Santa Barbara Area Coastal Ecosystem Vulnerability Assessment

Funders:
- NOAA Climate Program Office
- Sea Grant (National Office)

Objective: To provide a vulnerability assessment focused on coastal ecosystems for the Santa Barbara area
Research Team

- Scripps/RISA
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- California Sea Grant
  - Monique Myers
  - Carey Batha

- UCSB Coastal LTER
  - Jenny Dugan
  - Mark Page
  - John Melack

- USGS
  - Patrick Barnard
Community Partners

- City of Carpinteria
  - Jackie Campbell

- City of Goleta
  - Anne Wells

- City of Santa Barbara
  - Rosie Dyste
  - Debra Andaloro
  - John Ledbetter (retired)

- County of Santa Barbara
  - Heather Allen
Process

- Climate downscaling
- CoSMoS hazard modeling

Vulnerability of
- Beaches
- Wetlands
- Watersheds
Geographic scope
Climate downscaling

- Methodology: Statistical downscaling of GCMs
- Products: Hourly precipitation and temperature data

Downscaled to 6-km grid

Downscaling Resolves Regional Precipitation Features
Climate downscaling

Climate downscaling

Precipitation:
Projected Period (2070-2099) – Historical Period

RCP45
Annual Precipitation (2070-2099): Change from Historical
Multi-Model Mean No. of Models = 10 Scenario: RCP45

RCP85
Annual Precipitation (2070-2099): Change from Historical
Multi-Model Mean No. of Models = 10 Scenario: RCP85

* Denotes at least 80% of models agree on sign
Historical Period: 1970-1999

Change from Historical (%)
Climate downscaling

Daily $T_{\text{MIN}}$ (low temperature): Historical Period 1970-1999
Climate downscaling

Daily $T_{\text{MIN}}$: Projected Period – Historical Period

Mean Tasmin (2070-2099): Change from Historical
Multi-Model Mean No. of Models = 10 Scenario: RCP45

Temperature Difference (deg C)

-1.40 -1.53 -1.65 -1.75 -1.91 -2.04 -2.16 -2.29 -2.42 -2.55 -2.67 -2.80
CoSMoS

- Physics-based numerical modeling system for assessing coastal hazards on West Coast
- Long-term coastal change
- Downscaled winds for local seas and surge
- Discharge from rivers for event response and sediment supply
- Scenarios and products designed to directly support LCP updates AND new Coastal Commission SLR guidance
- Directly supporting SB CEVA Project
Beaches

Credits: Dave Hubbard, Alan Pitcairn, Wikipedia Commons, Callie Bowdish
Beaches

Current elevation range of habitat “bands”: lower, mid, and upper beach biota

Sea level rise and shoreline change (CoSMos)

Position of future habitat bands

Upper beach zones are lost as beach in front of seawall is inundated
Wetlands

Endangered plants & animals

Biodiversity

Nursery habitat

Socio-economic value

Food chain support
Wetlands

- Three locations
  - Carpinteria Salt Marsh
  - Goleta Slough
  - Devereux Slough

Attach inundation frequencies to habitat types: subtidal, mudflat, low march, mid marsh, high marsh, uplands.

Inundation regime

Habitat & Vegetation Mix

Credit: Sadro et al. 2007

Sea level rise and accretion scenarios

Future habitat distribution
Watersheds

Hourly precipitation forecast → Future creek discharge → Flood management

Future creek discharge → Sediment & sand delivery to coast
Coordination

- Review of Draft LCP policies
- Review City of Santa Barbara’s habitat maps
- Identifying specific focus areas for the report
  - Pilot project ideas
  - Specific locations: e.g. access points to Carp Salt Marsh, etc.
  - Specific policies: e.g. dune policies in Goleta’s CAP
Example: Carpinteria
Lessons Learned

- Flexibility is important
- Coordinating timelines is important
- Create opportunities for reciprocal exchange of information between parties involved