Sources, Pathways, and Loadings

Regional Monitoring Program for Trace Substances

Annual Meeting, March 23rd 2002

Lester McKee

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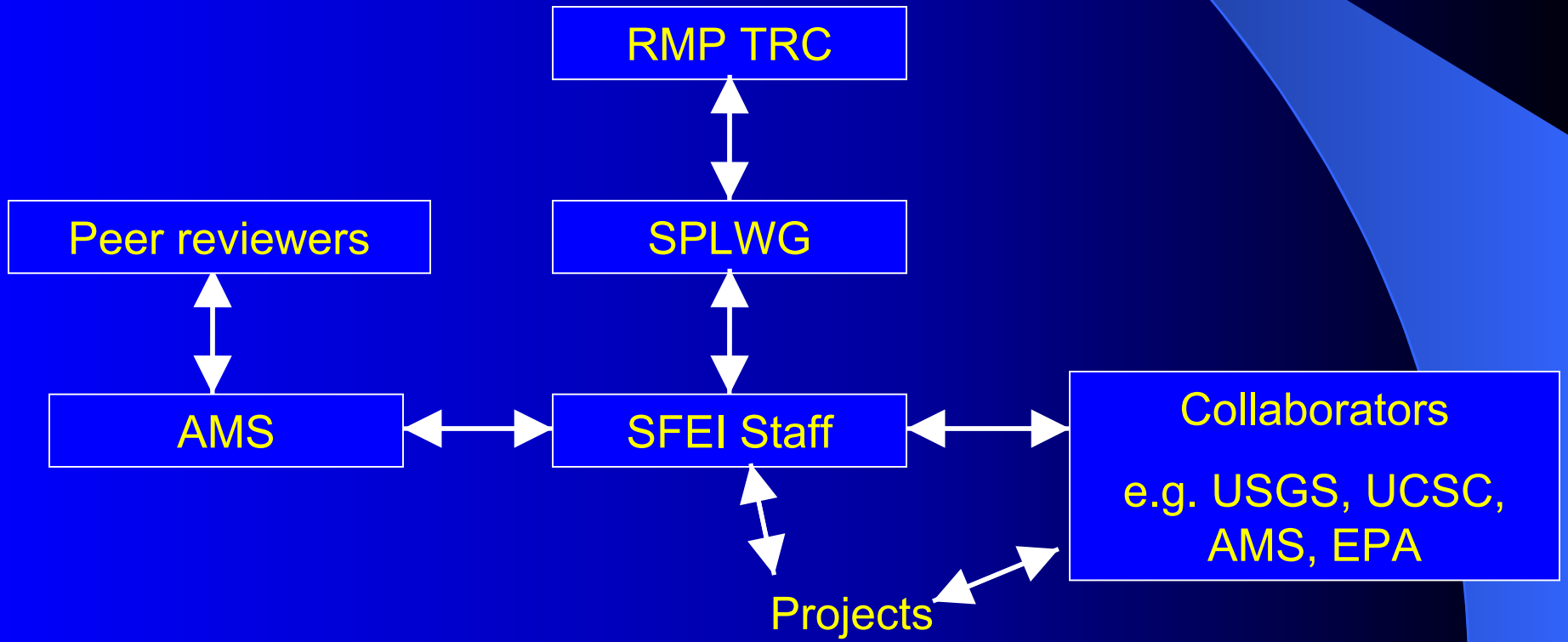
San Francisco Estuary Institute

SPL Objectives and Structure

Objective:
To describe general sources and loadings of contaminants to the Bay



Work Group Members

Tom Mumley, SFBRWQCB
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Jim McGrath, Port of Oakland
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Joseph Domagalski, USGS
Mike Nolan, USGS
Fred Hetzel SFBRWQCB

Lester McKee, SFEI
Don Yee, SFEI
Jay Davis, SFEI
Jon Leatherbarrow, SFEI
Eric Wittner, SFEI

History of Completed Work Products

1999

- Technical report of the SPLWG (Davis, Abu-Saba, Gunther)

2000

- Contaminant Loads from Stormwater to Coastal Waters in the San Francisco Bay Region (Davis, McKee, Leatherbarrow, Daum)

2001

- Estuary Interface Pilot study (Leatherbarrow, Hoenicke, McKee)
- Air Deposition Pilot Studies (Hg, TM, PAHs and PCBs) (Tsai, Hoenicke)
- Literature Review of Loading of Sediment Particles to the Bay from the Central Valley (McKee, Ganju, Schoellhamer, Davis, Yee, Leatherbarrow, Hoenicke)

Projects near completion

- Storm drain mapping pilot study
- Urban runoff processes literature review and local data synthesis

Literature Review of Loading of Sediment Particles to the Bay from the Central Valley

Lester McKee, SFEI
Neil Ganju and David Schoellhamer, USGS

Jay Davis, Don Yee, Jon Leatherbarrow, SFEI
Rainer Hoenicke, State Resources Agency

Why are Particle Loads Important? Objectives of the Literature Review

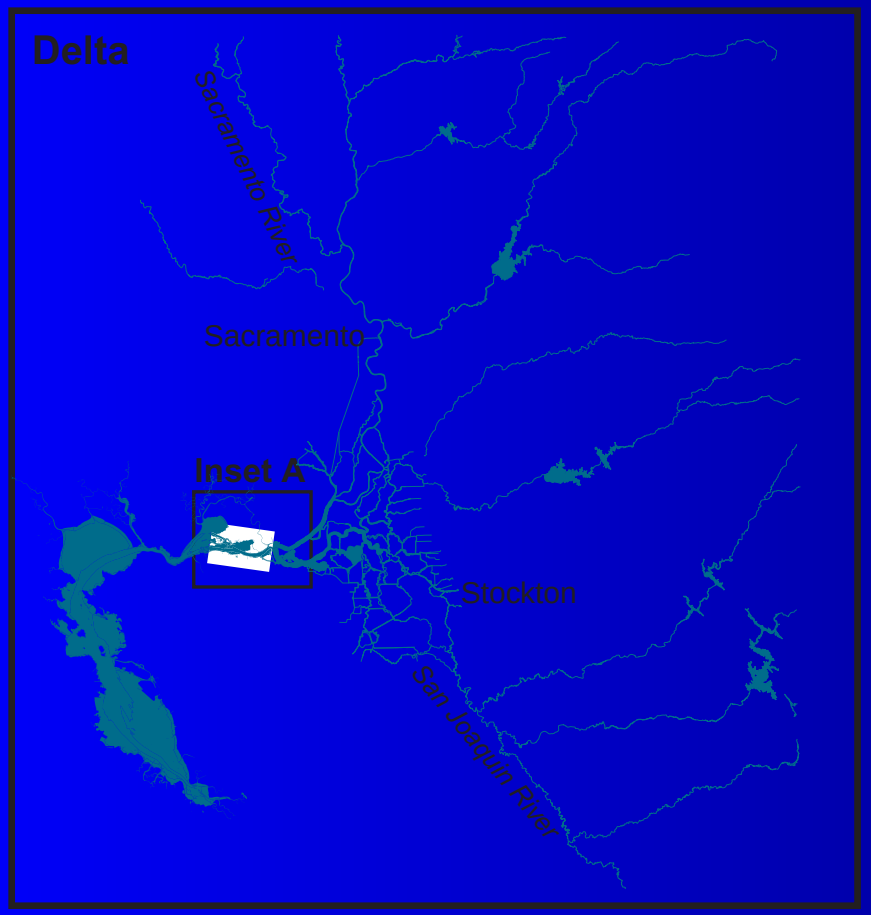
- Most contaminant that are currently of concern in the Bay attach to particles
- The Central Valley the largest pathway of particles and therefore contaminants to the Bay

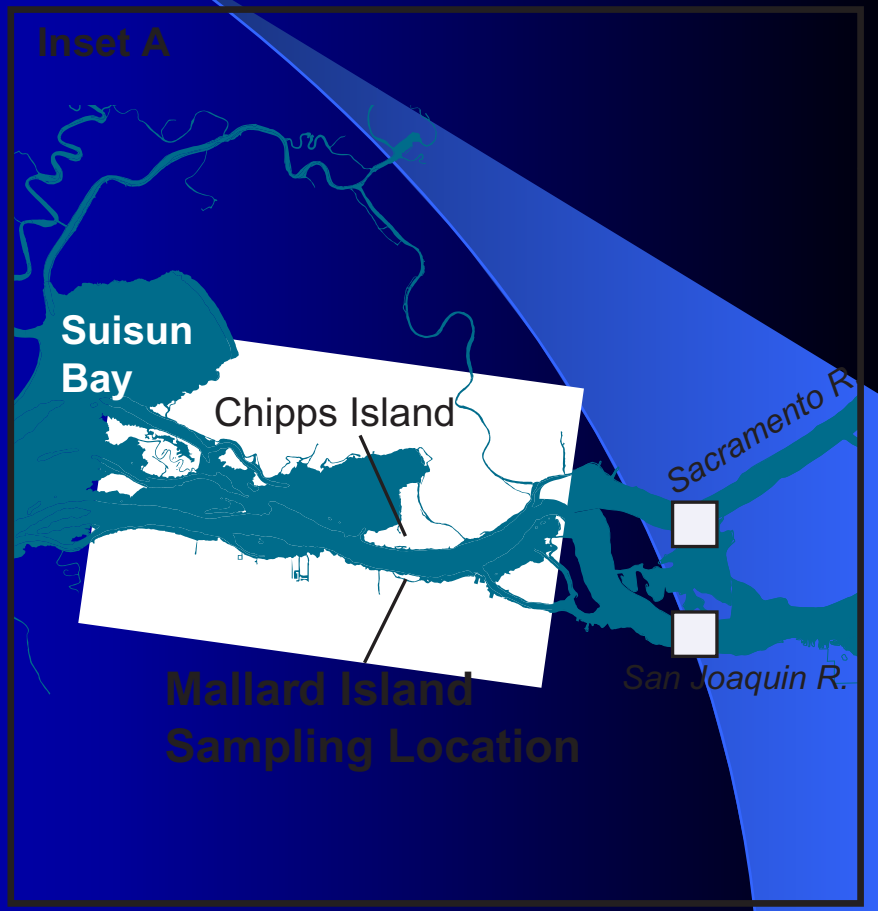
- The objective during 2001 was to determine if the data collected by USGS is suitable for determining particle loads to the Bay
- To propose a study for 2002 on sediment associated contaminants to fill data gaps

Sampling Methods

- USGS has maintained an OBS instrument at Mallard Island since 1994
- USGS collects water samples for SSC analysis
- Regression and estimation of SSC
- Funded by CALFED through to 2004

Sampling Location





SSC Data for the Water Years 1995-98

- Data: 1995 to 1998 water years
- A full day record has 96 data points (samples every 15 min)
- 52% of the days gained a full record
- 72% of the days had >24 out of 96 data points
- 27% of the days had no data at all due to equipment malfunction

Methodology for Estimating Loads

Fresh Water Advective

- Flux = mean daily SSC x daily Delta Outflow
- On days without SSC data, load was estimated using linear interpolation

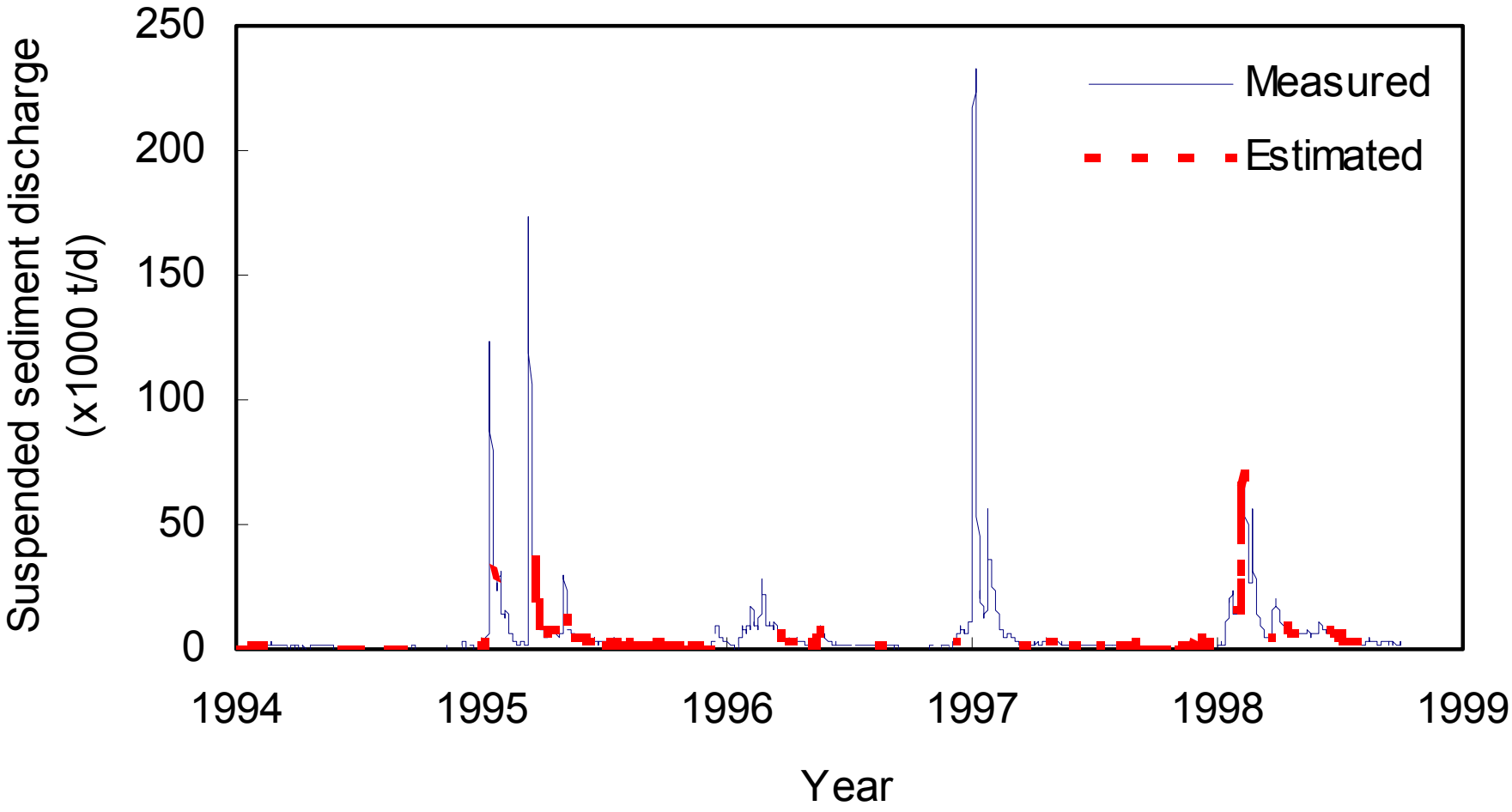
Tidal advective

- Determined using velocity and SSC data collected in the 1994 and 1996 WY by USGS

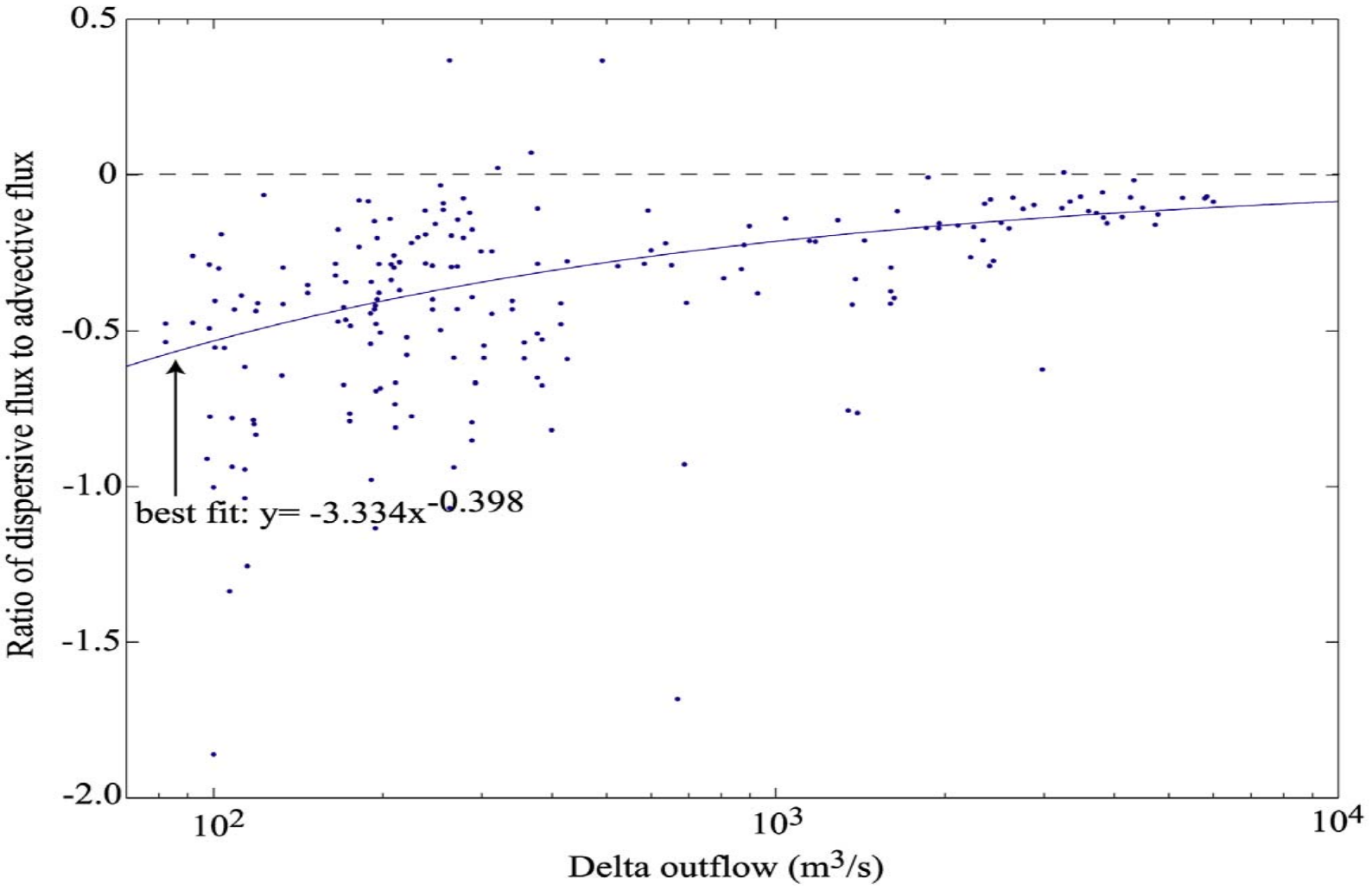
Errors

- A number of sources of error were considered. The sum of the errors was ±16.5%

Results - Advective Flux



Results - Dispersive Fluxes



Between-year Variations in Sediment Loads

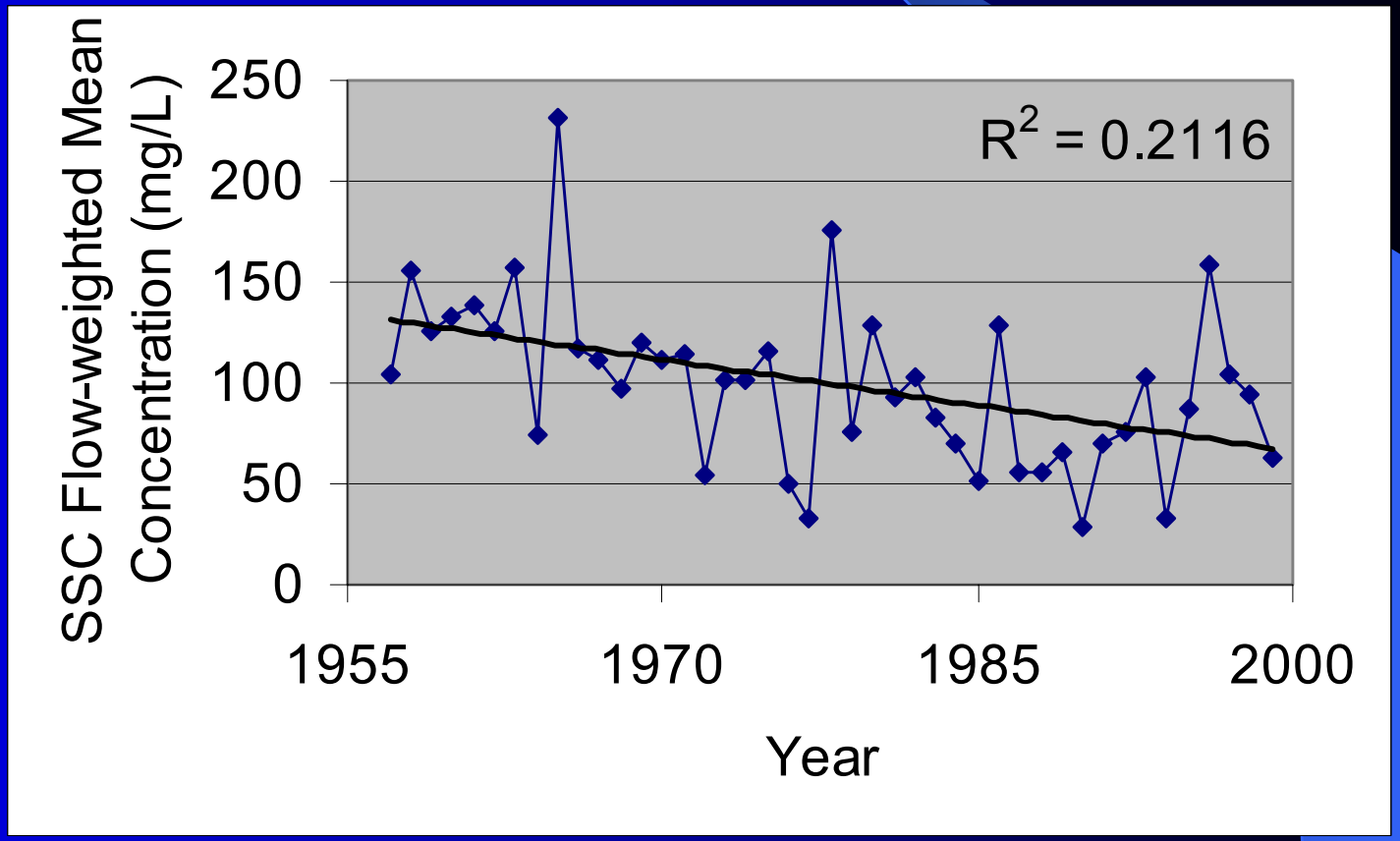
	Annual suspended sediment flux	
Data calculation period	**(Mt)**	**(Million cubic yards)**
1994/95	2.6 ±0.4	6.4±1.0
1995/96	1.0 ± 0.2	2.5±0.4
1996/97	2.2 ± 0.4	5.4±0.9
1997/98	2.4 ± 0.4	5.9±1.0
4 year average	2.1 ± 0.3	5.2±0.9

Trends

- This mass is less than estimates from previous studies

(Krone, ’79; Smith, ’63; Schultz, ’65; USACE ’67; Porterfield ’80; Ogden Beeman ’92)

Oltmann et al. (1999)



Implications and Conclusions

- A decreasing trend of sediment loads supports the work of Jaffe et al. on erosion over the past 50 years in the northern bays
- Local tributary loads may be becoming more important
- Contaminants stored in sediment sinks of the Bay may become more important
- There may be less sediment available for restoration projects
- **The SSC data collected by the USGS are suitable for loads analysis and if these are combined with contaminant data, estimates of contaminant loads can be made**

2002 RMP Special Study

Estimating Particle-associated Contaminant Loads from the Sacramento and San Joaquin Watersheds

Objectives

- To determine loads of Hg, TM, PCB, PAHs, and historic use pesticides (OCs) entering the Bay from the Central Valley

Method

- Flood response water column sampling
- Relationships between contaminants and suspended sediment

Progress

- Jan 2002: UCSC/ SFEI team begins sampling
- Jan/ Feb 2002: Peer-review comments used to refine the study design

2002 SPL Activities

- Review the roles and structure of the SPLWG
- Improve linkages with WQAS, SWAMP, USGS watershed sediment loads monitoring
- Invite and pay specific scientific experts to contribute to the new field study based SPL
- Gain funding and begin work on new special studies

"It has often been observed, that those who have the most time at their disposal profit by it the least. A single hour a day, steadily given to the study of some interesting subject, brings unexpected accumulations of knowledge." (William Ellery Channing)

"In times of change learners inherit the earth; while the learned find themselves beautifully equipped to deal with a world that no longer exists." (Eric Hoffer)