EXECUTIVE SUMMARY

Map 1 & 2. Study Area
The Marin County Coastal Zone covers approximately 82,168 acres. Of this, approximately 33,913 acres are owned and managed by the National Park Service, leaving 48,255 acres of the Coastal Zone under County jurisdiction [Pursuant to the Federal Coastal Zone Management Act of 1972 (16 U.S.C. 1451, et seq.)]
Map 2. Muir Beach Sea Level Rise Scenario

Note: Muir Beach coastal access, parking lot, and habitat areas were reconfigured in 2013, after this imagery and model were run.

Scenarios

1. 10” SLR + Annual Storm
2. 10” SLR + 20-year Storm
3. 20” SLR + 20-year Storm
4. 40” SLR + 20-year Storm
5. 80” SLR + 100-year Storm
Map 4. Bolinas Sea Level Rise Scenarios

Scenarios

1. 10" SLR + Annual Storm
2. 10" SLR + 20-year Storm
3. 20" SLR + 20-year Storm
4. 40" SLR + 20-year Storm
5. 80" SLR + 100-year Storm

Source: Maps for Our Coast, Our Future

Disclaimer: Vulnerability Assessment maps, tables, etc. are intended to be a guide to helping prioritize planning efforts and vulnerable areas. Local conditions vary, and it is important to ensure that the accuracy of maps is verified by local experts. Maps and data are generalizations and subject to future revision. Local conditions and data must be examined. Commercial use is prohibited.
Map 5. Inverness Sea Level Rise Scenarios

Scenarios

1. 10" SLR + Annual Storm
2. 10" SLR + 20-year Storm
3. 20" SLR + 20-year Storm
4. 40" SLR + 20-year Storm
5. 80" SLR + 100-year Storm

Source: Marin Maps, Our Coast Our Future

Disclaimer: The Inverness Sea Level Rise Assessment maps, tables, etc., can be used as a reference to the SLR (Sea Level Rise) potential residential areas and recreational assets. Marin County and data provider here in make no warranties of the accuracy or completeness of data and information. Map data subject to errors and may not reflect actual conditions. Contact Marin Maps for further details.

Date: 11/2/2010
Map 8. Dillon Beach Sea Level Rise Scenarios

Scenarios

1. 10" SLR + Annual Storm
2. 10" SLR + 20-year Storm
3. 20" SLR + 20-year Storm
4. 40" SLR + 20-year Storm
5. 80" SLR + 100-year Storm

Map created by: [Map creation software or creator name]

Source: [Map data source]

Notes: [Any additional notes or disclaimers]

Date: [Date of map creation or last update]
Map 10. Muir Beach Buildings Vulnerable to Accelerated Erosion
Map 11. Stinson Beach Vulnerable Parcels & Buildings

Exposed Buildings
- Scenario 1: Red
- Scenario 2: Pink
- Scenario 3: Orange
- Scenario 4: Yellow
- Scenario 5: Light Blue

Source: Base Map, Marin County Fire

Disclaimer: The information provided in this document is for planning purposes only. It is not intended to be used for legal or engineering purposes. Consultation with the appropriate agencies is recommended for specific projects or developments.
Map 12. Stinson Beach Buildings Vulnerable to Accelerated Erosion
Map 13. Bolinas Vulnerable Parcels & Buildings

Exposed Buildings
- Scenario 1
- Scenario 2
- Scenario 3
- Scenario 4
- Scenario 5

Note: The map illustrates areas vulnerable to sea level rise. The scenarios represent different outcomes of sea level rise impacts. Colors indicate varying levels of vulnerability. The map is a preliminary assessment and does not include all potential future scenarios.
Map 14. Bolinas Buildings Vulnerable to Accelerated Erosion
Map 16. Point Reyes Station Vulnerable Parcels & Buildings
Map 17. East Shore Vulnerable Parcels & Buildings

Exposed Buildings

- Scenario 1: Parcels
- Scenario 2: Park Parcels
- Scenario 3
- Scenario 4
- Scenario 5

Source: Map, U.S. Coast Guard
Map 18. Dillon Beach Buildings Vulnerable to Accelerated Erosion
Map 20. Stinson Beach Vulnerable Transportation Assets

Exposed Roadway

- 10" + Annual storm
- 10" + 20-year storm
- 20" + 20-year storm
- 40" + 100-year storm
- 80" + 100-year storm

- Boat Launch
- Fishing Pier
- Access Point
- Port
- Marina

Legend: Boat Launch, Fishing Pier, Access Point, Port, Marina
Map 21. Bolinas Vulnerable Transportation Assets
Map 23. Point Reyes Station Vulnerable Transportation Assets

Exposed Roadway
- 10" + Annual storm
- 10" + 20-year storm
- 20" + 20-year storm
- 40" + 100-year storm
- 80" + 100-year storm

- Boat Launch
- Fishing Pier
- Access Point
- Port
- Marina

Sources: Our Coast Our Future: Marin Map
Disclaimer: Vulnerability Assessments and maps, tables, etc. can be used as a guide to help identify potential hazards related to flooding, and data provided herein makes no warranties of the accuracy or completeness of map and data. Maps are representation of ongoing work in progress. Local site conditions must be examined. Consult with a professional.
Map 25. Stinson Beach Vulnerable Utilities

The Seadrift, Calles, and Patios neighborhoods are vulnerable to damage to water distribution lines below each road. All homes use Onsite Wastewater Treatment Systems, and several systems leach below ground. Of these, older models are vulnerable in the near-term. All are are vulnerable in the long run. During high waters, unsecured propane tanks can be hazardous. Electricity service is vulnerable to tree falls during storms.

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Exposed roads w/ utility lines beneath</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 10&quot; SLR + Annual Storm</td>
<td>Scenario 1 Buildings</td>
</tr>
<tr>
<td>2 10&quot; SLR + 20-year Storm</td>
<td>Scenario 2 Utilities</td>
</tr>
<tr>
<td>3 20&quot; SLR + 20-year Storm</td>
<td>Scenario 3 Culverts</td>
</tr>
<tr>
<td>4 40&quot; SLR + 20-year Storm</td>
<td>Scenario 4 Culvert Lines</td>
</tr>
<tr>
<td>5 80&quot; SLR + 100-year Storm</td>
<td>Scenario 5 Man Hole, Catch Basin Grate</td>
</tr>
</tbody>
</table>

Road Side Ditches
Map 26: Bolinas Vulnerable Utilities

The Downtown and Little Mesa neighborhoods are vulnerable to damage to the lift station at the eastern end of Wharf Rd. under Scenario 5. During high waters, unsecured propane tanks in Downtown could be hazardous. The Little Mesa, Big Mesa and Downtown are vulnerable where eroding roads have water and/or wastewater lines below. Electricity service is vulnerable to fallen trees during Storms.
Map 27: Inverness Vulnerable Utilities

Water lines under to Sir Francis Drake Blvd. that convey water from NMWD Pt. Reyes Station wells to Inverness Park and Paradise Estates are vulnerable to road damage. Inverness PUD provides drinking water to bay front properties whose connections may be vulnerable. Septic systems for bay front properties are also vulnerable. Electricity service is vulnerable to fallen trees during storms. Cellular service is limited.
Point Reyes Station water conveyance and septic systems are vulnerable in the low-lying areas along lagunitas Creek. One upland well is vulnerable to salt water intrusion in Scenario 5. Electrical lines are vulnerable to fallen trees during storms. Communication services are not vulnerable.
The Eastshore and the Town of Marshall depend on private wells for drinking water and Onsite Wastewater Treatment Systems for septic. Buildings bordering Tomales Bay may be vulnerable to sea level rise, as nearly 30 property owners have already sought inland leaching alternatives. Wells near Tomales Bay or its tributaries may be vulnerable to saltwater intrusion.
Dillon Beach has a well at Dillon Creek that is vulnerable to salt water intrusion. In addition, a sewage pump station along the coastal cliff in Oceana Marin is vulnerable to bluff erosion. Lawson's Landing water lines and septic may be vulnerable to sea level rise.
Map 32: South of Nick's Cove (East Shore) Vulnerable Working Lands

Scenarios

Exposed Roads

1 47' SRL - 121 years
   17' SRL - 40 years
   22' SRL - 20 years
   47' SRL - 121 years
   47' SRL - 121 years

2 47' SRL - 121 years
   17' SRL - 40 years
   22' SRL - 20 years
   47' SRL - 121 years
   47' SRL - 121 years

3 47' SRL - 121 years
   17' SRL - 40 years
   22' SRL - 20 years
   47' SRL - 121 years
   47' SRL - 121 years

4 47' SRL - 121 years
   17' SRL - 40 years
   22' SRL - 20 years
   47' SRL - 121 years
   47' SRL - 121 years

5 47' SRL - 121 years
   17' SRL - 40 years
   22' SRL - 20 years
   47' SRL - 121 years
   47' SRL - 121 years

Note: This map is a draft and may be subject to change.

Date: 7/29/2015

DRAFT: Sea Level Rise Vulnerability Assessment Page 31
Map 33. North of Nick’s Cove (East Shore) Vulnerable Working Lands
Map 35. Muir Beach Vulnerable Natural Resource Assets

**Scenarios**

1. 10\(^{th}\) SLR + Annual Storm
2. 10\(^{th}\) SLR + 20-year Storm
3. 20\(^{th}\) SLR + 20-year Storm
4. 40\(^{th}\) SLR + 20-year Storm
5. 80\(^{th}\) SLR + 100-year Storm

- Natural Resource Assets
- Park Parcels
- Wetland
- Estuary
- Marsh

Date: 7/28/2015

[Map Description]

Muir Beach is vulnerable to sea level rise and storm events, affecting natural resources and infrastructure. The map outlines areas susceptible to loss and identifies key natural resource assets to be protected.
Map 36. Stinson Beach Vulnerable Natural Resources

Scenarios

1. 10' SLR + Annual Storm
2. 10' SLR + 20-year Storm
3. 20' SLR + 20-year Storm
4. 40' SLR + 20-year Storm
5. 80' SLR + 100-year Storm

Natural Resource Assets

- Seabird Colony
- Mammal Haul Out

Legend:
- Park Parcels
- Wetland
- Estuary
- Marsh

Date: 7/29/2016
Map 37. Bolinas Vulnerable Natural Resources

**Scenarios**

1. 10' SLR + Annual Storm  
2. 10' SLR + 10-year Storm  
3. 20' SLR + 20-year Storm  
4. 40' SLR + 10-year Storm  
5. 80' SLR + 100-year Storm

- Natural Resource Assets
- Park Parcels
- Wetland
- Estuary
- Marsh
- Seabird Colony
- Mammal Haul Out

*Note: The map illustrates various scenarios of sea level rise and their impacts on natural resources in Bolinas.*
Map 38. Inverness Vulnerable Natural Resources
Map 39. Point Reyes Station Vulnerable Natural Resources

Scenarios

1. 10' SLR + Annual Storm
2. 10' SLR + 20-year Storm
3. 20' SLR + 50-year Storm
4. 40' SLR + 100-year Storm
5. 80' SLR + 100-year Storm

Natural Resource Assets

Seabird Colony
Mammal Haul Out

Map 39. Point Reyes Station Vulnerable Natural Resources

MAPS

DRAFT: Sea Level Rise Vulnerability Assessment
Map 40. East Shore Vulnerable Natural Resources

Scenarios
1. 10' SLR + Annual Storm
2. 10' SLR + 20-year Storm
3. 20' SLR + 20-year Storm
4. 40' SLR + 20-year Storm
5. 80' SLR + 100-year Storm

Legend:
- Natural Resource Assets
- Park Parcels
- Wetland
- Estuary
- Marsh
- Seabird Colony
- Mammal Haul Out

North
Map 43. Stinson Beach Vulnerable Recreational Assets
Map 44. Bolinas Vulnerable Recreational Assets
Map 47. East Shore Vulnerable Recreational Assets
Map 50: Bolinas Vulnerable Emergency Service Assets

Exposed roads w/ evacuation routes
- Scenario 1
- Scenario 2
- Scenario 3
- Scenario 4
- Scenario 5

Maps

DRAFT: Sea Level Rise Vulnerability Assessment
Map 51: Inverness Vulnerable Emergency Service Assets

Exposed roads w/ evacuation routes:
- Scenario 1: Emergency Services
- Scenario 2: Buildings
- Scenario 3
- Scenario 4
- Scenario 5

Legend:
- Red: Scenario 1
- Yellow: Scenario 2
- Purple: Buildings

Source: "Our Coast Our Risk & Resilience" Map (2016), Marin County, California. This map identifies areas at risk from sea-level rise and potential flooding. It can be used as a guide to inform decisions on infrastructure and emergency response planning.
Map 52. Dillon Beach Vulnerable Emergency Service Assets

Exposed roads w/ evacuation routes

- Scenario 1
- Scenario 2
- Scenario 3
- Scenario 4
- Scenario 5

Legend:

- Red: Scenario 1
- Orange: Emergency Services
- Yellow: Scenario 2
- Green: Scenario 3
- Blue: Scenario 4
- Gray: Scenario 5

Source: Curb Cutt Out Public Firebrand Map (2016)

Disclaimer: Vulnerability Assessment maps, tables, etc. can be used as a reference to help identify potential hazards and areas at risk to climate change impacts. They are not intended as an endorsement or support of specific land use or development. Local land use policies should be reviewed. Contacted use is prohibited.

Date: 5/30/2016
Map 53. Archaeological Surveying in Marin County

Source: Anthropological Studies Center, 2015

Map 54. Historic Resources

Credit: Marin County Local Coastal Program Land Use Plan Proposed Amendments, 2013
Map 55. Bolinas Historic District

Map 56. Inverness Historic District
Map 57. Marshall Historic District

Map 60. Muir Beach Restoration Project
Map 61. Muir Beach Vulnerable Developed Assets

Exposed Roads

- Agricultural/Forest
- Aquatics
- Buildings
- Hotels
- Governmental Services
- Historic
- Institutional
- Recreation
- Residential
- Transportation
- Utilities

* Roads may also have utility pipes underneath, and serve as emergency access in some locations.

Source: Main Map, Our Coast, Our Future, CA Coastal Commission

Golden Gate National Recreation Area Map Viewer

Waterfront Hazard Areas:
- 12'-4' Areal Storm
- 7'-8' Areal Storm
- 5'-6' Areal Storm
- 2'-3' Areal Storm
- 8'-9' Areal Storm

Notes:
- Waterfront Hazard Areas are based on past extreme events. Data is subject to change due to new research and new data.
- Waterfront Hazard Areas are not intended to guide development.
- Waterfront Hazard Areas are intended to guide development.

Map 61: Muir Beach Vulnerable Developed Assets

Legend:
- Commercial
- Education
- Emergency
- Food
- Governmental Services
- Historic
- Institutional
- Recreation
- Residential
- Transportation
- Utilities

Scale: 0, 0.1, 0.5, 1, 10, 100, 1000
Map 62. Muir Beach Vulnerable Natural Resource Assets
Map 64. Stinson Beach at 20 inches Sea Level Rise & 20-Year Storm

Source: OCOF Flood Depth Layer
Map 65. Stinson Beach Beach Loss by Sea Level Rise Amount (no storms)

**Western Half: Stinson Beach Length**

**Eastern Half: Upton Beach & Federal Beach Length**

**Scenarios**

1. 10' SLR + Annual Storm  
   Beach loss at 10 inches SLR
2. 10' SLR + 20-year Storm  
   Beach loss at 80 inches SLR
3. 20' SLR + 20-year Storm  
   Beach loss at 40 inches SLR
4. 40' SLR + 20-year Storm  
   Beach loss at 20 inches SLR
5. 80' SLR + 100-year Storm  
   Beach loss at 10 inches SLR
Map 66. Easkoot Creek Flood Extent Under Storm and Downstream Sea level Rise in Bolinas Lagoon Scenarios (no direct coastal flooding)
Map 67. Stinson Beach Vulnerable Developed Assets

Exposed Roads

* Roads may also have utility poles underneath, are used for recreation, and serve as emergency access in some locations.
Map 68. Stinson Beach Vulnerable Natural Resource Assets
Map 69. Bolinas Beach Loss By Scenario

Scenarios
1. 10' SUR - Annual Storm (Beach around end of century)
2. 10' SUR - 20-year Storm (Beach Loss @ 80 inches SLR)
3. 20' SUR - 20-year Storm (Beach Loss @ 40 inches SLR)
4. 40' SUR - 20-year Storm (Beach Loss @ 20 inches SLR)
5. 80' SUR - 100-year Storm (Beach Loss @ 10 inches SLR)

Date: 04/16/2015

[Maps showing the loss of beach area by scenario at Agate Beach and Brighton & Wharf Road Beaches]
Map 70. Bolinas Lagoon Elevation Capital ($z^*$) by Scenario at 6 mm/year of Sedimentation

- **Baseline**
- **Scenario 4**
  - Sea level rise only
- **Scenario 1 & 2**
  - Sea level rise only
- **Scenario 3**
  - Sea level rise only
- **Scenario 5**
  - Sea level rise only

Dark and light brown color in the lagoon is an artifact of the aerial imagery and not a distinction in Intertidal habitat. Source: ESA, 2015
Map 72. Bolinas Vulnerable Natural Resource Assets

Scenarios
1. 10" SLR + Annual Storm
2. 10" SLR + 20-year Storm
3. 30" SLR + 20-year Storm
4. 40" SLR + 20-year Storm
5. 80" SLR + 100-year Storm

- Natural Resource Assets
- Wetland
- Estuary
- Marsh
- Parks
- Seabird Colony
- Mammal Haul Out

Legend:
- N

Note: Map data is under copyright by the U.S. Fish and Wildlife Service and may not be used for commercial purposes without permission.
Map 74. Inverness Area Marsh Habitat Transitions by Scenario at 1.5mm/ year Sedimentation

- Baseline
- Scenario 3: Sea level rise
- Scenario 4: Sea level rise

**Elevation Capital**
- $1.5 < z^* < 3$ (Transition)
- $1.0 < z^* < 1.5$ (High Salt Marsh)
- $0.75 < z^* < 1.0$ (Mid Salt Marsh)
- $0 < z^* < 0.75$ (Low Salt Marsh)
- $-1.17 < z^* < 0$ (Intertidal Mudflats)
- $z^* < -1.17$ (Subtidal Channels)
Map 75. Inverness Vulnerable Developed Assets

Exposed Roads

- Red: 10’ + 6-year event
- Yellow: 10’ + 20-year event
- Black: 20’ + 6-year event
- Purple: 20’ + 20-year event
- Green: 50’ + 6-year event
- Light Blue: 50’ + 20-year event

Legend:
- Commercial
- Educational
- Merchandise
- Food
- Government Service
- Industrial
- Recreational
- Residential
- Transportation
- Utilities

Note: Exposed roads may also have utility pipes underneath and are used for evacuation and serve as emergency access in some locations.

Source: Map 75, Draft/Sea Level Rise Vulnerability Assessment, CA Coastal Commission

Disclaimer: The vulnerability assessment results, tables, etc., can be used as a tool to help identify potential hazardous areas and vulnerable assets. Users should consult the responsible agency for site-specific and technical data. The methodology and assumptions are based on the best available information and are subject to further refinement. The use of the end product is subject to review and approval of the Agency.
Map 76. Inverness Vulnerable Natural Resource Assets

Scenarios
1. 10" SLR + Annual Storm
2. 10" SLR + 20-year Storm
3. 20" SLR + 20-year Storm
4. 40" SLR + 20-year Storm
5. 80" SLR + 100-year Storm

- Natural Resource Assets
- Wetland
- Estuary
- Marsh
- Parks
- Seabird Colony
- Mammal Haul Out

Date: 11/2/2015
MAPS

Map 77. Pt. Reyes Station Marsh Habitat Transition

Baseline

Scenario 4
sea level rise

Scenario 3
sea level rise

Elevation Capital
- $1.5 < z^* < 3$ (Transition)
- $1.0 < z^* < 1.5$ (High Salt Marsh)
- $0.75 < z^* < 1.0$ (Mid Salt Marsh)
- $0 < z^* < 0.75$ (Low Salt Marsh)
- $-1.17 < z^* < 0$ (Intertidal Mudflats)
- $z^* < -1.17$ (Subtidal Channels)
Map 78. Pt. Reyes Station Vulnerable Developed Assets

Exposed Roads

- Roads may also have utility sites underneath, which serve as emergency access in some locations.

Source: Marine Map, Our Coast Our Future, CA Coastal Commission. Data may be used as a reference to help identify potential residential, industrial, and utility areas. Models and data provided by the California Department of Fish and Game. Models are representational and subject to future revision. Local site conditions must be examined. Commercial use is prohibited. Data copyright.
Map 79. Pt. Reyes Station Vulnerable Natural Resource Assets

Scenarios
1. 10" SLR + Annual Storm
2. 10" SLR + 20-year Storm
3. 20" SLR + 20-year Storm
4. 40" SLR + 20-year Storm
5. 80" SLR + 100-year Storm

Legend:
- Natural Resource Assets
- Wetland
- Estuary
- Marsh
- Parks
- Seabird Colony
- Mammal Haul Out

Source: Draft Map, Our Coast Our Future. Department of Fish and Wildlife.
Disclaimer: Vulnerability Assessment maps, tables, etc. can be used as a measure to help identify potential hazardous areas and vulnerable assets. Martin County and data providers have made no warranties, express or implied, of the accuracy, or completeness of maps and data. Maps are representational and subject to future changes. Local site conditions must be examined. Commercial use is prohibited.

Date: 10/19/2013
Map 80. East Shore Marsh Habitat Shifts by Scenario at 1.5 mm/year Sedimentation

Baseline

Scenario 3
Sea level rise

Scenario 4
Sea level rise

Elevation Capital

1.5 < z* < 3 (Transition)
1.0 < z* < 1.5 (High Salt Marsh)
0.75 < z* < 1.0 (Mid Salt Marsh)
0 < z* < 0.75 (Low Salt Marsh)
-1.17 < z* < 0 (Intertidal Mudflats)
z* < -1.17 (Subtidal Channels)

Source: ESA, 2015
Map 82. East Shore Vulnerable Natural Resource Assets

Scenarios

1. 10" SLR + Annual Storm
2. 10" SLR + 20-year Storm
3. 20" SLR + 20-year Storm
4. 40" SLR + 20-year Storm
5. 80" SLR + 100-year Storm

Legend:
- Natural Resource Assets
- Wetland
- Estuary
- Seabird Colony
- Marsh
- Mammal Haul Out
- Parks

Source: Martin Maps. Our Coast Our Future. Department of Parks & Wildlife. Developed: Vulnerability Assessment map. Tables and figures may be used as a reference to help better understand regional impacts of SLR and vulnerable assets. The color and data presented may be subject to limitations and constraints of the accuracy of the compiled data of maps and data. Maps are representational and subject to future revision. Local use permissions must be examined. Commercial use is prohibited.

Date: 10/16/2015
Map 83. Dillon Beach Vulnerable Developed Assets

Exposed Roads

- Agricultural Parcels
- Aquaculture
- Buildings
- Parks
- Roads
- Historic District

Commercial
Education
Emergency
Food
Government District
Historic
Institutional
Marina
Marine Park
Transportation
Utilities

Source: Marin Map, Out Coast Our Future, CA Coastal Commission

Notes: This map can be used as a teaching tool to help identify potential vulnerability areas and vulnerable assets. Please consult the original source for more detailed information and updates.

Note: Roads may also have utility pipes underneath or serve as emergency access in some locations.