



SAN FRANCISCO BAY

SAND TRANSPORT STUDY

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SAND TRANSPORT IN THE BAY



- Long-term sand transport inland watersheds -> ocean
- Most previous research: fine sediment focus
- Time, spatial scales of sand transport not well known

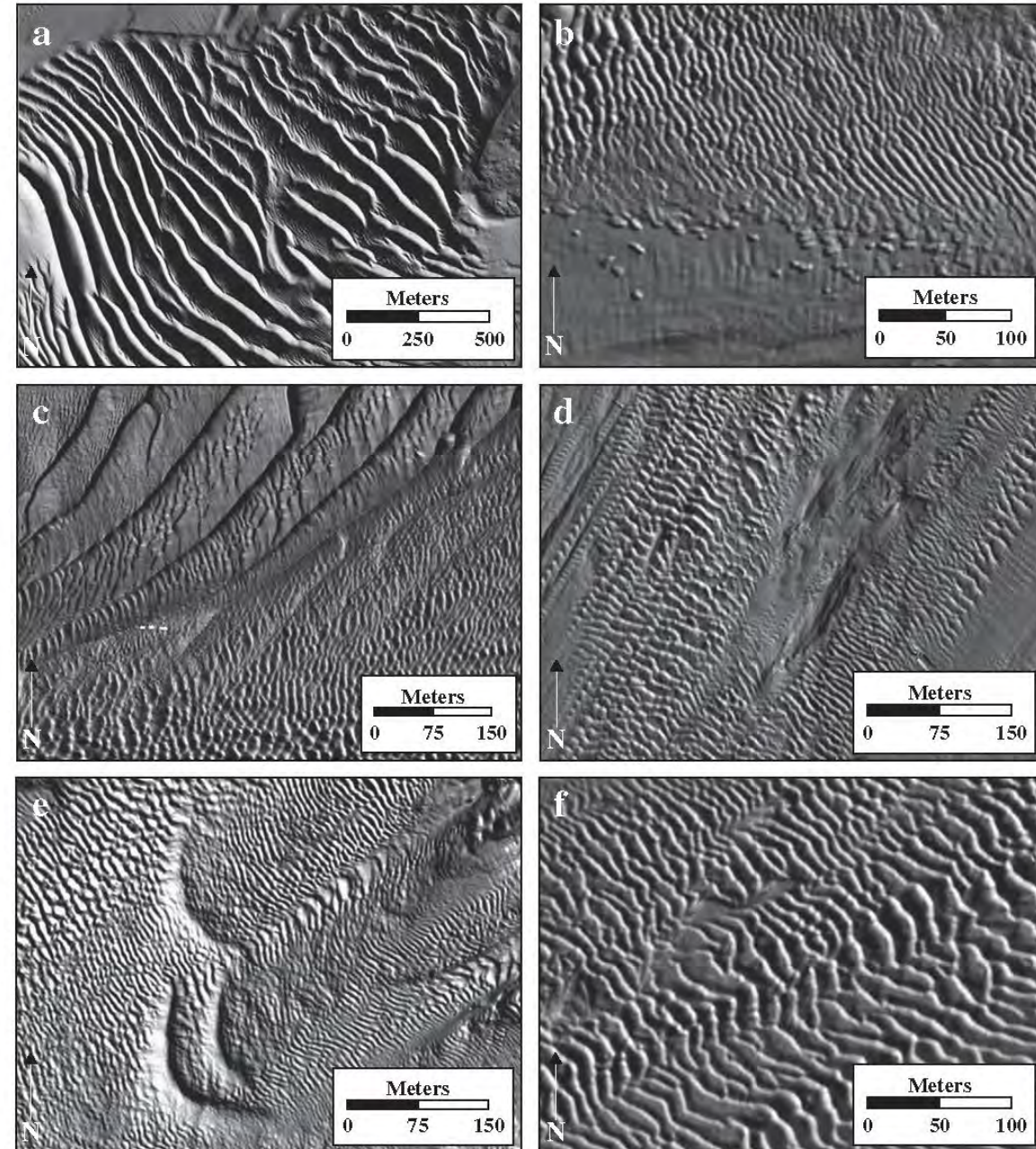
SAND TRANSPORT STUDY

Reason for Interest

- Sand transport influences landforms, bedforms, and influences ecological function.
- Sand mining changes bathymetry and bedforms, and may alter hydrodynamics, sand supply, grain size, and sand transport.

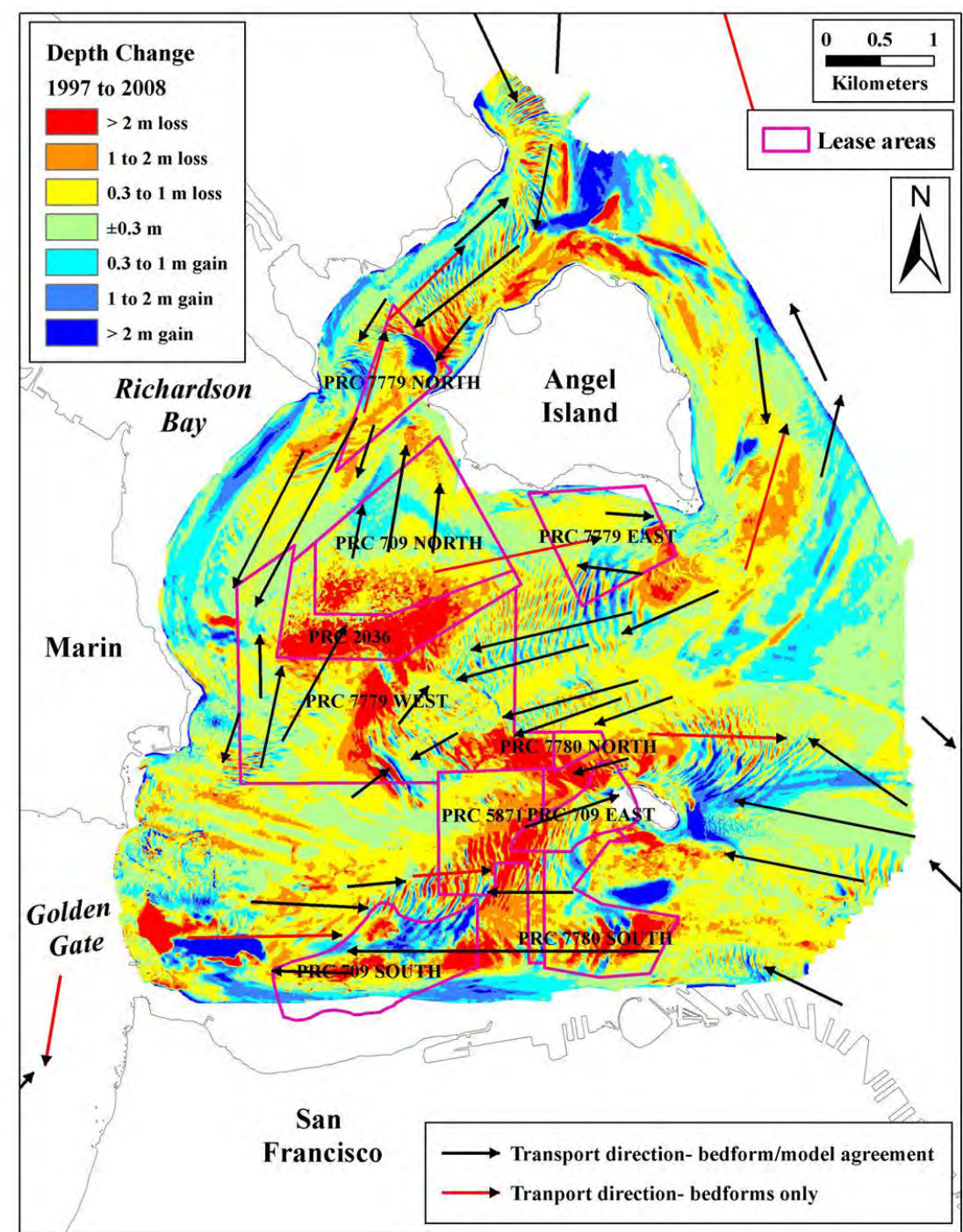
Goals

1. Describe sand transport in/near sand mining lease areas
2. Describe effects of sand mining on sand transport.



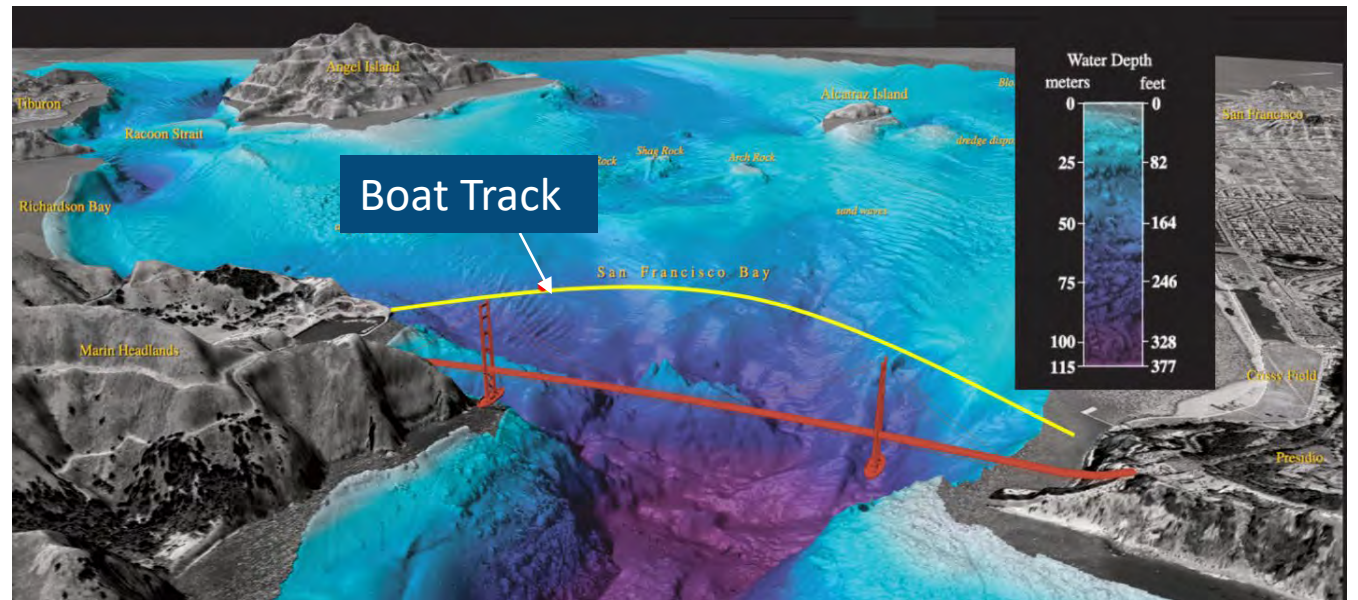
PREVIOUS WORK

- USGS (Barnard et al. 2013) assessed net sand transport directions in Central Bay
- Comparison and validation with other studies support this method as a sound tool for understanding sand transport
- Recent data provides an excellent opportunity to address sediment management questions



GOLDEN GATE SUSPENDED SEDIMENT FLUX

- Measured three times in 2016 and 2017
- ~One day each

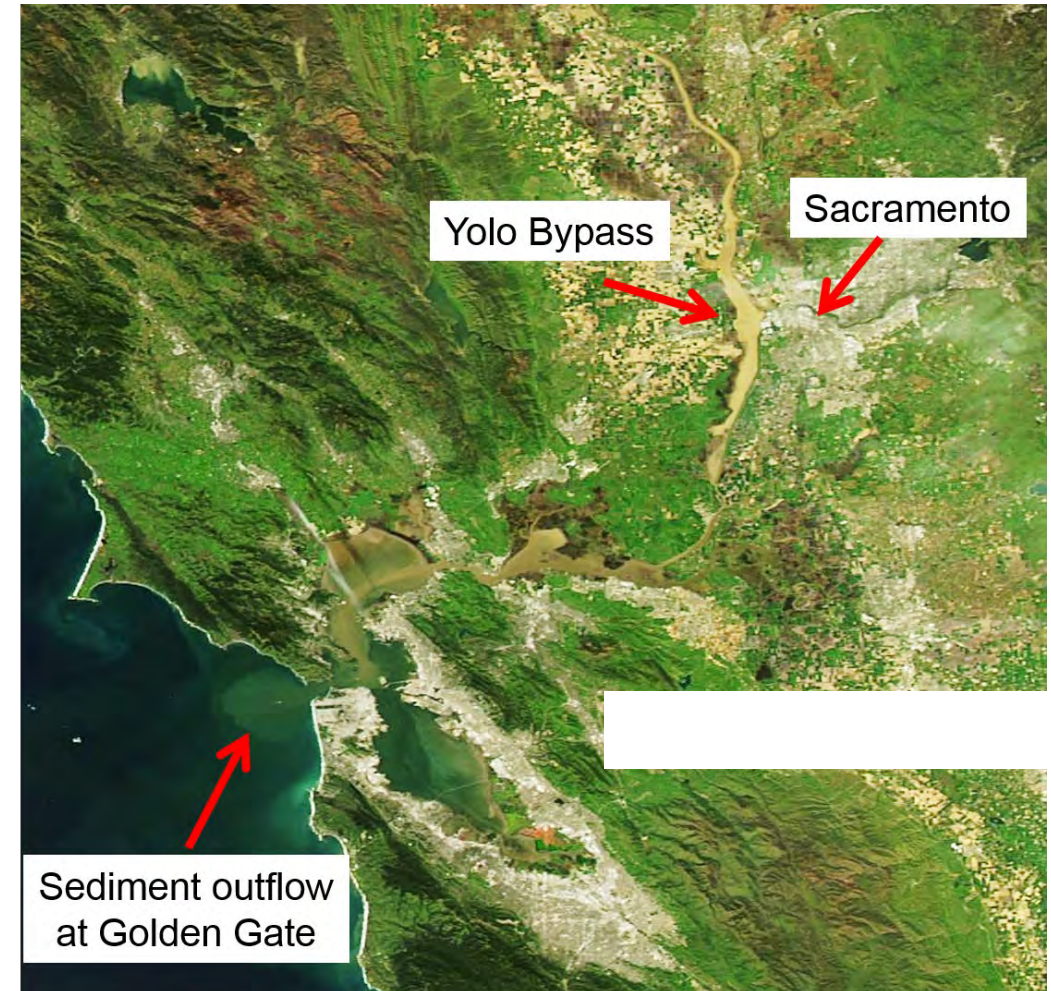


Dartnell, 2006

GOLDEN GATE FINDINGS: SUSPENDED SEDIMENT

- Peak water flow (3/16): 128,000 m³/s
SEAWARD
- Peak sediment flow (2/17): 7660 kg/s
LANDWARD
- Central Valley watershed discharge is an order of magnitude < peak flows through the Gate.
- Substantial trapping within the bay.

Downing-Kunz, M.A., Work, P.A., and Schoellhamer, D.H., 2021. Tidal Asymmetry in Ocean-Boundary Flux and In-Estuary Trapping of Suspended Sediment Following Watershed Storms: San Francisco Estuary, California, USA. *Estuaries and Coasts*, 10.1007/s12237-021-00929-y.



Mar 2016 MODIS Imagery

PRIMARY MANAGEMENT QUESTIONS (SAND TRANSPORT)

- Is sand mining having a measurable impact on sediment transport (patterns or magnitude) and supply within San Francisco Bay or the Outer Coast?
- What are the anticipated physical effects of sand mining at permitted levels on sand transport and supply within San Francisco Bay and the Outer Coast?

SCOPE OF WORK

- **Investigators:** SFEI and AnchorQEA
- AnchorQEA to evaluate (via numerical modeling) the effects of sand mining on sand transport throughout San Francisco Bay and through the Golden Gate
- SFEI to analyze recently collected bathymetric surveys and evaluate directions of sand transport
- Synthesize findings from the volume analysis and sediment transport modeling with existing research and describe the overall sand transport patterns in San Francisco Bay
- Evaluate sand flux through the Golden Gate under a range of conditions

THANK YOU