RMP
REGIONAL MONITORING PROGRAM FOR WATER QUALITY IN SAN FRANCISCO BAY

sfei.org/rmp

RMP Sediment Workgroup 2024 Meeting #2

May 16, 2024

INTRODUCTION

Scott Dusterhoff, SFEI

SFEI Housekeeping Reminders

Out the doors and to the right

Password: sfsfsfsfsf

Please silence cell phones & laptops

Optional

Zoom tips

1. Update your name and add your affiliation
2. Raise your hand if you have a comment or question
3. Unmute yourself and turn on video when you are speaking
4. Use the chat function if you have a comment, question, or technical issue

In person attendees

1. If you want to connect to Zoom to see the Chat, don't connect to audio **and** turn down the volume on your laptop
2. Turn off your camera

Guidelines for Inclusive Conversations

1. Try it on
2. Practice self focus
3. Understand the difference between intent and impact
4. Practice both / and thinking
5. Refrain from blaming or shaming self and others
6. Move up / move back
7. Practice mindful listening
8. Right to pass
9. Avoid jargon
10. It’s okay to disagree (respectfully)

RMP

We acknowledge the San Francisco Bay is the ancestral homeland of many indigenous people, including the Ohlone, Patwin, Coast Miwok, and Bay Miwok.

(acknowledgement developed by the native people of the SF Bay)

S. Bezalel

Sediment Workgroup Expert Advisors

Dr. Patricia Wiberg

Professor, University of Virginia, Dept. of Envi. Sci.

Expertise: sediment erosion, transport, and deposition in coastal and tidal wetland environments; numerical modeling

Dr. David Schoellhamer

Research Hydrologist Emeritus, USGS CA Water Science Center

Expertise: estuarine and cohesive sediment transport; watershed sediment supply to estuaries

zoom

RMP

INTRODUCTIONS

Goals for the Meeting

- Review findings from Sediment Workgroup studies
- Update on RMP study from outside the Sediment Workgroup
- Discuss and rank 2025 Special Study proposals (Tier 1 and Tier 2)

Agenda (Morning)

Item	Time
1. Introduction & Meeting Overview	10:00 – 10:15 am
2. Information: Overview of Workgroup Planning Efforts	10:15 – 10:30 am
3. Information: Sediment Dynamics on Bay Marshes	10:30 – 11:10 am
4. Information: Susp Sed and Wave Monitoring in South Bay and Lower South Bay	11:10 – 11:30 pm
5. Information: Hydrodynamic Modeling Using the DFM	11:30 – noon
LUNCH (45 mins)	noon – 12:45 pm

Agenda (Afternoon)

Item	Time
6a. Information: 2025 Proposals - Tier 1	12:45 – 2:00 pm
BREAK (15 mins)	2:00 – 2:15 pm
6b. Information: 2025 Proposals - Tier 2	2:15 – 3:45 pm
7. Decision: Proposal Ranking (Closed Session)	3:45 – 4:45 pm
8. Report Out on Proposal Ranking	4:45 – 5:00 pm
Adjourn	5:00 pm

RMP Sediment Workgroup

Mission

To provide technical oversight and stakeholder guidance on RMP studies addressing questions about ***sediment delivery, sediment transport, dredging, and beneficial reuse of sediment.***

RMP Sediment Workgroup

Guiding Management Questions

1. What are acceptable levels of chemicals in sediment for placement in the Bay, baylands, or restoration projects?

2. Are there effects on fish, benthic species, and submerged habitats from dredging or placement of sediment?

3. What are the sources, sinks, pathways and loadings of sediment and sediment-bound contaminants to and within the Bay and subembayments?

4. How much sediment is passively reaching tidal marshes and restoration projects and how could the amounts be increased by management actions?

5. What are the concentrations of suspended sediment in the Estuary and its segments?

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Overview of All Workgroup Efforts to Date

Since 2018, SedWG has funded 23 Special Studies ($2.3M total budget)

Special Study Name	PI	Lead Organization	Partner Organizations	Year funded	Funded Amount	Total Funded Amount	Funding Source (RMP or SEP)	Completion Date	URLs for work products
Water and Suspended-Sediment Flux Measurements at the Golden Gate, 2016-2017	Maureen Downing-Kunz	USGS	–	2016	$68,500 (SEP) $33,000 (RMP)	$101,500	RMP funds SEP	December 2017	https://www.sfei.org/sites/default/files/biblio_files/Downing-Kunzetal_2017GoldenGateReport_FINAL.pdf
Sediment Monitoring and Modeling Strategy	Scott Dusterhoff	SFEI	–	2017	$50,000	$50,000	RMP Special Study	April 2021	Incorporated into the Sediment for Survival report https://www.sfei.org/sites/default/files/biblio_files/Sediment%20for%20Survival%2004212 1%20med%20res.pdf
Sediment Supply to San Francisco Bay, Water Years 1995 through 2016: Data, trends, and monitoring recommendations to support decisions about water quality, tidal wetlands, and resilience to sea level rise	Dave Schoellhamer Lester McKee	USGS	SFEI	2017 2018	$40,000 (2017 funds) $13,000 (2018 funds)	$53,000	RMP funds	June 2018	https://www.sfei.org/sites/default/files/biblio_files/Sediment%20Supply%20Synthesis%20Report%202017%20-%202018-06-11.pdf
DMMO Data Synthesis for PCBs	Don Yee Adam Wong	SFEI	–	2018	$45,000	$45,000	SEP	March 2019	https://www.sfei.org/sites/default/files/biblio_files/DMMO%20PCB%20Synthesis%20Report%20Final.pdf
Mallard Island Suspended-Sediment Monitoring	Maureen Downing-Kunz Dave Schoellhamer	USGS	–	2018	$30,490	$30,490	RMP Special Study	December 2017	https://waterdata.usgs.gov/ca/nwis/inventory/?site_no=11185185
Hosting and Support for Dredged Material Management Office (DMMO) Database	Cristina Grosso Don Yee Shelah Sweatt Brain Ross	SFEI	USACE USGS	2018	$55,000	$55,000	RMP Special Study	December 2018	
Napa River and Sonoma Creek Sediment Transport Monitoring	Scott Wright	USGS	–	2018	$115,000	$115,000	SEP	June 2019	https://waterdata.usgs.gov/monitoring-location/11458000/#parameterCode=00065&period=P7D&showMedian=true https://waterdata.usgs.gov/monitoring-location/11458500/#parameterCode=00065&period=P7D&showMedian=true
Improved Lower South Bay suspended-sediment flux measurements	Daniel Livsey Maureen Downing-Kunz Dave Schoellhamer	USGS	–	2018 2019 2020	$120,000 (2018 funds) $158,000 (2019 funds) $36,300 (2020 funds)	$314,300	RMP Special Study (2018) SEP (2019, 2020)	November 2020	https://link.springer.com/article/10.1007/s12237-020-00734-z https://link.springer.com/article/10.1007/s12237-020-00840-y
Special Study on Buk Density	Jeremy Lowe Katie McKnight	SFEI	–	2019	$30,000	$30,000	RMP Special Study	Apri 2020	https://www.sfei.org/sites/default/files/biblio_files/SFEI_BulkDensityReport_April30_2020_v2.pdf
Workshop on Sediment Screening and Testing Guidelines for Beneficial Reuse of Dredged Sediments	Melissa Foley	SFEI	SFBRWQCB BCDC EPA	2019	$30,000	$30,000	RMP Special Study	March 2020	https://www.sfei.org/sites/default/files/biblio_files/Workshop%20Report_final.pdf
Sediment Monitoring and Modeling Strategy	Lester McKee	SFEI	–	2019 2020	$78,000 (2019 funds) $26,000 (2020 funds)	$104,000	RMP Special Study	November 2020	https://www.sfei.org/sites/default/files/biblio_files/SMMS_Nov2020.pdf
Update of Erosion and Deposition in San Francisco Bay	Bruce Jaffe Theresa Fregoso	USGS	–	2019 2020	$77,000 (2019 funds) $77,000 (2020 funds)	$154,000	RMP Special Study	March 2023	USGS Data Release https://www.sciencebase.gov/catalog/item/619aeb70d34eb622f692f986 USGS Open File Report https://pubs.usgs.gov/of/2023/1031/ofr20231031.pdf
Sediment bioaccumulation threshold review for PCBs in dredged sediment	Miguel Mendez Diana Lin Ila Shimabuku	SFEI	–	2020	$22,500	$22,500	RMP Special Study	October 2022	https://www.sfei.org/sites/default/files/biblio_files/PCB%20Sediment%20Bioaccumulation%20Report_Final_Website_0.pdf
Simulating Sediment Flux Through the Golden Gate	Michael MacWilliams	Anchor QEA		2020	$45,000	$45,000	RMP Special Study	March 2021	https://www.sfei.org/sites/default/files/biblio_files/FINAL_RMP_GoldenGateFlux_031121.pdf

Current Workgroup Efforts

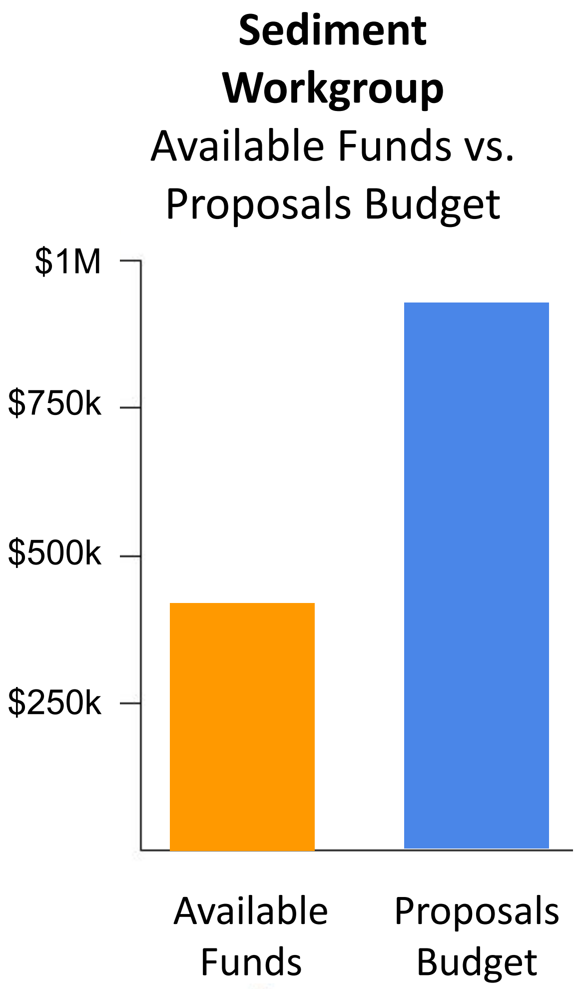
- Update and enhance the DMMO database
- Measure the temporal variability in sediment delivery to Whale's Tail marsh (2021-2022) and North Bay and Central Bay marshes (2022-2023)
- Monitor suspended sediment and wave monitoring in South and Lower South Bay (2022-2024)
- Monitor sediment flux at Richmond/San Rafael Bridge (will begin in 2025)
- Spatial variability of sediment accretion in San Francisco Bay restorations

RMP

Our Primary Job Today

Rank the Tier 1 and Tier 2 Proposals for 2025 funding considering

- Anticipated funding the RMP is allocating for 2025 Special Studies
- Anticipated additional funding that could be coming to the RMP from the EPA



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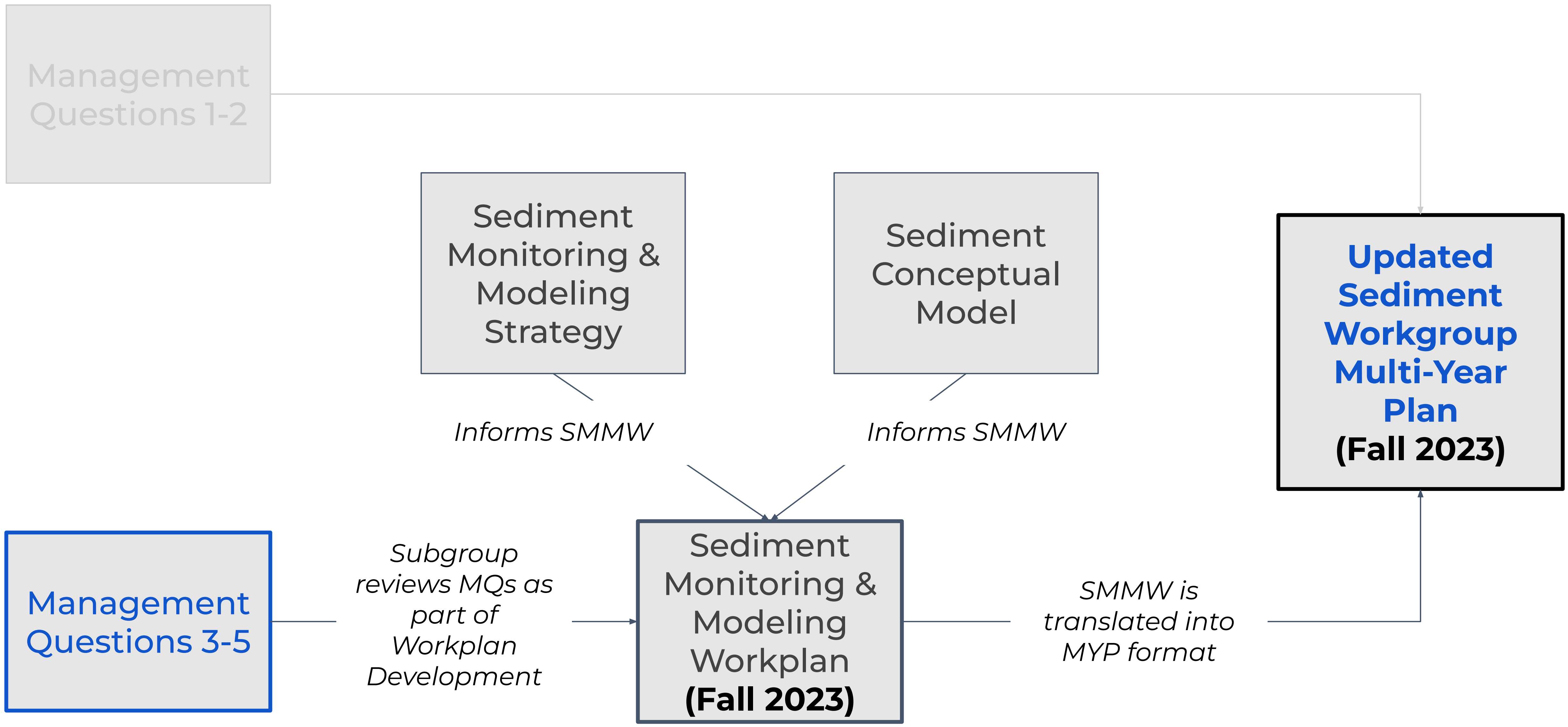
Overview of Sediment Workgroup Planning Efforts

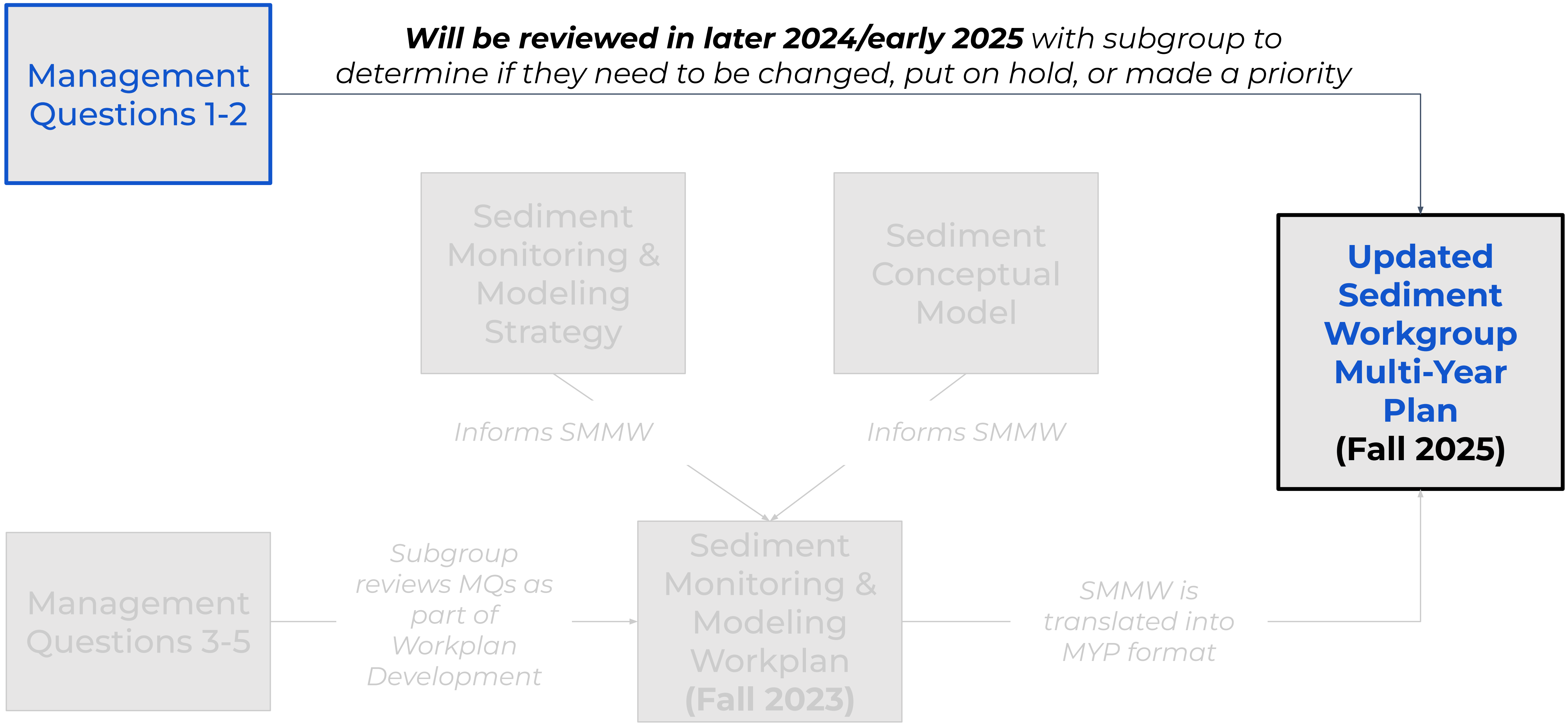
Scott Dusterhoff, SFEI

SedWG Meeting

May 16, 2024 – Hybrid


Management Questions 1-2
Management Questions 3-5
Sediment Workgroup Multi-Year Plan


Management Questions 1-2
Sediment Monitoring & Modeling Strategy
Sediment Conceptual Model
Updated Sediment Workgroup Multi-Year Plan (Fall 2023)
Informs SMMW
Informs SMMW
Management Questions 3-5
Subgroup reviews MQs as part of Workplan Development
Sediment Monitoring & Modeling Workplan (Fall 2023)
SMMW is translated into MYP format


Management Questions 1-2
Will be reviewed in later 2024/early 2025 with subgroup to determine if they need to be changed, put on hold, or made a priority
Sediment Monitoring & Modeling Strategy
Sediment Conceptual Model
Informs SMMW
Informs SMMW
Updated Sediment Workgroup Multi-Year Plan (Fall 2025)
Management Questions 3-5
Subgroup reviews MQs as part of Workplan Development
Sediment Monitoring & Modeling Workplan (Fall 2023)
SMMW is translated into MYP format

Main Considerations for MQ 1 & 2

- **Have not been a priority for the SedWG over the past few years**
  - *Since 2019, only ~10% of SedWG funds have gone to MQ 1 & 2 studies*
- **Others are funding studies that are addressing MQ 1 & 2**
  - *USACE - 1122 Strategic Placement Pilot and RDMMP Studies*

<u>Bottom Line</u> - RMP can not fund every study that needs to be done and needs to focus on the highest priority studies

Next Steps

- **Early Fall 2024 -** Assemble SedWG subgroup
- **Late Fall 2024 -** Hold meeting with SedWG subgroup to develop ideas for updating MQ 1 and 2 and potential Workplan elements
- **Winter 2025 -** Draft updates to MQ 1 and 2 and draft Workplan out for Workgroup review
- **Spring 2025** - Finalized updated to MQ 1 and 2 and Workplan
- **Fall 2025** - Update SedWG Multi-Year Plan

2025 Strategy Funds requested for this effort

Questions?

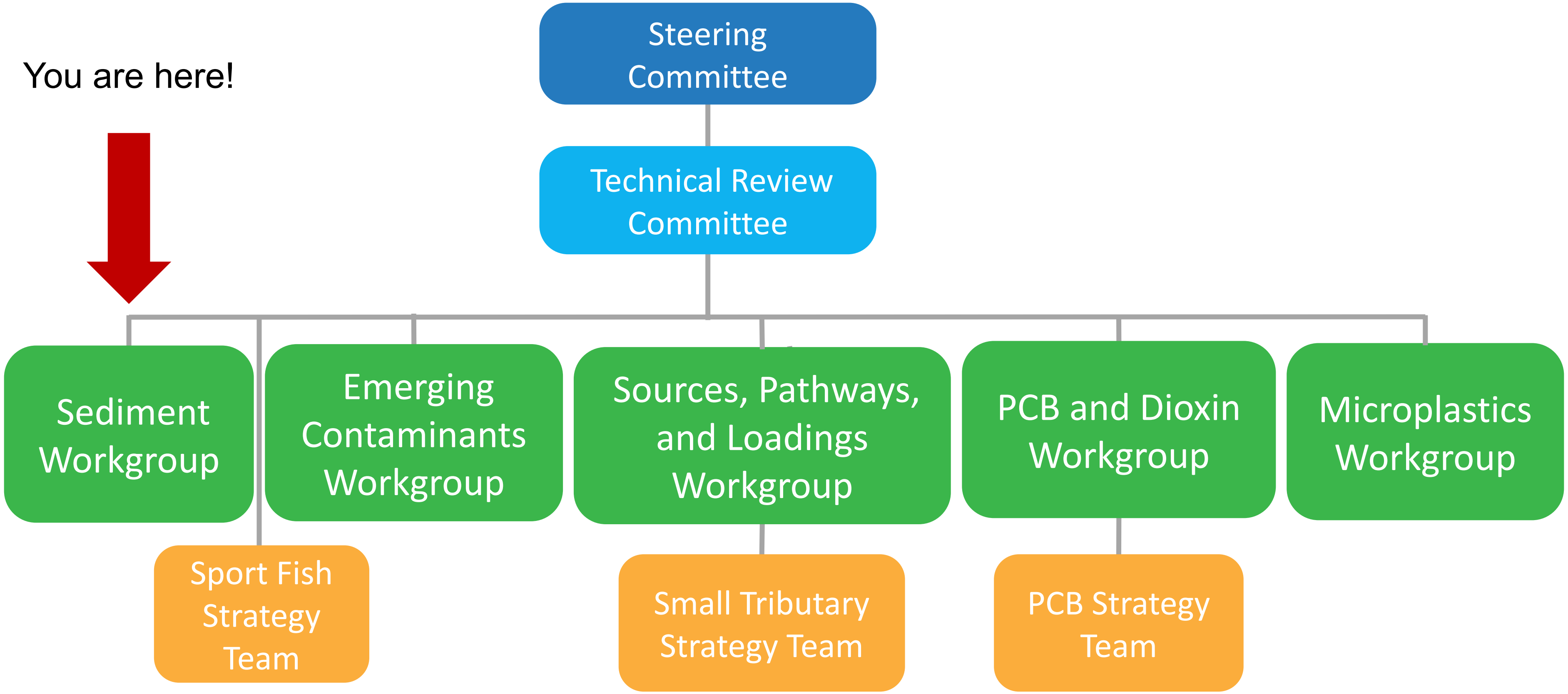
Regional Monitoring Program

Collect data and communicate information about water quality in San Francisco Bay in support of management decisions

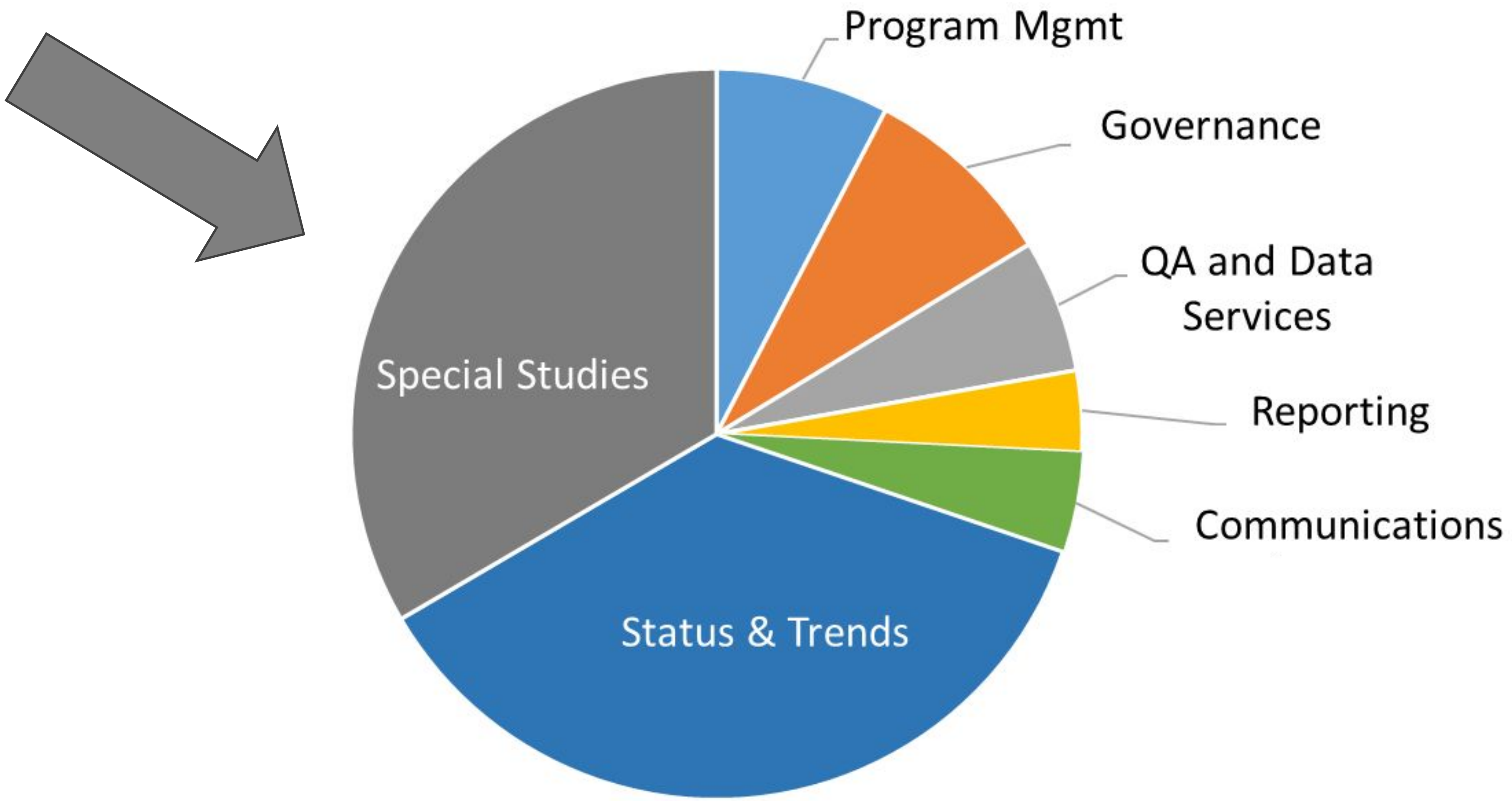
~ 68 entities in the Program

- Municipal wastewater
- Industrial wastewater
- Municipal stormwater
- Dredgers

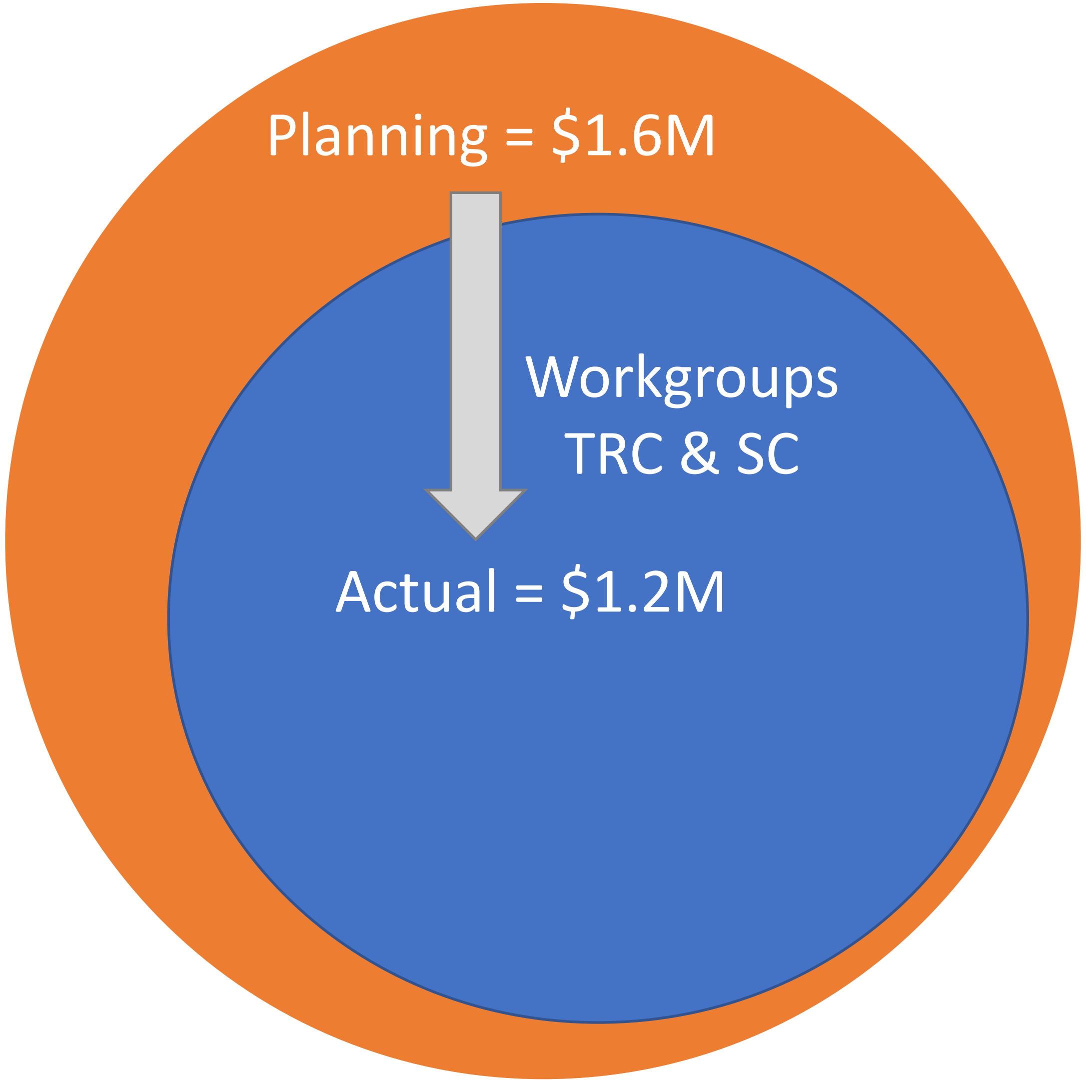
RMP Program Structure

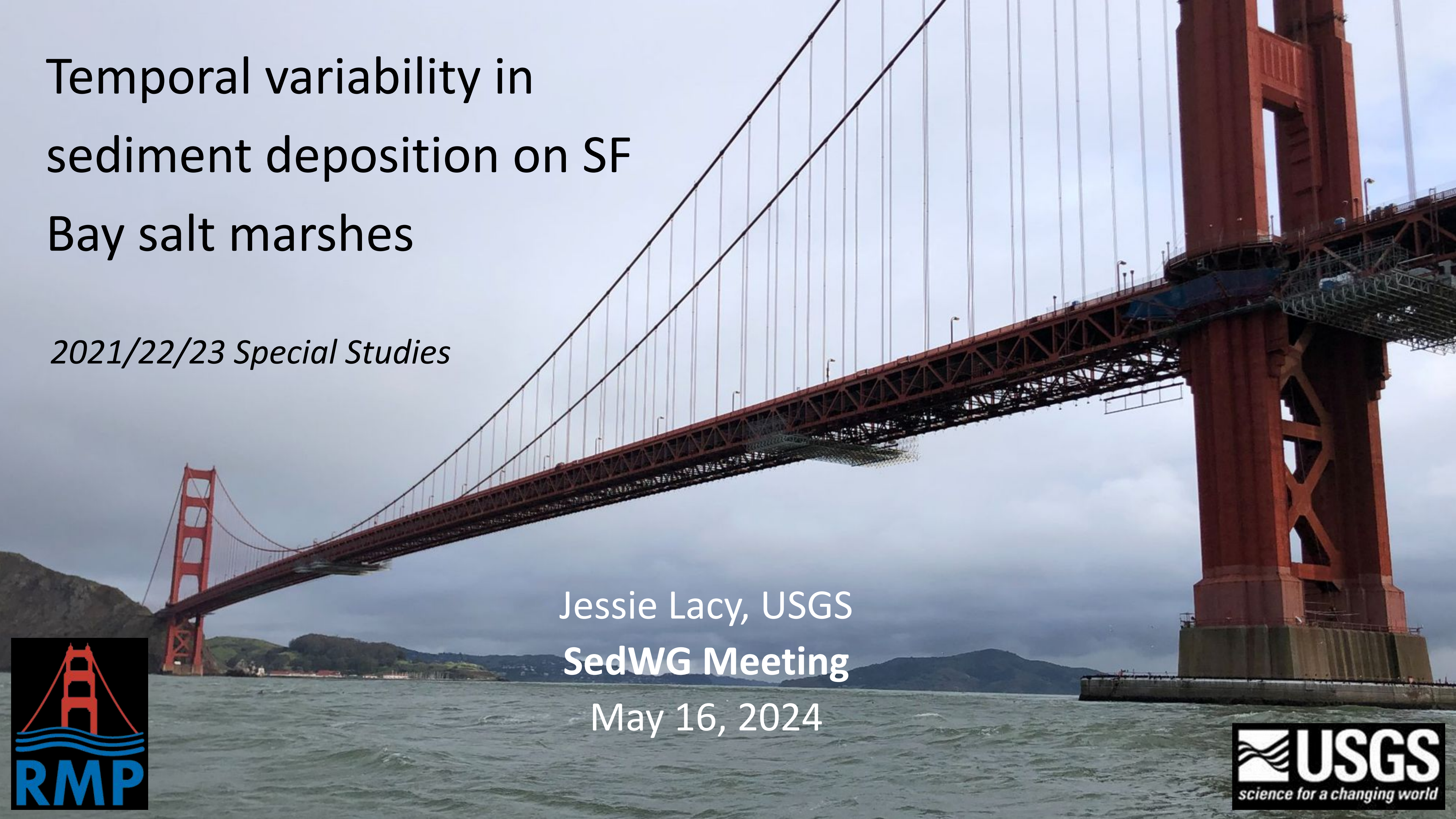


Regional Monitoring Program Budget



Special Studies Budget for 2024





Temporal variability in sediment deposition on SF Bay salt marshes

2021/22/23 Special Studies

Jessie Lacy, USGS

SedWG Meeting

May 16, 2024

RMP

USGS
science for a changing world

Project Team

PCMSC

PI: Jessie Lacy

Dan Nowacki

Samantha McGill

Andrew Stevens

Joanne Ferreira

MarFac group

WERC

PI: Karen Thorne

McKenna Bristow

Scott Jones

Kevin Buffington

Lyndsay Rankin

UC Berkeley

Lukas WinklerPrins

Mark Stacey

We gratefully acknowledge funding from:

San Francisco Bay RMP

USGS San Francisco Bay Priority Ecosystems Program

USGS CMHRP Program

USGS Ecosystems Mission Area

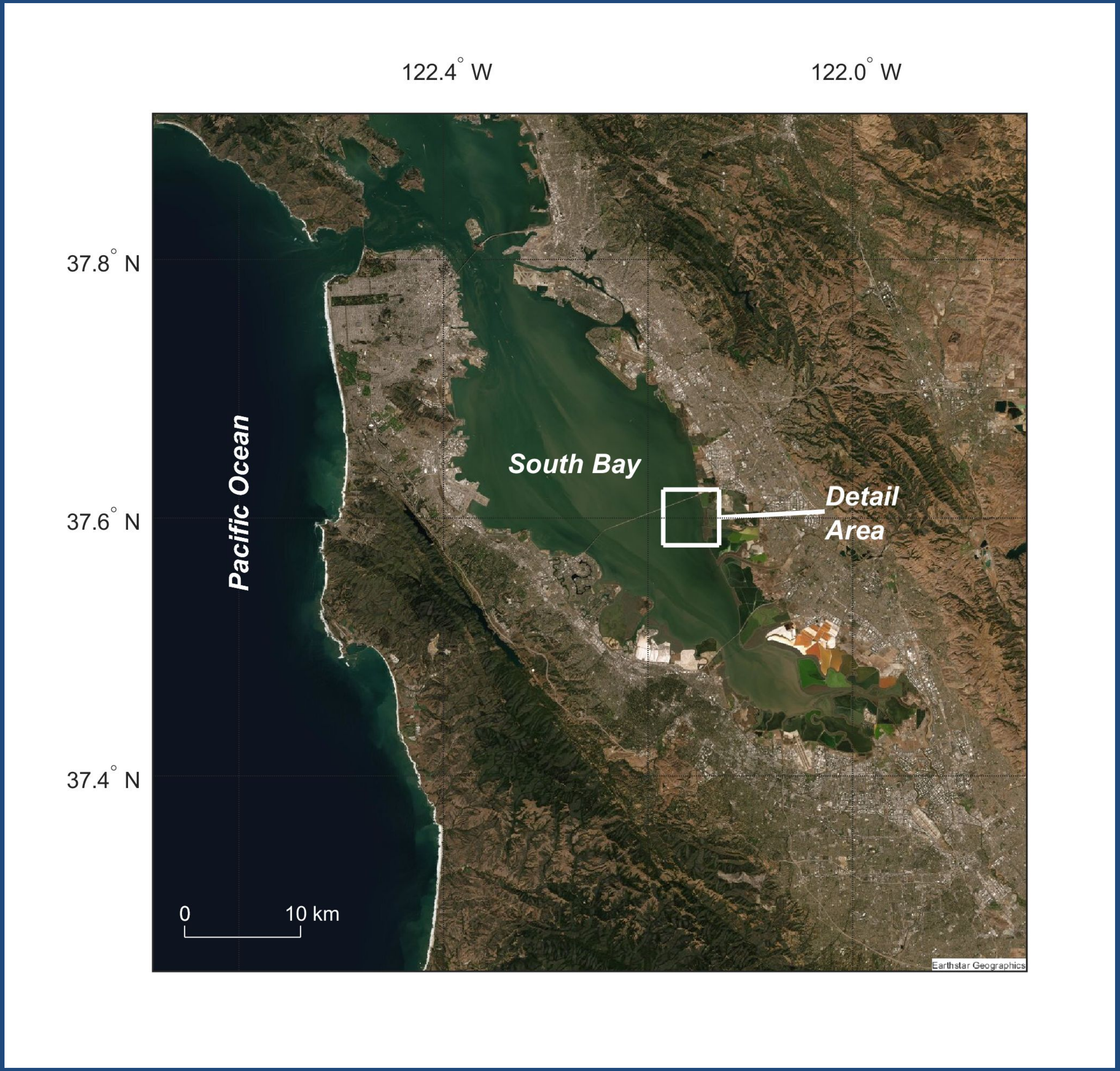
Questions/goals

1. How do deposition and erosion in a salt marsh vary with tides, wave conditions, and season?
2. What information do we need to predict sediment deposition in a salt marsh?
   - suspended-sediment concentration (SSC) in the shallows ?
   - where and when?
   - other site attributes: wave climate, marsh edge morphology, vegetation type/density?
3. Collect data to support development of models of marsh resilience

Whale's Tail Marsh south in South San Francisco Bay
2021/22 RMP Special study

- Large wave fetch
- steep scarp/erosional edge
- Proximity to ongoing marsh restoration

- Focus on understanding processes
- More spatial and temporal resolution, shorter study duration: 8-wk studies in summer 2021 and winter 2021/22



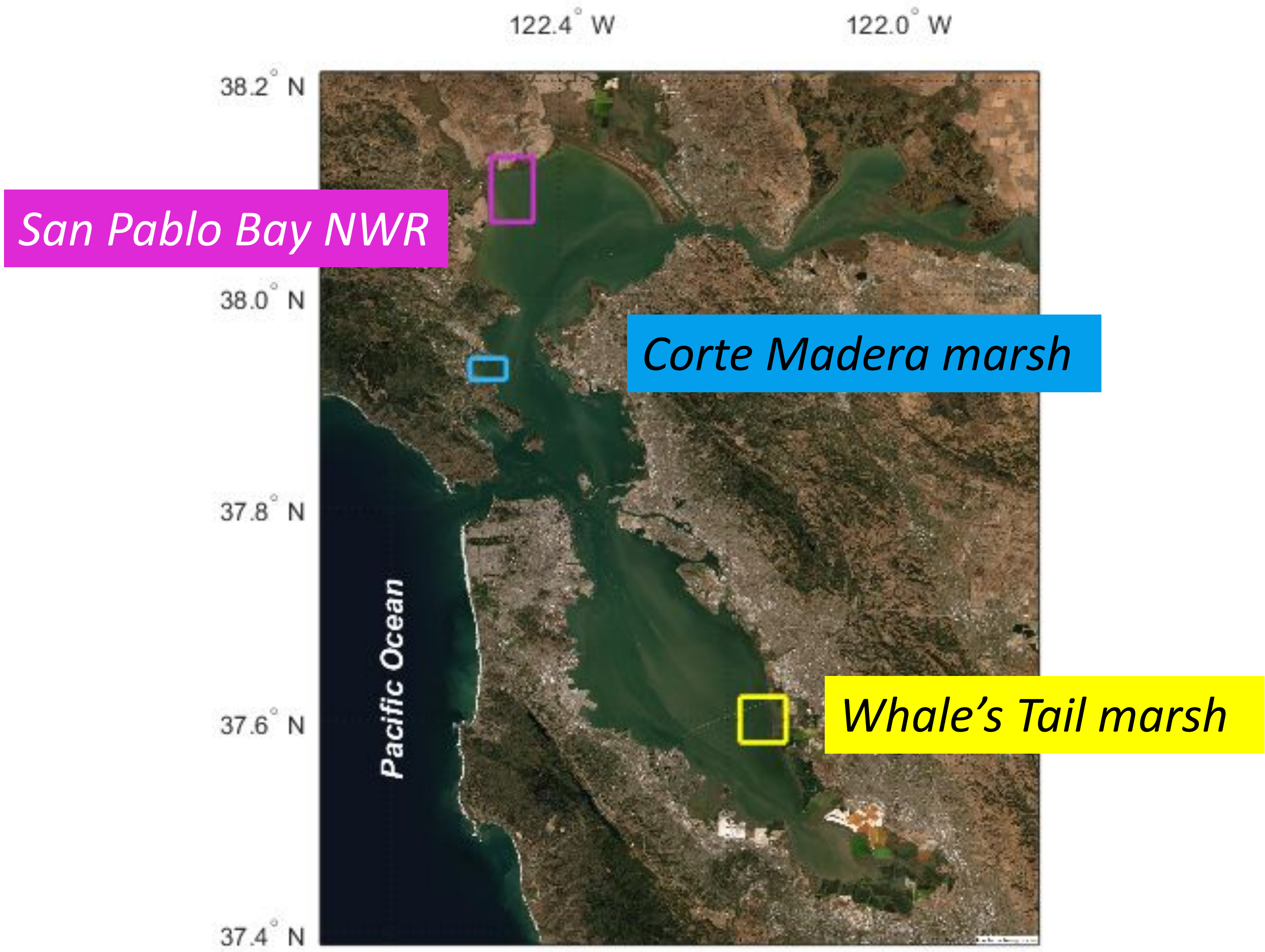
2022/23 RMP special study:

2 more sites

Examine variation in deposition in San Francisco Bay marshes due to :

- Proximity to Delta and local sediment sources
- Wave exposure
- Marsh edge type
- Vegetation type

Less intensive data collection, longer duration



Temporal variability in sediment delivery to a South San Francisco Bay salt marsh

2020 Special study
Products

Deliverable	Date
Data release: time-series data https://doi.org/10.5066/P972R6AW	**April 2023**
Data release: Aerial imagery and Digital Surface Maps from Structure from Motion https://doi.org/10.5066/P9L9R2VS	**May 2023**
Data release: sediment properties https://doi.org/10.5066/P98BL0XF	**August 2023**
Data release: deposition, accretion, and vegetation characteristics https://doi.org/10.5066/P9YBBXIZ	**Sept 2023**
Report (submitted paper): Seasonality of retreat rate of a wave-exposed marsh edge (WinklerPrins et al., in review at JGR-Earth Surface)	**Sept 2023**

Deliverable	Date
Report (submitted paper): Where does blue carbon come from? A meter-scale perspective from a salt marsh (Thorne et al.)	Sept 2024
Report (submitted paper) Hydrodynamic forcing of sediment deposition in an erosional marsh landscape (WinklerPrins et al.)	June 2024
Presentations at Regional Meetings • South Bay Salt Ponds Science Symposium Science Symposium 2022: Day 2, Part 2 - YouTube • RMP Annual Meeting	**May 2022** **Oct 2022**
Presentations to RMP SWG	**May 2023** **May 2024**

Temporal variability in sediment delivery to Corte Madera and San Pablo Bay NWR marshes

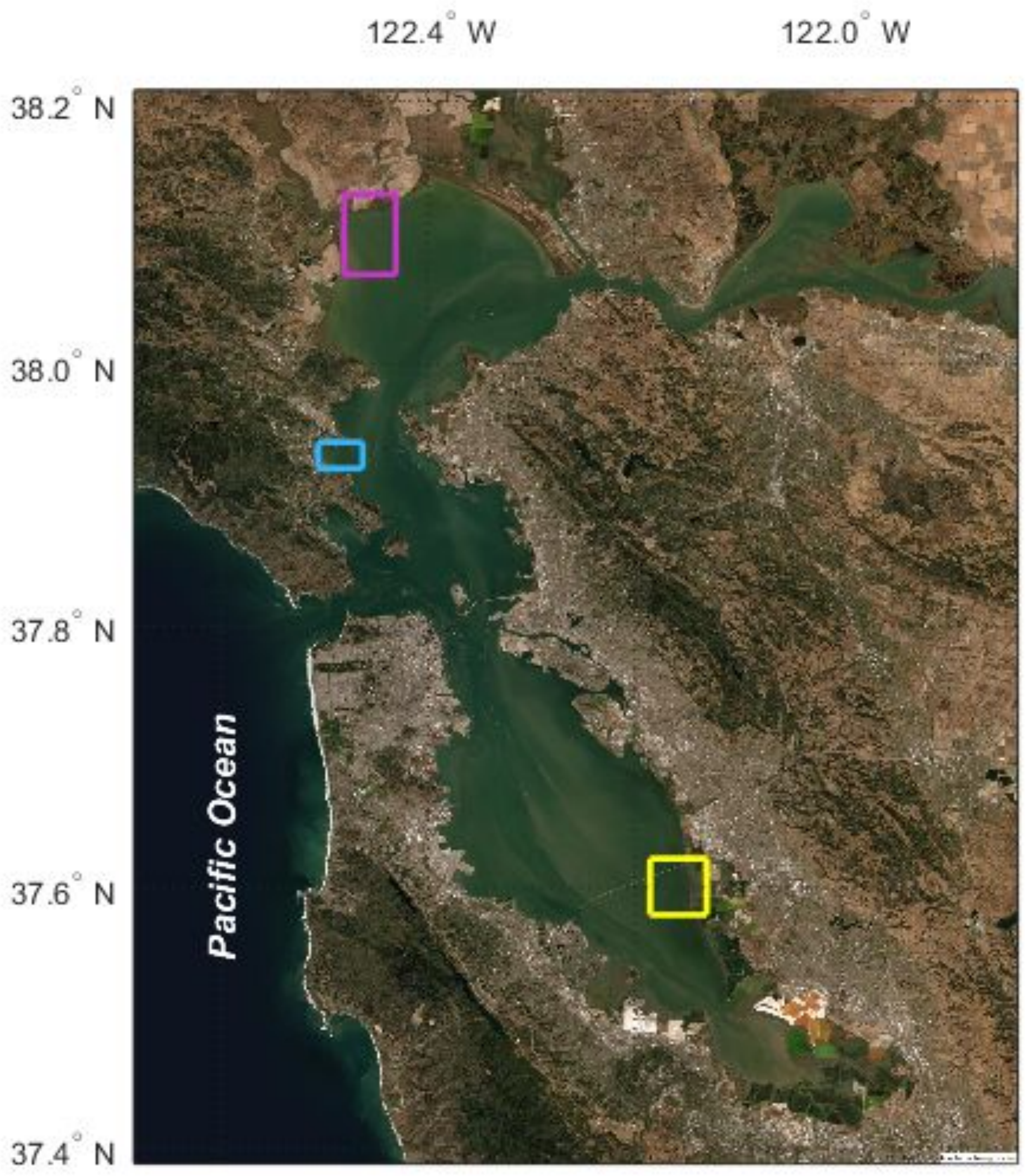
2022/23 Special studies
Products

Deliverable	**Date**
Data release: Time series data and sediment properties	June 2024
Data release: deposition, accretion, and vegetation characteristics	June 2024
Report (draft paper) investigating the relationships among SSC in the shallows, SSC at long-term channel stations, and sediment deposition on marshes	Mar 2025
Final Presentation to RMP Sediment Workgroup	May 2024 May 2025
Presentation at State of the Estuary Conference (poster)	May 2024

Ramped edge,
fringing Spartina

Scarped
edge
~0.5 m

Scarped edge
1-2 m



1 dominant
Salicornia pacifica
Avg ht: **15.9 cm**
Est perc. cover: **80%**

4 dominants, patchy
S. pacifica, *Spartina foliosa*,
Distichilis spicata, *Jaumea carnosa*
SAPA avg ht = **26.0 cm**, cover = **40%**
SPFO avg ht = **44.1 cm**, cover = **9%**
DISP avg ht = **20.1 cm**, cover = **19%**
JACA avg ht = **14.3 cm**, cover = **14%**

2 dominants
Low marsh = *S. foliosa*
Avg ht: **68.6 cm**
Perc. cov: **11%**
High marsh = *S. pacifica*
Avg ht: **38.1 cm**
Perc. cov: **71%**
Transition ~20 m from mudflat

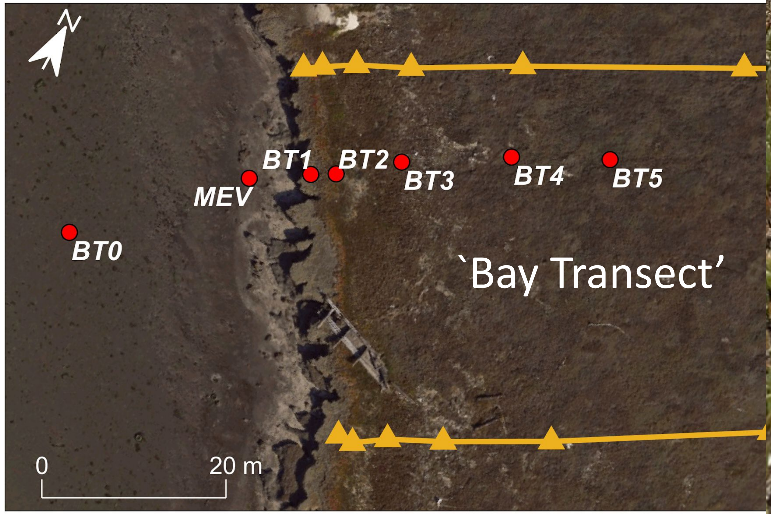
Summer 2021 and 2022

Measuring sediment deposition: sediment pads

Pads deployed in transects parallel to the Bay edge or a tidal creek

- 6-7 distances per transect
- 3 replicates per distance
- collected every 14 days (Whale's Tail) or 30 days
- dry mass measured

Marker horizon plots also deployed at the three sites



Time series measurements:

SSC, water level, currents, waves in bay shallows

- Subtidal station
- Intertidal station

SSC and water level on each marsh (multiple stations at Whale's Tail, one station at San Pablo NWR and Corte Madera marshes)

Sediment flux in tidal creeks:

- Whale's Tail
- Corte Madera marsh

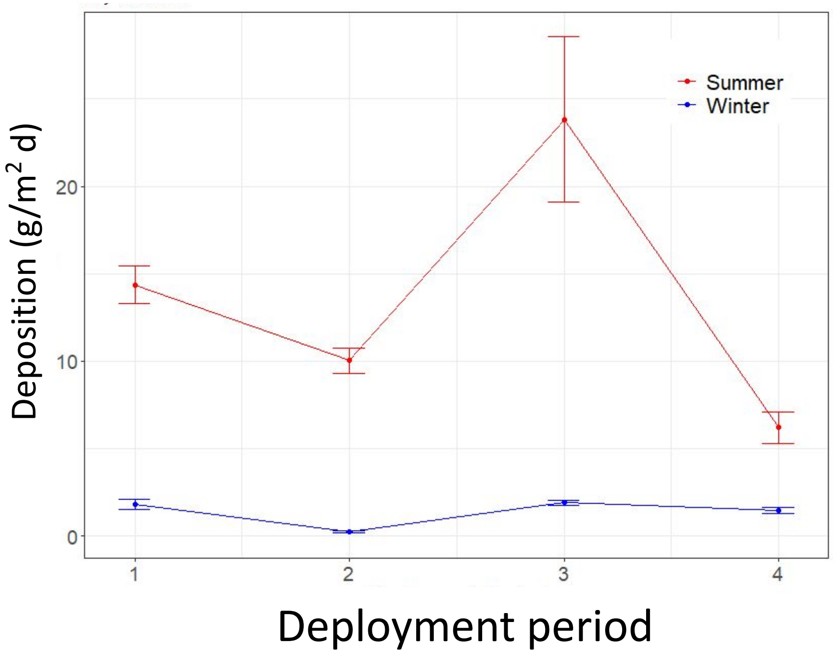
Whale’s Tail

Deposition: temporal variation

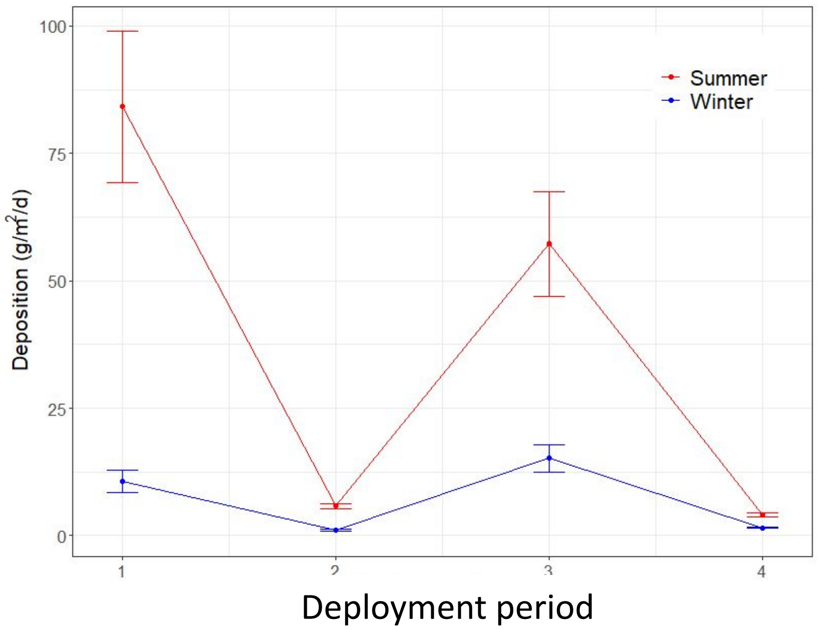
- Deposition much greater during summer than winter at all sites
- Deposition greater in periods with big spring than weaker spring tides

Averages across transects

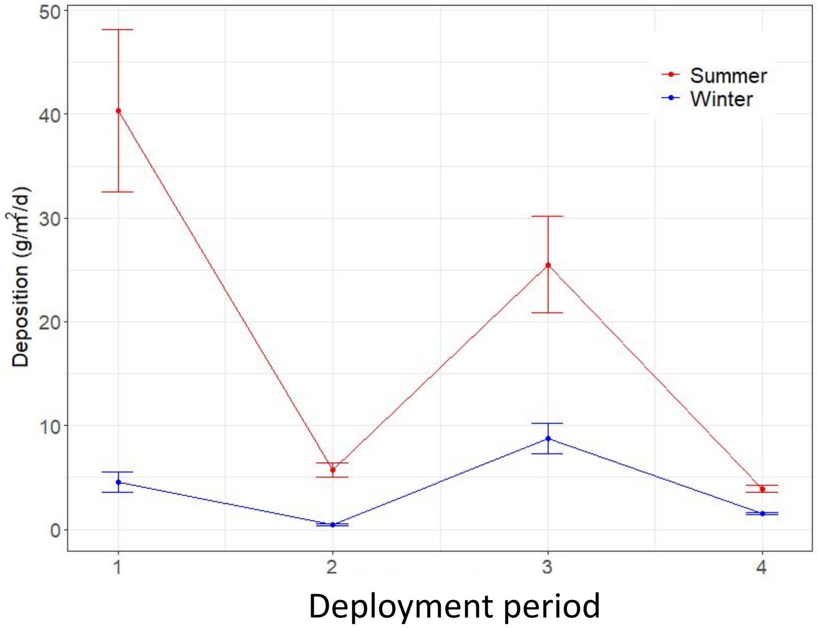
Bay transect



Channel transect

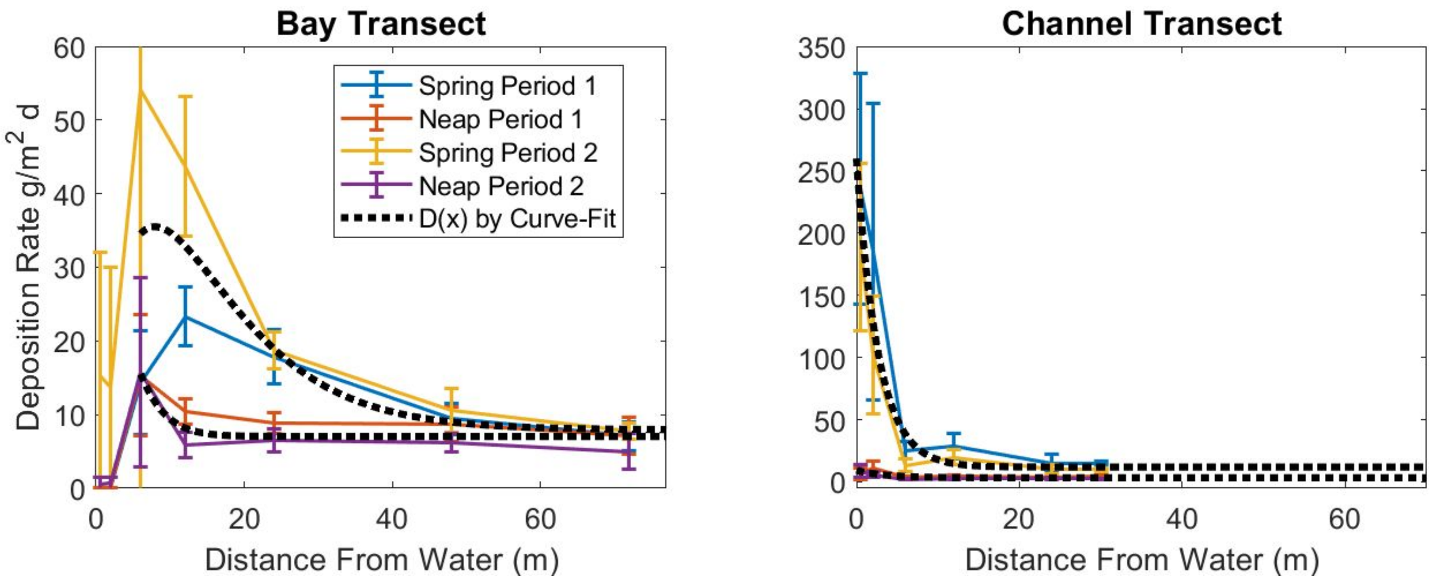


Interior transect



Deposition vs. distance from source

- Deposition decreases with distance from sediment source
- Maximum deposition further landward on Bay transect than channel transect



Note difference in y-axis range!

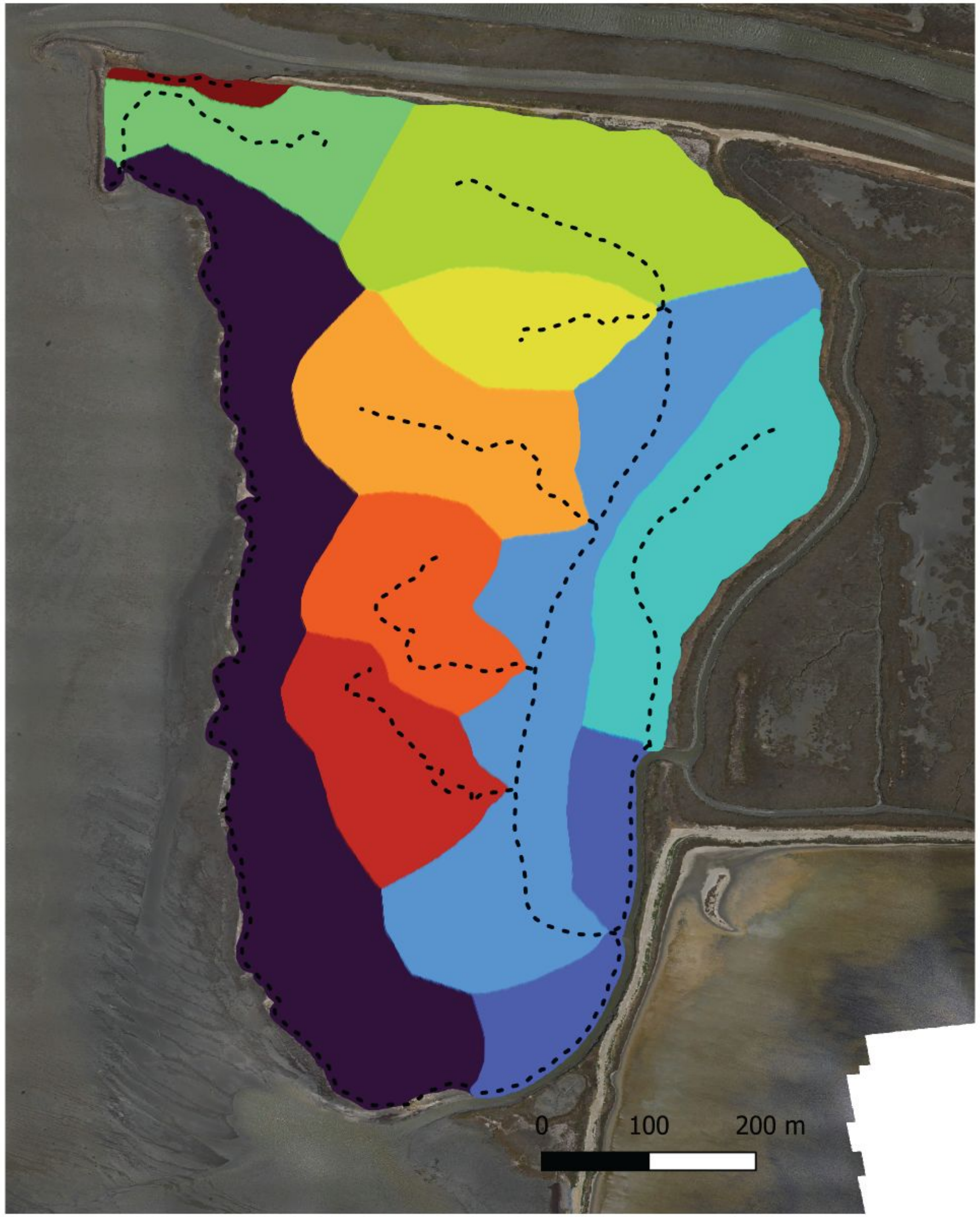
At Whale’s Tail, we also measured lateral retreat of the marsh edge, using DEMs constructed from aerial imagery and Structure for Motion

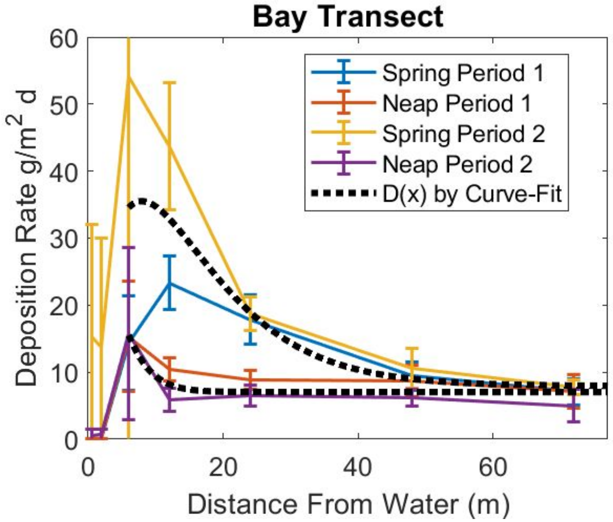
Edge retreat was significantly greater in spring and summer than fall and winter

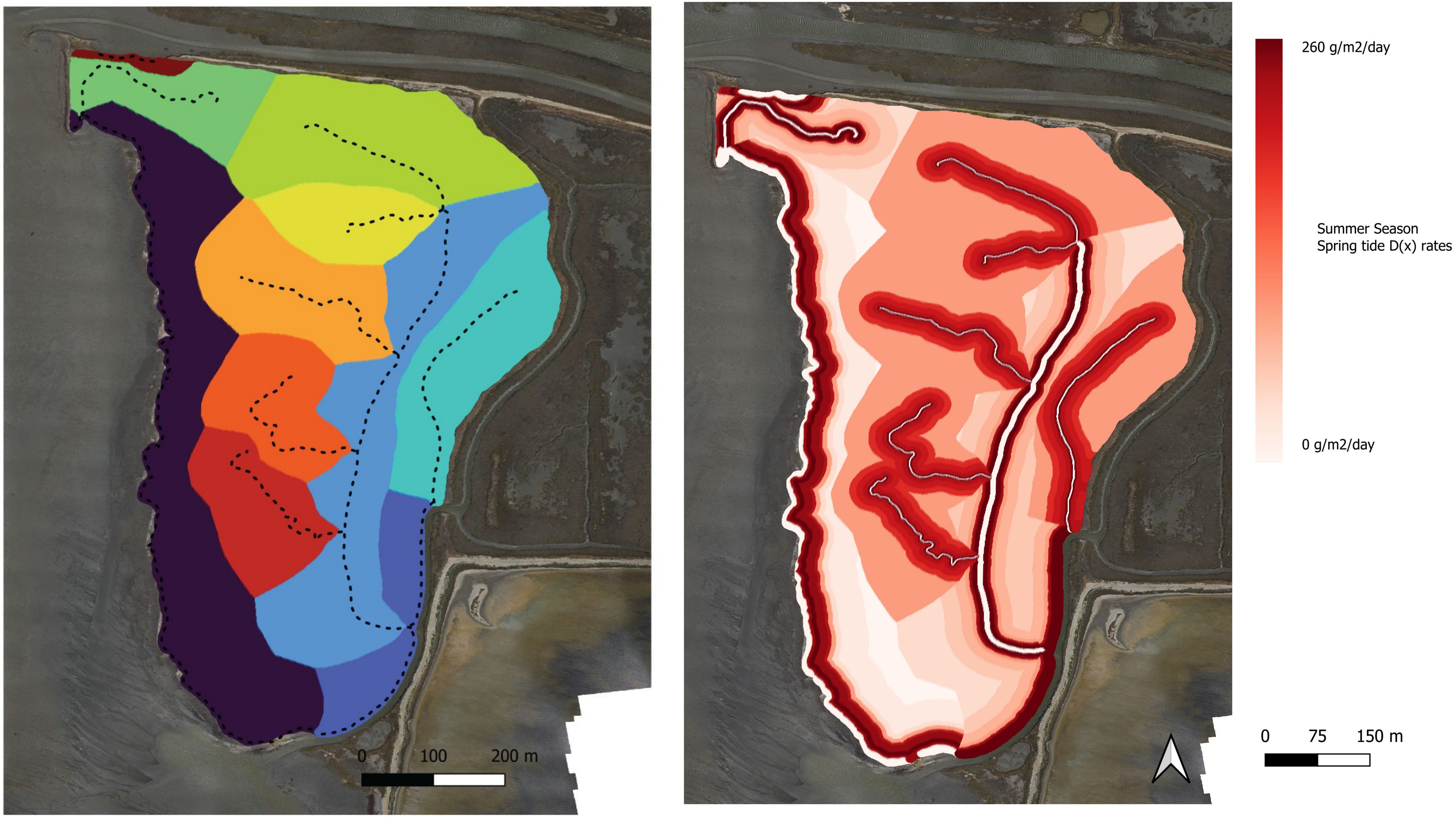
Wavy summer sea breeze season is associated with both greater edge erosion and greater deposition on the marsh top

Estimating annual sediment budget

- Divide marsh into zones associated with the closest water source.
- Classify zones as bay, primary creek, or secondary creek
- Estimate annual deposition using a fitted curve to sediment pad data for each class, then averaging spring and neap, winter and summer.






0
100
200 m
260 g/m2/day
Summer Season
Spring tide D(x) rates
0 g/m2/day
0
75
150 m


Tile-based model
WinklerPrins et al., in prep
+3500 kg/day
Whale's Tail south
Cargill marsh


+1200 kg/day
+3500 kg/day
Tidal creek sediment flux
Nowacki et al., in prep
Whale's Tail south
Cargill marsh

DEMs made with Structure for Motion *WinklerPrins et al., in review*

Imports and exports roughly in balance

Lateral erosion balanced by vertical accretion = shrinking marsh

Goal of the 2022 Special Study is to investigate the relationships between deposition and SSC, waves, and tidal forcing in two marsh sites in different settings

Data collection April 2022-July 2023, including very wet winter of 2022/23

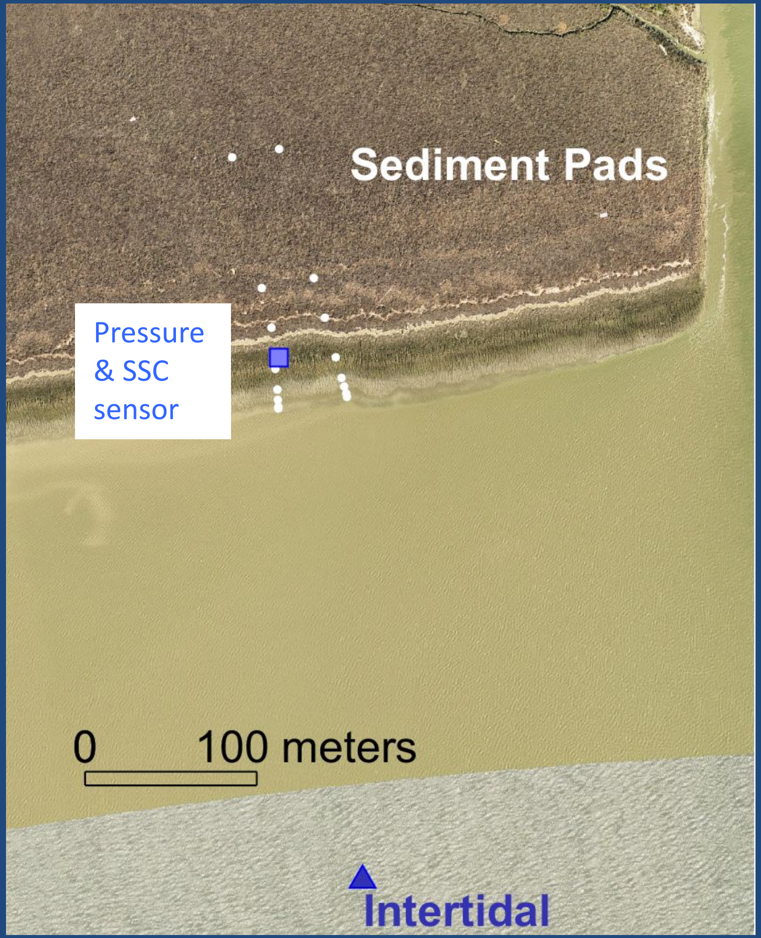
We used the average of deposition on pads between 18 and 48 m from the bay edge for comparing to SSC.

SSC on the marsh was measured 24 m from the edge

Corte Madera marsh

Corte Madera marsh

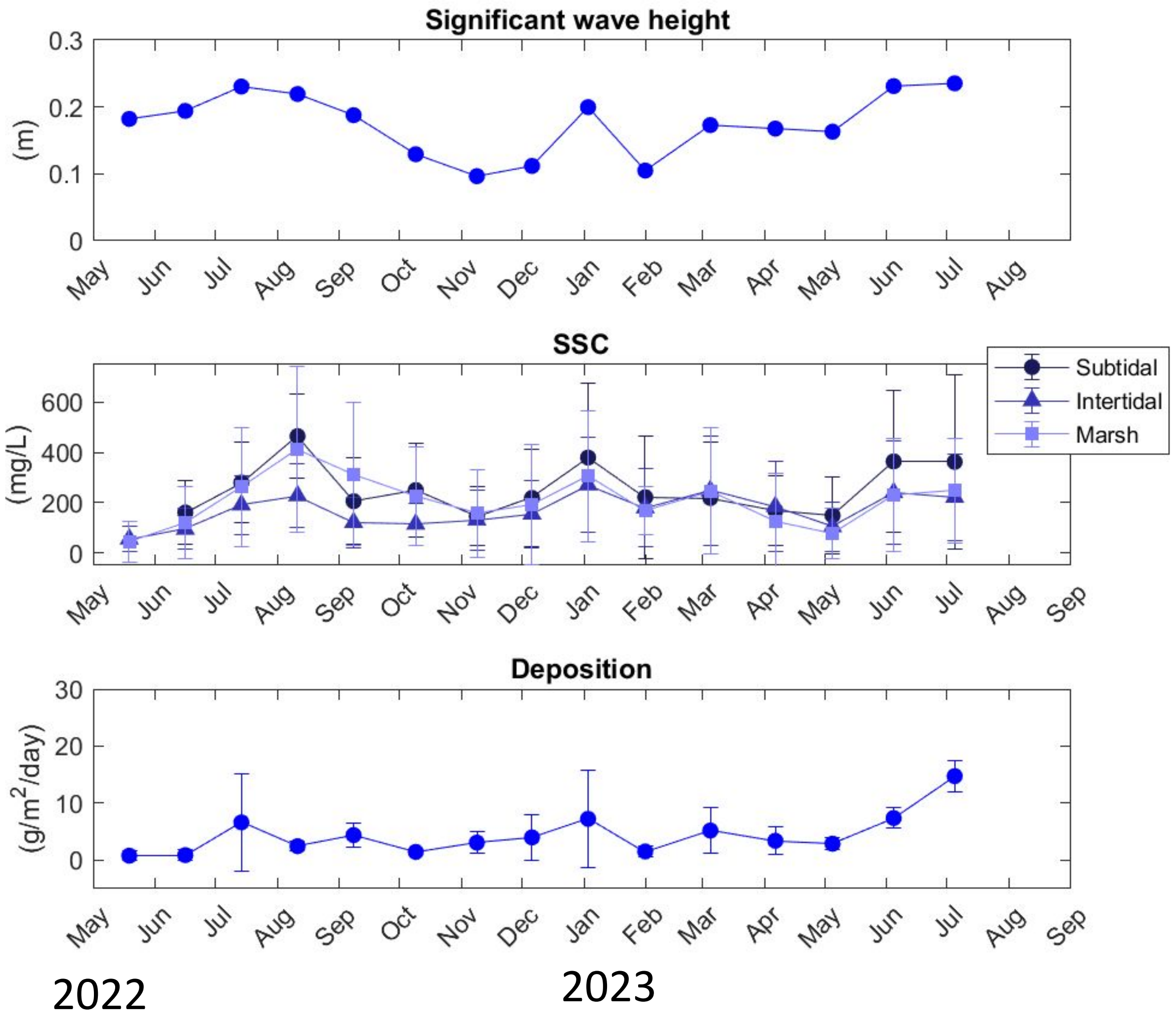
- Scarped, retreating edge
- Less wave exposure than Whale’s Tail
- Relatively low elevation



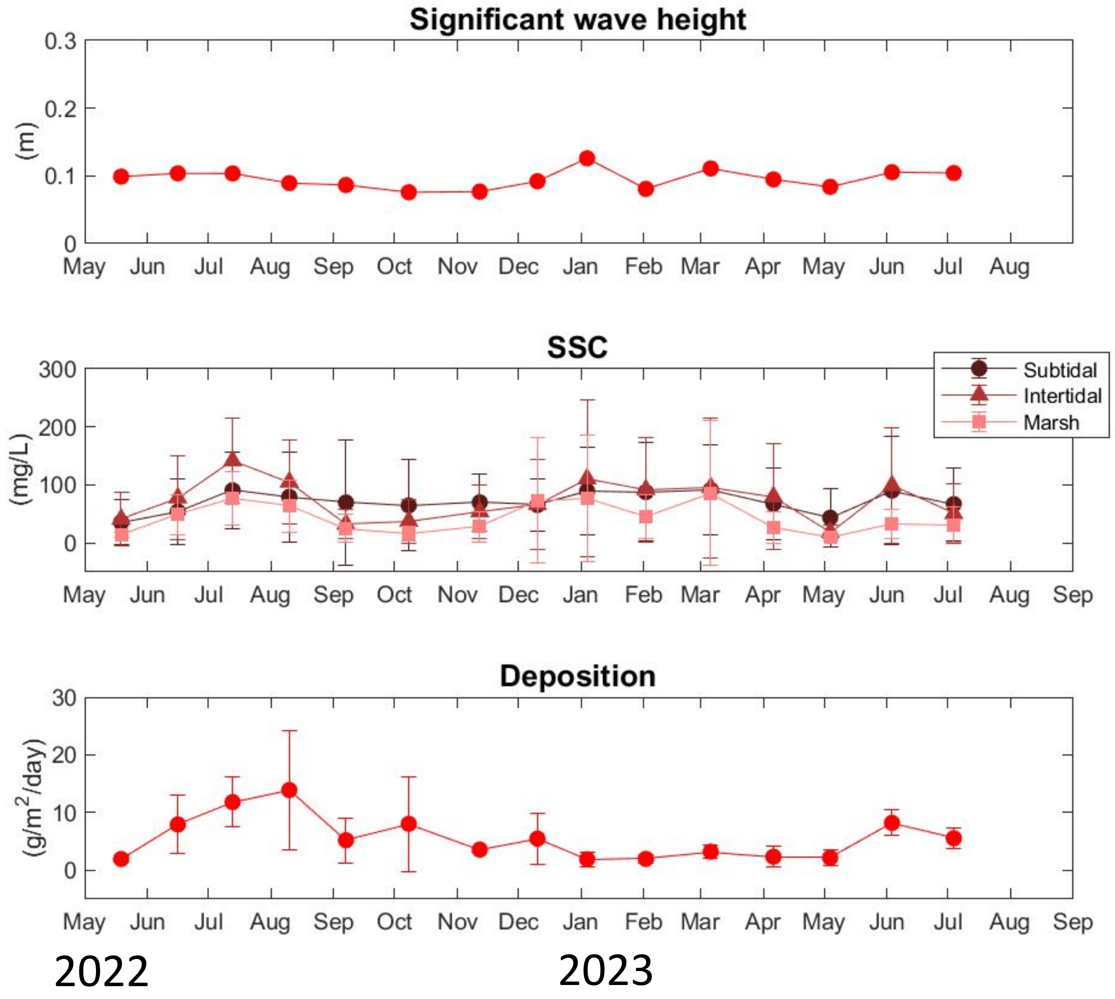
San Pablo Bay NWR

- Adjacent to a fluvial sediment source
- Ramped edge
- Accretion monitoring since 2013

San Pablo NWR

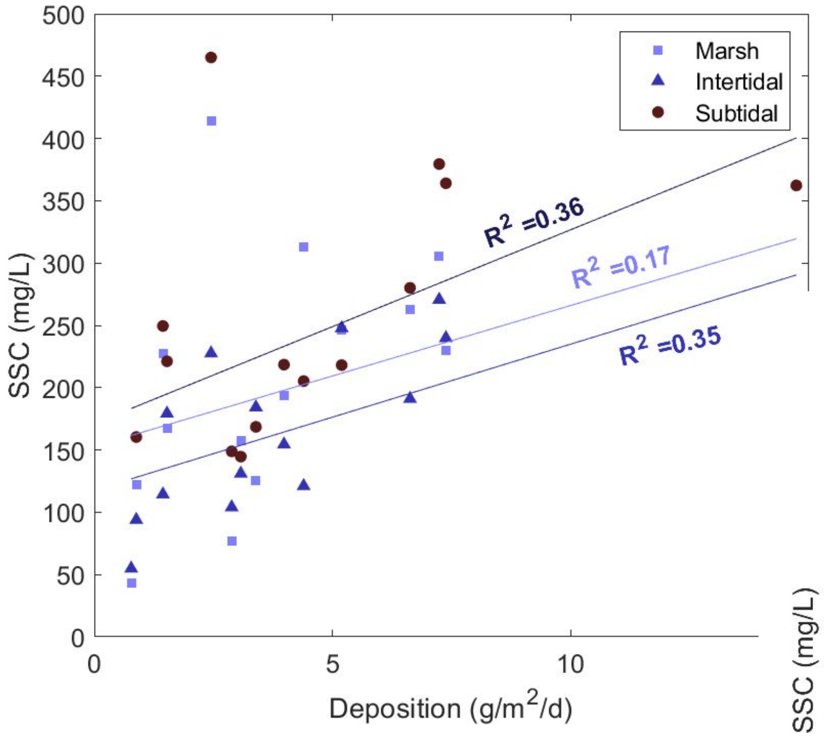


Corte Madera marsh

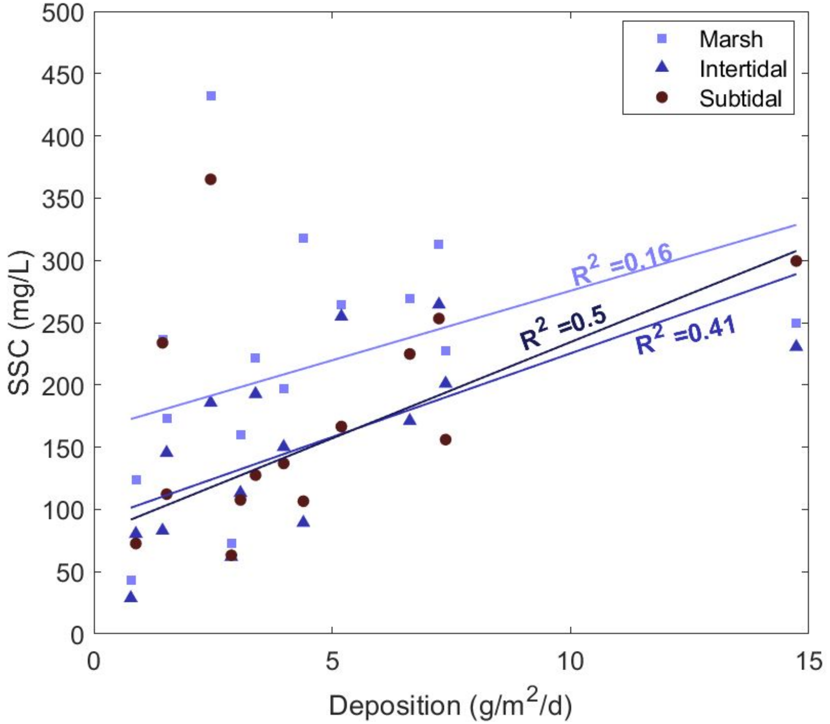


Wave and SSC data averaged over sediment pad periods

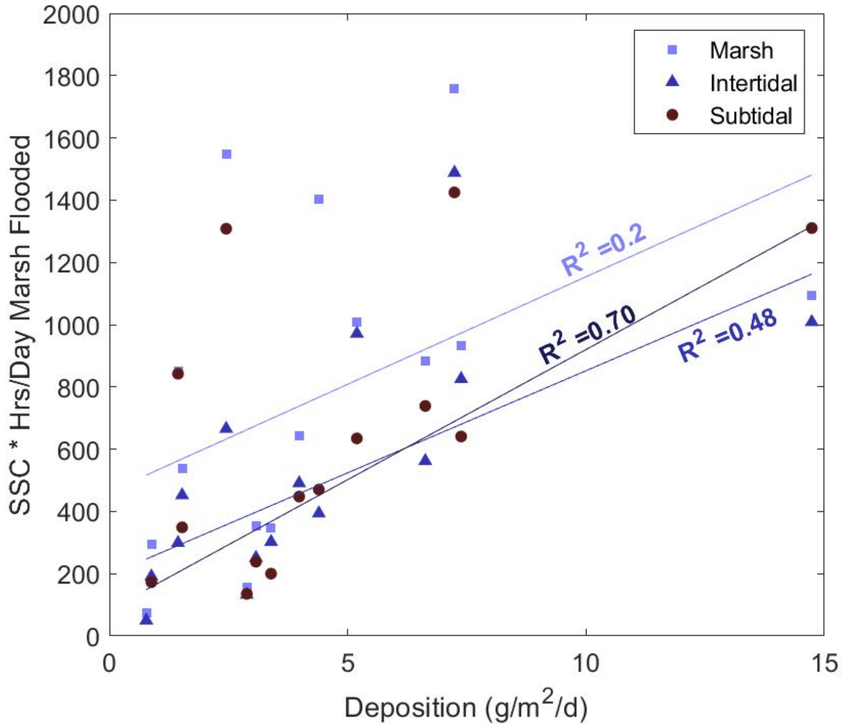
San Pablo NWR



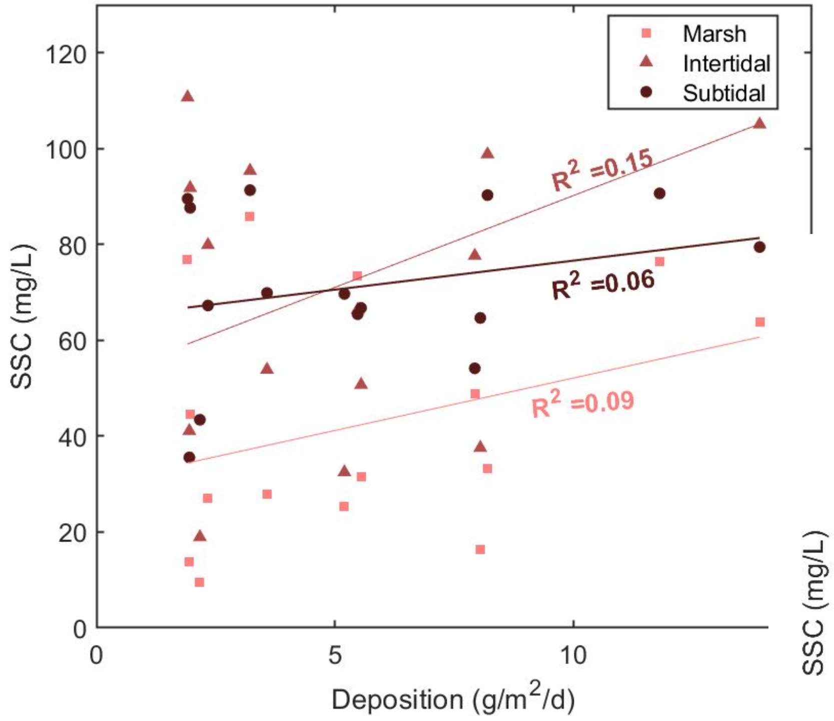
Water level > MHW



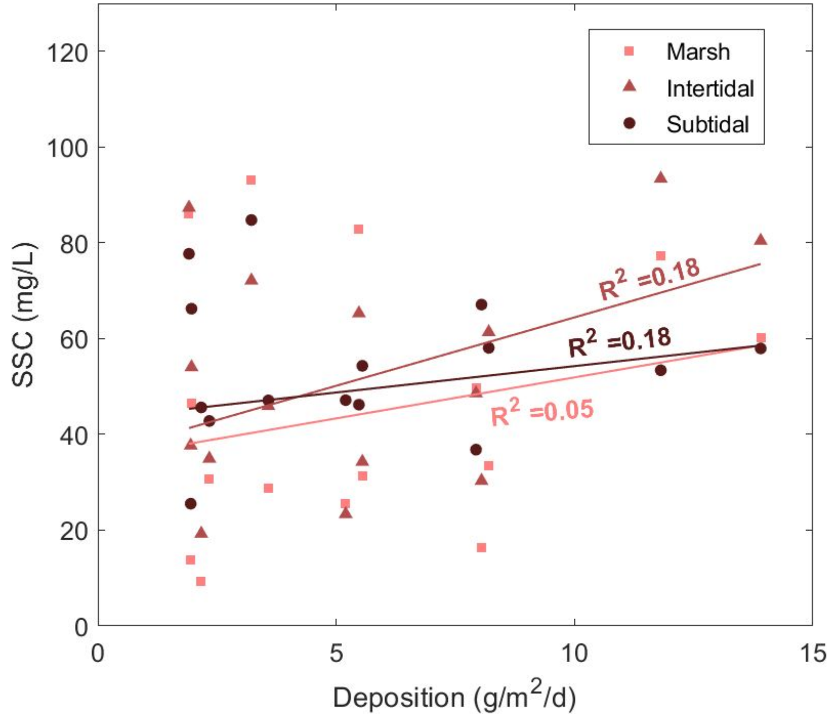
Water level > MHW
Weighted by inundation time



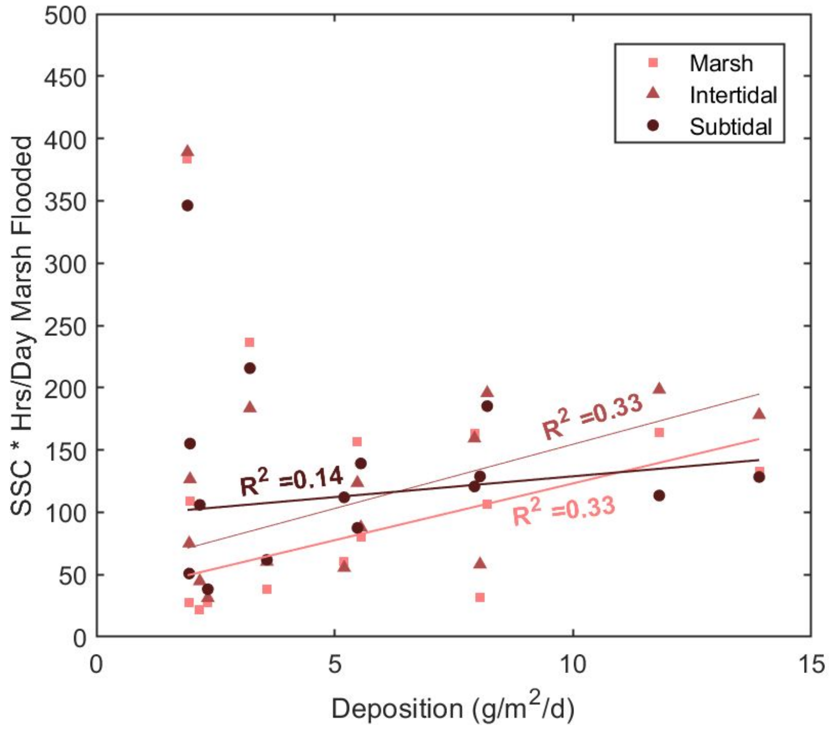
Corte Madera Marsh



Water level > MHW



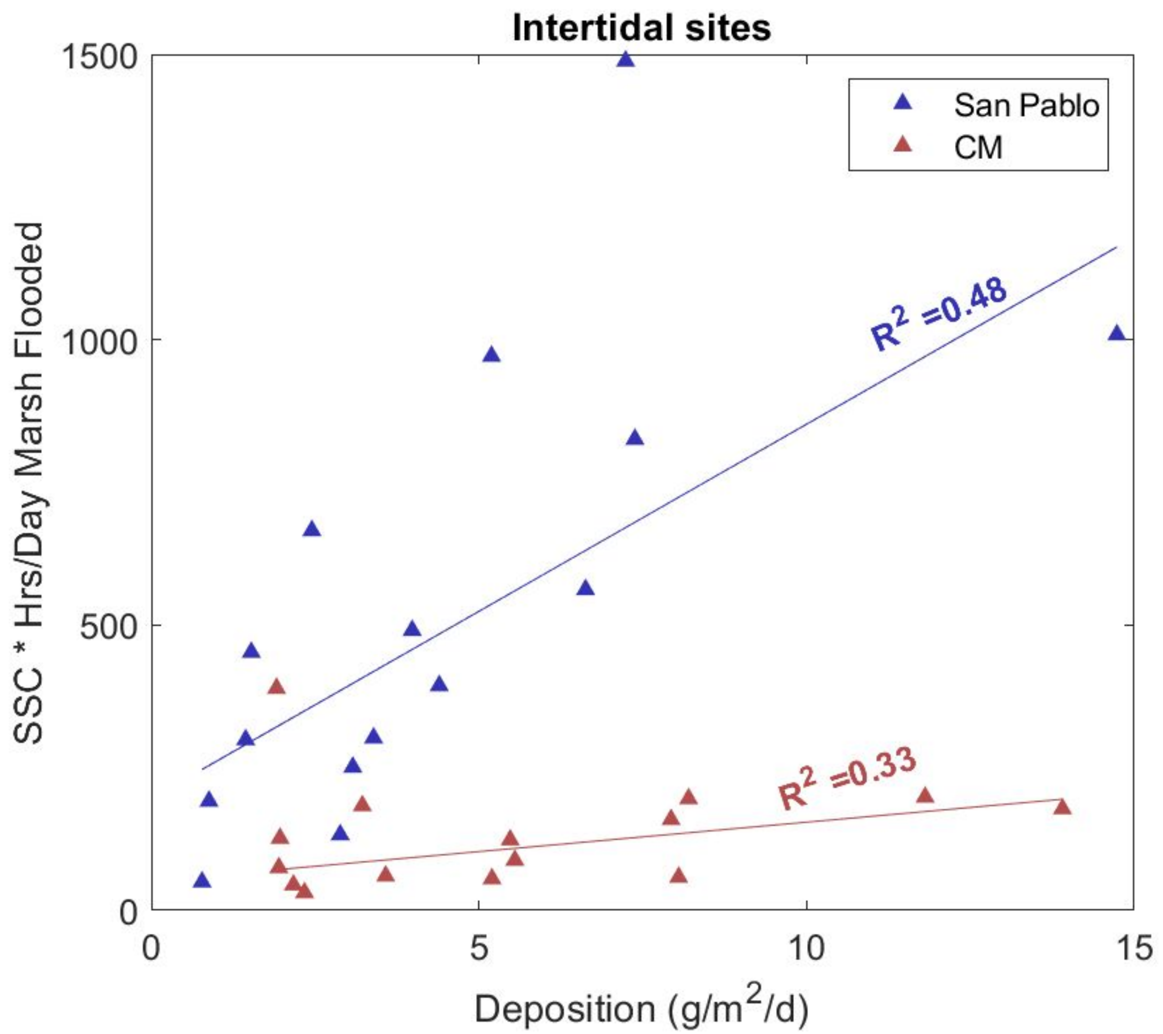
Water level > MHW
Weighted by inundation time



Comparing the two sites

Relationships between SSC or SSC*x*Inundation hours and deposition are clearly different :

- For a given level of SSC, there is more deposition at Corte Madera than San Pablo Bay
- SSC and SSC*x*Inundation hours are greater at SPB than Corte Madera, but rates of deposition are similar



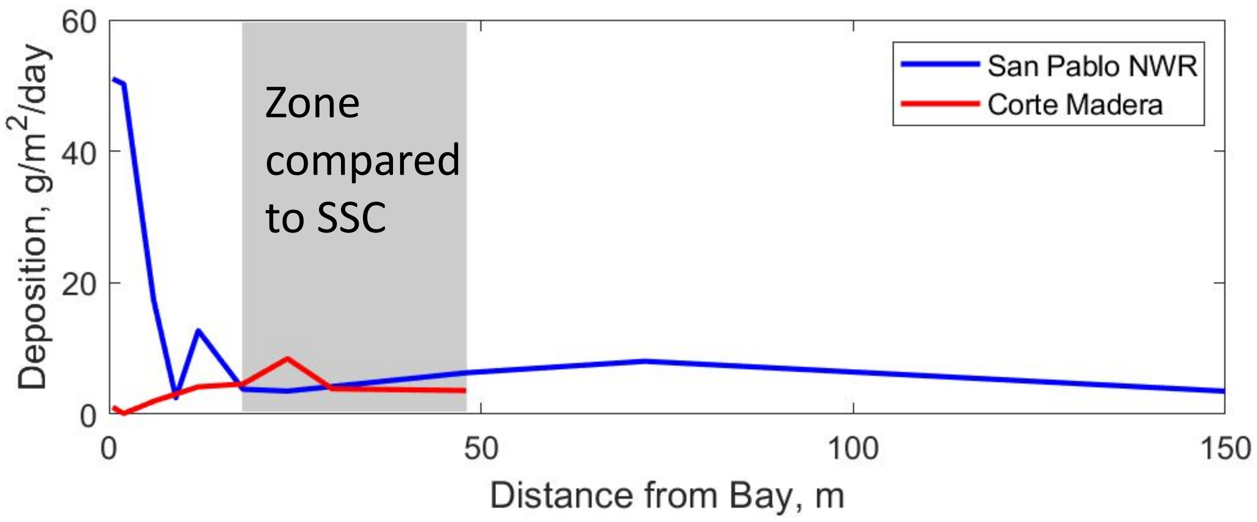
Why is the relationship different at the two sites?

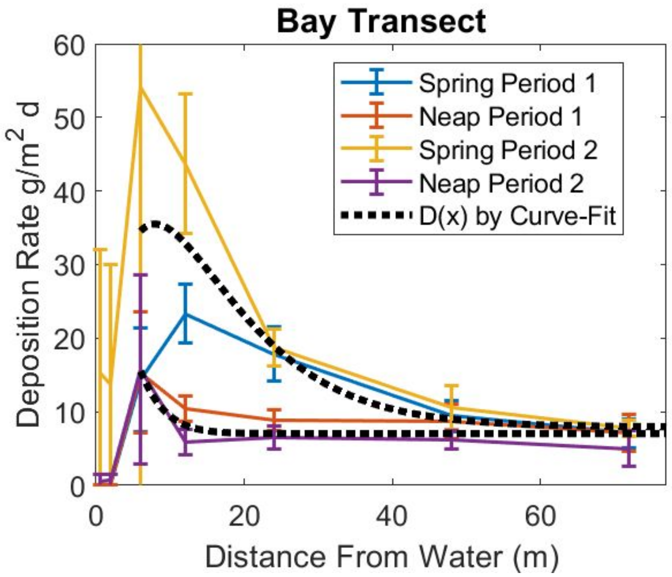
Spatial pattern of deposition at the two marshes differed

- Scarped vs. ramped
- Differences in vegetation

Sediment trapped close to the edge (in Spartina) at San Pablo NWR not accounted for in our analysis.

Average deposition over 16 months

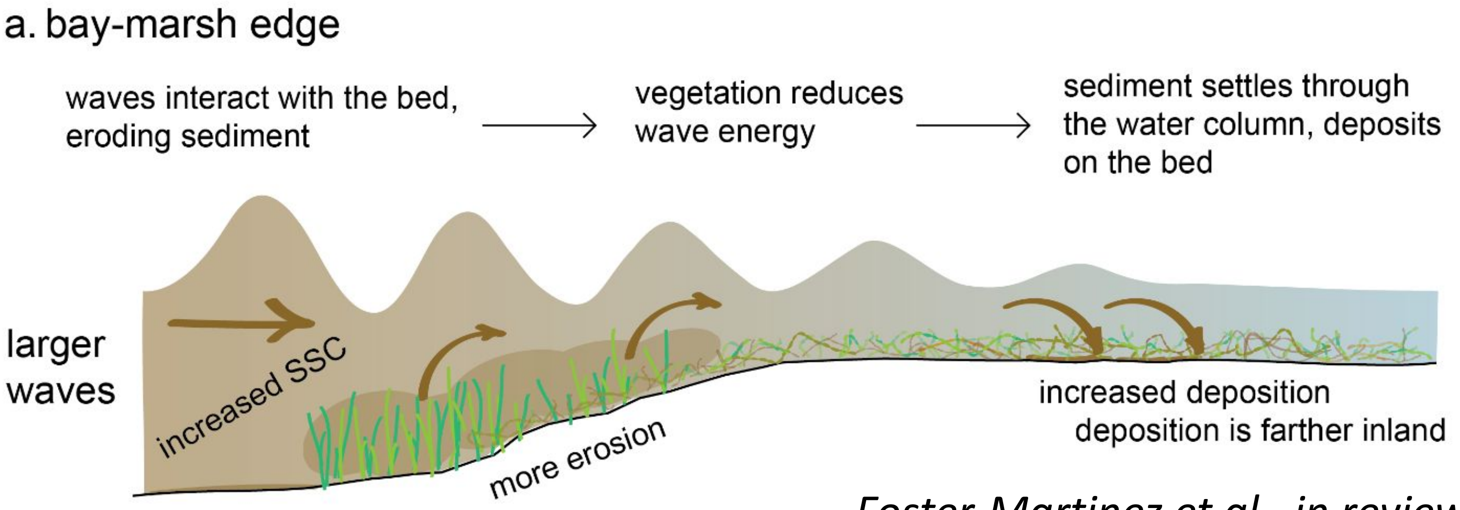




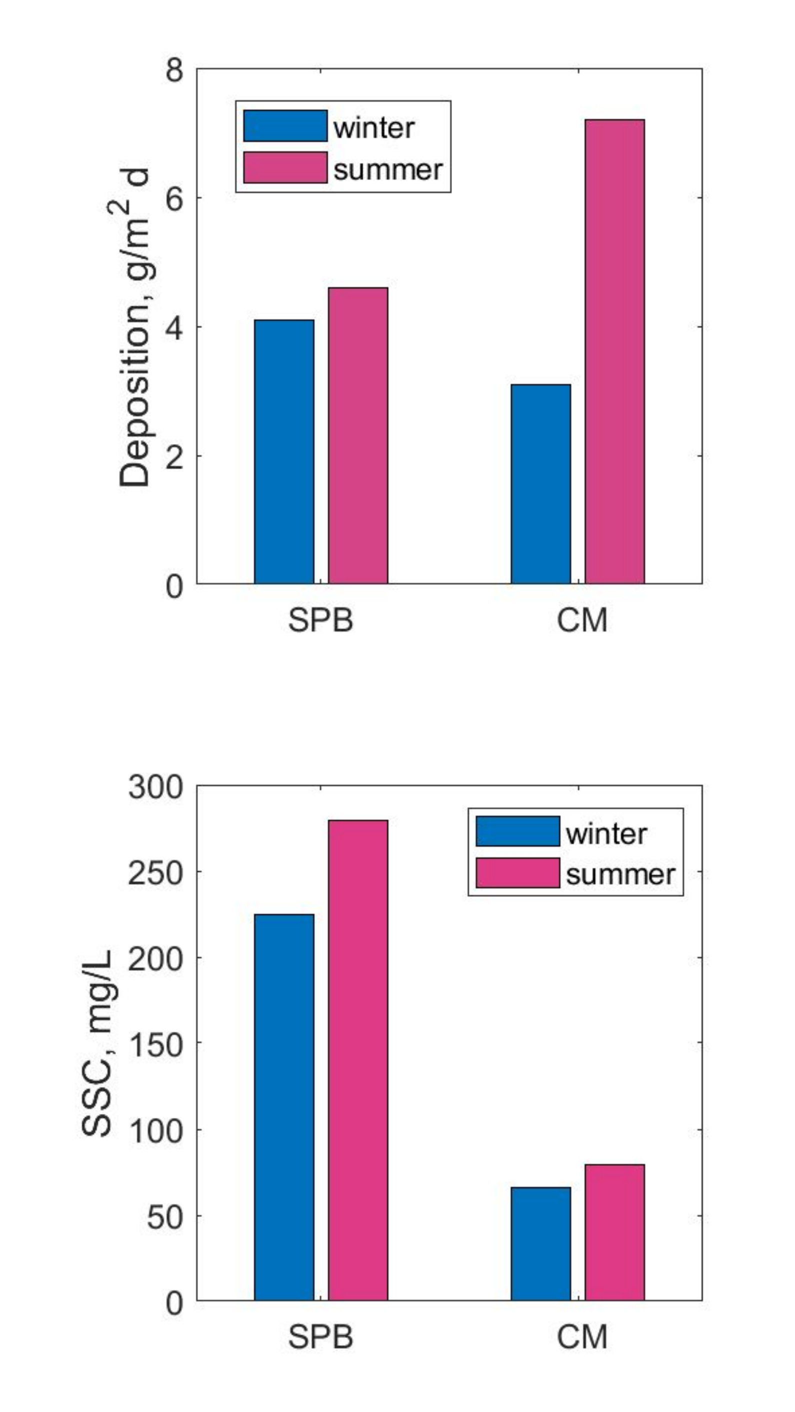
Why is the relationship different at the two sites?

SSC and inundation time account for deposition when sediment dynamics in a marsh are dominated by settling (bathtub model)

We expect this approach to work better during calm conditions than wavy or energetic conditions, when erosion and transport are important



Foster-Martinez et al., in review.



Seasonal variation?

Average deposition greater for summer than winter months in Corte Madera marsh, but not in San Pablo NWR

Stormier winter than during Whale’s Tail study

Seasonal pattern in deposition not reflected in average subtidal SSC


Questions?
USGS
science for a changing world
RMP

Continuous SSC Monitoring in South and Lower South San Francisco Bay

Year Two (2023)

Lilia Mourier, Lucy Montgomery, Martin Volaric,
Ariella Chelsky , David Senn
San Francisco Estuary Institute

SWG Meeting

May 16, 2024

Acknowledgements

Funding:

South Bay Salt Pond Restoration Project, Regional Monitoring Program for Water Quality in San Francisco Bay, and San Francisco Bay Nutrient Management Strategy

Acknowledgements

Field support:

USGS PCMSC Marine Facility, USGS California Water Science Center, and CCC Watershed Stewards Program

1. Introduction
2. Data collection
3. Model development and calibration
4. Results
5. Data access
6. Future work

Goal of project

- Establish turbidity-suspended sediment concentration (SSC) calibrations at eight continuous, high-frequency turbidity monitoring stations located throughout the channel, shoal, and slough habitats of SB and LSB
- Three year effort (2022-2024)

Continuous high-frequency SSC monitoring is of high importance

Essential for …

- Sediment transport model validation
- Characterizing background conditions for targeted empirical studies
- Characterizing light attenuation conditions for biogeochemical studies

… but data are sparse in SB and LSB, especially in shallow margin habitats

SSC monitoring is currently limited to the deep channel of the SB and LSB

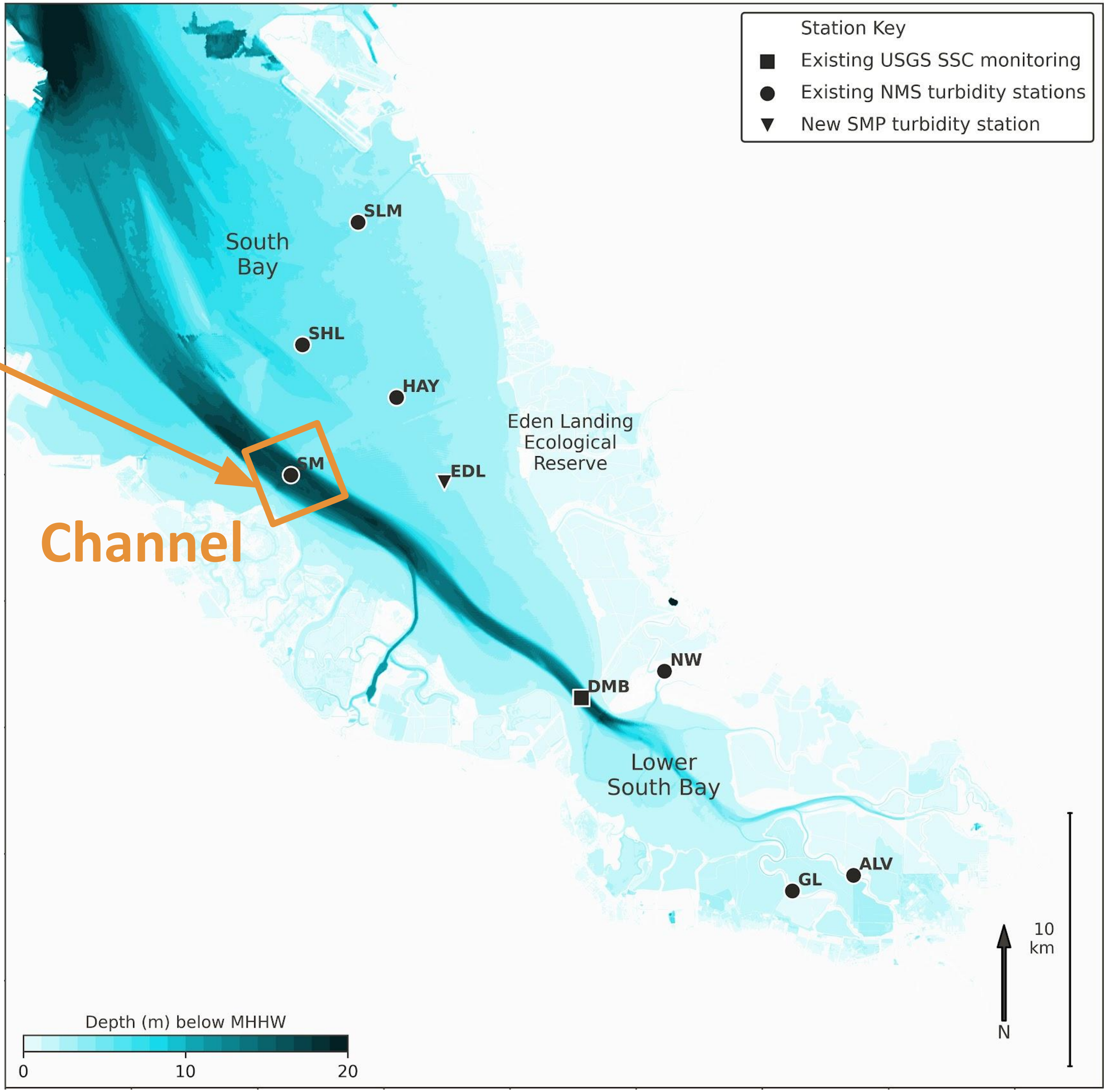
- USGS has one continuous monitoring station with publicly available data (Dumbarton Bridge)
- USGS has conducted short-term studies in shallow habitats
- A critical gap exists for long-term monitoring in shallow margin shoal and slough habitats

RMP

2. Data collection

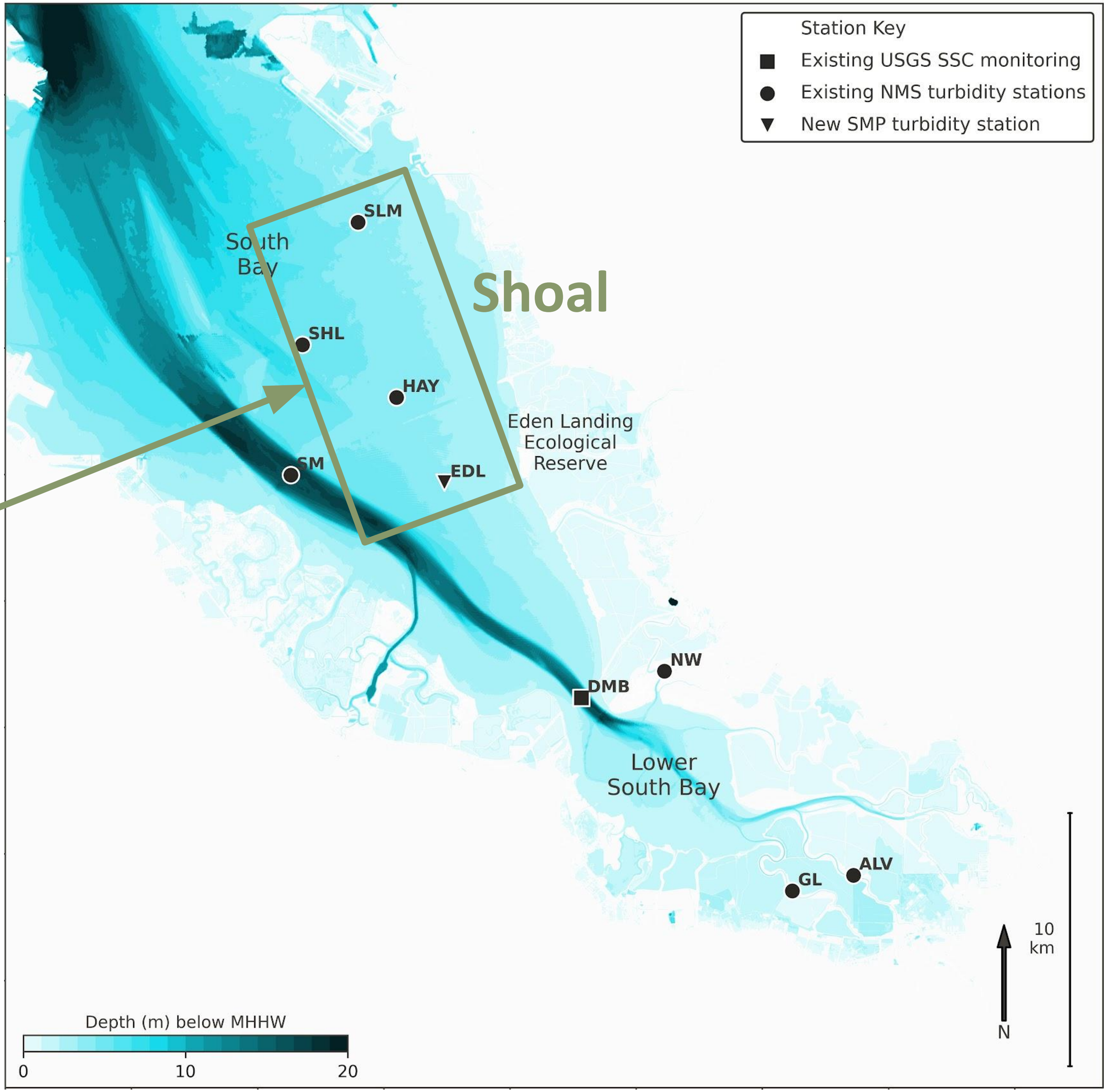
Turbidity stations

- **SM - San Mateo Bridge**



Turbidity stations

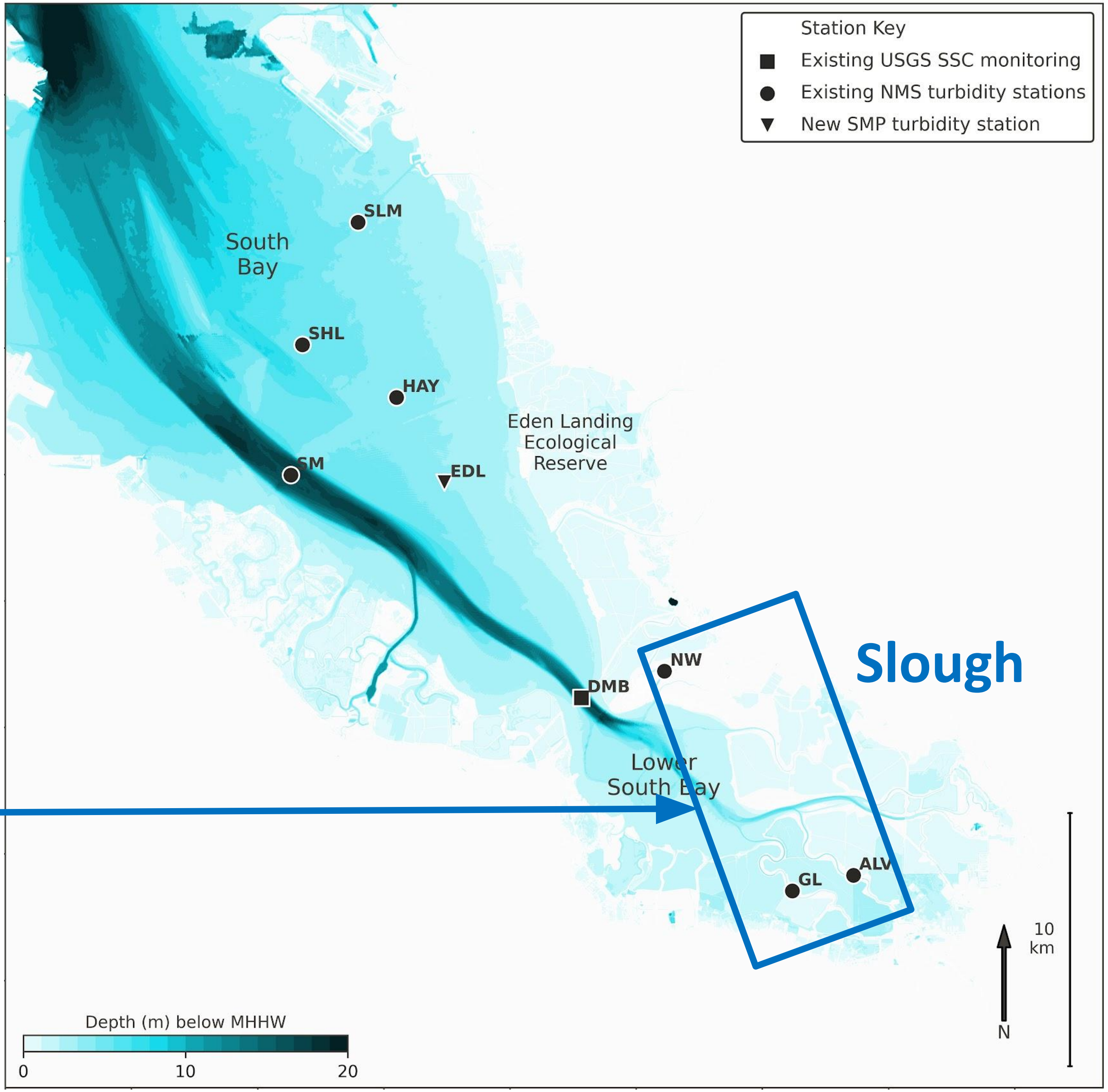
- **SM** - San Mateo Bridge
- **SLM - San Leandro Marina**
- **HAY - Hayward**
- **SHL - Shoal**
- **EDL - Eden Landing**



RMP

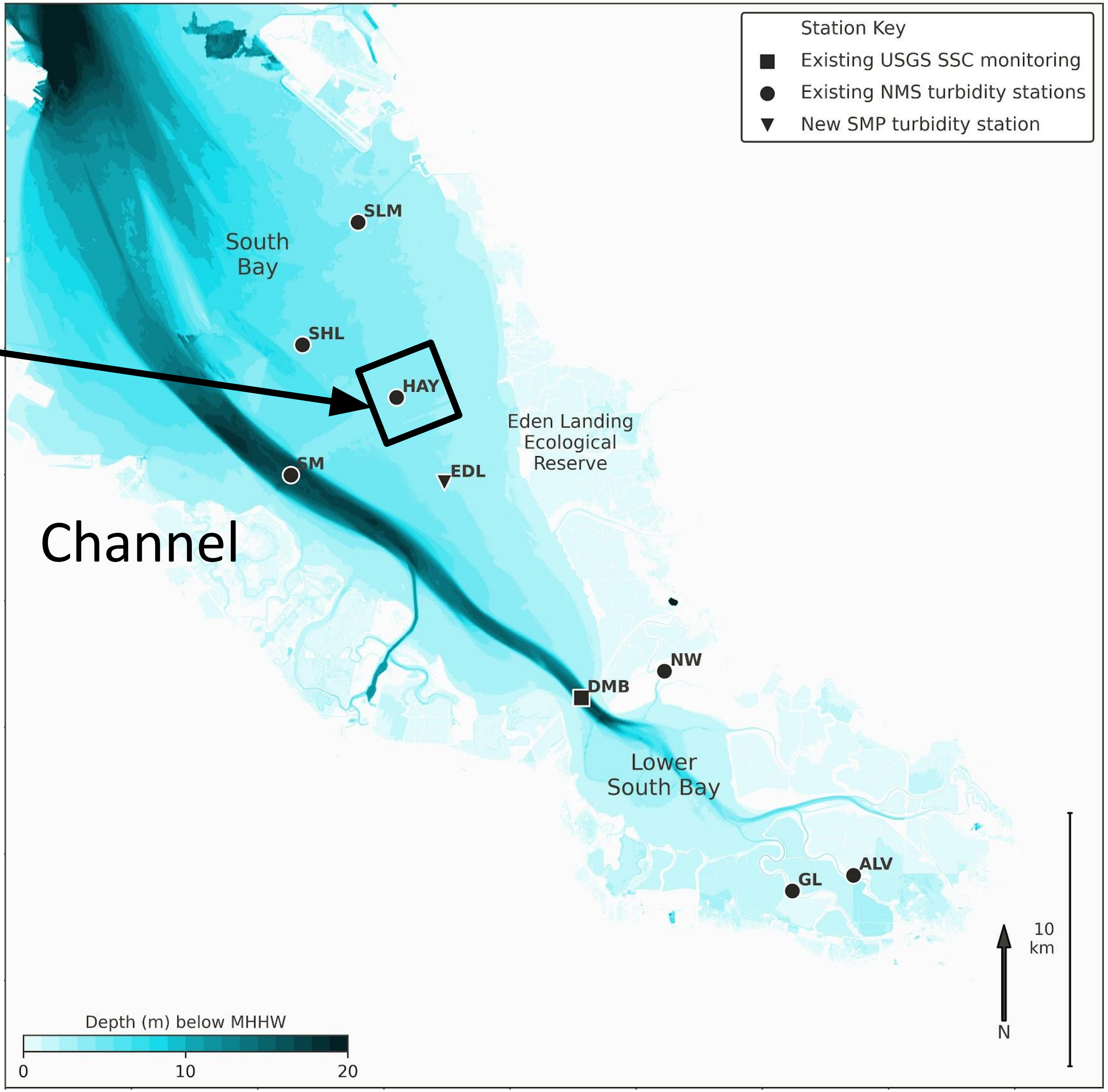
Turbidity stations

- **SM** - San Mateo Bridge
- **SLM** - San Leandro Marina
- **HAY** - Hayward
- **SHL** - Shoal
- **EDL** - Eden Landing
- **NW - Newark Slough**
- **GL - Guadalupe Slough**
- **ALV** - **Alviso Slough**



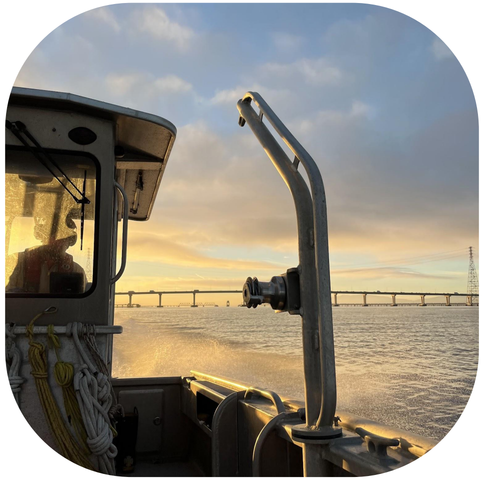
Wave station

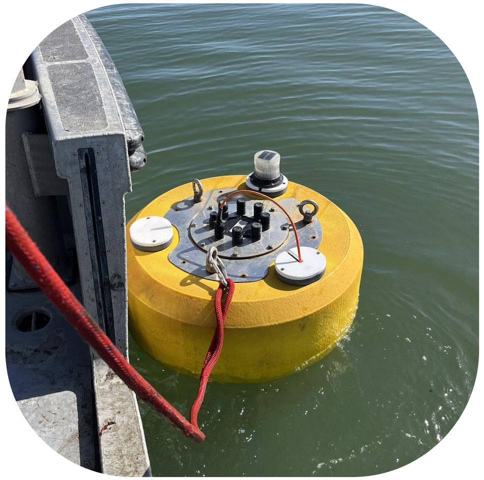
- **HAY - Hayward**



Data collected in 2023

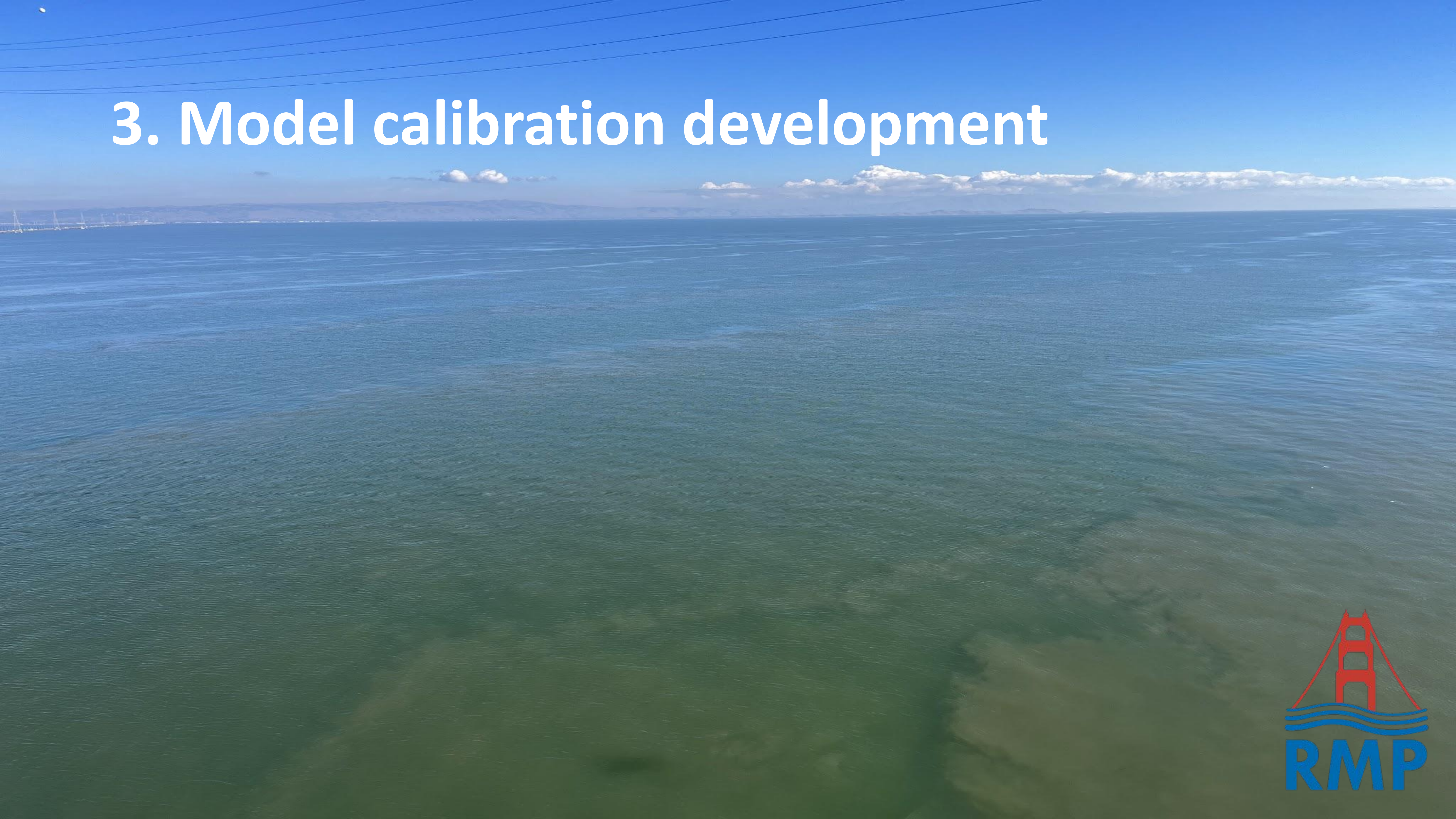
- 15-min continuous turbidity
- Monthly discrete SSC samples
- 5-min continuous wave height and period





RMP

3. Model calibration development



Models used in 2023

Linear Mixed Effect Model (LMM)

- LMMs combine fixed effects (FE), that are shared across all sites, with site-specific random effects (RE)
- Assumes similarity in x-y relationships across sites

Models used in 2023

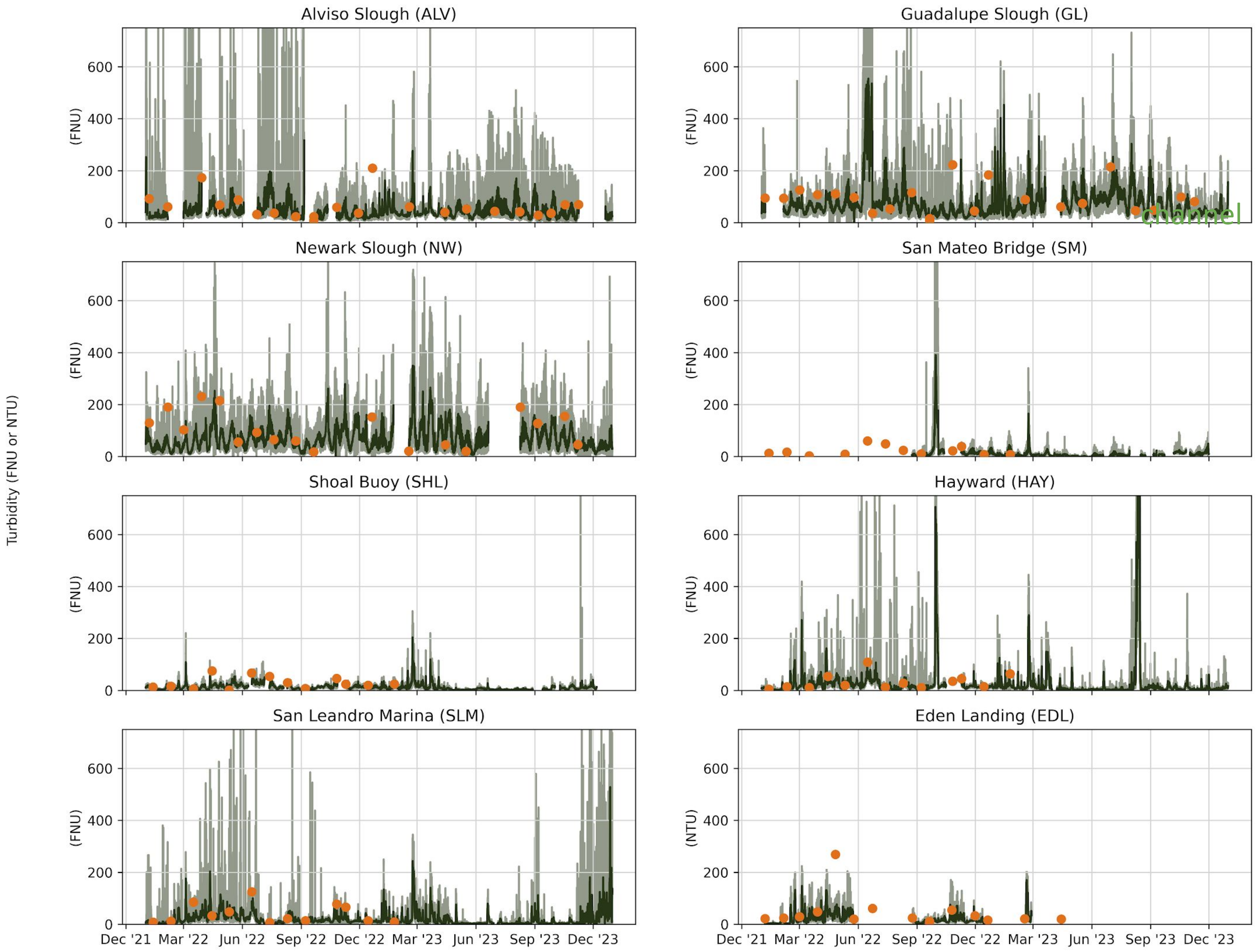
Linear Mixed Effect Model (LMM)

- LMMs combine fixed effects (FE), that are shared across all sites, with site-specific random effects (RE)
- Assumes similarity in x-y relationships across sites

Least squares linear regression (LSLR)

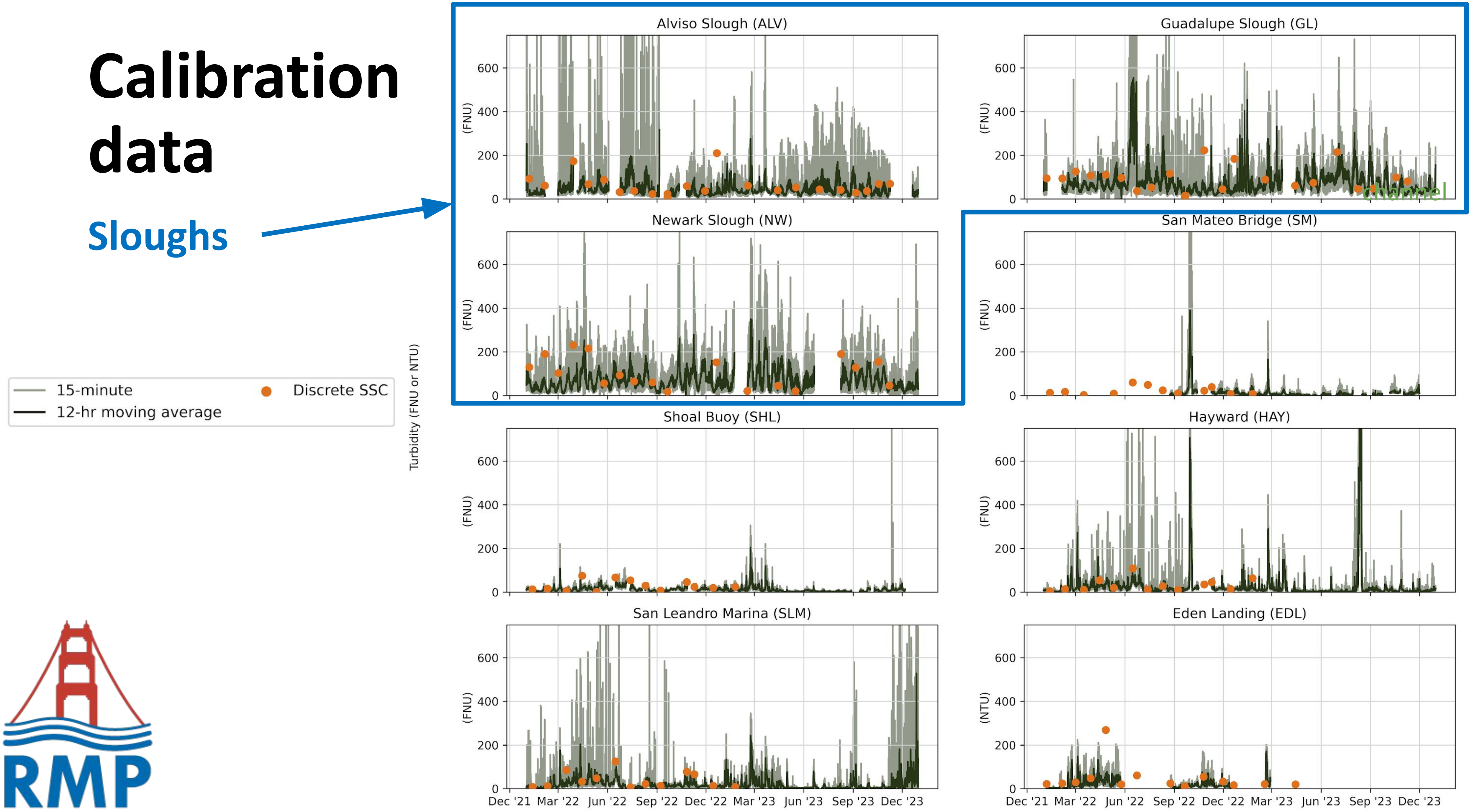
- For Eden Landing station only
- USGS method

Calibration data



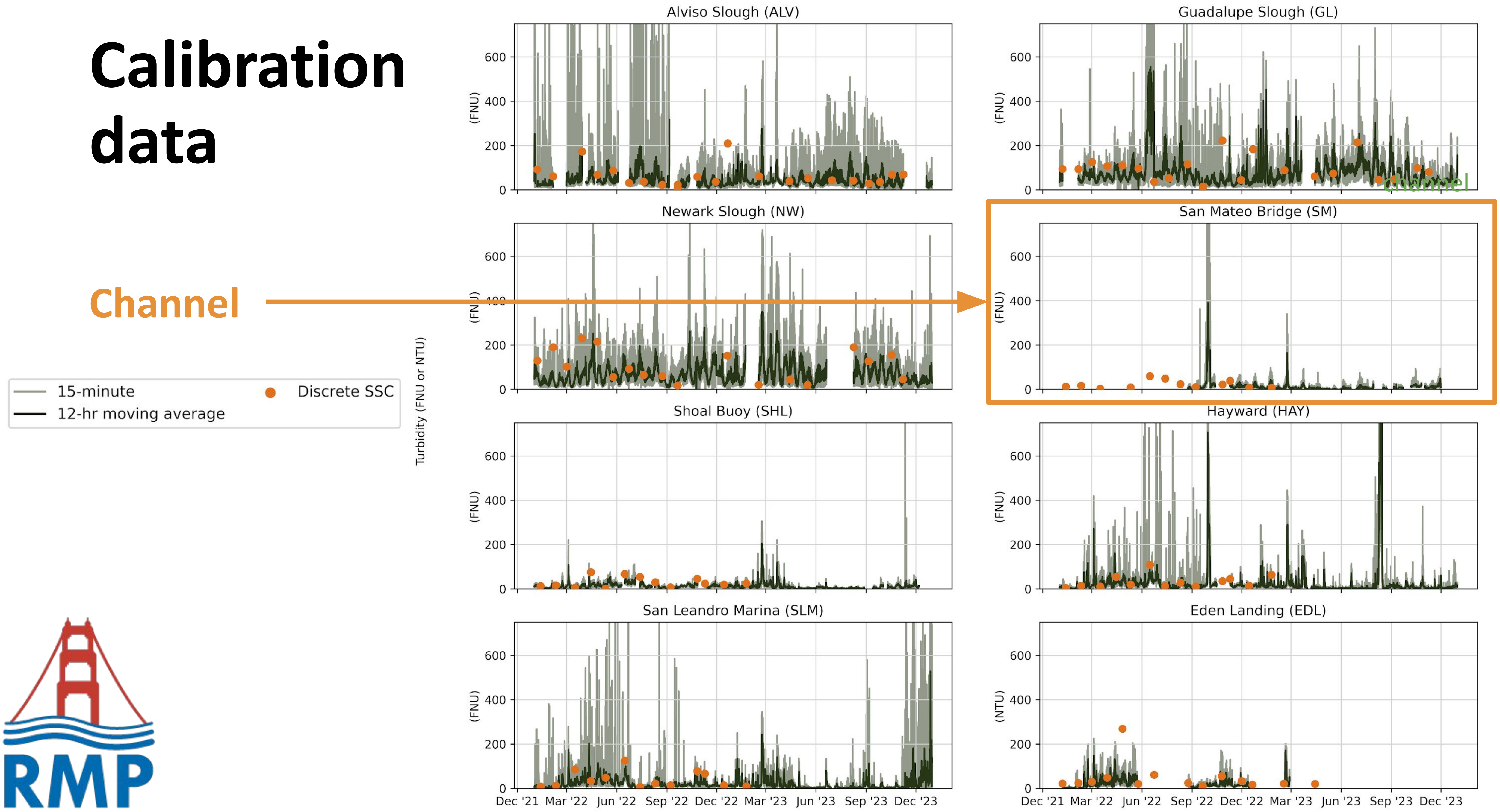
Calibration data

Sloughs



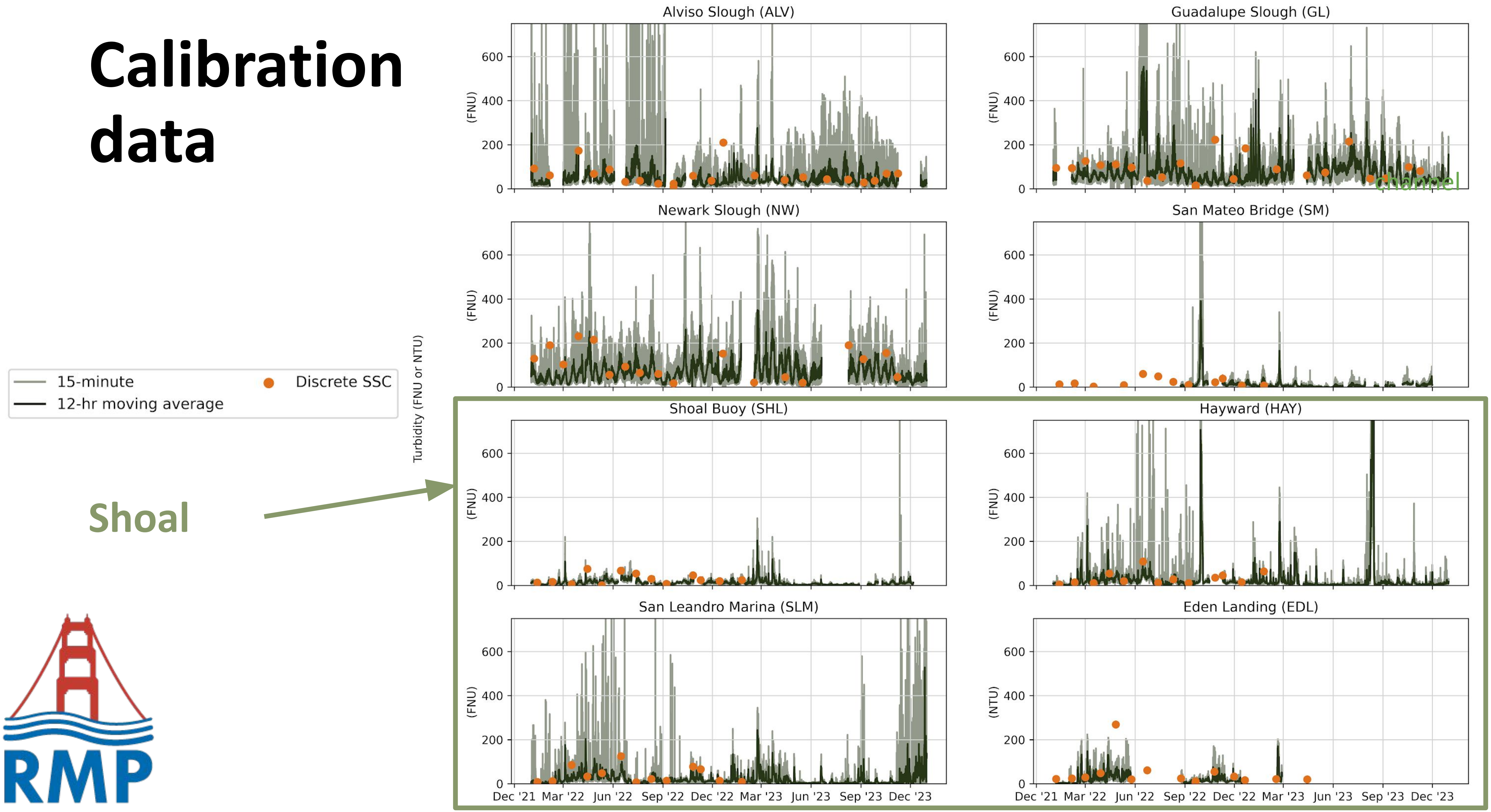
Calibration data

Channel



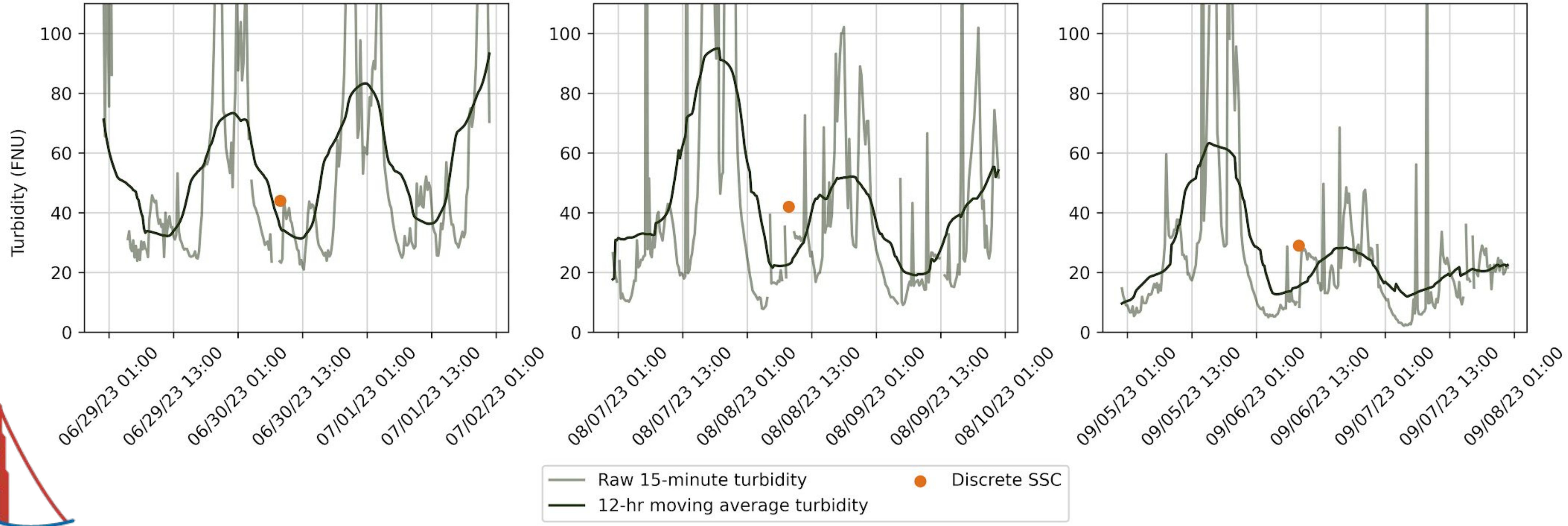
RMP

Calibration data



Calibration data - constraints

- Discrete SSC samples did not capture elevated or peak SSC turbidity due to site accessibility restraints and safety concerns in the field

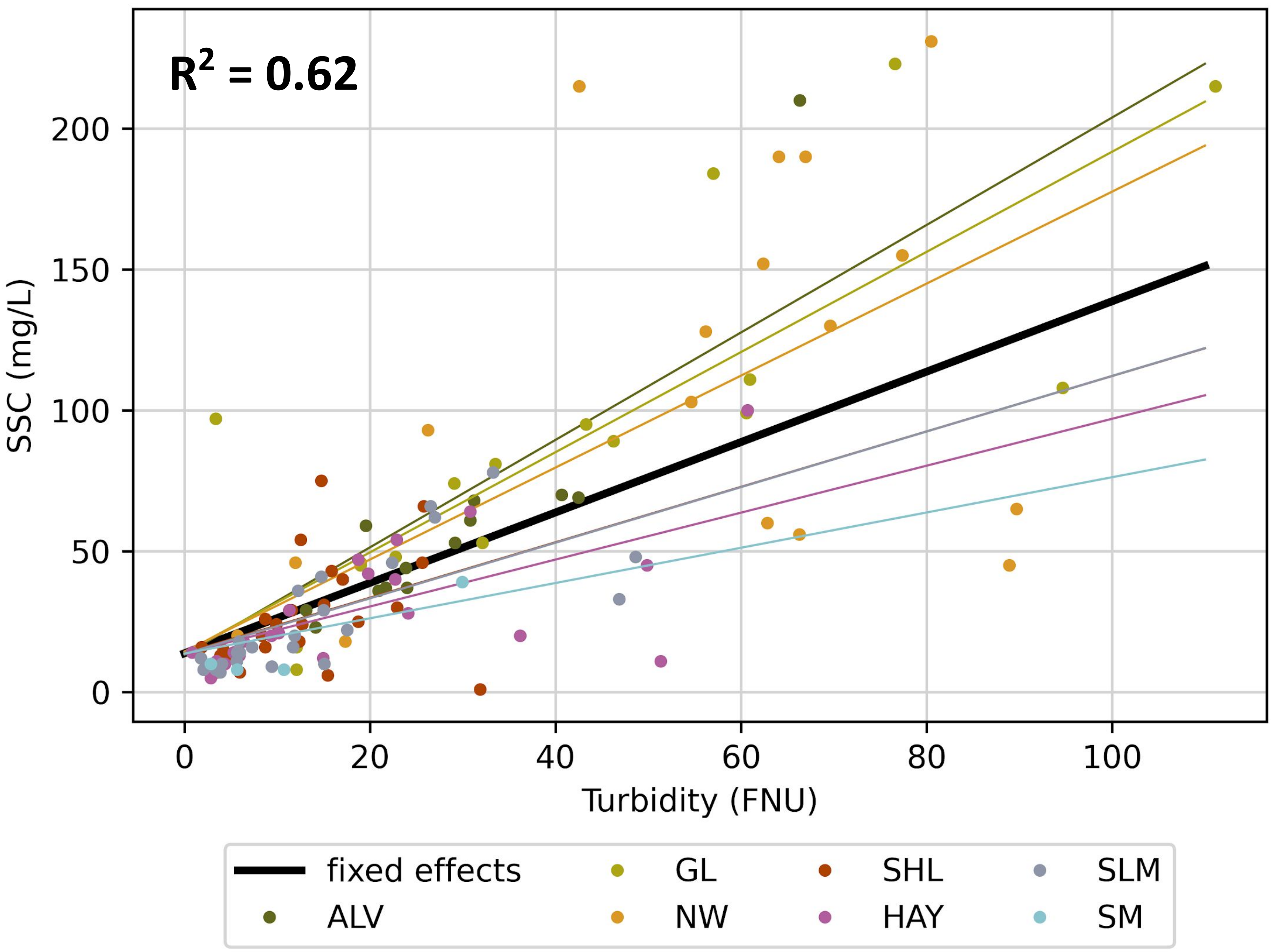


Calibration data - thresholds

- Calibration thresholds for the LMM and the LSLR are 122 FNU and 20.6 NTU, respectively
- Majority of turbidity data (87% - 99%) were within the acceptable range for SSC conversion (EXO stations), while only 68% were for EDL station

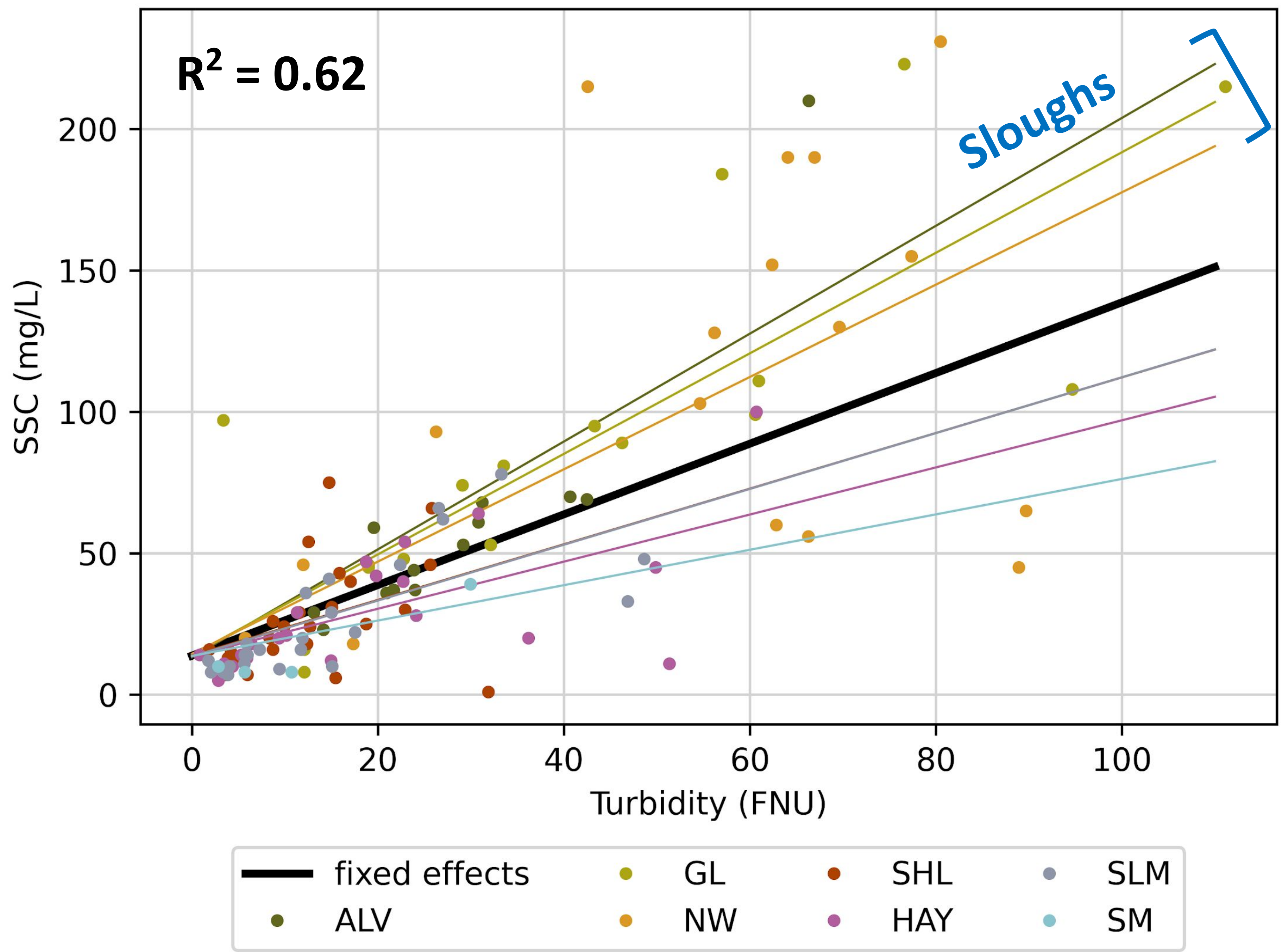
4. Results

LMM model



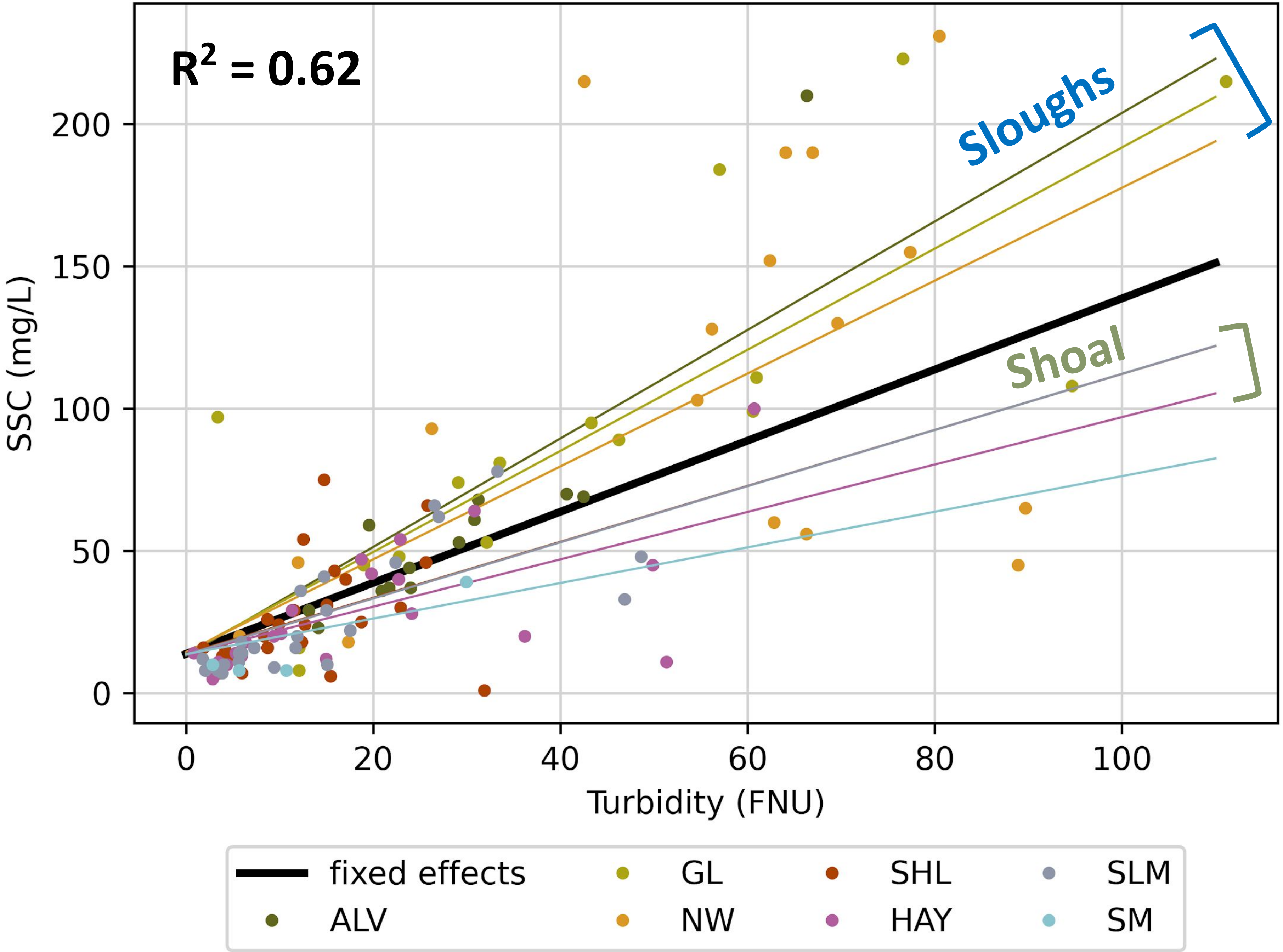
$R^2 = 0.62$
SSC (mg/L)
200
150
100
50
0
0
20
40
60
80
100
Turbidity (FNU)
fixed effects
ALV
GL
NW
SHL
HAY
SLM
SM

LMM model



R² = 0.62
Sloughs
SSC (mg/L)
Turbidity (FNU)
0
50
100
150
200
0
20
40
60
80
100
fixed effects
ALV
GL
NW
SHL
HAY
SLM
SM

LMM model



R² = 0.62
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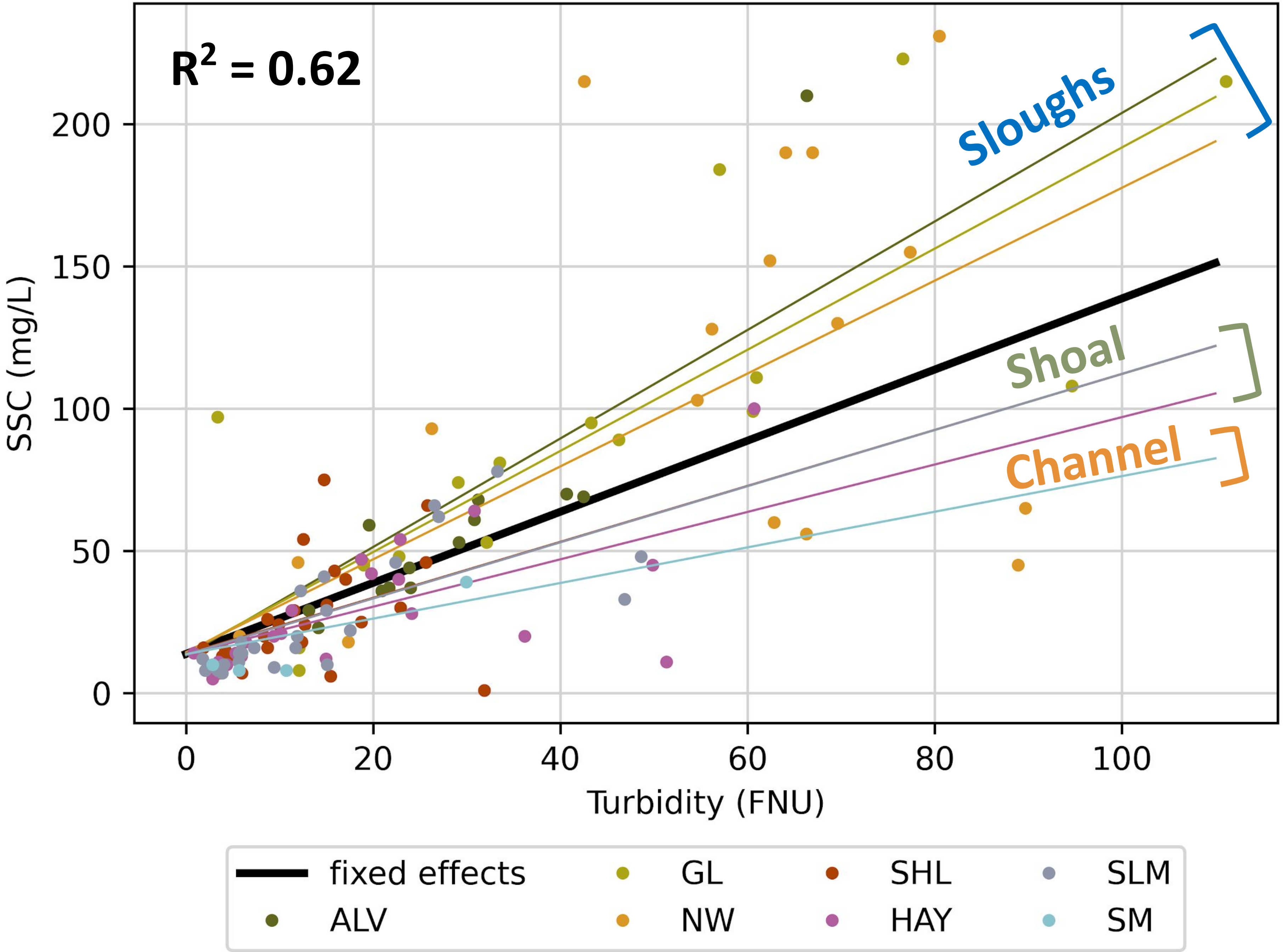
LMM model



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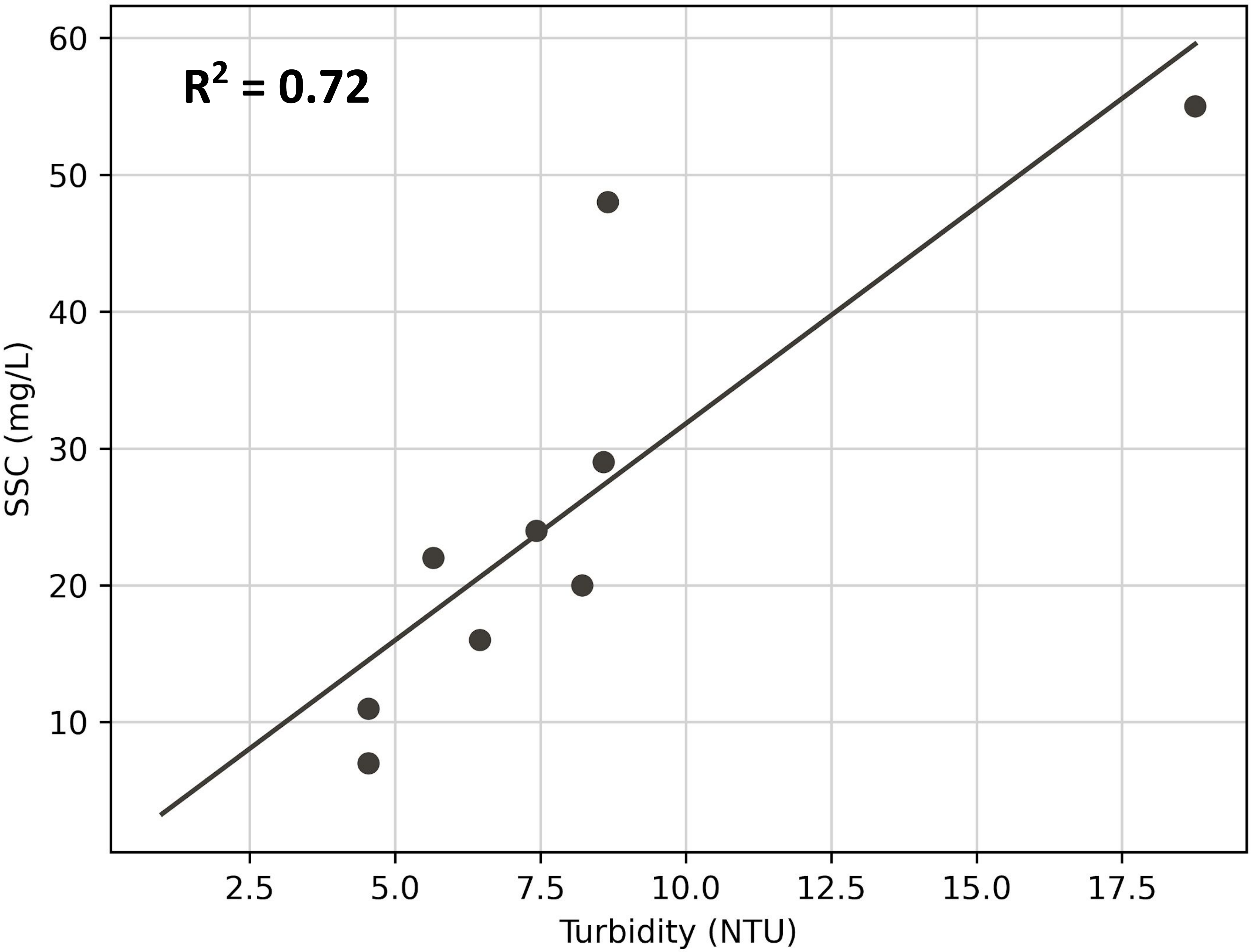
200
0
20
40
60
80
100
Turbidity (FNU)
fixed effects
ALV
GL
NW
SHL
HAY
SLM
SM

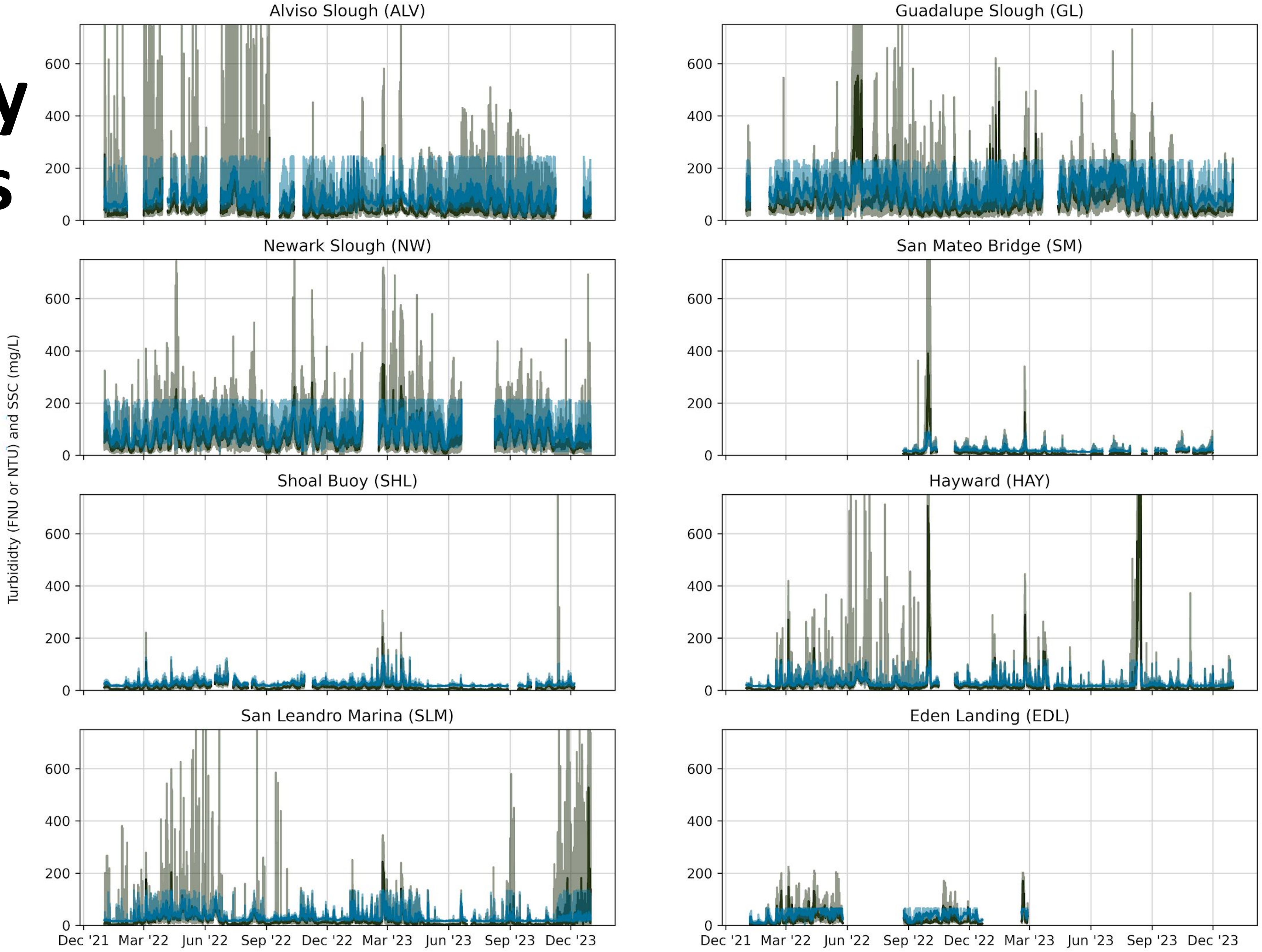
LSLR model



RMP

Preliminary continuous SSC

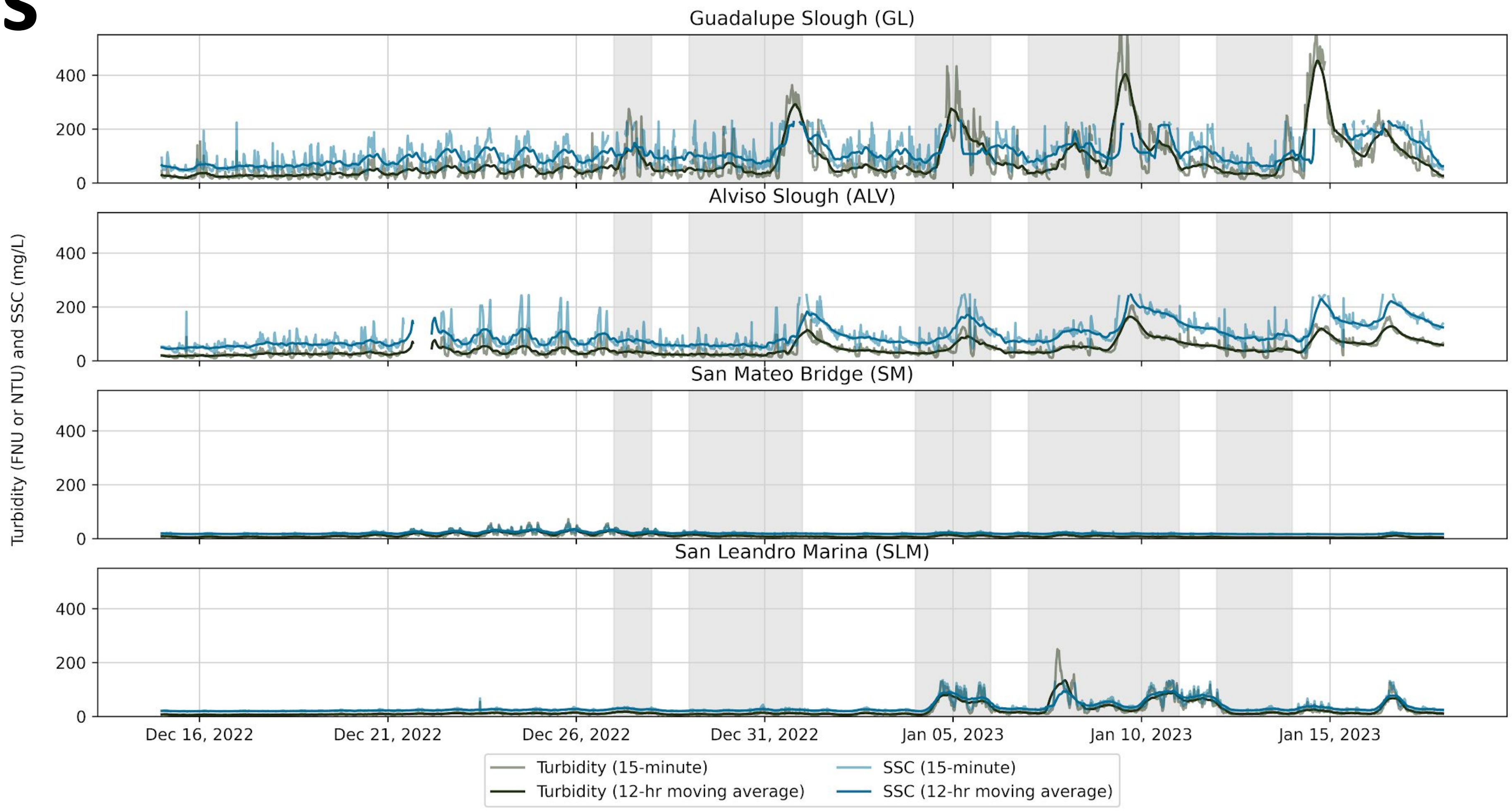
Turbidity (15-minute)
Turbidity (12-hr moving average)
SSC (15-minute)
SSC (12-hr moving average)



RMP

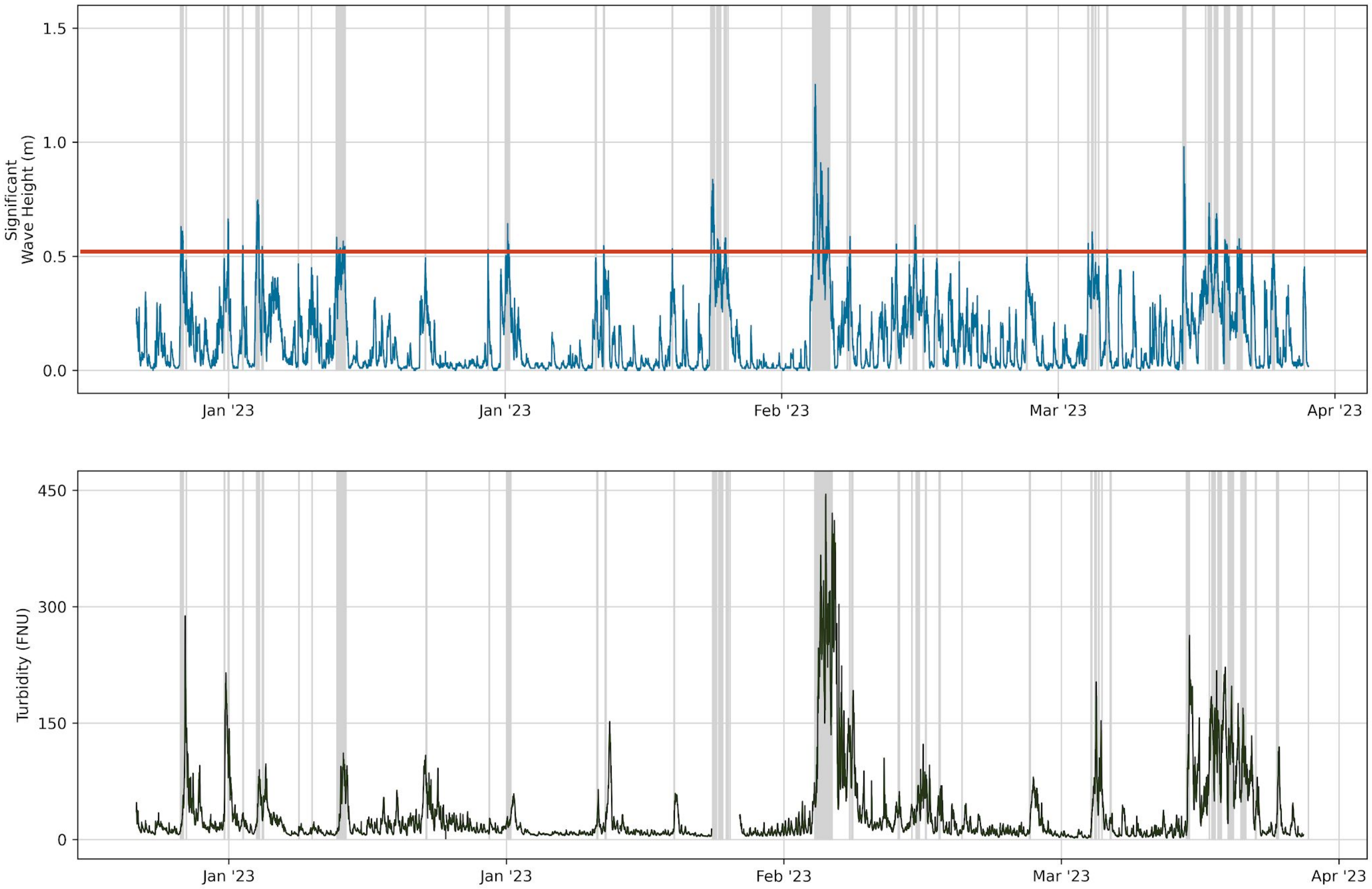
Preliminary continuous SSC

Turbidity (15-minute)
Turbidity (12-hr moving average)
SSC (15-minute)
SSC (12-hr moving average)



RMP

Wave resuspension on the shoal



RMP

5. Data access

Project data repository (preliminary)

- Preliminary data from project years 1 and 2 (2022-2023) are available for download on the SFEI google drive
- Final project data will be available winter ‘24/’25
- Data will eventually be included in the NMS Data Dashboard

File Name	Contents	Years
discrete_sediment.csv	• Total sediment (g) • Sediment concentration (mg/L) • Total sand (g) • Total fine (g) • Percent finer (%)	2020, 2021, 2022, 2023
turbidity_ssc.csv	• Continuous turbidity (FNU or NTU) • Continuous suspended sediment concentration (mg/L)	2022, 2023
wave.csv	• Water column depth (m) • Significant wave height (m) • Significant wave period (s) • 90 percentile wave height (m) • 90 percentile wave period (s) • Maximum wave height (m) • Maximum wave period (s) • Average wave height (m) • Average wave period (s) • Wave energy (J/m^2) • Pressure (dbar) • Sensor depth (m)	2022, 2023

RMP

6. Future work

Work in year three - calibration refinement

- Concentrate on strengthening and finalizing site-specific calibrations, leverage an additional six months of data collected in 2024.
- Resolve outliers in the model calibration data
- Assess the validity period of both models
- Conduct an in-depth comparison of models

Work in year three - reporting

- Evaluate longer term trends in SSC, ranging from seasonal to interannual
- Write a comprehensive report
- After year 3, publish final project repository to NMS data dashboard (in early development and supported by other funds)

Questions?

Contact: Lilia Mourier, liliam@sfei.org and Martin Volaric, martinv@sfei.org

INSIGHT FOR AN EVOLVING WORLD

Sediment Transport Modeling in San Francisco Bay

Craig Jones- Integral Consulting
Samuel McWilliams – Integral Consulting
Jay Davis - SFEI

5/16/2024

Sediment Management Work Group Meeting

San Francisco Bay is a photograph by Jesse Allen And Robert Simmon/u.s. Geological Survey/nasa which was uploaded on August 2nd, 2016.

PCB Management Workgroup Modeling Phases

Table 3. Details of five-phase workplan.

Phase	Goals	Duration
Phase 1—Site Model for San Leandro Bay and Whole-Bay Dilution Model	Use existing NMS model to address specific PCB loading and sediment recovery questions in SLB. Investigate transport and dilution patterns of dissolved phase CECs from various sources of interest at the whole-Bay scale.	1 year starting in Q1
Phase 2—Site Model for Steinberger Slough/Redwood Creek (SS/RC)	Use existing NMS model to address specific PCB loading and sediment recovery questions in SS/RC .	1 year starting in Q3
Phase 3—Whole-Bay Model Development	Develop and validate a whole-Bay sediment and contaminant fate model for use in addressing management questions.	2 years starting in Q1
Phase 4—Bioaccumulation Model Development	Develop and validate a bioaccumulation model suitable for application with the PMU models.	2 years starting in Q1
Phase 5—Model Maintenance and Future Applications	Investigate long-term scenarios, maintain the model, and provide model applications to other management challenges in the Bay.	Ongoing

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PCB Management Workgroup
Phase/Task 3 – Whole-Bay Model Development

Subtask 3.1 - Evaluate model goals and tasks in terms of management questions

Subtask 3.2 – Develop boundary conditions

Subtask 3.3 – Diagnostic Sediment transport modeling

Subtask 3.4 – Conduct prognostic model analysis

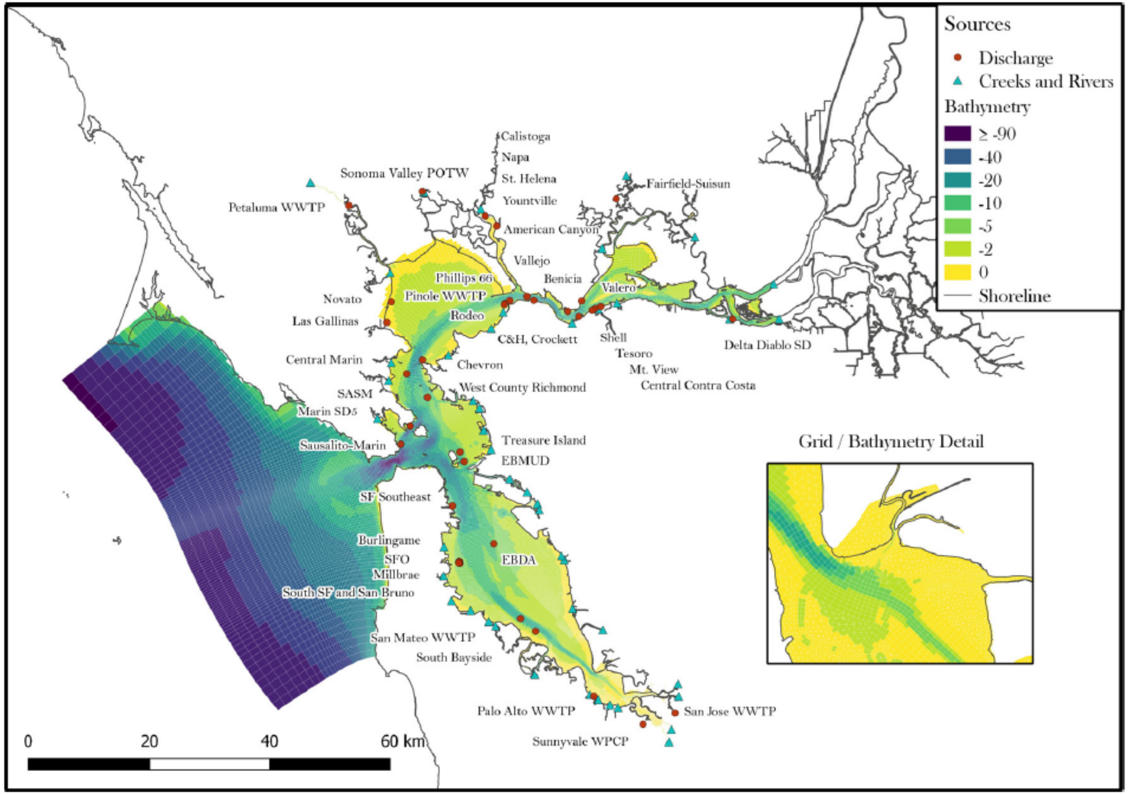
Subtask 3.5 – Develop additional scenarios for Sediment, CEC and other model evaluation and diagnostics

Subtask 3.6 – Reporting on model analysis and lessons learned for future modeling

Sediment Management Questions

- **3.2** What is the flux of sediment through the Golden Gate and other Bay cross-sections?
- **3.3** What are the main sediment transport processes and pathways within sub-embayments?
- **3.4** Are our marsh edges and shorelines undergoing net erosion or progradation?
- **3.5** What is the current sediment budget and how is the sediment budget changing?
- **3.6** What is the source and pathway of coarse grain material to beaches?

SFEI's San Francisco Bay Biogeochemical Model Spatial Domain



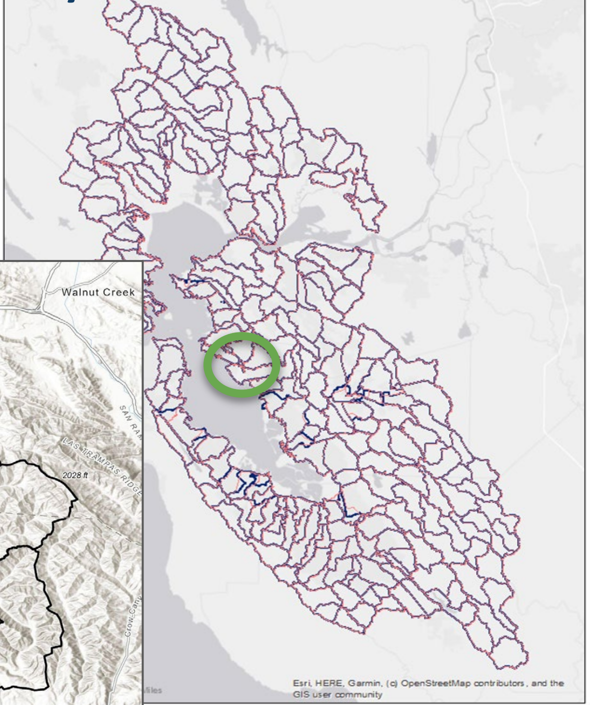
- Lower South Bay through Suisun Bay
- 10 sigma layers in the vertical direction
- Applied to WY2013 and WY2017
- Working on additional water years through WY2023
- Model performance assessed by goodness of fit, evaluated through statistical (bias, RMSE) and graphical comparison

int

Watershed Dynamic Model

- Rainfall (from PRISM data) is routed across the landscape.
- A series of parameters are tuned for different landscapes, storage, flow types.
- WDM has been calibrated and validated with USGS gauges (flow + sediment) and other spot monitoring efforts

Bay-Wide WDM Cachements



SLB from Watershed Dynamic Model

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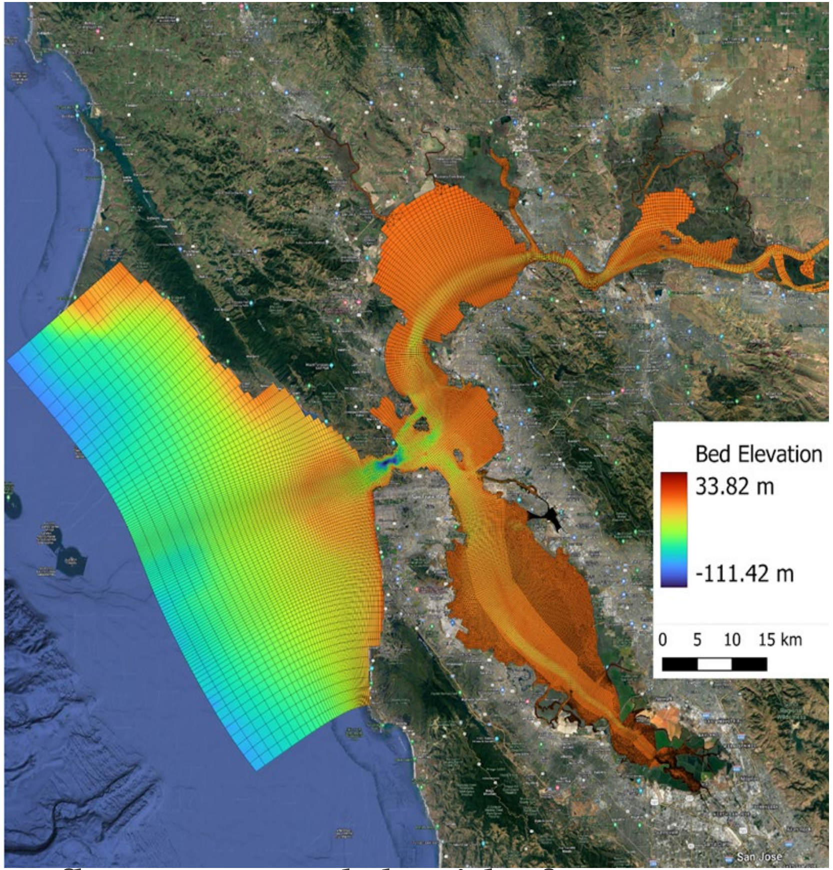
3.2 Bay Wide Sediment Flux

- Watershed Dynamic Model used for all tributary inputs into the Bay.
  - Refining workflow with SLB case
- Empirical and modeling work (e.g., USGS, USACE, AnchorQEA) at Golden Gate can support additional model refinement and applications
- How does Sediment transfer between North, Central, and South Bay?



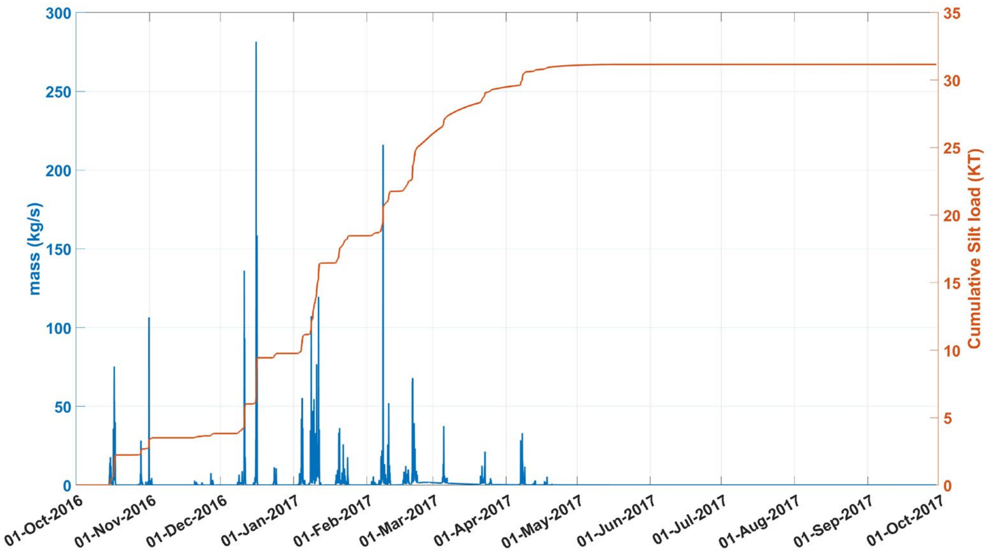
Dflow-FM model grid of SF-Bay

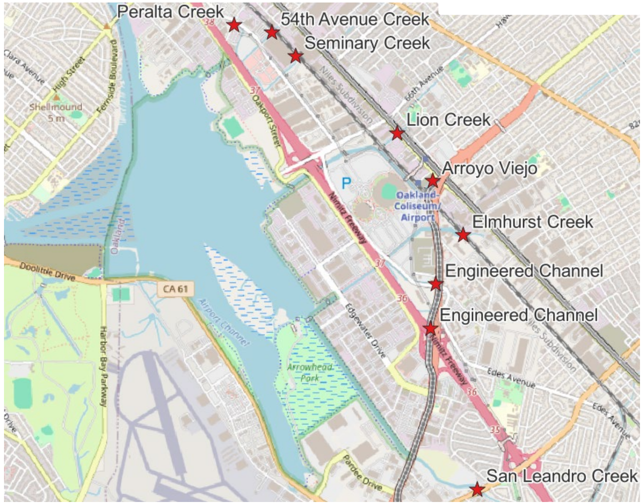
3.3 Sub-Embayment Transport Pathways

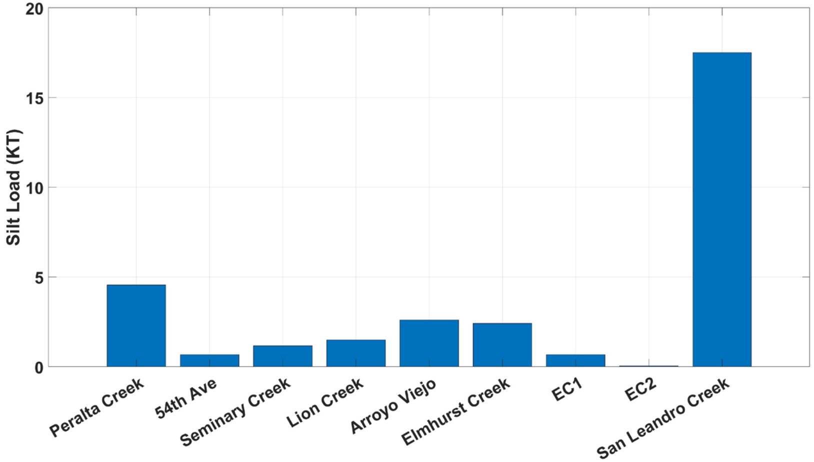
- San Leandro Bay is testbed for sub-embayment processes and dynamics
  - Refined flexible model grid
- Coupled Watershed Dynamic Model with Sediment Transport model
  - Provides upland and bay boundary conditions
  - Hydrodynamics driven by tides and winds

San Leandro Bay Silt Loads

WDM provides Silt, Clay, and Sand Fractions at hourly timesteps







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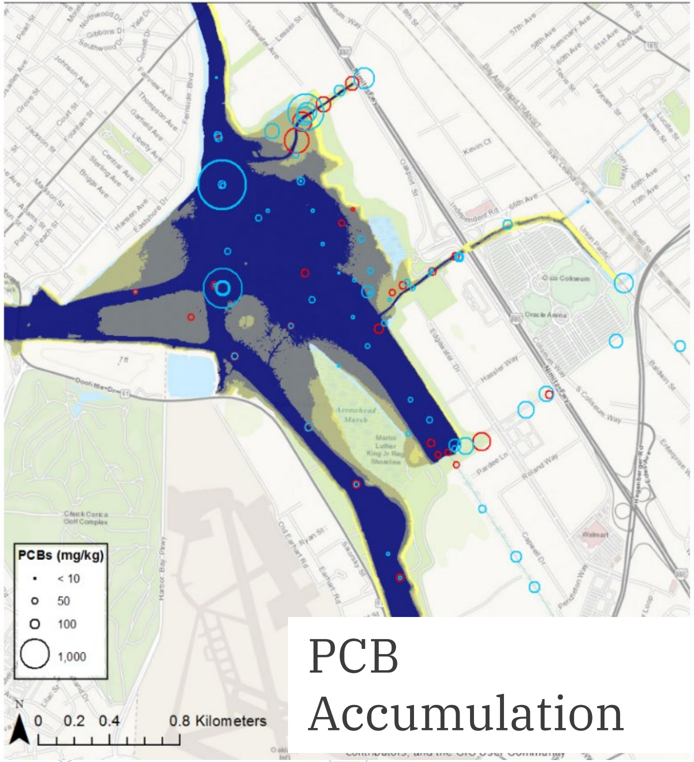
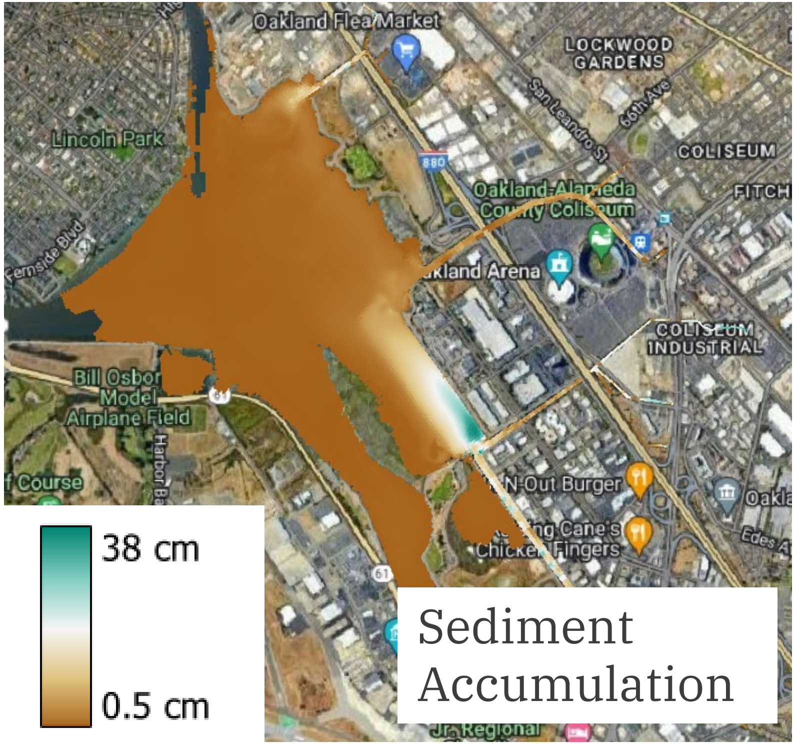
Sediment Accumulation in San Leandro Bay

2016/2017 water year high watershed input event

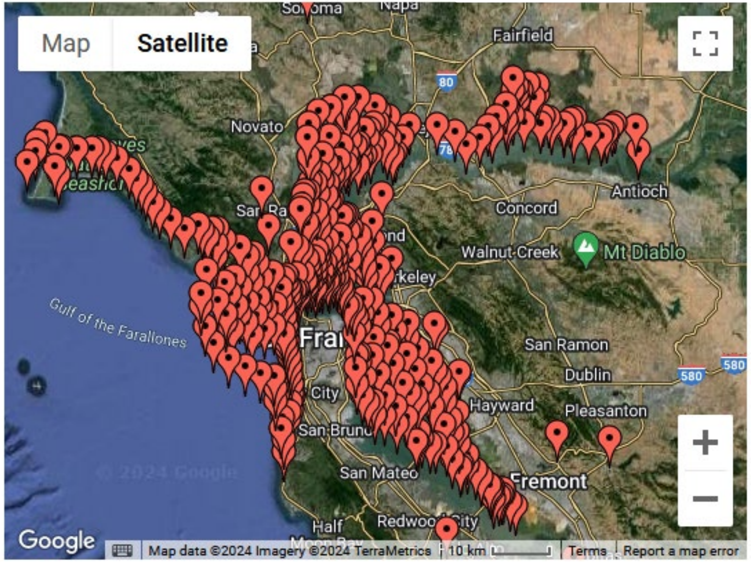
Model Evaluation- Comparison with Empirical Data





Expanding to Bay-wide Study

- Regional bed composition data sets from USGS
- SEDFlume and other ancillary data to characterize erosion rates
- Requires characterization of sediment bed, lateral loadings and long-term Delta and ocean BCs



USGS Sediment data

Table 4
Fitting Parameters Obtained Through Regression of 1 to SEDflume Erosion Data

	E_0 (cm s^{-1} Pa^{-b})	b (–)	τ_{cr} (Pa)	r^2
P1	3.74e-5	1.48	0.18	0.86
P2	6.52e-5	1.76	0.11	0.95
P3	5.02e-5	1.90	0.13	0.83

SEDflume parameters from NSF South Bay Study

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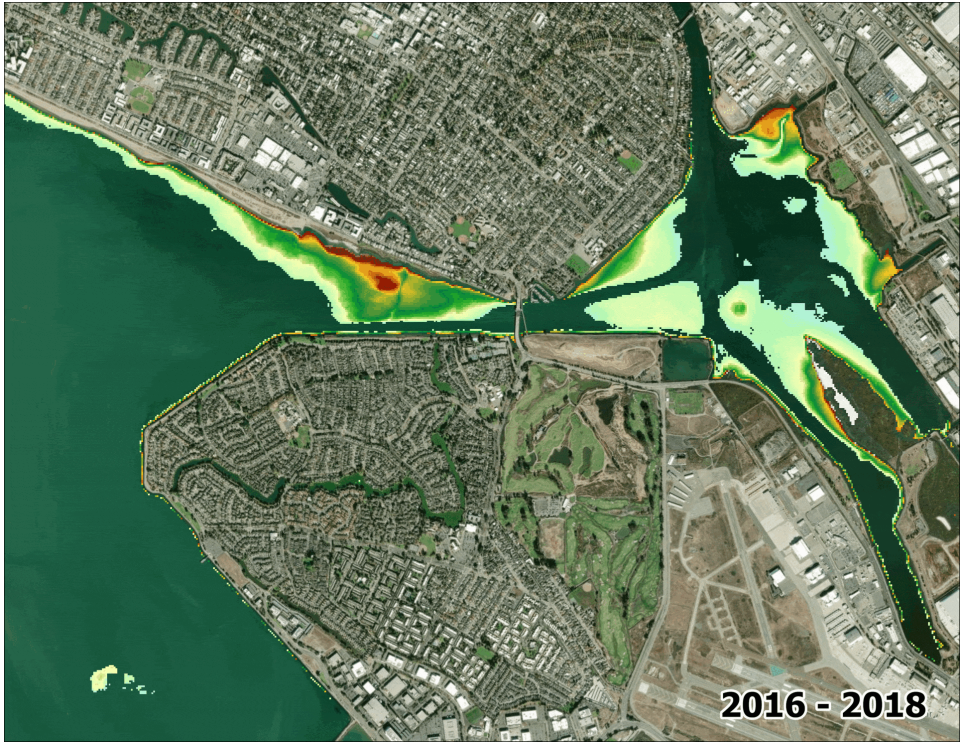
3.4 Marsh Edge and Shoreline Change

- Will require specific grid refinement in areas of study
- Linkage to site-specific studies where possible (Lacey et al.)
- Qualitative and quantitative assessment support model evaluation



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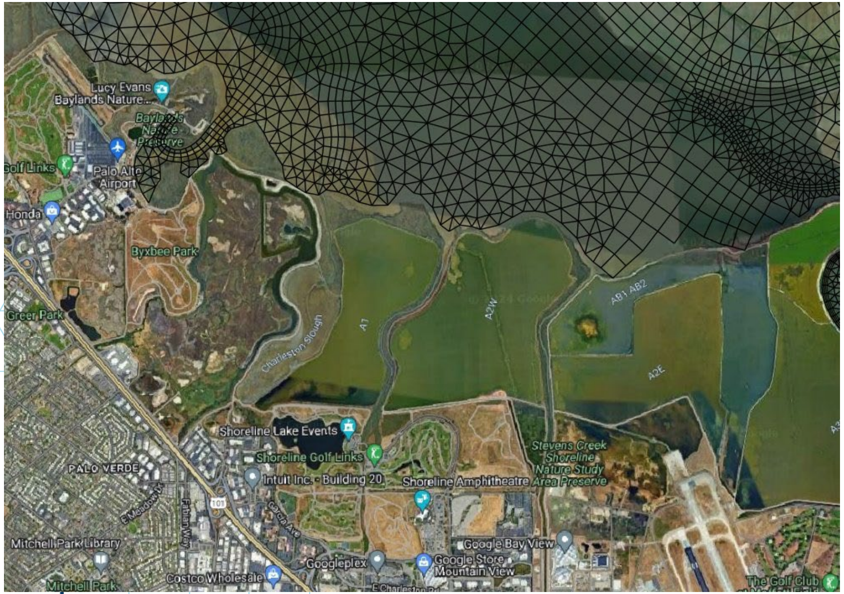
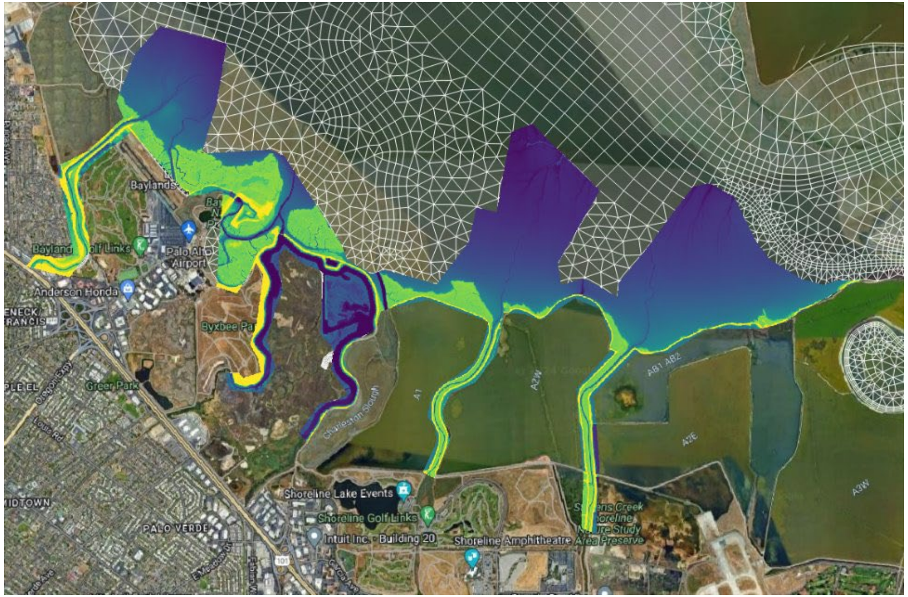
Increase level of complexity as needed

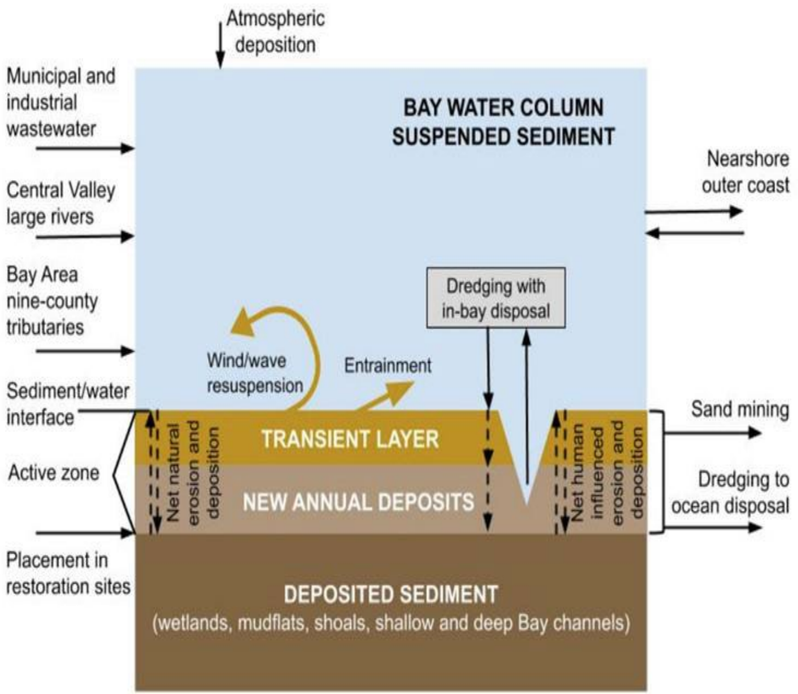
- Start with simple uniform beds
- Can revise grids, hydrodynamics, and sediment based on geomorphology





3.5 Sediment Budget

- Sediment Budget modeling is constrained by boundary conditions
  - Delta Loads
  - Direct Watersheds
  - Golden Gate Exchange
- Modeling can help integrate boundary conditions and investigate in-bay sources and sinks



Whole system mass balance conceptual model (modified from Krone, 1979).

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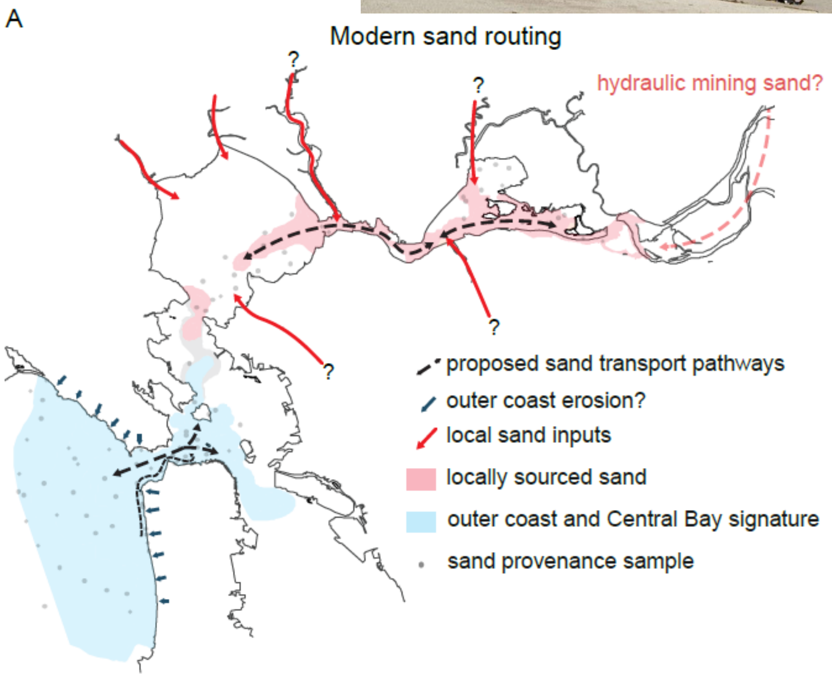
3.6 Sediment Transport to Beaches

- Modeling of sediment flux in bay- Sand Focused
- Coupled with coastal wave models (SWAN) to include longshore transport and beach evolutions
- What are the sources of sediment and delivery mechanisms to selected beaches?



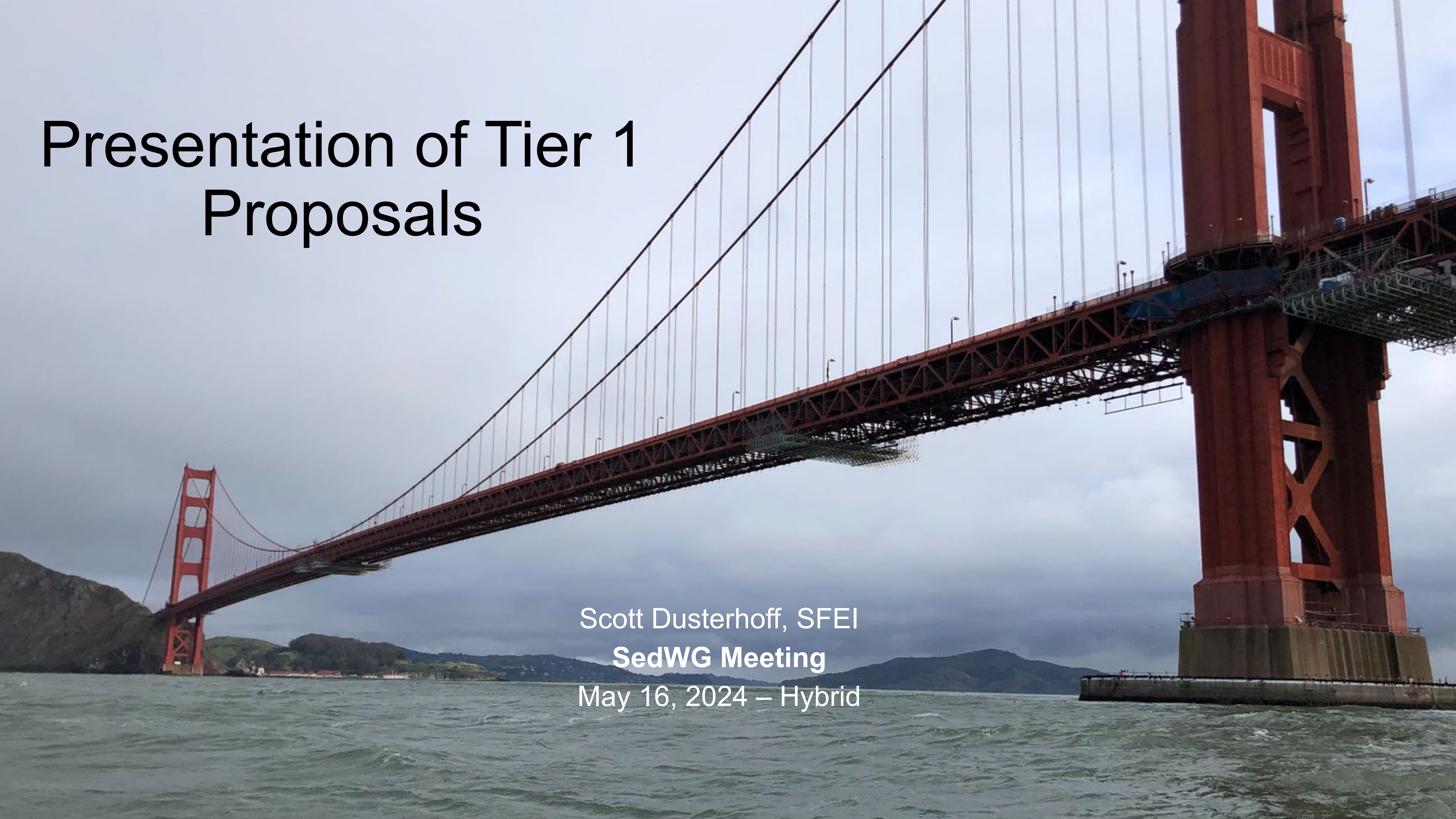
integral SFEI AQUATIC SCIENCE CENTER
SAN FRANCISCO ESTUARY INSTITUTE & THE AQUATIC SCIENCE CENTER

Challenges

- No one model scale, setup, or calibration will address all questions
- Each question requires specific metrics to address, which in turn requires specific data for calibration and validation
- Various workgroup needs will have model convergence and divergence points within the same modeling framework

integral

RMP
sfei.org/rmp



Presentation of Tier 1 Proposals

Scott Dusterhoff, SFEI

SedWG Meeting

May 16, 2024 – Hybrid

2025 Special Study Proposal Approach

Anticipated funding from RMP = ~$240k

Anticipated additional funding from EPA = ~ $140k

Anticipated total funds for 2025 Studies = ~ $380k

Total Budget for Tier 1 Proposals = ~$310k

Total Budget for Tier 2 Proposals = ~ 525k - $580k

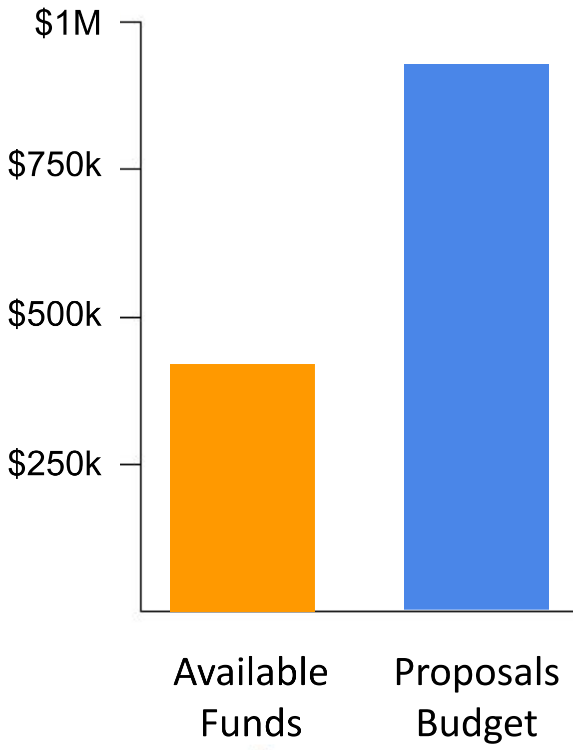
Total Budget for all 2025 Proposals = ~ $835k - $890k

So, we need to prioritize *all study proposals* for the TRC

Need to identify options

- Scaling
- Phasing
- Leveraging
- Postponing

Sediment Workgroup
Available Funds vs. Proposals Budget



2025 Special Study Proposals - Tier 1

Proposal	**Budget**
Refining the Conceptual Understanding of Sediment Transport in San Pablo Bay *Kyle Stark (SFEI)*	$65,000
Develop a study plan to improve characterization of bed sediments and settling velocity to advance sediment transport modeling for San Francisco Bay *Jessie Lacy (USGS)*	$106,900
Analysis of satellite-based surface turbidity for improved sediment transport modeling in San Francisco Bay *Oliver Fringer (Stanford University)*	$135,475
TOTAL	**$307,375**

Refining the Conceptual Understanding of Sediment Transport in San Pablo Bay

Kyle Stark, Lester McKee, Alex Braud, Scott Dusterhoff (SFEI)

Sediment Workgroup Meeting

5/16/24

Motivations

Conceptual models provide a roadmap to more sophisticated models through:

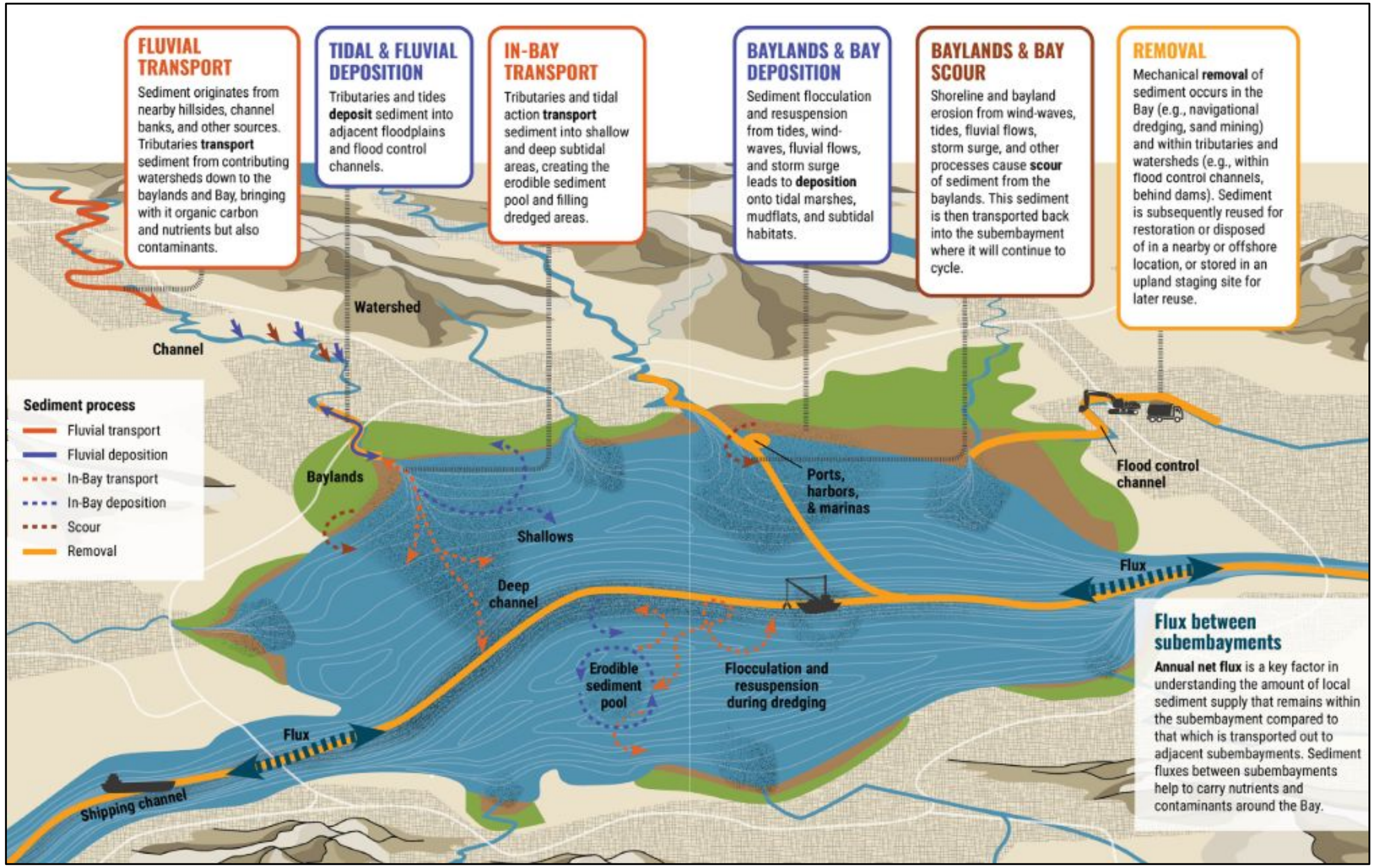
- Identifying datagaps
- Supporting management efforts
- Identifying funding targets for research and monitoring

RMP

Motivations

This proposal builds on previous efforts funded by the RMP and other regional interested parties, such as:

- A Conceptual Understanding of Sediment Processes in San Francisco Bay (RMP)

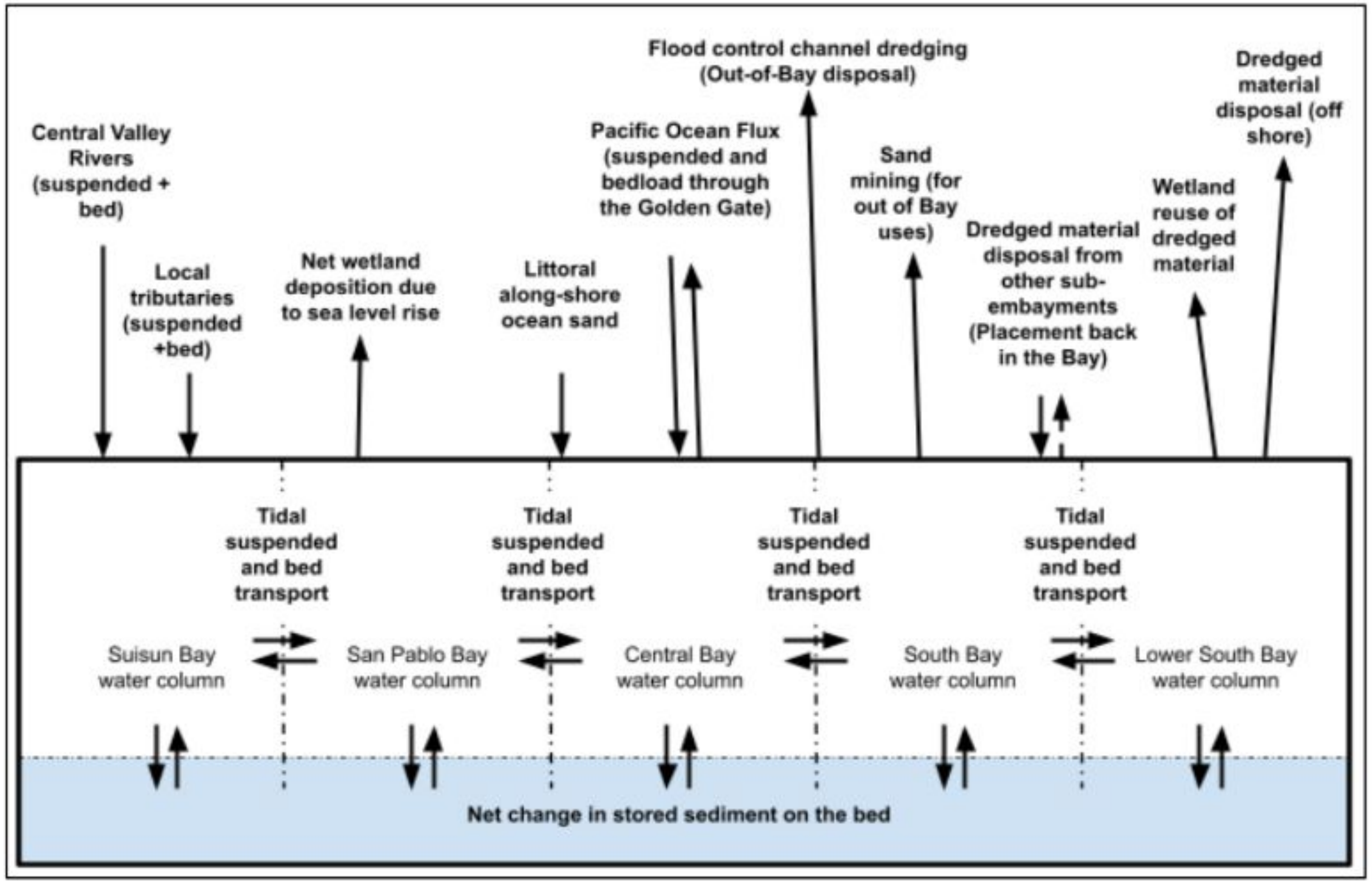


RMP

Motivations

This proposal builds on previous efforts funded by the RMP and other regional interested parties, such as:

- A Conceptual Understanding of Sediment Processes in San Francisco Bay (RMP)
- Sand Budget and Sand Transport in San Francisco Bay (BCDC)

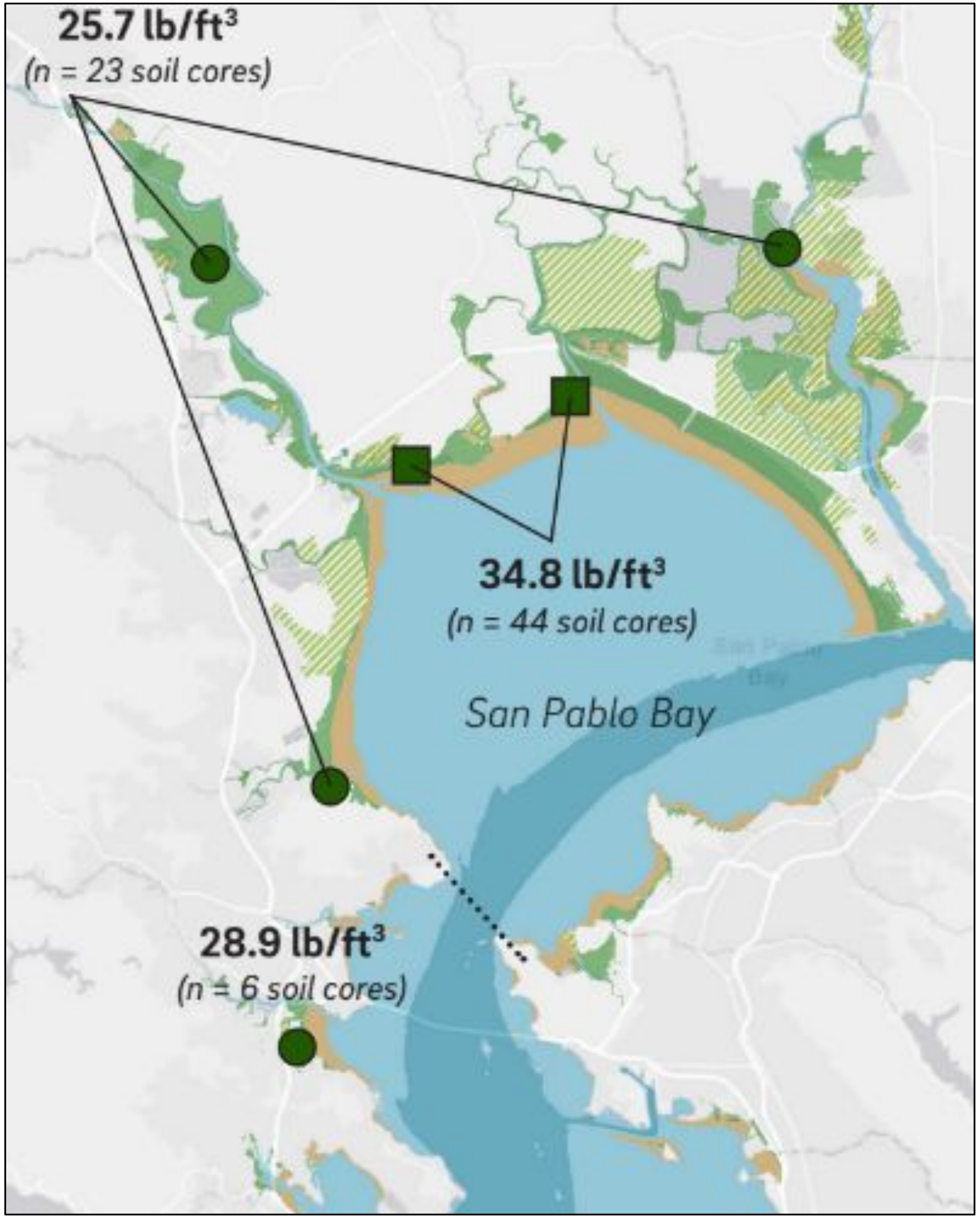


RMP

Motivations

This proposal builds on previous efforts funded by the RMP and other regional interested parties, such as:

- A Conceptual Understanding of Sediment Processes in San Francisco Bay (RMP)
- Sand Budget and Sand Transport in San Francisco Bay (BCDC)
- Special Study on Bulk Density (RMP)



Project Overview

The work extends these previous efforts with a targeted in San Pablo Bay with three new areas of focus:

- Compiling all available literature related to San Pablo Bay.
- Augmenting existing tributary delivery estimates with the latest data from the last 10 years. When physical sampling is absent, utilize already existing RMP products (Zi et al. 2022).
- Refining the McKnight et al. (2023) conceptual model of the tributary-marsh-sediment pool pathway using an updated set of literature.

Justification

- Improving the conceptual understanding of SF Bay subembayments has been identified as a priority for the Sediment Workgroup.
- We chose San Pablo Bay because it has sufficient data and previous analysis.
- Our work is not being conducted in a vacuum: EPA-funded work (Destination Clean Bay) is planning a Bay-wide sediment update.
- This work is intended to act as a blueprint for understanding the Bay's subembayments at a more refined and deeper scale.

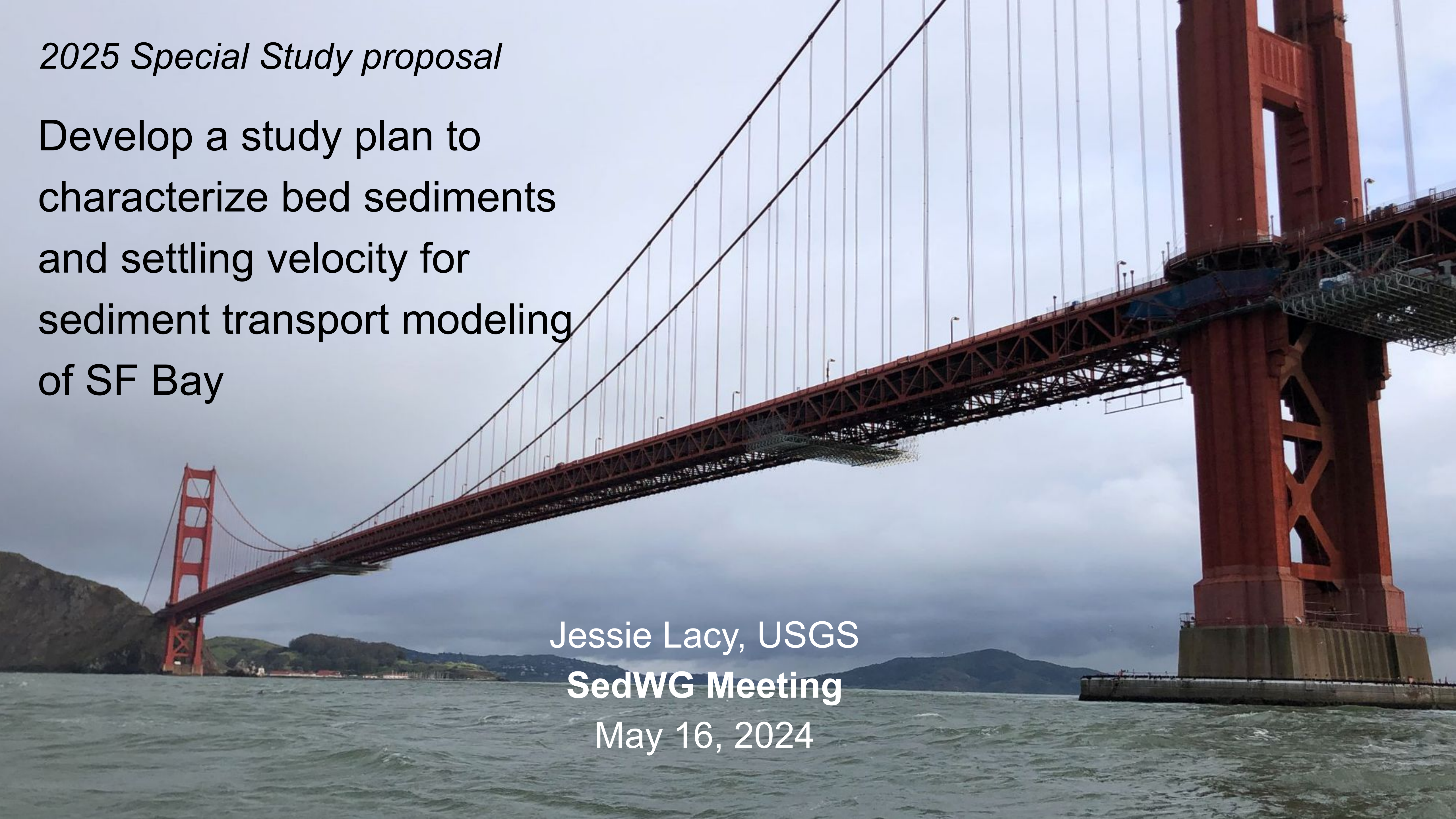
RMP Management Questions

Management Question	Modeling / Monitoring Science Question
3. What are the sources, sinks, pathways, and loadings of sediment and sediment-bound contaminants to and within the Bay and subembayments?	SQ 3.3. What are the main sediment transport processes and pathways within subembayments? SQ 3.5. What is the current sediment budget and how is the sediment budget changing?
4. How much sediment is passively reaching tidal marshes and restoration projects and how could the amounts be increased by management actions?	SQ4.2 What actions can we undertake to increase deposition rates in restoration sites? SQ4.4 What are the accretion/erosion rates and fluxes between individual marshes, mudflats, and shallow subtidal shoals?

RMP

Schedule

Deliverable	Due Date
Progress presentation at the annual Sediment Workgroup meeting, including the information from the technical advisors.	May 2025
Draft technical report submitted to the Sediment Workgroup and steering committee	April 2026
Presentation of results to the Sediment Workgroup	May 2026
Final technical report completed	August 2026



2025 Special Study proposal

Develop a study plan to characterize bed sediments and settling velocity for sediment transport modeling of SF Bay

Jessie Lacy, USGS

SedWG Meeting

May 16, 2024

Project Team

Jessie Lacy	USGS
Oliver Fringer	Stanford University
Rachel Allen	USGS
Lester McKee	SFEI

Motivation

Sediment transport models (STMs) are valuable tools for resource managers; the RMP is developing a STM.

Several STMs have been developed for SF Bay, and perform well by the standards of STMs, e.g. UnTRIM (MacWilliams et al. 2015) + SediMorph: Bever et al. (2018).

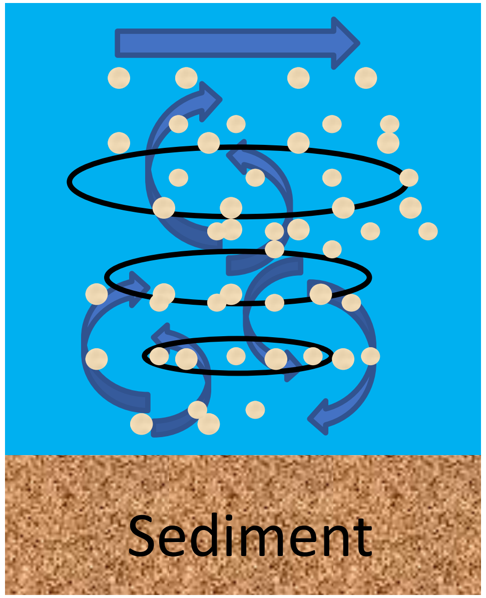
However, STMs typically do not reproduce the full range of SSC over tidal cycles or peak SSC during energetic events.

One factor limiting STM performance is that they require specification of numerous parameters which are poorly constrained by observations and characterize complex processes.

Our goal is to improve parameters representing two processes: erosion and settling.

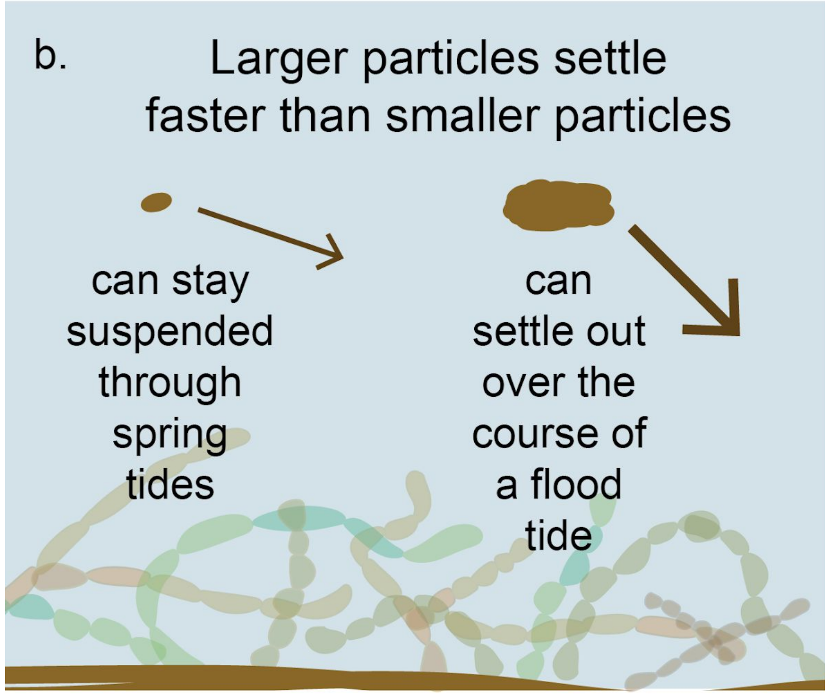
Erodibility

Relating rate of erosion to wave and current shear stress



- Cohesive sediment erodibility can be influenced by physical properties of sediment, history of physical forcing, benthic infauna, and phytoplankton.
- Observations in SF Bay show that erodibility can vary seasonally and on event timescales.
- There are several methods for measuring erodibility. They are not necessarily comparable, and each has limitations.
- Sediment bulk density and bed sediment particle size have been identified as indicators of erodibility.
- Models input parameters can include critical shear stress, erosion rate, depth of erodible sediment, consolidation rate.

Settling velocity



Foster-Martinez et al., in review.

- In the estuary, particle size changes due to flocculation and break up over tidal timescales.
- Flocculation is influenced by turbulent shear, organic content, and other factors.
- Settling velocity is influenced by particle size and floc density, and is difficult to measure in the field
- Most STMs model multiple sizes of sediment particles, which are represented by their settling velocities.
- One or more size class may represent flocs, but flocculation and break up are not typically modeled.

Goal is to improve parameterization of erodibility and settling velocity for STMs, addressing these questions in the SedWG SMMWP:

Management question	Monitoring/modeling science questions
MQ5: What are the concentrations of suspended sediment in the Estuary and its subembayments?	5.2 How does bed erodibility vary around the Bay in relation to physical factors such as texture, tides, and waves, and biotic factors such as phytobenthos and bioturbation?
	5.3 How do flocculation processes and floc sizes vary throughout the Bay in relation to SSC, water column depth, tides, wind, and other drivers, and how do these influence settling velocity?

The SMMWP questions envision a data-driven approach to the problem.

However, the best model input values cannot be determined solely by collecting more data, because

- representing the full spatial and temporal complexity of these parameters in STMs would make model results very difficult to interpret
- the parameters should not be optimized separately, because they influence each other

We propose to develop an integrated observational and modeling plan, starting from existing data and model capabilities, using modeling to determine data needs, collecting data, and using data to check model performance, in an iterative manner.

Approach

Task 1: Literature review and study plan outline

- Lit review for each topic
- Outline ideas for study plan to present to Workshop

Task 2. Convene a technical workshop

- 20-25 technical experts
- At Stanford University

Task 3. Presentation to RMP stakeholders

- Present study plan concepts to get input on scope, budget, and alternatives

Approach con’t

Task 4. Draft the study plan

- Literature review for each of the two topics
- Plan for three-year combined observational and modeling study for each of the two topics

Task 5: Final report

Submitted by March 1, 2026, before the RMP SedWG 2026 proposal cycle.

Study plan content

- definition of spatial scale or study area(s)
- scope, methods, and estimated cost of initial data collection
- scope, identification of model(s), and estimated cost of initial modeling
- identification of model output(s) to be used for evaluating performance
- a plan for iterating between modeling and measurements
- estimated budget for the 3-yr study

Deliverable	Due Date
Convene technical workshop to inform the study plan (Task 2)	June 2025
Presentation to stakeholders through RMP SedWG (Task 3)	October 2025
Draft report presenting study plan for improving characterization of settling velocity and bed sediments to advance sediment transport modeling in San Francisco Bay (Task 4)	January 2026
Final report (Task 5)	March 1, 2026

Budget

	USGS	Stanford University	SFEI
Task 1	$13,000	$11,000	$6,000
Task 2	$3,000	$2,500	$1,500
Task 3	$1,000	$500	$3,500
Task 4	$11,000	$10,000	$8,000
Task 5	$2,000	$1,000	$1,000
Subtotal	$30,000	$25,000	$20,000
Indirect	$18,300	$6,250	
Total	$48,300	$31,250	$20,000

Total: $99,550

Analysis of satellite-based surface suspended sediment concentrations for improved sediment transport modeling in San Francisco Bay

Oliver Fringer[1] and Jessie Lacy[2]

[1]Stanford University, Dept. of Civil and Environmental Engineering and Dept. of Oceans
[2]USGS Pacific Coastal and Marine Science Center

SedWG meeting

5/16/24

Motivation

Many sediment transport models have been applied to San Francisco Bay:

- UnTRIM (MacWilliams et al. 2015) + SediMorph: Bever et al. (2018)
- SCHISM (Chao et al. 2018) + SED3D: Wang et al. (2021)
- Dflow-FM or DFM (Marty-Koller et al. 2017; Holleman et al. 2017; King 2019; King et al. 2019) + sediment: Van Gijzen (2020)
- SUNTANS (Fringer et al. 2006) + sediment: Chou et al. (2018)

Status of the current state of the art

Anchor QEA 2021 Report on simulating sediment flux through the Golden Gate using UnTRIM + SediMorph:

"The major simplifications made in this application were:"

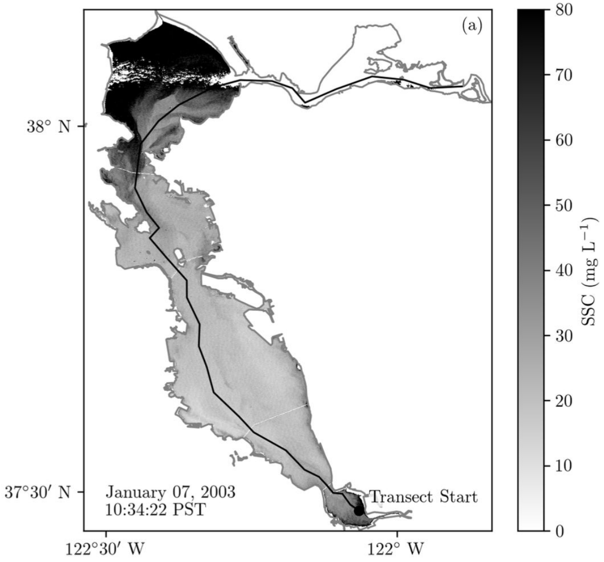
- Discrete set of sediment classes with constant sediment parameters.
- No model for aggregation and disaggregation of sediment particles.
- Simple treatment of the seabed.

Some of the effects of these simplifications:

- Decreased peak suspended sediment concentration (SSC) during energetic periods because flocs do not disaggregate and resuspend more easily.
- Underestimation of sediment flux from channels and onto mudflats.
- Increased SSC at the start of spring tides owing to a lack of consolidation during the preceding neap tide.

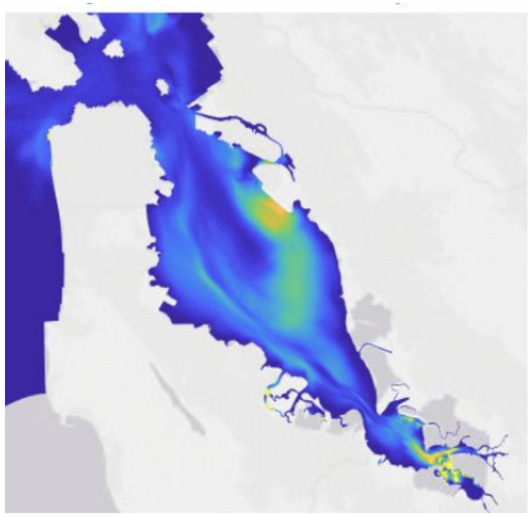
Long-term goal

Use data assimilation techniques to dynamically estimate parameters like settling velocity and bed erodibility that give best match between modeled and in-situ or satellite-based surface SSC.



Satellite-based surface SSC from Adelson (2020).

What distribution of settling velocity and bed erodibility gives the best match between these two results?



Simulated surface SSC with Dflow-FM (White 2022)

Methods: Ensemble Kalman filter (EKF) (e.g. Vitousek et al. 2023), Uncertainty Quantification.

Six-year timeline:

- **Year 1 (2025): Analyze satellite remote sensing data of surface SSC and compare to in-situ observations to assess accuracy and determine trends throughout SF Bay. Cost: $135K (This proposal)**
- Years 2-4 (2026-2028): Incorporate satellite-based SSC into the SFEI DFM model using data assimilation techniques. The method will be model-agnostic and will be applicable to any model. Cost: $400K
- Year 5 (2029): Study sediment fluxes at different transects in SF Bay to understand physical processes impacting the fluxes and to compute long-term sediment budgets (e.g. verify conceptual model of Livsey et al. 2021). Cost: $135K
- Year 6 (2030): Develop methods to compute fluxes and sediment budgets directly from the satellite data (i.e., without the sediment transport model). Cost: $135K

Satellite remote sensing of surface SSC

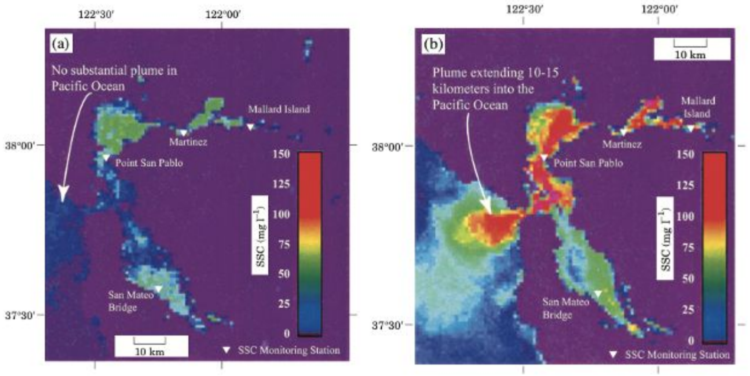
- Satellite-derived water-leaving reflectance is calibrated with in-situ turbidity data using the red (630-690 nm) and/or near-infrared (780-900 nm) bands.
- Limitations: Cloud cover, sun glint, white capping, organics, shallow water, adjacency to land.
- Need to convert turbidity SSC with in-situ measurements (site specific).
- Can also regress satellite reflectance with in-situ SSC (site specific).
- Satellites capable of measuring turbidity:

Satellite	**Launch year**	**Resolution (m)**	**Revisit time (days)**
Landsat	1999 (7), 2013 (8)	30	16
Sentinel 2	2015 (A), 2017 (B)	10	10 (5 for high latitudes)
Sentinel 3	2016 (A/B)	300	1-2
Planet Dove/Superdove	***2013/2019***	***3-5***	***1***

Previous studies of satellite SSC in SF Bay

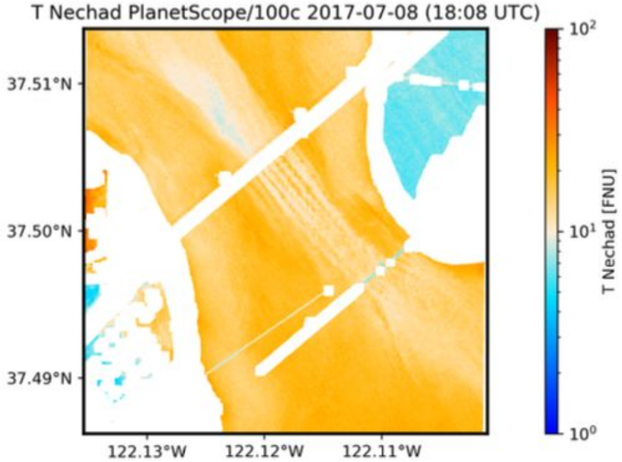
Ruhl et al. (2011): NOAA AVHRR : 1 km, 20 day revisit period

- 43 images during 1994-1998, regressed to USGS SSC monitoring sensors
- General qualitative features of SSC dynamics



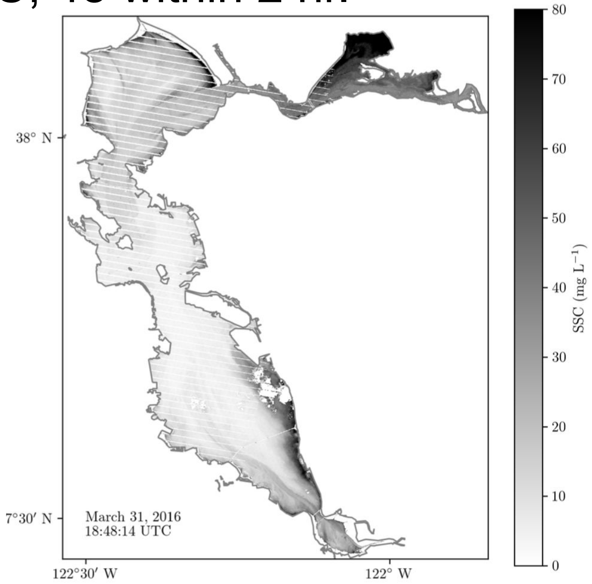
Adelson (2020): Landsat 7 ETM+: 30 m, 16-day revisit period

- 309 images during 1999-2017, regressed to USGS Polaris along-bay SSC transects
- Regression depends on time overlap between satellite and in-situ measurement □ 5 images within 5 minutes of SSC, 48 within 2 hr.

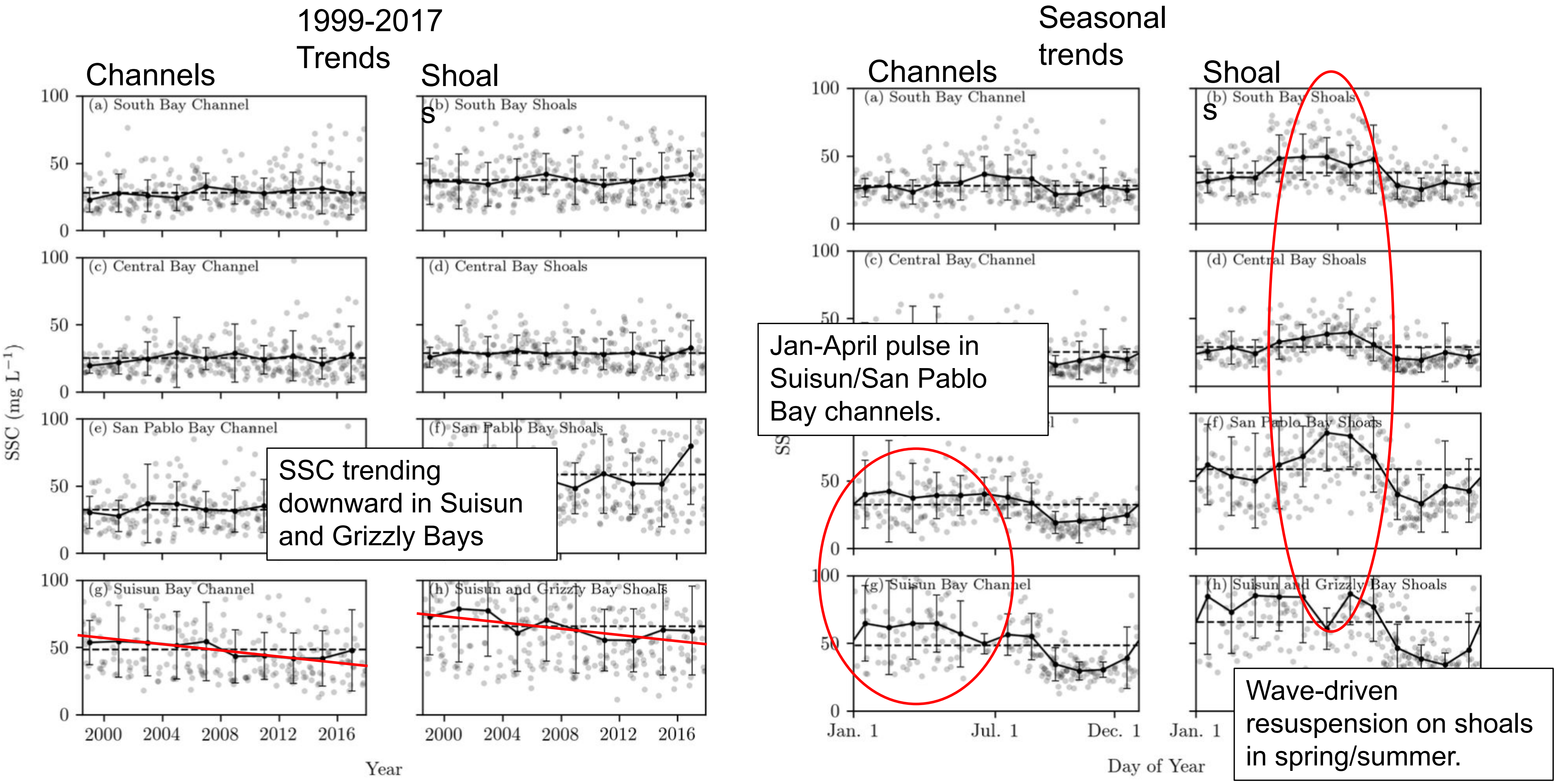


Vanhellement (2019): Planet dove: 3-5 m, 1 day revisit time

- Direct calculation of turbidity with Nechad et al. (2011) coefficients (based on North Sea).
- Promising results indicate good match with USGS continuously monitored turbidity.



Annual and seasonal trends (Adelson 2020)



Status and proposed work

- There is great potential to use satellite imagery to understand sediment dynamics in SF Bay and assimilate data into models.
- Primary limitation has been related to lack of overlap between in-situ and satellite sensors to regress imagery to in-situ measurements.
- Proposed work:
  - Create database of available satellite products that overlap with in-situ sensors.
  - Calibrate satellite products to produce better estimates of Bay-wide SSC and annual and seasonal trends.
  - Assess reliability of turbidity vs SSC from imagery throughout Bay (better to calibrate to match SSC or turbidity?).
  - Evaluate potential to estimate high-frequency trends from Planet imagery (tidal, spring-neap, diurnal).

Budget

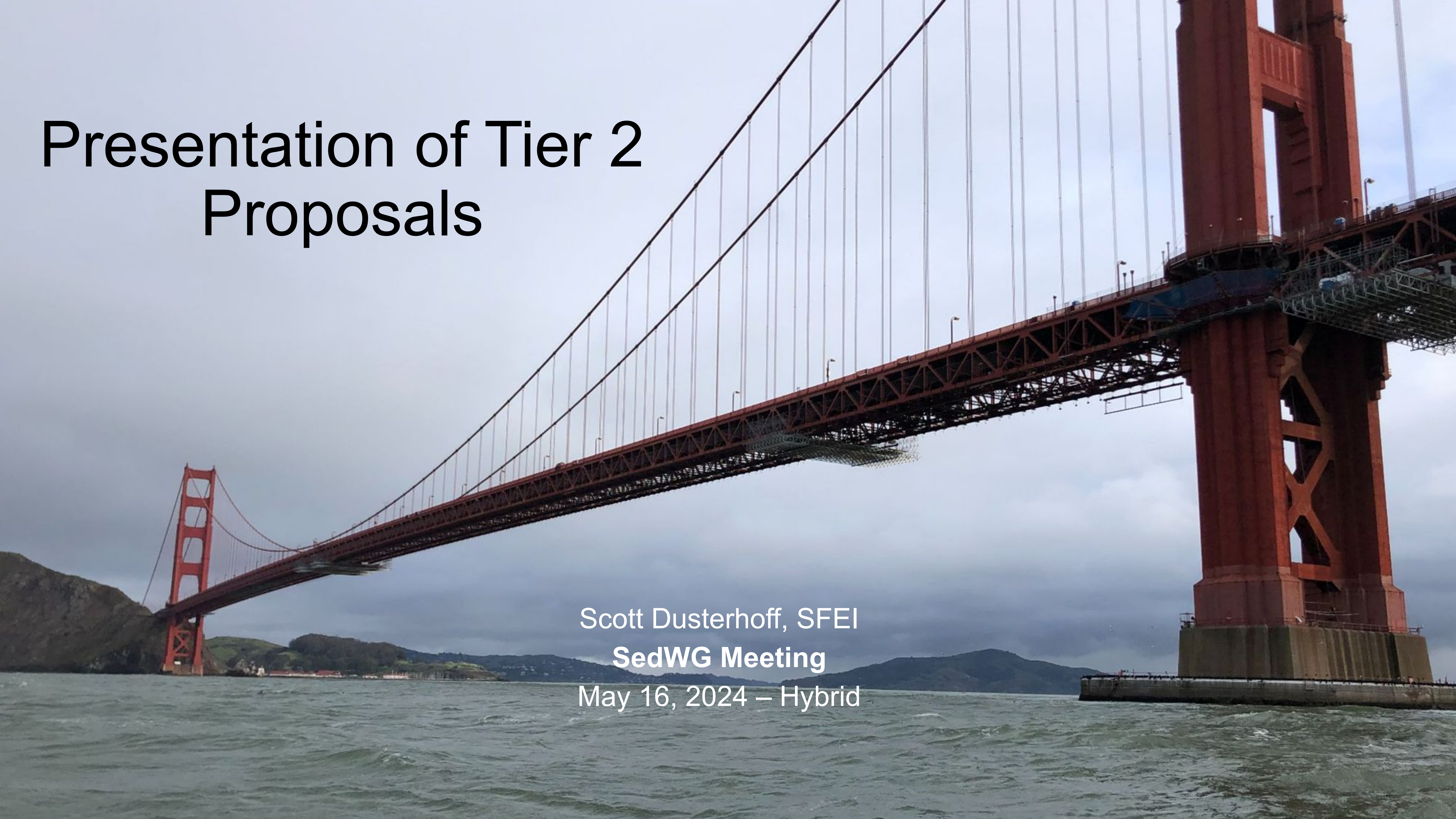
Stanford	
Fringer salary	2,556
Postdoc 1 year salary	119,919
Laptop + travel	5,000
Stanford Total	127,475
USGS	
McGill salary	8,000
USGS Total	8,000
Grand total Stanford + USGS	135,475

- Stanford postdoc (TBD) will work on analysis of satellite imagery (Salary = $75K).
- Samantha McGill at USGS will help with in-situ data requisition and analysis.
- Fringer requesting minimum required 1% academic year salary.

In-kind and leveraged contributions:

- Lacy's time will be provided as an in-kind contribution.
- Two Ph.D. students will join Fringer's group in fall 2024:
  - Cage Mitchell: Data assimilation of sediment into SFEI Dflow-FM model.
  - Sarah Chang: Satellite remote sensing + machine learning + modeling to understand/predict HABs in SF Bay (with David Senn, SFEI).

Presentation of Tier 2 Proposals



Scott Dusterhoff, SFEI

SedWG Meeting

May 16, 2024 – Hybrid

2025 Special Study Proposals - Tier 2

Proposal	Budget
Napa-Sonoma Sediment Loads (USGS & SFEI)	$142,040
Bay Sediment Budget Update (SFEI)	$50,000
Shoreline Change in San Francisco Bay (SFEI)	$80,000
Suspended Sediment Flux Measurements at Richmond-San Rafael Bridge, CA (USGS-CWSC)	$15,000 - $71,000
Spatial Variability of Sediment Accretion in San Francisco Bay Restorations: Expanded Coverage (USGS-WERC & USGS-PCMSC)	$115,000
Sediment Dynamics in a Fluvially Influenced Salt Marsh (USGS-PCMSC & USGS-WERC)	$121,000
TOTAL	**$523,040 - $579,040**

2025 Special Study Proposals - Tier 2

Proposal	Lead(s)	Budget	Overall Summary
Napa-Sonoma Sediment Loads	Andy Watson (USGS-Ukiah) Lester McKee (SFEI)	$142,040 per year	• Monitor suspended sediment and bedload in Napa River and Sonoma Creek • Will help understand current sediment loads from two large sources and help calibrate WDM

2025 Special Study Proposals - Tier 2

Proposal	Lead(s)	Budget	Overall Summary
Bay Sediment Budget Update	Lester McKee (SFEI)	$50,000	• Update the Bay sediment budget with improved bathymetric change data, a better bed texture-bulk density relationship, and an understanding of the ESP • Will provide a better understanding of sediment dynamics in the Bay

2025 Special Study Proposals - Tier 2

Proposal	Lead(s)	Budget	Overall Summary
Shoreline Change in San Francisco Bay	Alex Braud, Lester McKee, Jeremy Lowe, Scott Dusterhoff (SFEI)	$80,000	• Update and expand estimates of shoreline change and baylands loss around the Bay over the past 200 years (with an emphasis on the last 15 years) • Will help identify baylands that vulnerable to shoreline retreat under a rising sea level

2025 Special Study Proposals - Tier 2

Proposal	Lead(s)	Budget	Overall Summary
Suspended Sediment Flux Measurements at Richmond-San Rafael Bridge, CA	David Hart (USGS-CWSC)	$15,000 - $71,000	● Expand the upcoming transect monitoring of sed flux at the Richmond Bridge to include installing and maintaining a fixed water quality sensor on the bridge ● Will help improve understanding of sediment flux variability at the SPB-CB subembayment boundary

2025 Special Study Proposals - Tier 2

Proposal	Lead(s)	Budget	Overall Summary
Spatial Variability of Sediment Accretion in San Francisco Bay Restorations: Expanded Coverage	Karen Thorne & Kevin Buffington (USGS-WERC) Jessie Lacy & Dan Nowacki (USGS-PCMSC)	$115,000	● Expand coverage of current study to include Napa River and South SF Bay (3 additional sites) ● Will be useful for understanding controls on sediment accretion in restoration sites and prioritizing future restoration locations

2025 Special Study Proposals - Tier 2

Proposal	Lead(s)	Budget	Overall Summary
Sediment Dynamics in a Fluvially Influenced Salt Marsh	Jessie Lacy & Dan Nowacki (USGS-PCMSC) Karen Thorne (USGS-WERC)	$121,500	● Assess sediment flux at Gray's Marsh along Petaluma River (site turning back into a marsh after a recent unintentional breach) ● Will help determine the relative contribution of fluvial- and Bay-derived sediment to accretion rates

Closed Session: Ranking 2025 Special Studies Proposals

Guidelines for Inclusive Conversations

1. Try it on
2. Practice self focus
3. Understand the difference between intent and impact
4. Practice both / and thinking
5. Refrain from blaming or shaming self and others
6. Move up / move back
7. Practice mindful listening
8. Right to pass
9. Avoid jargon
10. It's okay to disagree (respectfully)

RMP

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Anticipated additional funding from EPA = ~ $140k

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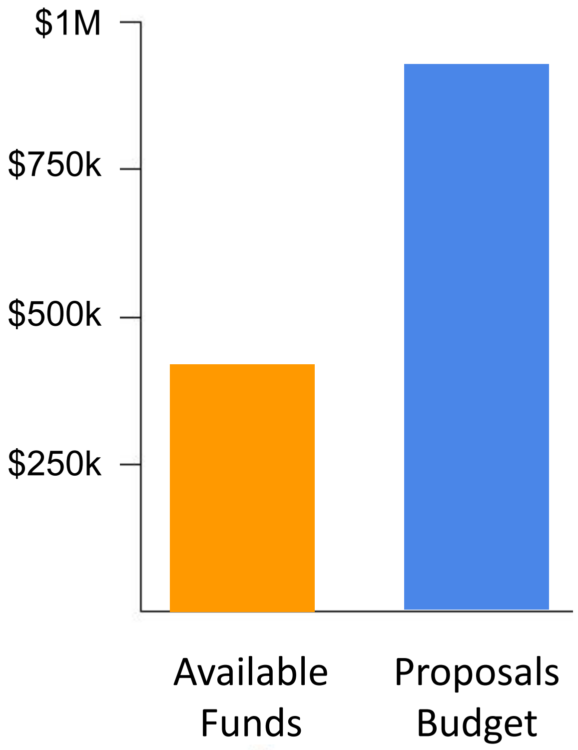
Sediment Workgroup
Available Funds vs. Proposals Budget



Proposal		Budget
Tier 1	1. Refining the Conceptual Understanding of Sediment Transport in San Pablo Bay	$65,000
	2. Develop a study plan to improve characterization of bed sediments and settling velocity to advance sediment transport modeling for San Francisco Bay	$106,900
	3. Analysis of satellite-based surface turbidity for improved sediment transport modeling in San Francisco Bay	$135,475
Tier 2	4. Napa-Sonoma Sediment Loads	$142,040
	5. Bay Sediment Budget Update	$50,000
	6. Shoreline Change in San Francisco Bay	$80,000
	7. Suspended Sediment Flux Measurements at Richmond-San Rafael Bridge, CA	$15,000 - $71,000
	8. Spatial Variability of Sediment Accretion in San Francisco Bay Restorations: Expanded Coverage	$115,000
	9. Sediment Dynamics in a Fluvially Influenced Salt Marsh	$121,000
	TOTAL	**$830,415 - $886,415**