Sustaining a Long-Term Water Quality Monitoring Program: The Lessons from San Francisco Bay

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Why Does a Monitoring Program Persist for 13 Years With Increased Funding?

- History
- Evidence of Success
  - Funding History
  - Stakeholder Survey
  - Publications Track Record
- Elements of Success
  - Governance
  - Relevance
  - Trust

History of the Regional Monitoring Program

- Resolution 92-043…….April 15, 1992

EO to implement the RMP

A coordinated multi-media regional monitoring program

Implementation of the Regional Monitoring Program

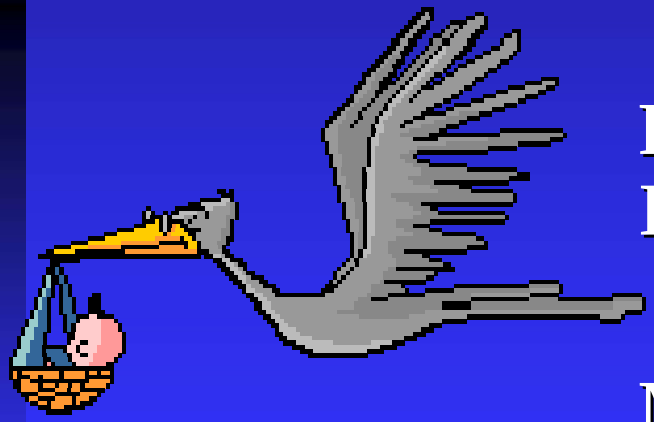
- Section 13267 Request…….June 12, 1992

Program to be phased-in to limit cost increases

Reduction of routine effluent and receiving water monitoring

Implementation of the Regional Monitoring Program

- RB Correspondence……..August 5, 1992



Payment to the Aquatic Habitat Institute constitutes compliance

MOU includes development of San Francisco Estuary Institute

The Result: Collaborative Monitoring with > 70 participants

Municipal Dischargers

Industrial Dischargers

Cooling Water

StormWater

Dredging

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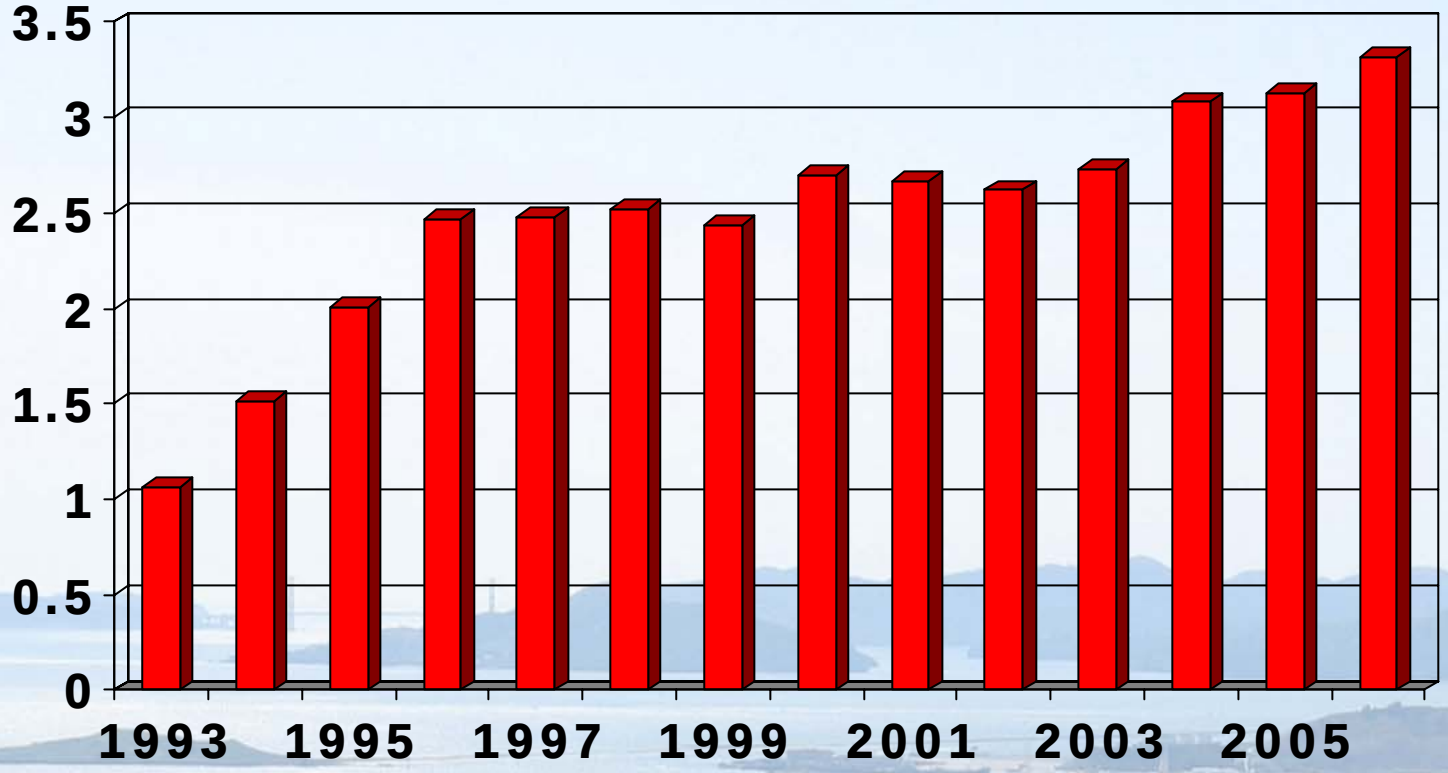
RMP Annual Budget (Fees- $ Millions)



A Monitoring Report Card for the RMP

Subject	A	B	C	D	F
Clear goals and objectives	37	33	18	7	4
Carefully crafted questions	23	54	23	0	0
Technical design based on the current understanding of system linkages and processes	46	42	8	4	0
Stability of financial support	42	23	27	4	4
Identified set of clients	30	52	18	0	0
Public education program	12	27	38	12	12
Integration into decision-making system	22	37	26	11	4
Coupling to research and modeling programs	15	44	33	4	4

AQUARIUM OF THE PACIFIC

Subject	A	B	C	D	F
Informational products tailored to primary and secondary clients	26	37	26	11	0
Timely synthesis of results	18	37	30	11	4
Flexibility of program	27	62	8	4	0
Frequency and quality of peer-reviews	46	50	4	0	0
On-going forum of stakeholders	50	38	8	4	0
Integration with other monitoring programs	15	42	31	12	0
Appropriate allocation of resources	17	52	26	4	0

RMP Journal Publications

- Special Issue of Environmental Research coming soon
  - Davis et al. Submitted. Polychlorinated biphenyls (PCBs) in San Francisco Bay
  - Connor et al. Submitted. The slow recovery of the San Francisco Estuary from the legacy of organochlorine pesticides.
  - Thompson et al. Submitted. Biological Effects of Anthropogenic Contaminants in the San Francisco Estuary.
  - Oros et al. Submitted. Polycyclic Aromatic Hydrocarbon (PAH) Contamination in San Francisco Bay: A 10-Year Retrospective of Monitoring In An Urbanized Estuary
  - Hoenicke et al. Submitted. Adapting an Ambient Monitoring Program to the Challenge of Managing Emerging Pollutants in the San Francisco Estuary
  - Yee et al. In prep. Quality assurance
  - Sedlak et al. In prep. Nickel

RMP Journal Publications

- Other recent publications
  - Greenfield and Davis. 2005. A PAH fate model for San Francisco Bay. Chemosphere 60: 515-530.
  - Davis. 2004. The long-term fate of polychlorinated biphenyls (PCBs) in San Francisco Bay. Env Toxicol Chem 23: 2396–2409.
  - Greenfield, Davis, et al. 2005. Seasonal, interannual, and long-term variation in sport fish contamination, San Francisco Bay. Sci Tot Env 336 25– 43
  - Oros et al. 2005. Levels and Distribution of Polybrominated Diphenyl Ethers in Water, Surface Sediments, and Bivalves from the San Francisco Estuary. Environ. Sci. Technol. 39, 33-41
  - Oros and Ross. 2005. Polycyclic aromatic hydrocarbons in bivalves from the San Francisco estuary: Spatial distributions, temporal trends, and sources (1993–2001). Mar Env Res 60: 466–488
  - Ross and Oros. 2004. Polycyclic aromatic hydrocarbons in the San Francisco Estuary water column: Sources, spatial distributions, and temporal trends (1993–2001). Chemosphere 57: 909–920
  - Oros and Ross. 2004. Polycyclic aromatic hydrocarbons in San Francisco Estuary sediments. Marine Chemistry 86: 169– 184
  - Thompson and Lowe. 2004. Assessment of the macrobenthos response to sediment contamination in the San Francisco Estuary, California, USA. Env Toxicol Chem 23: 2178–2187

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RMPs governance balances agency and funder viewpoints with science review

RMP COMMITTEE ORGANIZATION CHART

- STEERING COMMITTEE
  - TECHNICAL REVIEW COMMITTEE
    - SOURCES, PATHWAYS, AND LOADING WORKGROUP
    - EXPOSURE AND EFFECTS WORKGROUP
    - CONTAMINANT FATE WORKGROUP

RMP participants have many chances to weigh in:

- Project design
- Project review
- Committee & annual mtgs.

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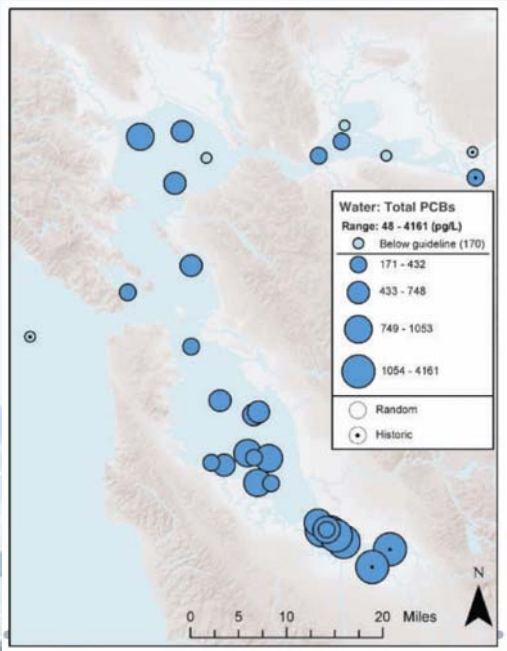
Objective 1

Describe the distribution and trends of pollutant concentrations in the Estuary

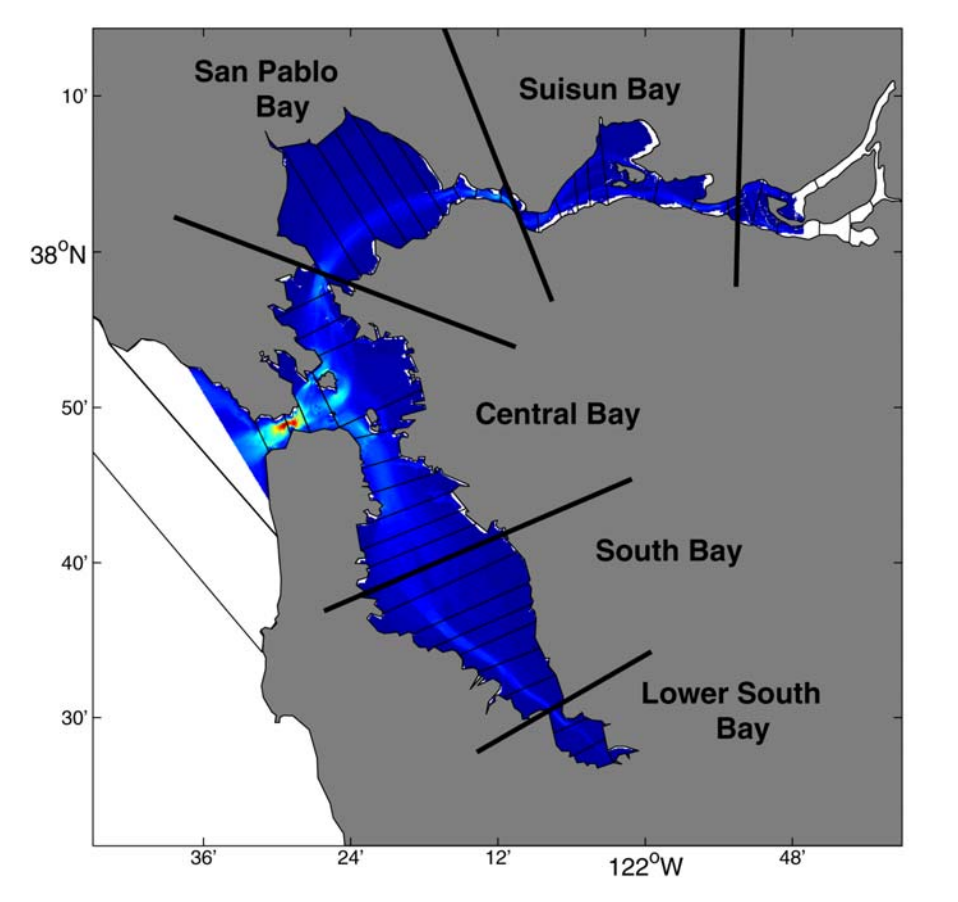


- **Water chemistry**
- **Sediment chemistry**
- **Mussel watch**
- **Sport fish**
- **Small fish**
- **Avian eggs**

Objective 2

<u>Project future contaminant status and trends</u> using current understanding of ecosystem processes and human activities

- **Multibox mass budget model**
- **Coring study**



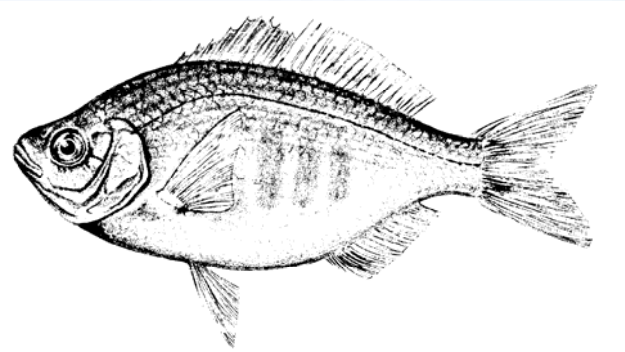
Objective 3

Describe sources, pathways, and loading of pollutants entering the Estuary

- **Guadalupe River Study**
- **Mallard Island Study**
- **Multibox model – erosion of buried sediment**
- **Atmospheric deposition**

Objective 4

Measure pollution <u>exposure and effects</u> on selected parts of the Estuary ecosystem (including humans)

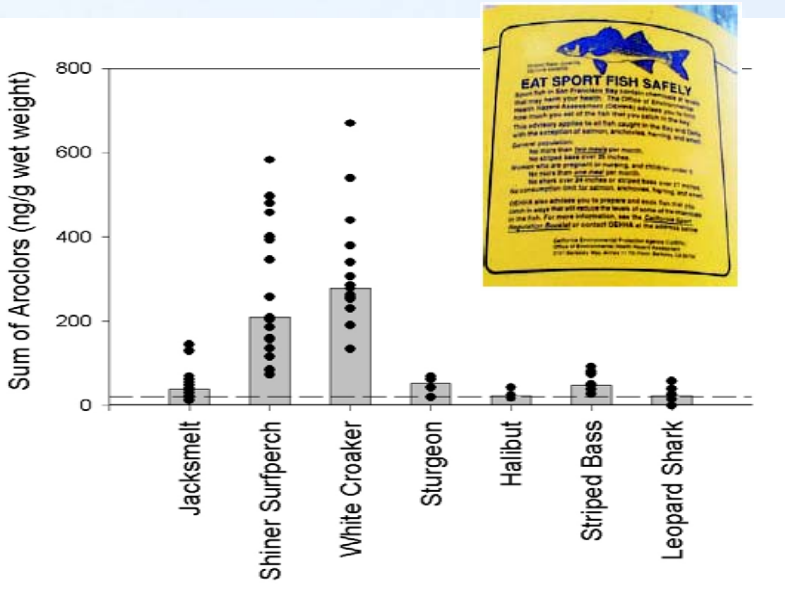


- **Shiner Surfperch Study**
- **Sediment Toxicity**
- **Aquatic Toxicity**
- **Benthic Community Analysis**
- **Tern Egg Hatchability**
- **Sport Fish Chemistry (human exposure)**
- **Small Fish Study (wildlife exposure)**

Objective 5

<u>Compare monitoring information to relevant benchmarks</u>, such as TMDL targets, tissue screening levels, water quality objectives, and sediment quality objectives

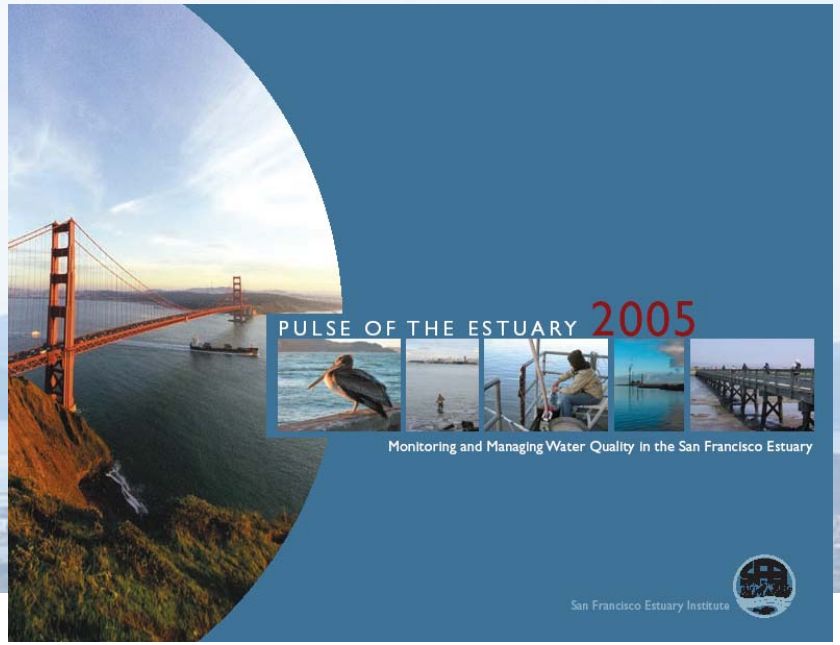
- **Water chemistry**
- **Aquatic toxicity**
- **Sediment chemistry**
- **Sediment toxicity**
- **Sport fish**



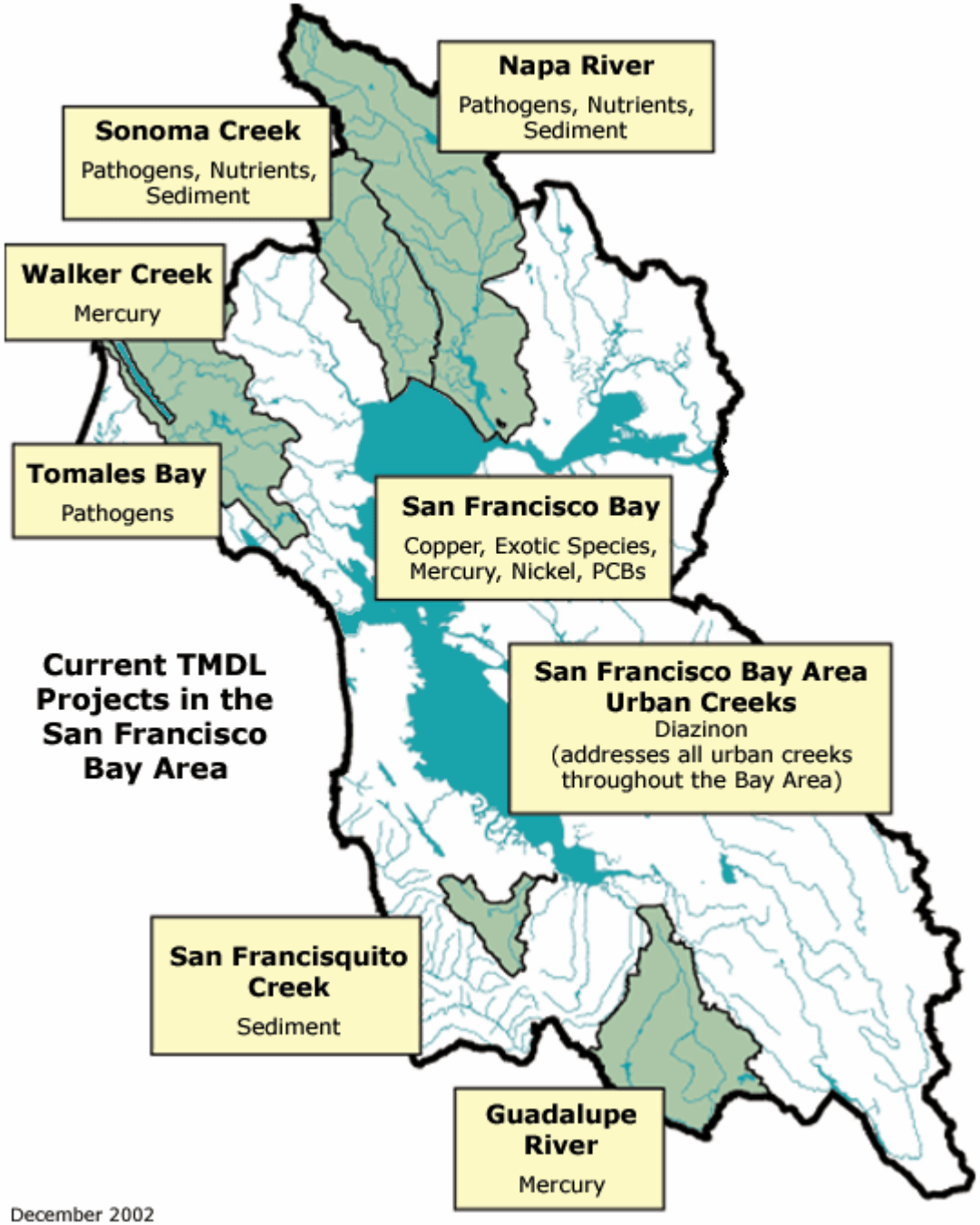
Objective 6

<u>Effectively communicate information from a range of sources</u> to present a more complete picture of the sources, distribution, fate, and effects of pollutants and beneficial use attainment or impairment in the Estuary ecosystem

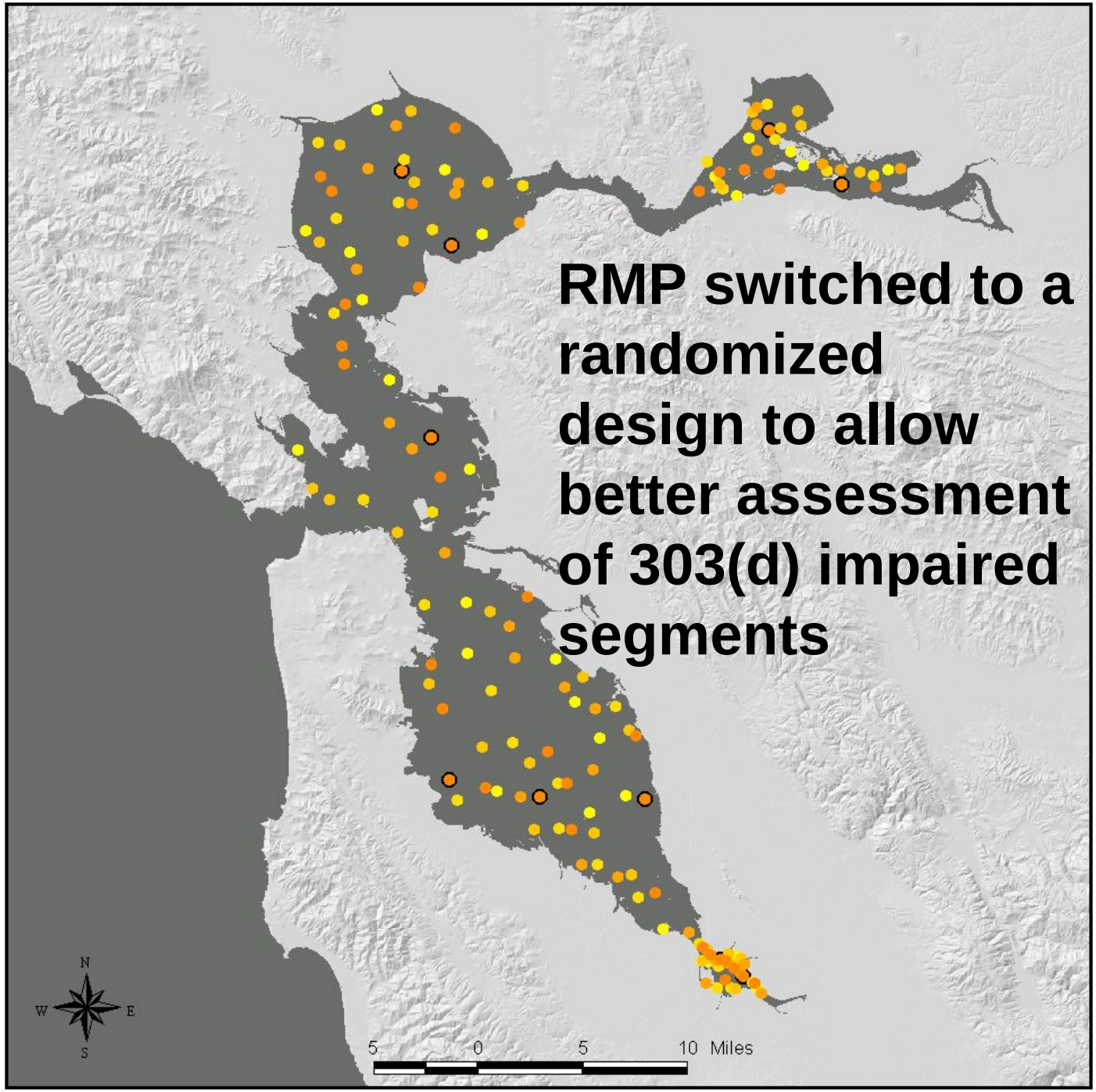
- **Pulse of the Estuary**
- **10 Year Synthesis Special Issue of Environmental Research**
- **Annual Meeting**
- **Literature Reviews**
- **Web site**



Listing impaired waters and developing TMDLs have become the major water quality policy focus

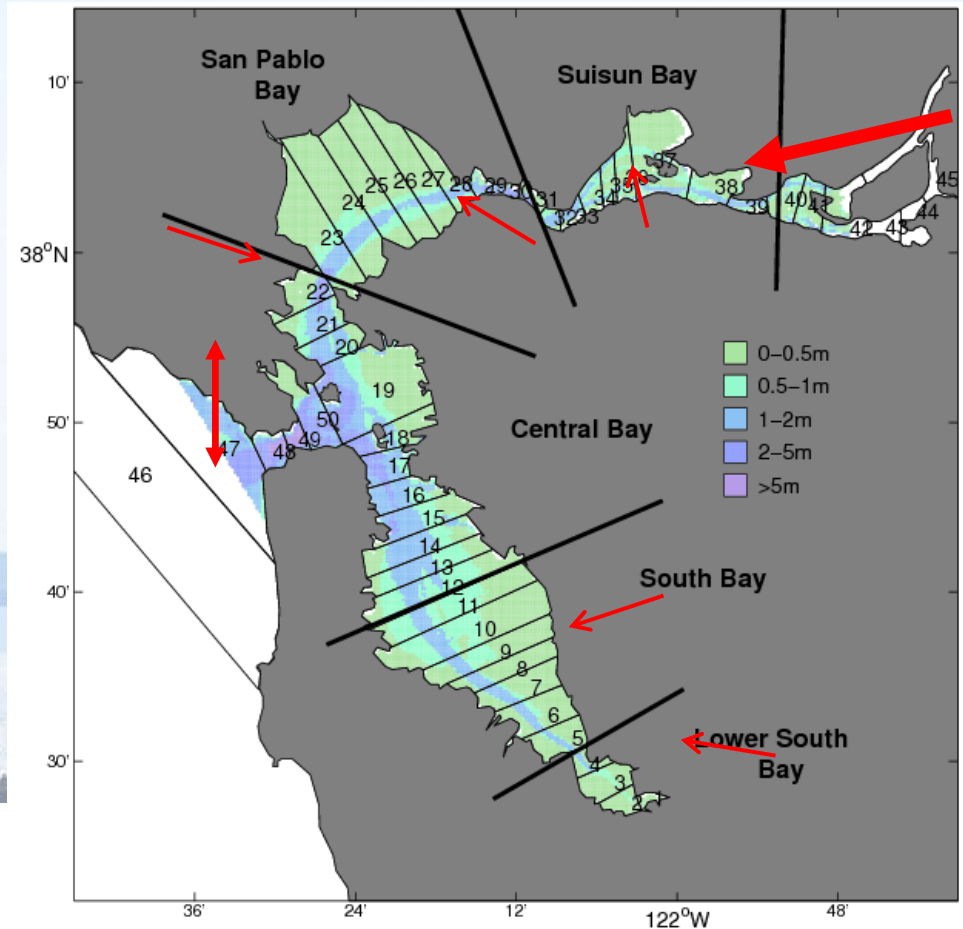


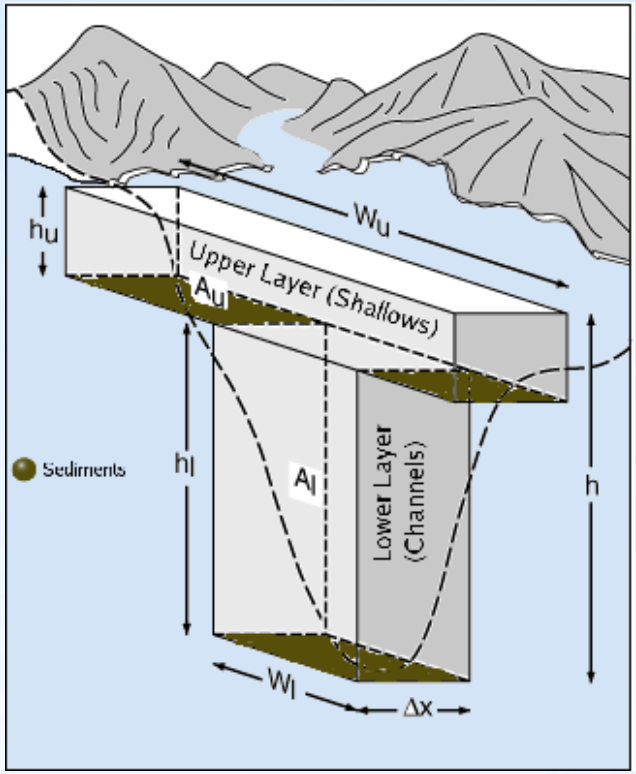
December 2002



RMP switched to a randomized design to allow better assessment of 303(d) impaired segments

- TMDL Modeling
  - 50 Model Boxes
  - 2 Vertical Layers
  - 100 cm of sediments





- Physics Forced by:
  - Golden Gate Tides
  - 'Delta Outflow'
  - Local Tributaries
  - Wind, Rain

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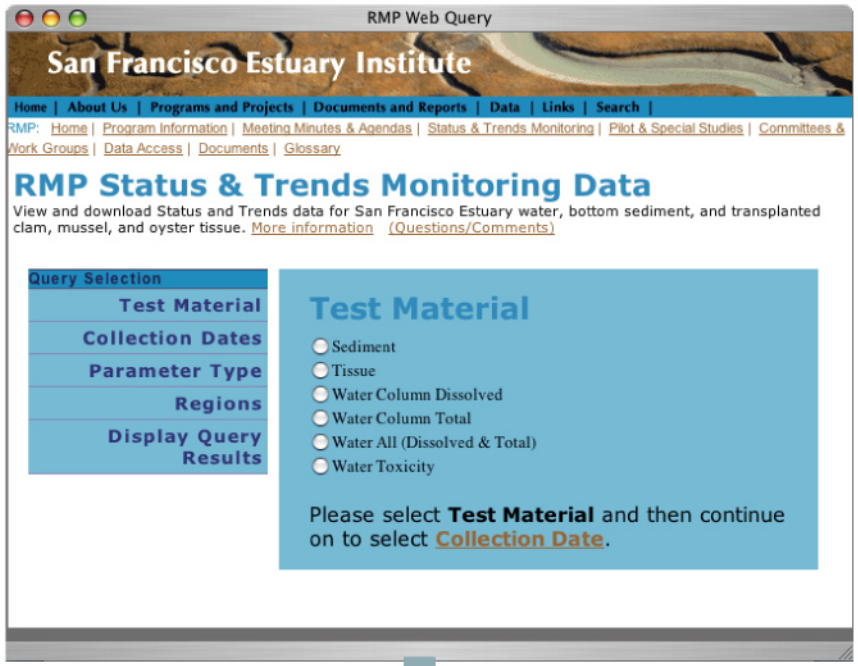
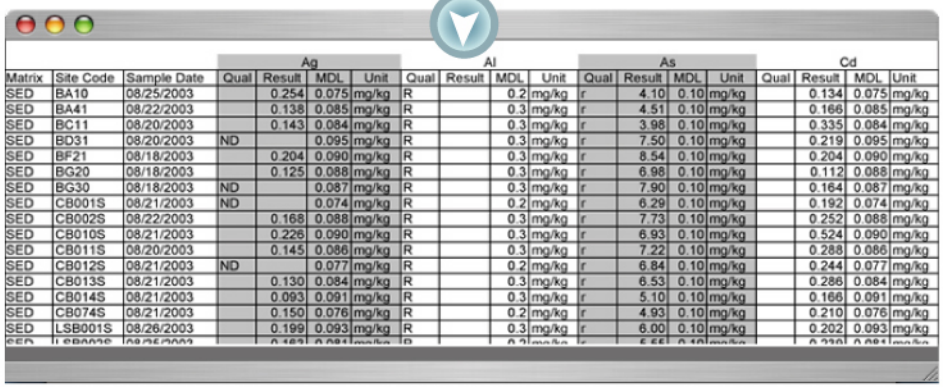
QA Multi-Step Review

- Data verification- Do we get what we expect?
  - Completeness and correctness of field and QC samples (sample & analyte names, formats, units)
- Data validation- Is what we get any good?
  1. Performance on specific QC samples/measures- blanks, replicates, spikes, reference materials
  2. Consistency checks- internal (e.g. relative congener abundance) and external (vs. previous year, other region data sets)
  3. Marginal and suspect data flagged or censored

Poster: Variability in Long Term RMP Data (Yee) Presentation: Why is My Blank Not Blank (Sedlak)

Data & QC Info Web Accessible





			Ag				Al				As				Cd			
Matrix	Site Code	Sample Date	Qual	Result	MDL	Unit	Qual	Result	MDL	Unit	Qual	Result	MDL	Unit	Qual	Result	MDL	Unit
SED	BA10	08/25/2003		0.254	0.075	mg/kg	R		0.2	mg/kg	r	4.10	0.10	mg/kg		0.134	0.075	mg/kg
SED	BA41	08/22/2003		0.138	0.085	mg/kg	R		0.3	mg/kg	r	4.51	0.10	mg/kg		0.166	0.085	mg/kg
SED	BC11	08/20/2003		0.143	0.084	mg/kg	R		0.3	mg/kg	r	3.98	0.10	mg/kg		0.335	0.084	mg/kg
SED	BD31	08/20/2003	ND		0.095	mg/kg	R		0.3	mg/kg	r	7.50	0.10	mg/kg		0.219	0.095	mg/kg
SED	BF21	08/18/2003		0.204	0.090	mg/kg	R		0.3	mg/kg	r	8.54	0.10	mg/kg		0.204	0.090	mg/kg
SED	BG20	08/18/2003		0.125	0.088	mg/kg	R		0.3	mg/kg	r	6.98	0.10	mg/kg		0.112	0.088	mg/kg
SED	BG30	08/18/2003	ND		0.087	mg/kg	R		0.3	mg/kg	r	7.90	0.10	mg/kg		0.164	0.087	mg/kg
SED	CB001S	08/21/2003	ND		0.074	mg/kg	R		0.2	mg/kg	r	6.29	0.10	mg/kg		0.192	0.074	mg/kg
SED	CB002S	08/22/2003		0.168	0.088	mg/kg	R		0.3	mg/kg	r	7.73	0.10	mg/kg		0.252	0.088	mg/kg
SED	CB010S	08/21/2003		0.226	0.090	mg/kg	R		0.3	mg/kg	r	6.93	0.10	mg/kg		0.524	0.090	mg/kg
SED	CB011S	08/20/2003		0.145	0.086	mg/kg	R		0.3	mg/kg	r	7.22	0.10	mg/kg		0.288	0.086	mg/kg
SED	CB012S	08/21/2003	ND		0.077	mg/kg	R		0.2	mg/kg	r	6.84	0.10	mg/kg		0.244	0.077	mg/kg
SED	CB013S	08/21/2003		0.130	0.084	mg/kg	R		0.3	mg/kg	r	6.53	0.10	mg/kg		0.286	0.084	mg/kg
SED	CB014S	08/21/2003		0.093	0.091	mg/kg	R		0.3	mg/kg	r	5.10	0.10	mg/kg		0.166	0.091	mg/kg
SED	CB074S	08/21/2003		0.150	0.076	mg/kg	R		0.2	mg/kg	r	4.93	0.10	mg/kg		0.210	0.076	mg/kg
SED	LSB001S	08/26/2003		0.199	0.093	mg/kg	R		0.3	mg/kg	r	6.00	0.10	mg/kg		0.202	0.093	mg/kg

Poster: (Grosso et al.) Facilitating the Exchange and Reporting of Monitoring Data

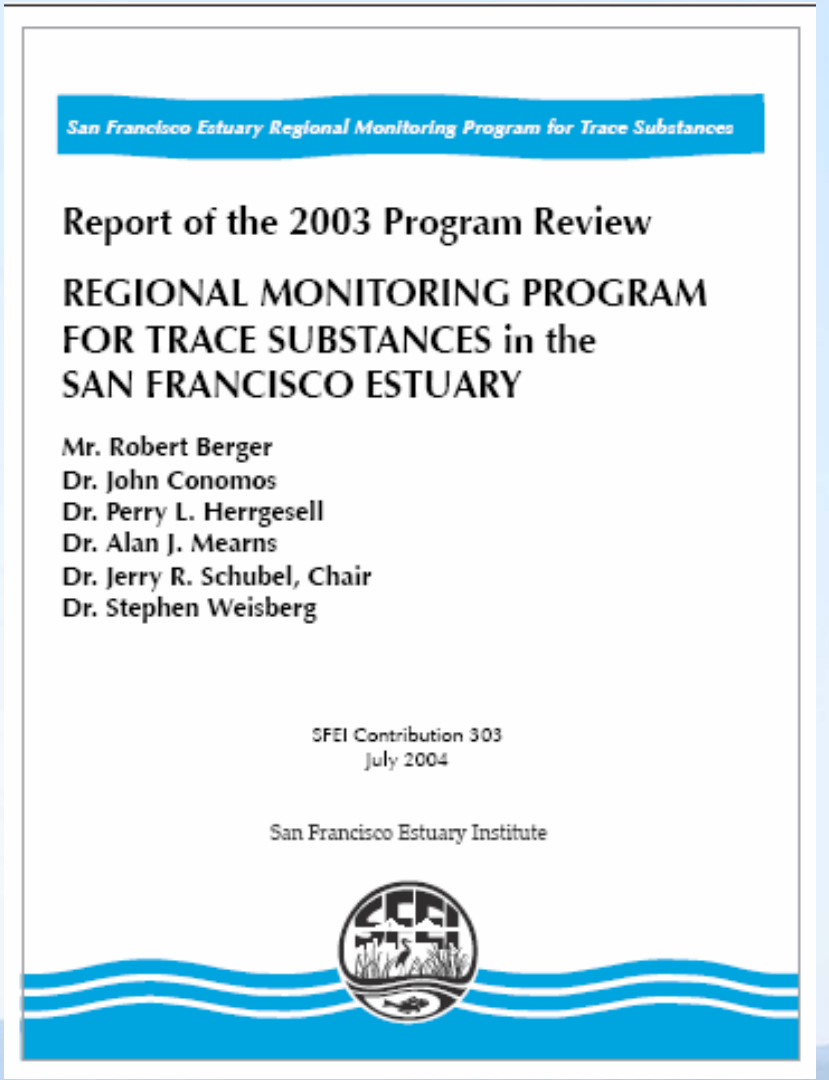
Five-Year Program Review Regional Monitoring Program for Trace Substances in the San Francisco Estuary

Panel:
Dr. Donald Boesch, University of Maryland, Center for Estuarine and Environmental Studies
Mr. Robert Cushman, Oak Ridge National Laboratory, Carbon Dioxide Information Analysis Center
Mr. William Crooks, private consultant
Dr. Alan Mearns, NOAA Ocean Assessment Division
Dr. Susan Metzger, Lawler, Matusky and Skelly Engineers
Dr. Thomas O'Connor, NOAA National Status and Trends Program
Dr. Allan Stewart-Oaten, University of California at Santa Barbara

Coordinators:
Dr. Brock Bernstein, EcoAnalysis, Inc.
Dr. Joseph O'Connor, private consultant

Final July 21, 1997

RMP Contribution #28



San Francisco Estuary Regional Monitoring Program for Trace Substances

Report of the 2003 Program Review

REGIONAL MONITORING PROGRAM FOR TRACE SUBSTANCES in the SAN FRANCISCO ESTUARY

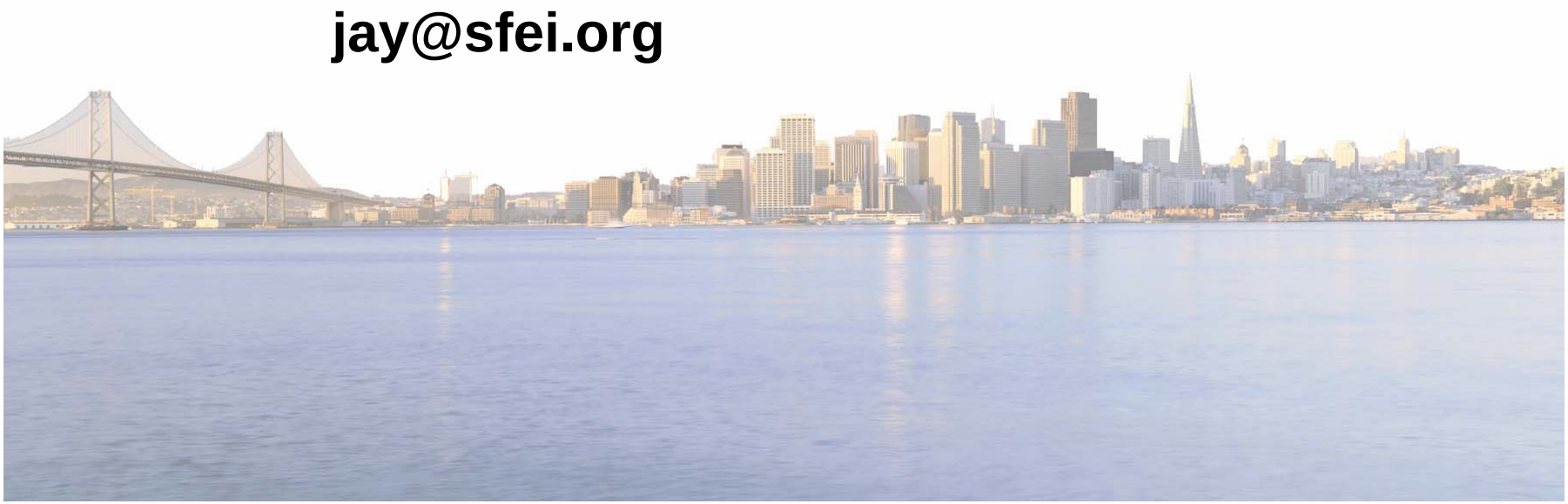
Mr. Robert Berger
Dr. John Conomos
Dr. Perry L. Herrgesell
Dr. Alan J. Mearns
Dr. Jerry R. Schubel, Chair
Dr. Stephen Weisberg

SFEI Contribution 303
July 2004

San Francisco Estuary Institute

Reports and information available at:

SFEI Booth

www.sfei.org

jay@sfei.org