STRATEGIC SHALLOW WATER PLACEMENT PILOT PROJECT

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SAN FRANCISCO DISTRICT, USACE
SEPT 14, 2022

Photo: Pete Kauhanen, SFEI

THANK YOU TO THE PROJECT TEAM

- USACE
  - Peter Mull- Project Manager
  - John Dingler- Planning Mentor
  - Arye Janoff - Planner
  - Julie Beagle- Environmental Planner
  - Eric Joliffe- Environmental Planner
  - Ellie Covington- Environmental Planner
  - Tiffany Cheng- Coastal Engineer
  - Fanny Chan- Civil Engineer
  - Kelly Boyd – Real Estate
- Non-Federal Sponsor (Coastal Conservancy)
  - Evyan Sloane (SCC)-Sponsor Program Manager
  - Brenda Goeden (BCDC)-Sponsor Technical Support
- Contractor (Modeling)
  - AnchorQEA (Michael MacWilliams, Aaron Bever)

SF Bay Regional Water Quality Control Board (CEQA Lead)

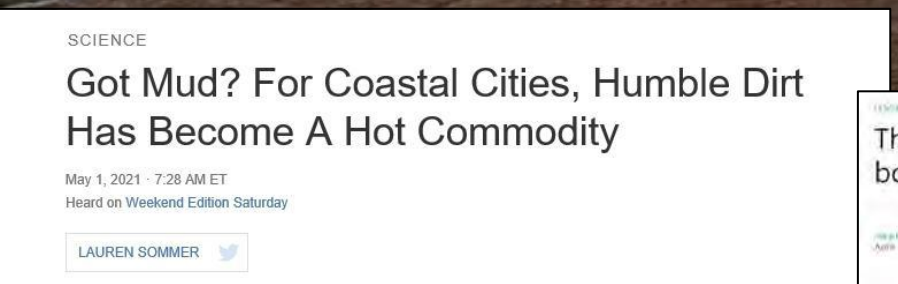
- Xavier Fernandez
- Kevin Lunde
- Jazzy Graham-Davis
- Sami Harper

Problems

- A change in sediment regime, sea level rise, and localized erosion will lead to a long-term loss of mudflats and marshes in the San Francisco Bay.
- Dredged sediment is critical for adaptation/restoration of marshes and mudflats that protect us from rising seas and storms.

Opportunities

- Strategic shallow water placement may offer one of many possible solutions to the problem of losing mudflats and marshes.
- Potential to lower the cost of beneficial reuse of dredge material by using natural processes to bring the material onshore.

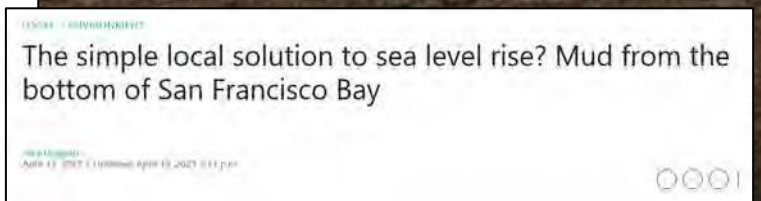

SCIENCE

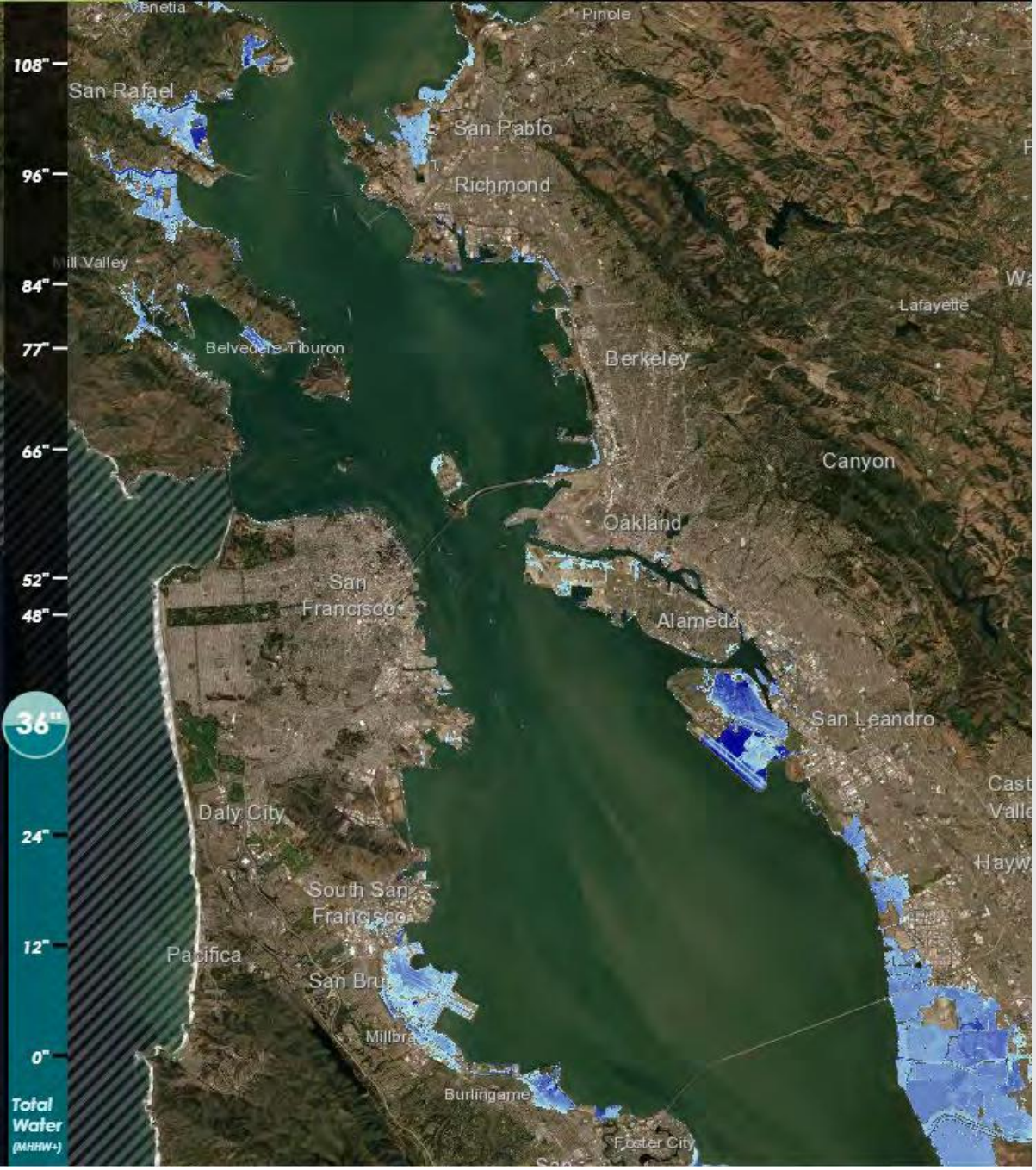
Got Mud? For Coastal Cities, Humble Dirt Has Become A Hot Commodity

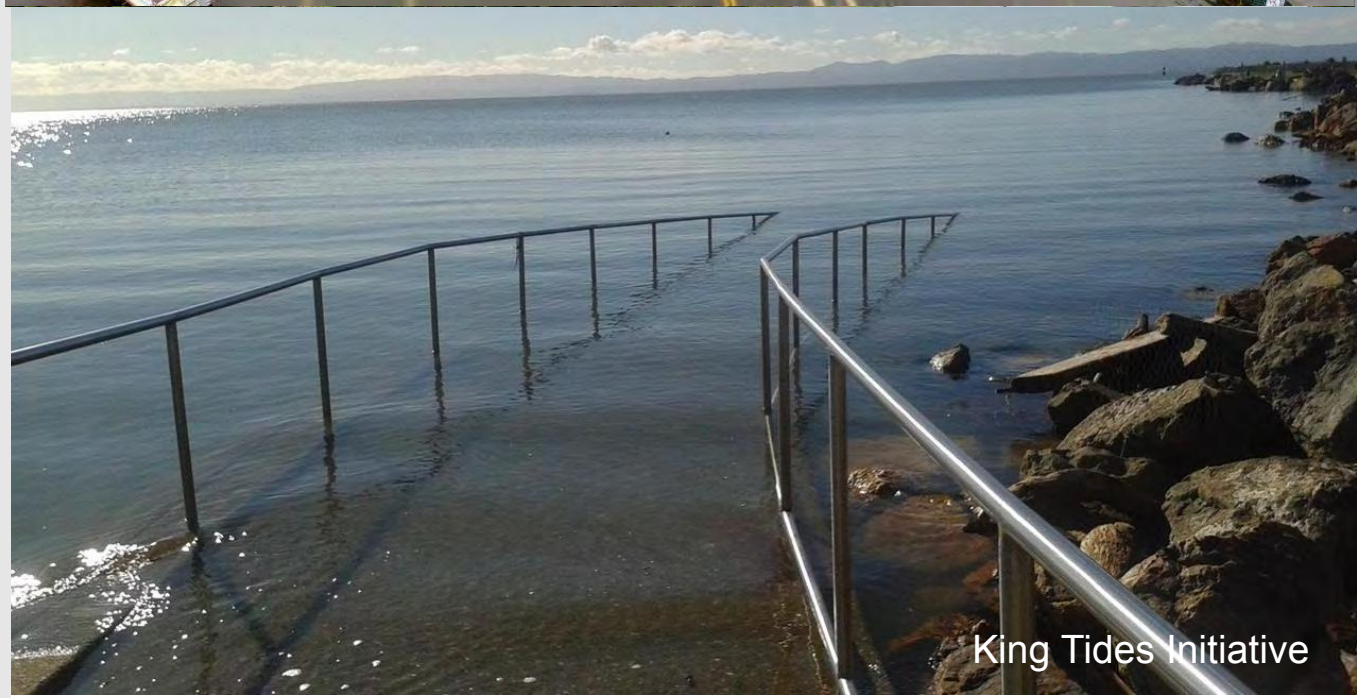
May 1, 2021 · 7:28 AM ET

Heard on Weekend Edition Saturday

LAUREN SOMMER


The simple local solution to sea level rise? Mud from the bottom of San Francisco Bay

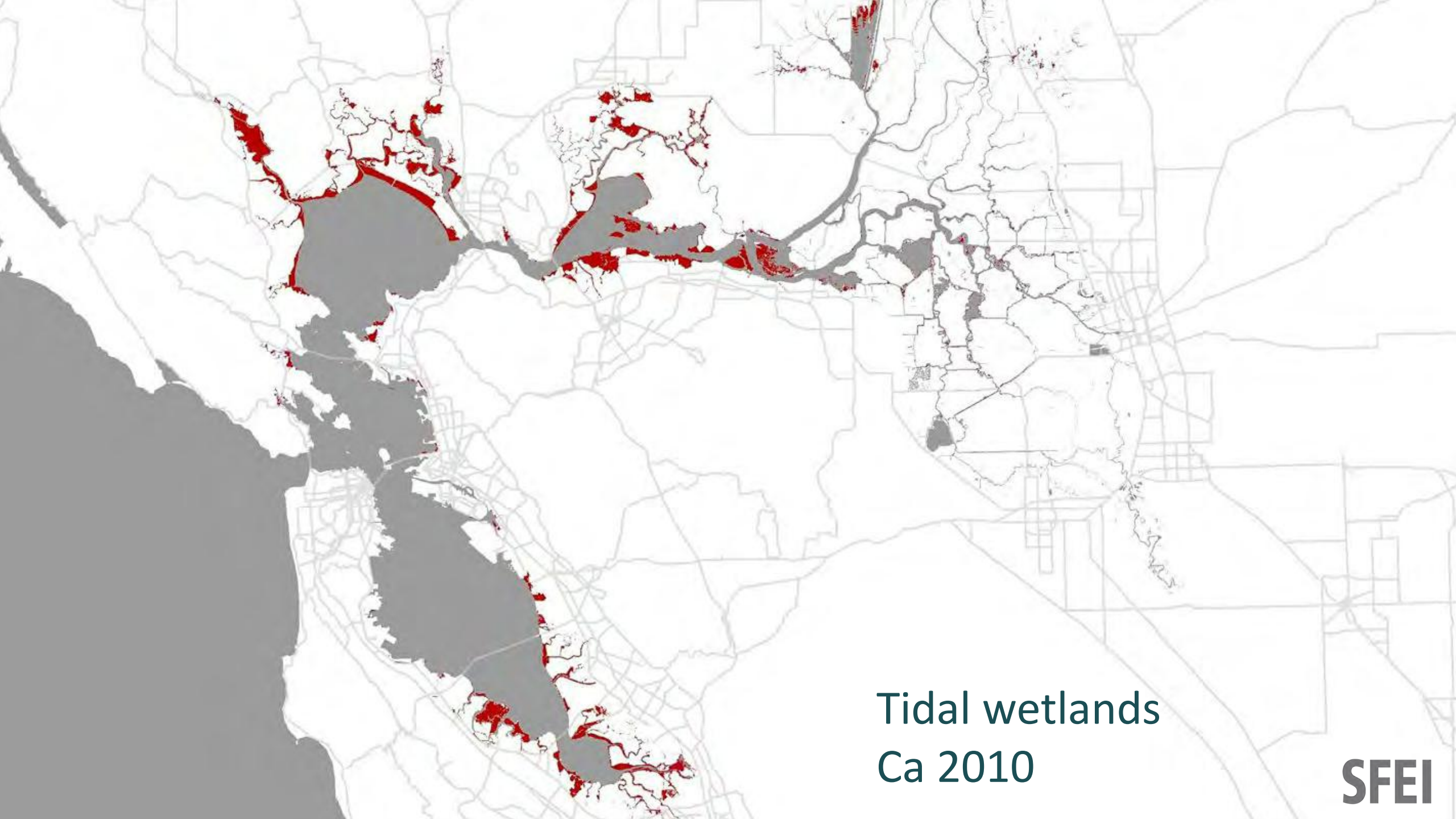




ART Bay Area Shoreline Flood Explorer

Tidal wetlands
Ca 1800

SFEI



Tidal wetlands
Ca 2010

SFEI

MARSH DROWNING

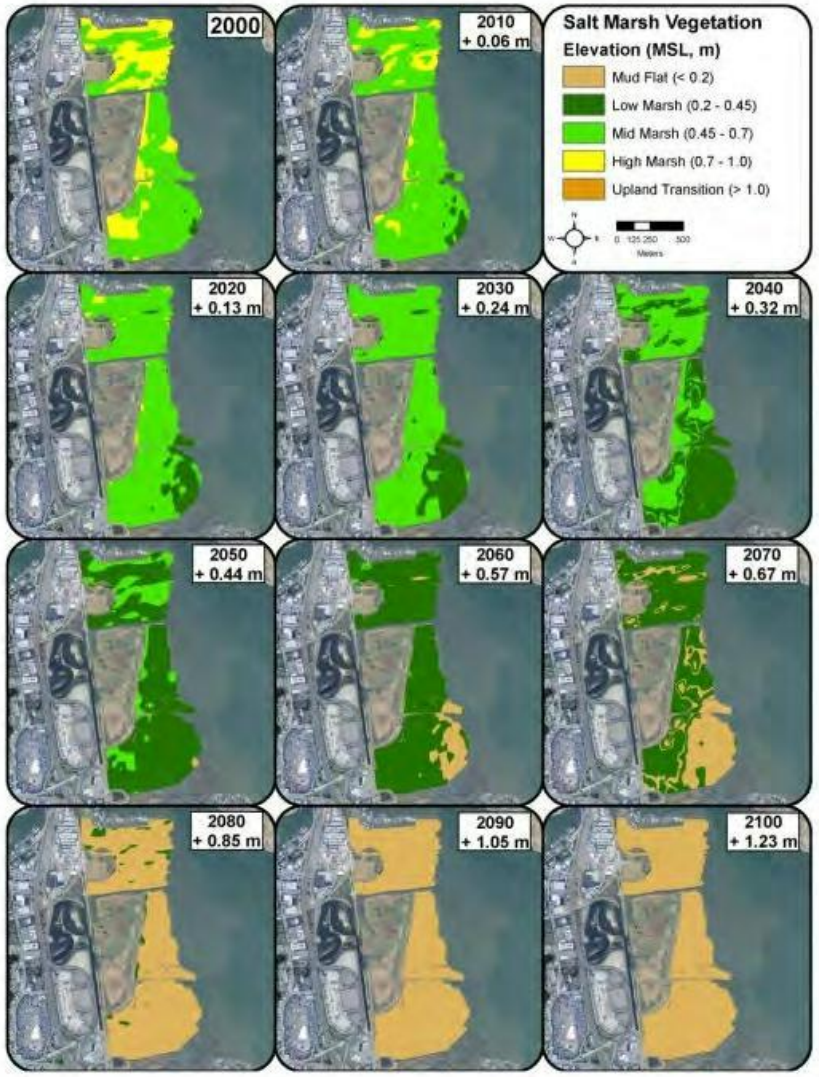


Figure G-9. Corte Madera WARMER results in terms of vegetation category: mudflat, low, mid, or high marsh, or upland transition.

From Karen Thorne, USGS

Habitat availability of Ridgways rails over time

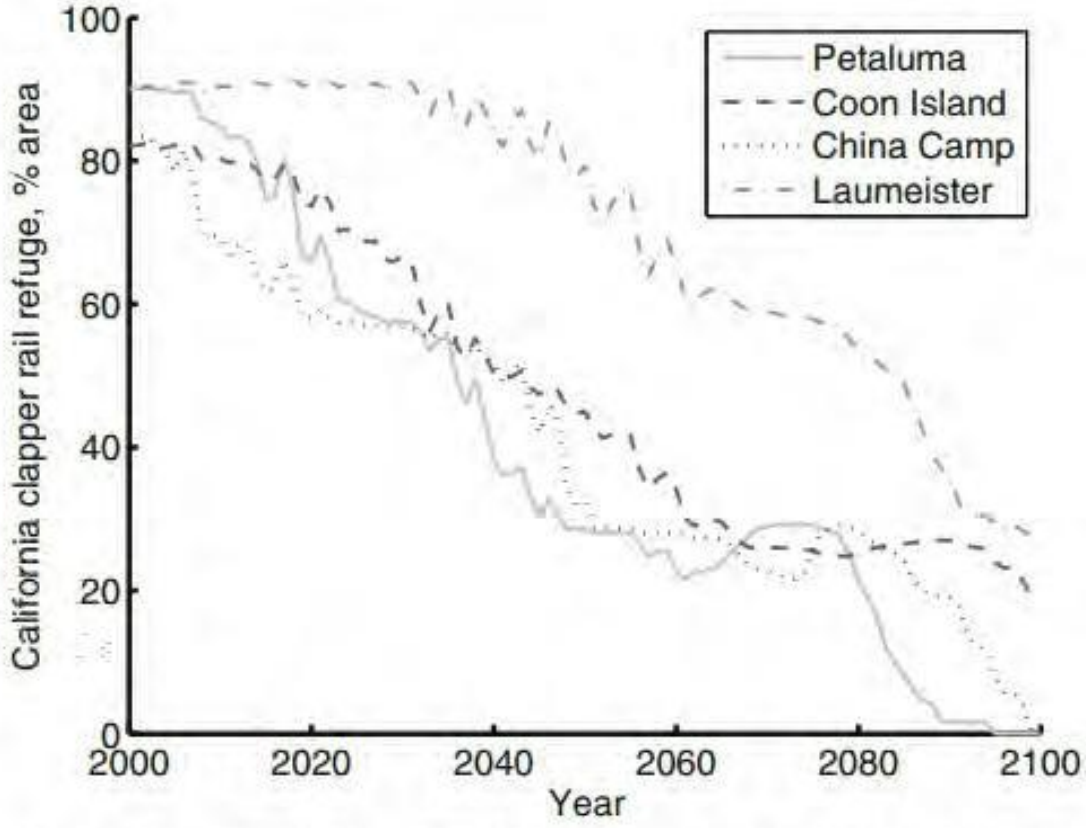
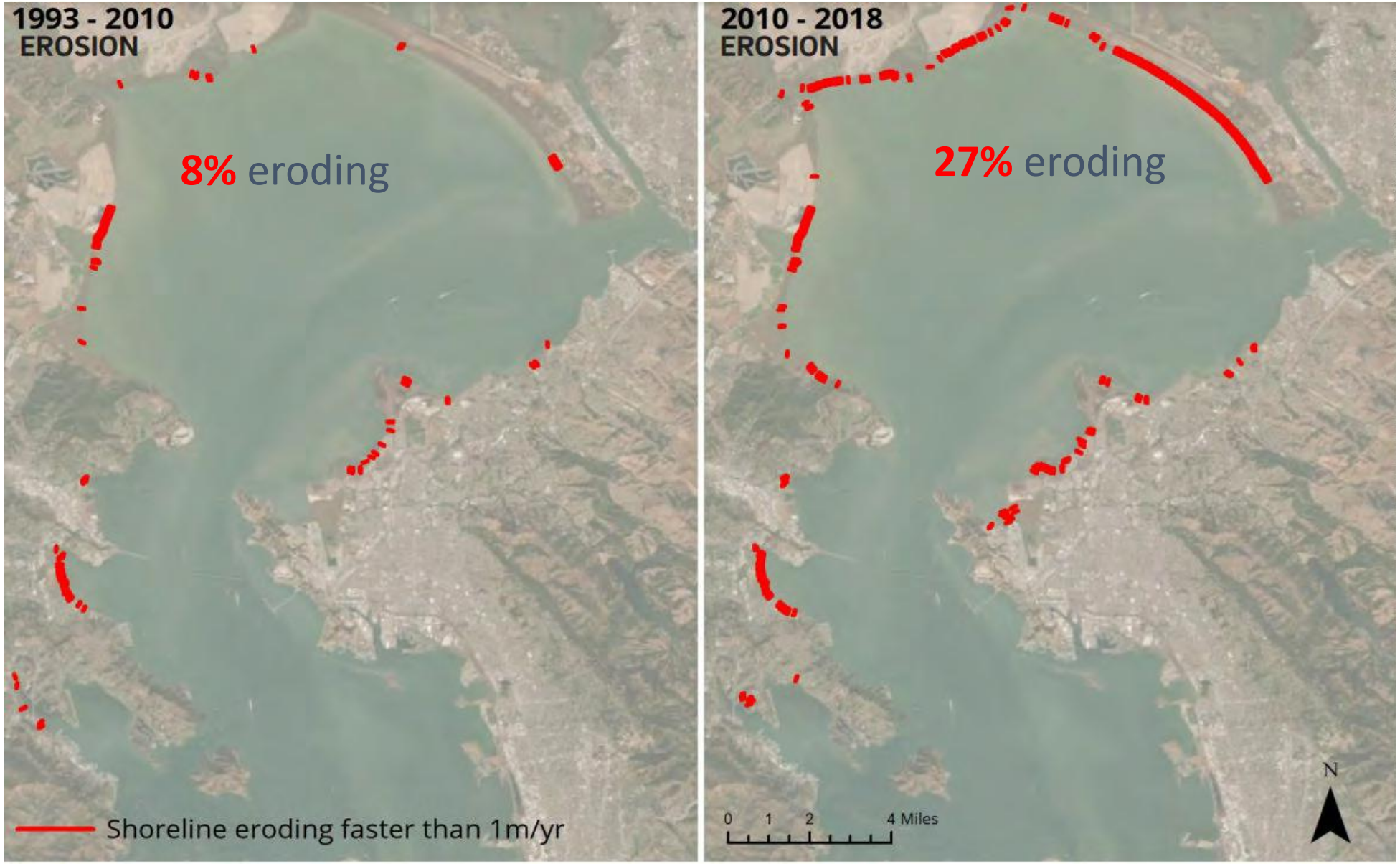


Fig. 9 *R. longirostris obsoletus* habitat availability at MHHW. Projected marsh area (%) where elevation plus maximum vegetation height exceeds MHHW by at least 20 cm

Swanson et al. 2013

MARSH EDGE EROSION



New life for eroding shorelines (SFEI and Baye 2020)

Need for sediment

- USACE dredges navigation channels yearly
- "Cheaper” to take the material offshore
- We need to reuse the sediment in a smart way, collaboratively if we want to design with nature for climate resilience

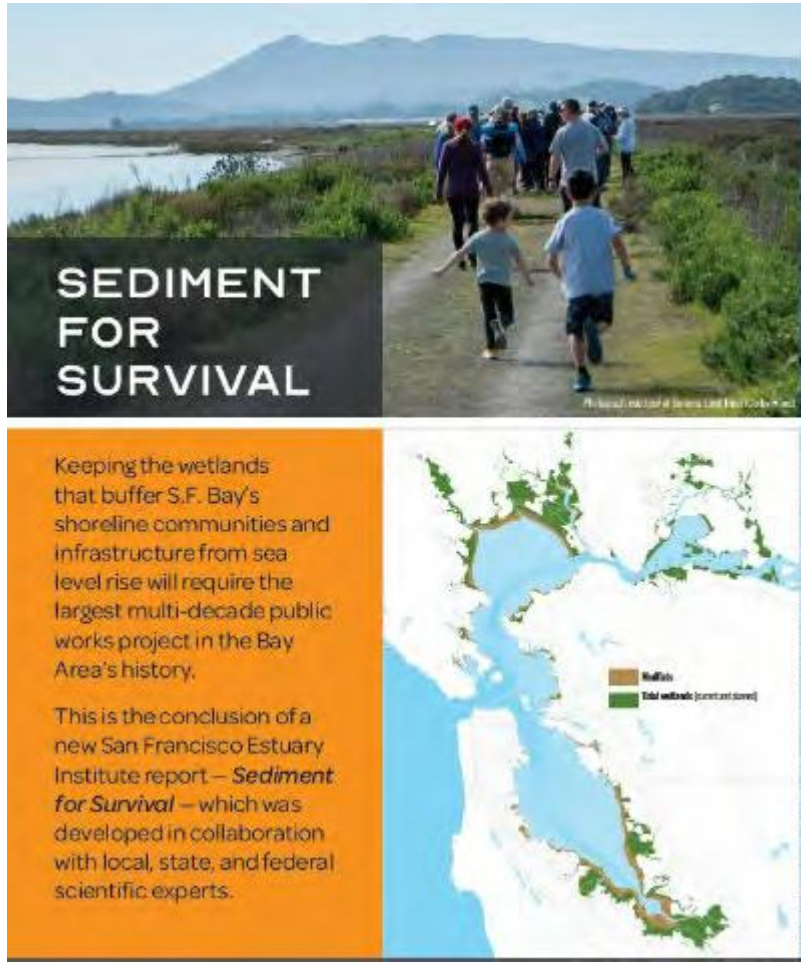
The Mercury News | San Francisco Bay: Protection from costly...

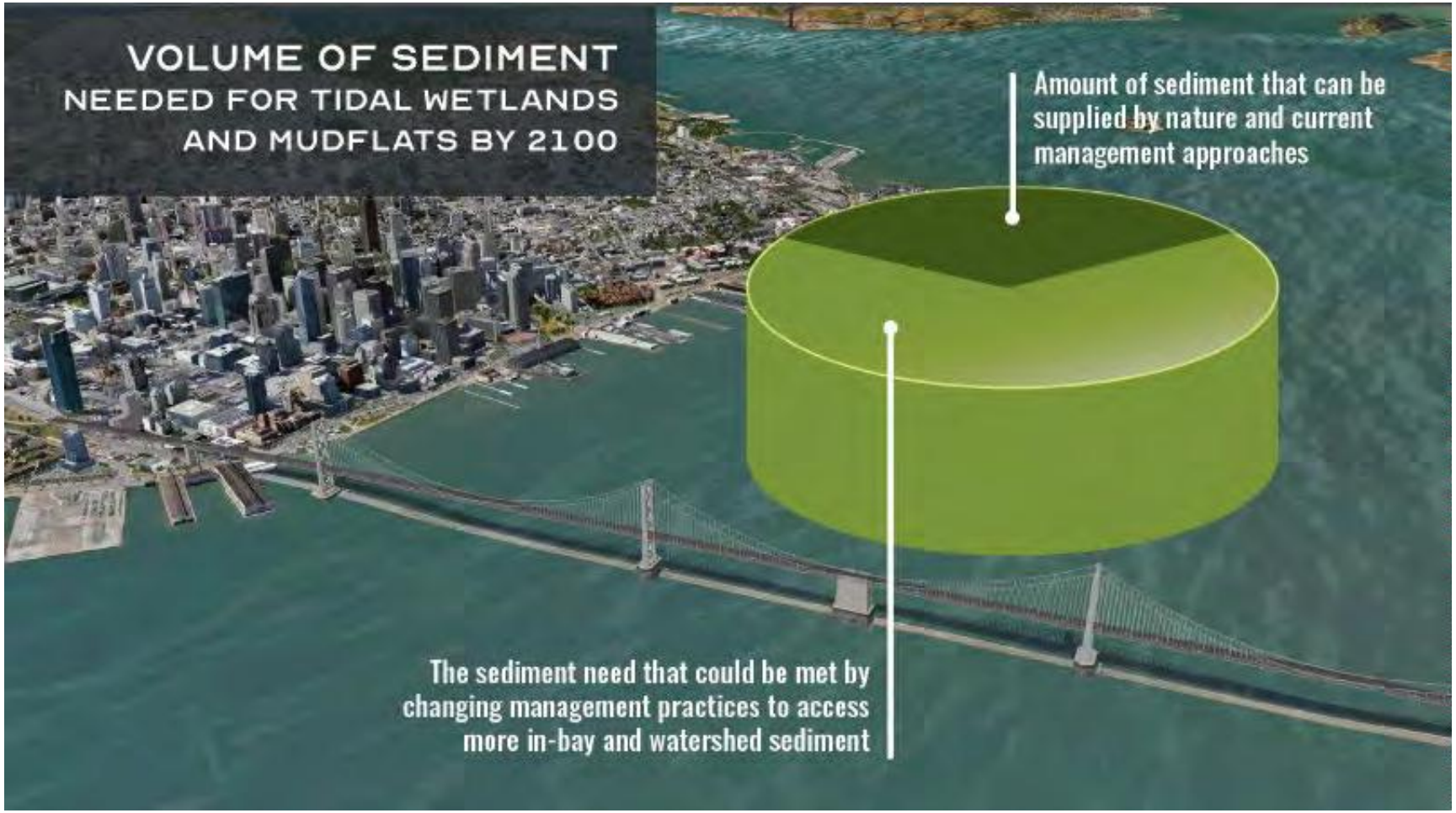
NEWS › ENVIRONMENT

San Francisco Bay: Protection from costly disasters is being thrown away, scientists say

Sea level rise threatens billions in flood damage, but dredged mud to raise shoreline isn’t being used

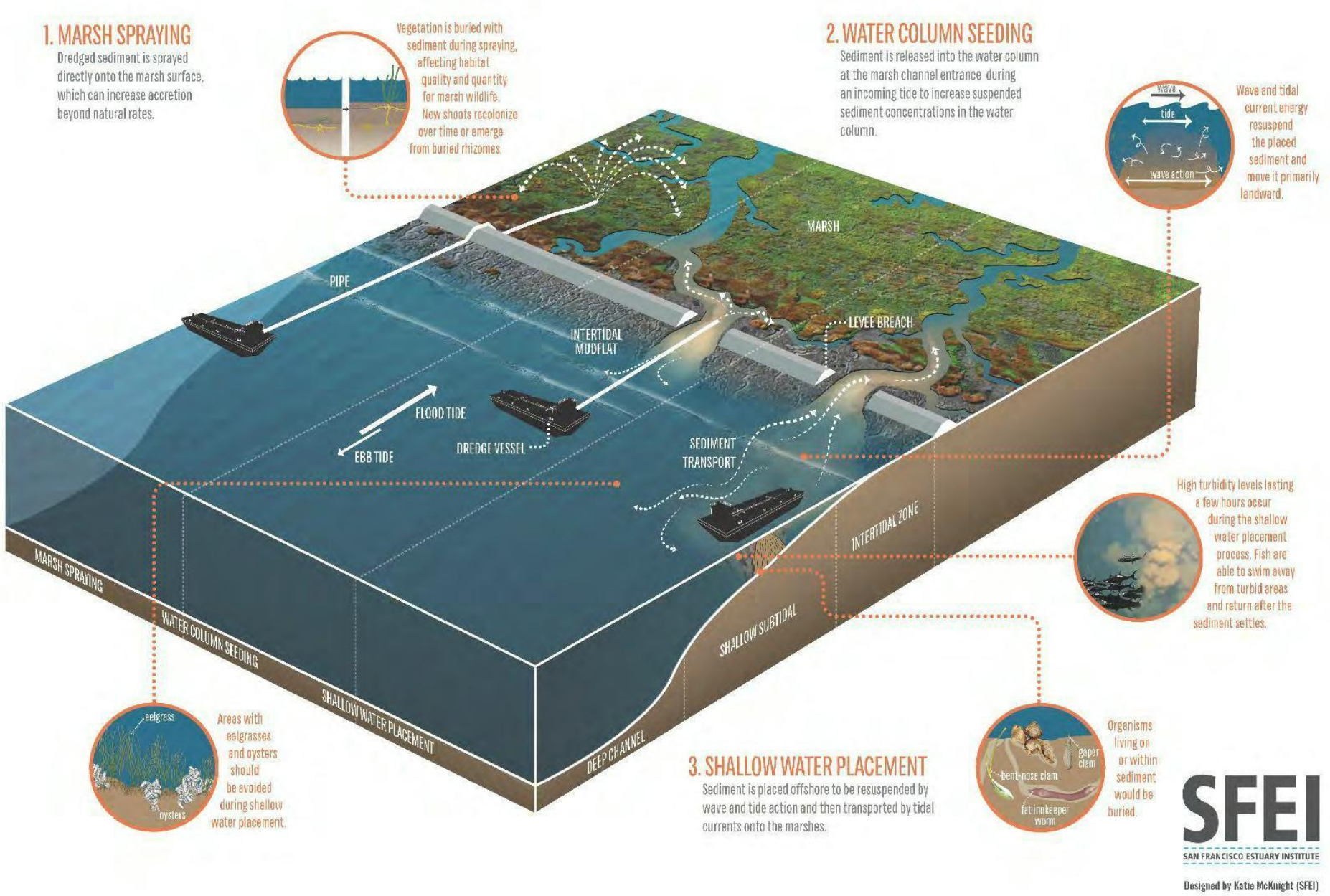
SEDIMENT FOR SURVIVAL



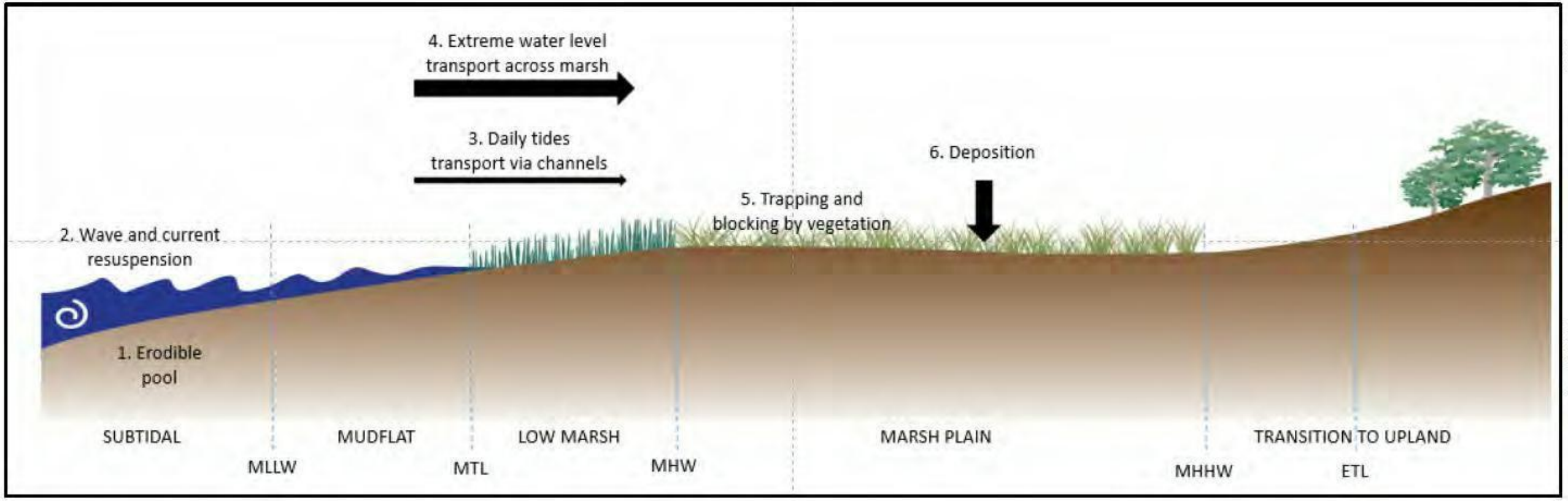


Dusterhoff et al., 2021

BENEFICIAL USE PROJECTS IN SF BAY


1. MARSH SPRAYING
Dredged sediment is sprayed directly onto the marsh surface, which can increase accretion beyond natural rates.
Vegetation is buried with sediment during spraying, affecting habitat quality and quantity for marsh wildlife. New shoots recolonize over time or emerge from buried rhizomes.
2. WATER COLUMN SEEDING
Sediment is released into the water column at the marsh channel entrance during an incoming tide to increase suspended sediment concentrations in the water column.
wave
tide
wave action
Wave and tidal current energy resuspend the placed sediment and move it primarily landward.
MARSH
PIPE
LEVEE BREACH
INTERTIDAL MUDFLAT
FLOOD TIDE
EBB TIDE
DREDGE VESSEL
SEDIMENT TRANSPORT
INTERTIDAL ZONE
SHALLOW SUBTIDAL
DEEP CHANNEL
MARSH SPRAYING
WATER COLUMN SEEDING
SHALLOW WATER PLACEMENT
High turbidity levels lasting a few hours occur during the shallow water placement process. Fish are able to swim away from turbid areas and return after the sediment settles.
eelgrass
oysters
Areas with eelgrasses and oysters should be avoided during shallow water placement.
3. SHALLOW WATER PLACEMENT
Sediment is placed offshore to be resuspended by wave and tide action and then transported by tidal currents onto the marshes.
gaper clam
bent-nose clam
fat innkeeper worm
Organisms living on or within sediment would be buried.
SFEI
SAN FRANCISCO ESTUARY INSTITUTE
Designed by Katie McKnight (SFEI)

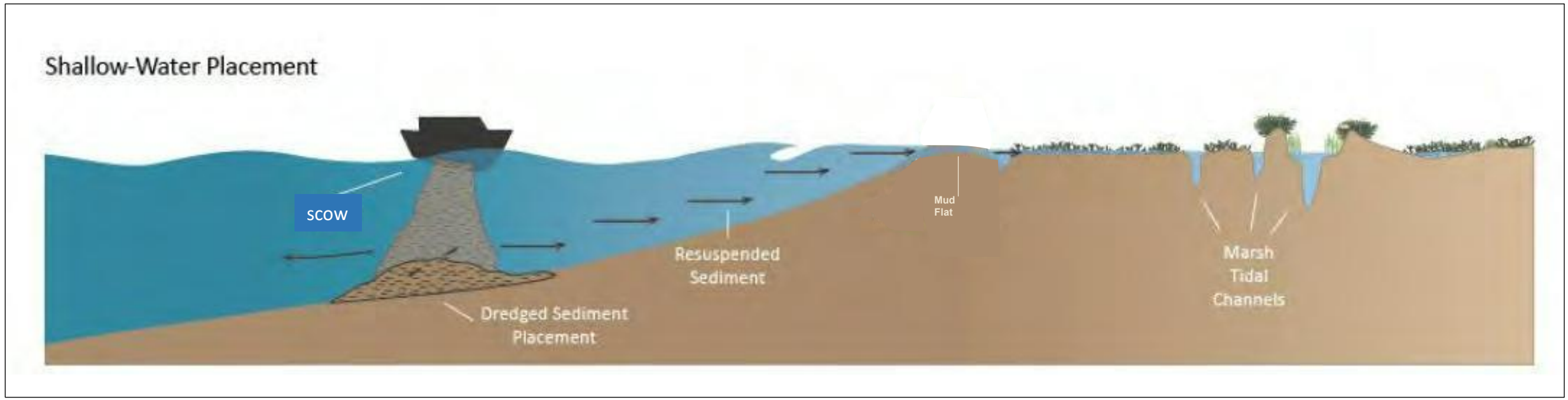
INORGANIC SEDIMENT SUPPLY TO MARSHES (CONCEPTUAL FRAMEWORK)



SFEI framework, 2017 draft

STRATEGIC SHALLOW WATER PLACEMENT PILOT

- Tests using natural transport processes to move sediment onshore
- Creates resilience for mudflats and marshes
- Innovative, cost-effective, moves towards regional goals
- Monitoring impacts and effectiveness



SFEI framework, draft, 2017

MUD MOTOR, THE NETHERLANDS

The dredged sludge is usually thought to be useless and it is spread in the Wadden Sea.

4. Salt marsh growth

Sediment arrives at the salt marsh. The mudflats and salt marshes are flooded at high tide. The sediment can then settle to the bed. The salt marsh grows. This process is repeated again and again. In natural conditions, salt marshes are formed by sediment and the vegetation in place slows down the flow of water, allowing sediment to settle.

2. Sediment transport to salt marsh

In the Mud Motor project, the dredged material from the port of Harlingen is spread in a tidal channel in front of the salt marshes near Koehoal. If that material is deposited at the right time and in the right place, it moves onto and in front of the salt marshes.

1. Dredging work in Harlingen

Sediment settles in harbours because harbours are sheltered from currents and waves. To keep the port of Harlingen open to shipping, 1.3 million cubic metres has to be dredged annually.

3. Tidal flow and wind

The tidal flow and the wind then transport the material naturally to the salt marsh and the mudflats in front of it. Adequate sediment flows allow salt marshes to grow with sea level rise as long as the sediment can be retained.

Mud Motor, Ecoshape

SECTION 1122 OF WRDA 2016

BENEFICIAL USE OF DREDGED SEDIMENT PILOT PROGRAM

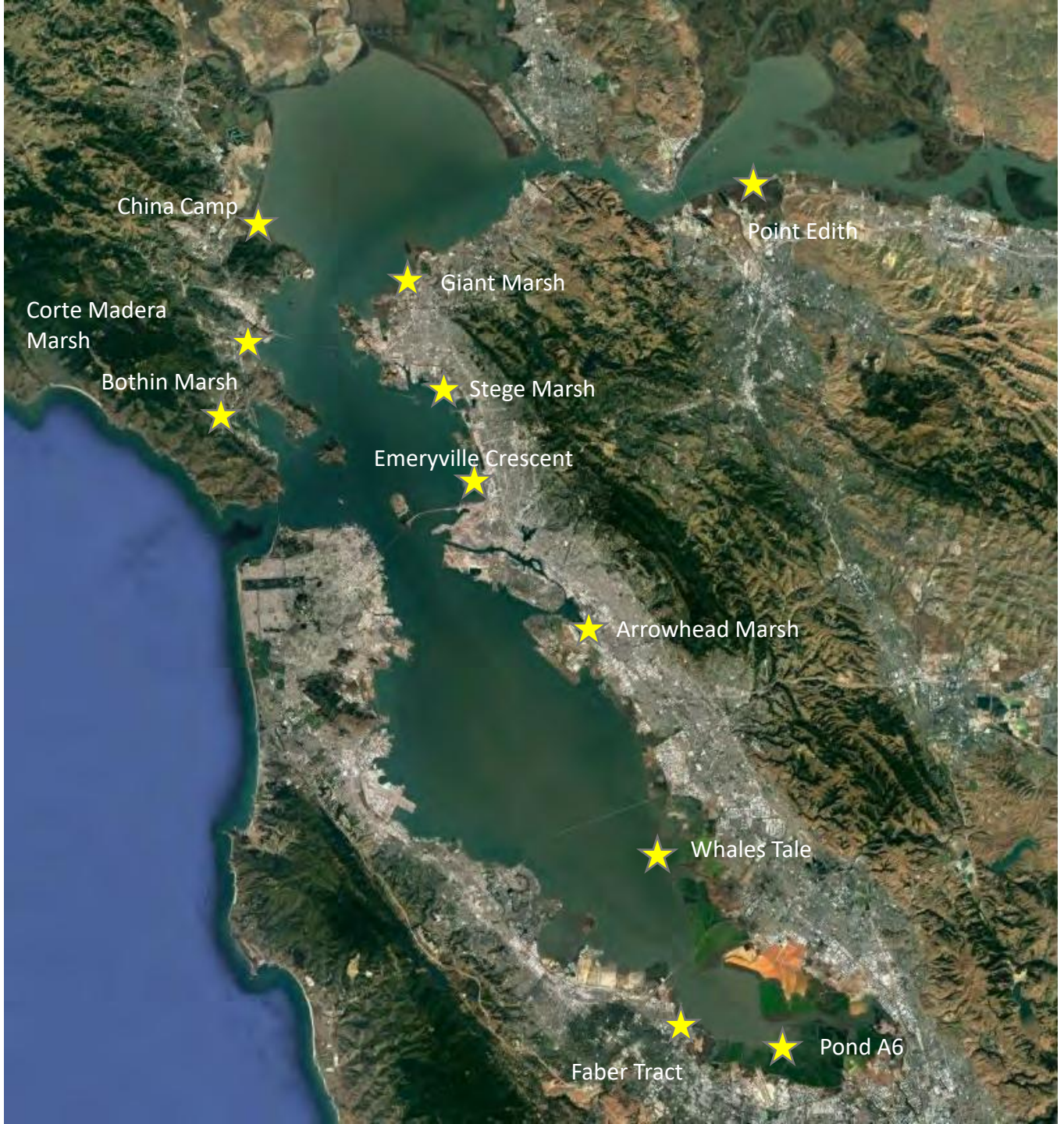
- Section 1122 of WRDA 2016 requires USACE to establish a pilot program to beneficial use of dredged sediment
- $50 mil proposal by State Coastal Conservancy with BCDC requested funds for both direct and strategic placement
- SF District was funded to do shallow water placement pilot project to test new innovative method through the Resilient SF Bay Project

PROJECT PHASES AND STEPS

	Project phases	Date	Status
1	Initial site selection criteria and screening	Charettes and kick off in Feb/March 2021	Complete
2	Hydrodynamic and sediment transport modeling to select pilot location	November 2021-June 2022	Complete
4	Environmental compliance and permit applications	Ongoing	Draft EA in progress. Draft permits pending project specifics. Estimated release of draft documents Sept 2022
5	Outreach. Stakeholder meetings, Tribal consultations, community groups.	Ongoing	Tribal consultations ongoing. Community science discussions.
6	Monitoring plan	Ongoing	Contracting with USGS for impacts, benefits
7	Contracting	Ongoing	In discussions with dredging community, contracting and construction branches at USACE

1. SCREENING OF SITES

- **Site selection criteria** ☆
  - Eroding or drowning marsh, lack of natural sediment supply



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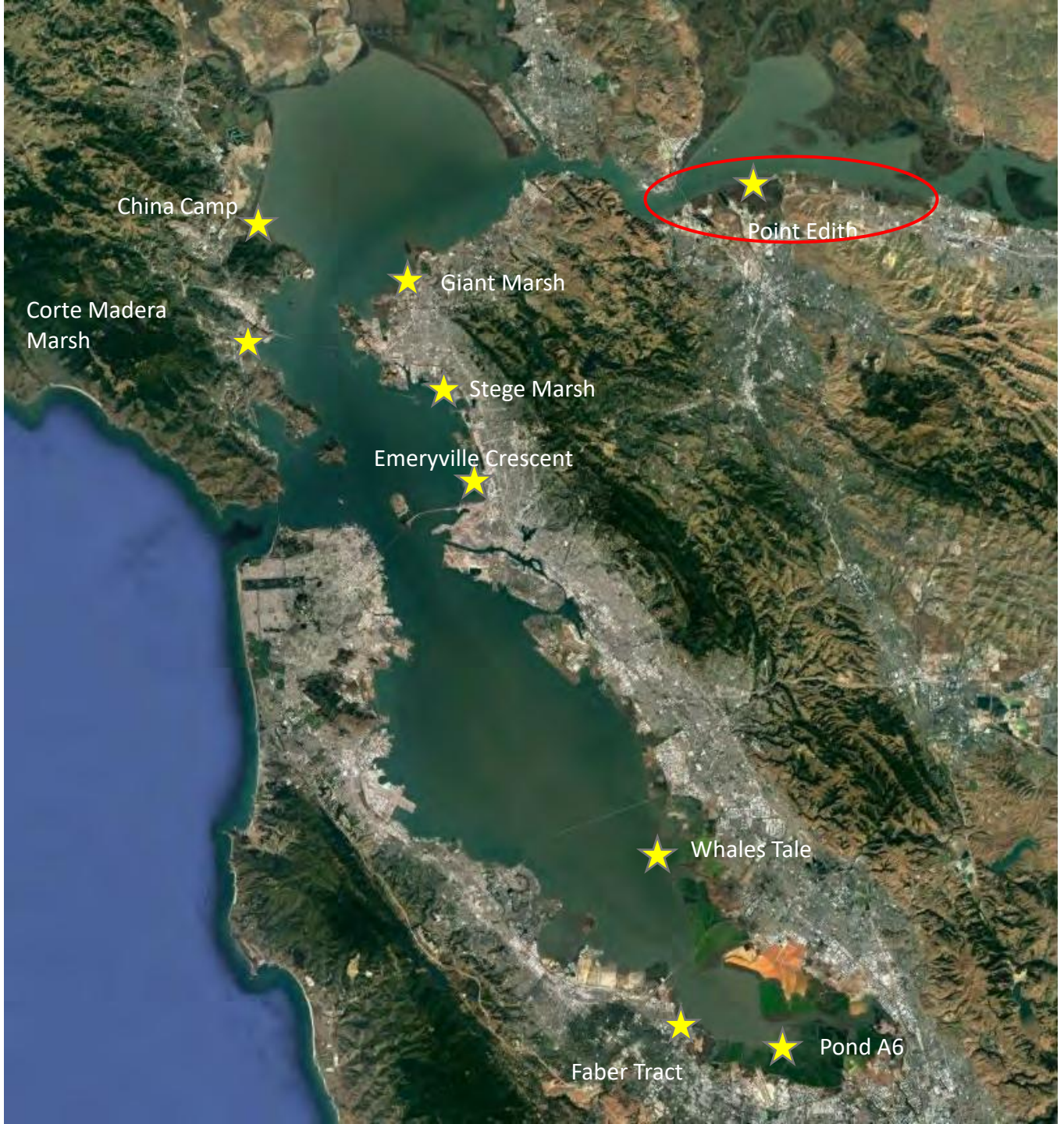

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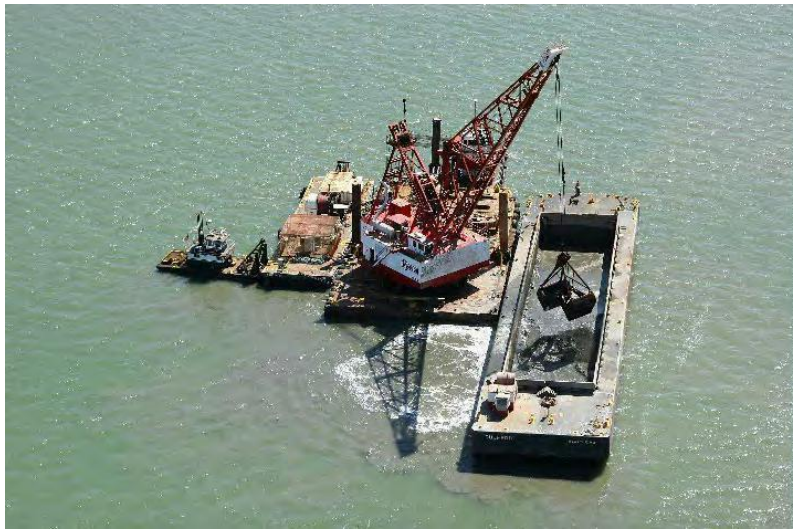
  - Proximity to a Federal Channel
  - Water deep enough to get scow close to shore



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  - Proximity to a Federal Channel
  - Water deep enough to get scow close to shore
  - Lower populations of critical species
  - Avoiding large eelgrass beds/nearshore reef projects
  - Protection for disadvantaged communities/EJ considerations

2. MODELING

- Modeling using UnTRIM Bay-Delta model and sediment transport model to simulate existing conditions and placement alternatives

2. MODELING

- **First Round – Site Selection**
  - Determine whether Emeryville or Eden Landing is most suitable for this pilot study
  - Evaluate different placement strategies
    - Testing 100,000 yd3 total
    - Placement locations

2. MODELING

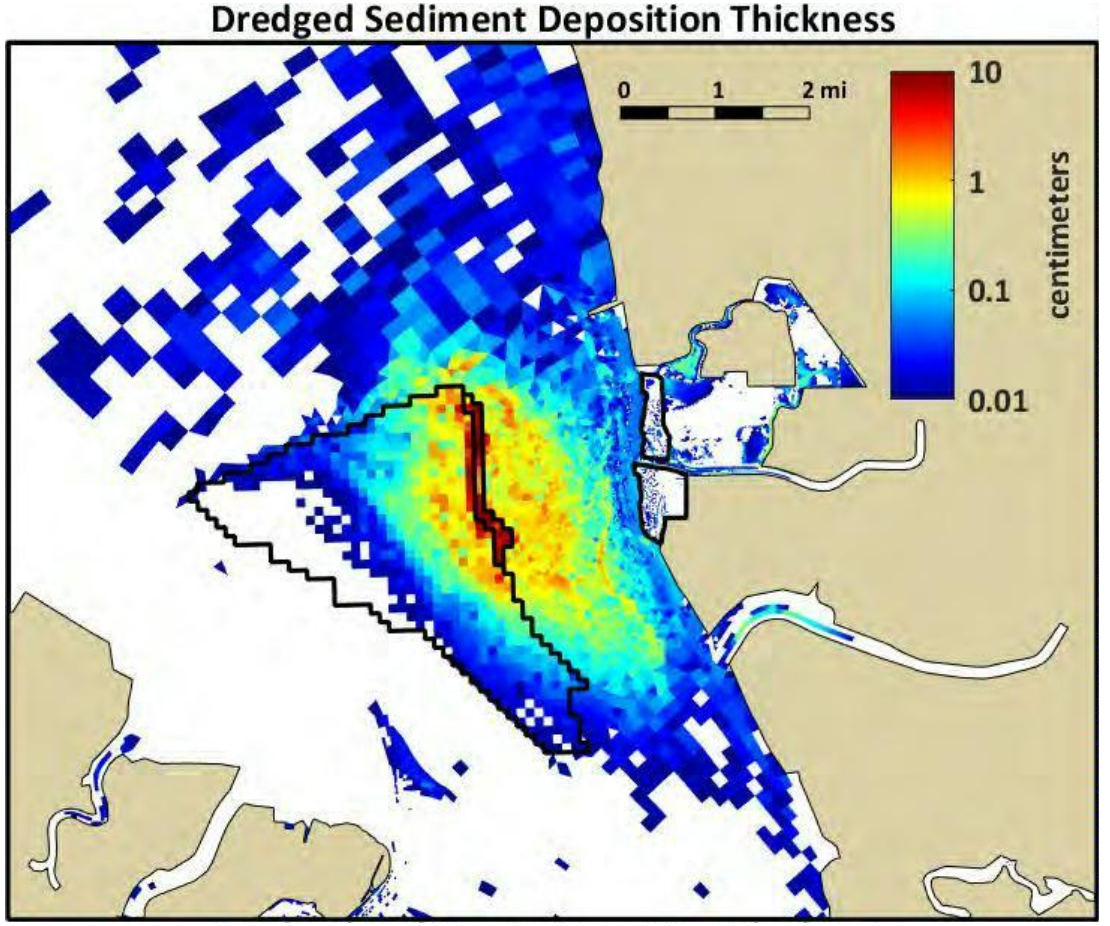
- **First Round – Site Selection**
  - Determine whether Emeryville or Eden Landing is most suitable for this pilot study
  - Evaluate different placement strategies
    - Testing 100,000 yd3 total
    - Placement locations

- **Second Round –sensitivity analysis**
  - Different volumes
  - Seasonal differences
  - Size of placement footprint
  - Sediment sources

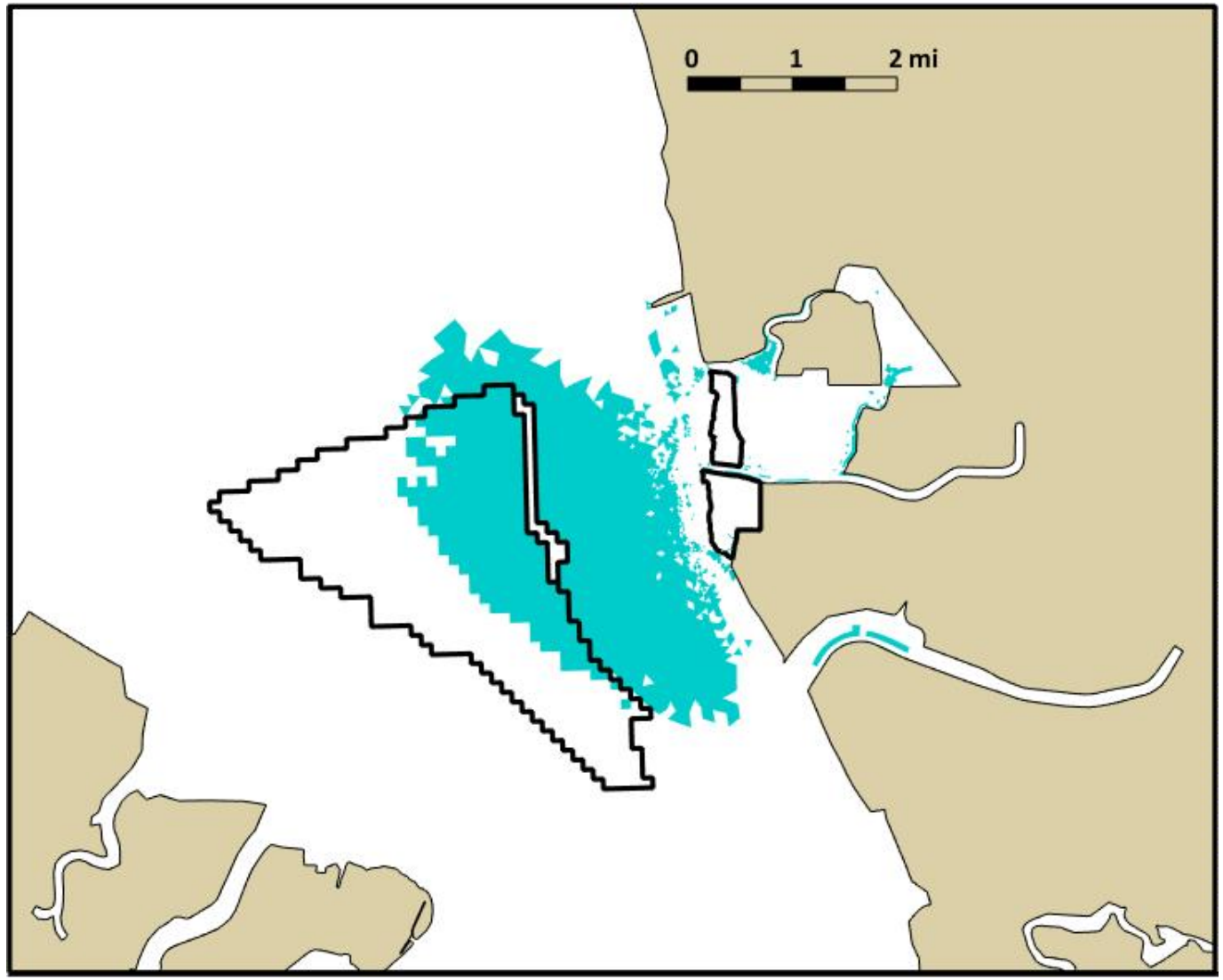

Costco Wholesale
EDEN SHORES
Waves and tides moves material toward shore
1.5 miles
Eden Landing Ecological Reserve
iFLY
San Mateo-Hayward Bridge
Alameda Creek Vista Point
Coyote Hills Regional Park
Scow brings sediment from port of redwood city to placement site
OOD SHORES
Bair Island
Dumbarton Bridge

EDEN LANDING MODELING RESULTS
SCENARIO: 100K YD^3 PLACEMENT IN SUMMERTIME

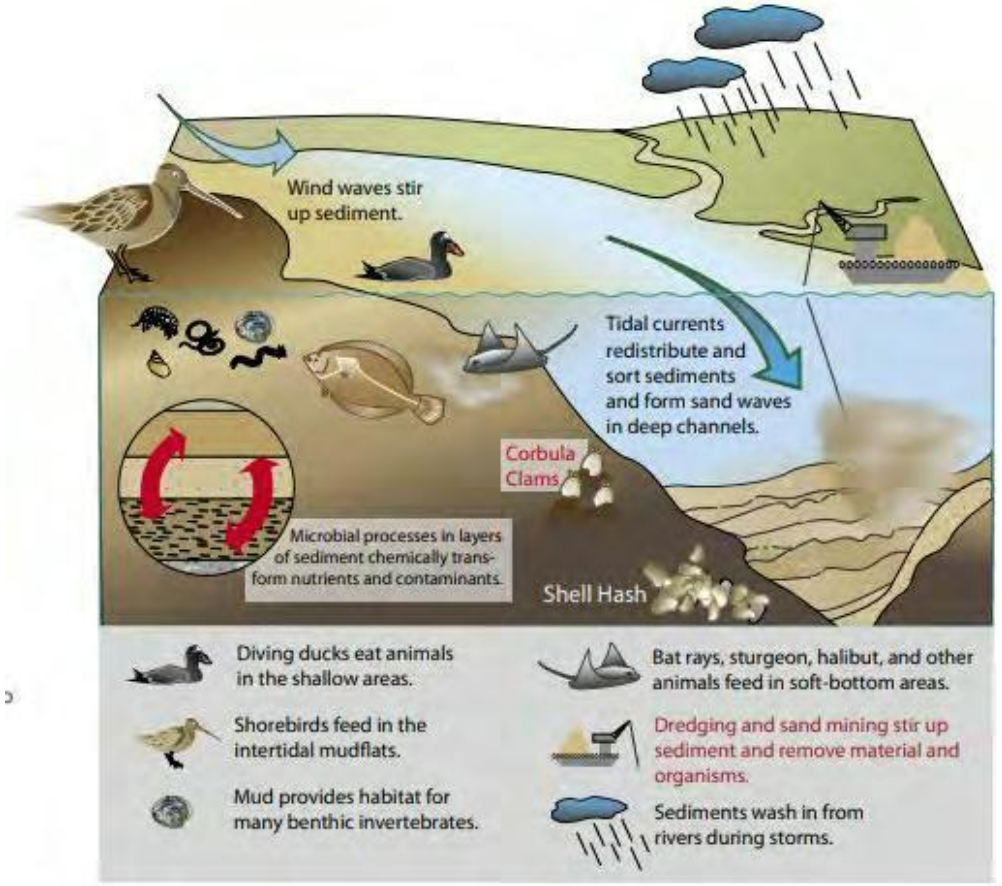
- Deposition thickness at placement area is ~ 1/3 – 1 ft (Red)
- Deposition thicknesses on mudflat and in marsh channels is ~ 1 mm to 1 cm. (Dark blue)
- On natural depositional scale and mimics natural processes.



POTENTIAL ENVIRONMENTAL IMPACTS



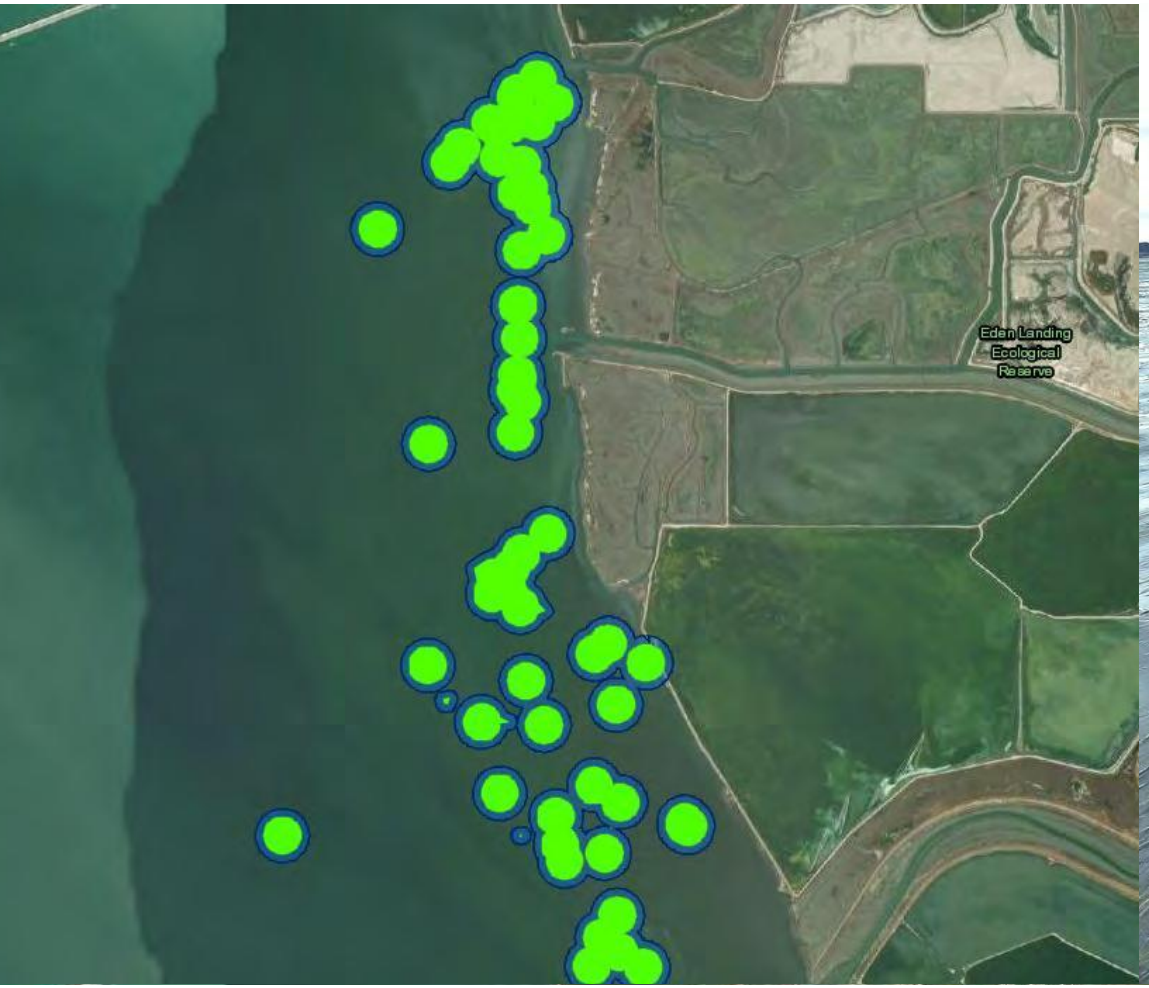
Areas expected to experience more than 1mm of deposition



Subtidal goals, 2010

POTENTIAL IMPACTS TO EELGRASS

Eelgrass near Eden Landing site



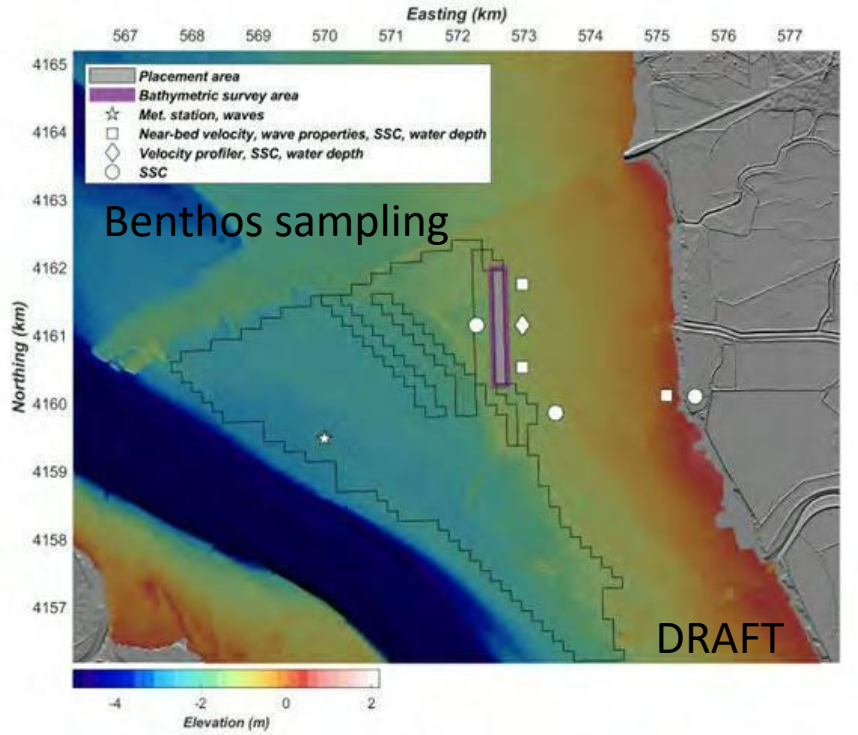
BCDC SF Bay Eelgrass Assessment tool

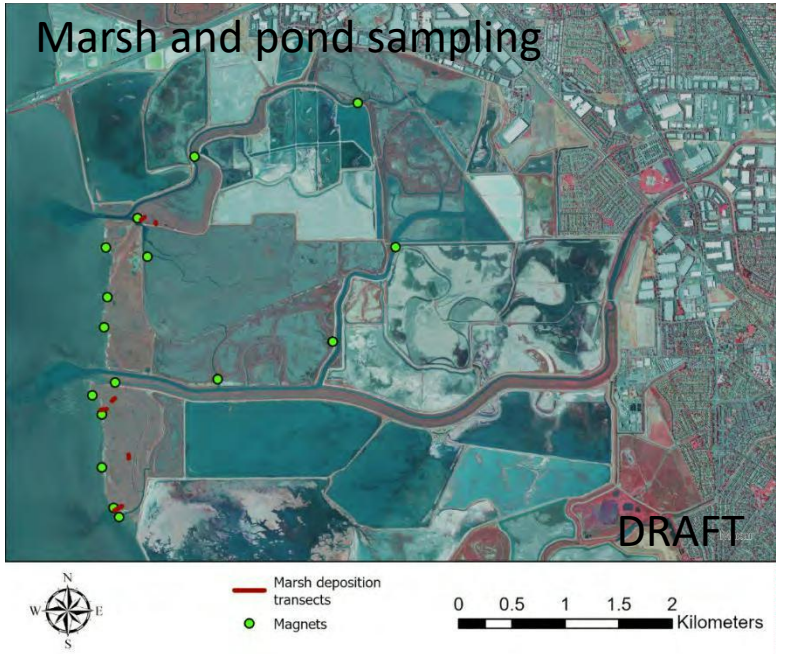
Photo credit: SF State EOS Center

DRAFT MONITORING PLAN

- **Pre-project**
  - Water depth and elevation
  - Suspended sediment, wave conditions
  - Eelgrass surveys
  - Sediment transport rates
  - Background marsh/mudflat gain or loss

- **Post-project**
  - Water depth and elevation
  - Benthos, eelgrass
  - Sediment transport rates
  - Marsh/mudflat gain or loss
  - Magnetic Particle Tracking Study





ENVIRONMENTAL COORDINATION

- Stakeholder meetings 10 March 2021; 16 May 2022
- Resource agency meetings 26 March 2021; 23 April 2022
- Public meetings 15 July 2022; 18 Aug 2022

Landowners:

- Working with CDFW and South Bay Salt Ponds, State Lands Commission.
- Met with ACFCWD, Union Sanitary District, EBDA to go over project and modeling results.

Community Engagement

- Tribal consultations ongoing, and site visit planned for October 2022
- Working with City of Hayward and Hayward Rec and Park
- Tabled Hayward Street Fair with South Bay Salt Ponds

NEXT STEPS

- **ENVIRONMENTAL COMPLIANCE/ NEPA/CEQA**
  - Draft NEPA/CEQA document public/MSC review **20 SEPT - 20 OCT 2022**
    - » Draft permit request included in NEPA/CEQA draft release
  - Final Approvals needed **JAN/FEB 2023**

- **CONTRACTING & Final design sept – Jan 2023**
  - Solicitation **Spring 2023**
  - Implementation **June/July 2023**
  - MONITORING **April 2023**

SUCCESS CRITERIA: “PROOF OF CONCEPT”

– Delivery to mudflats, and eventually marshes, and restoration ponds

– Placement without significant impact to ecological function of shallows

– Keeping sediment not going to disposal site

– Completion of a successful contract with available existing equipment to give a basis for cost comparison

– Testing a tool that will become more useful as the century progresses

THANK YOU! QUESTIONS?

Photo: Pete Kauhanen, SFEI

Julie.R.Beagle@usace.army.mil

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