Strategies to Conserve Coastal Habitats in the face of Sea Level Rise

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Given sea level rise and existing land cover and management is no net loss possible?
Coastal California

- Biodiverse
- 67% natural habitat
- 31% conserved
- supports 159 imperiled species
Characterized larger coastal area for landscape conservation context

HABITATS:
22 wetland types
18 terrestrial types

BUILT ENVIRONMENT:
17 types
Habitat specific vulnerability

- 22 wetland types
- 18 terrestrial types

Species of concern
- 159 imperiled species
- 3 marine mammal
- 3 shorebird – nesting
High resolution site level spatial data e.g. El Cerrito

1 km² hexagonal analytic units

**Built Environment Groups**
- Transportation infrastructure
- Developed - high intensity
- Developed - medium intensity
- Developed - low intensity
- Other infrastructure
- Undeveloped uplands

**Habitat**
- Annual Grassland
- Freshwater Marsh
- Lakes / Ponds
- Irregularly-flooded Estuarine Marsh
- Regularly-flooded Estuarine Marsh
- Tidal Channel
- Tidal Flat and Salt Panne

Coastal Analytic Units
Vulnerability = Potential Impact / Adaptive Capacity

Habitat

(Exposure * Sensitivity) (room for Transgression)
Vulnerability = Area weighted average of all $V_{habitat}$ Index

Habitat
- Annual Grassland: $V = 0.3$
- Freshwater Marsh: $V = 0.1$
- Lakes / Ponds: $V = 0.5$
- Irregularly-flooded Estuarine Marsh: $V = 1.0$
- Regularly-flooded Estuarine Marsh: $V = 0.7$
- Tidal Channel: $V = 0.1$
- Tidal Flat and Salt Panne: $V = 1.1$

V$_{index}$ = 0.8
Vulnerability Index, 1.5 m sea level rise

- **0.0 – 0.5** (no Potential Impact)
- **0.5 – 0.8**
- **1.2 – 1.5**
- **1.5 – 1.9**
- **2** (no Adaptive Capacity)

59% of the area of California's coastal habitats are highly vulnerable to 5 feet of sea level rise.

- 39 rare, threatened, and endangered species are highly vulnerable to 5 feet of sea level rise
- 41,000 acres of coastal conservation lands are projected to be drowned by subtidal waters
Statewide Habitat Vulnerability
Statewide Habitat Vulnerability and Conservation Management Status

Key:
- Vulnerable non-conserved
- Vulnerable conserved
- Resilient non-conserved
- Resilient conserved
Conserve and Manage for Resilience

- **Resilient Conserved Habitat**
  Maintain the resilience and conservation status of existing conservation land.

- **Resilient Non-conserved Habitat**
  Invest in conserving resilient landscapes.

Important for *all* habitats

Critical for:
- Rocky intertidal
- Beaches
- Irregularly-flooded marsh
- Terrestrial habitats

With concerted action, California could *more than double* its area of conserved resilient habitats.
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**Vulnerable Conserved Habitat**
Manage in place for resilience to help habitat keep pace with sea level rise.

Critical for:
- Estuarine marshes
- Tidal flats
- Beaches
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Mitigate Potential Losses of Vulnerable Habitats

- **Vulnerable Non-conserved Habitat**
  Mitigate potential losses by adapting adjacent built environment and/or investing in potential future habitat.
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- **Potential Future Habitat**
  Invest in conservation and management that allows vulnerable habitat to transgress inland.

Critical to maintenance of habitat area

- Conserved Habitat
- Non-conserved Habitat
- Undeveloped Uplands
- Built Environment
Conserve and Manage for Resilience

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- **Potential Future Habitat**
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- **Exposed Built Environment**
  Adapt the built environment to enhance habitat area and function.
Hope for the Coast Campaign

VISION:
We will maintain and enhance California’s coast in the face of sea level rise, other climate change-induced challenges, and development. By working collectively and guided by science, we will ensure the coast is protected for future generations to enjoy, replete with as much or more habitat and wildlife, as well as social, economic, and recreational benefits, as we have today.
Hope for the Coast
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http://coastalresilience.org/project/hope-for-the-coast/
Study Area
Includes analytic zone, extends 5 miles inland from farthest extent of inundation from projected 5 feet of sea level rise.

Analytic Zone
Includes the area of current tidal range, mean lower low water (MLLW) to mean higher high water (MHHW), and up to a contour twice the vertical elevation of projected sea level rise.

Analytic zone on the ground
This image from Santa Cruz County shows how the analytic zone lies on the ground (red polygon). The area inside the analytic zone represents a realistic zone of influence for sea level rise. Differences in slope and topography determine the area of the analytic zone as it follows an elevation contour five vertical feet above projected sea level rise. Image © DigitalGlobe
Built Environment Categories

- Transportation infrastructure
- Developed - high intensity
- Developed - medium intensity
- Developed - low intensity
- Other infrastructure
- Undeveloped uplands

% of total area of built environment within analytic zone

North Coast

Central Coast

South Coast

Sonoma County
Napa County
Solano County
Sonoma County
San Mateo County
Alameda County
Santa Clara County
Santa Cruz County
San Francisco County
Contra Costa County
Sonoma County
Coronado County
San Diego County
Ventura County
Los Angeles County
Santa Barbara County
Orange County

0 15 30 Km
1 in = 55 km
0 15 30 Km
1 in = 55 km
0 15 30 Km
1 in = 48 km
59% of the area of California’s coastal habitats is highly vulnerable to 5 feet of sea level rise.

- Resilient Conserved Habitat: 19%
- Resilient Non-conserved Habitat: 22%
- Vulnerable Conserved Habitat: 30%
- Vulnerable Non-conserved Habitat: 29%

Non-Habitat
- Potential Future Habitat
- Exposed Built Environment

Conserved Habitat
Non-conserved Habitat
Undeveloped Uplands
Built Environment