Suspended Sediment: Past a Tipping Point – What’s Next?

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Acknowledgements

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I ideas and RMP adaptations

1) Less sediment supply from Central Valley: local watersheds relatively more important

2) Future sediment supply: stabilize or decrease?

3) Other possible adaptations
Sediment supply: past 200 years

Why less sediment?
12~13 Mm$^3$/yr less than peak (~90%)

1) Diminishment of hydraulic mining pulse

2) Reservoir deposition: Deposition in Oroville, Folsom, and Englebright ~2.4 Mm$^3$/yr (Wright and Schoellhamer 2004)

3) Smaller floods: Dams reduce downstream flood flows

4) Flood bypasses: Deposition in Colusa, Sutter, Yolo near Fremont Weir 1.3 Mm$^3$/yr (Singer and Aalto 2008)

5) Bank protection: Banks on over half the lower Sacramento River were protected from 1960-2000 (USFWS 2000)
Less sediment from the Central Valley makes supply from local watersheds relatively more important.
Possible RMP adaptations
Goal: better quantify local watershed supply

1) **Expand stream gaging:** no sediment supply measurements 1974-1999

2) **Creek mouth measurements:** traditional stream gages above tides, deposition in tidal creeks decreases Bay supply

3) **Watershed model:** too many watersheds to measure, use to extrapolate gage data to ungaaged creeks
Ideas and RMP adaptations

1) Less sediment supply from Central Valley: local watersheds relatively more important

2) Future sediment supply: stabilize or decrease?

3) Other possible adaptations
Continuous monitoring of SSC 1991-present
WY1999: 36% step decrease in Bay SSC
Transport regulation
Supply regulation
Prior to 1850, the rivers and Bay were relatively clear.

Hydraulic mining in the late 1800s added substantial sediment and created an erodible sediment pool in the river channels and on the bed of the Bay.

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Erosional wave
Downstream effect of reduced sediment supply

Petts and Gurnell 2005
Hypotheses: Conclusions

1) An erosional wave propagated from the watershed to the Bay during the 20th century: supported by synthesis of many studies

2) This wave is waning in the Bay, resulting in a new regime of lower sediment and carbon supply to the Bay: supply has decreased, establishment of a new regime is uncertain
Possible RMP adaptations

Will Central Valley supply stabilize or decrease?:
Key assumption for simulating Bay legacy contaminants and geomorphic response to sea level rise

1) River cross section analysis:
Are Central Valley rivers still eroding?

2) Central Valley watershed model:
causes of decreased supply

3) Directly measure sediment supply at Mallard Island
Other Possible RMP adaptations

1) **Sediment supply between subembayments**: Measuring sediment flux at Dumbarton Bridge

2) **Golden Gate sediment flux**: biggest unknown in Bay sediment budget

3) **Salinity and temperature**: key ecosystem variables, monitored with SSC, water contractors want to stop funding
Summary: Possible RMP adaptations

Expand stream gaging
Creek mouth measurements
Bay Area watershed sediment model
River cross section analysis
Central Valley watershed sediment model
Directly measure sediment supply at Mallard Island
Sediment supply between subembayments
Golden Gate sediment flux
Salinity and temperature
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