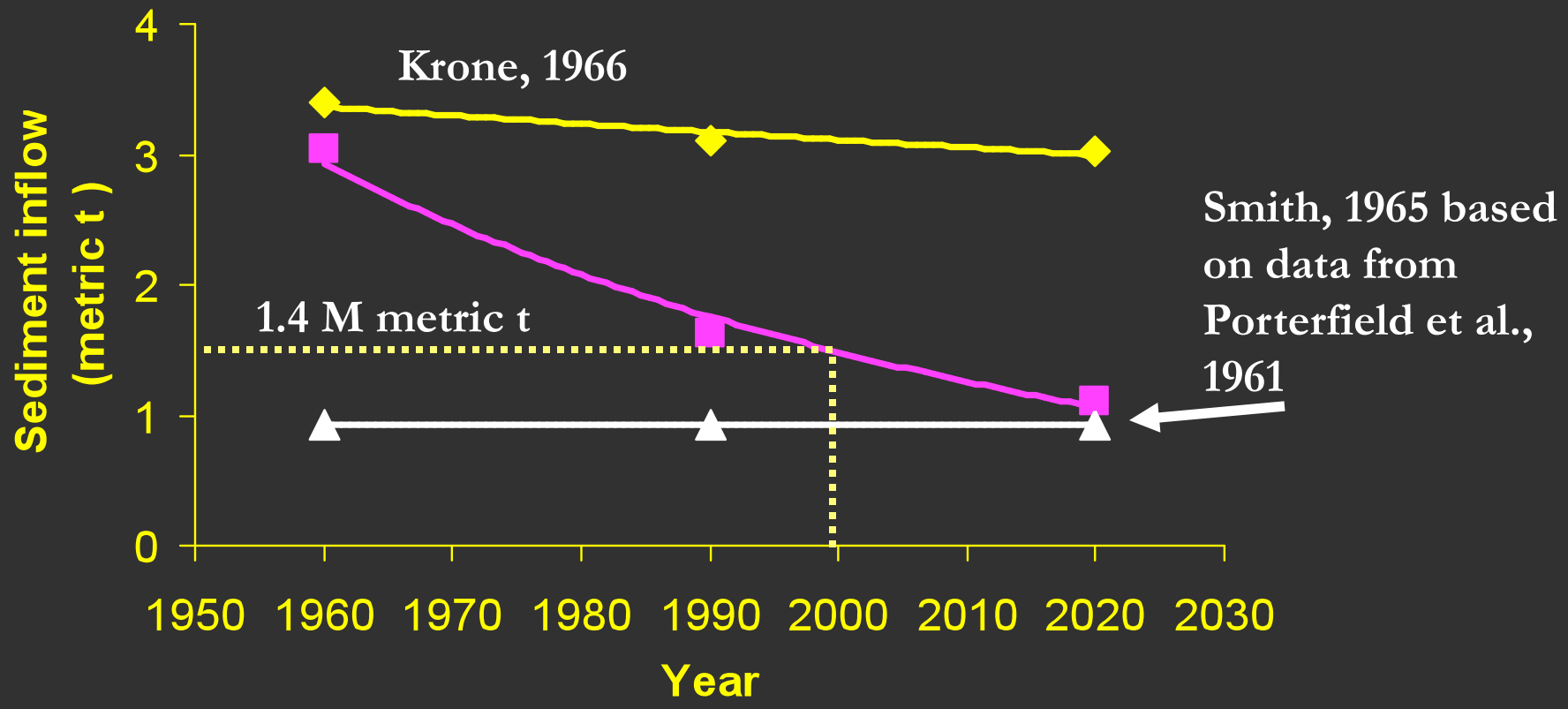
	Volume (Mm^3)	(%)
Large Rivers	**24900**	**92**
Small Tributaries	**918**	**3.4**
Municipal Wastewater	**800**	**3.0**
Rainfall	**381**	**1.4**
Industrial Wastewater	**36**	**0.13**



Some knowledge has really changed

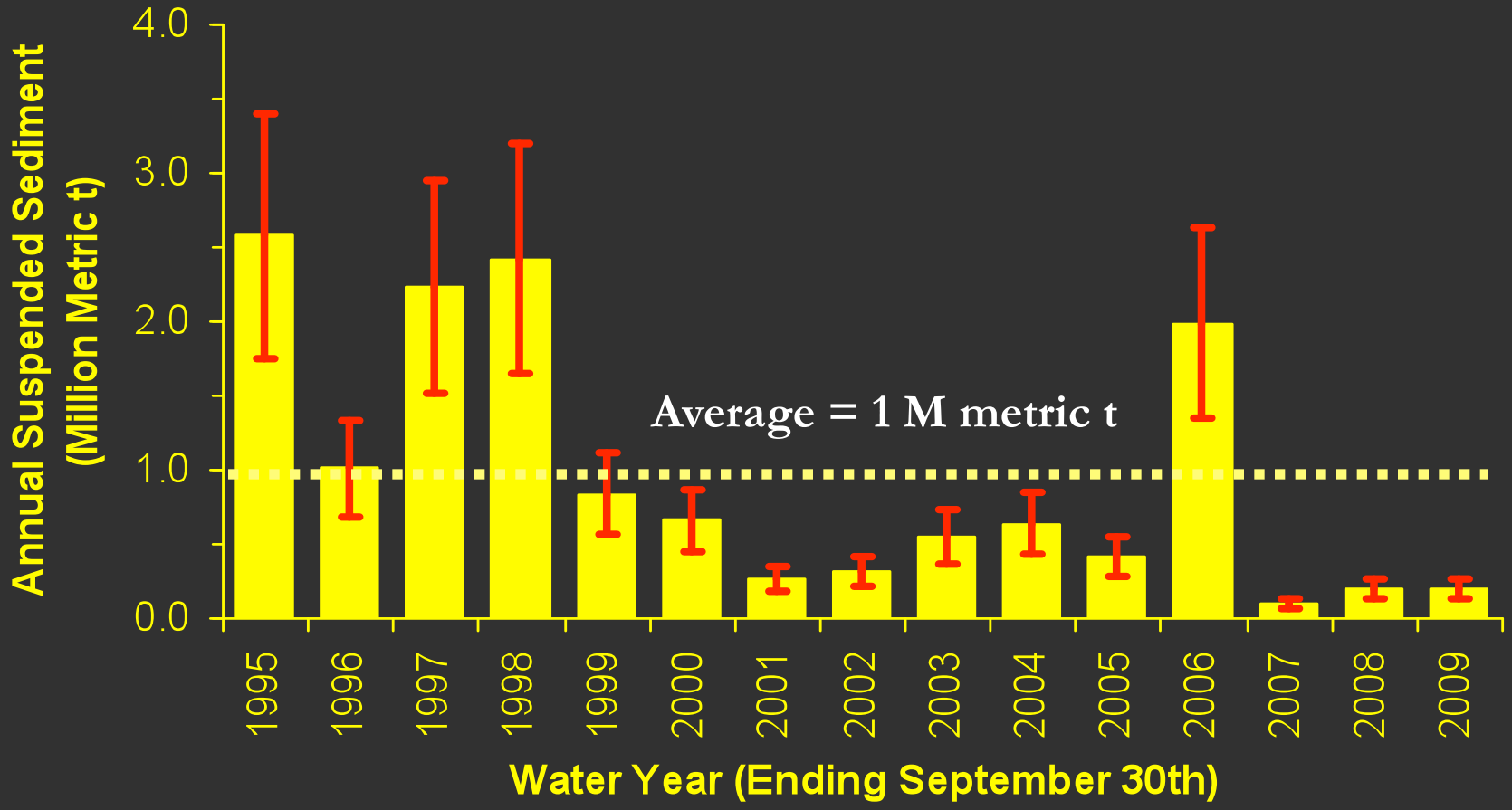
- Sediment budget
- Polychlorinated Biphenyl (PCB) budget
- Mercury budget
- Information about sources and treatment options improving

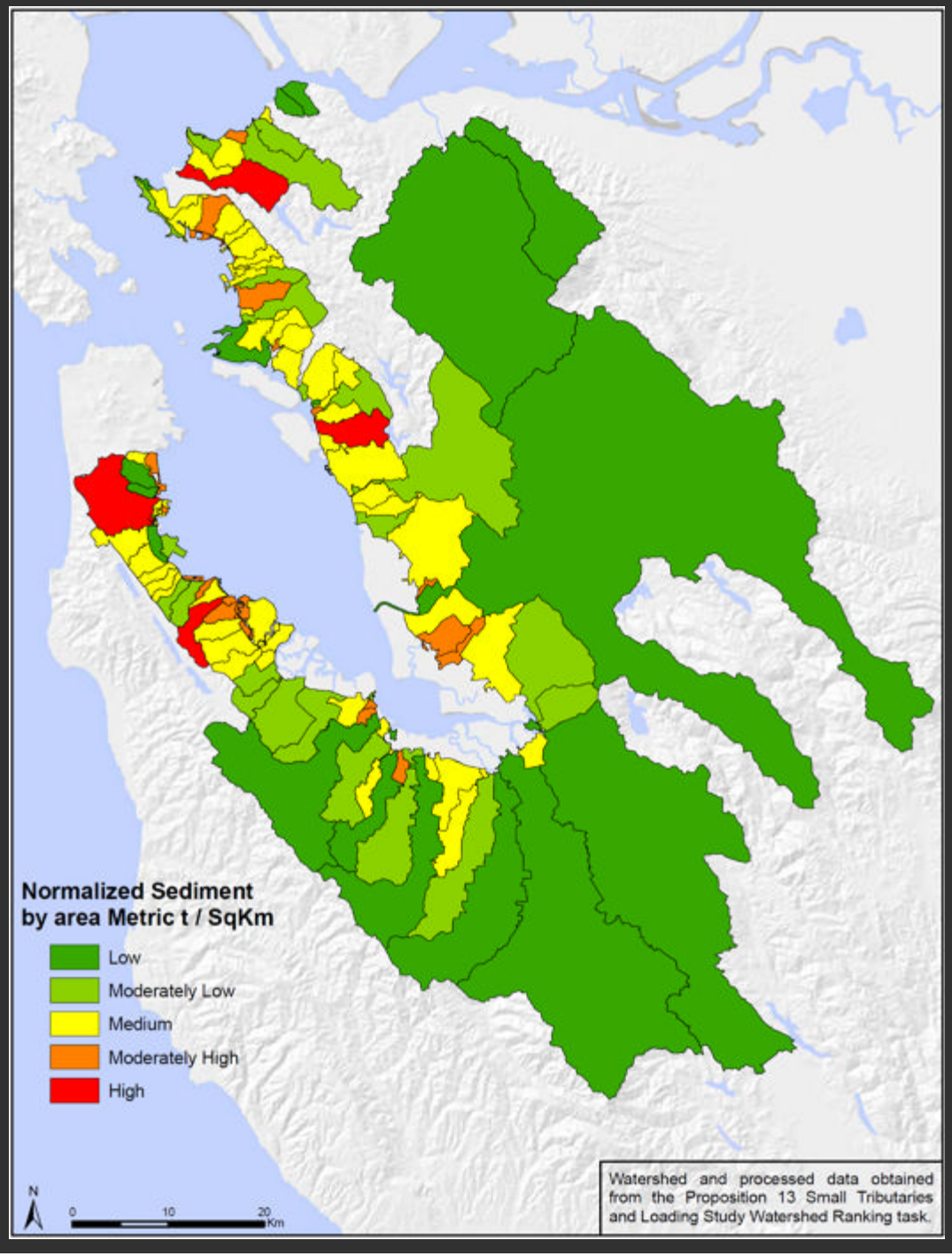
Sediment knowledge prior to year 2000



Central Valley suspended sediment loads

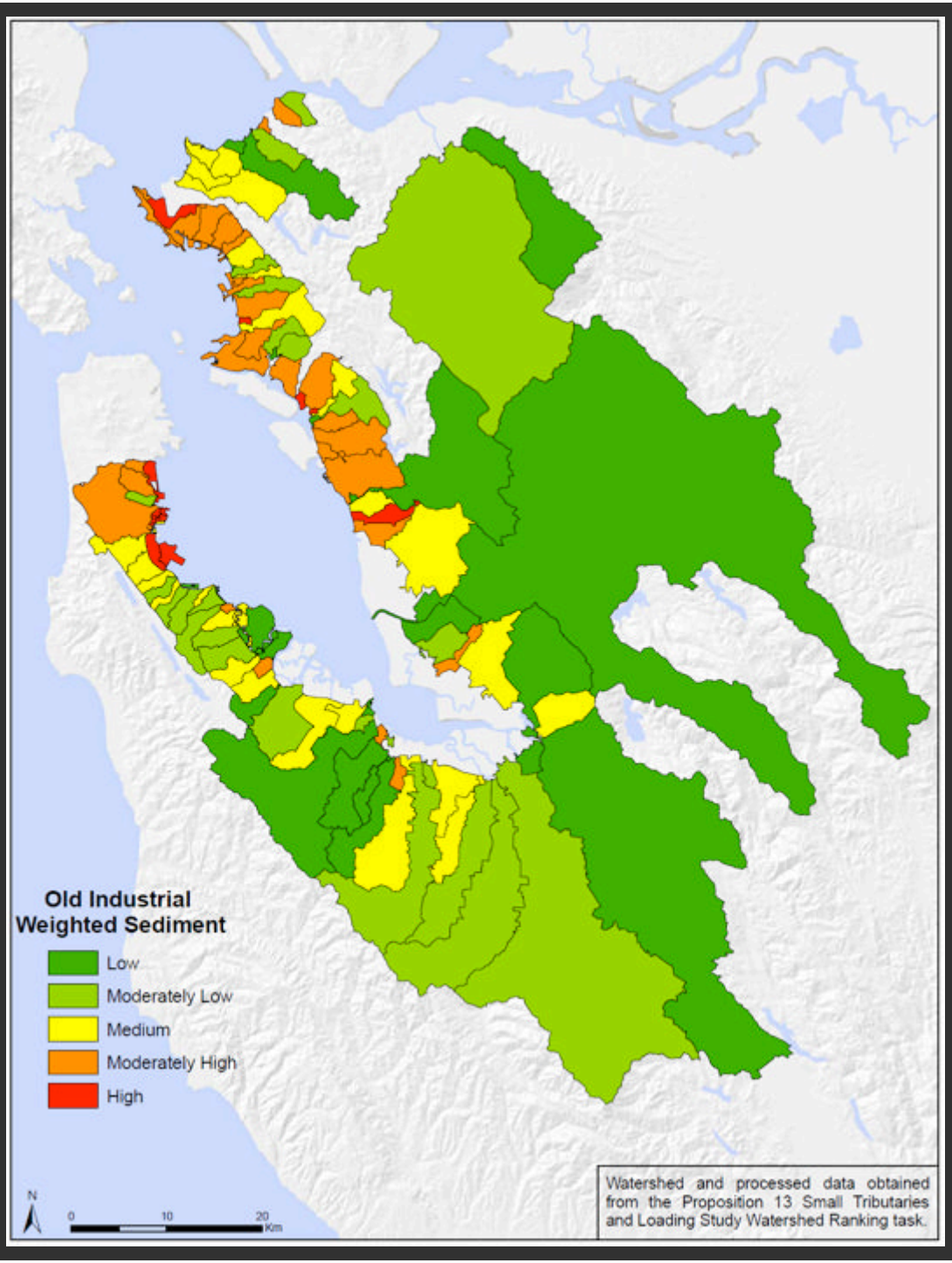
(McKee et al., 2002; 2006; David et al., 2009; RMP Pulse, 2010)





Spatially resolved suspended sediment loads estimates

(Lewicki and McKee, 2009)



Useful information?

- Estimates of relative particle concentrations

Loads from small tributaries by Bay segment

RMP Bay Segment	Load (t/year)
Rivers	27,353
Suisun Bay	203,453
Carquinez Strait	25,693
San Pablo Bay	281,789
Central Bay	246,170
South Bay	270,202
Lower South Bay	214,940
Total	1,269,606

*Note “Rivers” is the name of the northeastern most RMP Bay segment and is not referring to input from the Sacramento or San Joaquin River.

Summary of allochthonous suspended sediment loads

- Predictions of Ray Krone seem to have become reality
- Bay sediment supply has switched from Central Valley dominated to local small tributary dominated

1960 Average

3 M t

76%

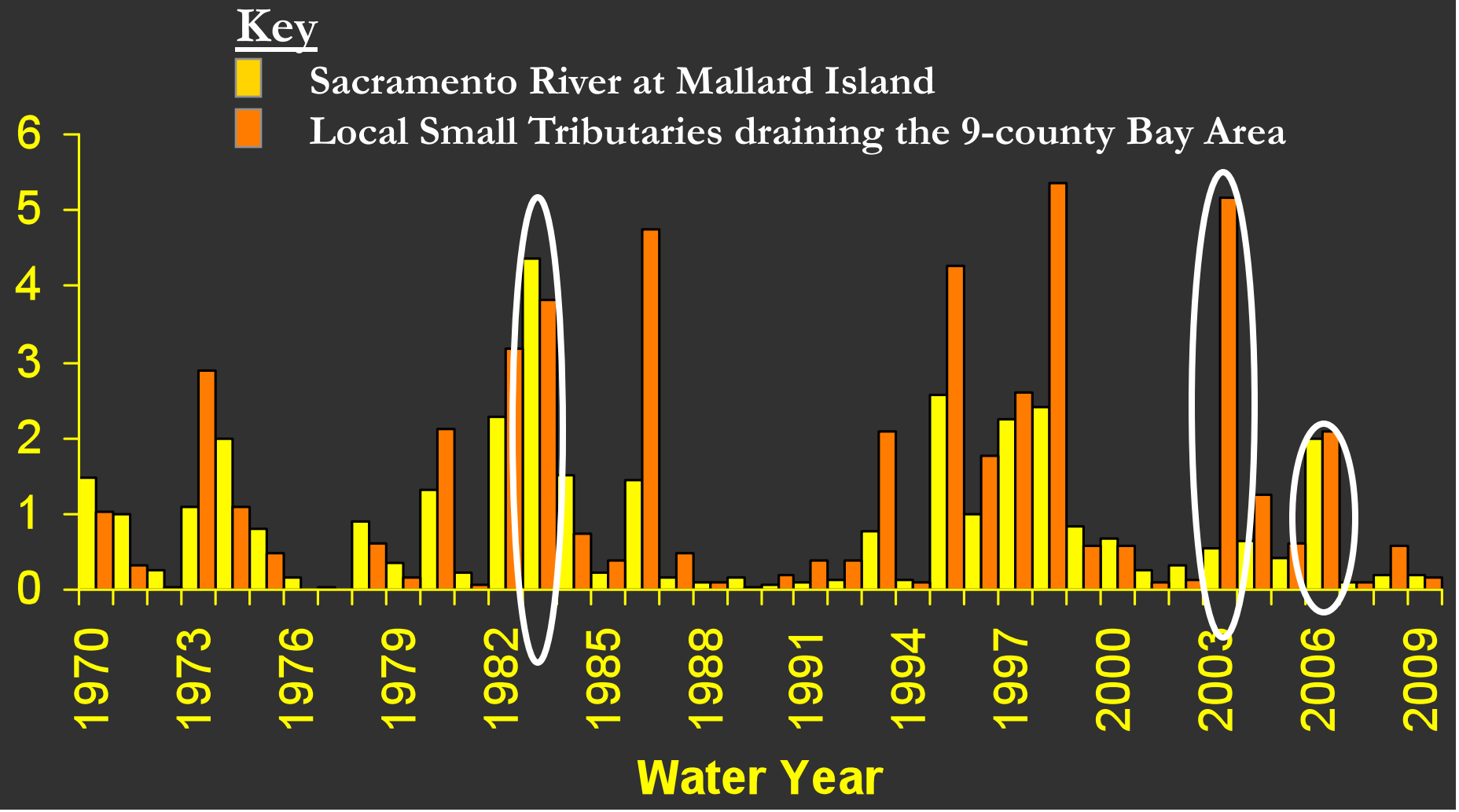
Summary of allochthonous suspended sediment loads

- Predictions of Ray Krone seem to have become reality
- Bay sediment supply has switched from Central Valley dominated to local small tributary dominated

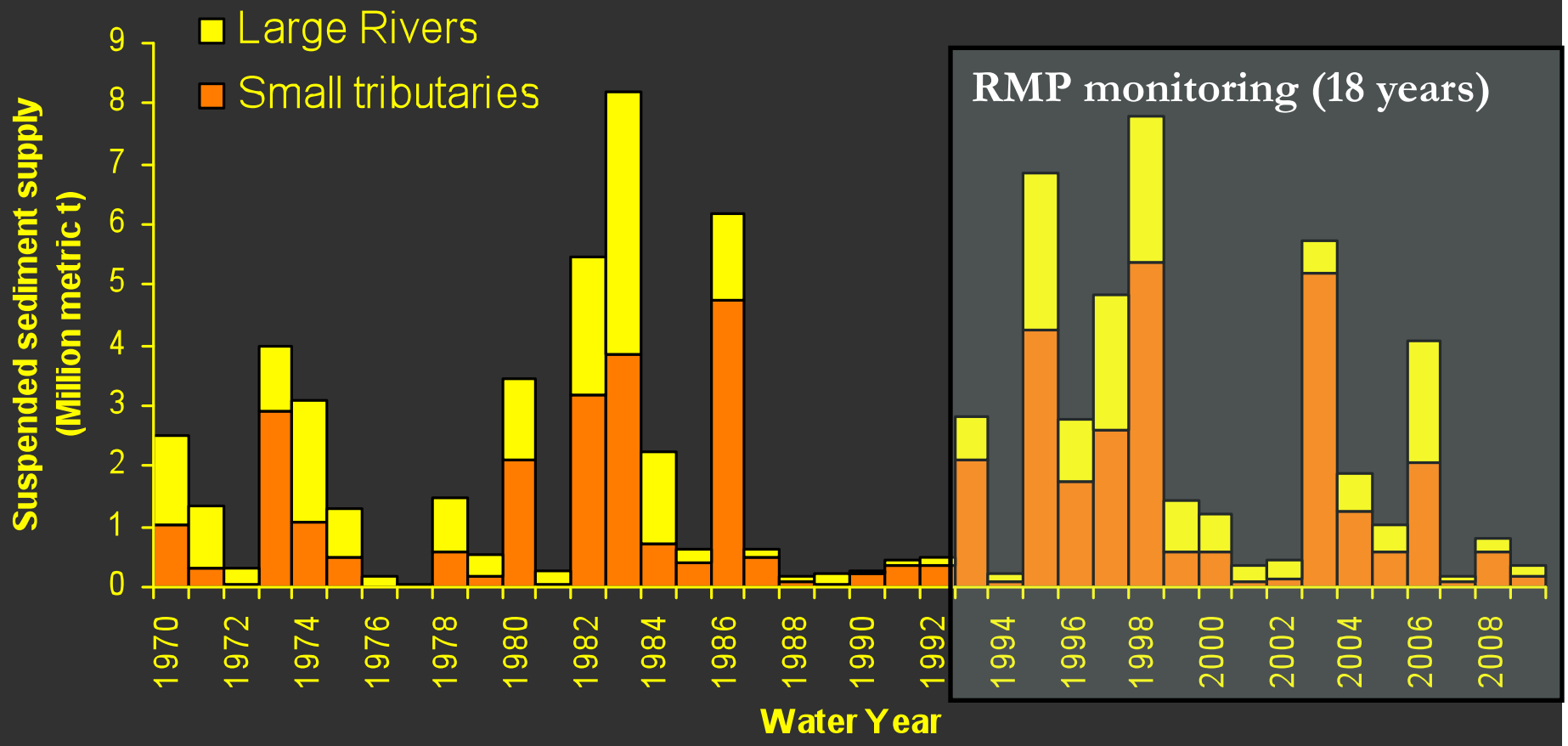
2000 Average
1 M t
44%

Temporally resolved suspended sediment loads

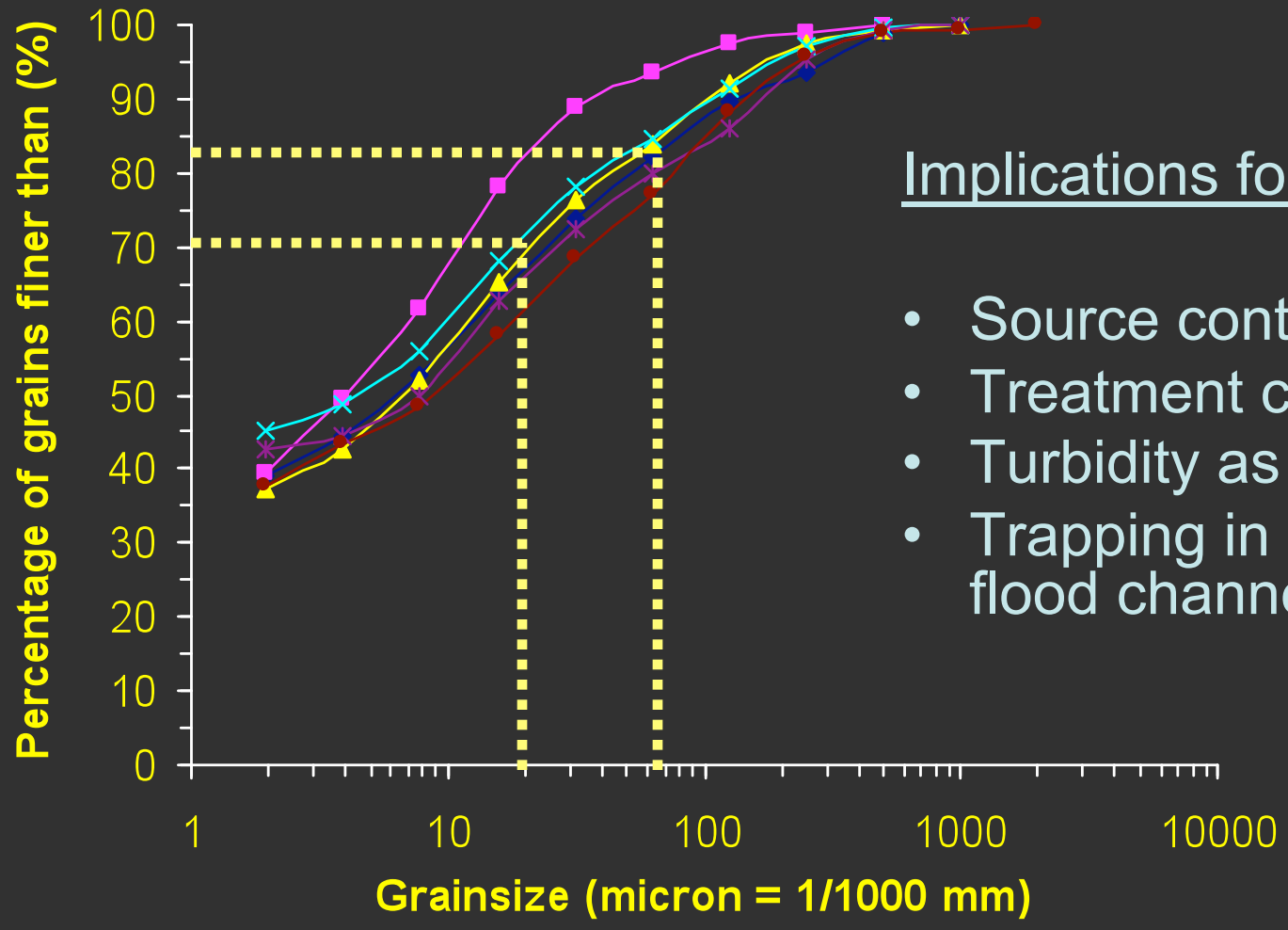
(Million metric t)



Estimated suspended sediment supply



Sediment grainsize



Implications for

- Source control
- Treatment control
- Turbidity as a surrogate
- Trapping in reservoirs and flood channels

Sediment as a resource

Alameda flood control channel example

- D50: mostly fine – medium sand
  - Some samples >50% gravel
- 14% is <62.5 micron

Monitoring contaminant loads

Where have we been monitoring?

Sacramento River at Mallard Island

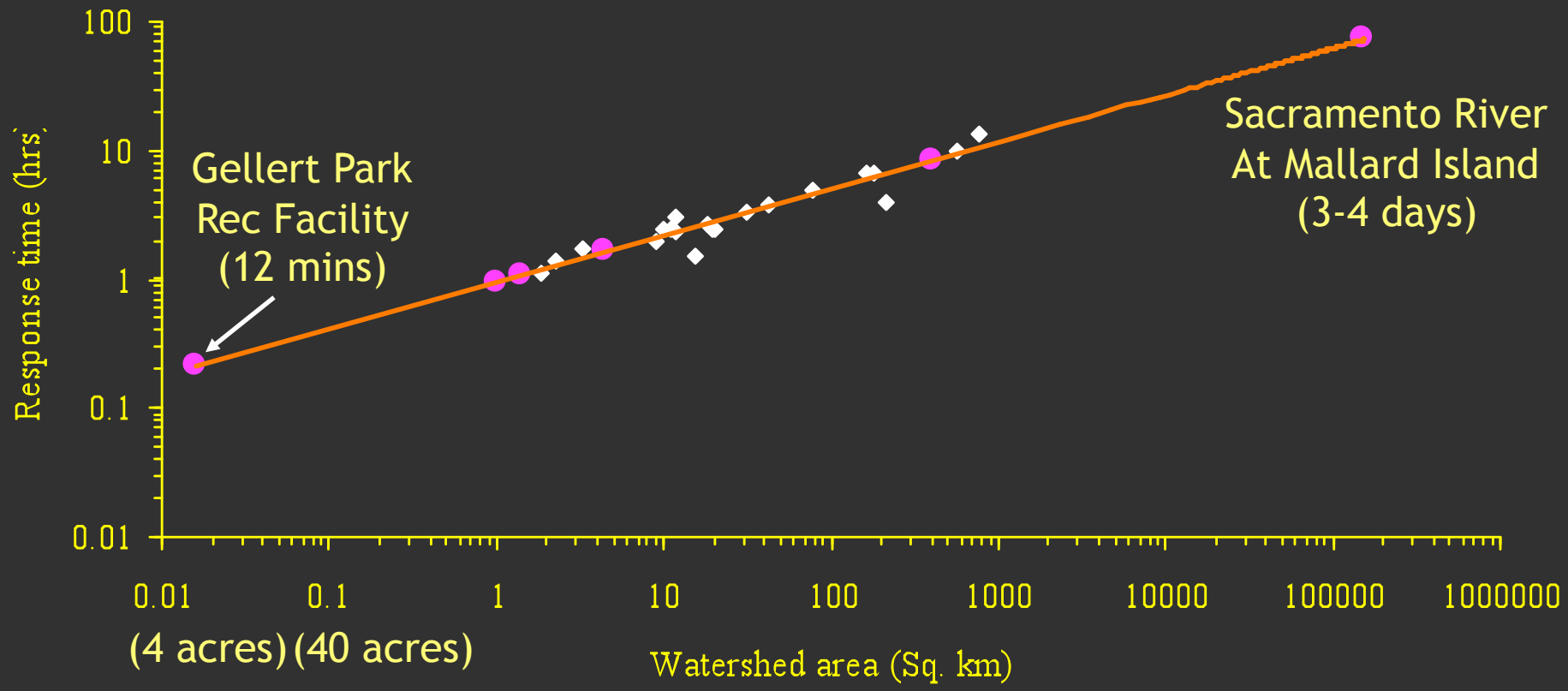
154,000 km^2

Size

Gellert Park Recreational Facility

0.016 km^2

Challenges of scale in monitoring?



Sacramento River at Mallard Island

Guadalupe River at Hwy 101

Zone 4 Line A in Hayward

North Richmond Pump Station

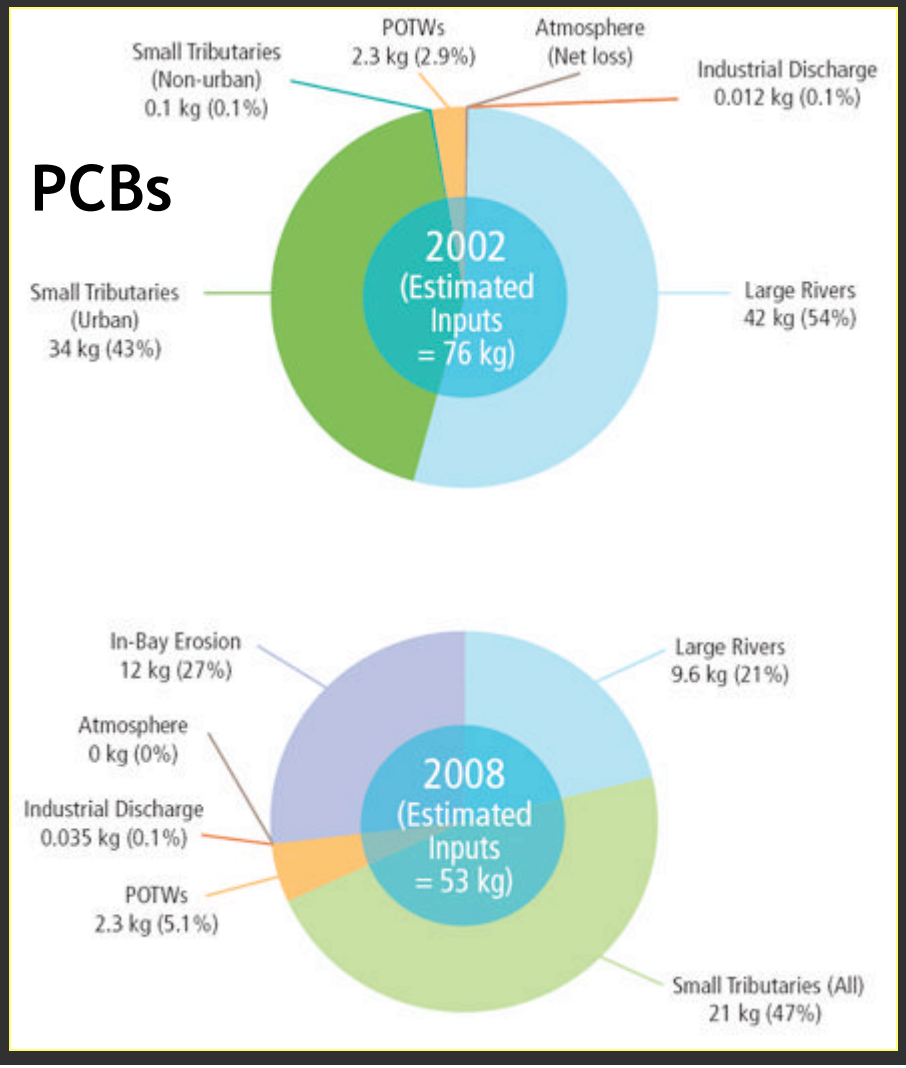
Gellert Park recreational facility, Daly City

How do we scale up from local to regional?

- PCB TMDL – simple climate and area scaling
- Future – calibrated modeling

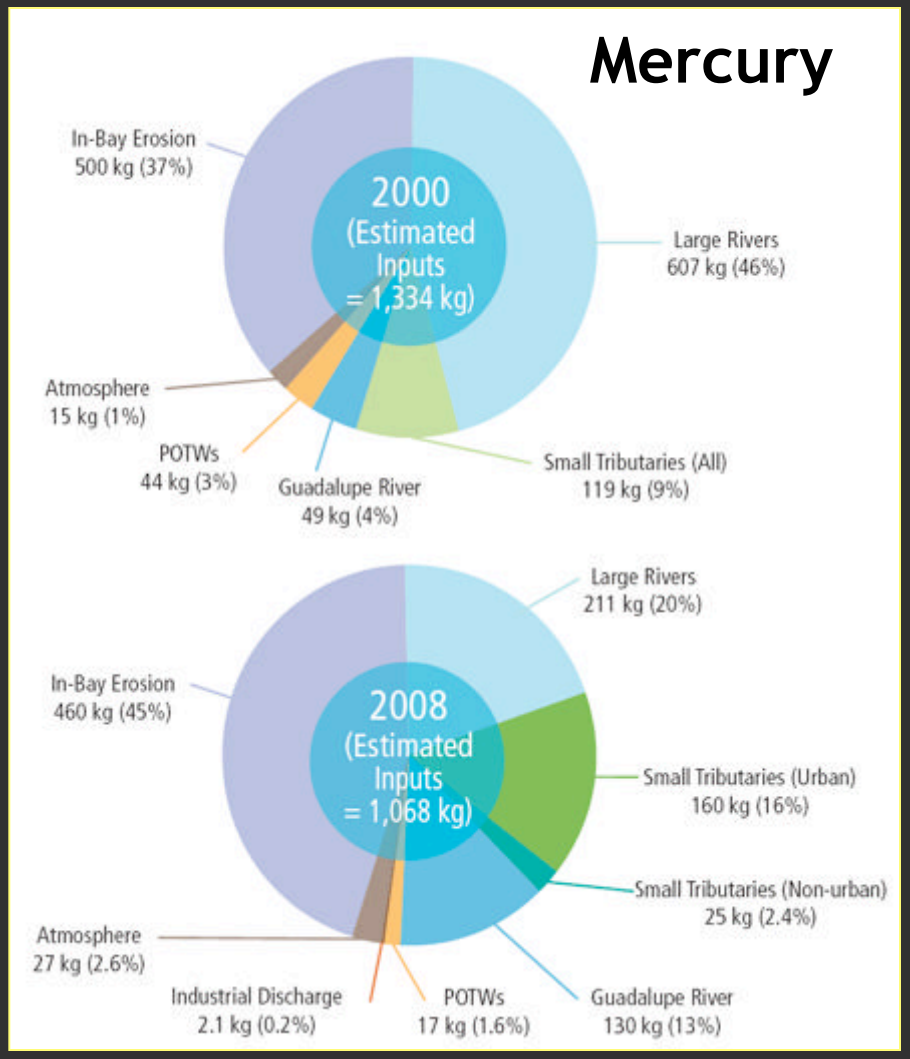
Runoff area	x	EMC	=	Load

Loading information continues to improve - PCBs



- 2000
  - 76 kg
  - Large rivers 54%
  - Small tributaries 43%
- 2010
  - 53 kg
  - Large rivers 21%
  - Small tributaries 47%
  - In-Bay erosion 27%

Loading information continues to improve - Hg

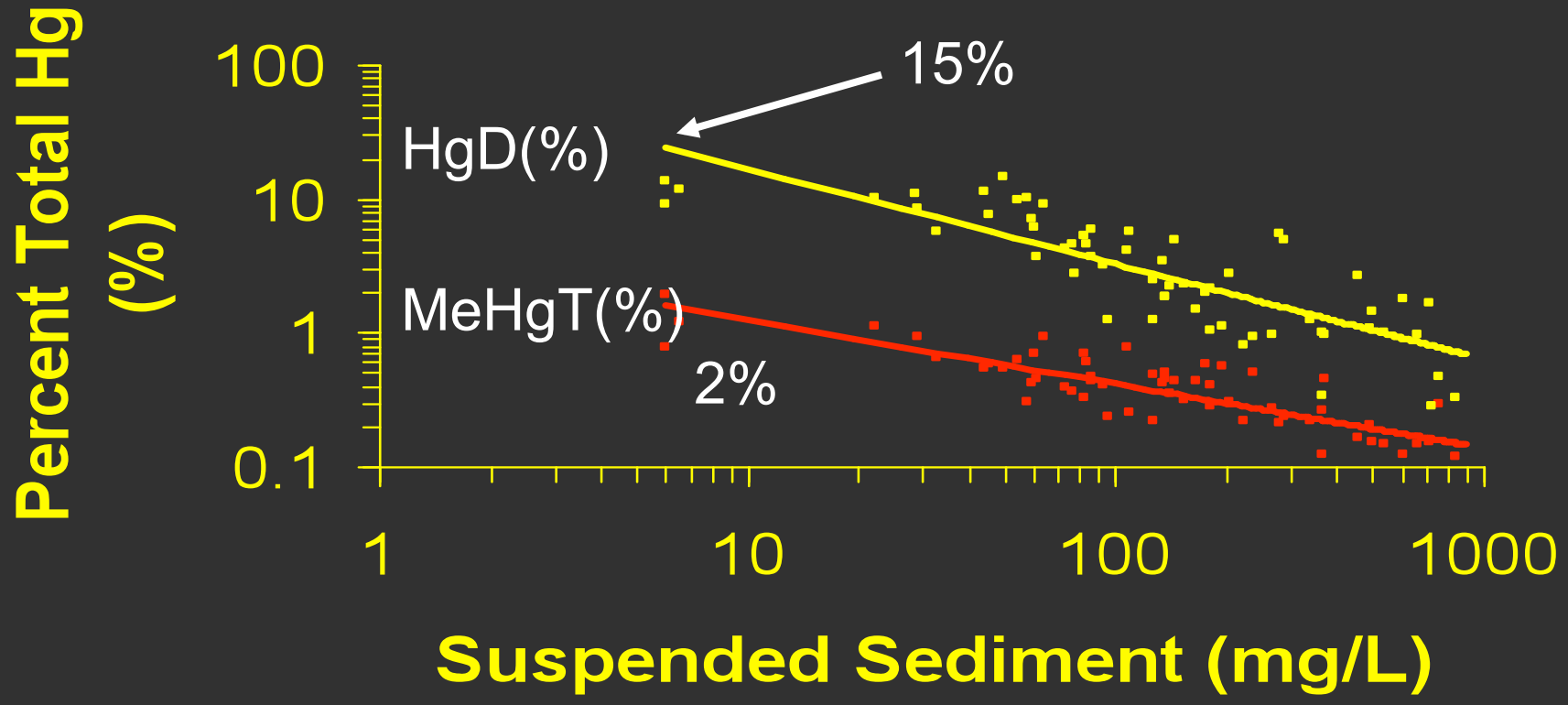


- 2000
  - 1,334 kg
  - Large rivers 46%
  - Small tributaries 9%
  - Guadalupe 4%

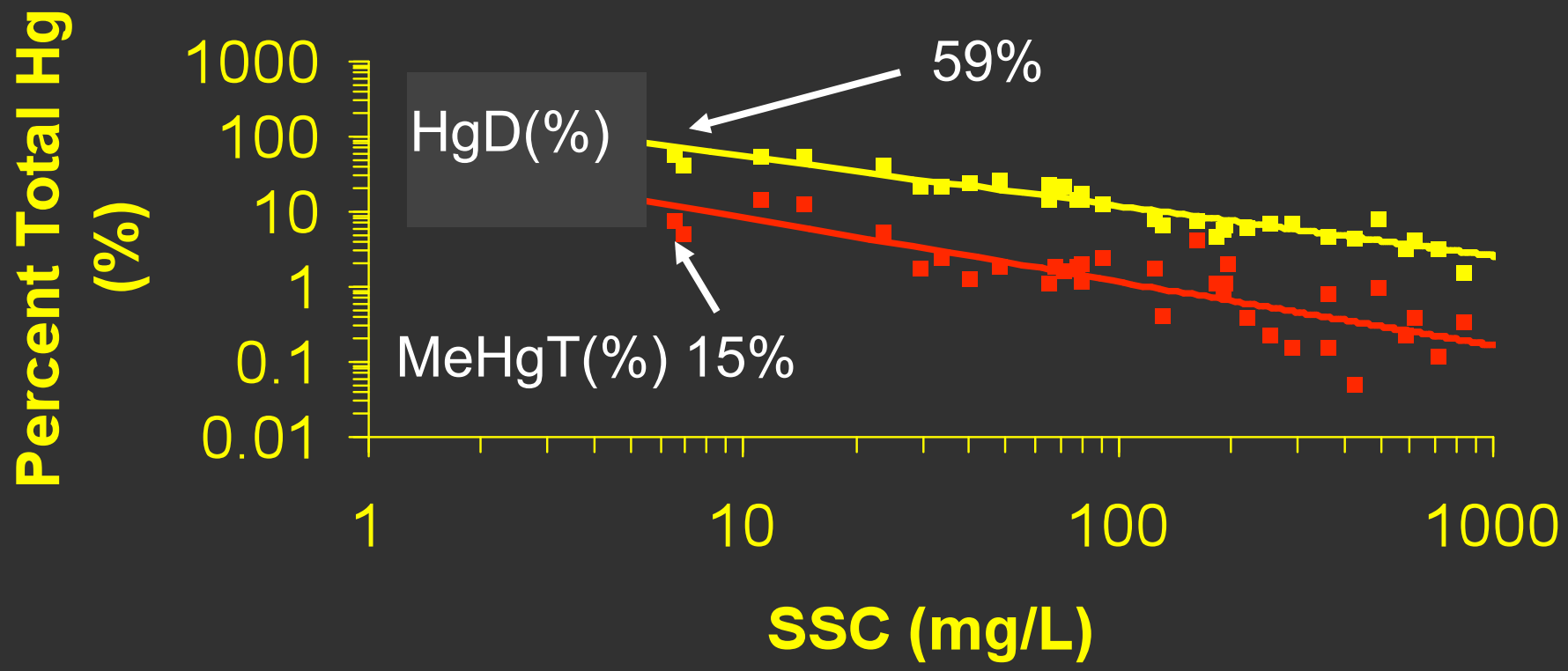
  13%
- 2010
  - 1068 kg
  - Large rivers 20%
  - Small tributaries 18%
  - Guadalupe 13%

  31%

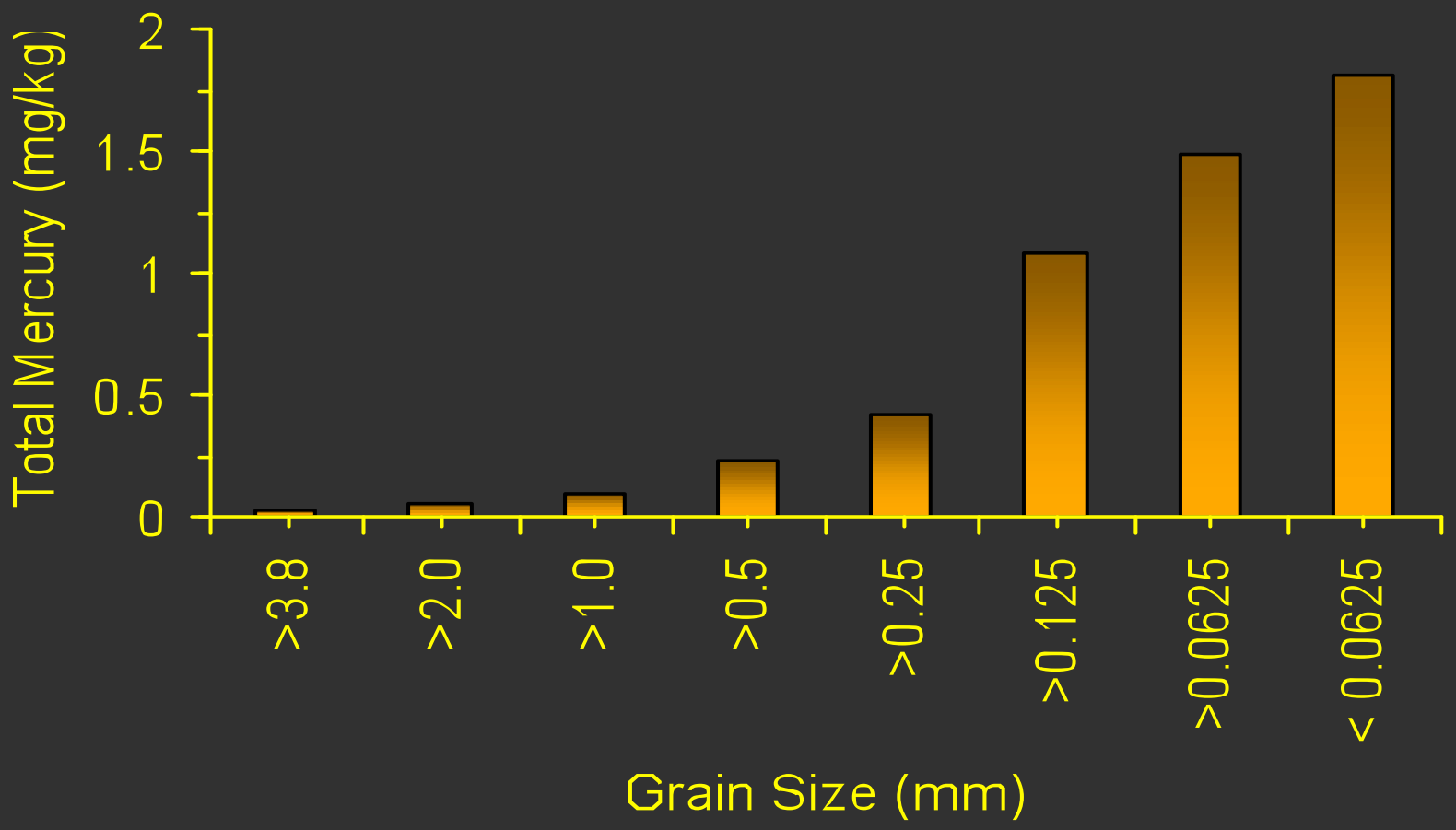
Mercury speciation - Guadalupe



Mercury speciation – Urban Zone 4 Line A

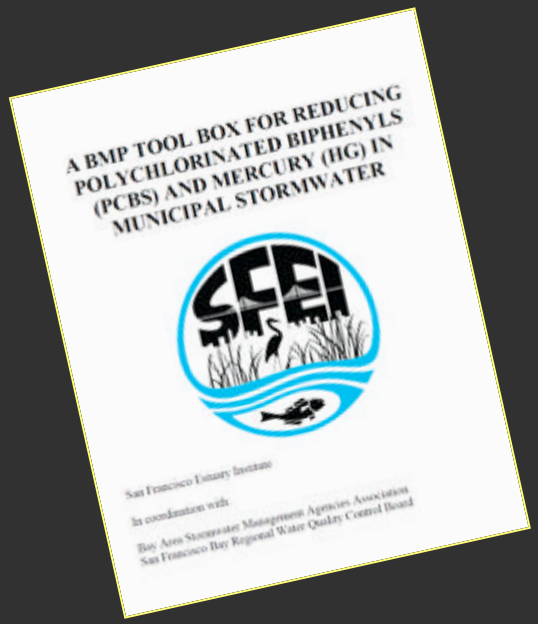


Mercury particle size relations



Knowledge for managers:

Tracking and abating - the PCB example



Tracking and abating: What did we use PCBs for?

	Metric t used in the Bay Area	Examples
"Completely" closed systems	7,400 (60%)	Large transformers, fluorescent light ballasts
Nominally closed systems	1,200 (10%)	Vacuum pumps, consumer appliances
Open-ended	3,700 (30%)	Waxes, caulking compounds, plasticizers

Tracking and abating: What did we use PCBs for?

Fluorescent light ballast

PG&E facilities

Old factory transformers

Caulking

Floor polish

Household appliances

Tracking and abating: How can we identify PCBs at their source?

Photo courtesy of Trish Eliasson

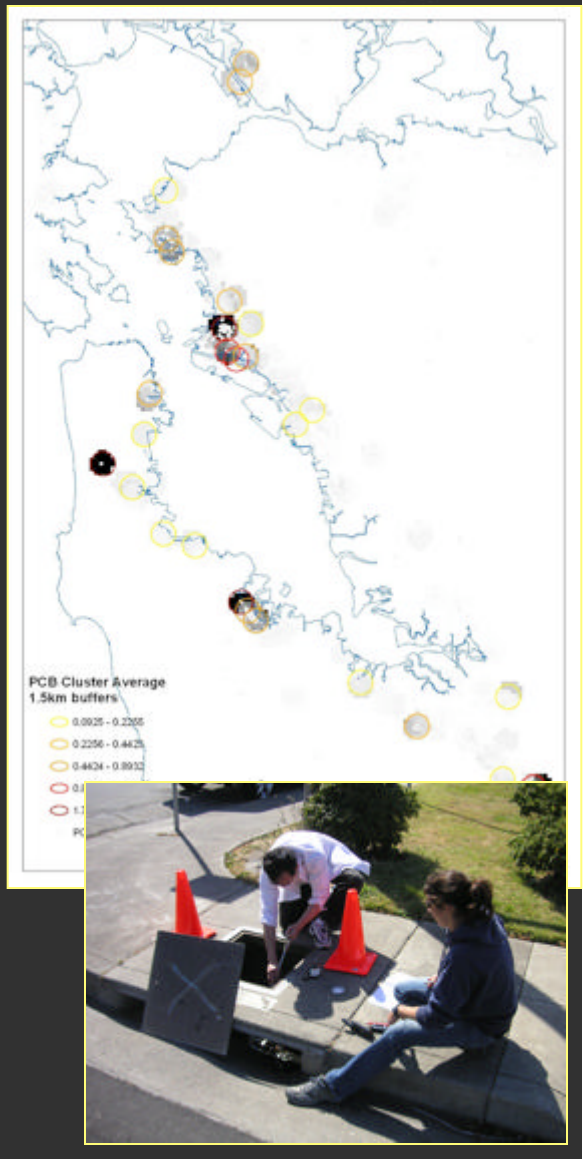
Trade name	Company
Arochlor	**Monsanto**
Asbestol	
Askarel	
Bakota	
Chlorextol	**Allis-Chalmers**
Hydol	
Inerteen	**Westinghouse**
N0-Flamol	
Pyranol	**General Electric**
Saf-T-Khol	
Therminol	

Tracking and abating: PCBs still in **legal** use

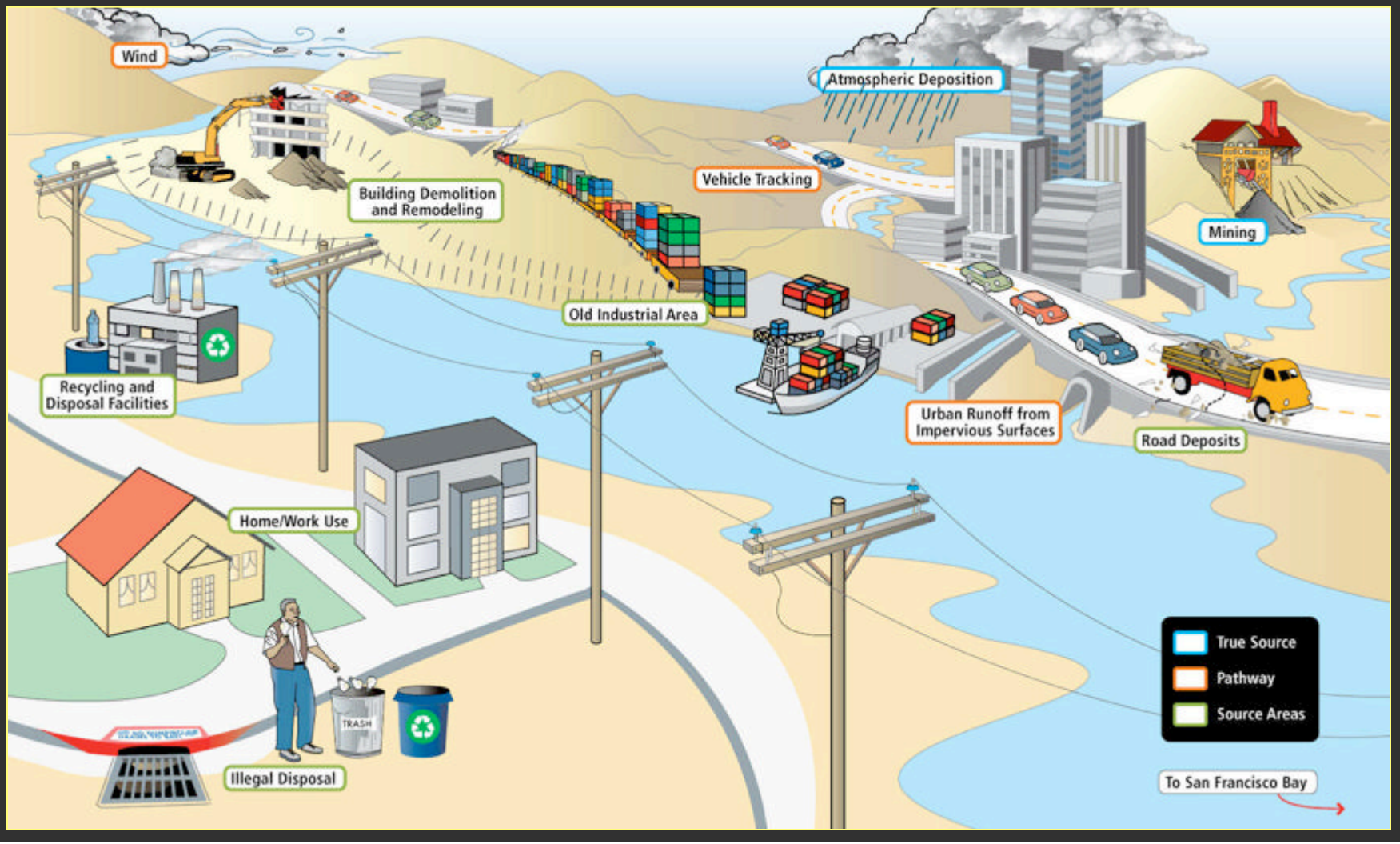
Company	Address	City	Number of transformers	Mass (kg)
USS-POSCO Industries	900 Loveridge RD.	Pittsburg	105	203802
Quebecor Printing San Jose, Inc.	696 East Trimble Road	San Jose	5	32094
NASA	Ames Research Center	Moffett Field	17	7052
Gaylord Container Corp	2301 Wilbur Ave.	Antioch	2	6078
General Chemical	510 Nichols Road	Pittsburg	3	4800
Rhodia Inc.	100 Mococo Road	Martinez	3	2807
NASA Ames Research Center	M/S 218-1; Building N229, Room 156	Moffett Field	2	1916
Pacific Custom Materials, Inc.	9000 Carquinez Scenic Dr.	Port Costa	2	1590
DOT Maritime Administration Suisun Bay Reser	2595 Lake Herman Rd.	Benicia	3	1048
Hollywood Park Land Company, LLC	4 Embarcadero Center, Suite 3300; Grandstand Building at Tunnel #4 Inside C-Vault Electrical Room	San Francisco	1	927
Hollywood Park Land Company, LLC	1200 Park Place, Suite 200; Grandstand Building at Tunnel #4 Inside C-Vault Electrical Room	San Mateo	1	927
Macaulay Foundry, Inc.	811 Carleton St.	Berkley	1	913

Tracking and abating: Mapping sediment / soil contamination

Number of sites in patch	PCB concentration (mg/kg)			Patch description (centroid x-streets)
	Average	Minimum	Maximum	
6	3.45	0.00	20.29	Quarry Rd & Industrial Blvd, San Carlos
5	3.37	0.00	16.81	El Camino Real & Collins Ave, Colma
99	2.70	0.00	93.41	Helen St & Peralta St, Oakland
9	1.72	0.15	7.65	ML King Jr Way & 1st St, Oakland
11	1.49	0.00	7.65	Embarcadero Way & Oak St, Oakland
40	1.37	0.00	26.75	Leo Ave & S 7th St, San Jose
42	0.89	0.00	20.29	Montgomery St & Industrial Rd, San Carlos
49	0.86	0.00	11.52	Washington St & Bayport Ave, San Carlos
2	0.80	0.35	1.26	Michigan St & Couch St, Vallejo
54	0.74	0.00	2.79	S 4th St & Cutting Blvd, Richmond
14	0.65	0.00	2.26	S Marina Way & Hall Ave, Richmond
12	0.44	0.03	1.16	26th St & Minnesota St, San Francisco
8	0.41	0.00	1.38	E California Ave & Morse Ave, Sunnyvale
4	0.36	0.00	1.27	E 8th St & 7th Ave, Oakland
10	0.29	0.00	0.92	Mare Island Way & Maine St, Vallejo



Tracking and abating: How do PCBs to get into stormwater or wastewater?

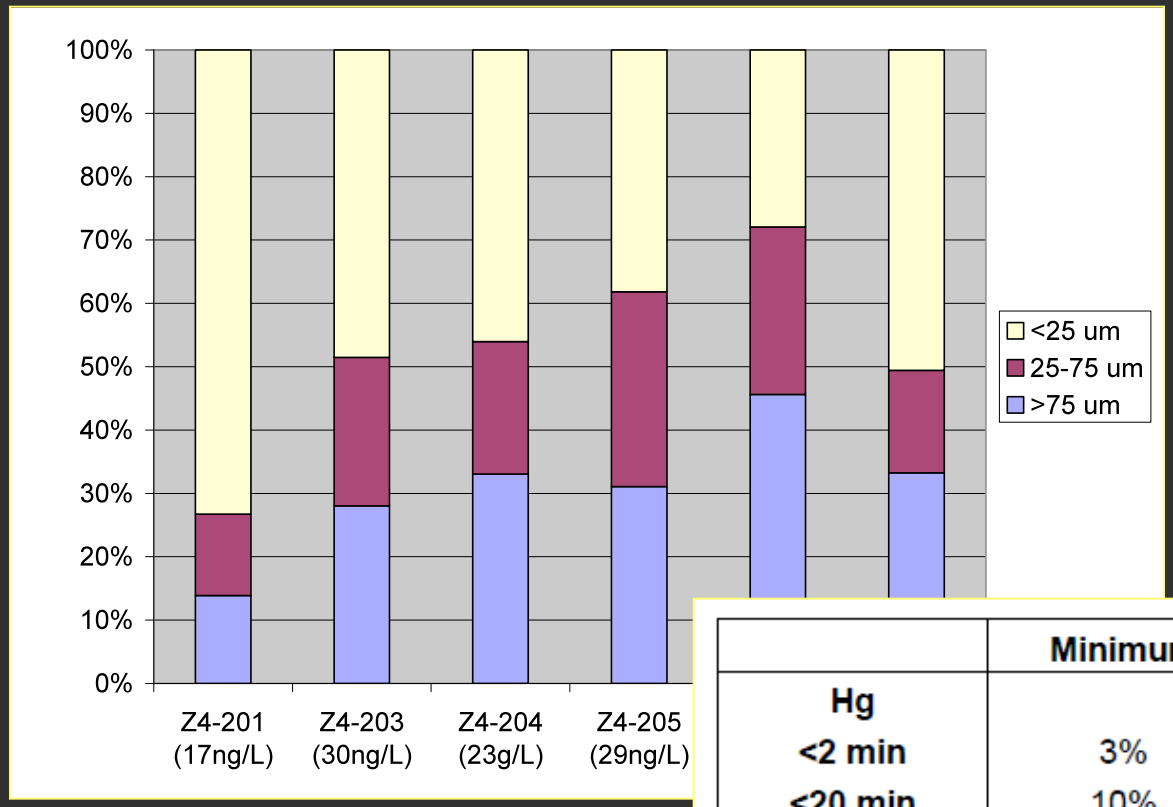


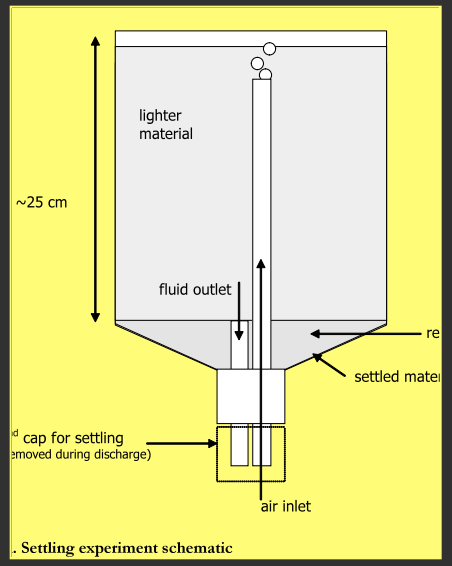
Tracking and abating: Institutional controls?

- Changes to laws
- Clean up of illicit waste dumps
- Industrial inspection and education programs
- Clean up of contaminated sites
  - Enforcement actions
  - Volunteer
- Building demolition and remodeling
  - Public buildings
  - Private

- Caulking
- Light ballast
- Wall coverings ceiling tiles
- Floor wax
- Floor finish
- Heavy electric wiring
- Lift motors
- Paint
- Appliances

Tracking and abating: Better treatment control design





	Minimum	Maximum	Average
Hg			
<2 min	3%	12%	7%
<20 min	10%	28%	17%
PCB			
<2 min	14%	46%	31%
<20 min	27%	72%	53%

Take home messages

- Sediment information is improving and remains the basis for estimation and tracking contaminants
- Sediment grainsize influences the quality of the sediment resource and our ability to manage contamination
- Monitoring takes different tools and effort and each watershed scale
- Hg is found on small particles and in dissolved phase under lower flow conditions
- Source control shows promise for PCBs (and Hg) - treatment control may be more suitable for PCBs

Next steps

2011

1. Watershed loads reconnaissance study
   - Pick 16 watersheds
     - Distributed amongst the county programs
     - Old industrial areas
     - Imperviousness
2. Complete a literature review and EMC based spreadsheet model

2012

3. Resume loads monitoring a selected watersheds
4. Further EMC model development

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  - Regional Monitoring Program for Water Quality in SF Bay (RMP)
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