Fostering Climate Resiliency in Coastal Marin

CA Coastal Resilience Network, January 10, 2017

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Sea Level Rise Adaptation Process

1. Identify Assets
2. Assess Vulnerability
3. Evaluate Adaptations
4. Plan Action
5. Implement & Monitor
Identifying Future Risk with CoSMoS

1. Global forcing using the latest climate models

2. Drives global and regional wave models

3. Scaled down to local hazards projections
### NRC Sea-Level Projections*

<table>
<thead>
<tr>
<th>Sea Level Rise amount</th>
<th>No storm</th>
<th>Annual storm</th>
<th>20-year storm</th>
<th>100-year storm</th>
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</thead>
<tbody>
<tr>
<td>0'0&quot;/ 0 cm</td>
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<tr>
<td>0'10&quot; / 25 cm</td>
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<tr>
<td>1'8&quot; / 50 cm</td>
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<td>2'6&quot; / 75 cm</td>
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<td>3'3&quot;/ 100 cm</td>
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<tr>
<td>4'1&quot;/ 125 cm</td>
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<tr>
<td>4'11&quot;/ 150 cm</td>
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<tr>
<td>5'9&quot;/ 175 cm</td>
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<tr>
<td>6'7&quot;/ 200 cm</td>
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<tr>
<td>16'5&quot;/ 500 cm</td>
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</tbody>
</table>

- **C-SMART Scenario**

*NAS-NRC, 2012*
Geomorphic Change
**Asset Mapping & Inventorying**

- Agricultural land
- Protected areas
- Public beaches and parks
- Dunes
- River & streams
- Wetland areas
- Habitat areas
- Oyster beds
- Sandspits
- Shorebirds
- Roads and transportation
- Trails
- Buildings
- Residential development
- Commercial buildings
- Schools
- Elderly/mobility limited facilities
- Hotels/Motels
- Harbors and marinas
- Fishing, aquaculture facilities
- Utilities & services
- Septic leach fields
- Water Supply wells
- Archeological/Paleontological sites
- Historic sites

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Community Development Agency
Fostering Climate Resiliency in Coastal Marin
1/10/17
marinslr.org
Stinson Beach

Exposed Assets

1. Stinson Beach
2. State Highway 1
3. California Coastal Trail
4. Picnic Area
5. Stinson Beach Parking Lots
6. Commercial/Residential Development
7. Bolinas Lagoon
8. Tsunami Evacuation Route
9. Emergency Generator
10. Fire Station
11. Water District Office

Additional Natural Resources include Steelhead Trout habitat, Harbor Seal Haul Outs, Brown Pelican Roosting Sites, Wetlands

Sea Level Rise (SLR) Scenarios

- Baseline No SLR/ No Storm
- 25 cm (0'10") SLR w/ Annual Storm
- 25 cm (0'10") SLR w/ 20 year Storm
- 50 cm (1'8") SLR w/ 20 year Storm
- 100 cm (3'3") SLR w/ 100 year Storm
- 200 cm (6'6") SLR w/ 100 year Storm

Properties Exposed

- 2
- 120
- 398
- 490
- 250

This map was developed for planning and discussion purposes. The County of Marin is not responsible or liable for use of this map beyond its intended purpose. This map is representative only and does not constitute an official map or dataset of the County of Marin.
The Vulnerability Assessment Tool

C-SMART
Collaboration Se:
Asset Vulnerability
COUNTY OF MARIN

Interviewer:

Interviewee:

Relationship:

Instructions to GD:

Thank you for agreeing to be in this interview. We hope that you find it interesting. By participating, you are helping to assess the vulnerability of several public assets and your town. These assets are:

1.

2.

3.

We know that this process could take 30 minutes per asset, and that the interview is sensitive to questionnaires, followed by reading aloud of the interview questions. Completing this for each asset will enable information gathering.

Before you start, do you have any questions? (Show GD)

GD: We will get started with the first asset of need. The first asset is the [Asset Name]. [GD inquires about the current condition of the asset, the risk level, and any recent updates or plans for maintenance or repair.]

GD: Thank you. Please consider how the following were the next storm surge exposures could impact [Asset Name]. The exposures include:

- Alluvial Filling
- Saltwater Intrusion
- Permanent Flooding
- Temporary Flooding
- Wave Impact
- High-Water Events
- Beach/Cliff Erosion
- Nuisance

Do you have any questions about what any of these exposures are? (Show GD and clarify if needed)

For the next, we will address sensitivity, define adaptive capacity, and plan for action. For the sensitivity assessment, the asset is defined as the degree of asset could be damaged or the service it provides disrupted. Please indicate if:

[GD shows a scale for sensitivity, ranging from 1 to 5, with labels: Low, Medium, High, Very High, and Extreme.]

GD: We will now assess the adaptive capacity of the asset for each exposure. Do you have any questions about the adaptive capacity of the asset or how it would be affected by the next storm surge event?

GD: We will now assess the actions that your agency has taken to prepare for the next storm surge event. Do you have any questions about your agency's preparedness for the next storm surge event?

GD: We will now assess the actions that your agency has taken to prepare for the next storm surge event. Do you have any questions about your agency's preparedness for the next storm surge event?
Vulnerability Assessment

- Executive Summary
- Introduction
- Methods
- Asset Profiles
  - Parcels & Buildings
  - Transportation
  - Utilities
  - Working Lands: Agriculture & Aquaculture
  - Natural Resources
  - Recreation
  - Emergency Services
  - Historic & Archeological Resources
- Coastal Zone Community Profiles
  - Muir Beach
  - Stinson Beach
  - Bolinas
  - Inverness
  - Point Reyes Station
  - East Shore
  - Dillon Beach
- Conclusion
- Append A: Workshop Summary
- Append B: Exposed Asset Tables
- Append C: Vulnerability Assessment Interview Tool
- Appendix D: ESA Memorandum on Marsh and Beach Shifts
Combined Riverine and SLR Flooding
Game of Floods: Pt. Reyes Station
## LCP Response to Sea Level Rise

### County Proposal

Facilitates adaptive management approach to address Sea Level Rise

| Elevates structures 3 feet above FEMA based on best available science |
| Provides flexibility to raise existing homes to meet FEMA and Sea Level Rise projections |
Example of Future Building Elevation with 3 feet of Sea Level Rise

BSLRE = Base Sea Level Rise Elevation
BFEs are based on high-intensity storm floodwater elevations that have a projected 1% chance to occur in any given year (commonly referred to as the "100-year flood")

*Plus additional analysis required to address erosion and flooding hazard for projected 3 feet of Sea Level Rise
Stinson Beach: FEMA Velocity (VE) Zone

- **Existing:** 14’ BFE
- **County Proposal**
  - **New:** 7’BFE
Development Requirements

22.68.060 Improvements to existing structures. Exempt if NOT in an appeal zone & NOT on a beach; in a wetland, stream or lake; seaward of the mean high tide line; in an ESHA; within 50 feet of the edge of a coastal bluff; or additions resulting in an increase of less than 10 percent of the floor area.

Exempt

Coastal Permit (Standard Findings)

Coastal Permit

ON a beach; IN a wetland, stream or lake; seaward of the mean high tide line; IN an ESHA; or within 50 feet of the edge of a coastal bluff

IN APPEAL ZONE property that is located between the ocean and the first public road. Increase of no more than 10% of floor area of existing structure increase in height of no more than than 10% of an existing structure.

New Development on Vacant Lot or Non-Exempt, Non-Excluded Expansion.
Redevelopment

1. alteration (including interior and/or exterior remodeling and renovations, demolition or partial demolition, etc.) of 50% or more of **major structural components** (including exterior walls, floor and roof structure, and foundation) considered individually;

2. additions and alterations to such development that lead to a 50% or more increase in **floor area** for the development; and/or

3. additions and alterations to such development that costs 50% or more of the **market value** of the existing structure before construction
Adaptation Report Major Sections

- Executive Summary
- Introduction
- Methods
- Adaptation Framework
- Asset Adaptation
  - Parcels & Buildings
  - Transportation
  - Utilities
  - Working Lands
  - Natural Resources
  - Recreation
  - Emergency Services
  - Historic & Archeological
- Community Alternatives
  - Muir Beach
  - Stinson Beach
  - Bolinas
  - Inverness
  - Point Reyes Station
  - East Shore
  - Dillon Beach
- Conclusions
  - Next Steps
  - Lessons Learned
Next Steps

- Community Plans for Adaptation to Coastal Hazards (PATCHs)
- West Marin Interagency Sea Level Rise Task force
- Formalize relationships with local/state/federal agencies who oversee transportation, utilities, parks/open space, emergency services, etc.
- Accommodate Sea Level Rise in capital improvement projects
- Establish a citizen’s advisory committee with citizen science monitoring program
- Establish/formalize a sea level rise public education program
- Network with other agencies planning for sea level rise to evaluate adaptation strategies
- Continue to work with the Greater Farallones National Marine Sanctuary on natural resources strategy implementation

STAFF RECOMMENDATIONS ONLY, HAVE NOT BEEN VETTED WITH CDA MANAGEMENT OR BOARD OF SUPERVISORS
Community PATCHs

PLANS FOR ADAPTATION TO COASTAL HAZARDS

1) ID vulnerable infrastructure assets of community wide importance for each community.
2) Determine flooding frequency, intensity, and duration for the identified assets under different future scenarios.
3) Survey community members to determine ‘trigger points’ for vulnerable infrastructure. Link trigger points to specific timeframes (e.g., 2030, 2050).
4) With community members and asset managers initiate PATCHs around the identified timeframe to implement prior to nuisance flooding.
5) Develop adaptation alternatives for evaluation (e.g., elevation, relocation, alignment). Populate matrices with information including costs, impacts and benefits. The matrices would guide the determination of a preferred alternative based on maximizing public benefits while minimizing costs and negative impacts.
6) Collaborate with partners on implementation of the preferred alternative through capital improvement programs.
Adaptation Processes?

Graphic Credit: San Francisco Estuary Institute
WHAT KIND OF COMMUNITY IS YOURS?

WE WANT TO TALK MORE!

a) Beach/Sandspit?

b) Urban?

c) Eroding Bluffs?

d) Sheltered Bay?

Photo credit: Mairn LJ
SAVE THE DATE!
World Ocean Day • 6-8-17