Climate change, Bay wetlands, and actions we can take

Bay Alive!
20 May 2020

LETITIA GRENIER
SAN FRANCISCO ESTUARY INSTITUTE

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1800

Tidal Marsh

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why do we care about

TIDAL MARSHES?

clean water

flood control

food web and wildlife

recreation and scenery

1800

Tidal Marsh

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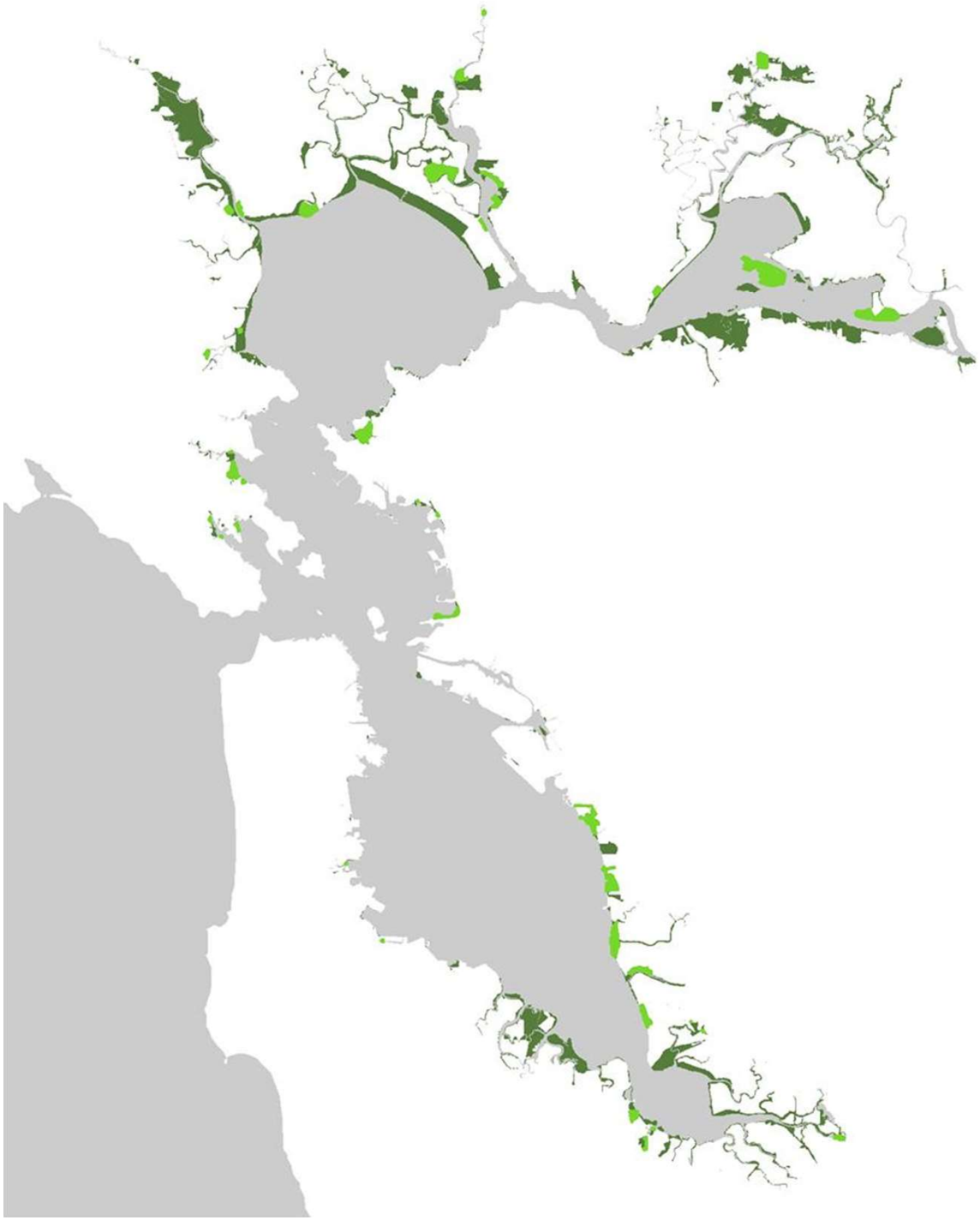

1998

Tidal Marsh

Restored Tidal Marsh

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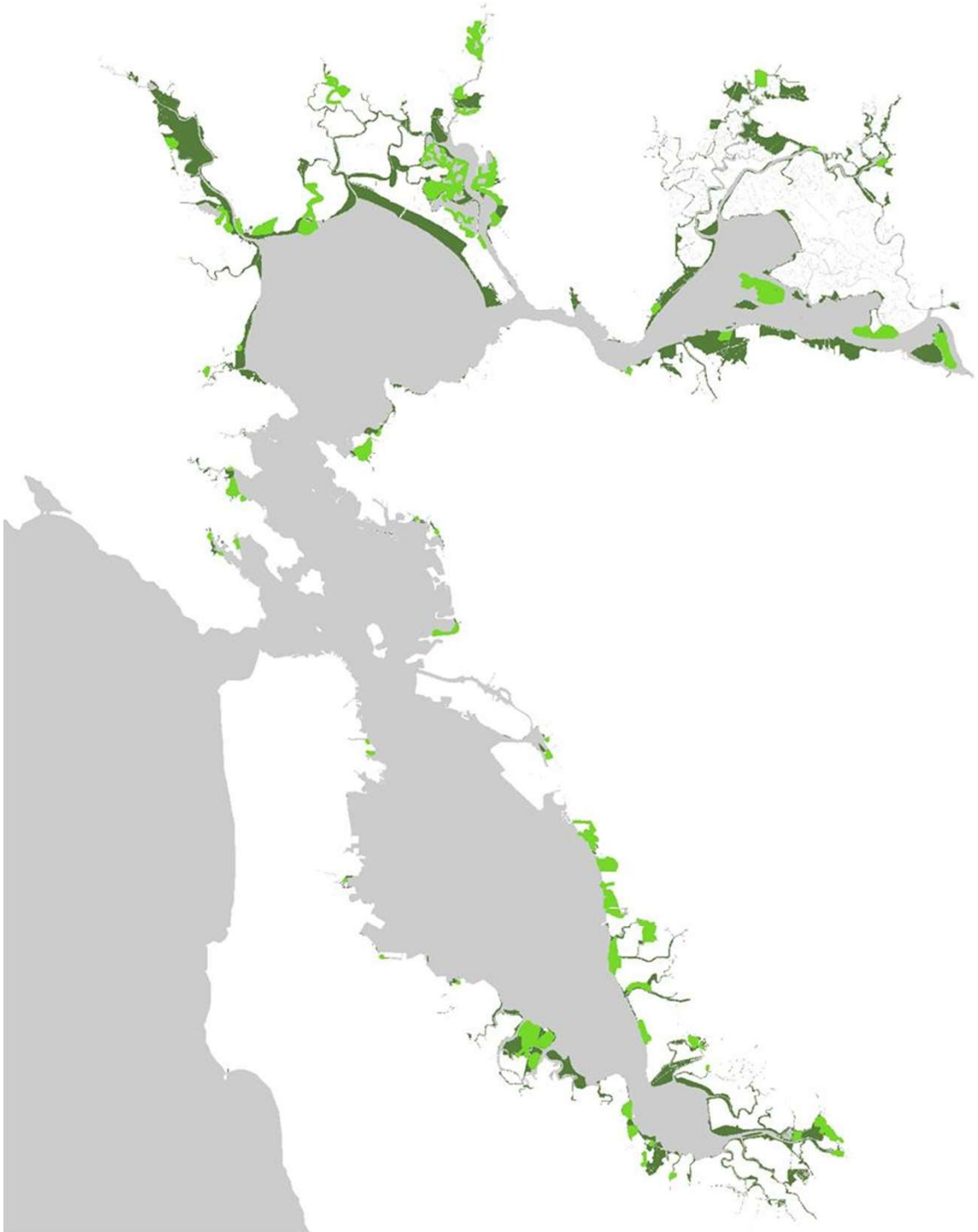

2009

Tidal Marsh

Restored Tidal Marsh

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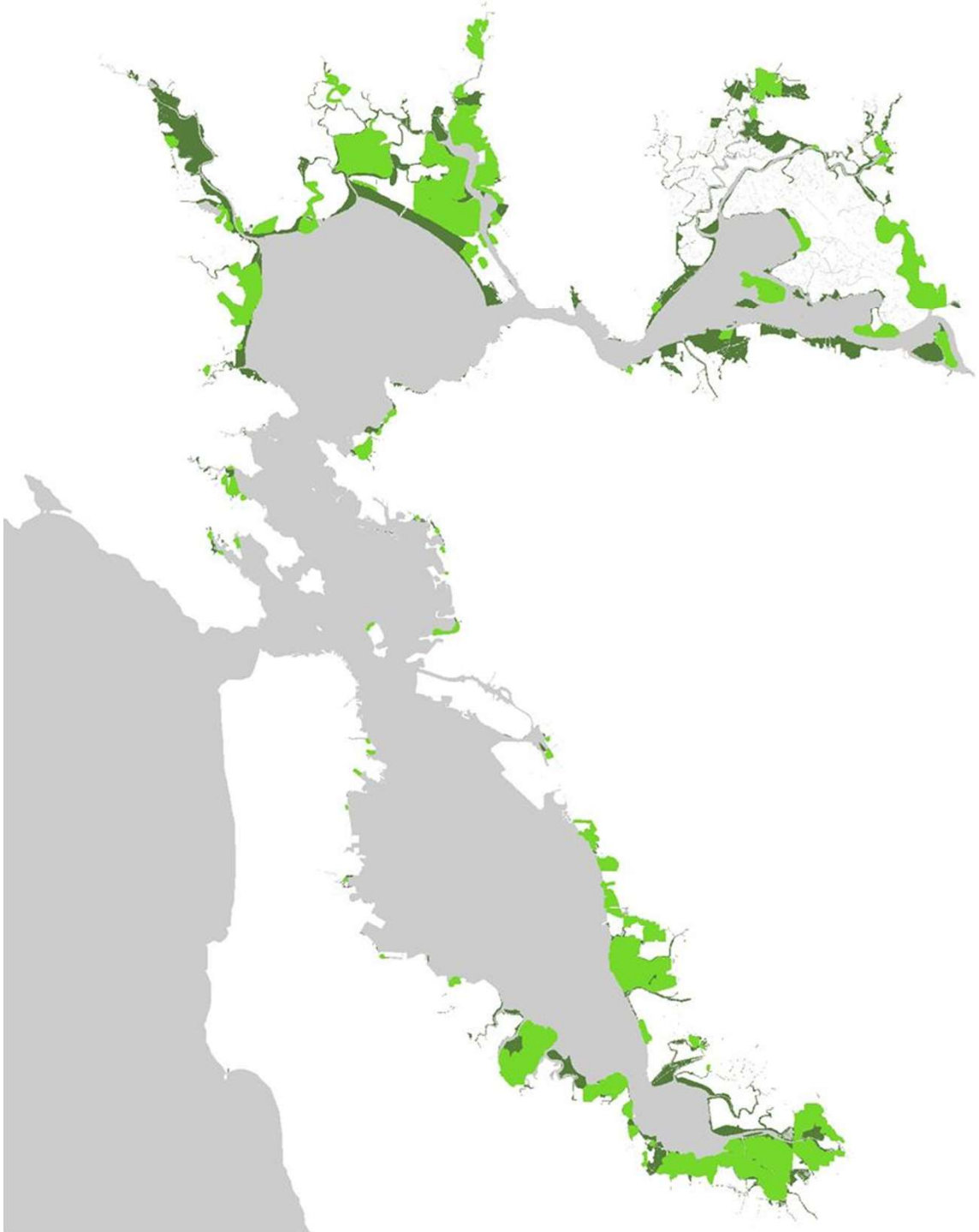

FUTURE

Tidal Marsh

Restored Tidal Marsh

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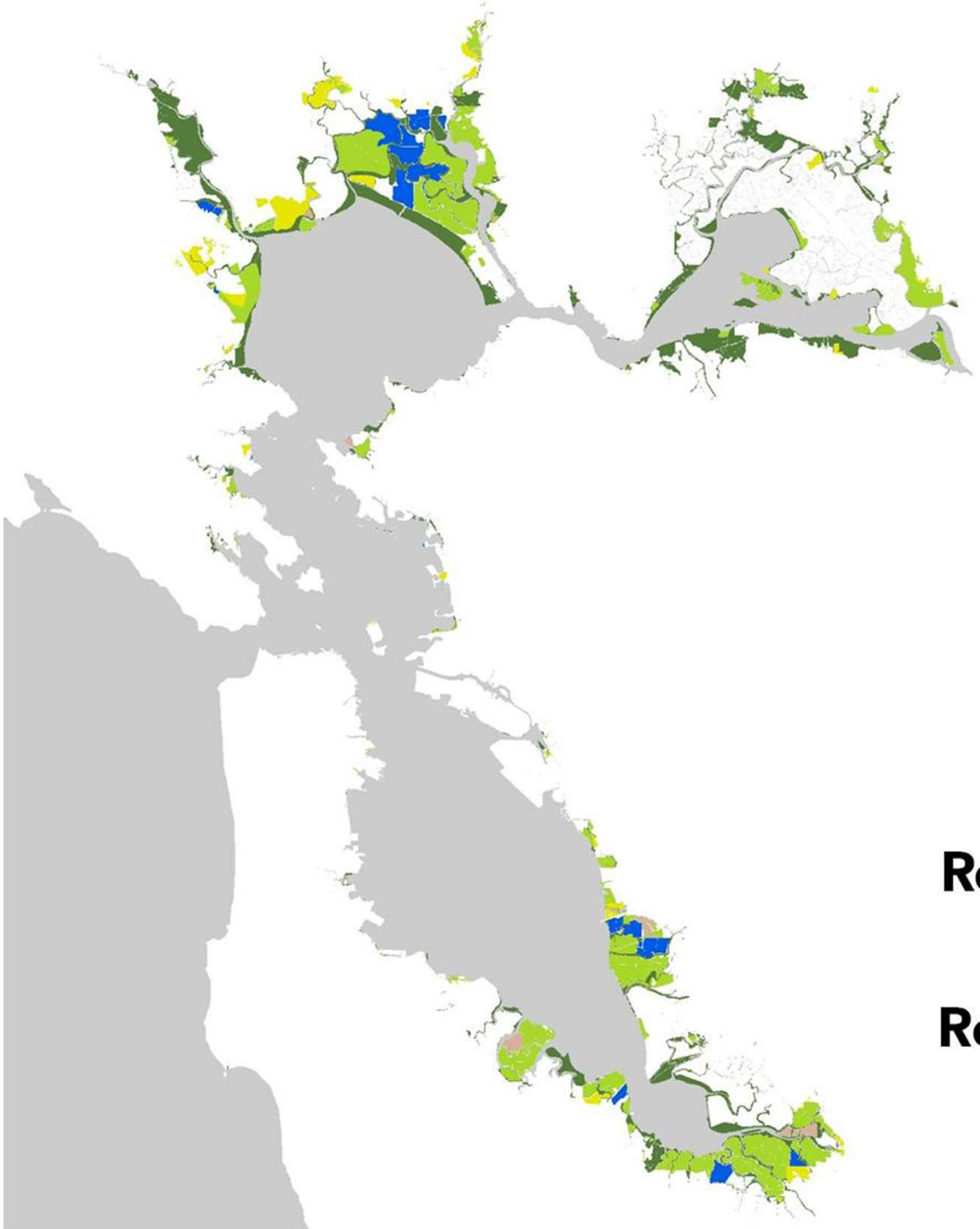

FUTURE

Existing Tidal Marsh

Restored Tidal Marsh

Restored Tidal Flat

Restored Diked Wetland

Restored Managed Pond

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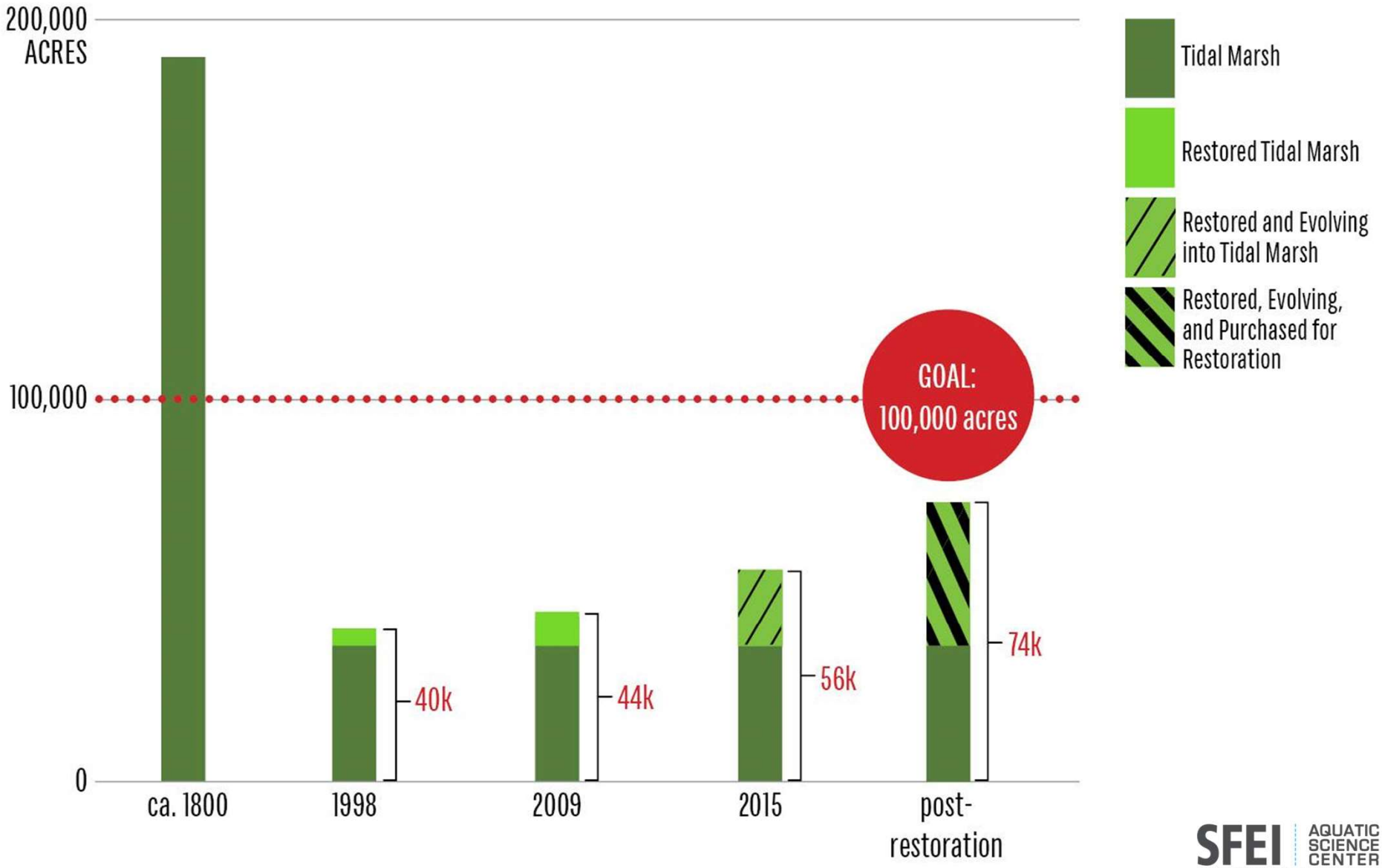
TIDAL MARSH *restoration*



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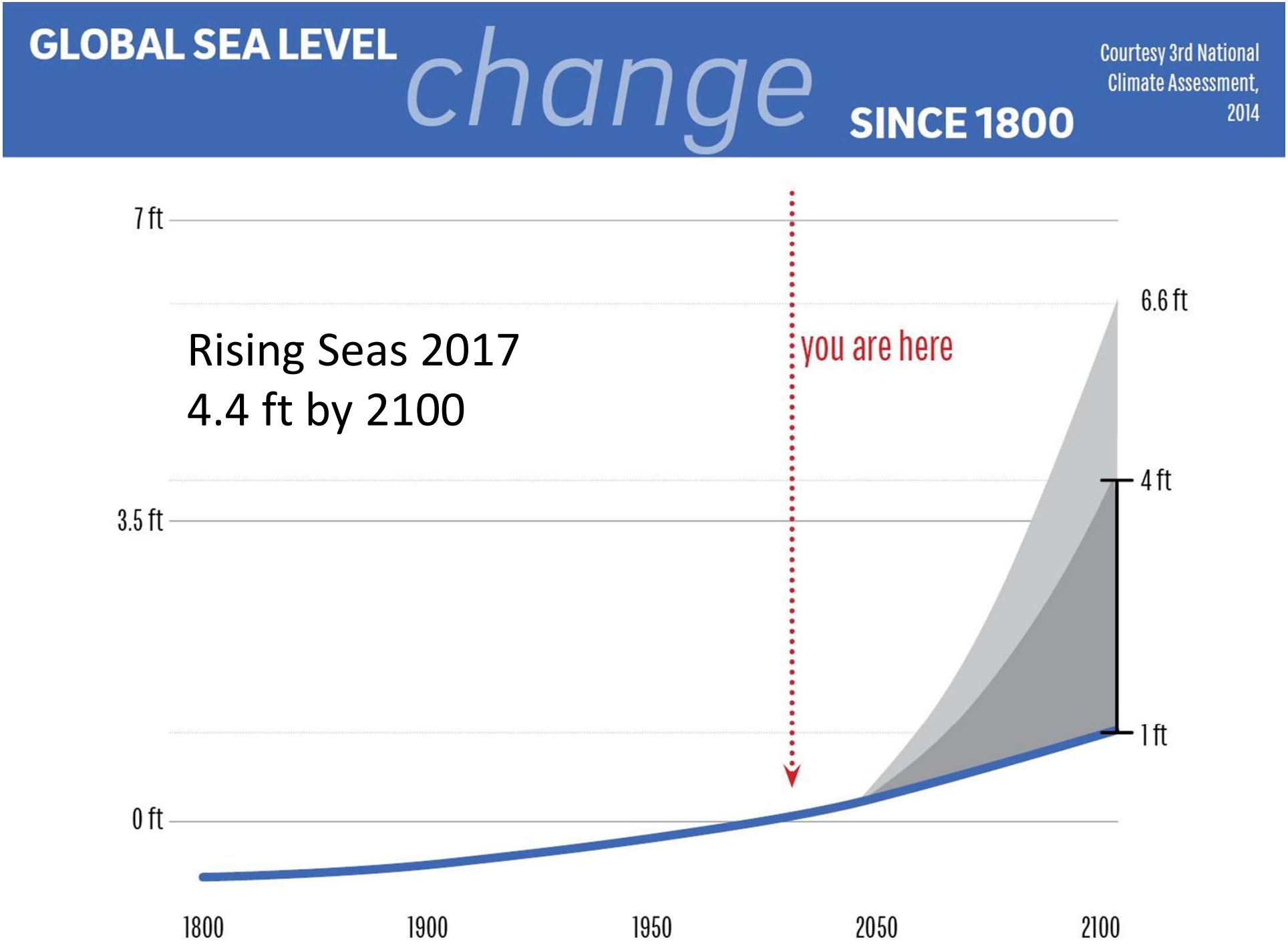
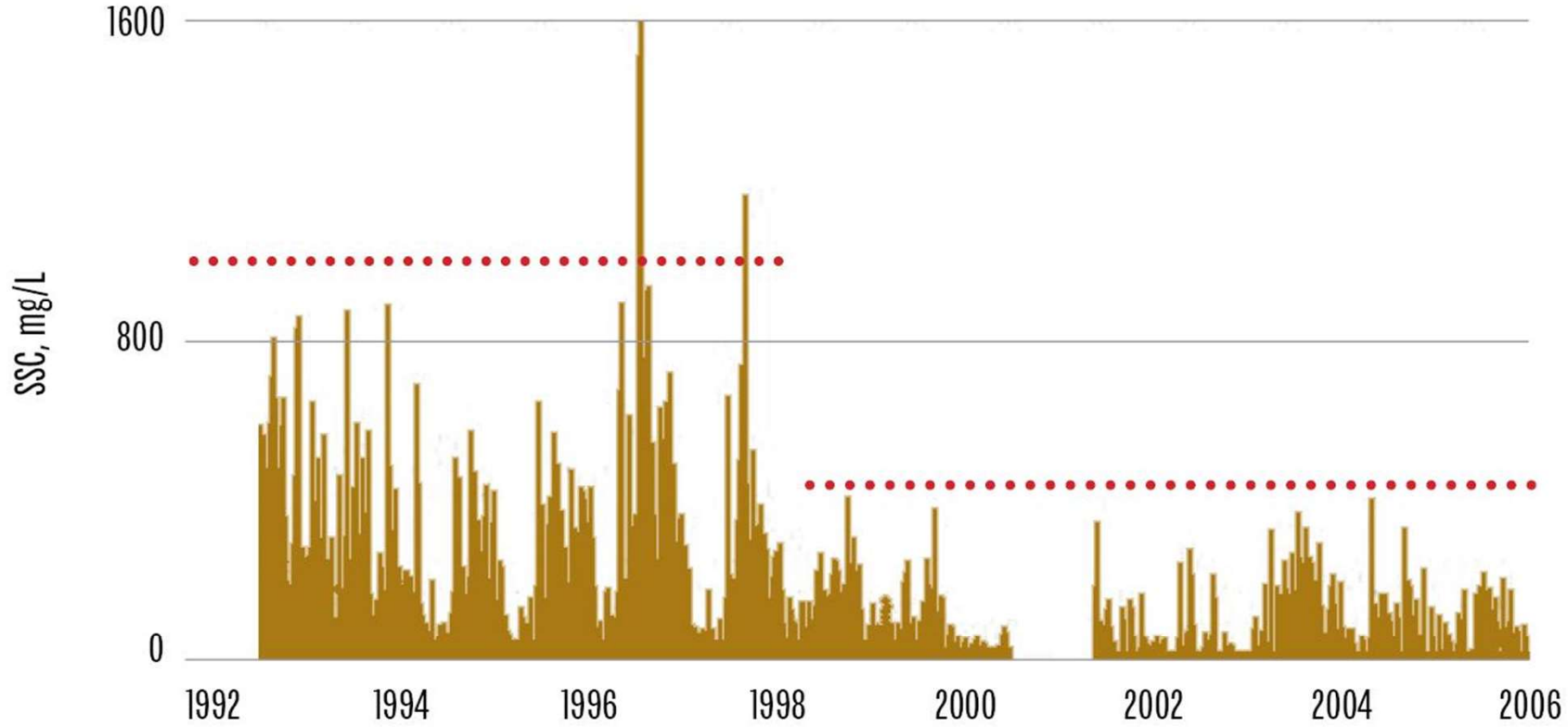
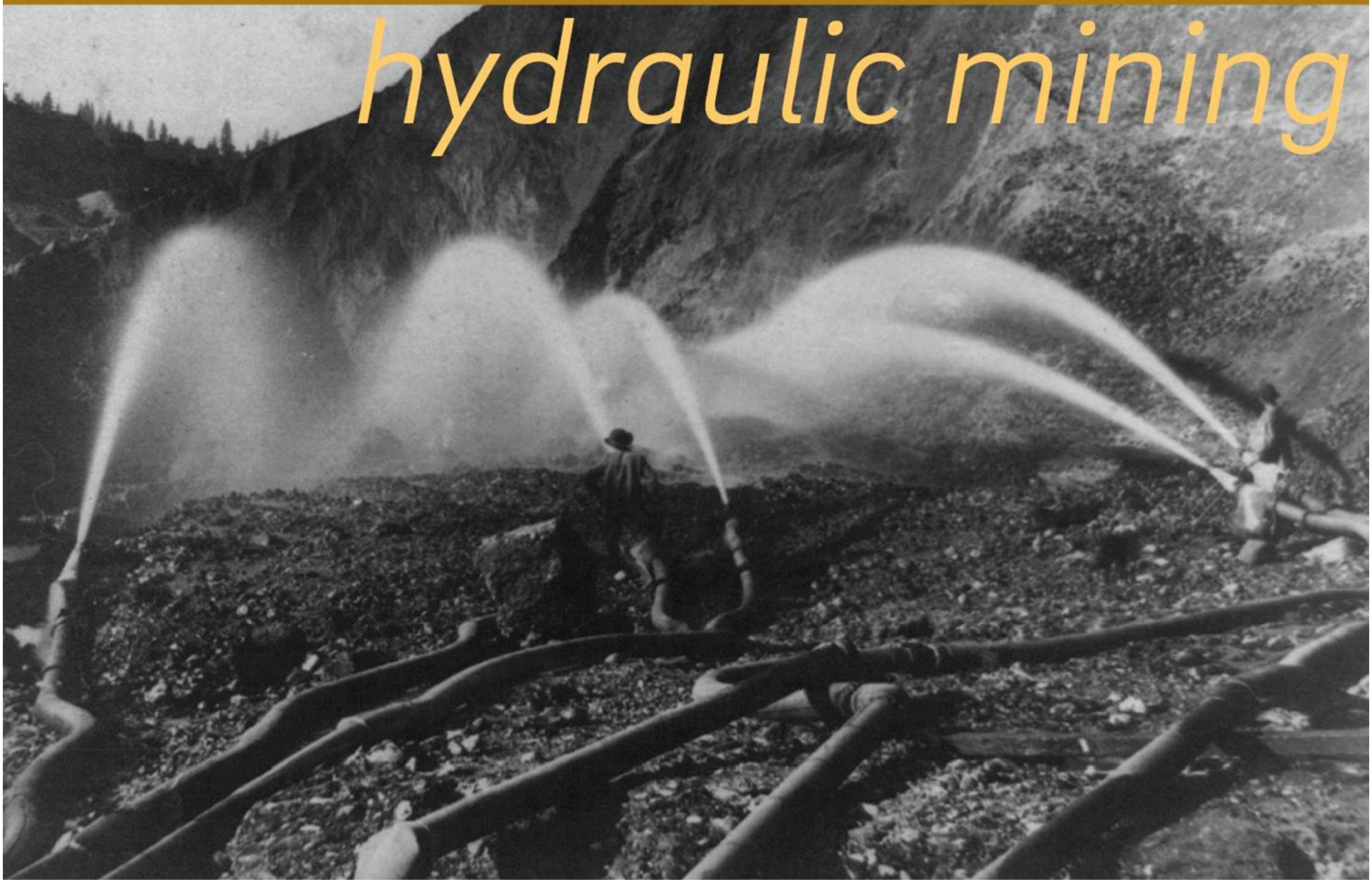

GLOBAL SEA LEVEL change SINCE 1800
Courtesy 3rd National Climate Assessment, 2014
Rising Seas 2017
4.4 ft by 2100
7 ft
3.5 ft
0 ft
you are here
6.6 ft
4 ft
1 ft
1800
1900
1950
2050
2100

SEDIMENT SUPPLY *reduction*

Courtesy
Dave Schoelhamer
2011

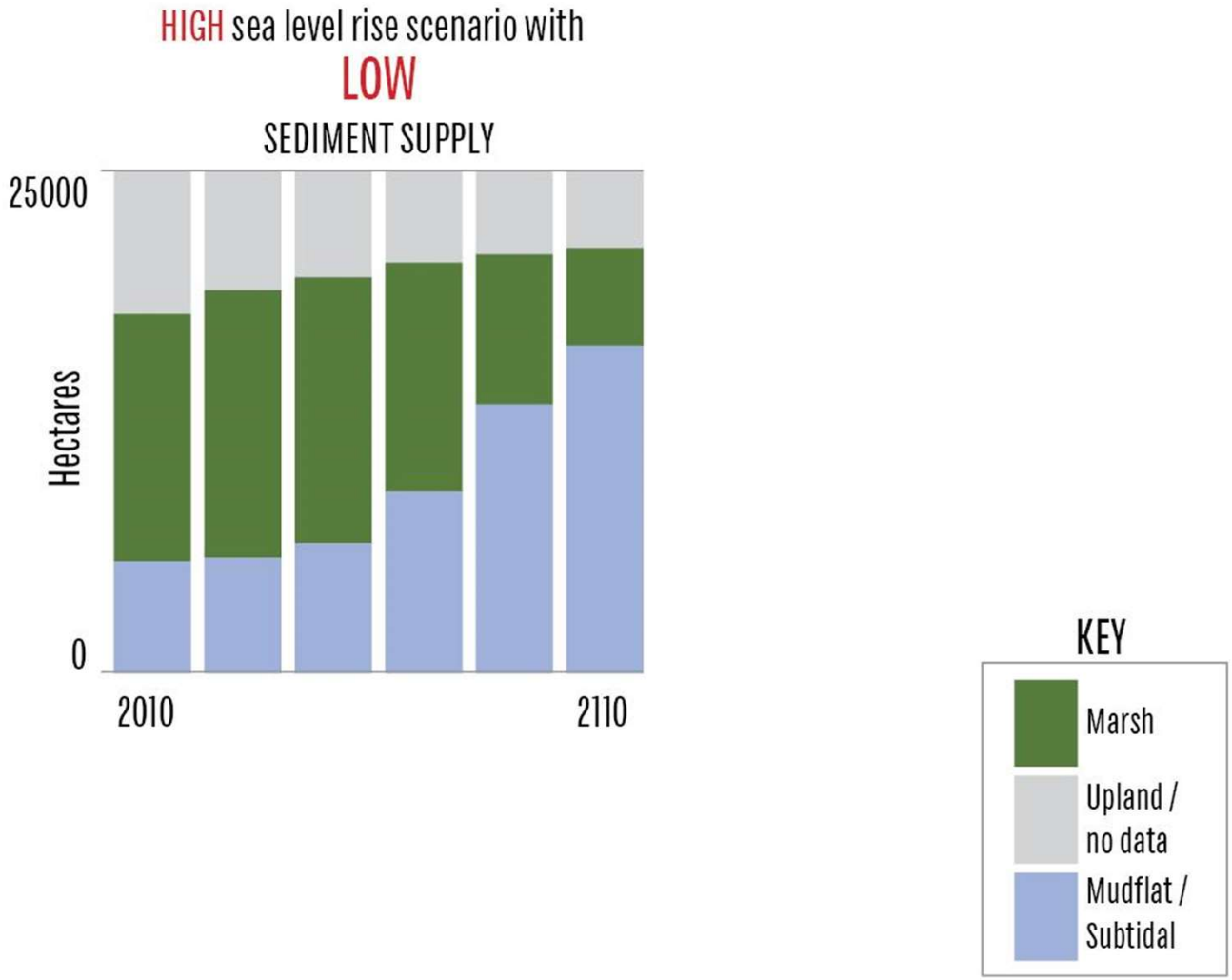


SEDIMENT SUPPLY



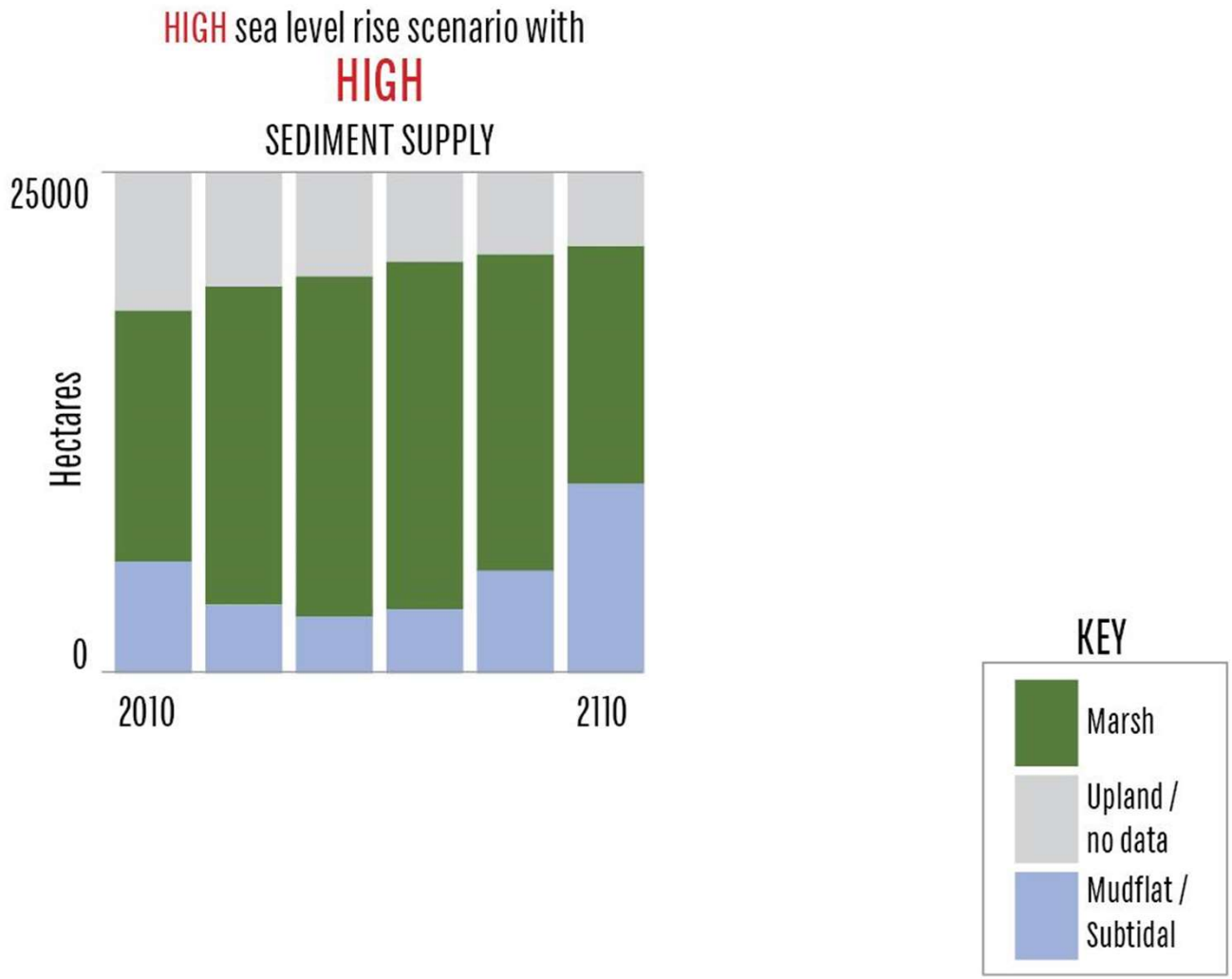
THE FUTURE OF MARSHES DEPENDS ON *sediment supply*

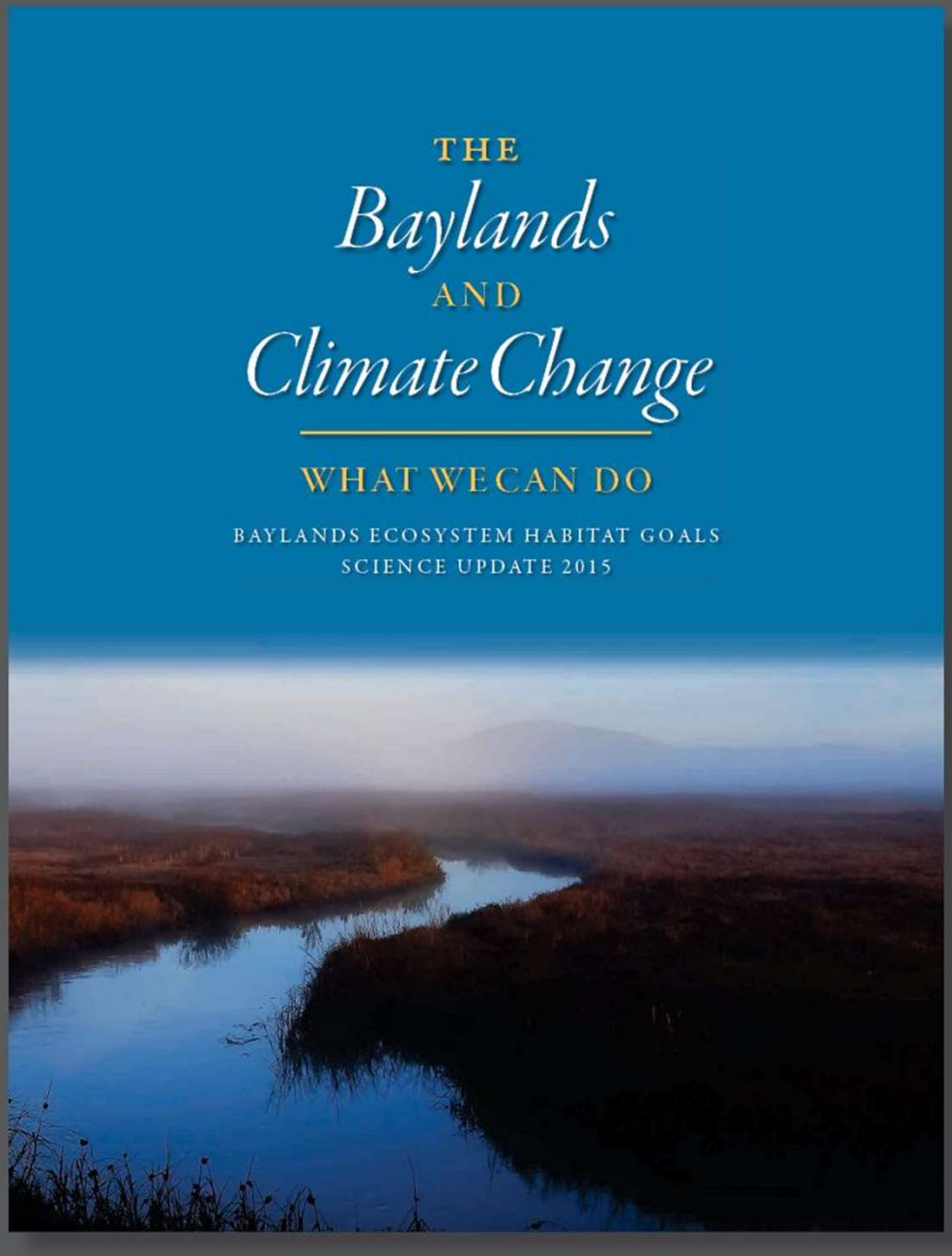
Courtesy Stralberg et al. 2011



THE FUTURE OF MARSHES DEPENDS ON *sediment supply*

Courtesy Stralberg et al. 2011





- 200+ scientists, land managers, regulators
- 26 agency steering committee

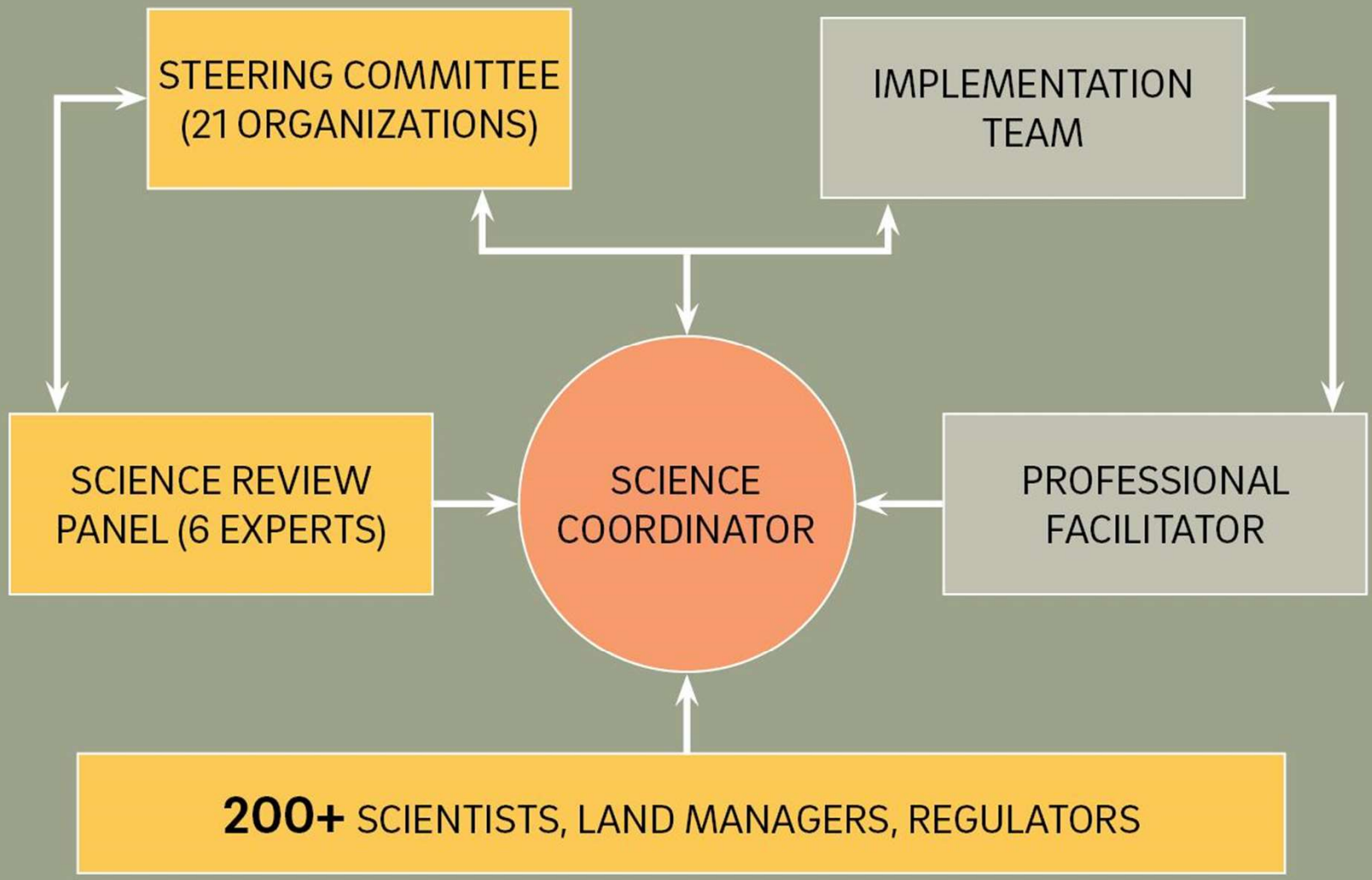
State of California
Coastal Conservancy

BAY AREA ECOSYSTEMS CLIMATE CHANGE CONSORTIUM

BAYLANDS GOALS 2015

- Science synthesis
- Effect of future change, especially climate and sediment supply, on the Baylands
- Goal is healthy ecosystem, providing a resilient shore for people and wildlife
- Recommendations and landscape visions for the next century

ROBUST COLLABORATIVE PROCESS



STEERING COMMITTEE

Resource management, regulatory, restoration organizations

Coastal Conservancy	***Sam Schuchat, Chair (Nadine Peterson)***
Delta Conservancy	*Kristal Davis-Fadtke*
Delta Stewardship Council	*Marina Brand*
EBRPD	*Brad Olson (Chris Barton)*
NOAA	*Becky Smyth (Korie Schaeffer)*
Point Blue	*Grant Ballard (Julian Wood)*
SFEI	*Robin Grossinger (Lester McKee)*
USACE	*Tom Kendall (Fari Tabatabai)*
USEPA	*Sam Ziegler (Luisa Valiela)*
BAFPAA	*Carol Mahoney (C Morrison)*
Water Board	*Andree Greenberg (N Feger)*
USFWS	*Anne Morkill*
BCDC	*Joe LaClair*
DFW	*Carl Wilcox*
DWR	*Erin Chappell*
EBDA	*Michael Connor*
NPS	*Kristen Ward*
SFBJV	*Beth Huning*
SFEP	*Judy Kelly*
Suisun RCD	*Steve Chappell*
URS	*Mike Monroe*

Shira Bezalel

WHAT WE CAN DO

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Regional Recommendations

1	Restore estuary-watershed connections that nourish the Baylands with sediment and fresh water.
2	
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HISTORICAL

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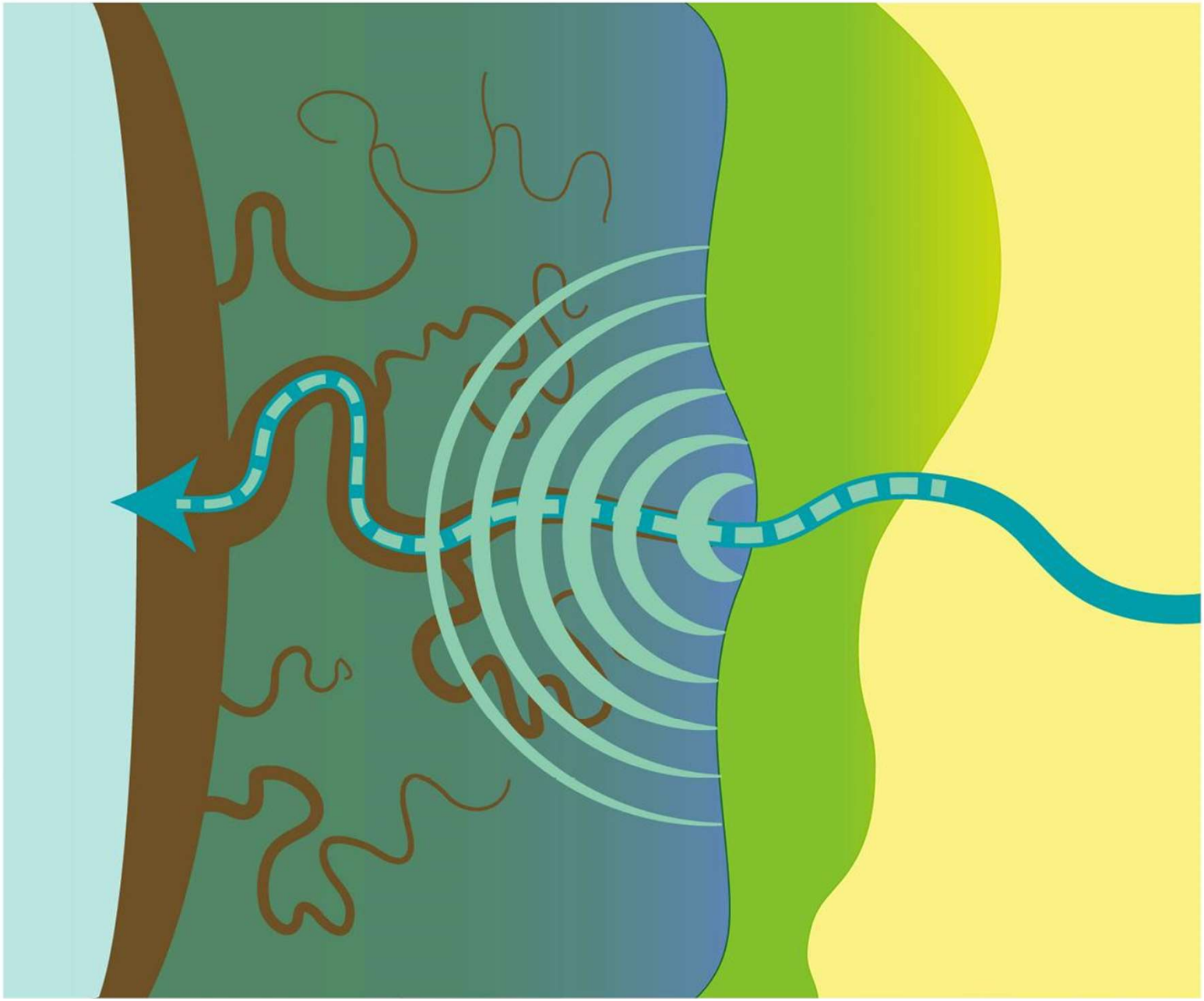

MODERN

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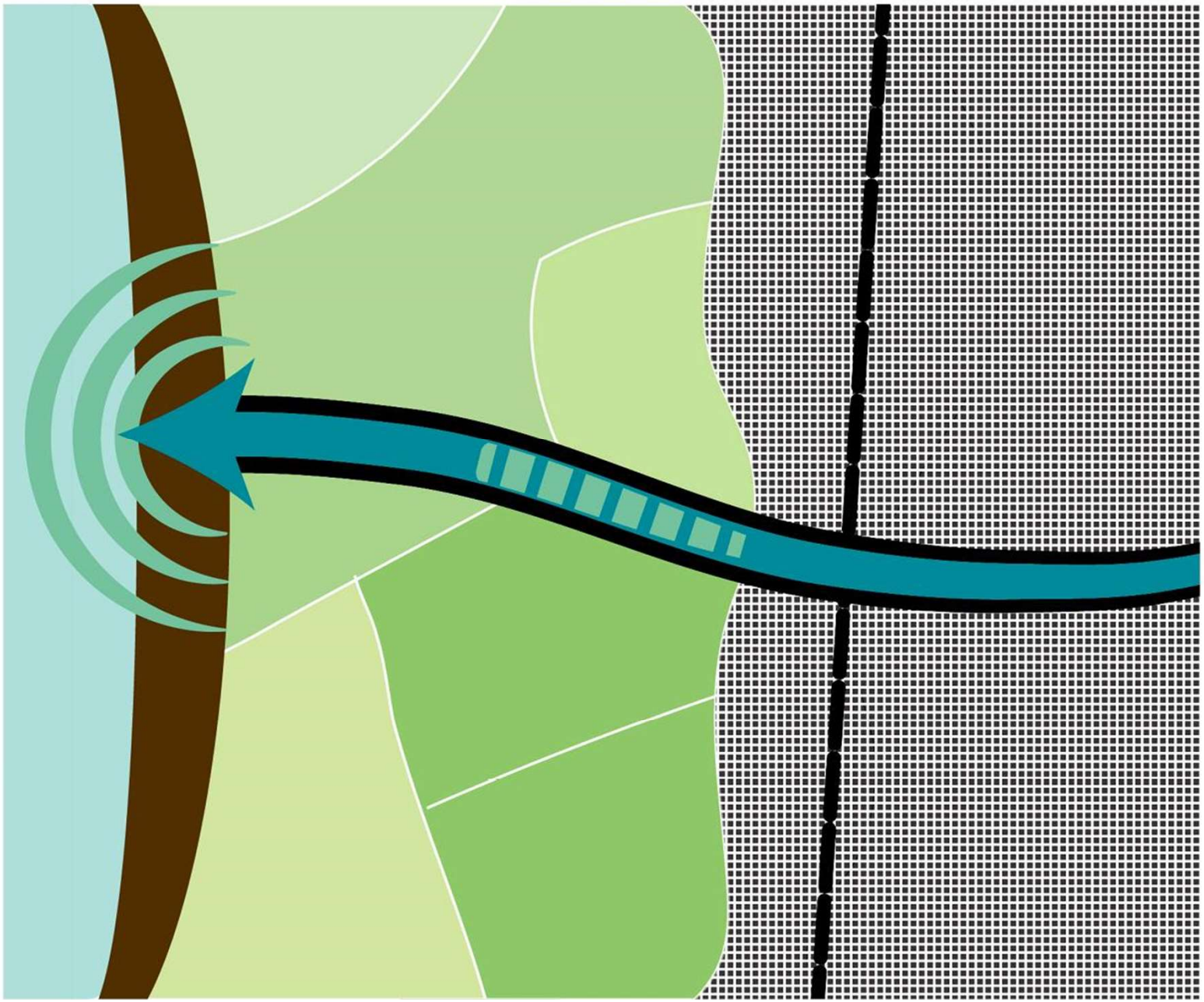

FUTURE

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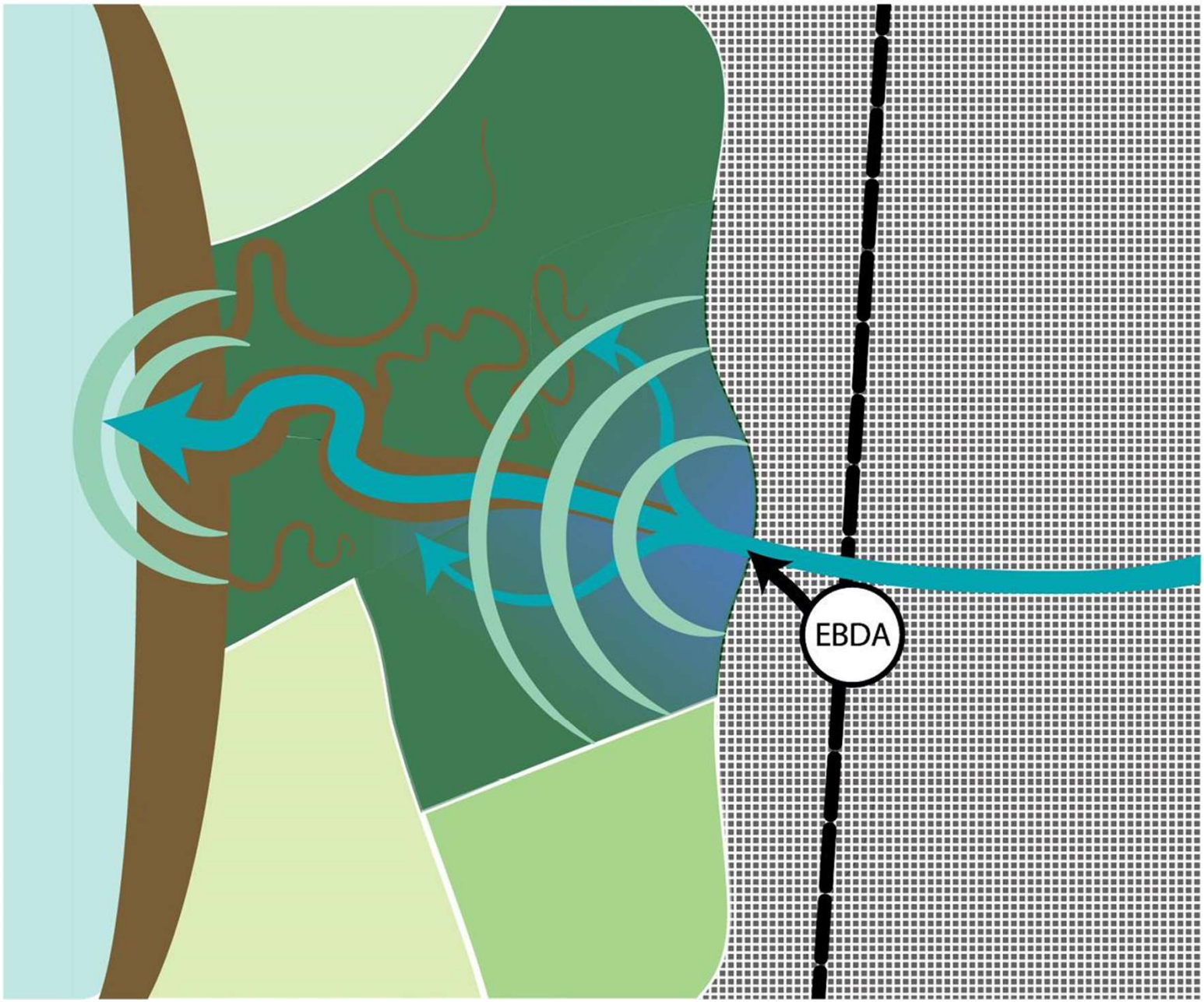
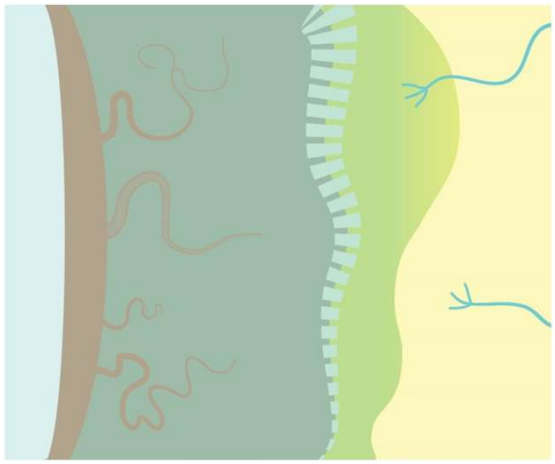
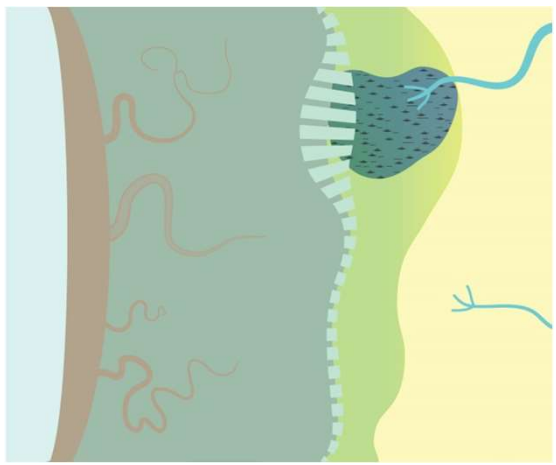
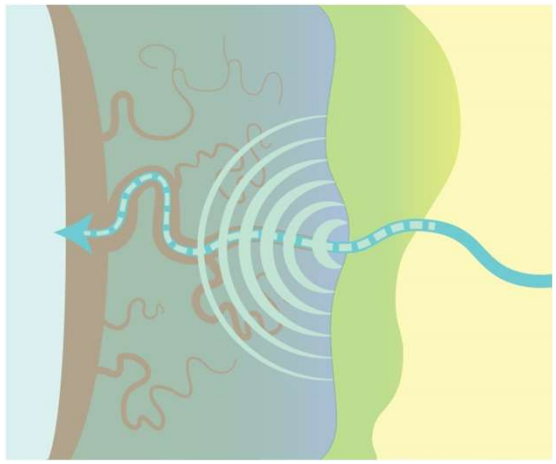




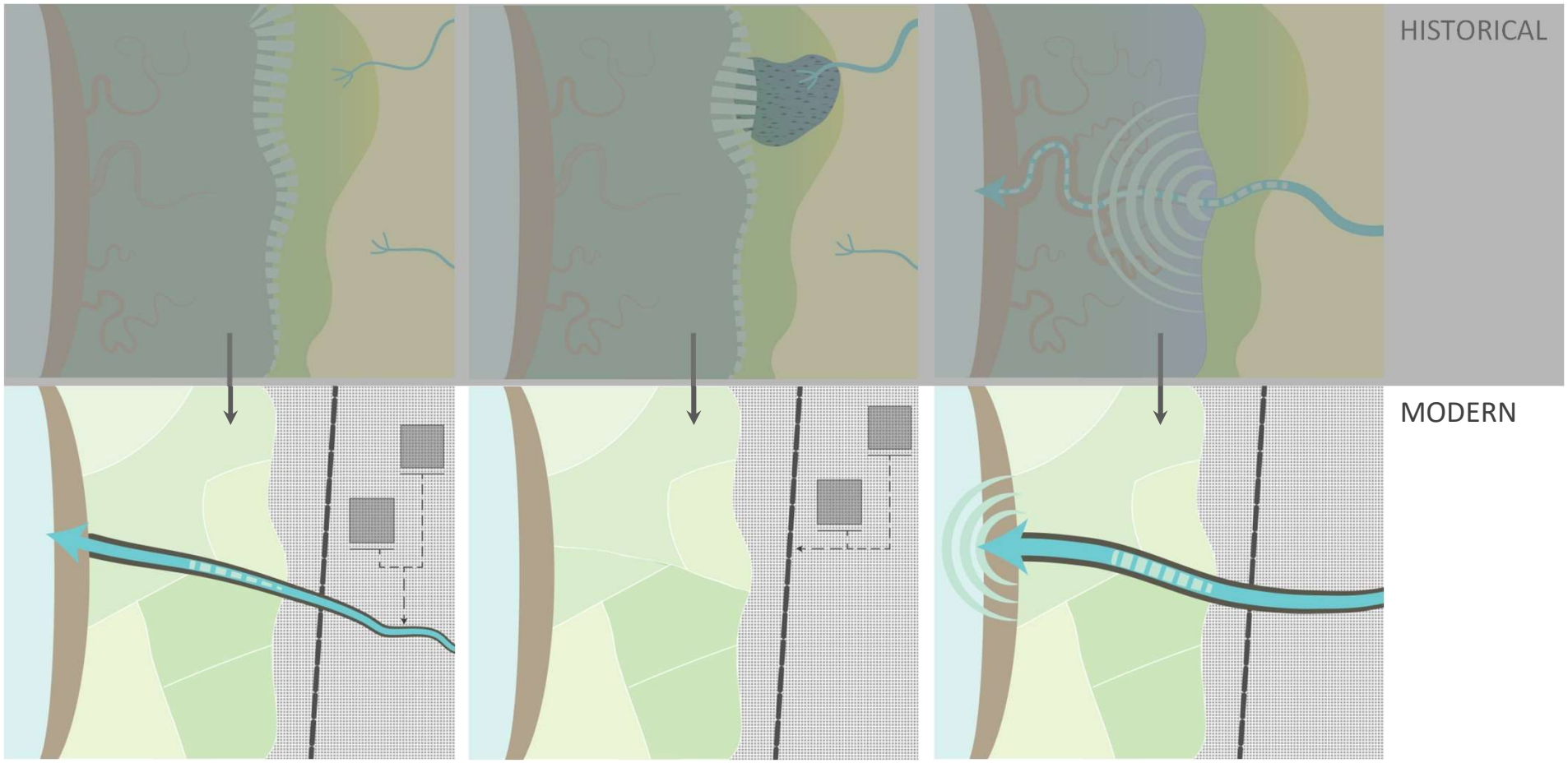


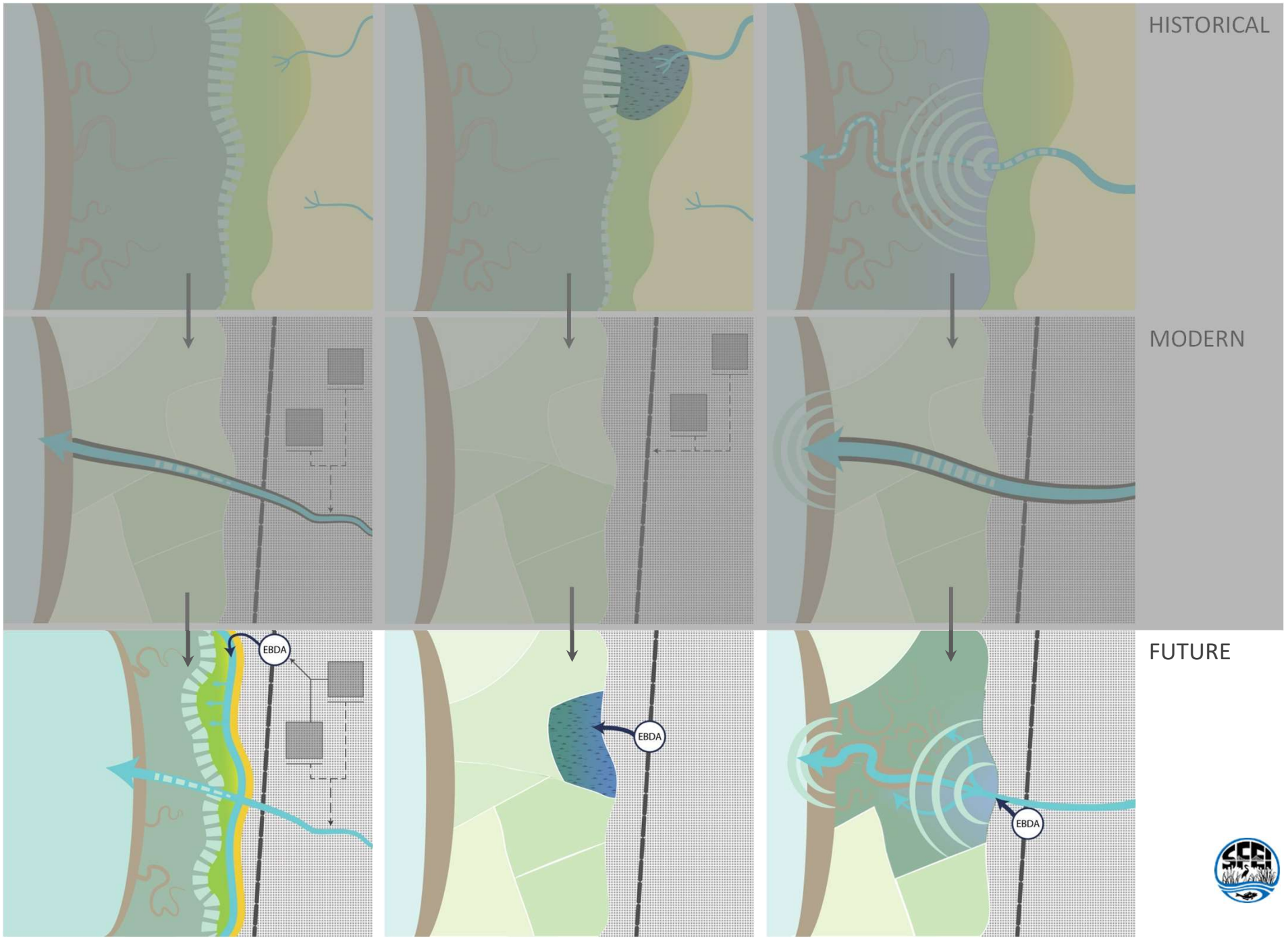


HISTORICAL

MODERN

FUTURE


HISTORICAL
MODERN
FUTURE


HISTORICAL
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EBDA

Regional Recommendations

1	Restore estuary-watershed connections.
2	Design complexity and connectivity into the Baylands landscape.
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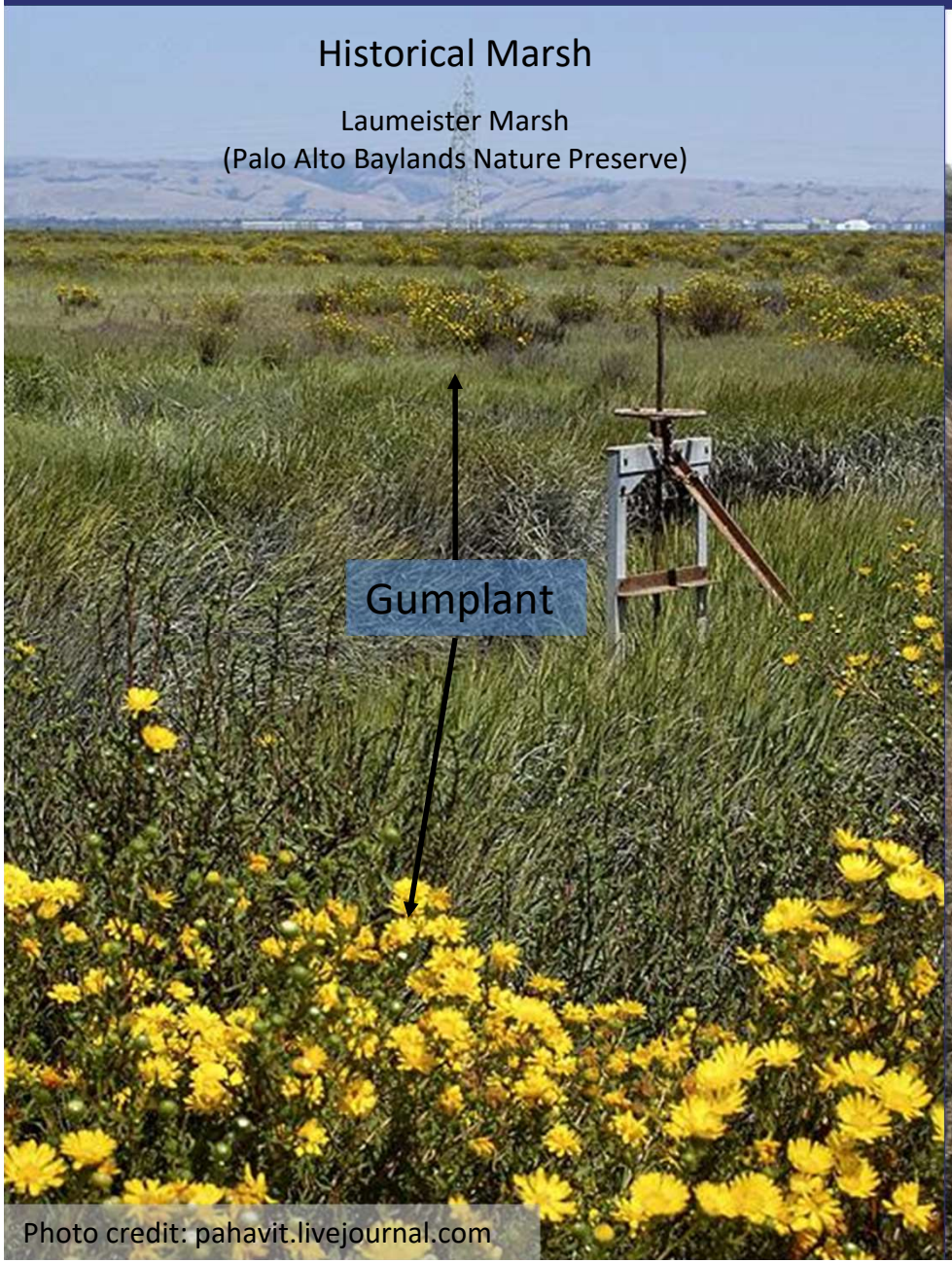
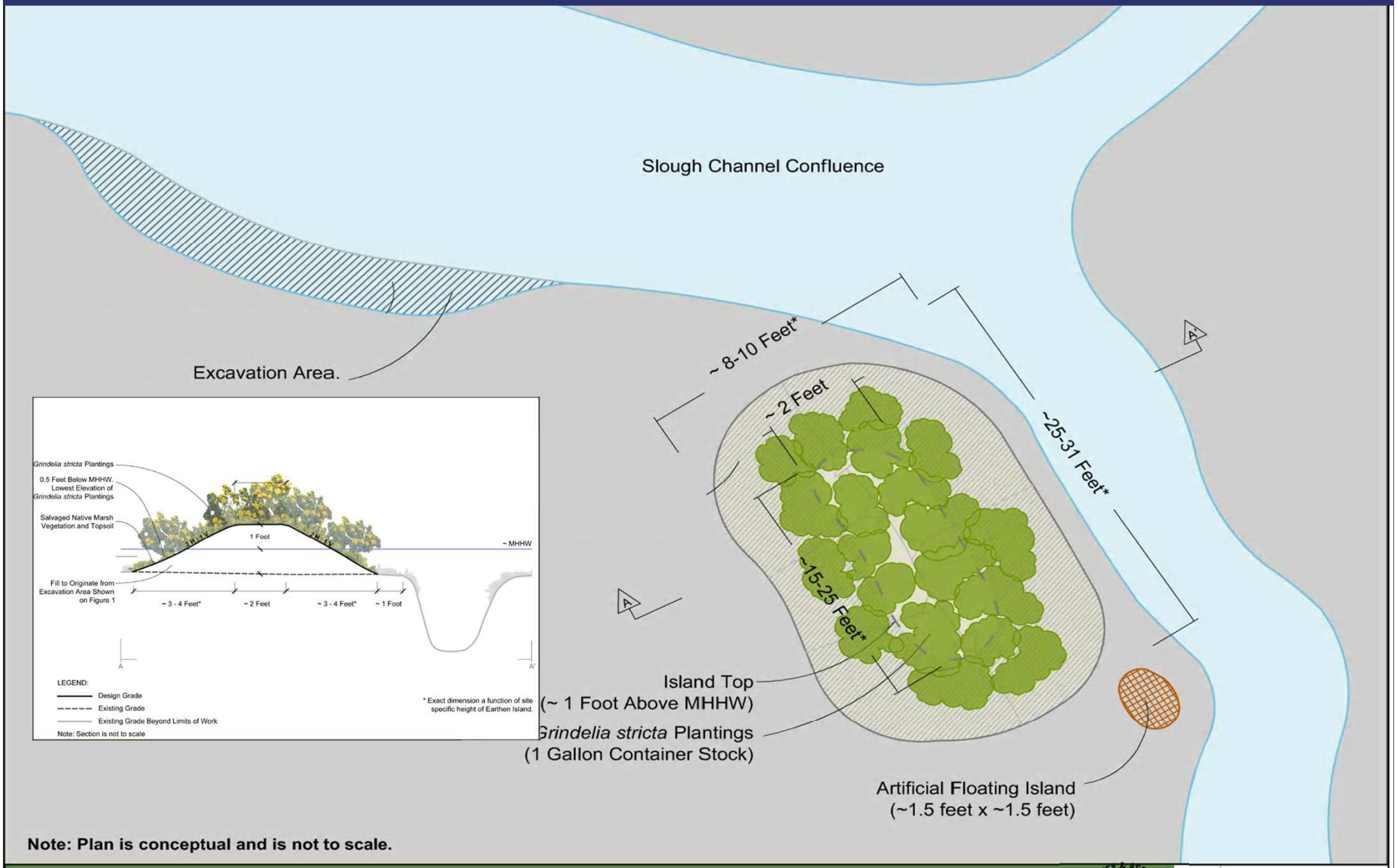
Need for More Complex Marsh Vegetative Structure



High-Tide Refuge Island



Note: Plan is conceptual and is not to scale.

Figure 1: Typical Plan View
Earthen Refugial Island Conceptual Plan

H.T. HARVEY & ASSOCIATES Ecological Consultants

San Francisco Estuary Invasive Spartina Project
Preserving native wetlands

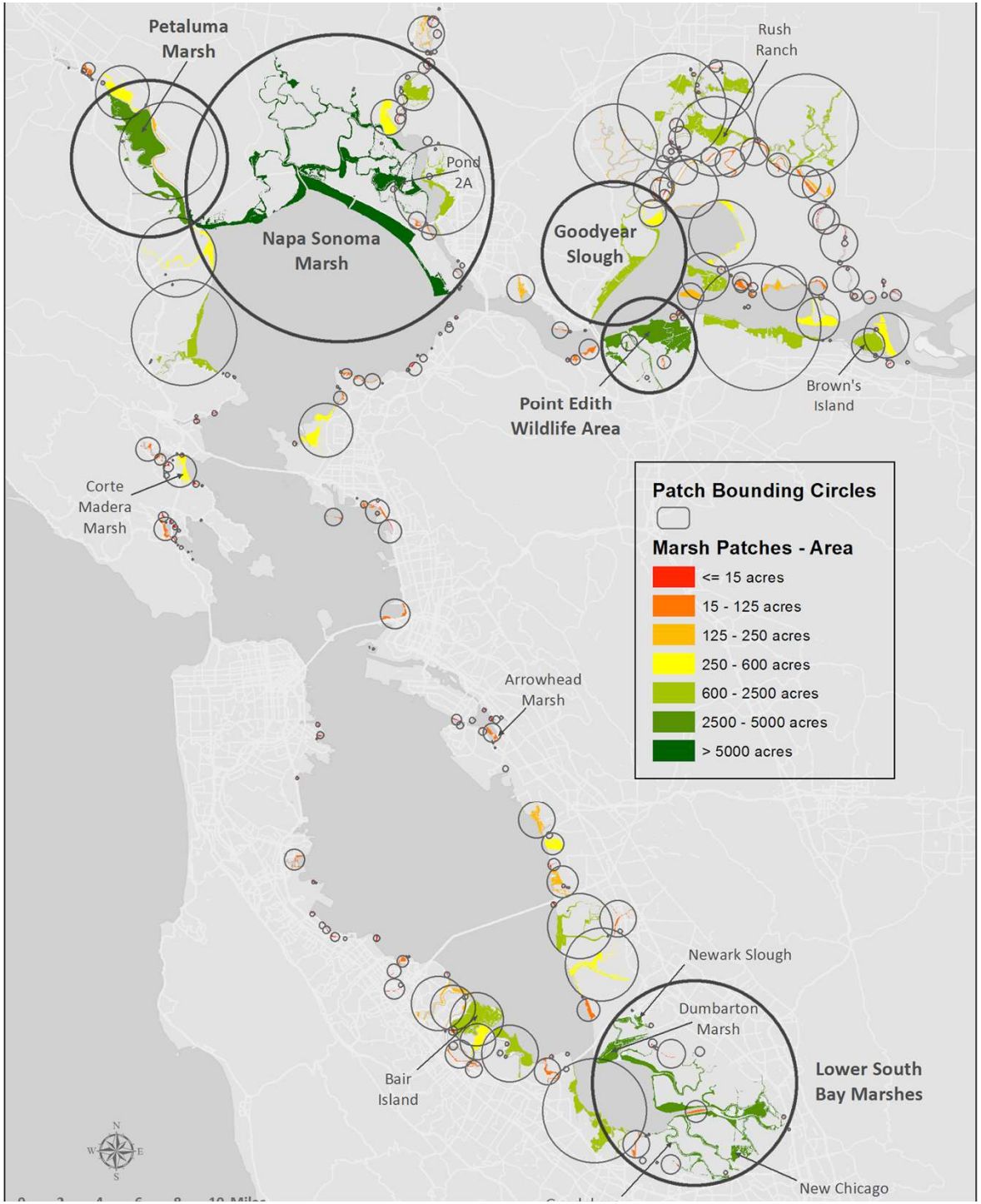
Construction

Coastal Conservancy

Vegetation Survival Monitoring

Coastal Conservancy

Design connectivity into the Baylands landscape



Regional Recommendations

1	Restore estuary-watershed connections.
2	Design complexity and connectivity into the Baylands landscape.
3	Restore and conserve complete tidal wetlands systems.
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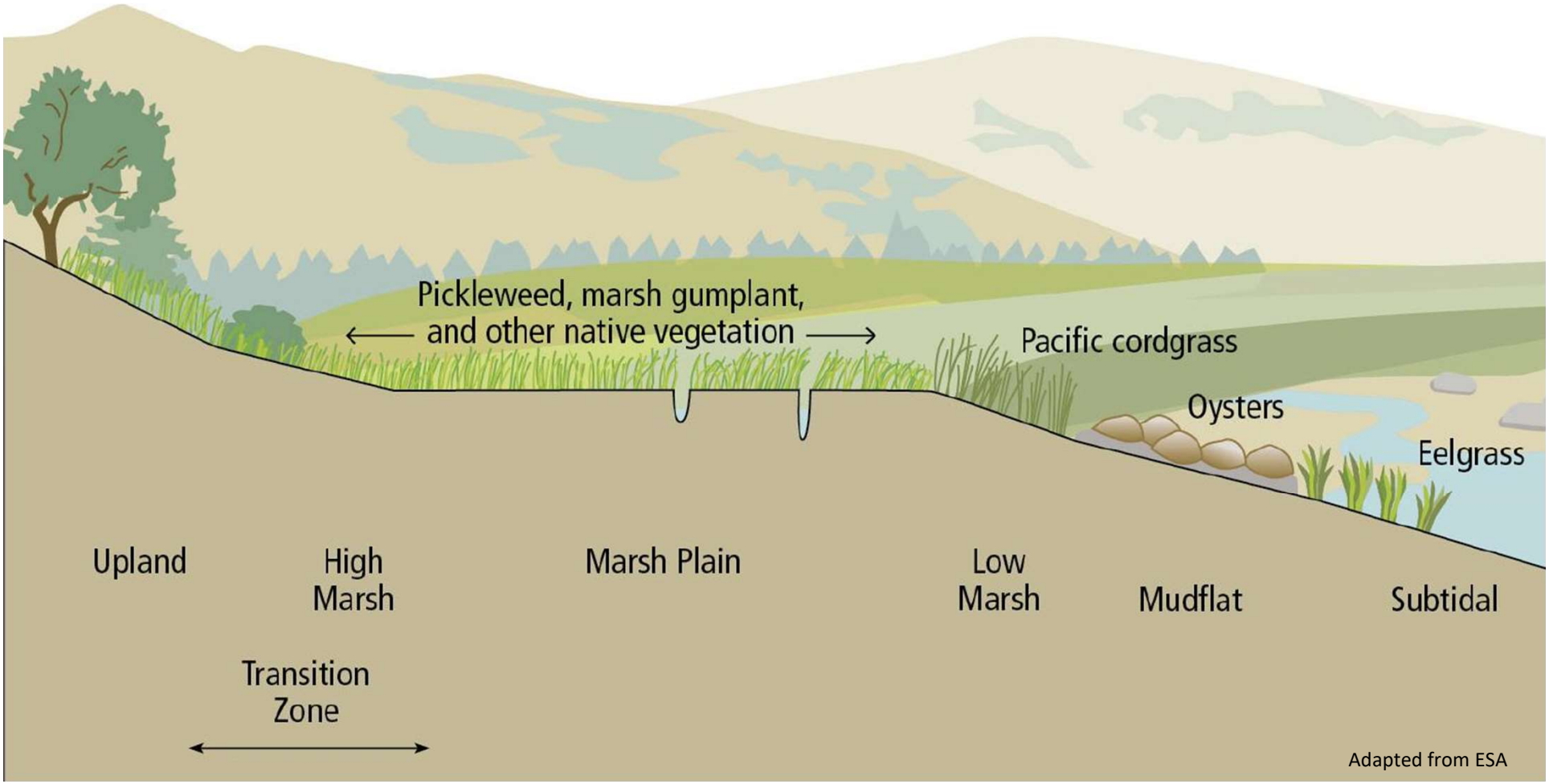
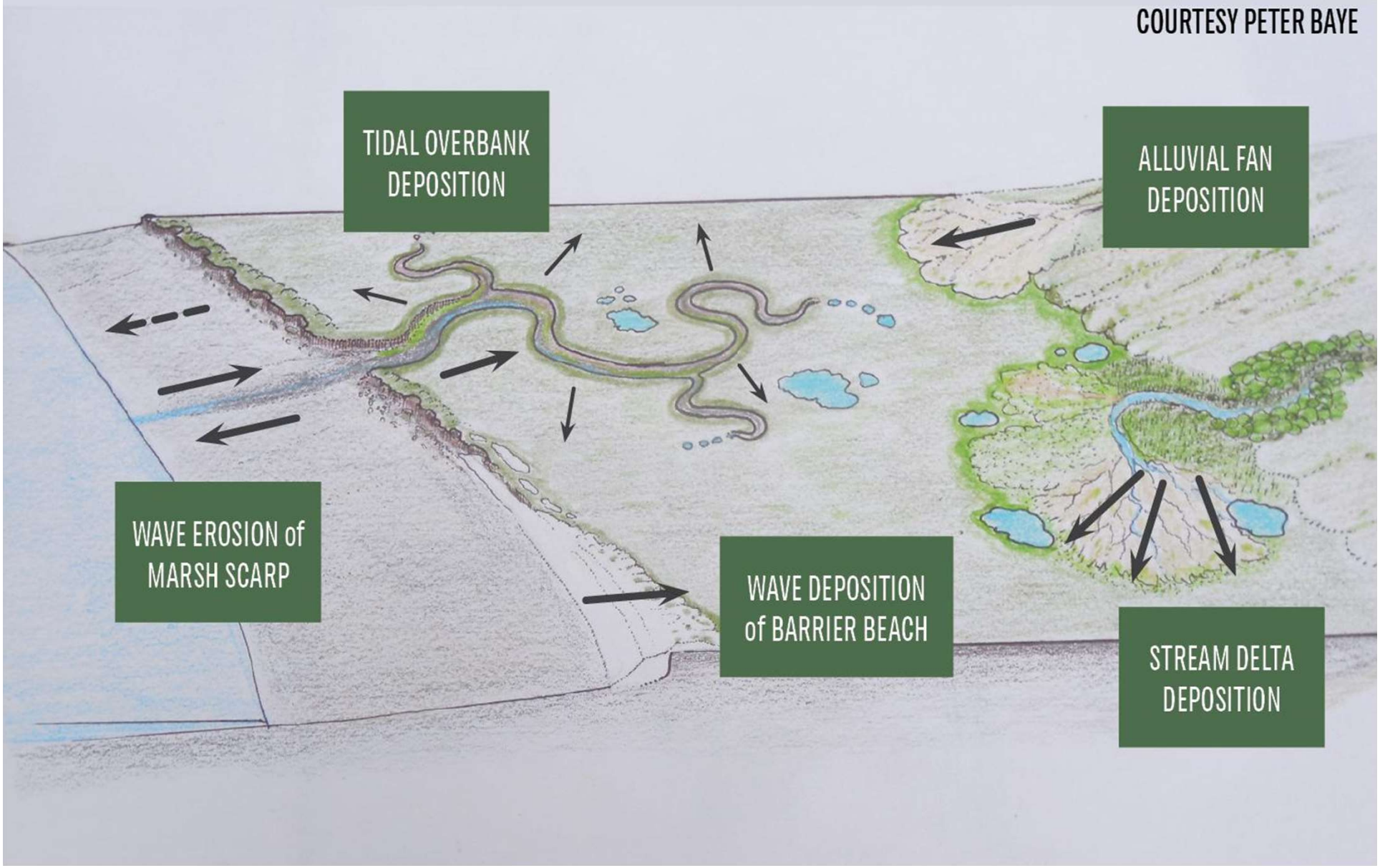
Restore COMPLETE SYSTEMS



Adapted from ESA

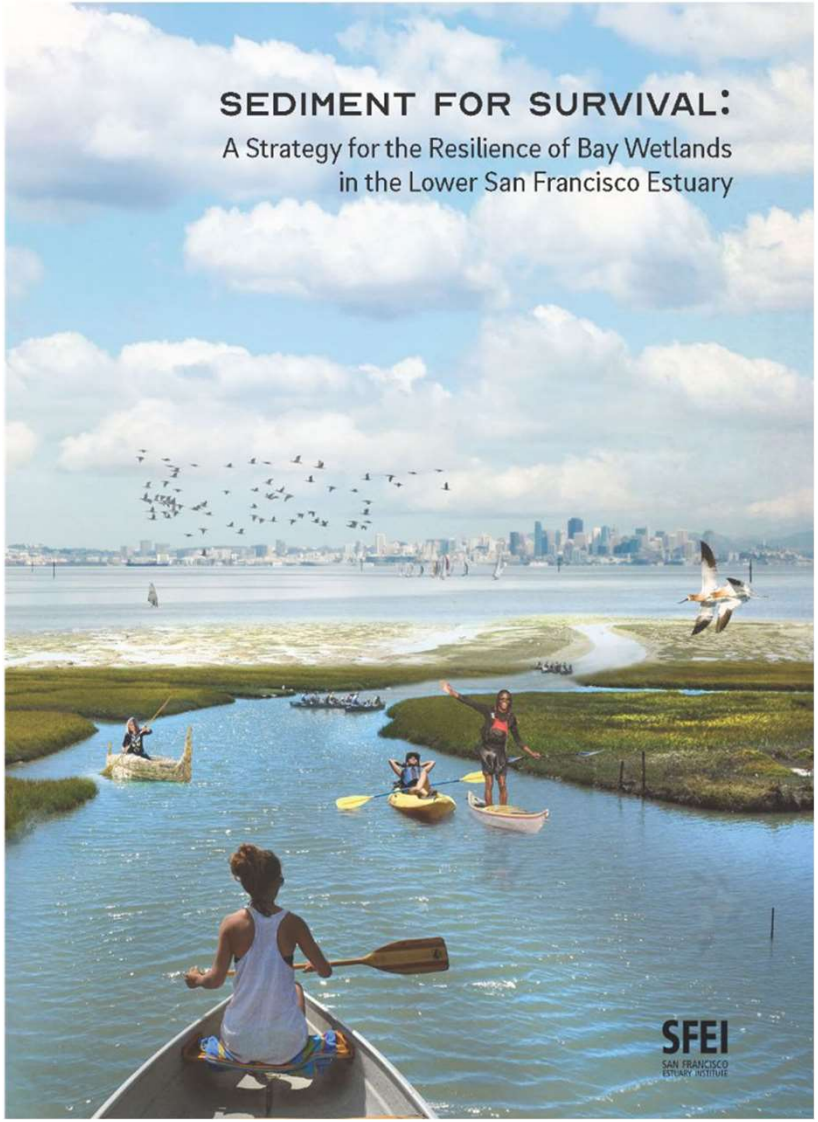
MEANS RESTORING *PROCESSES* NOT JUST PLACES



SEDIMENT IS A *precious resource*

Dave R

SEDIMENT IS A *precious resource*



Authors

SFEI

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Katie McKnight
Letitia Grenier

Strategic Adaptation Consultant

Nate Kauffman

Design and Cartography

SFEI

Ruth Askevold
Katie McKnight
Ellen Plane

FUNDED BY

San Francisco Bay Water Quality Improvement Fund, EPA Region IX

Regional Monitoring Program for Water Quality in San Francisco Bay

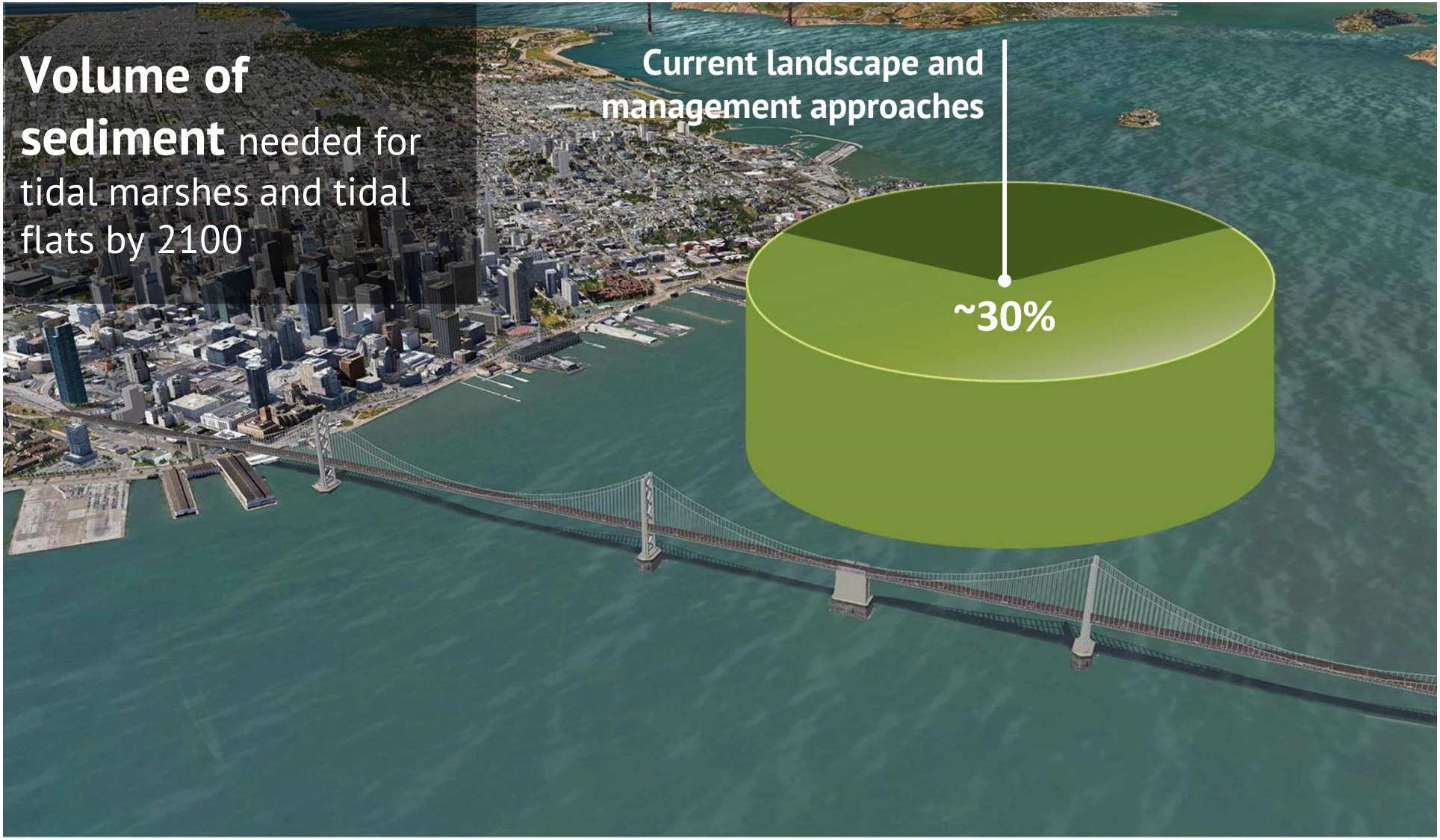
A PRODUCT OF **HEALTHY WATERSHEDS • RESILIENT BAYLANDS**

SAN FRANCISCO ESTUARY PARTNERSHIP

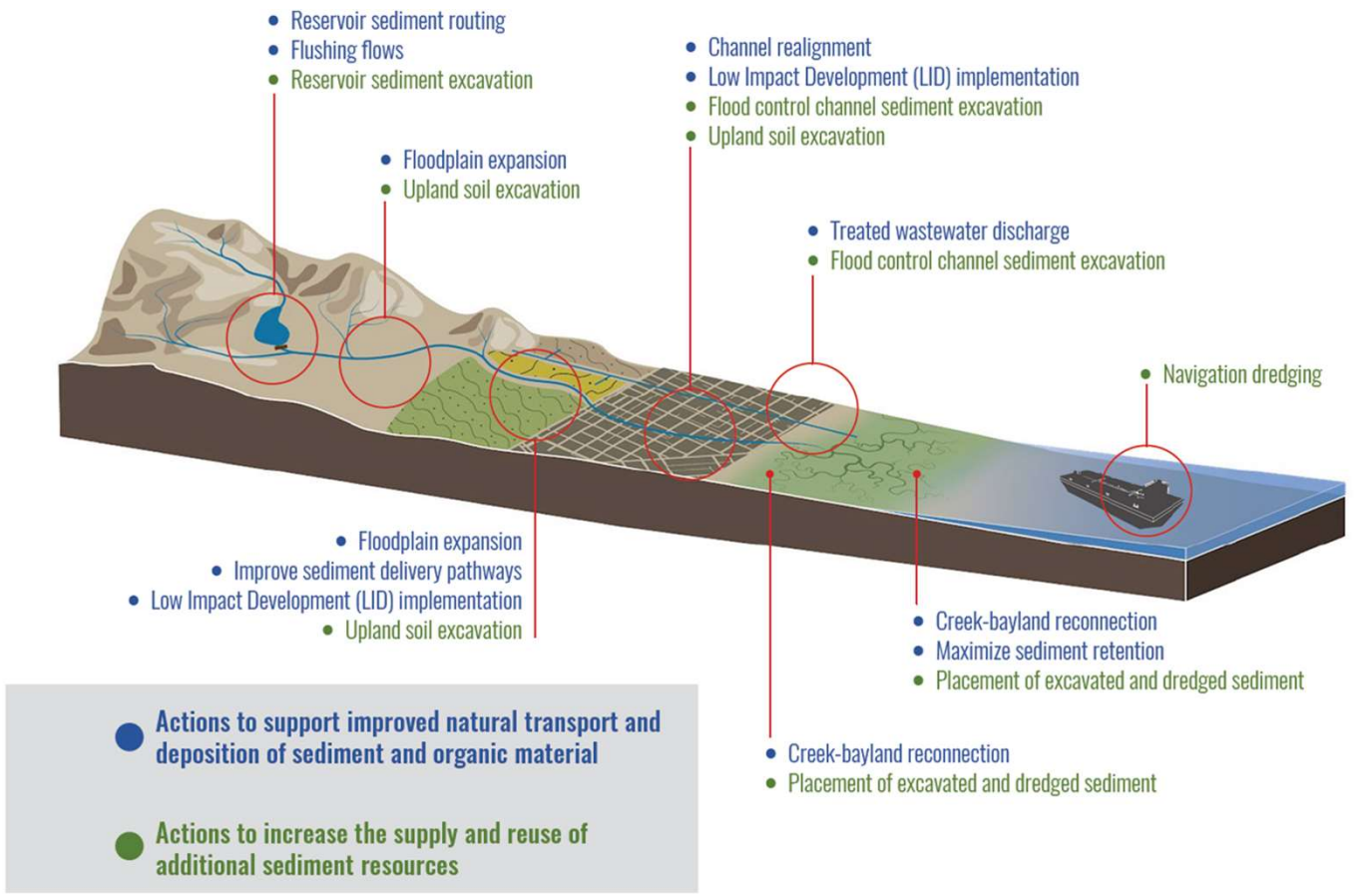
CALIFORNIA WATER BOARDS San Francisco - R2

bcdc

Bay Area FLOOD PROTECTION AGENCIES Association


Volume of sediment needed for tidal marshes and tidal flats by 2100
Current landscape and management approaches
~30%

Integrated Watershed-Baylands Management



Three Legged Strategy

- Dredged sediment from the Bay
- Migration space
- Watershed design and management
  - Reservoir sediment/water: pulsed flows, spill from bottom of reservoirs, slurry, dredge reservoirs
  - Floodplain restoration
  - Flood control channel dredging
  - Connect watershed runoff to baylands
    - Creeks into marshes (sediment, freshwater for peat)
    - Treated wastewater into marshes
  - Excavated dirt

Regional Recommendations

1	Restore estuary-watershed connections.
2	Design complexity and connectivity into the Baylands landscape.
3	Restore and conserve complete tidal wetlands systems.
4	Restore Baylands to full tidal action prior to 2030.
5	
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restore MARSHES BY 2030 IN AREAS WHERE THEY'RE LIKELY TO persist

Build up of sediment and vegetation takes time

Higher starting elevation means marshes survive sea-level rise for longer

Regional Recommendations

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5	Plan for the Baylands to migrate.
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PLAN FOR THE BAYLANDS TO *migrate*

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PLAN FOR THE BAYLANDS TO *migrate*

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PLAN FOR THE BAYLANDS TO *migrate*

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Shira Bezalel

MIGRATION SPACE

strategies

- *Acquire and conserve*
- *Construct (horizontal levee)*
- *Planned retreat*

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Regional Recommendations

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3	Restore and conserve complete tidal wetlands systems.
4	Restore Baylands to full tidal action prior to 2030.
5	Plan for the Baylands to migrate.
6	Actively recover, conserve, and monitor wildlife populations to avoid bottlenecks and buffer population sizes.
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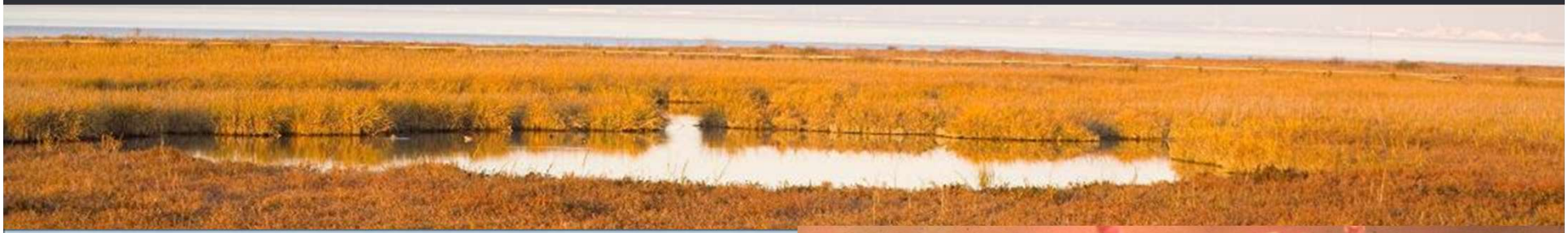
Wildlife Found Only in SF Bay Tidal Marshes



Not only endangered species……

California Vole

Salt Marsh Wandering Shrew

Western Harvest Mouse

Song Sparrow. Photo from PBCS by Tom Grey.

Savannah Sparrow

California Black Rail

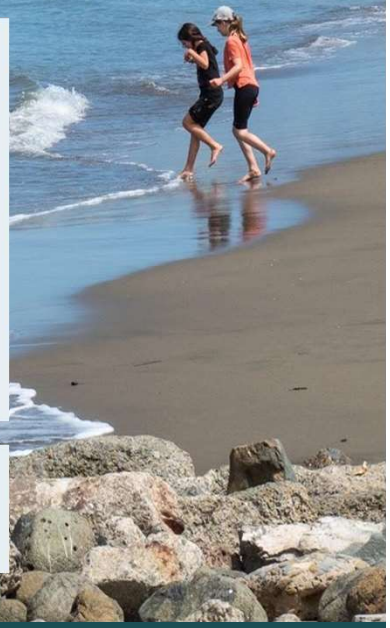
Salt Marsh Common Yellowthroat

Regional Recommendations

1	Restore estuary-watershed connections.
2	Design complexity and connectivity into the Baylands landscape.
3	Restore and conserve complete tidal wetlands systems.
4	Restore Baylands to full tidal action prior to 2030.
5	Plan for the Baylands to migrate.
6	Actively recover, conserve, and monitor wildlife populations.
7	Develop and implement a comprehensive regional sediment management plan.
8	Invest in planning, policy, research and monitoring.
9	Develop a regional transition zone assessment program.
10	Improve carbon management to prevent further subsidence, increase organic matter accumulation, reduce GHG emissions, and sequester more carbon.

ADAPTATION ATLAS

USING NATURE'S BOUNDARIES TO ADDRESS SEA LEVEL RISE



Julie Beagle, SFEI and Laura Tam, SPUR

Jeremy Lowe, Katie McKnight, Sam Safran, Letitia Grenier, SFEI

Photo by Shira Bezalel, SFEI

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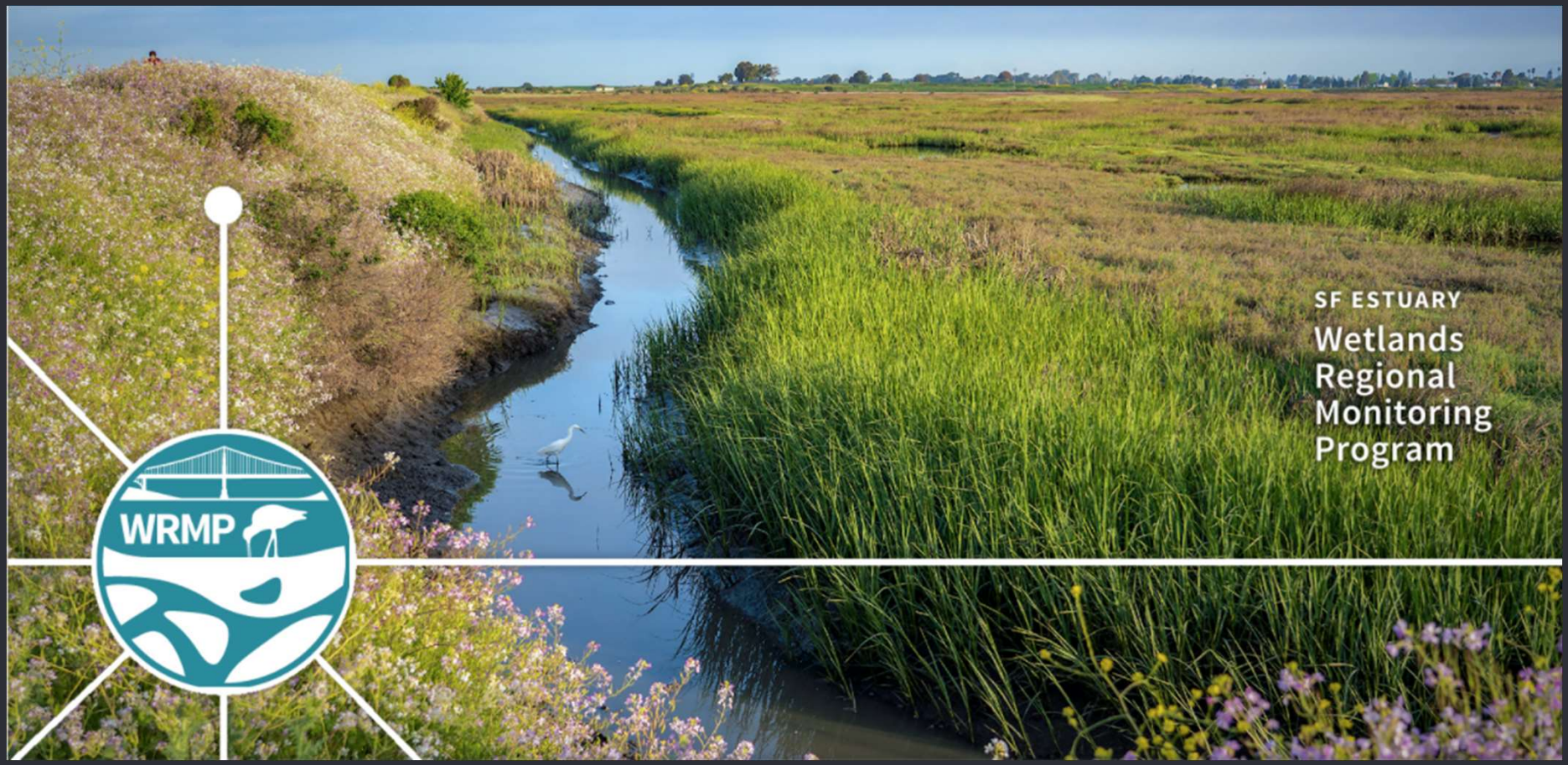
SPUR

Funding: **S.F. Bay Regional Water Quality Control Board**

With additional funding from the Bernard and Anne Spitzer Charitable Trust, the Marin Community Foundation, the Seed Fund, the Gordon and Betty Moore Foundation, and Google


SF ESTUARY
Wetlands
Regional
Monitoring
Program
WRMP

WE HAVE *choices to make*

FUNDERS

- *State Coastal Conservancy*
- *Gordon and Betty Moore Foundation*
- *Goals Update Steering Committee*

Thank You!

letitia@SFEI.org

behgu.aviandesign.net

Nate Kauffman