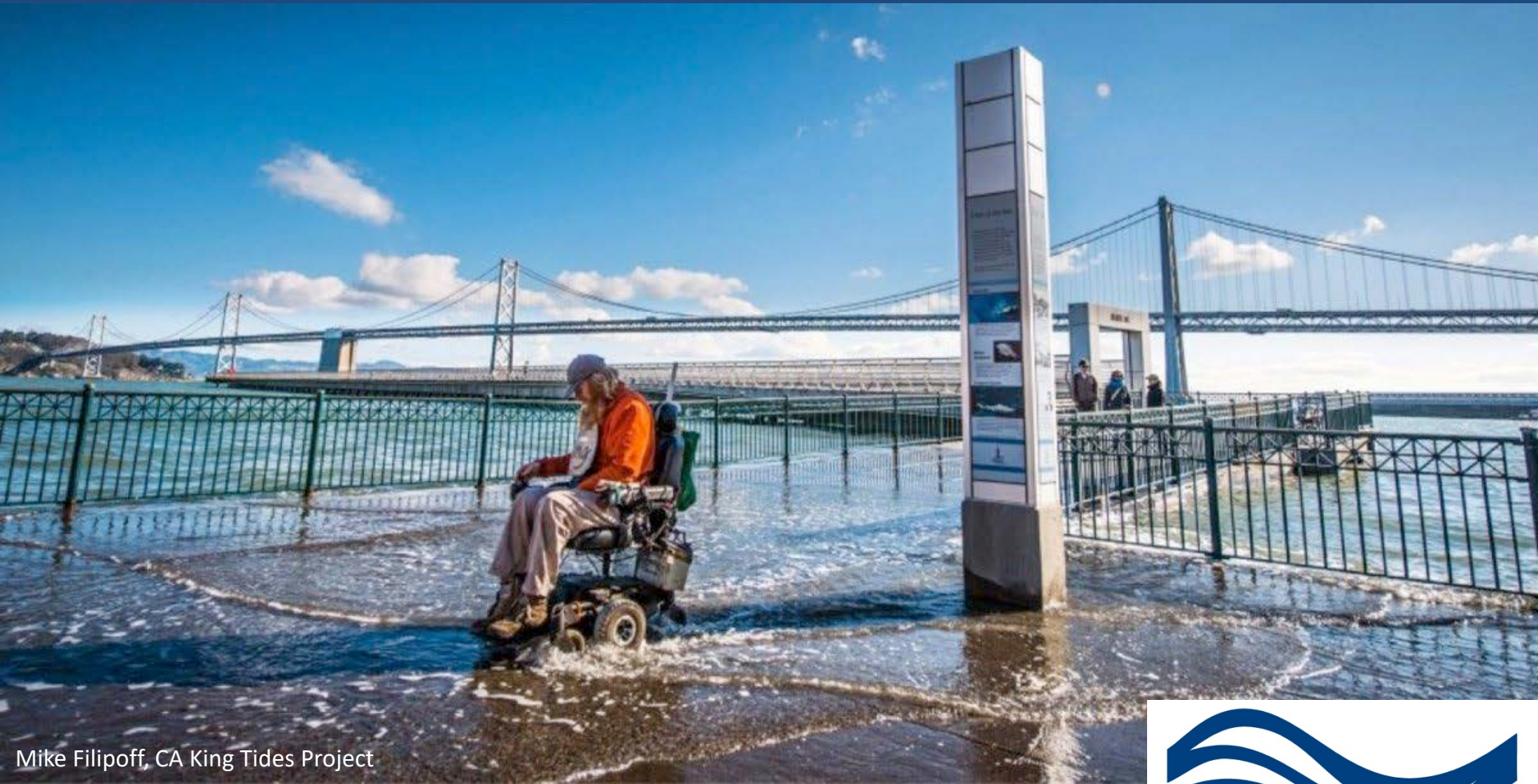


Meeting the Challenge of Climate Change



Mike Filipoff, CA King Tides Project

Christina Toms
Senior Environmental Scientist (Specialist)



Climate Change Threats

- More frequent and severe droughts and floods
- Sea level rise



Projected Sea Level Rise

(b) San Francisco, Golden Gate

<i>Feet above 1991-2009 mean</i>	MEDIAN	LIKELY RANGE	1-IN-20 CHANCE	1-IN-200 CHANCE
Year / Percentile	50% probability SLR meets or exceeds...	67% proba- bility SLR is between...	5% probability SLR meets or exceeds...	0.5% probability SLR meets or exceeds...
2030	0.4	0.3 – 0.5	0.6	0.8
2050	0.9	0.6 – 1.1	1.4	1.9
2100 (RCP 2.6)	1.6	1.0 – 2.4	3.2	5.7
2100 (RCP 4.5)	1.9	1.2 – 2.7	3.5	5.9
2100 (RCP 8.5)	2.5	1.6 – 3.4	4.4	6.9
2100 (H++)	10			
2150 (RCP 2.6)	2.4	1.3 – 3.8	5.5	11.0
2150 (RCP 4.5)	3.0	1.7 – 4.6	6.4	11.7
2150 (RCP 8.5)	4.1	2.8 – 5.8	7.7	13.0
2150 (H++)	22			

Climate Change Threats

- More frequent and severe droughts and floods
- Sea level rise
- Coastal flooding, overtopping, erosion
 - Higher groundwater tables
 - Drowning of tidal marshes



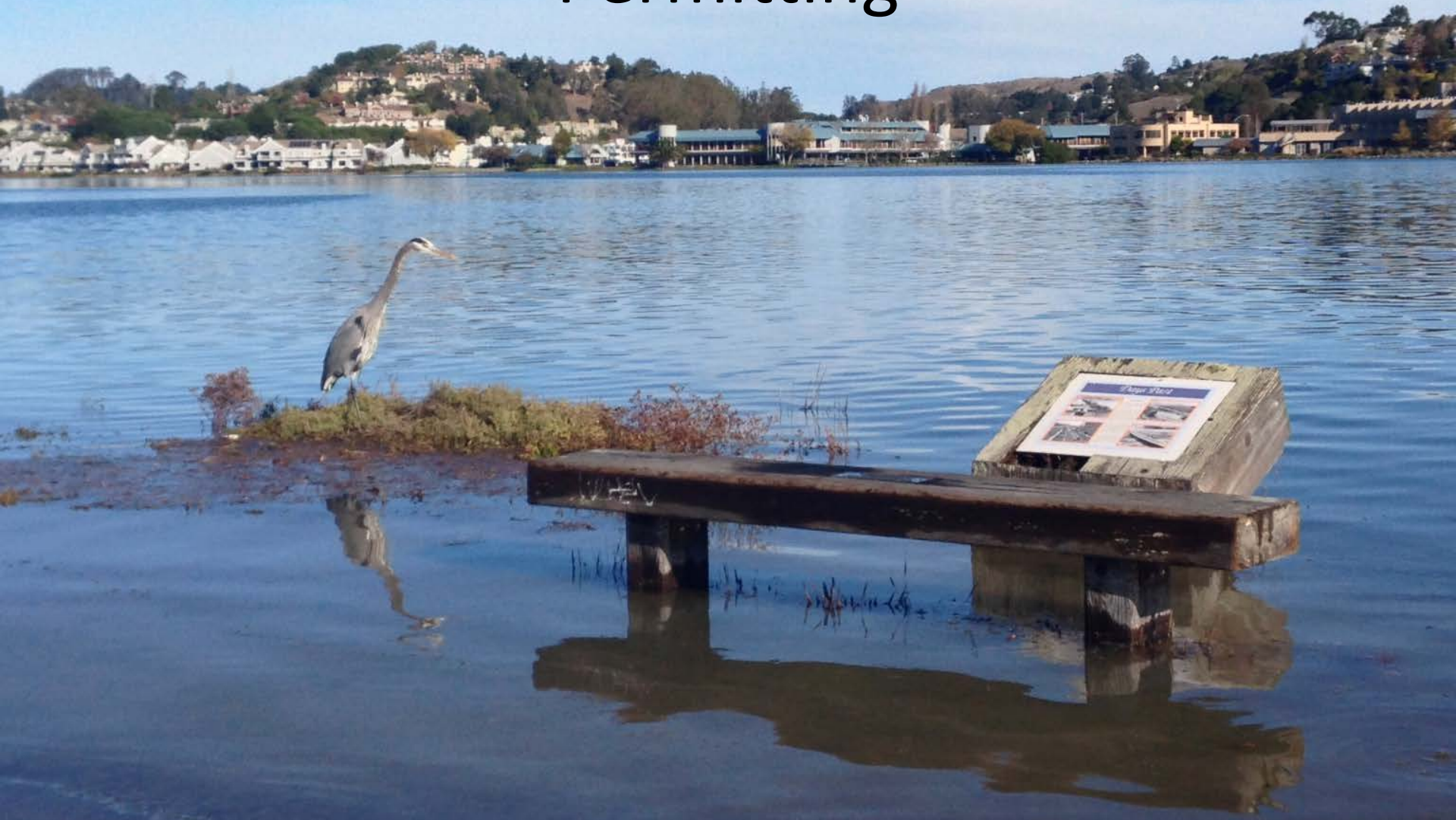
Wetland Policy Update

- What we're doing
- What we've learned
- What we're going to do

What We're Doing

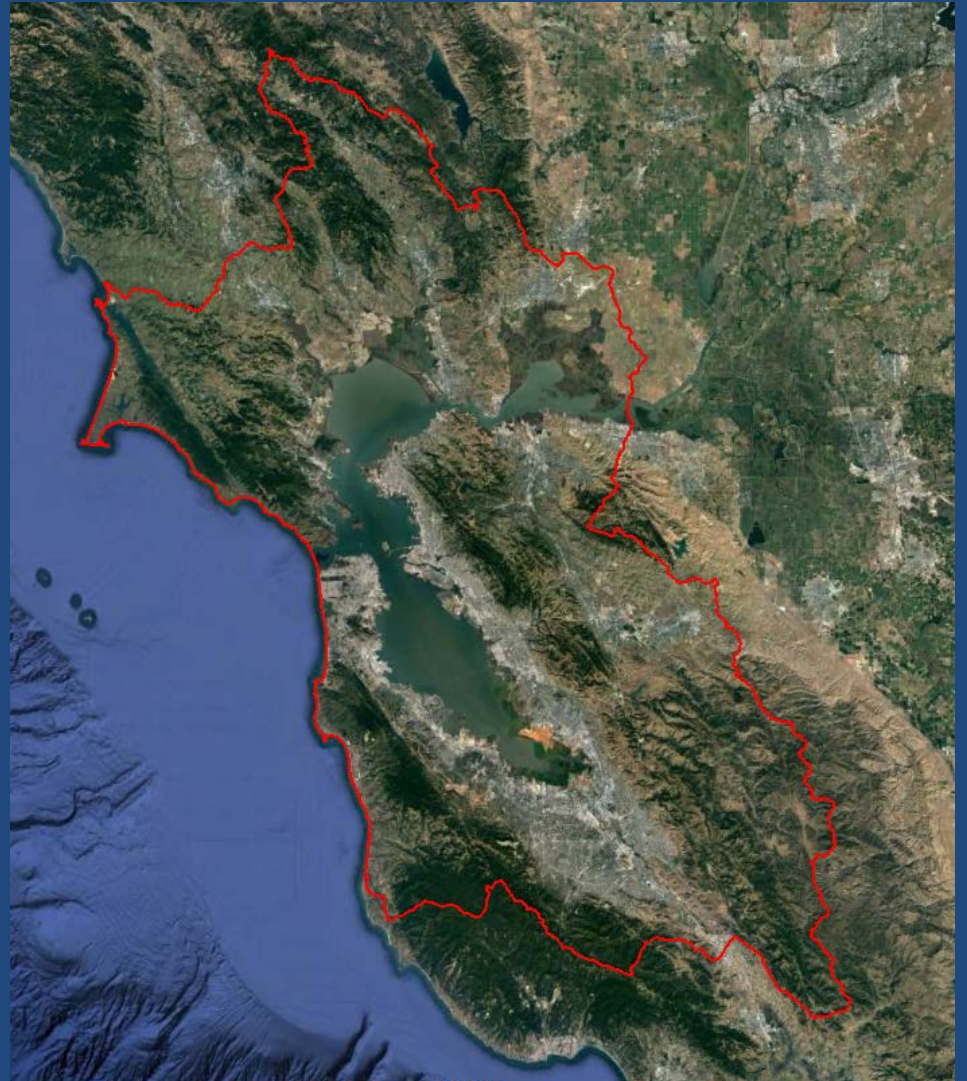
1. Case studies: Planning and permitting projects
2. Engaging in collaborations and outreach
3. Supporting the Adaptation Atlas

1. Case Studies: Project Planning and Permitting



Key Water Board Authorities

- Placement of fill in wetlands and waters
- Dredging and beneficial reuse
- Nearshore discharge of treated wastewater



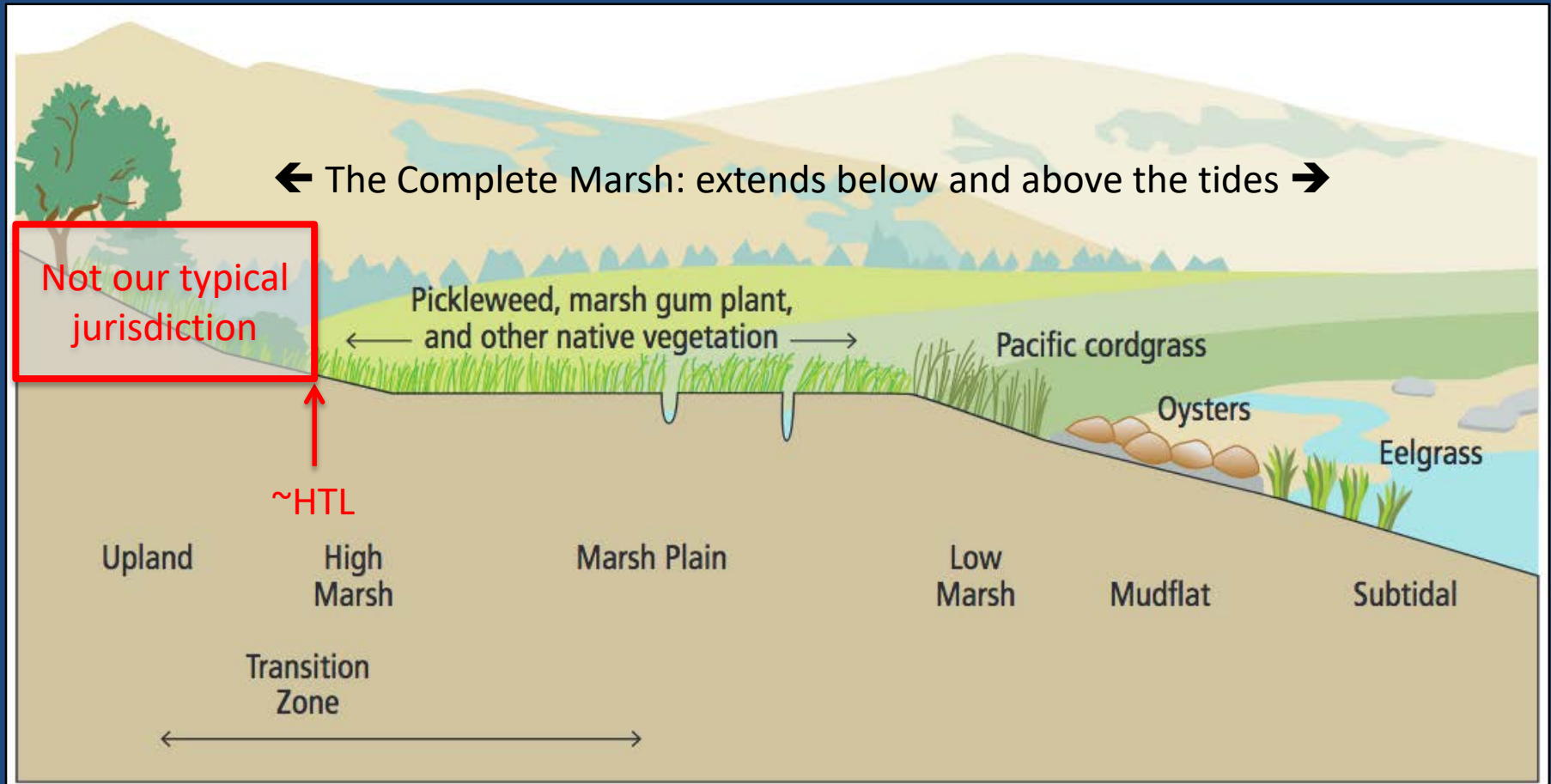
CA Wetlands Conservation Policy

- “No Net Loss”
- Ensures no overall net loss and a long-term net gain in wetlands acreage, functions, and values
- Emphasizes regional restoration goals, planning, and strategies

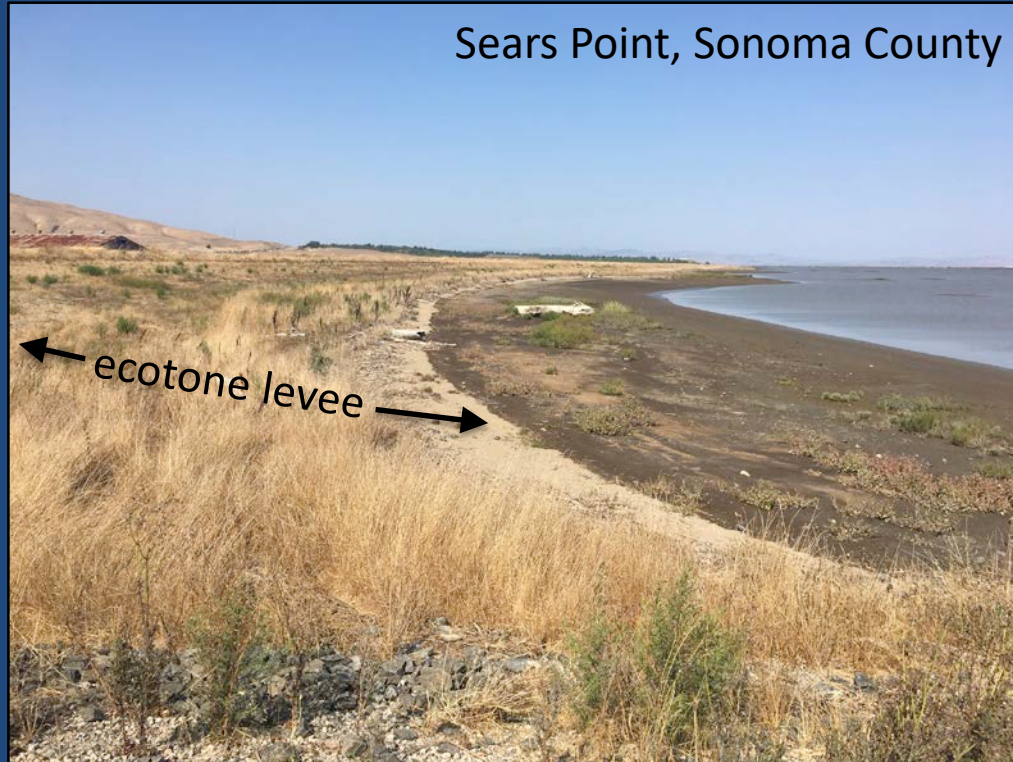


The Complete Tidal Marsh

- Important habitats above the high tide line (HTL)



Features Above the High Tide Line



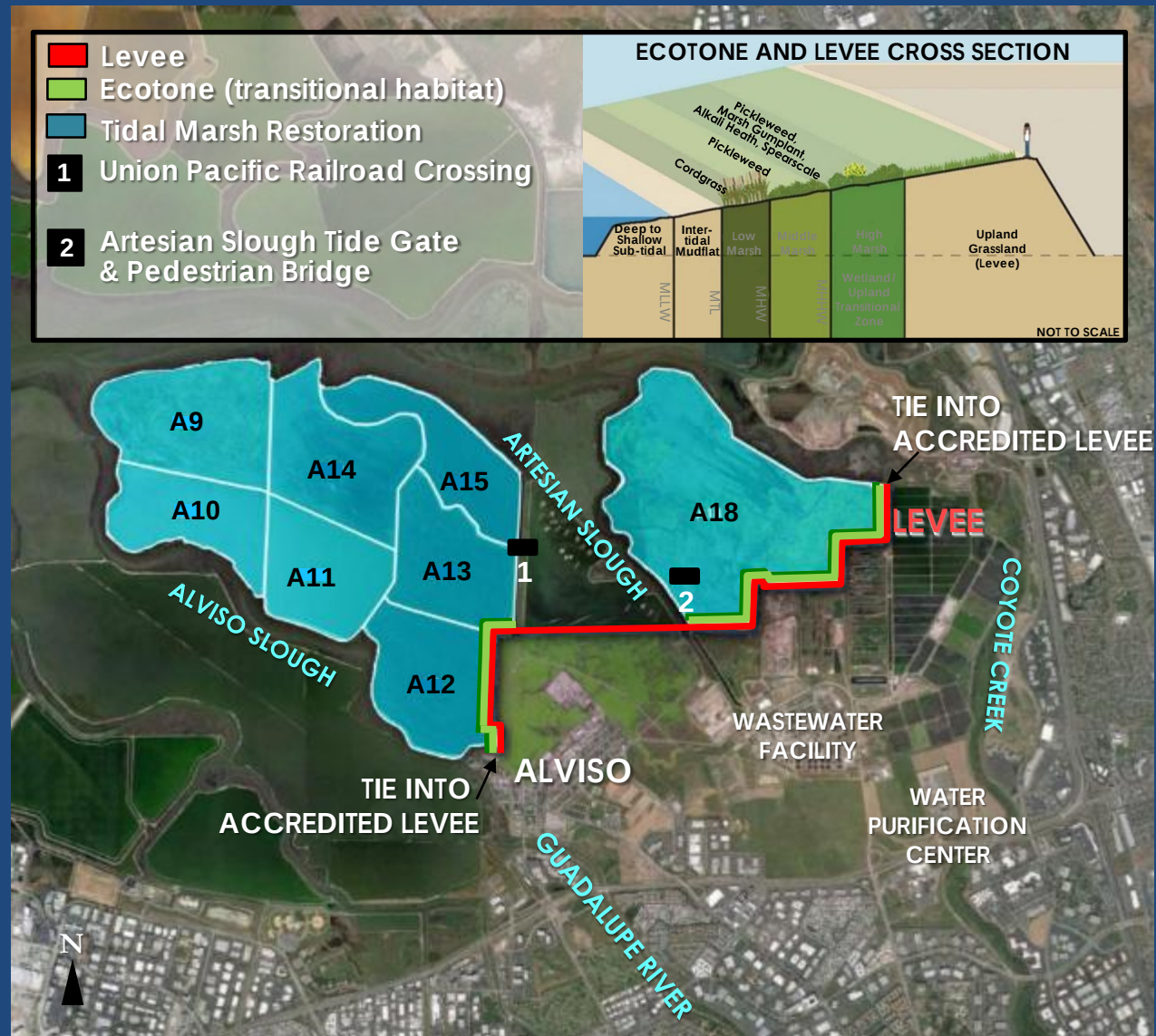
Case Studies: Multi-Benefit Projects

- Tidal wetland restoration
- Shoreline adaptation
 - Grey infrastructure
 - Green/nature-based infrastructure



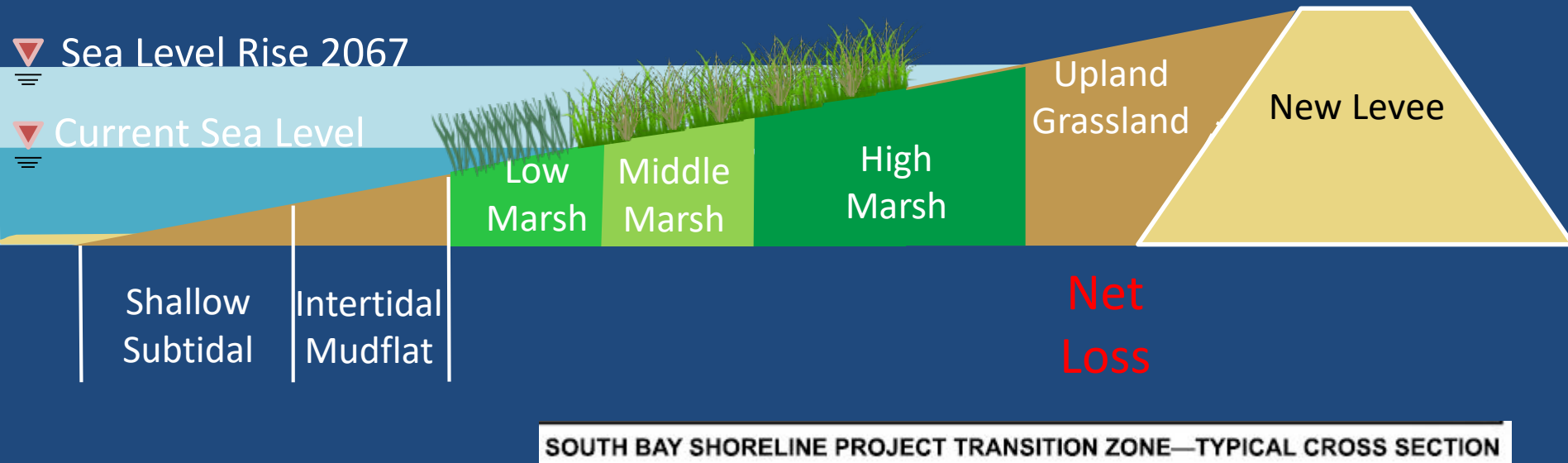
Tidal Wetland Restoration

- South Bay Shoreline (San Jose) Protection Project



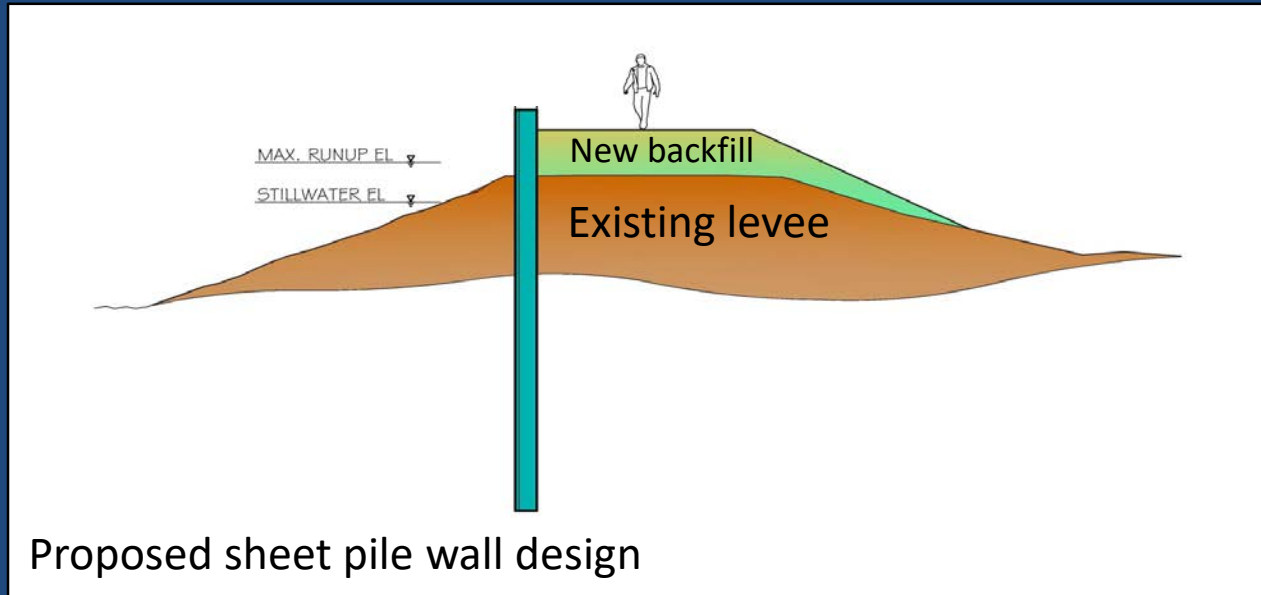
Tidal Wetland Restoration

- South Bay Shoreline (San Jose) Protection Project



Grey Infrastructure

- Foster City Levee Improvement Project



Nature-Based Infrastructure

- Aramburu Island (Mill Valley) Beach Enhancement Project (led by Water Board!)



Dredging and Beneficial Reuse

- Novato Creek 2016 Dredge and Thin-Lift Placement



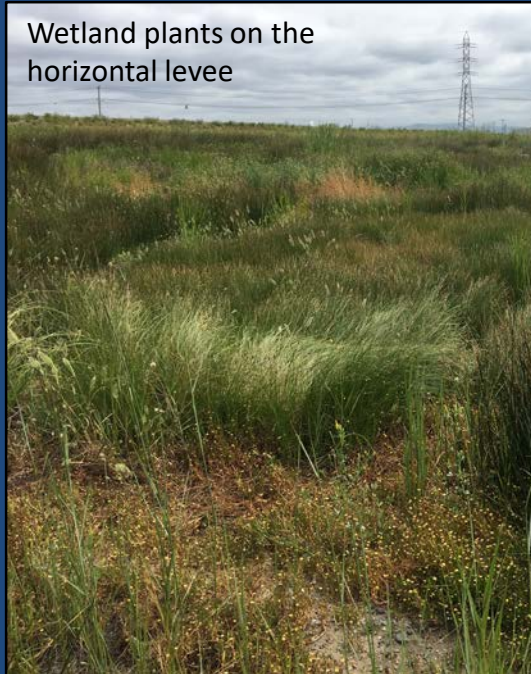
Nearshore Discharge of Treated Wastewater

- Oro Loma Horizontal Levee Pilot Project

Water Board staff with Dr. Peter Baye and Dr. David Sedlak



Wetland plants on the horizontal levee



Willows on the horizontal levee



2. Collaboration & Outreach



San Francisco Bay Restoration Regulatory Integration Team

- Inter-agency coordination of permitting for multi-benefit projects
- Outgrowth of SF Bay Restoration Authority



San Francisco Bay Restoration Authority

Bay Conservation and Development Commission

- Bay Plan Amendment on Fill for Habitat
- Adapting to Rising Tides Project



Wetland Regional Monitoring Program

- Core Team, Steering Committee, and Science Advisory Team
- Lead the Physical Processes Team
- Four workshops with a broad range of decision-makers and scientists

Collaborative Science for Healthy Wetlands

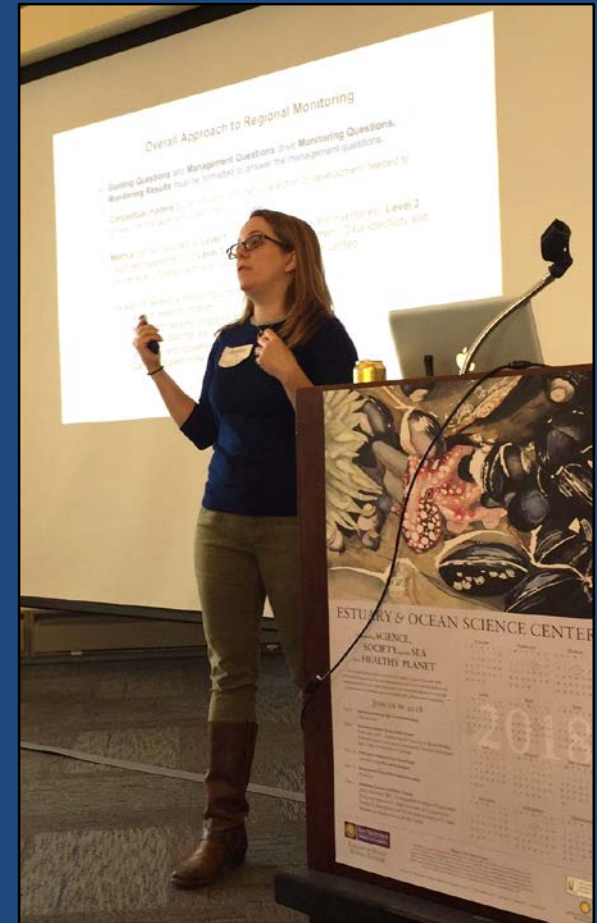
**A pilot program to monitor
tidal marsh habitat in the San
Francisco Estuary**

National and Regional Forums

- EPA Wetland Type Conversion Workgroup
- NOAA: National Thin-Lift Sediment Placement Technical Advisory Committee (TAC)
- Coastal Conservancy: Living Shorelines TAC
- The Nature Conservancy: Natural Infrastructure in California TAC
- SF Bay Joint Venture: Science Steering Committee

Conferences & Workshops

- Bay-Delta Science Conference
- State of the Estuary Conference
- Restoring America's Estuaries Summit
- Living Shorelines Tech Transfer Workshop
- Beneficial Reuse of Treated Wastewater Workshop



Collaborative Project Planning

- Bothin Marsh Evolving Shorelines (Mill Valley)
- Pond A8 Area (San Jose)
- Novato Baylands & Highway 37 Corridor
- San Pedro Road (San Rafael)
- Peyton Slough (Martinez)



BOTHIN MARSH OPEN SPACE PRESERVE

EVOLVING SHORELINES: A VISION FOR THE FUTURE AND A PLAN FOR TODAY

Tomales Bay Living Shorelines

Haire Ranch / Skaggs Island

Highway 37

EcoRestore

Sears Point

Novato Baylands

Drake's Lagoon

McInnis Marsh

San Pedro Road

Giant Marsh - Living Shorelines

Peyton Slough Marshes

Bolinas Lagoon

Bothin Marsh

San Francisco Embarcadero

Oro Loma WWTP

San Francisco Airport

South Bay Salt Ponds

Foster City 3rd Ave.

Palo Alto WQCP

South Bay Shoreline

Pond A8

Pescadero Marsh

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Collaborative Project Planning

3. Operational Landscape Units

DRAFT - December 4, 2018

SAN FRANCISCO BAY SHORELINE **Adaptation Atlas**

Working with Nature to Plan for Sea Level Rise

USING OPERATIONAL LANDSCAPE UNITS



What We've Learned

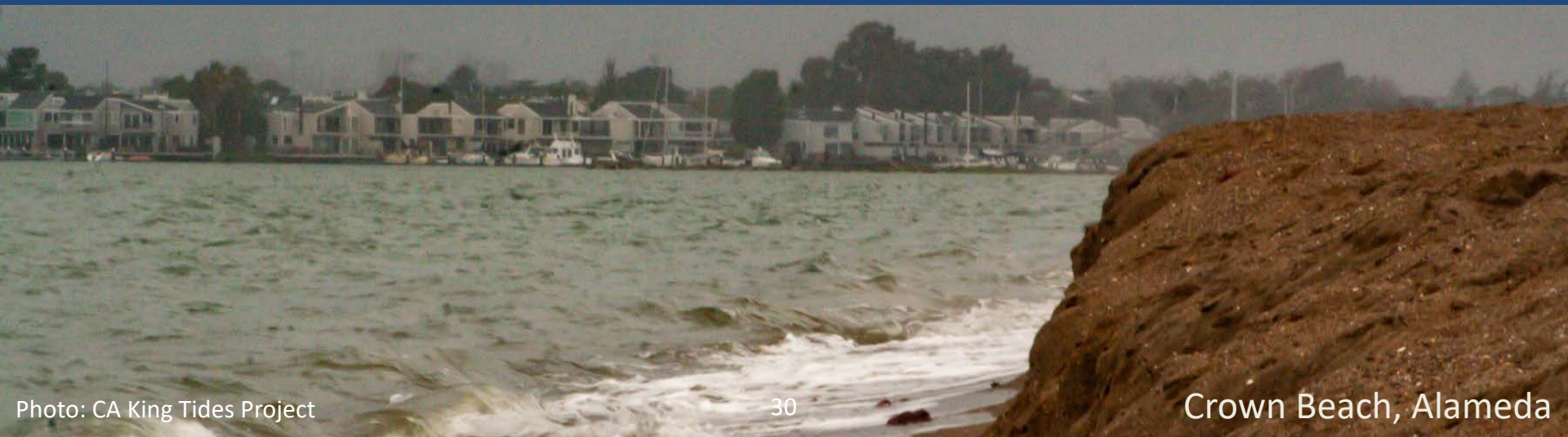
Key Regulatory Opportunities

1. Clarify how we will apply “No Net Loss” for
 - Horizontal and ecotone levees
 - Living shorelines, beaches, dunes, and hybrid “green-grey” infrastructure
 - Strategic/thin-lift sediment placement
 - High tide refugia



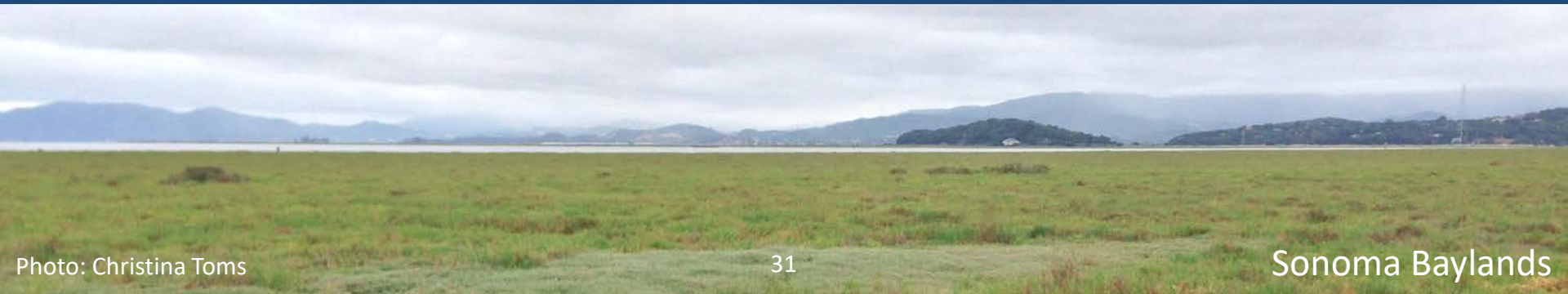
Key Regulatory Opportunities

2. Identify benefits of “complete” tidal wetland systems
3. Identify preferred strategies for SLR adaptation – Adaptation Atlas
4. Provide technical guidance for projects



Key Regulatory Opportunities

5. Clarify acceptable wetland type conversions
6. Consider temporal and spatial tradeoffs and uncertainties
7. Define “multi-benefit” projects
8. Incentivize landward alignments of shoreline protection, movement of natural shorelines



Key Regulatory Opportunities

9. Minimize shoreline hardening

10. Evaluate mitigation on a regional basis

11. Support regional tidal wetland monitoring



A photograph of a red SUV driving through a flooded road, creating a large splash of water. In the foreground, a yellow diamond-shaped sign with the word 'FLOODED' in black letters is mounted on a metal post. Below the sign is a white rectangular sign with the text 'COUNTY OF MARIN'. The road is wet and reflective, and the background shows a line of trees and a small car in the distance.

What We're Going To Do

Leverage Internal and External Resources

- Continue existing collaborations and outreach
- Identify internal project team
- Develop external advisory committee



Climate Change Technical Report

- Further technical detail
 - Climate change and the Bay's tidal wetlands
 - Permitting procedures and case studies
 - Key regulatory challenges and opportunities
 - Next steps: Developing an update regulatory framework
- Internal and external peer review
- Release: This summer

Stakeholder Engagement Strategy

- Hold workshops with Staff and Board on key technical and policy issues
- Collaborate on policy updates



New Partnerships

- Metropolitan Transportation Commission
- Bay Area Flood Protection Agencies Association (BAFPAA) Climate Hazards Adaptation Resiliency Group (CHARG)
- Bay Area Regional Collaborative (BARC)



Acknowledgments

- Water Board: Naomi Feger, Lisa Horowitz McCann, Thomas Mumley, Xavier Fernandez, Keith Lichten, Richard Looker, Sami Harper

- SFEI: Julie Beagle, Warner Chabot, Josh Collins, Letitia Grenier, Jeremy Lowe
- Photos: California King Tides Project, <http://www.coastal.ca.gov/kingtides/>





Questions?
christina.toms@waterboards.ca.gov