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MEMORANDUM

11-21-13

To: RMP Technical Review Committee
From: Jay Davis and Meg Sedlak, SFEI
Subject: Proposed Revisions to RMP Status and Trends Monitoring: Part 1 - Reducing Open Bay Monitoring

The following tables outline a draft plan for modifying the sampling design of RMP Status and Trends monitoring. The overall approach was to explicitly connect monitoring elements to use of the monitoring data in decision-making. An earlier draft of the tables was discussed with Water Board staff, so they do reflect, to a large degree but probably not completely, Water Board views. The net effect of the proposed changes would be to greatly reduce the cost of S&T monitoring in the open Bay. This would sharpen the focus of the RMP on data that actually are used in decision-making, and free up resources for new priorities such as monitoring on the Bay margins. Attention will shift to new priorities after we reach agreement on what can be trimmed back.

Table 1 explicitly summarizes how data for each analyte are used in decision-making and provides some detail on how they are used.

Table 2 translates that into a monitoring frequency for each analyte in each matrix.

Then a set of tables is presented that translates Table 2 into specific monitoring plans for each analyte in each matrix. This is all draft material - we're hoping it provides a good start to the discussion.

For the vast majority of these analyte/matrix combinations, power analysis is not a driver of the sampling design. In some cases (e.g., methylmercury and PCBs in sport fish) past monitoring has shown trends to be very slow to nonexistent, so power is a moot point. In most cases the monitoring is driven by the need for a regulatory check-in (e.g., water monitoring to address CTR compliance and RPA, sediment monitoring for dredged material management). There are two areas where power analysis may help refine the design. Copper in water and PAHs in bivalves. We will try to provide these analyses at the TRC meeting on December 12.

Also attached are some trend graphs for selected constituents in water and sediment. We will develop more of these to support the discussion on December 12. It should be noted in looking at the sediment PCB plots that EBMUD has determined that the anomalously low values in 2005 and 2006 were due to a less effective extraction procedure used in those years. We will also discuss this on December 12.

Table 1. Metrics explicitly used in regulatory decision-making (blue) and others that are also high priorities for consideration in decision-making.

	Sport Fish					Bird Eggs			Bivalves			Water						Sediment (Open Bay)					
	Baywide Comparison to Objective	Segment Comparison to Objective	Baywide Long-term Trend	Segment Long-term Trend	Site Long-term Trend	Baywide Long-term Trend	Segment Long-term Trend	Site Long-term Trend	Baywide Long-term Trend	Segment Long-term Trend	Site Long-term Trend	Baywide Comparison to Objective	Segment Comparison to Objective or Trigger	Baywide Long-term Trend	Segment Long-term Trend	Reasonable Potential Analysis	(Comparison of Pathway to Ambient)	Baywide Comparison to Objective	Segment Comparison to Objective	Baywide Long-term Trend	Segment Long-term Trend	Dredged Material Testing Thresholds	(Comparison of Pathway Particles to Ambient)
Methylmercury	X		X			X	X	X															
Mercury																				x	x	X	
PCBs	X		X		x	x	x	x												x	x	X	
Selenium	X		X			x	x	x	?	?	?	X	X	X	X								
Copper													X		X					x	x		
PAHs									x	x	x	X				X				x	x	X	
DDTs			x		x							X				X						X	
Chlordanes			x		x							X				X						X	
Dieldrin			x		x							X				X						X	
Dioxins and Furans			x		x	x	x	x				X				X						X	
Toxicity												X	X					X	X	X	X		
Benthos																		X	X	X	X		
Other CTR Pollutants												X				X							
Cyanide												X				X							
CECs						x	x	x	x	x	x			x	x		x			x	x		x
PBDEs						x	x	x	x	x	x									x	x		
PFOS						x	x	x												x	x		
Current Use Pesticides														x	x		x						x
Fipronil														x	x								
Ammonia												X				X							
Other Metals												X				X							
Nonylphenol									x	x				x	x					x	x		

Table 2. Monitoring frequency for analytes in the existing Status and Trends program.
A=every round, B=mid-level, C=minimal screening (e.g., every 8 yr at 3 sites for water)

	Sport Fish	Bird Eggs	Bivalves (reduced number of sites?)	Water	Sediment - Open Bay
Methylmercury	A	A		?	C
Mercury	A	A		C	C
PCBs	A	A		C	C
Selenium	A	A	?	A	C
Copper				A	C
PAHs			A	C	B
DDTs				C	C
Chlordanes				C	C
Dieldrin				C	C
Dioxins and Furans	A	A		C	C
Toxicity				B	C
Benthos (dry only)					C
Other CTR Pollutants				C	
Cyanide				C	
CECs		B	C	B	B
PBDEs	A*	A*	A*		B*
PFOS	A	A			B
Current Use Pesticides				B	
Fipronil				A	
Ammonia				A	
Other Metals				A	C
Nonylphenol			A*	A*	B*

* Continue for a limited period to track expected decline.

RMP STATUS AND TRENDS MONITORING PLAN - DRAFT 11-21-13

WATER

Analyte	Old Design	New Design	Uses of data in decision-making
Methylmercury	2 yr, 17 random, 5 historic	2 yr, 17 random, 5 historic	Possible value in mechanistic understanding of food web trends
Mercury	2 yr, 17 random, 5 historic	10 yr, 17 random, 5 historic	CTR, TMDL (long-term trend)
PCBs	4 yr, 17 random, 5 historic	10 yr, 17 random, 5 historic	CTR, TMDL (long-term trend)
Selenium	2 yr, 17 random, 5 historic	2 yr, 17 random, 5 historic	Comparison to objective
Copper	2 yr, 17 random, 5 historic	2 yr, 17 random, 5 historic	Comparison to site-specific triggers and objectives, segment-specific (power analysis needed)
PAHs	4 yr, 17 random, 5 historic	10 yr, 17 random, 5 historic	CTR, RPA, long-term trend
DDTs	4 yr, 17 random, 5 historic	10 yr, 17 random, 5 historic	CTR, RPA, long-term trend
Chlordanes	4 yr, 17 random, 5 historic	10 yr, 17 random, 5 historic	CTR, RPA, long-term trend
Dieldrin	4 yr, 17 random, 5 historic	10 yr, 17 random, 5 historic	CTR, RPA, long-term trend
Dioxins and Furans	10 yr, 3 historic	10 yr, 3 historic	CTR, RPA
Toxicity	5 yr, 17 random, 5 historic	4 yr, 17 random, 5 historic	Assessment of narrative objective
Other CTR Pollutants	10 yr, 3 historic	10 yr, 3 historic	CTR, RPA
Cyanide	2 yr, 17 random, 5 historic	10 yr, 3 historic	CTR, RPA
CECs	Special studies	4 yr, 17 random, 5 historic	CEC identification and prioritization, reference for pathway monitoring
PBDEs	4 yr, 17 random, 5 historic	No monitoring	
PFOS	Special studies	No monitoring	
Current Use Pesticides	(A few) 4 yr, 17 random, 5 historic	4 yr, 17 random, 5 historic	CEC identification and prioritization, reference for pathway monitoring
Fipronil	Special studies	2 yr, 17 random, 5 historic	CEC prioritization, track trend
Nonylphenol	Special studies	2 yr, 17 random, 5 historic	CEC prioritization, document expected decline
Ammonia	2 yr, 17 random, 5 historic	2 yr, 17 random, 5 historic	RPA, comparison to objectives
Other Metals	2 yr, 17 random, 5 historic	2 yr, 17 random, 5 historic	None - (these come along with copper analysis)
Ancillary Parameters	2 yr, 17 random, 5 historic	2 yr, 17 random, 5 historic	Interpretation of target analytes

SEDIMENT (OPEN BAY)

Analyte	Old Design	New Design	Uses of data in decision-making
Methyl-mercury	2 yr; Dry - 40 random, 7 historic; Wet - 20 random, 7 historic	8 yr; Dry - 40 random, 7 historic	TMDL (long-term trend)
Mercury	2 yr; Dry - 40 random, 7 historic; Wet - 20 random, 7 historic	8 yr; Dry - 40 random, 7 historic	TMDL (long-term trend), dredged material management
PCBs	4 yr; Dry - 40 random, 7 historic; Wet - 20 random, 7 historic	8 yr; Dry - 40 random, 7 historic	TMDL (long-term trend) , dredged material management
Selenium	2 yr; Dry - 40 random, 7 historic; Wet - 20 random, 7 historic	8 yr; Dry - 40 random, 7 historic	TMDL (long-term trend)
Copper	2 yr; Dry - 40 random, 7 historic; Wet - 20 random, 7 historic	8 yr; Dry - 40 random, 7 historic	Long-term trend
PAHs	4 yr; Dry - 40 random, 7 historic; Wet - 20 random, 7 historic	4 yr; Dry - 40 random, 7 historic	Dredged material management, long-term trend
DDTs	4 yr; Dry - 40 random, 7 historic; Wet - 20 random, 7 historic	8 yr; Dry - 40 random, 7 historic	Dredged material management, long-term trend
Chlordanes	4 yr; Dry - 40 random, 7 historic; Wet - 20 random, 7 historic	8 yr; Dry - 40 random, 7 historic	Dredged material management, long-term trend
Dieldrin	4 yr; Dry - 40 random, 7 historic; Wet - 20 random, 7 historic	8 yr; Dry - 40 random, 7 historic	Dredged material management, long-term trend
Dioxins and Furans	Special study	8 yr; Dry - 40 random, 7 historic	Dredged material management, long-term trend
Toxicity	2 yr; Dry - 40 random, 7 historic; Wet - 20 random, 7 historic	8 yr; Dry - 40 random, 7 historic	Comparison to SQO
Benthos	2 yr; Dry - 40 random, 7 historic; Wet - 20 random, 7 historic	8 yr; Dry - 40 random, 7 historic	Comparison to SQO
CECs	Special studies	4 yr; Dry - 40 random, 7 historic	CEC identification and prioritization
PBDEs	4 yr; Dry - 40 random, 7 historic; Wet - 20 random, 7 historic	4 yr; Dry - 40 random, 7 historic	Long-term trend (effectiveness of bans, especially for deca)
PFOS	Special studies	4 yr; Dry - 40 random, 7 historic	Long-term trend, mechanistic understanding of bioaccumulation
Current Use Pesticides	Special studies	None - focus on margins	
Fipronil	Special studies	None - focus on margins	
Nonyl-phenol	Special studies	4 yr; Dry - 40 random, 7 historic	CEC prioritization, track expected decline
Other Metals	2 yr; Dry - 40 random, 7 historic; Wet - 20 random, 7 historic	8 yr; Dry - 40 random, 7 historic	None - but they're free

SPORT FISH

Analyte	Old Design	New Design	Uses of data in decision-making
Methyl-mercury (Mercury)	5 yr	Same	TMDL target: assess impairment, long-term trend
PCBs	5 yr	Same	TMDL target: assess impairment, long-term trend
Selenium	5 yr	Same	TMDL target: assess impairment, long-term trend
DDTs	5 yr	None	None
Chlordanes	5 yr	None	None
Dieldrin	5 yr	None	None
Dioxins and Furans	5 yr, surfperch and croaker	Same	Long-term trend
PBDEs	5 yr	One more round, shiner surfperch	Long-term trend, effectiveness of bans
PFOS	5 yr	Same	Impairment assessment, long-term trend

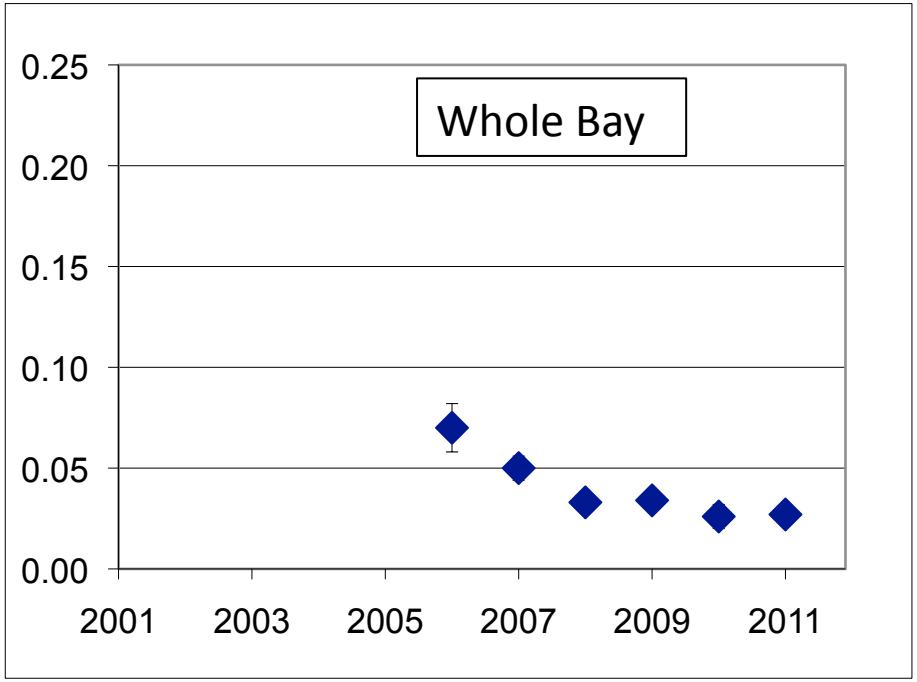
BIRD EGGS

Analyte	Old Design	New Design	Uses of data in decision-making
Methyl-mercury (Mercury)	3 yr, cormorants and terns	Same	TMDL monitoring target, long-term trend
PCBs	3 yr, cormorants	Same	Long-term trend
Selenium	3 yr, cormorants and terns	Same	Long-term trend
DDTs	3 yr, cormorants	None	
Chlordanes	3 yr, cormorants	None	
Dieldrin	3 yr, cormorants	None	
Dioxins and Furans	3 yr, cormorants	Same	Long-term trend
CECs	Special studies	Same	CEC prioritization and identification
PBDEs	3 yr, cormorants and terns	Same (one more round)	Long-term trend
PFOS	3 yr, cormorants	Same	Impairment indicator, long-term trend
Nonyl-phenol	Special studies	None	

BIVALVES

Analyte	Old Design	New Design	Uses of data in decision-making
PCBs	2 yr, 11 sites	8 yr, 6 sites	Long-term trend (infrequent check-in)
Selenium	None	?? consider support for Robin Stewart	Long-term trend
PAHs	2 yr, 11 sites	2 yr, 6 sites (power analysis could help)	Best food web indicator, long-term trend
DDTs	2 yr, 11 sites	None	
Chlordanes	2 yr, 11 sites	None	
Dieldrin	2 yr, 11 sites	None	
CECs	Special studies	10 yr, 6 sites (broad screening)	CEC prioritization and identification
PBDEs	2 yr, 11 sites	2 yr, 6 sites	Long-term trend (confirmation of decline)
Nonyl-phenol	Special studies	2 yr, 6 sites	Long-term trend (tracking effect of CARB use restriction)

Water MeHg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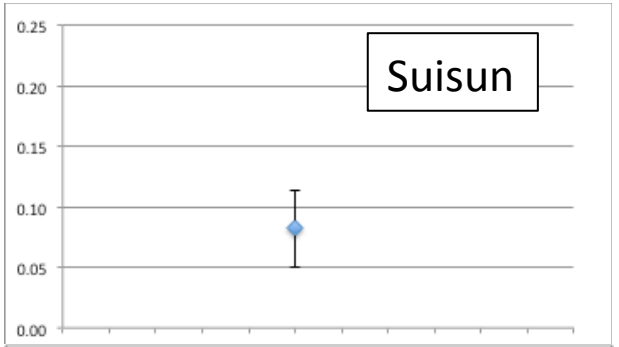
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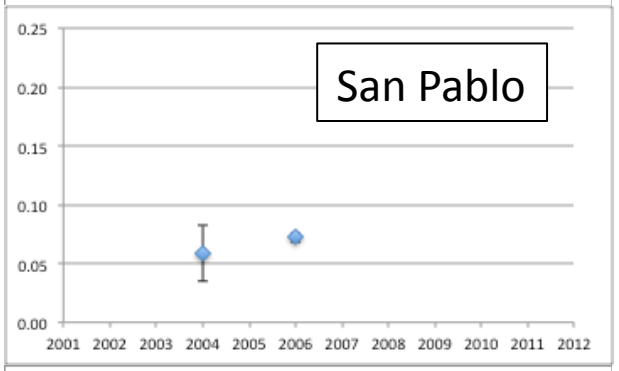
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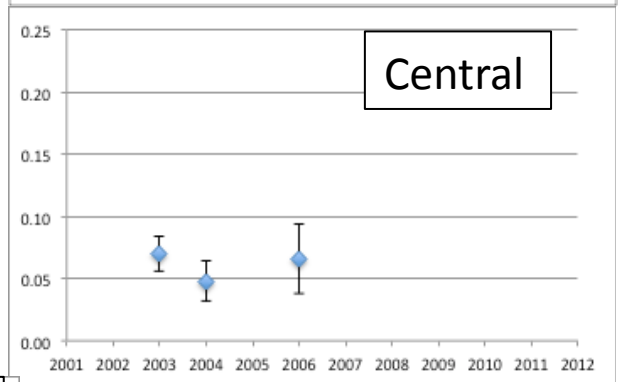
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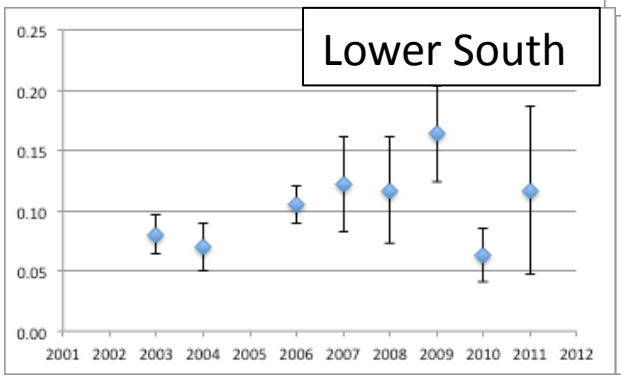
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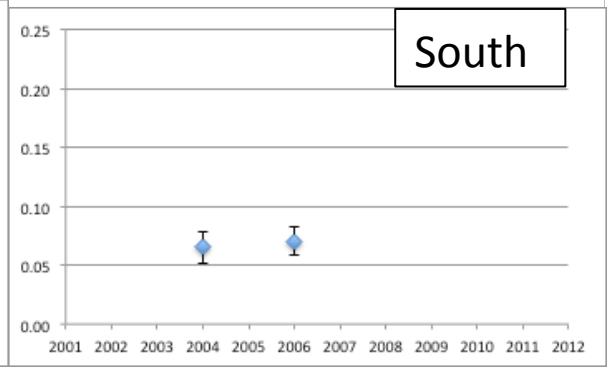
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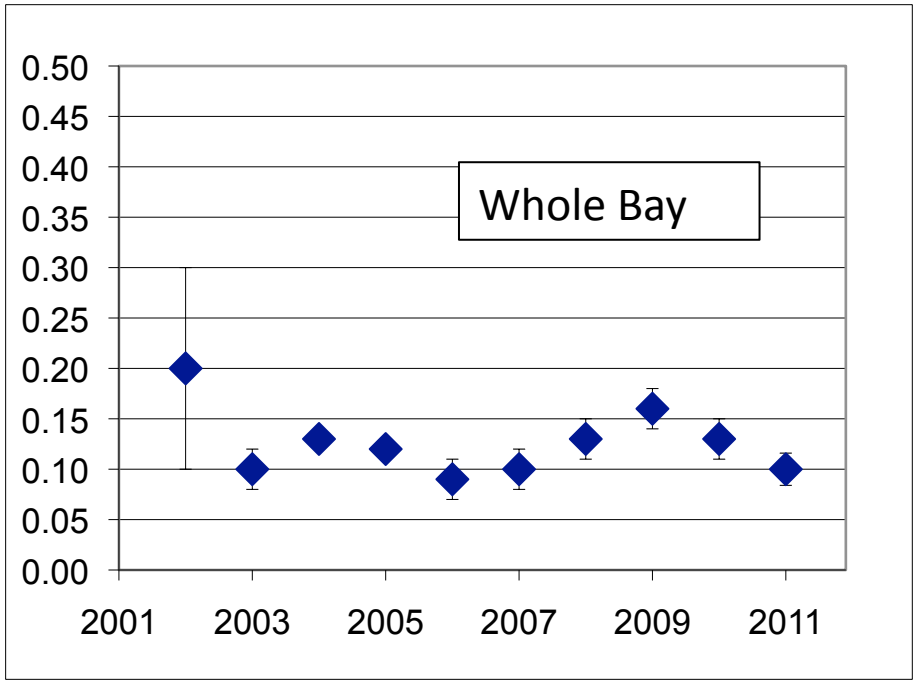
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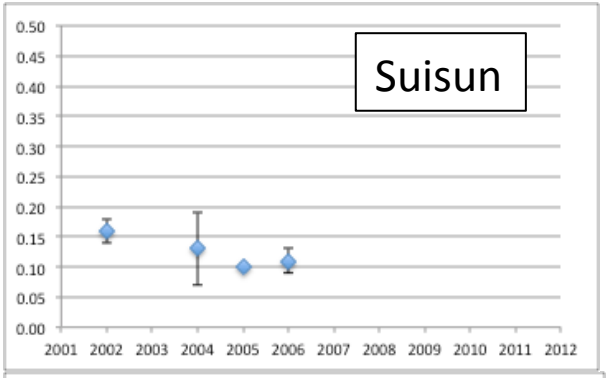
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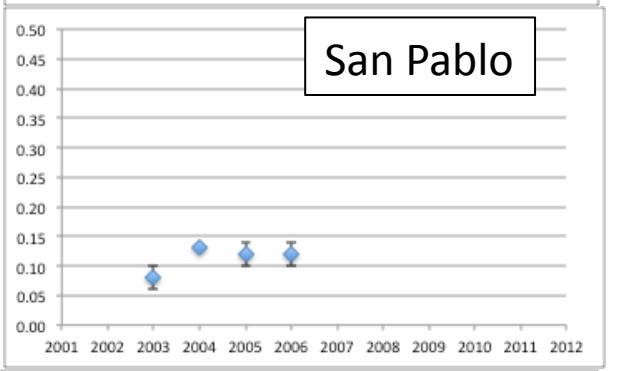
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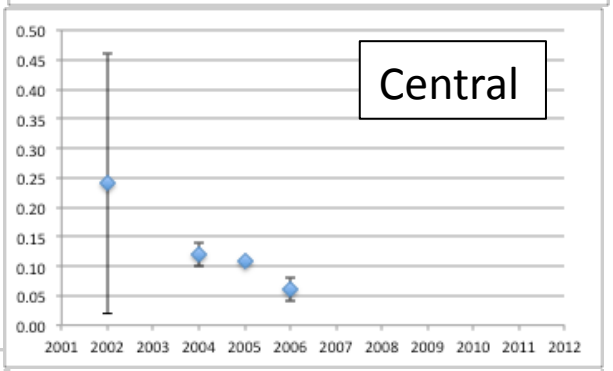
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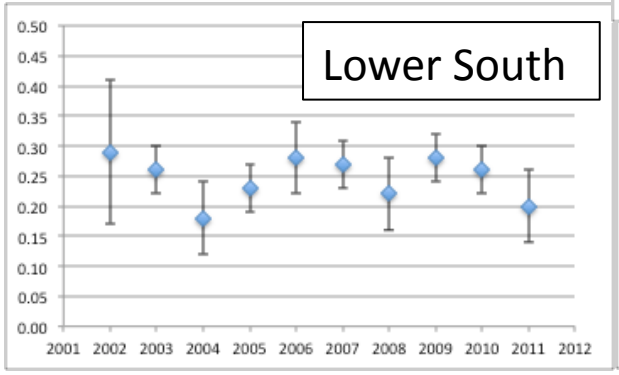
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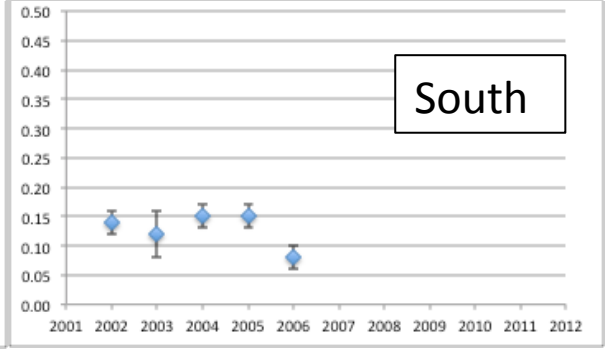
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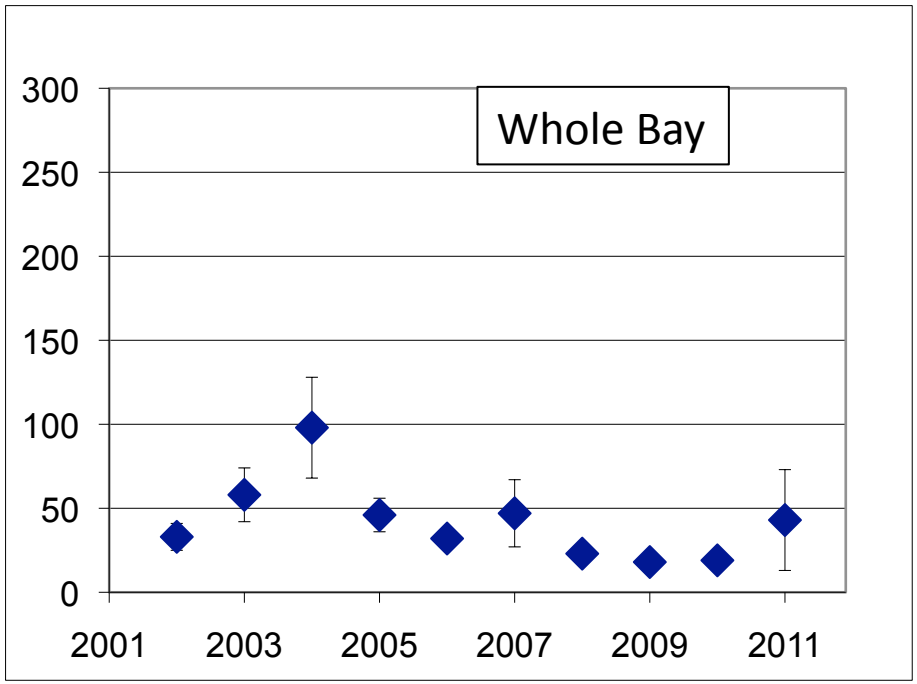
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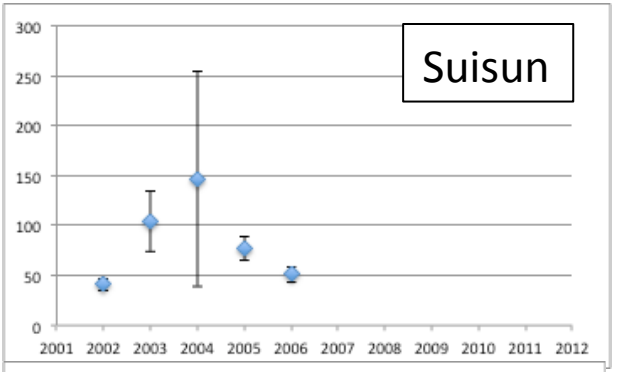
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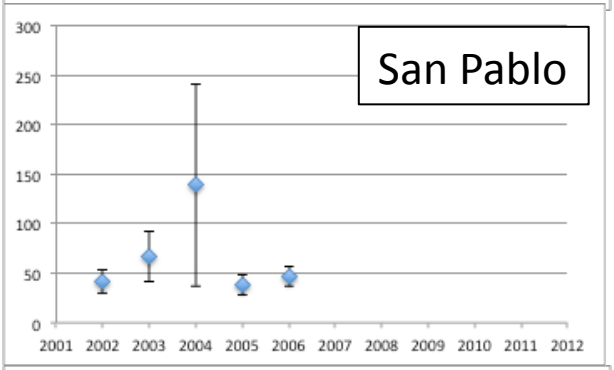
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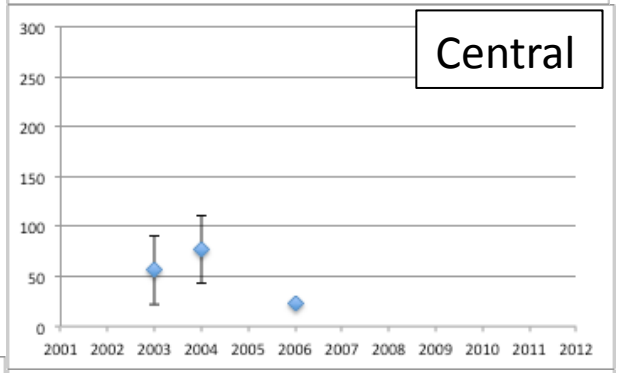
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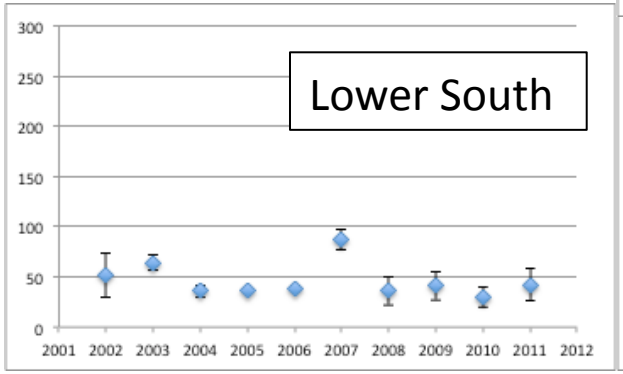
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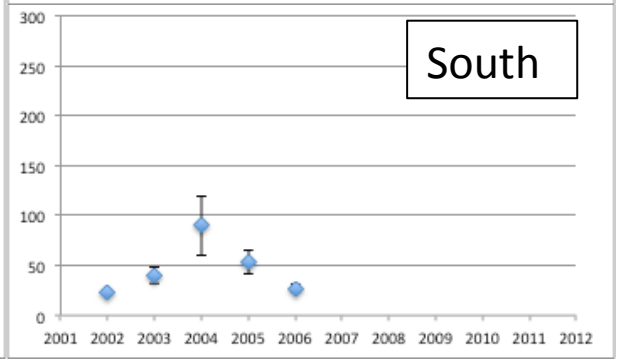
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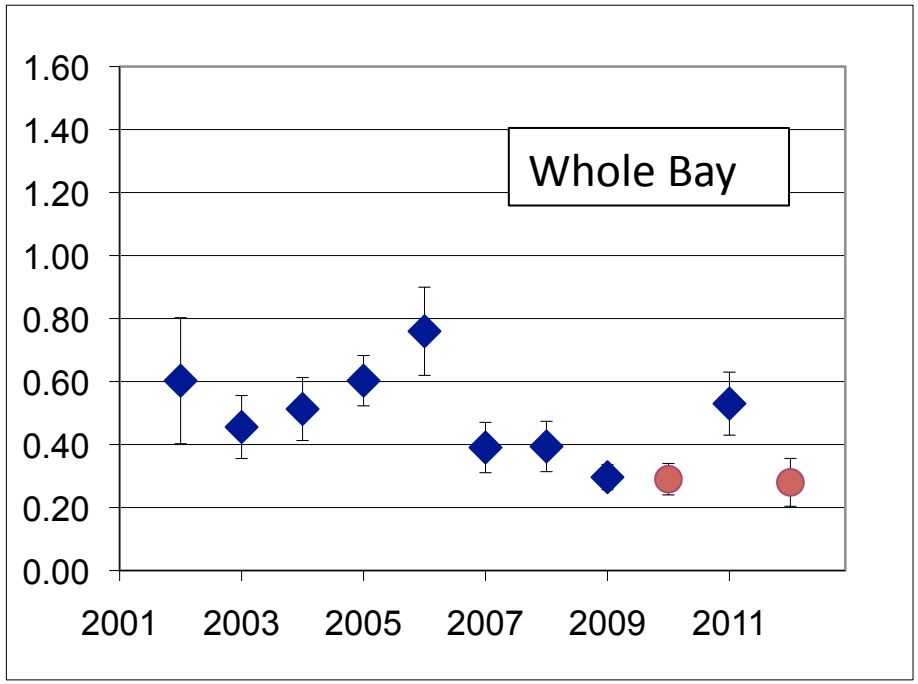
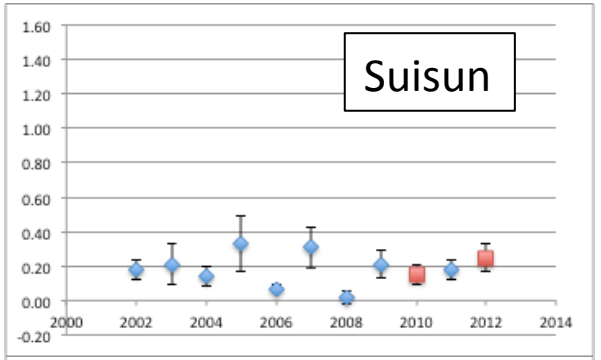
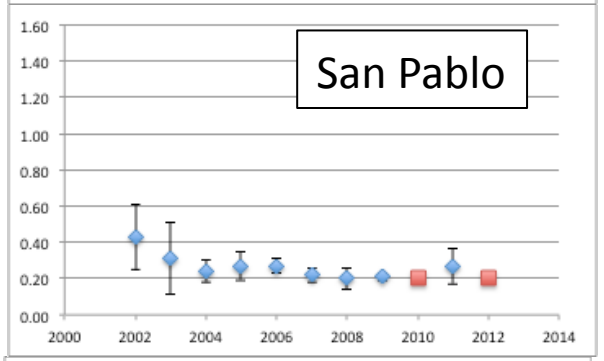
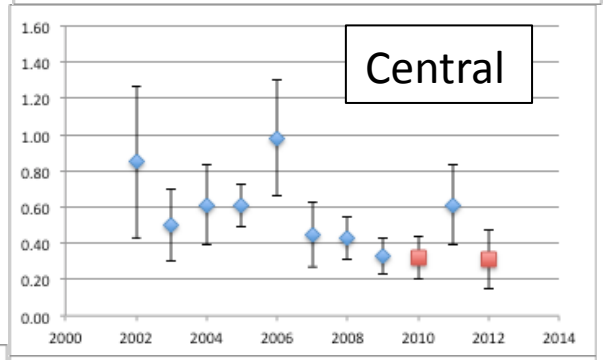
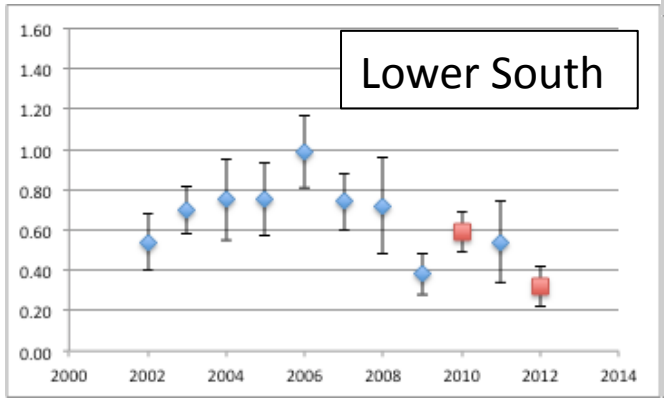
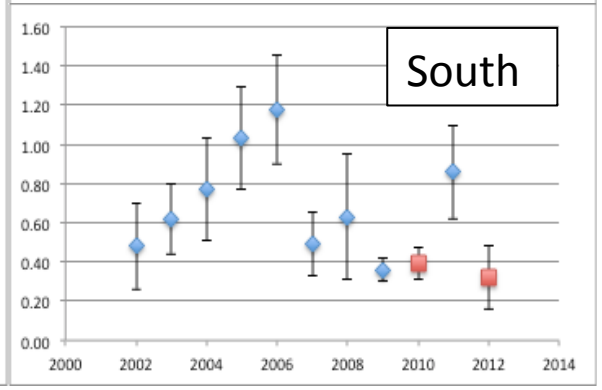






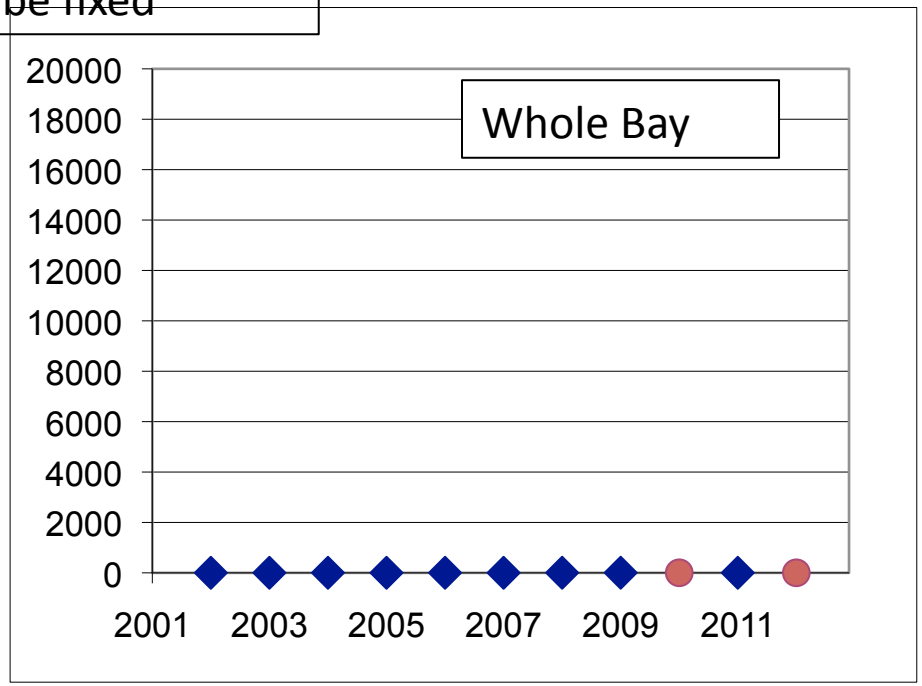


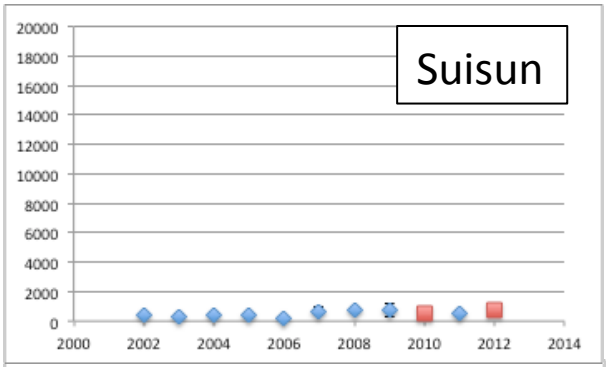


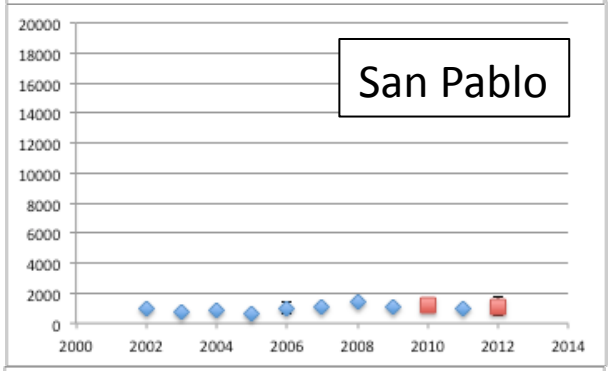


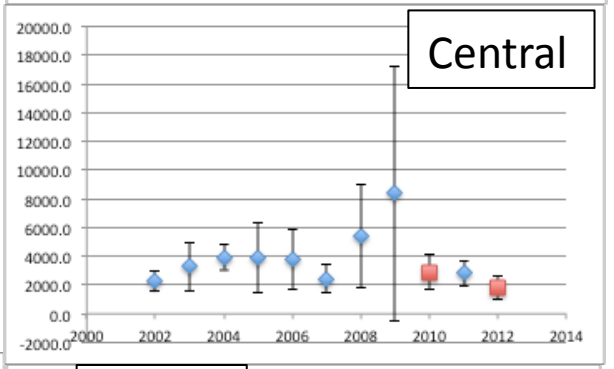
Sediment PAHs

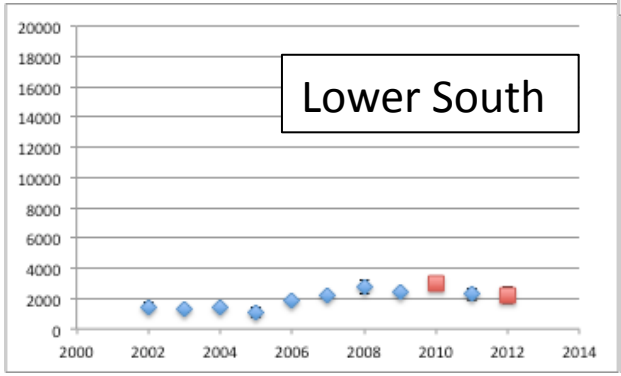
Whole Bay graph to be fixed

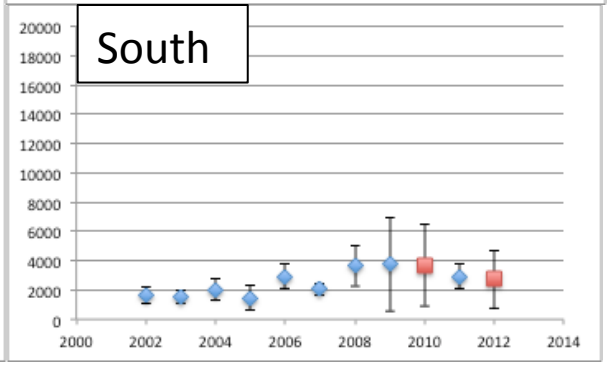




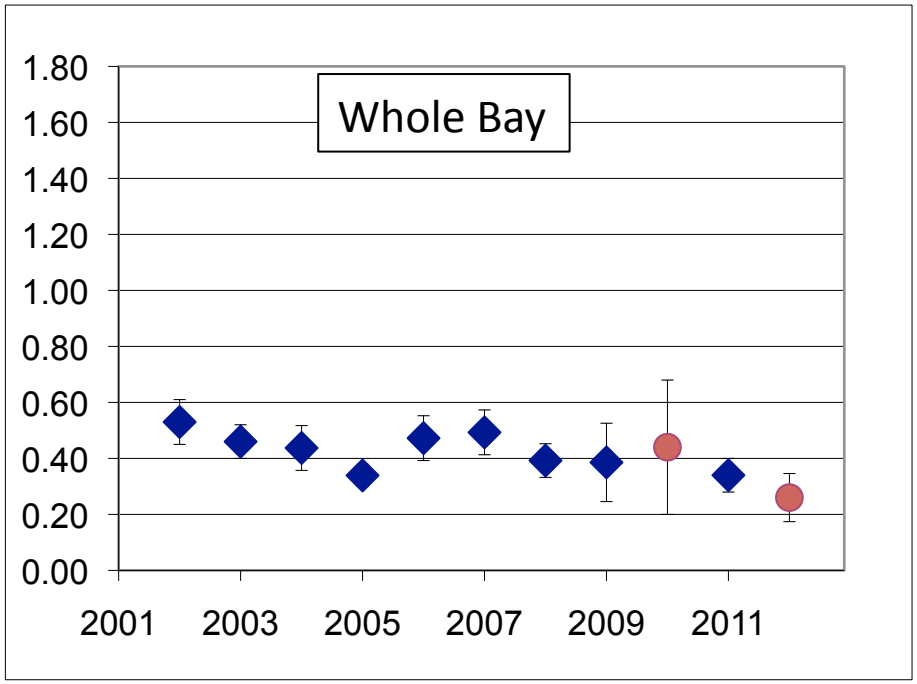


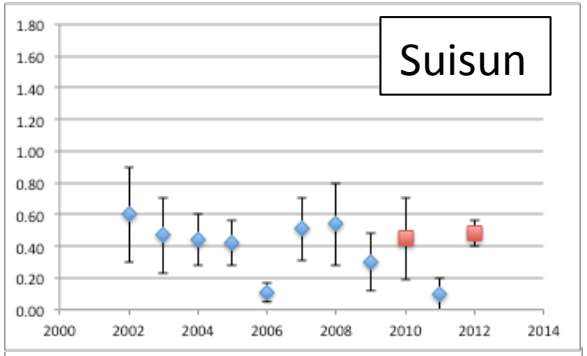


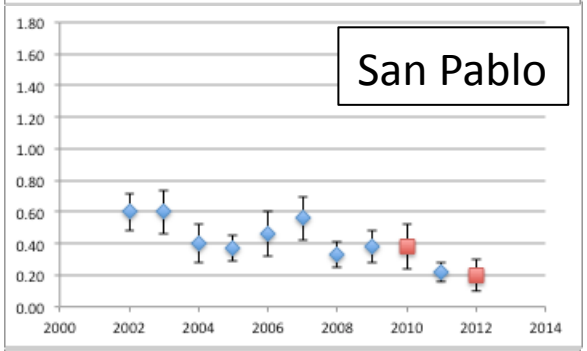


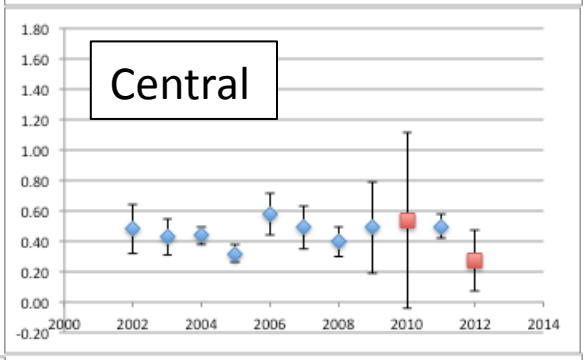


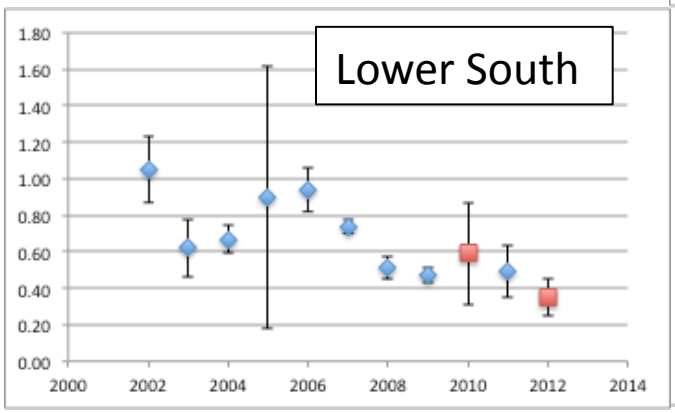
Sediment BDE47

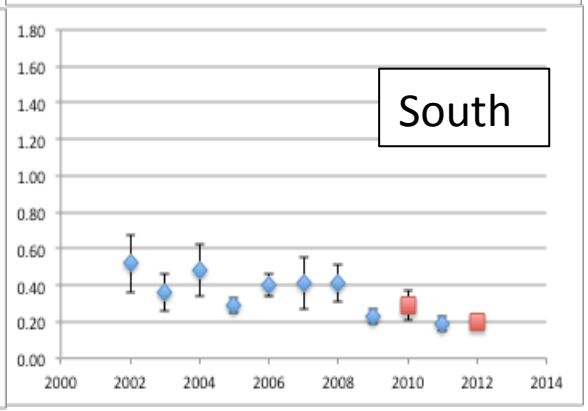




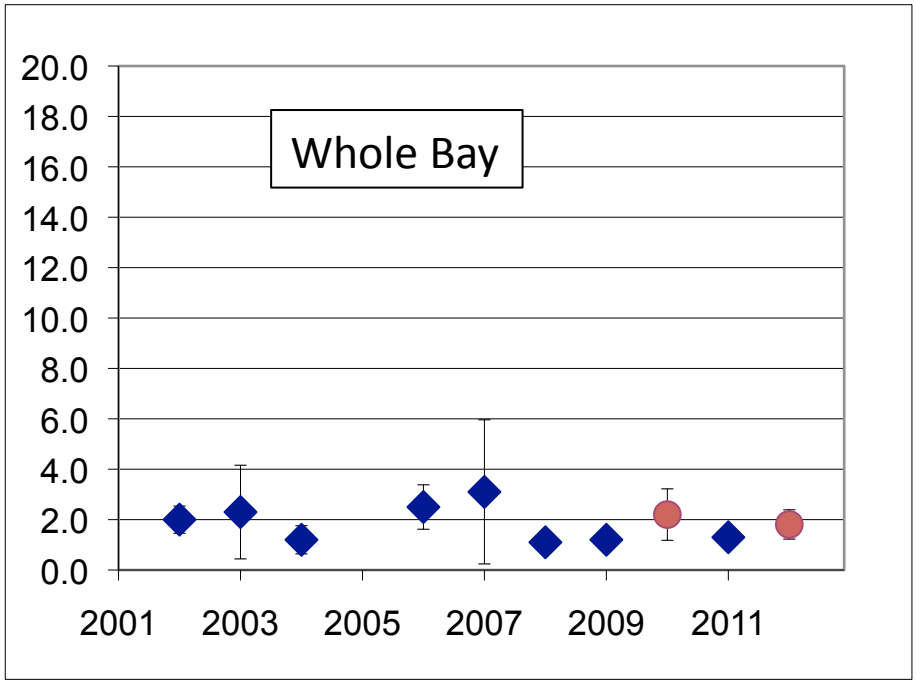


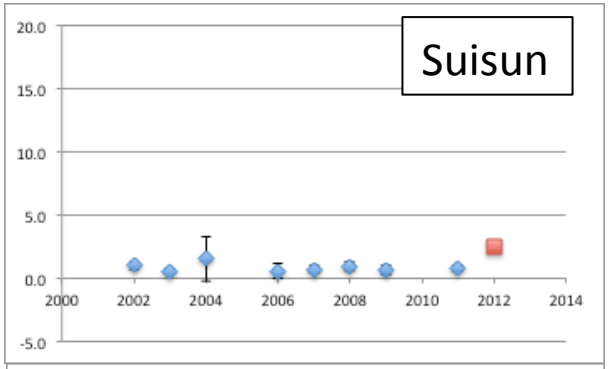


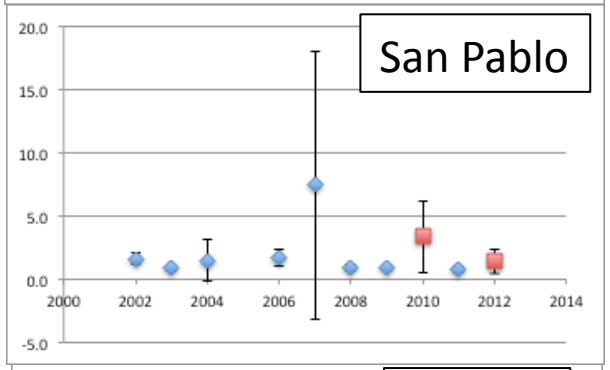


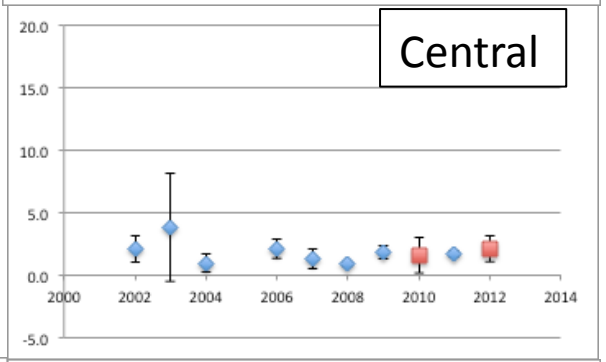


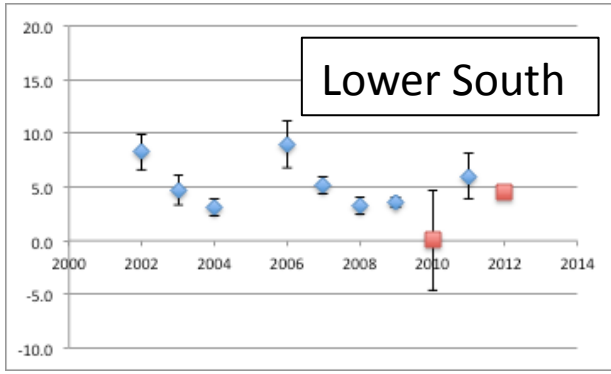
Sediment BDE209

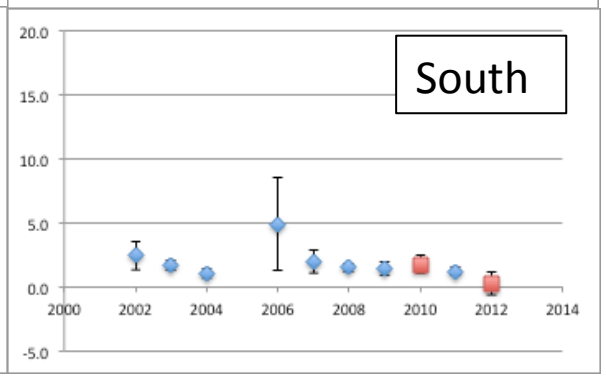




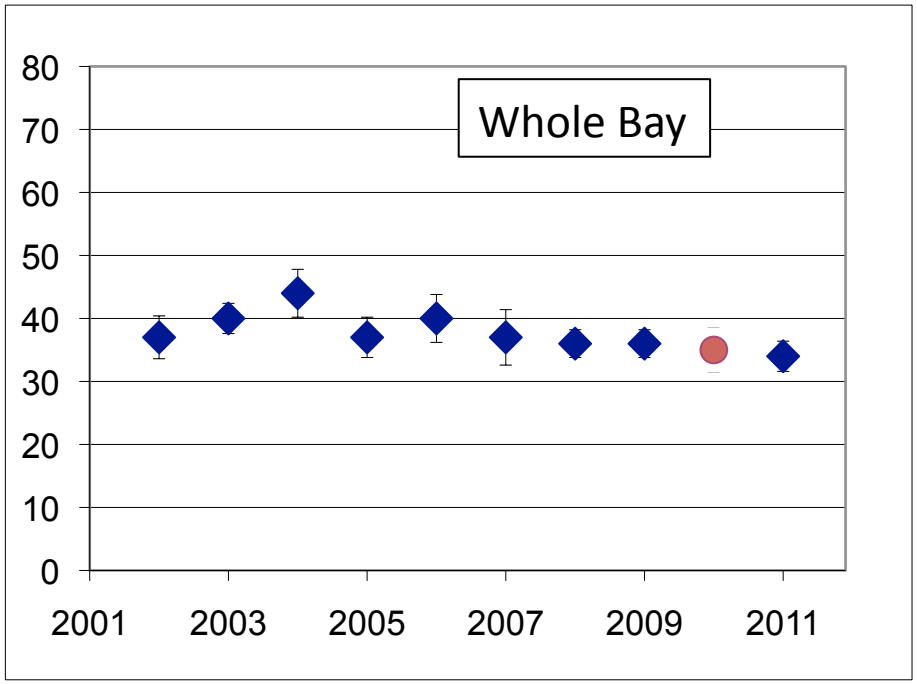


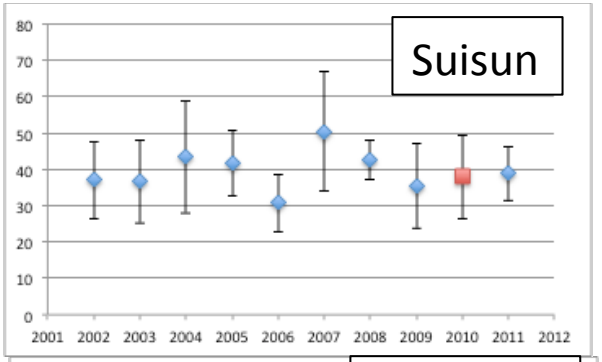


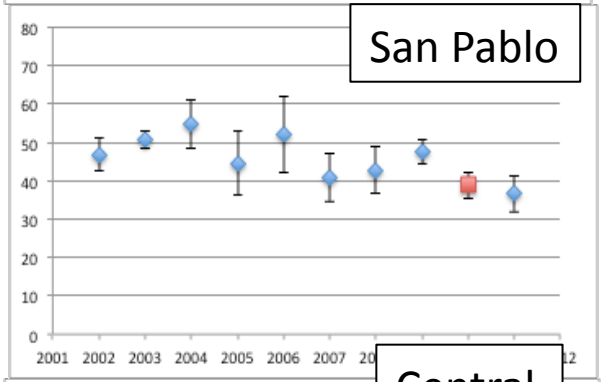


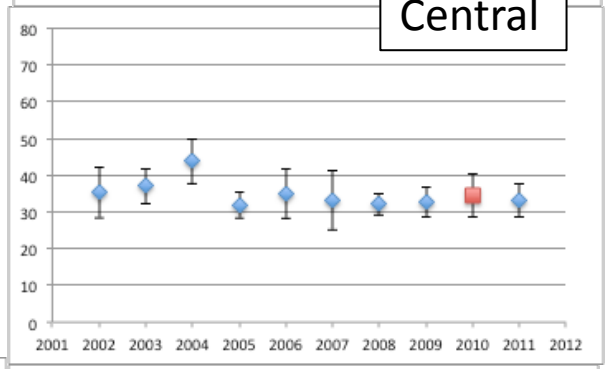


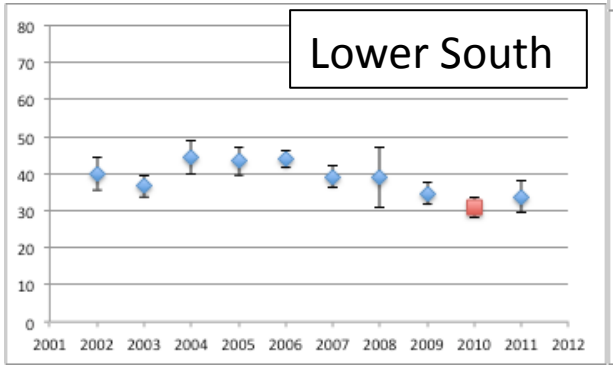
Sediment Cu

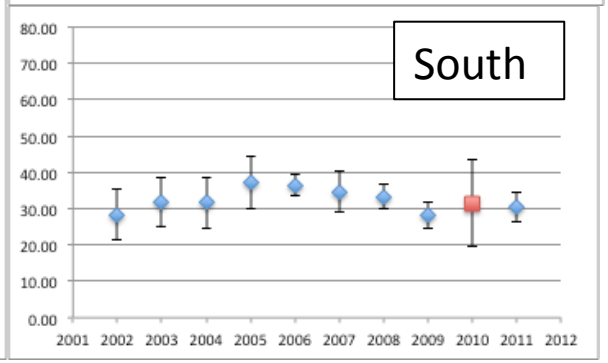

Whole Bay
80
70
60
50
40
30
20
10
0
2001
2003
2005
2007
2009
2011


Suisun
80
70
60
50
40
30
20
10
0
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012

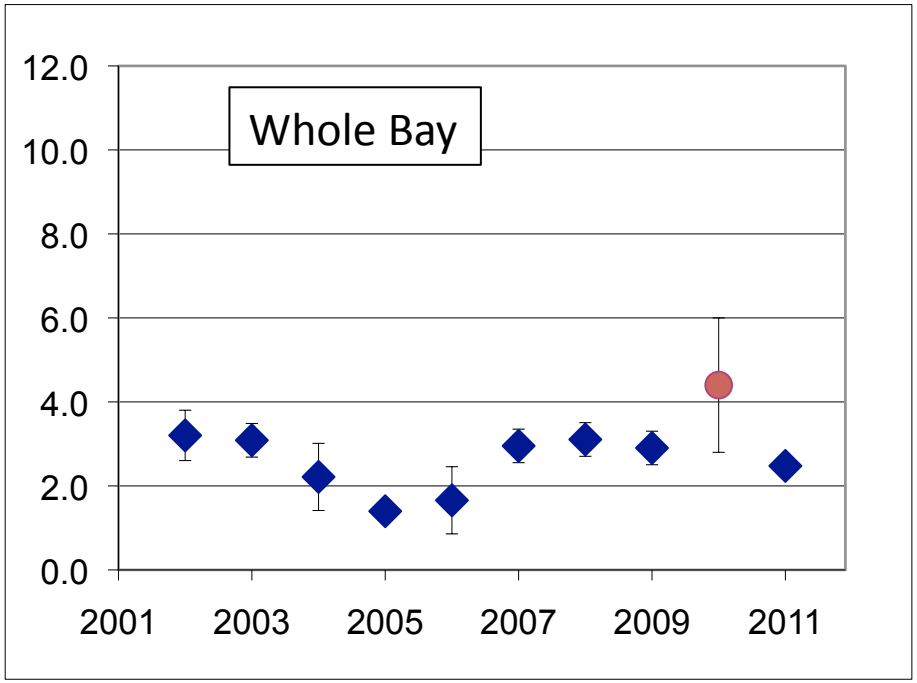

San Pablo
80
70
60
50
40
30
20
10
0
2001 2002 2003 2004 2005 2006 2007

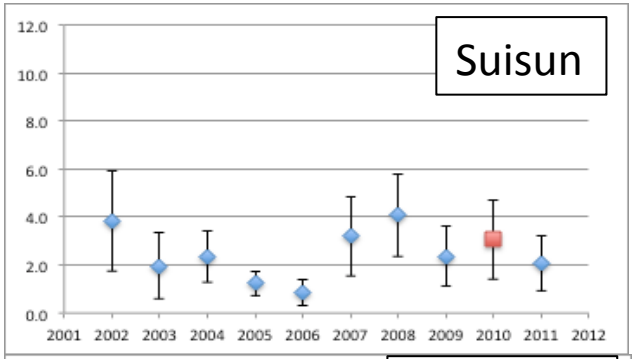

Central
80
70
60
50
40
30
20
10
0
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012

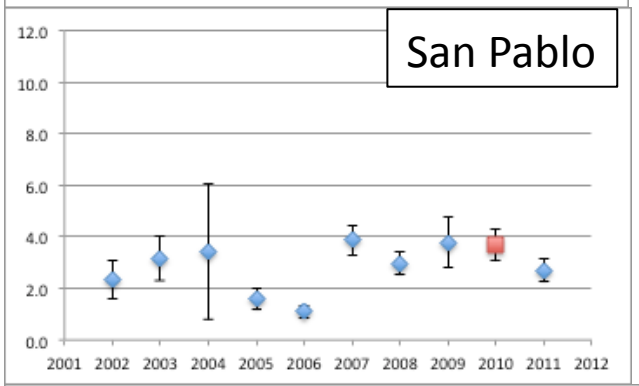

Lower South
80
70
60
50
40
30
20
10
0
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012

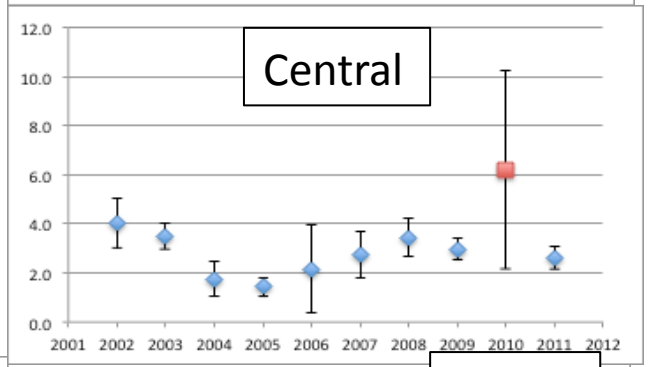

South
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012

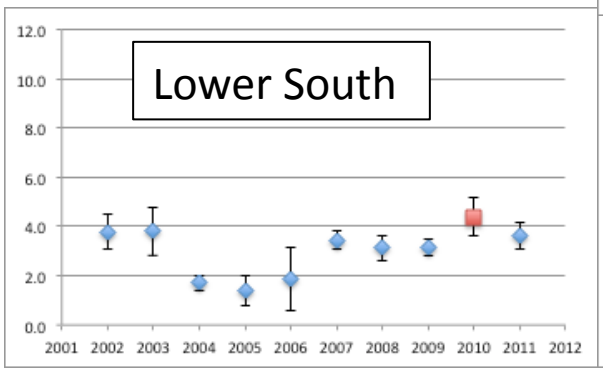
Sediment Sum of DDT

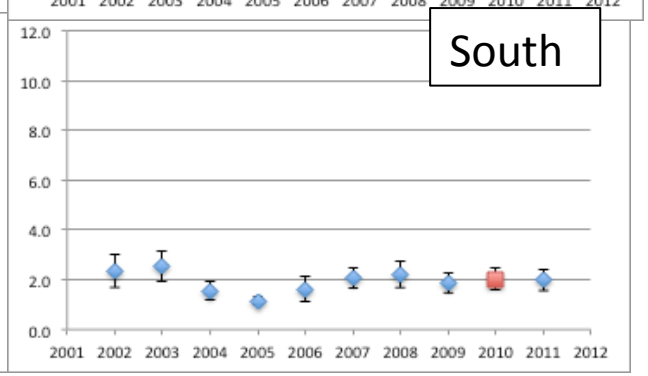




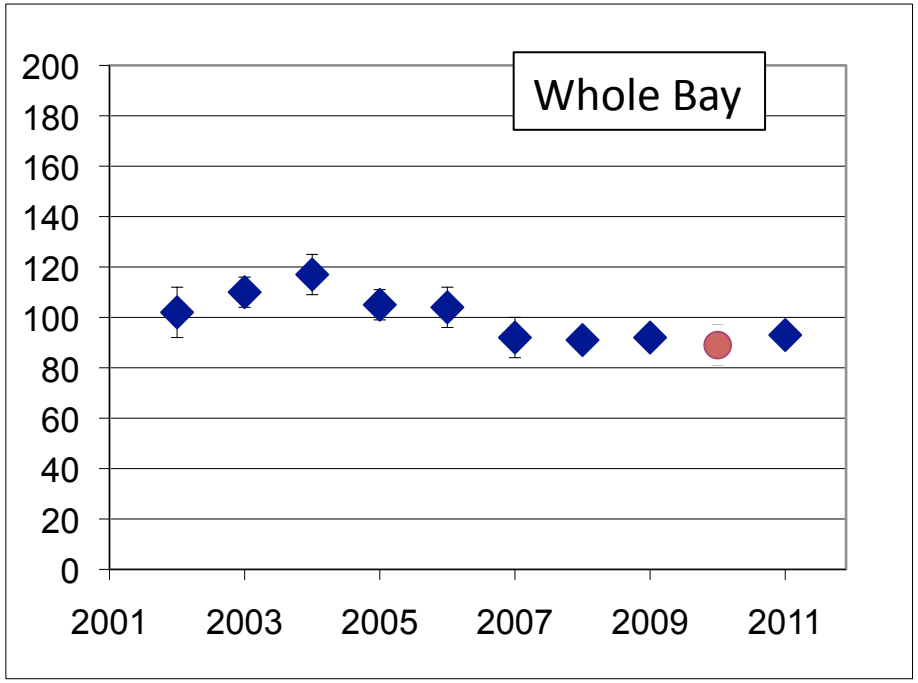


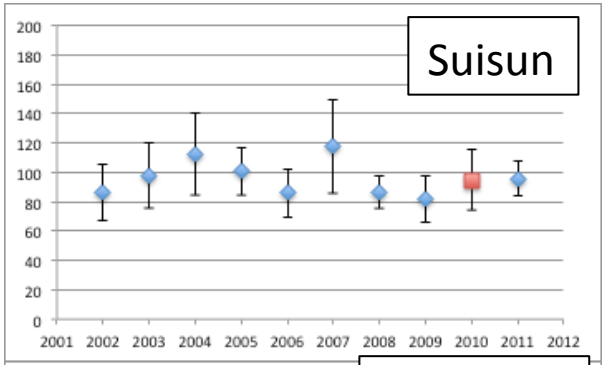


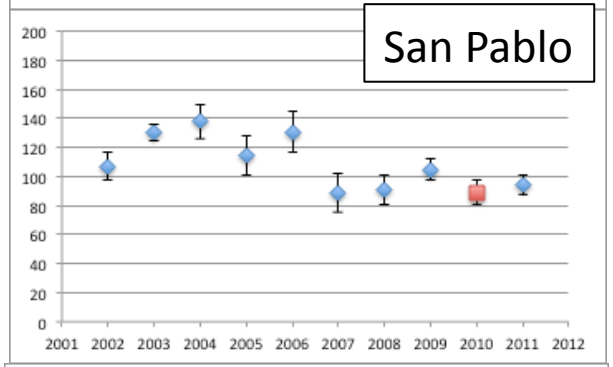


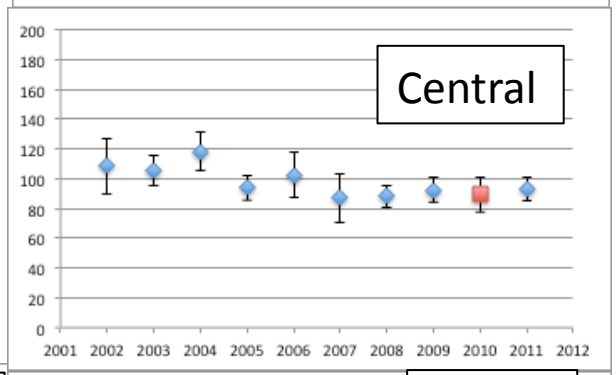


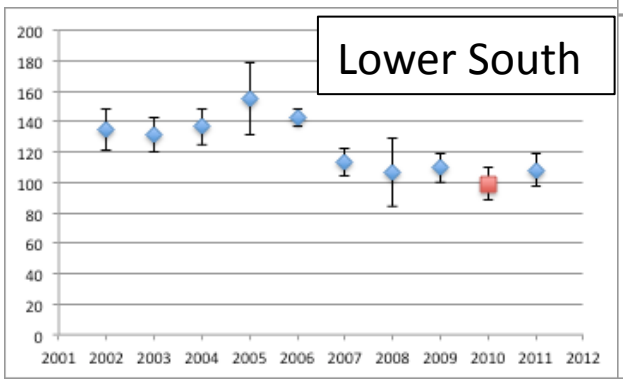
Sediment Zn

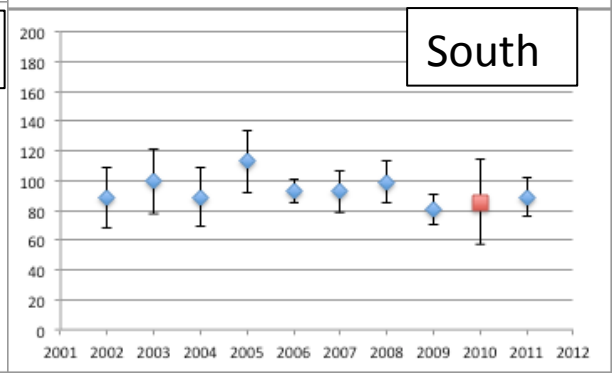

Whole Bay
200
180
160
140
120
100
80
60
40
20
0
2001
2003
2005
2007
2009
2011


Suisun
200
180
160
140
120
100
80
60
40
20
0
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012

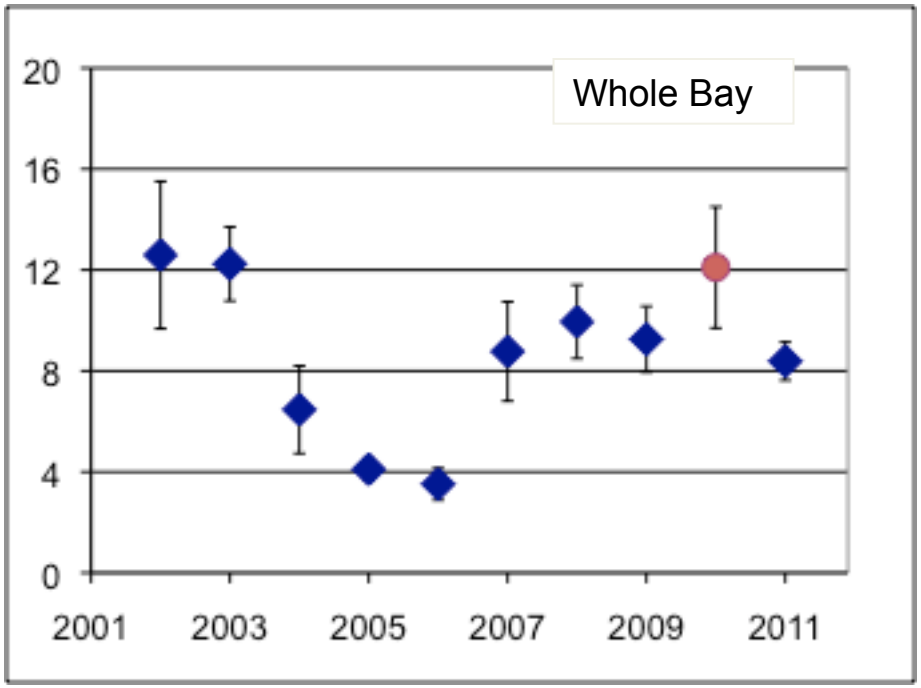

San Pablo
200
180
160
140
120
100
80
60
40
20
0
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012

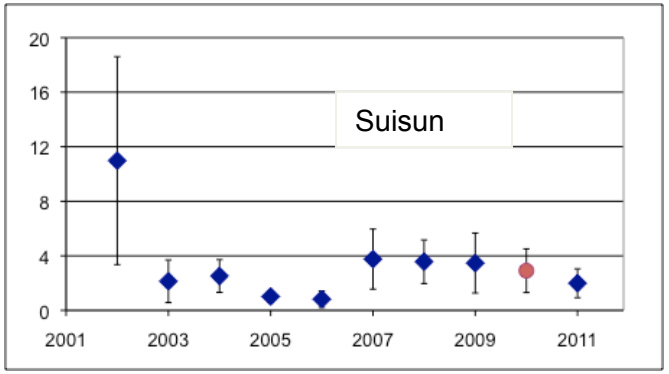

Central
200
180
160
140
120
100
80
60
40
20
0
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012

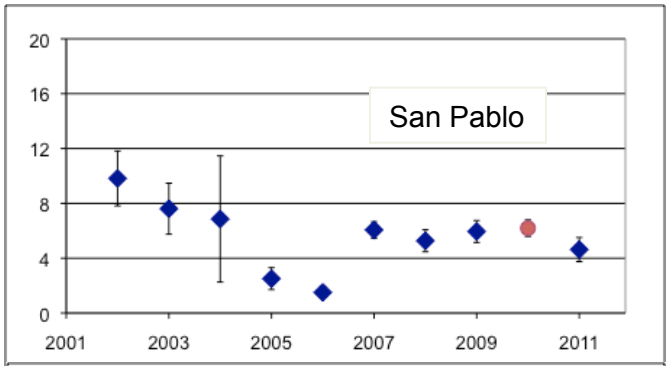

Lower South
200
180
160
140
120
100
80
60
40
20
0
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012

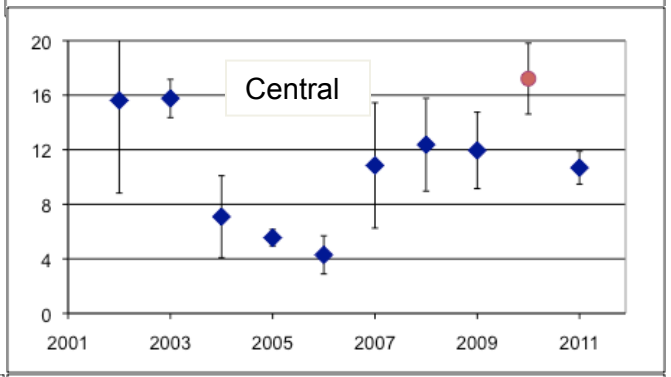

South
200
180
160
140
120
100
80
60
40
20
0
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012

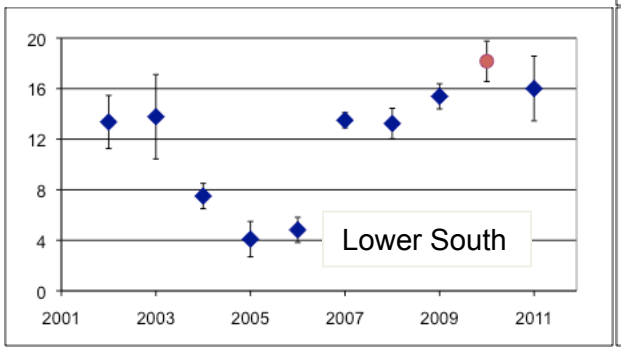
Sediment PCBs

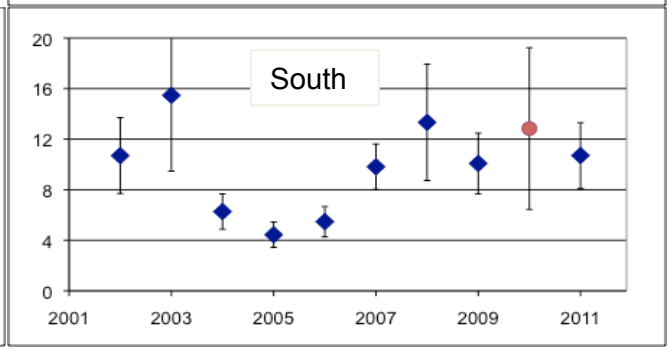




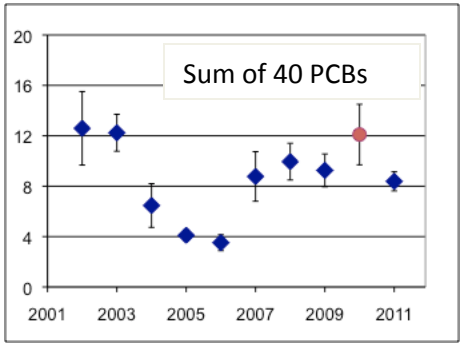


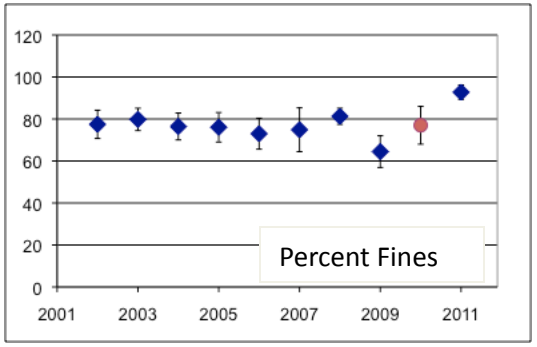


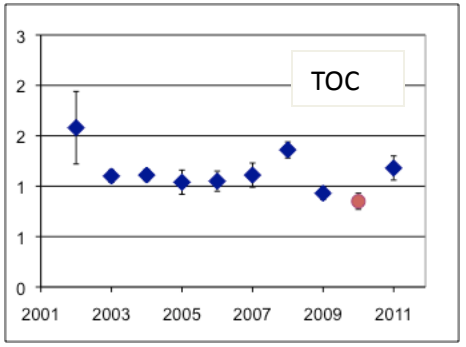


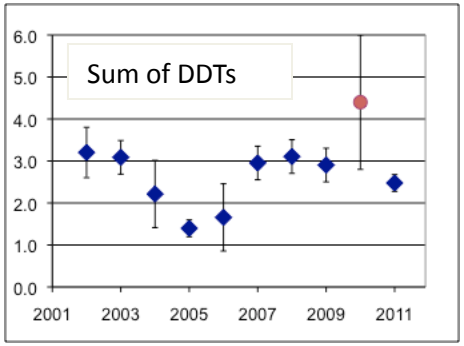


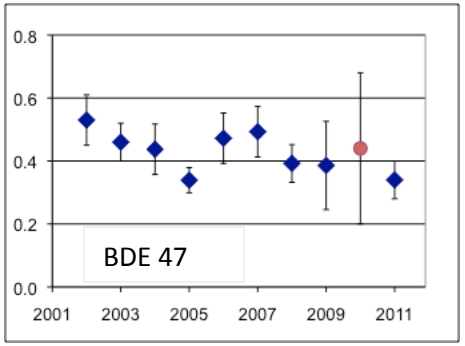
Sediment

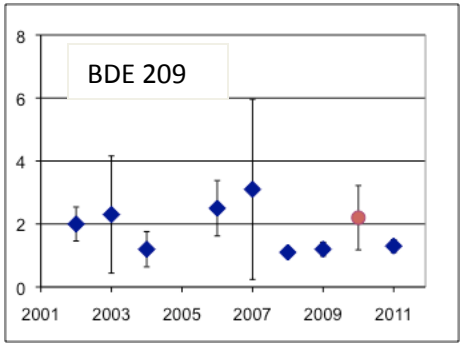

Sum of 40 PCBs
20
16
12
8
4
0
2001
2003
2005
2007
2009
2011

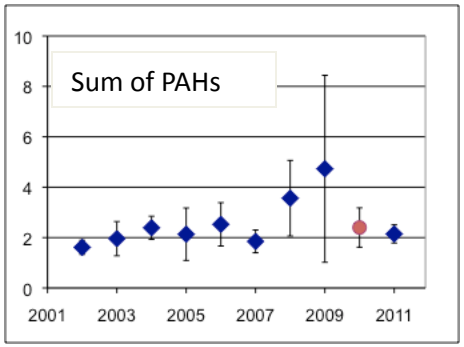

Percent Fines
120
100
80
60
40
20
0
2001
2003
2005
2007
2009
2011

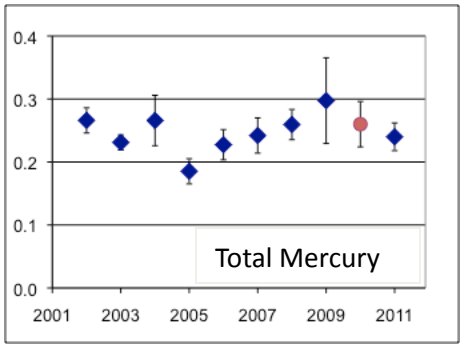

TOC
3
2
2
1
1
0
2001
2003
2005
2007
2009
2011

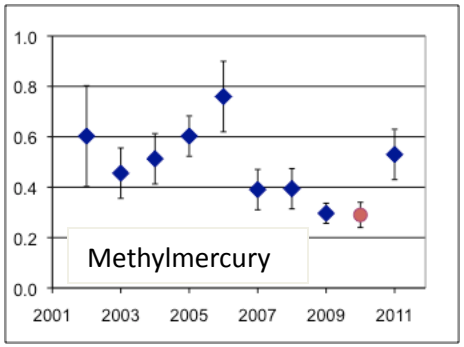

Sum of DDTs
6.0
5.0
4.0
3.0
2.0
1.0
0.0
2001
2003
2005
2007
2009
2011


BDE 47
0.8
0.6
0.4
0.2
0.0
2001
2003
2005
2007
2009
2011

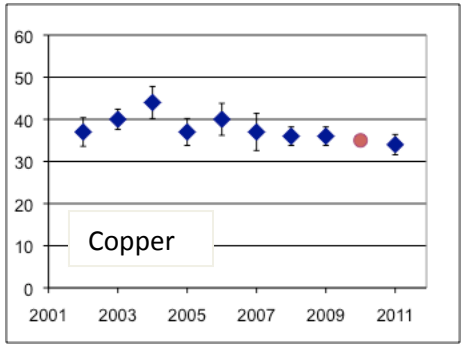

BDE 209
8
6
4
2
0
2001
2003
2005
2007
2009
2011

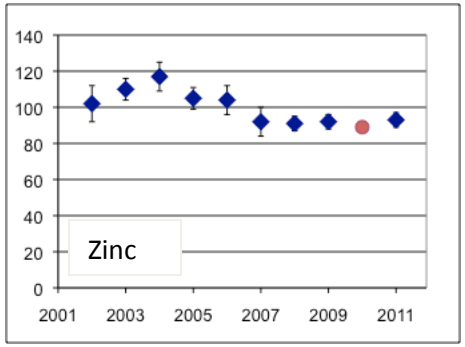

Sum of PAHs
10
8
6
4
2
0
2001
2003
2005
2007
2009
2011


Total Mercury
0.4
0.3
0.2
0.1
0.0
2001
2003
2005
2007
2009
2011


Methylmercury
1.0
0.8
0.6
0.4
0.2
0.0
2001
2003
2005
2007
2009
2011

Sediment


60
50
40
30
20
10
0
2001
2003
2005
2007
2009
2011
Copper


140
120
100
80
60
40
20
0
2001
2003
2005
2007
2009
2011
Zinc