Baylands Ecosystem Habitat Goals Science Update 2014

Planning for healthy shoreline ecosystems for the next hundred years

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State Coastal Conservancy

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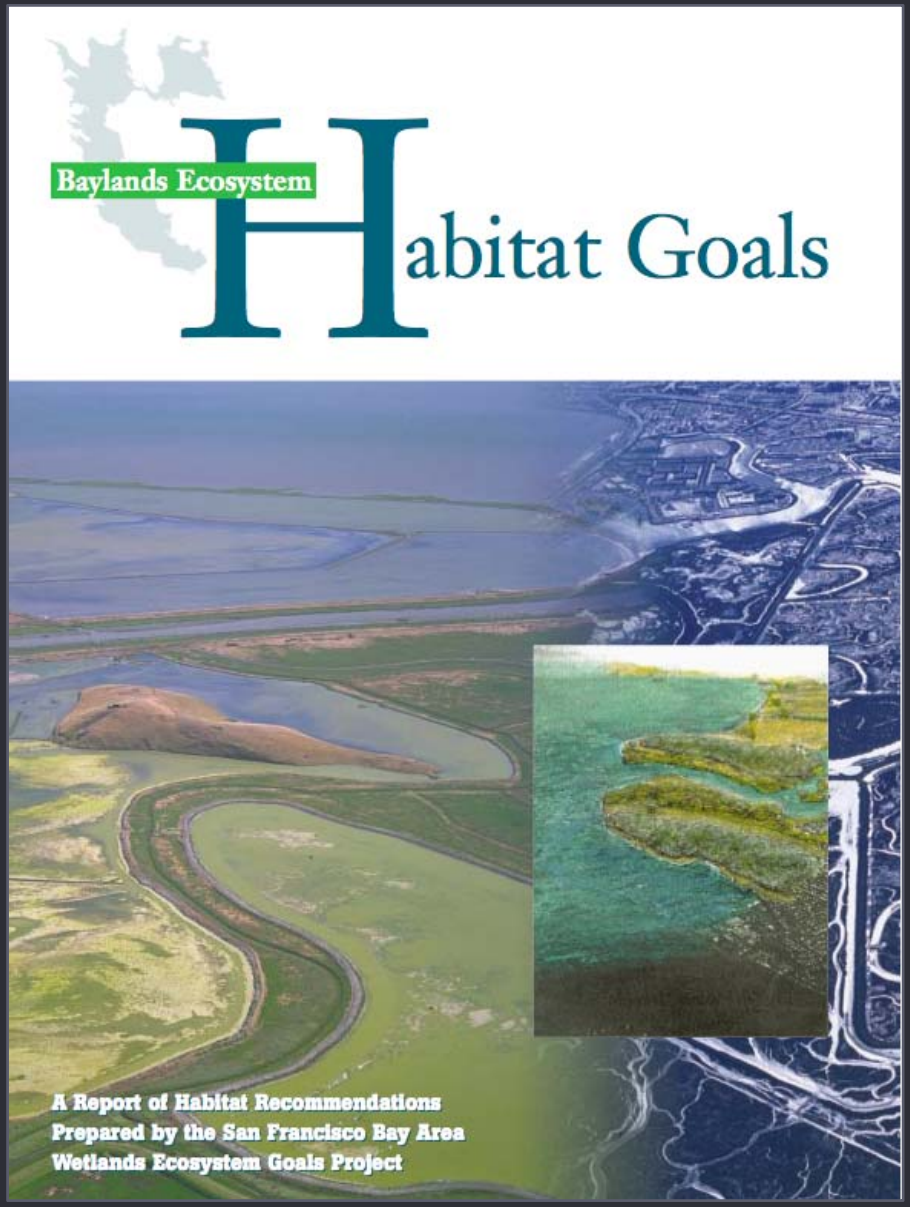
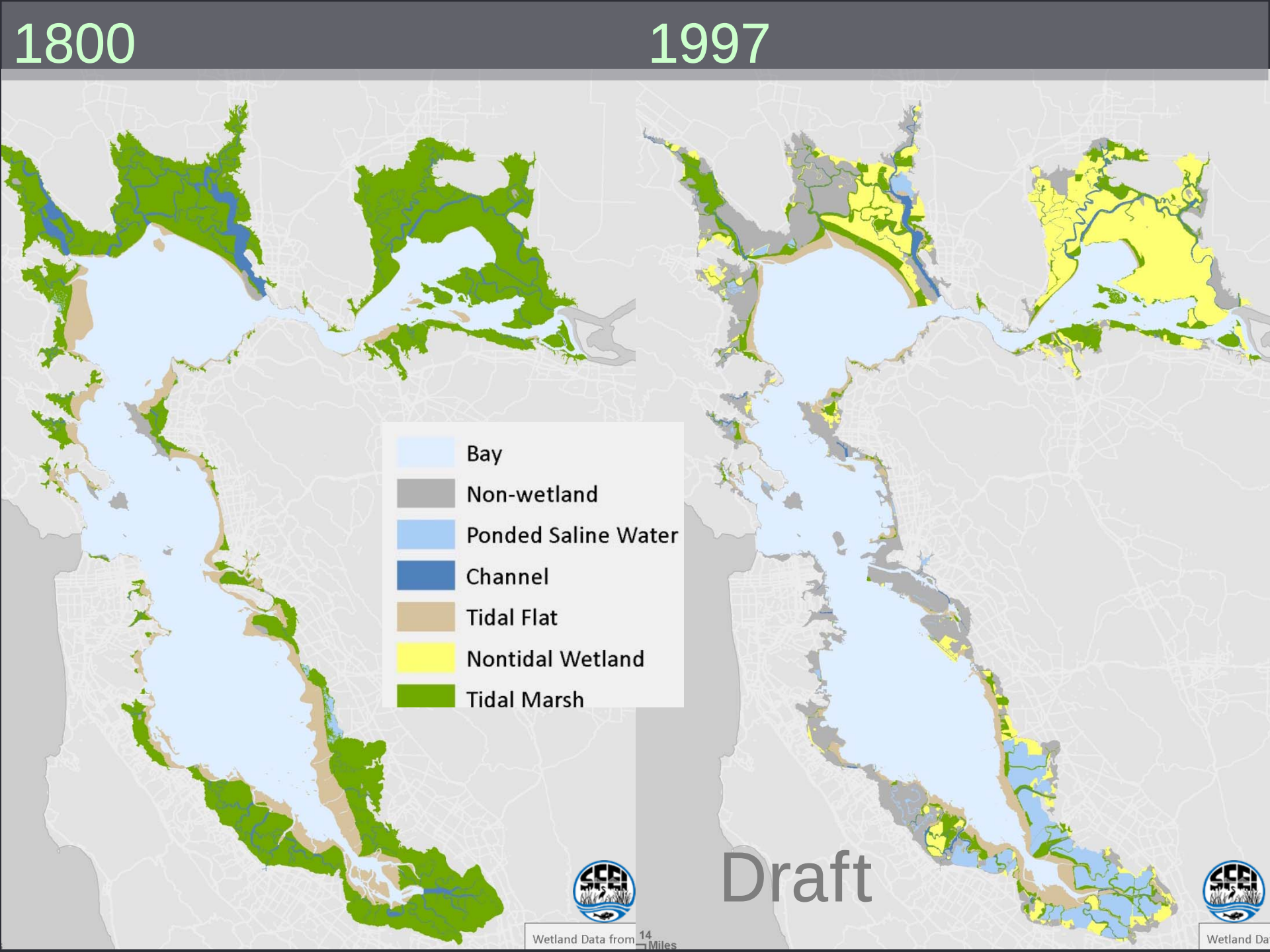
BAFPAA BAWN Conference
20 February 2014

Baylands Ecosystem Habitat Goals (1999)

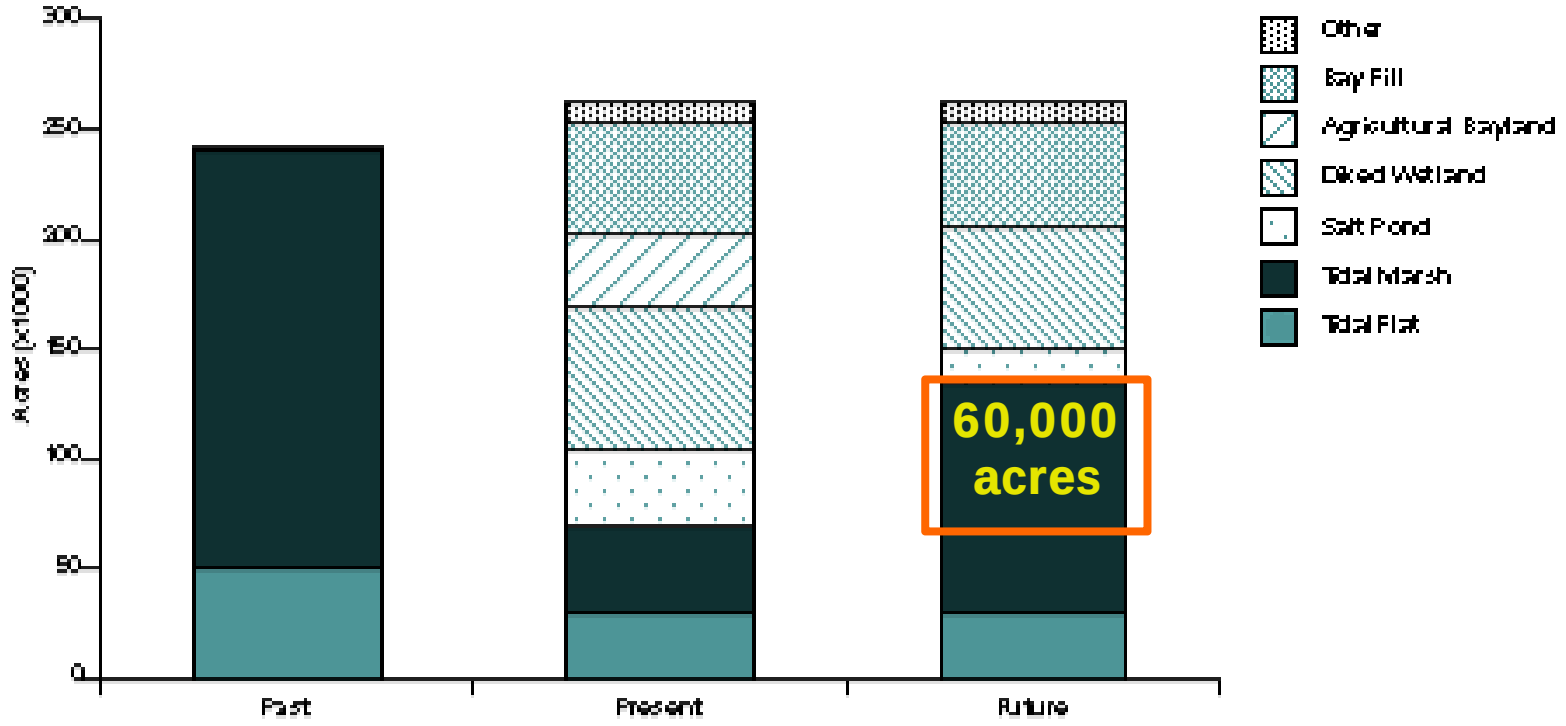


- Collaborative and inclusive
- Science synthesis
- Holistic goal of ecosystem health
- Inspired with a vision
- Specific recommendations
- Common mandate
- Unprecedented success


1800
1997
Bay
Non-wetland
Ponded Saline Water
Channel
Tidal Flat
Nontidal Wetland
Tidal Marsh
Draft
Wetland Data from
14
Miles
Wetland Da

Acreage Goals

FIGURE 5.1 **Past, Present, and Recommended Future Bayland Habitat Acreage for the Region**



Success of the Baylands Goals

- Largest restoration project went from 350 acres to 15,000 acres
- Written in to policy
  - Water Board, BCDC, SCC, SFBJV, etc.
- Dramatic increase in funding
  - SBSP, Prop 50, Restoration Authority
- Inspired other Goals projects
  - Uplands, Subtidal

THE BAYLANDS AND CLIMATE CHANGE: WHAT WE CAN DO

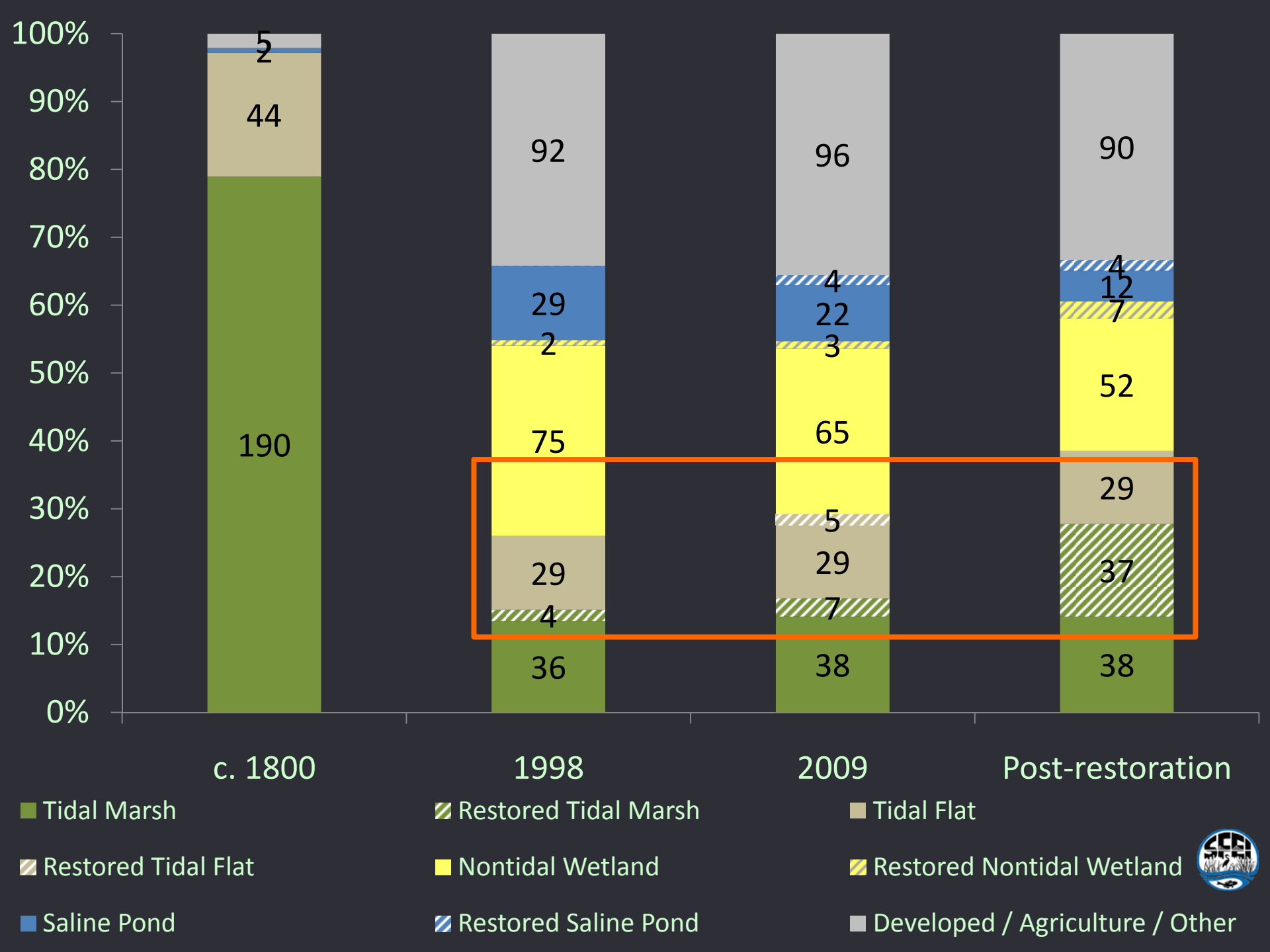
- Science synthesis and recommendations
- Effect of future change, especially climate change, on the Baylands
- Processes and functions in addition to habitat
- Due out later this summer

Project Structure

- Project Coordinator: Letitia Grenier, Ph.D.
- 21-member Steering Committee
- Science Review Panel
  - Chair: Glenn Guntenspergen, USGS Patuxent
- Science Contributors
  - ~120 Science experts
  - Organized into 5 workgroups with co-chairs

Science Chapters

- Conceptual model of landscape change
- Evolution of Baylands habitats over time and space
- Influence of a changing Bay
- Transition zone between Baylands and terrestrial edge
- Risks to wildlife (animals and plants)
- Carbon accounting and greenhouse gas flux


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
5
2
44
190
92
29
2
75
29
4
36
96
4
22
3
65
5
29
7
38
90
4
12
7
52
29
37
38
c. 1800
1998
2009
Post-restoration
Tidal Marsh
Restored Tidal Marsh
Tidal Flat
Restored Tidal Flat
Nontidal Wetland
Restored Nontidal Wetland
Saline Pond
Restored Saline Pond
Developed / Agriculture / Other

Drivers of Change

- Sea level rise
- Temperature
- Precipitation

- Sediment supply
- Freshwater inflows
- Salinity
- Nutrients

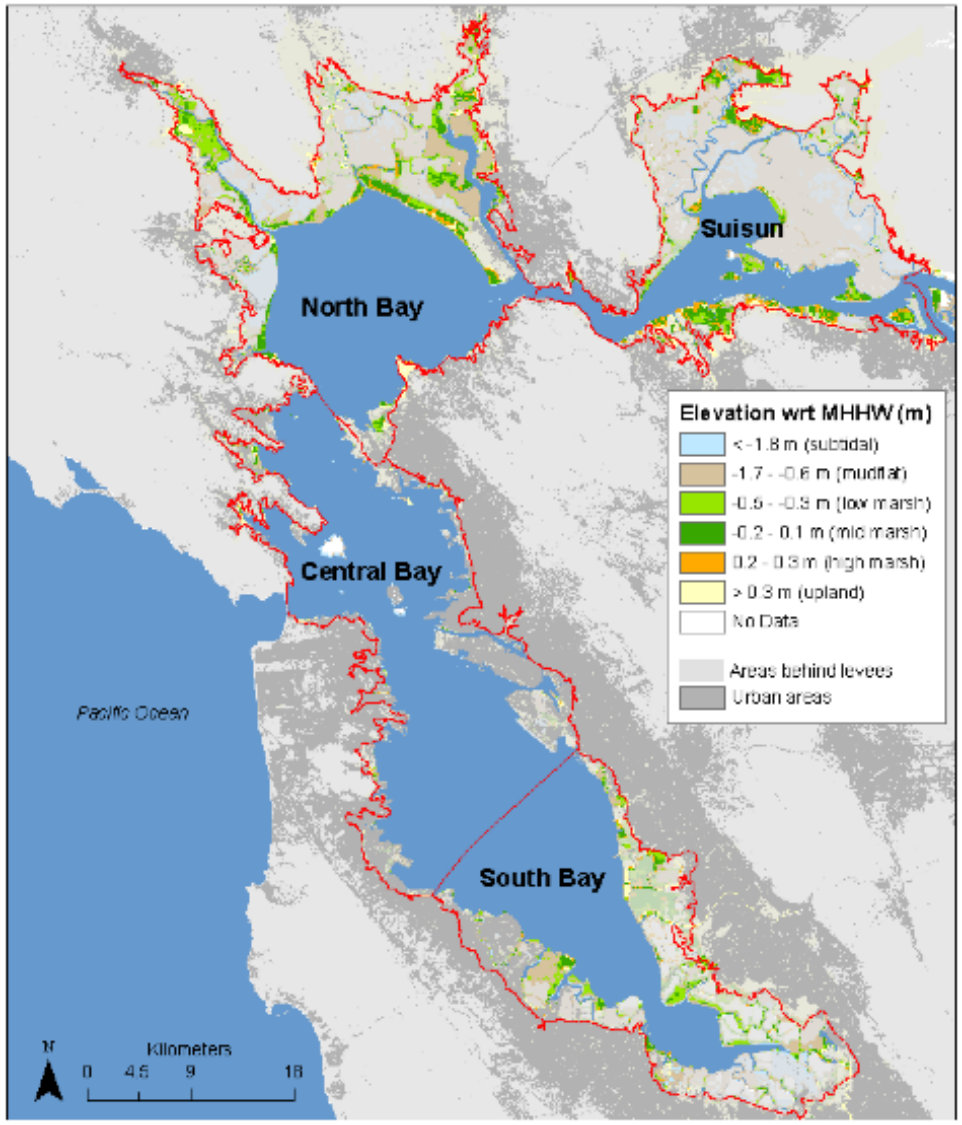
Future Scenarios

- Sea level rise projections for three time periods (NRC 2012)
  - 4–30 cm by 2030 (relative to 2000)
  - 12–61 cm by 2050
  - 42– 166 cm by 2100

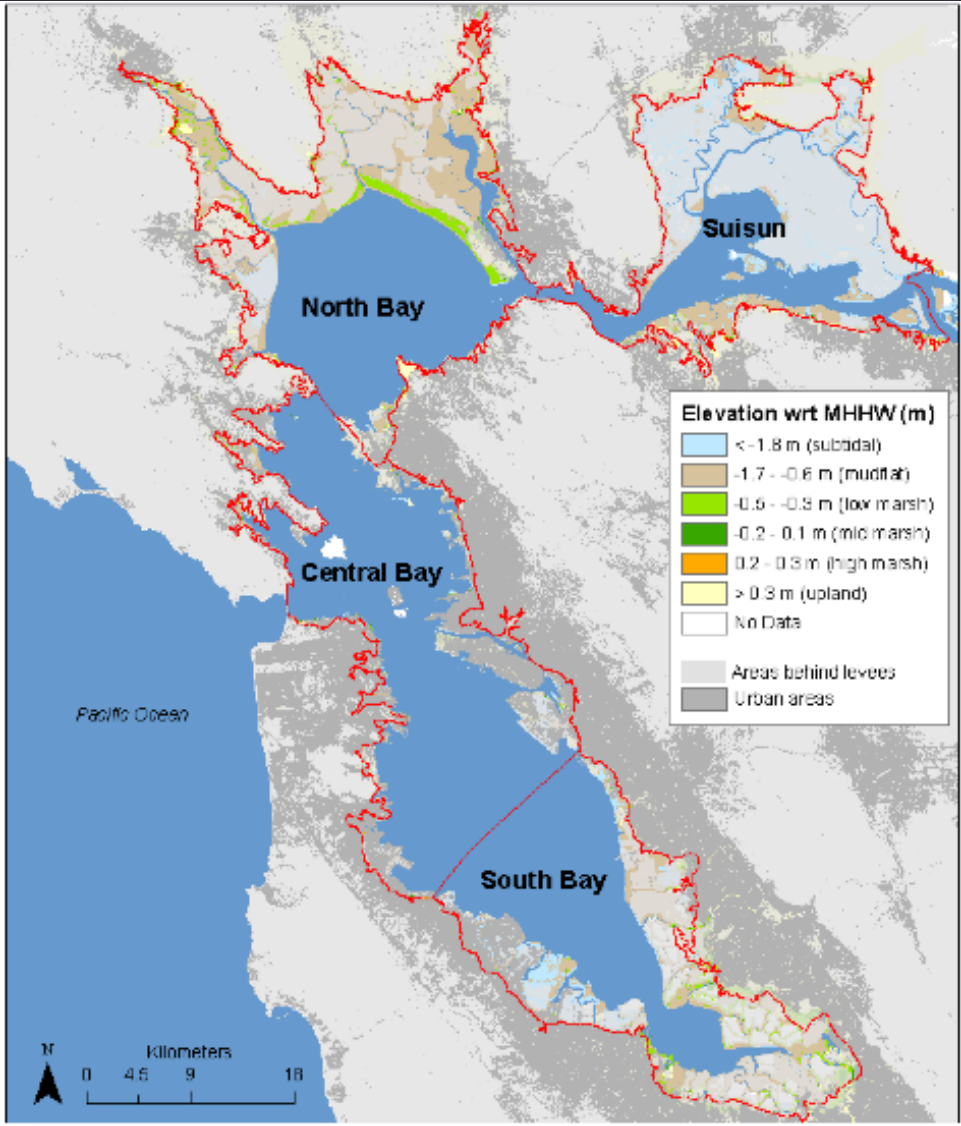
- High and low suspended sediment (Stralberg et al. 2011)
  - 25-150 mg/L
  - 50-300 mg/L

- CASCaDE downscaled projections for temperature, precipitation, snowmelt, runoff, and salinity (Cloern et al. 2011, Dettinger et al. 2008).
  - Ga: Much warmer and drier (GFDL model - accelerating A2 emissions)
  - Pb: Not so much warmer with no precipitation change (PCM model - B1 emissions)
- Winter storm event during El Niño and king tide

Now


Suisun
North Bay
Central Bay
South Bay
Pacific Ocean
Elevation wrt MHHW (m)
< -1.8 m (subtidal)
-1.7 - -0.6 m (mudflat)
-0.5 - -0.3 m (low marsh)
-0.2 - 0.1 m (mid marsh)
0.2 - 0.3 m (high marsh)
> 0.3 m (upland)
No Data
Areas behind levees
Urban areas
N
Kilometers
0 4.5 9 18

Later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No Data
Areas behind levees
Urban areas
N
Kilometers
0 4.5 9 18

Regional: Vision

- **Near-Term**
  - A diverse, connected mosaic of Baylands and adjacent habitat types
  - Complete tidal wetlands ecosystems
    - mudflats, low marsh, marsh plain, high marsh, natural levees along channels, and broad transition zones
- **Long-Term**
  - Viable Baylands habitat mosaics migrating landward in open spaces or up low-slope levees
  - Loss of habitat extent offset by better connectivity and management of stressors

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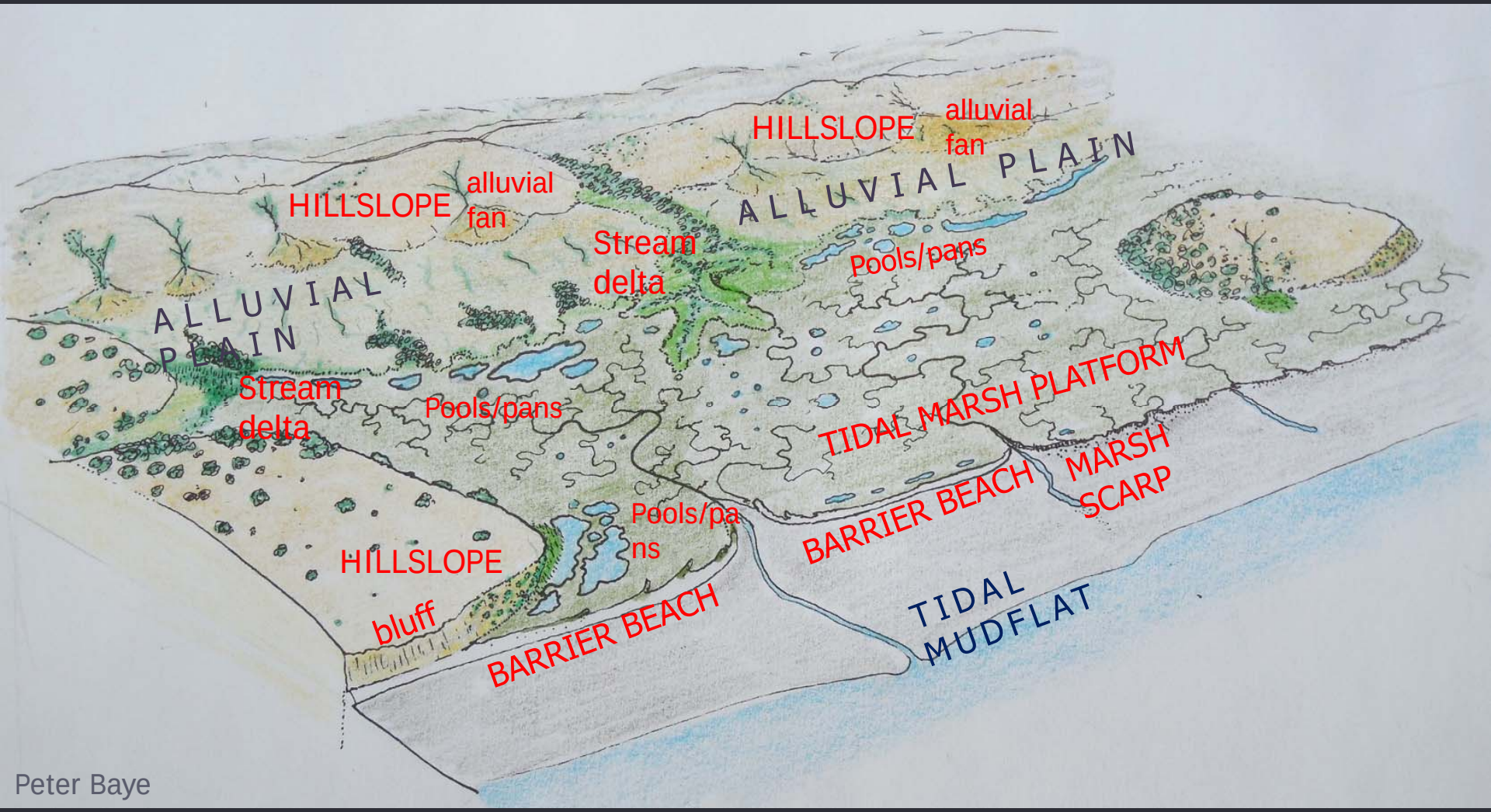
HILLSLOPE
alluvial fan
ALLUVIAL PLAIN
HILLSLOPE
alluvial fan
Stream delta
Pools/pans
ALLUVIAL PLAIN
Stream delta
Pools/pans
TIDAL MARSH PLATFORM
BARRIER BEACH
MARSH SCARP
Pools/pans
HILLSLOPE
bluff
BARRIER BEACH
TIDAL MUDFLAT

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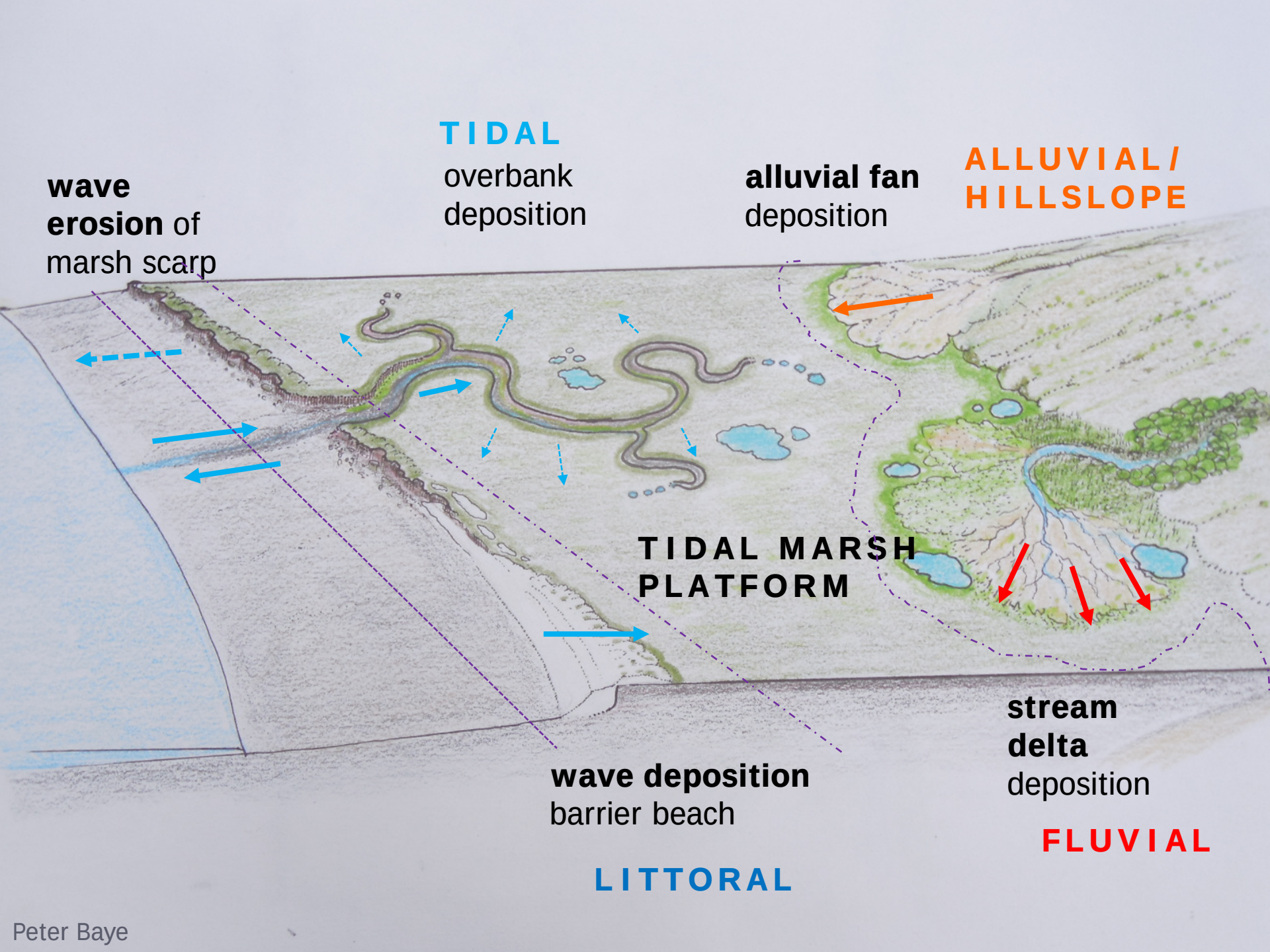
Overarching Recommended Actions

1. Use precious sediment and freshwater for restoration
2. Build in heterogeneity and gradients
3. Tighter adaptive management
4. Build a fire department
5. Educate the public


TIDAL
overbank
deposition
alluvial fan
deposition
ALLUVIAL/
HILLSLOPE
wave
erosion of
marsh scarp
TIDAL MARSH
PLATFORM
stream
delta
deposition
wave deposition
barrier beach
FLUVIAL
LITTORAL

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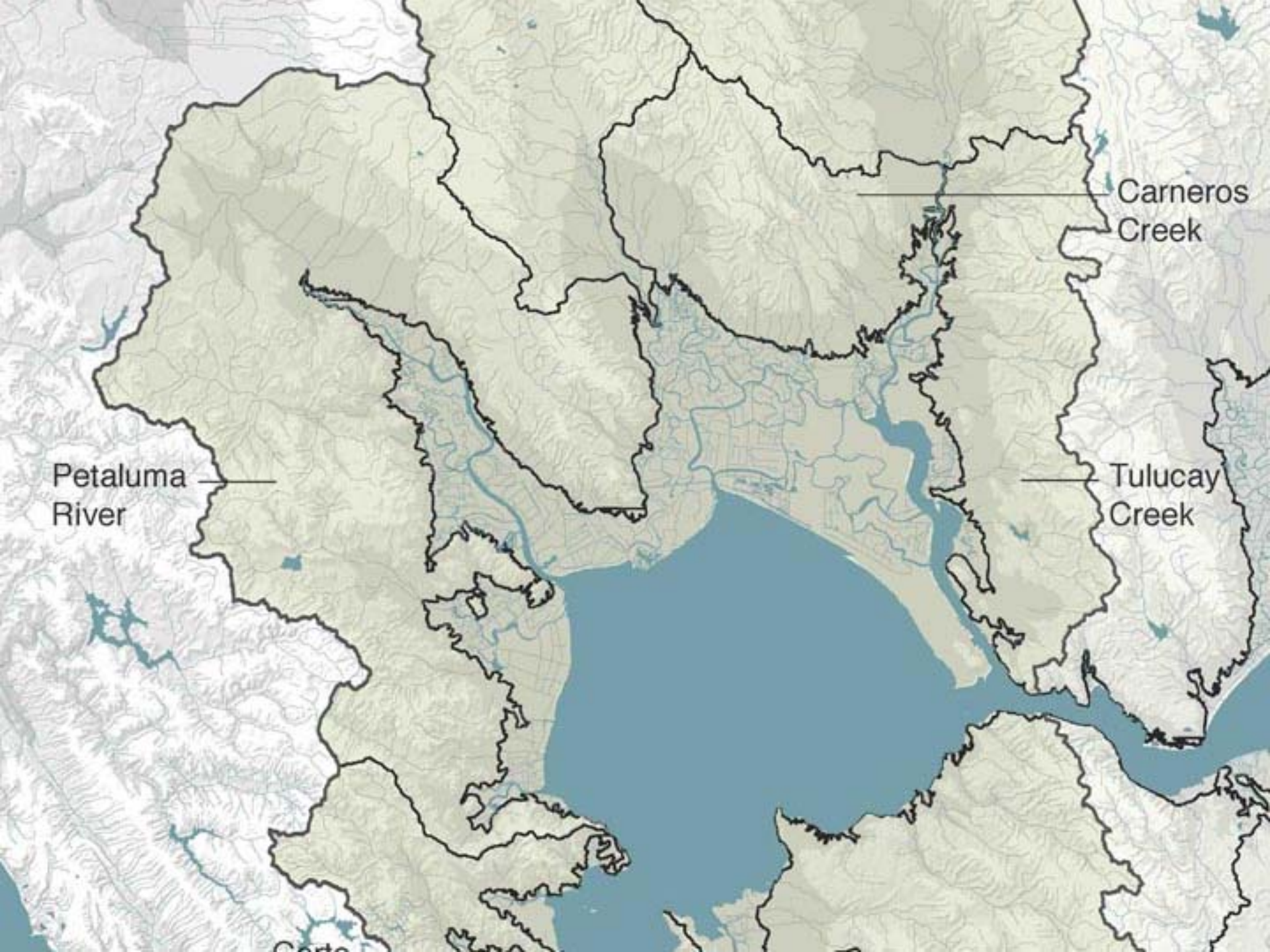
Regional: Actions to Accommodate Drivers of Change

- Restore earlier rather than later
- Use natural watershed sediment transport to nurture accretion of tidal marsh and adjoining Transition Zone
  - Restore natural connections between creeks and marshes
- Use local and regional, fine and coarse, sediment sources in the Baylands
- Identify and acquire existing Transition Zone as well as minimally developed lands within the projected future T-zone


Carneros
Creek
Petaluma
River
Tulucay
Creek

Regional: Actions for Restoration and Conservation

- Restore and connect large patches of tidal marsh (ideally > 1000 acres)
- Restore and connect tidal marsh along salinity gradients to enable species to move with changing conditions
- Optimize managed ponds and marshes to maximize wildlife habitat functions
- Establish natural transitions between the Baylands and adjacent terrestrial habitats
- Restore beaches, natural saline ponds, and other unique habitats

Marsh plains reduce flood risk

Photographs courtesy of John Callaway

Overall, a high, wide, vegetated bayland provides most flood risk reduction

Measures to decrease marsh edge erosion

Coarse beaches buffer wave erosion and preserve wide marsh

Outer Bair Island

Aramburu Island

Measures to increase vertical accretion

Mudflat and marsh recharge increase local sediment supply

Increasing channel density also increases sedimentation

China Camp (photographs courtesy of Peter Baye)

Measures to allow upland transgression

Create space to avoid coastal squeeze when sea level rise outpaces vertical accretion

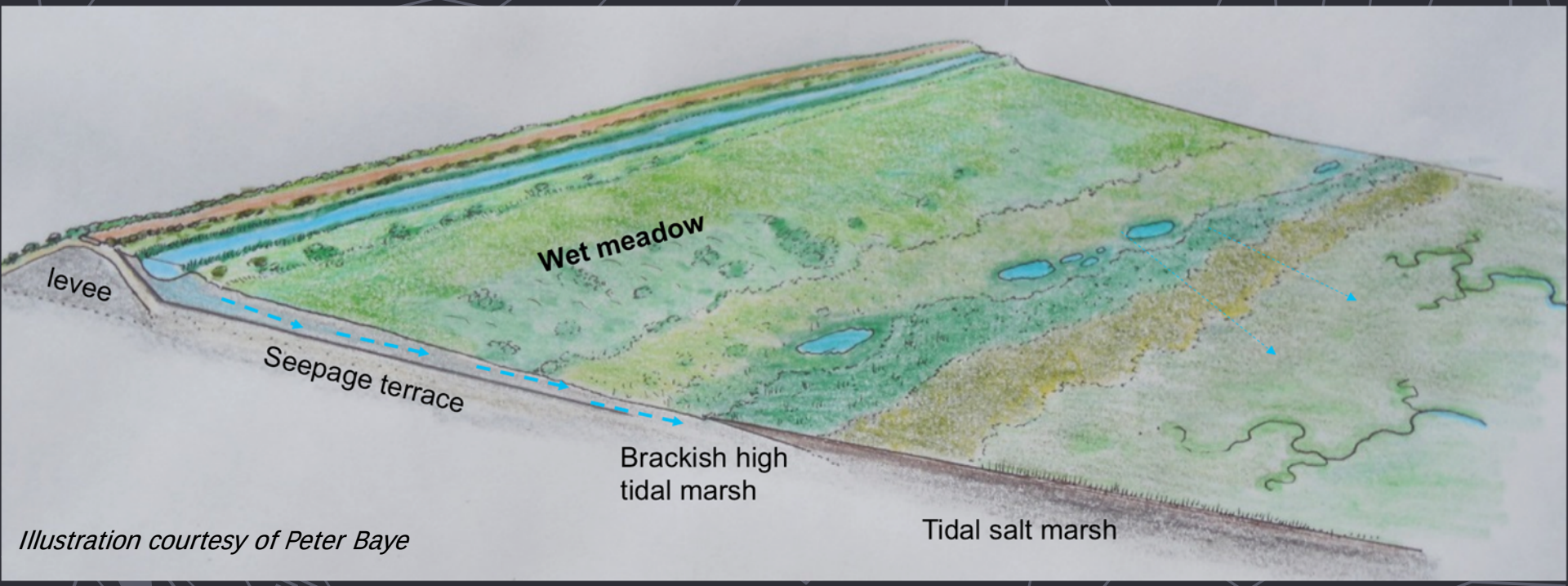


Illustration courtesy of Peter Baye

Take Home Messages

- Need to change how we do business
- Expect to invest more intensively in managing what we have
- Need integrated shoreline solutions AND wild places

Acknowledgements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Project Support

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

Thank You

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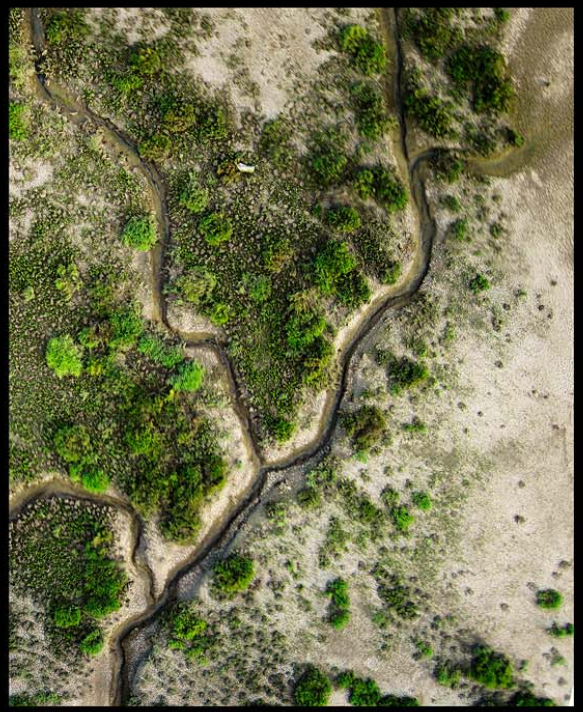
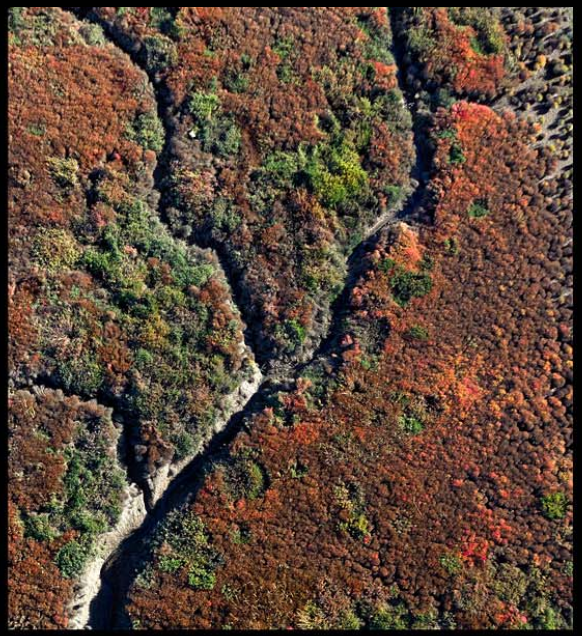
April 2008

September 2009



May 2010



October 2010

June 2011

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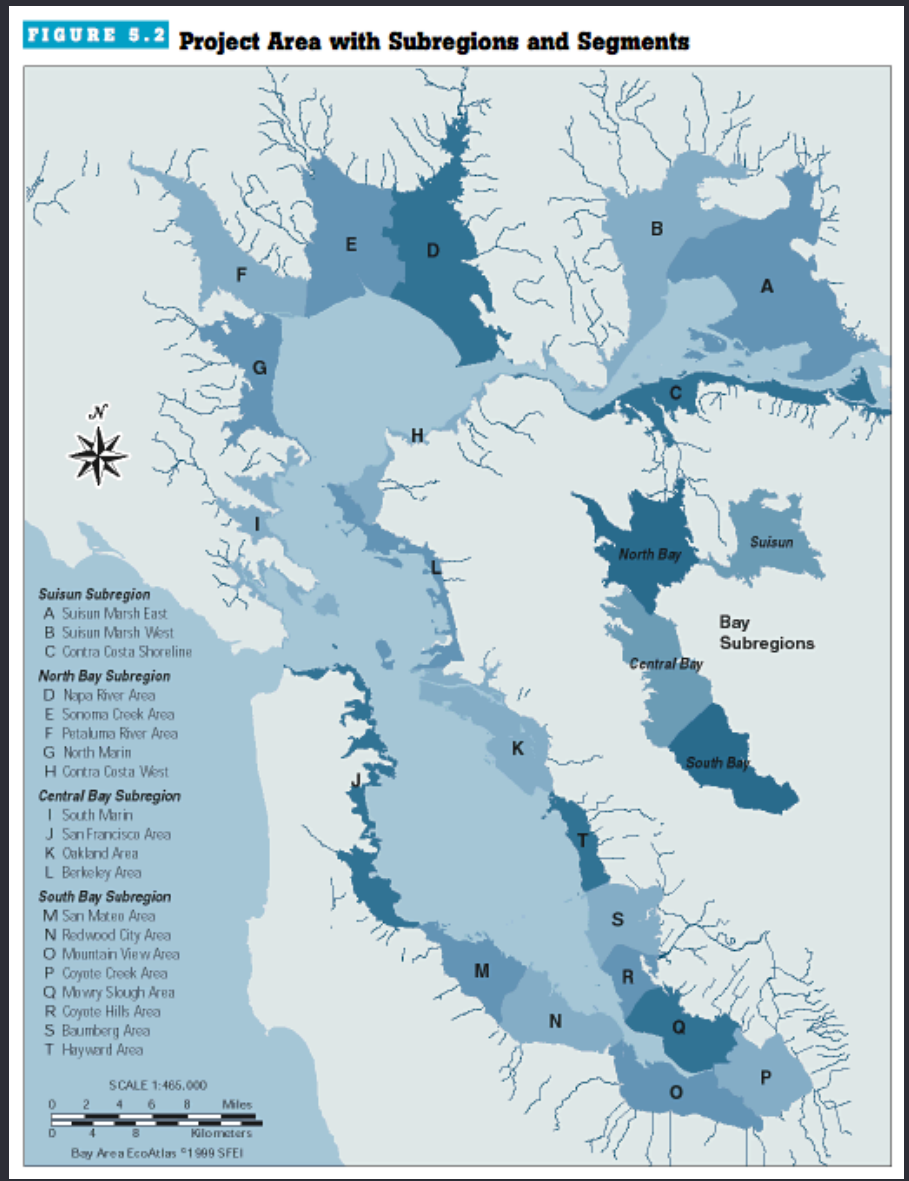
Spatial Extent and Scales

- Same as original Baylands Goals
- Geographic Scope
  - Through Suisun
  - Excludes Delta
- Spatial Scales
  - Region
  - 4 Subregions
  - 20 Segments



Science Review Panel Members

- Chair: Glenn Guntenspergen, USGS Patuxent
- Members
  - Jim Morris, U South Carolina
  - Joy Zedler, U Wisconsin
  - Dan Cayan, Scripps Institution of Oceanography
  - Peter Goodwin, Delta Science Program
  - Nils Warnock, Audubon Alaska

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

Deeper water requires a wider marsh