Marin County Flood Control & Water Conservation District

Challenges in Beneficial Sediment Reuse at Design Scale: Lessons from Marin County

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**All slides and opinions are my own and may not represent official Marin County or Flood District Policies*

MARIN COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT

Outline

- The Problems
- The Solutions – Pilots We Have Tried and Want to Try
- The Real-World Obstacles to More Beneficial Reuse
- Our “Solutions” in Legislative Speak

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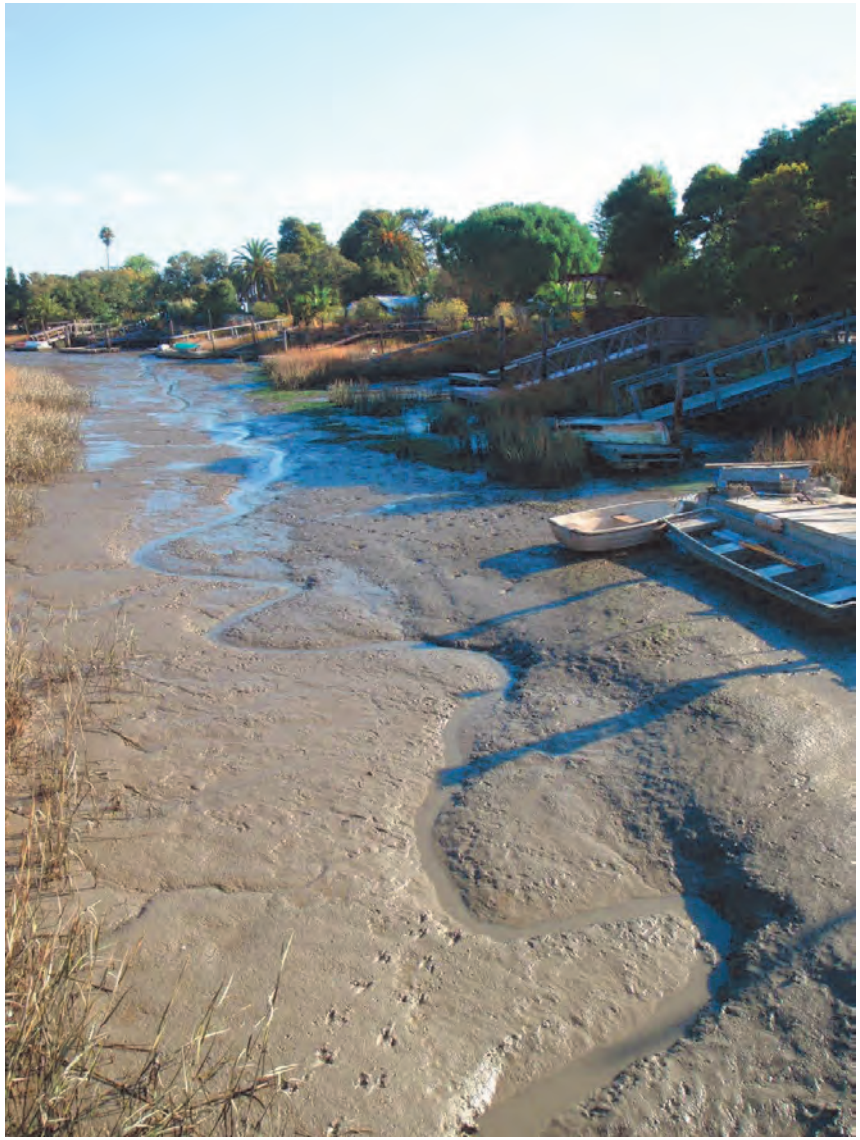


Gallinas Creek, Marin County

And What Our Residents Say…

Petaluma River dredge protect (above)

San Rafael Canal dredge protest (right)

The Problems…

- Flooding (direct and backwater flooding)
- Navigation losses, small and larger boats
- Water quality and loss of deeper water habitat
- Shoreline erosion and loss of tidal marsh habitat and wave damping benefits

HY 37 flooding, 2019

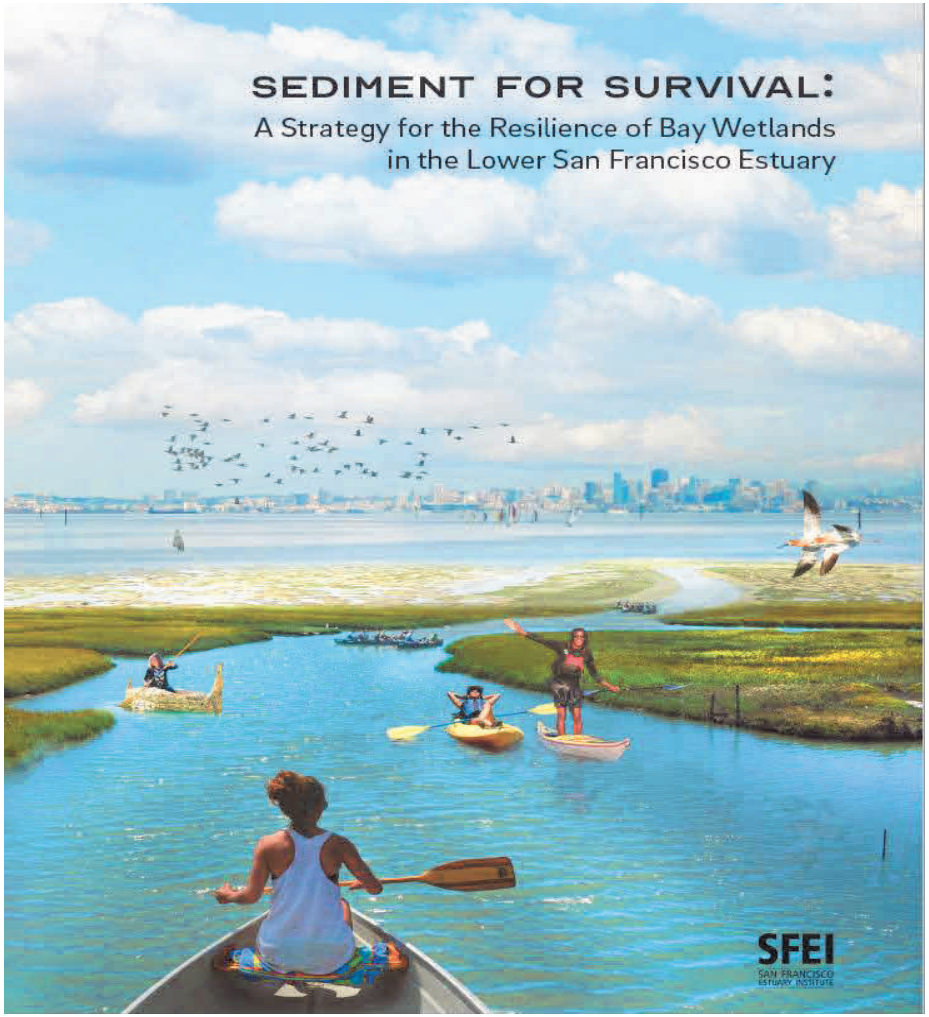
Flooding Up Tidal Channels is Major SLR Impact

- Direct flooding up tidal creeks is a major SLR impact
- Many home and business are located adjacent to these tidal channel
- Backwater prevents drainage = backwater flooding

Corte Madera Creek at high tide

Bay Wide Awareness of Sediment Needs

- Estimate 5 to 10% of sediment tied up in tidal channels – not being beneficially reused (*estimate is low IMO*)
- Channels are located closest to marshes and mudflats
- Beach type projects need the coarse-grained sediment – in very limited supply in SF Bay (MM Pier 94 waste gravels) – but many FC channels have it



SFEI 2021

Marin Pilot Projects and Proposals

- Thin-Lift Hydraulic Placement of Dredge Muds on Adjacent Marshes
  - Novato – done mechanically 2016, 2020 and now evaluating hydraulic for 2030
  - Gallinas to McInnis (evaluating both hydraulic dredge and new SSPD dredge)
  - Coyote to Bothin (hydraulic dredge)
- Connecting Creeks to their Adjacent Marshes (Coyote to Bothin)
- Geomorphic Dredge Design (*reduce dredge volume and impacts*) (Gallinas and Corte Madera Creeks)
- Coarse-grained beach design and marsh edge erosion
  - Aramburu built 2011/2012
  - Greenwood beach, Tiburon, proposing for 2026 construction
  - Corte Madara Marsh Edge, part of SCC Living Shorelines Projects
- New SSPD Dredge Approach (at end if time)

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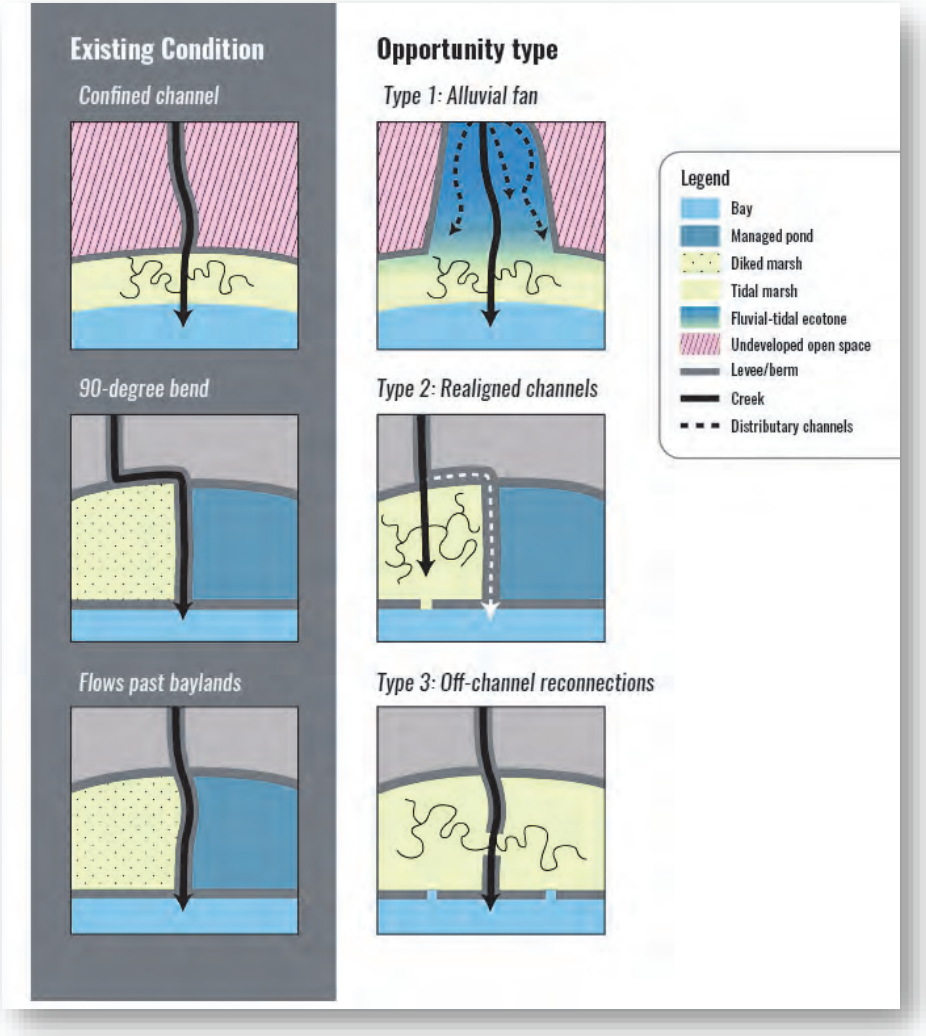
Direct Connection of Channels to Their Marshes

On SFEI TAC for this study of reconnecting creeks to Baylands

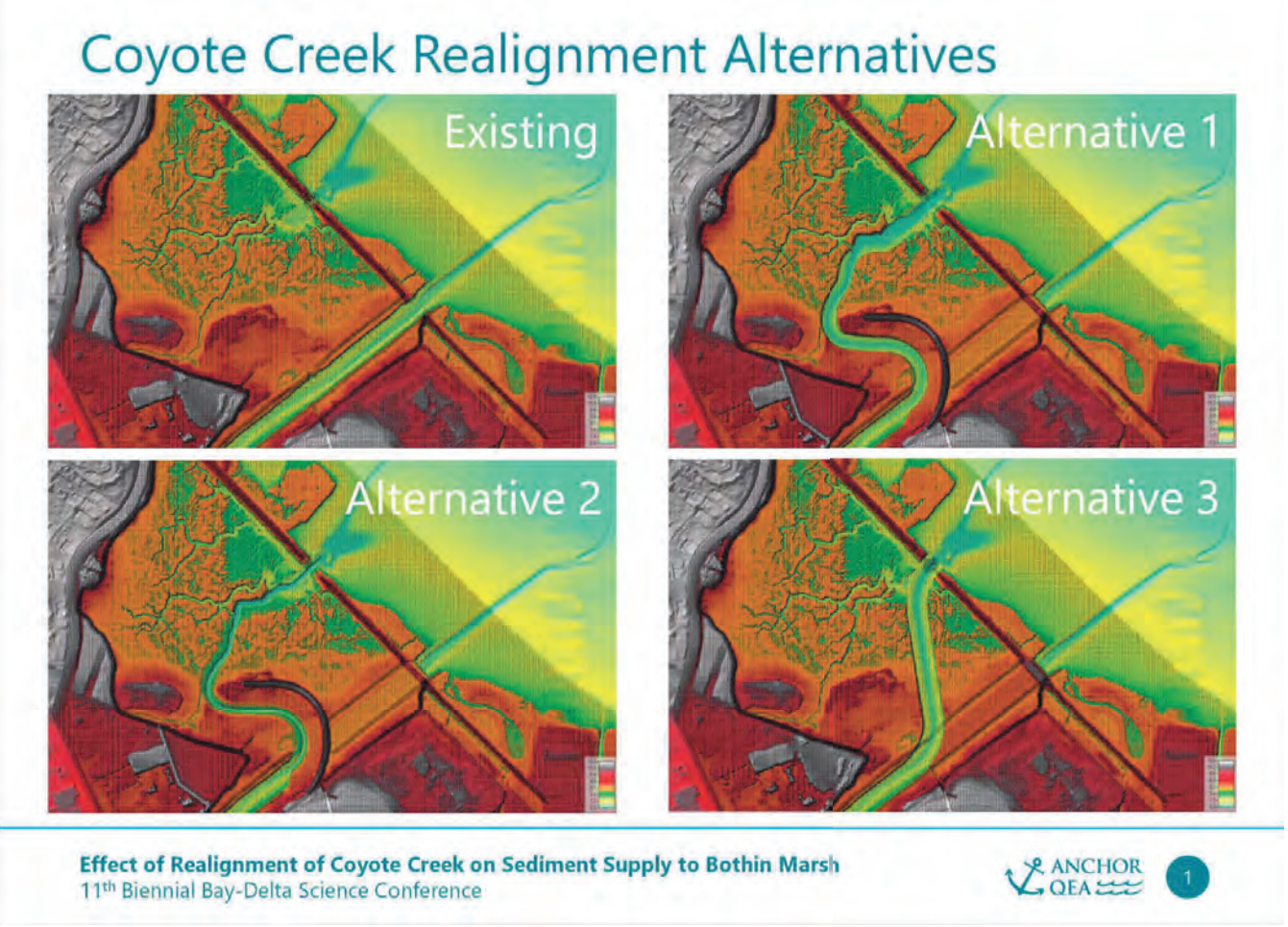
Marin DPW Coyote into Bothin channel realignment is an included case study

- Backwater flood impacts from channel bend

From SFEI report, Connecting Creeks to Marshes 2023



Coyote Creek Channel Realignment



District working with Marin Parks studied alternatives for realigning Coyote Creek into Bothin Marsh to deliver sediment natural and directly – hydrodynamic study

Upstream flooding issues limiting this alignment to less direct (and effective) alts

EwN Storm Driven Dredging - SSPD

- A proposal to naturally dredge tidal channels tied to episodic storm events when the Bay is naturally turbid – *a paradigm change in contracting*
- Limited to tidal channels
- Feeds the system with sediment when during AR type events. Recent science shows do the most to sustain tidal marshes (Thorne 2023)
- Low cost and low carbon

✓Very EwN but difficult to permit in SF Bay

SF Bay in storm conditions

Recent 2024 Findings –HD is expensive

Engineering estimated costs for hydraulic dredging (not bids)

Novato

EE at $37/cy (in-progress) for approx. 18,000 cy

plus mob/demob , cofferdam and no water management needed

Gallinas to McInnis

EE at $35/cy w/ limited pipe movement (re-confirming)

plus 2 mobs/demobs, dam, water management, and monitoring and maintenance costs

Total EE cost – approx. $6.2M for 120,000cy **= $52/cy plus /10 years monitoring at $70k/year**

Regional Sediment Management

SFEI October 2025

Other Real-World Issues Preventing the Wide-Spread Use of Thin-Lift Placement from Creeks to Marshes

Can't Always Time the Placement to a Restoration Projects. Placement at McInnis a diked off marsh with no immediate plans to restore to full tidal – tests the ability of BCDC and other agencies to permit opportunistic building of elevation capital with the goal of future tidal restoration either planned or due to levee failures that are coming.

Can't Put All Risks and Costs Onto the Applicant for Uncertain and Unknowable or Unavoidable Outcomes. Thin-lift is a goal not a scientific certainty in construction. Impossible to place sediment in the real-world with unform thickness never exceeding 15 cm. This can be a design goal **on average** but cannot be written into permits as a requirement with measurement and mitigation

Same for decant turbidity. Fine-grained muds don't settle well by definition so just like stormwater BMPs, the standard should be treatment by design and not solely by measurement. Too much risk for issues like wind-waves that are beyond control of the designer and thus requires more risk only affordable by large agencies with needs and deep pockets.

Costs for Dredging/Placement Are Too High and Uncertainty Risks. Constructability issues for contractors are unknown so who bears the risk and costs?

Real World Obstacles to Implementation …

Q: We have too much sediment in our channels and not enough on many of our adjacent marshes and mudflats…why can't we dredge and place?

- Costs and permitting complexity
- Overconservative environmental concerns in some areas
- Lack of demonstrations and proof for the professional engineering and contracting community (Marin's focus on pilot projects)
- Bureaucratic inertia
- How projects are funded and maintained and potential future liability
- Coarse grained sediments need a larger sediment rehandling strategy

What Are We Doing? (other than complaining)

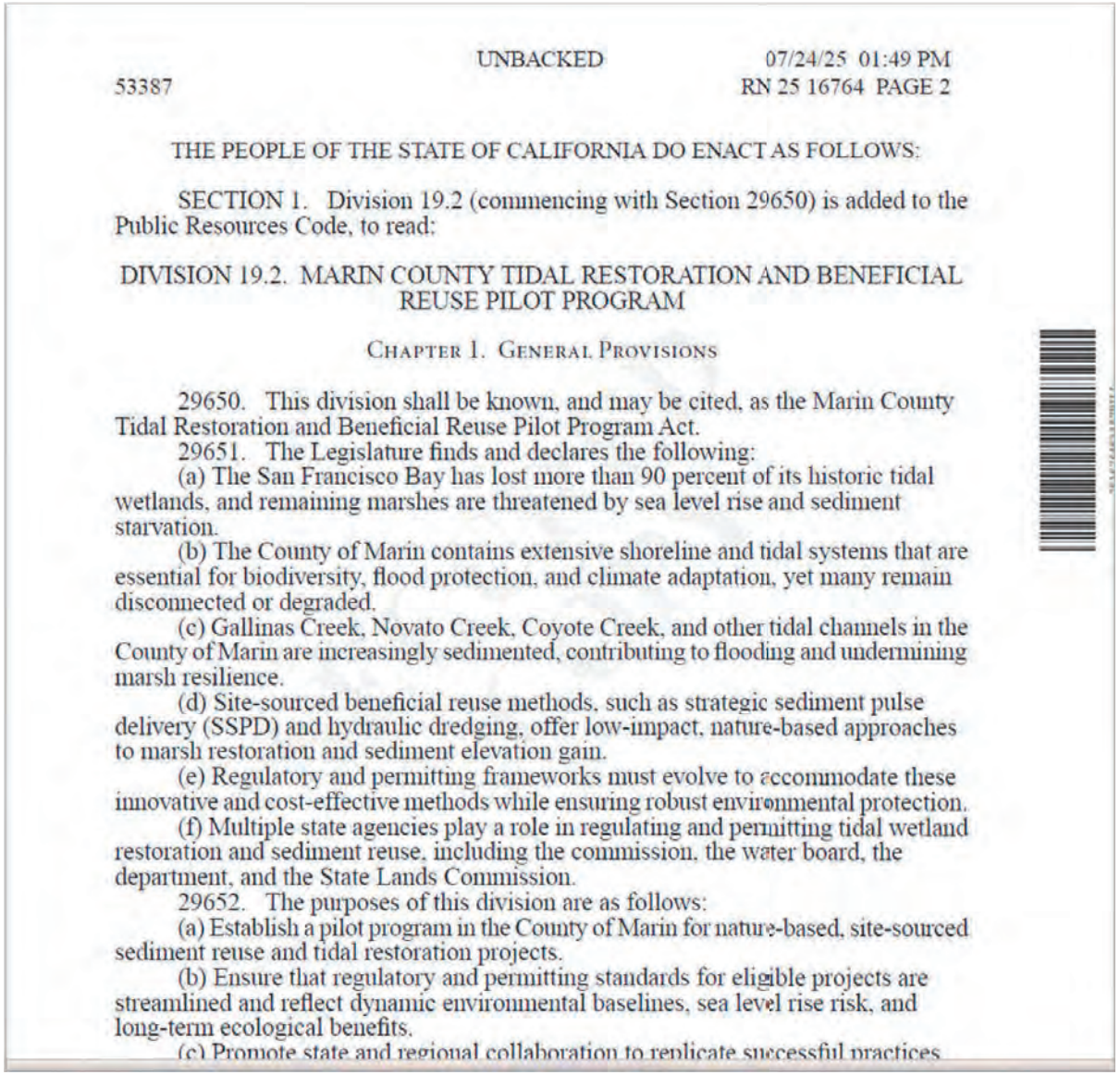
Developed detailed fact sheet laying out the issues and solutions for each real-world problem keeping beneficial reuse form happening.

- Engaged County legislative aide to work with Senator McGuire to craft specific legislative language to agencies on how to view and permit change
- For one, brief shining moment when Buffy Wicks was reforming CEQA with hearings, it seemed like this could happen…

✓Then Trump elected, wildfire chaos, big state budget issues so derailed for now….

✓*IMO this is largely a bureaucratic problem at scale so requires a bureaucratic solution also at scale…*

And here it is…in legislative speak



THE PEOPLE OF THE STATE OF CALIFORNIA DO ENACT AS FOLLOWS:

SECTION 1. Division 19.2 (commencing with Section 29650) is added to the Public Resources Code, to read:

DIVISION 19.2. MARIN COUNTY TIDAL RESTORATION AND BENEFICIAL REUSE PILOT PROGRAM

CHAPTER 1. GENERAL PROVISIONS

29650. This division shall be known, and may be cited, as the Marin County Tidal Restoration and Beneficial Reuse Pilot Program Act.

29651. The Legislature finds and declares the following:

(a) The San Francisco Bay has lost more than 90 percent of its historic tidal wetlands, and remaining marshes are threatened by sea level rise and sediment starvation.

(b) The County of Marin contains extensive shoreline and tidal systems that are essential for biodiversity, flood protection, and climate adaptation, yet many remain disconnected or degraded.

(c) Gallinas Creek, Novato Creek, Coyote Creek, and other tidal channels in the County of Marin are increasingly sedimented, contributing to flooding and undermining marsh resilience.

(d) Site-sourced beneficial reuse methods, such as strategic sediment pulse delivery (SSPD) and hydraulic dredging, offer low-impact, nature-based approaches to marsh restoration and sediment elevation gain.

(e) Regulatory and permitting frameworks must evolve to accommodate these innovative and cost-effective methods while ensuring robust environmental protection.

(f) Multiple state agencies play a role in regulating and permitting tidal wetland restoration and sediment reuse, including the commission, the water board, the department, and the State Lands Commission.

29652. The purposes of this division are as follows:

(a) Establish a pilot program in the County of Marin for nature-based, site-sourced sediment reuse and tidal restoration projects.

(b) Ensure that regulatory and permitting standards for eligible projects are streamlined and reflect dynamic environmental baselines, sea level rise risk, and long-term ecological benefits.

(c) Promote state and regional collaboration to replicate successful practices

And here it is…in legislative speak

Chapter 3. Pilot Project Designation and Permitting

29660. All eligible projects are designated as pilot projects for purposes of implementing nature-based sediment reuse and tidal restoration.

29661. The following regulatory streamlining directives shall apply to all permits issued for eligible projects pursuant to this division:

(a) Agencies shall permit innovative, nature-based sediment reuse approaches, including SSPD and small-scale hydraulic dredging, without requiring comparison to conventional barge or clamshell dredging.

(b) Agencies shall apply a dynamic environmental baseline consistent with Senate Bill 1 of the 2021–22 Regular Session to account for sea level rise, levee fragility, and the risk of habitat loss due to inaction.

(c) Species impact review shall use a net ecological benefit standard, allowing temporary, low probability disruptions if long-term habitat restoration is demonstrated.

(d) The water board shall permit sediment reuse under treatment by design principles, allowing flexible turbidity thresholds and localized decanting practices for site-sourced reuse.

(e) Mounding of sediment at discharge points shall not require mechanical grading if the project relies on tidal redistribution. Remaining mounds may be treated as ecologically beneficial features.

(f) Postconstruction monitoring and management obligations shall be scaled to the project's funding capacity and ecological goals. Agencies shall do both of the following:

(1) Set realistic vegetation goals, recognizing that existing vegetation may be nonnative.

(2) Allow elevation benchmarks to reflect delayed settling over a multiyear horizon.

(g) Permitting agencies shall allow expanded work windows outside of the standard June-November season when justified by low-impact methods and site-specific monitoring.

And here it is…in legislative speak

CHAPTER 5. MISCELLANEOUS

29670. Nothing in this division supersedes the authority of the United States Army Corps of Engineers or any federal agency with jurisdiction over dredging, wetlands, or endangered species.

29671. This division shall remain in effect only until January 1, 2035, and as of that date is repealed.

SEC. 2. The Legislature finds and declares that a special statute is necessary and that a general statute cannot be made applicable within the meaning of Section 16 of Article IV of the California Constitution because of the following unique circumstances of the County of Marin:

(a) There are unique ecological, regulatory, and logistical conditions present in the County of Marin's shallow draft tidal channel systems, including Gallinas Creek, Novato Creek, and Coyote Creek, that offer rare opportunities to implement nature-based, site-sourced sediment reuse projects that restore tidal wetlands, reduce flood risk, and support endangered species recovery while aligning with state climate resilience goals.

(b) The permitting practices, sediment availability, and physical conditions in the County of Marin's tidal channels are not uniformly present across California, and a general statute cannot achieve the same targeted reform or pilot implementation needed to advance regional restoration goals.

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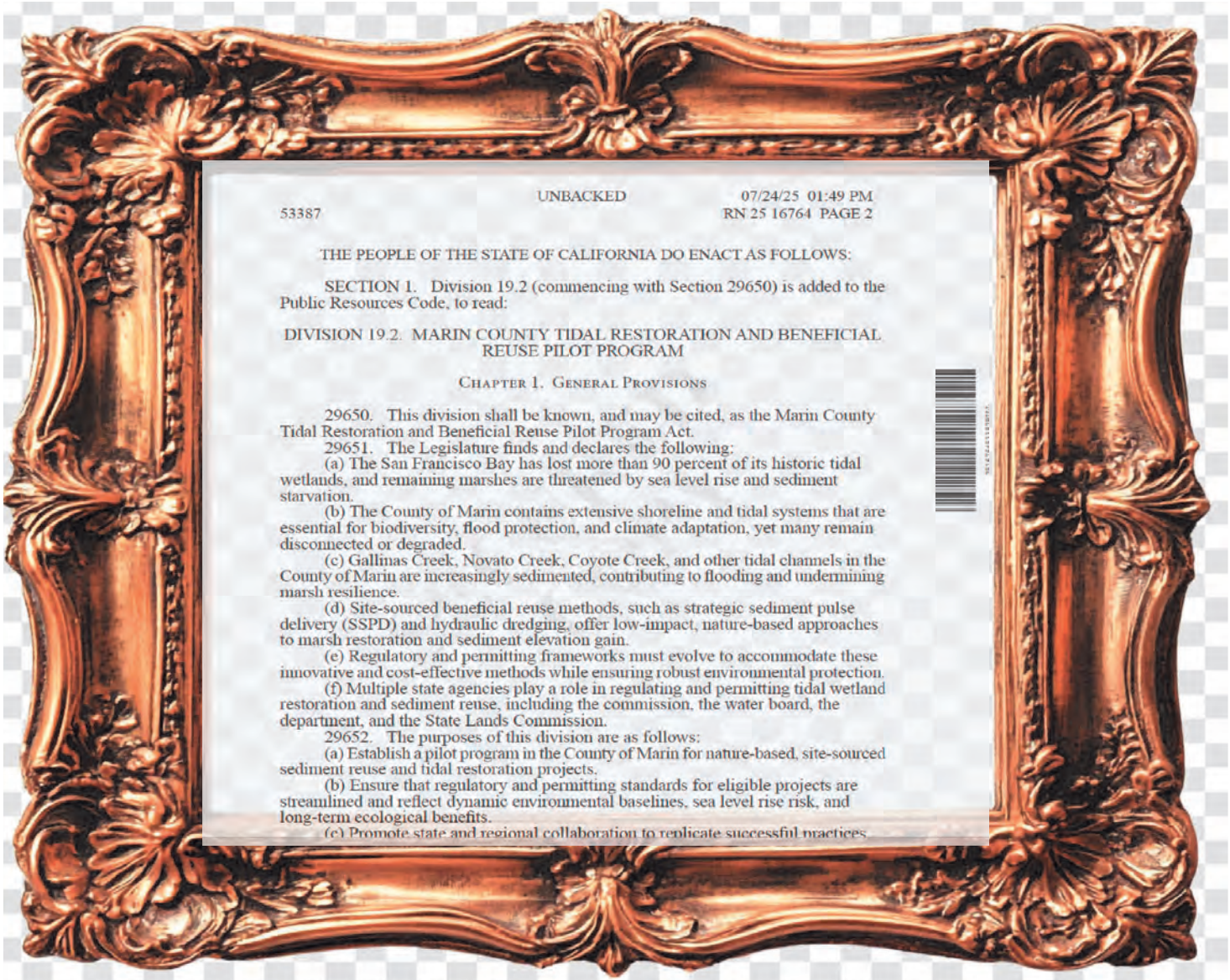

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Q&A - We take mud seriously in Marin