



Coastal Vulnerability Assessment of the San Francisco Bay Area Network (SFAN)

Importance: *Sea level rise can threaten coastal parks by eroding shorelines and submerging wetlands.*

Global sea levels have risen about 7 inches in the past century and are predicted to rise at least twice as fast over the next hundred years. Even small increases in sea level can have drastic effects on coastal environments, from eroding shorelines to submerging wetlands. The National Park Service (NPS) manages nearly 7,500 miles of shoreline along oceans and lakes. In 2001, the NPS Geologic Resources Division and the U.S. Geological Survey (USGS) began assessing the sea level rise vulnerability of 23 park shorelines in the U.S., American Samoa, Guam, and the U.S. Virgin Islands.

Coastal Vulnerability Assessment: *NPS and USGS determined the sea level risk of shorelines in Golden Gate National Recreation Area (GOGA) and Point Reyes National Seashore (PORE) based on factors including land type, slope and wave height.*

NPS and USGS identified at-risk shorelines in SFAN parks using the Coastal Vulnerability Index (CVI), which is based on six factors that account for susceptibility and adaptability to sea level rise. These factors are coastal slope, rate of shoreline change, tidal range, wave height, sea level change, and geomorphology, which indicates susceptibility to erosion.



Gently-sloping sandy beaches are particularly vulnerable to sea level rise in the Golden Gate National Recreation Area and Point Reyes National Seashore.

The resulting Coastal Vulnerability Assessments and maps provide a more comprehensive and quantitative park-wide view of vulnerability and risk than the parks have had before. They also give baseline data that park managers and scientists can use to prioritize restoration efforts, plan for the placement of future projects, and evaluate and plan for long-term threats to coastal resources. These Coastal Vulnerability Assessments are currently being incorporated into park General Management Plans and other resource assessments.

Status and Trends: *Gently-sloping beaches with high waves are most threatened by sea level rise in GOGA and PORE, and in both parks about half of the shoreline is highly vulnerable to sea level rise, while the other half is low to moderately vulnerable.*

GOGA and PORE shorelines vary from sand beaches to rock cliffs. Only three of the factors varied considerably and influenced the CVI the most.

- Geomorphology ranged from low to high vulnerability (rock cliffs to sand beaches, respectively)
- Coastal slope ranged from very low to very high vulnerability (steeper than 14.7% to shallower than 4.59%, respectively)
- Average wave height ranged from very low to high vulnerability of (0.3 to 8.5 feet, respectively)

Overall, the shorelines that are likely to be most vulnerable to sea level rise are gently-sloping beaches with high waves, which are Ocean Beach at GOGA and the Great Beach at PORE.

Golden Gate National Recreation Area:

In GOGA, 59 miles of shoreline were evaluated for sea level rise risks. Vulnerability is very high in 25%, high in 27%, moderate in 28%, and low in 20% of the evaluated shoreline.

Point Reyes National Seashore:

In PORE, 50 miles of shoreline were evaluated for sea level rise risks. Vulnerability is very high in 24%, high in 26%, moderate in 26%, and low in 24% of the evaluated shoreline.

Additional Resources:

Pendleton, Elizabeth A. et al. 2005a. Coastal Vulnerability Assessment of Golden Gate National Recreation Area to Sea-Level Rise. U.S. Geological Survey Open-File Report 2005-1058.

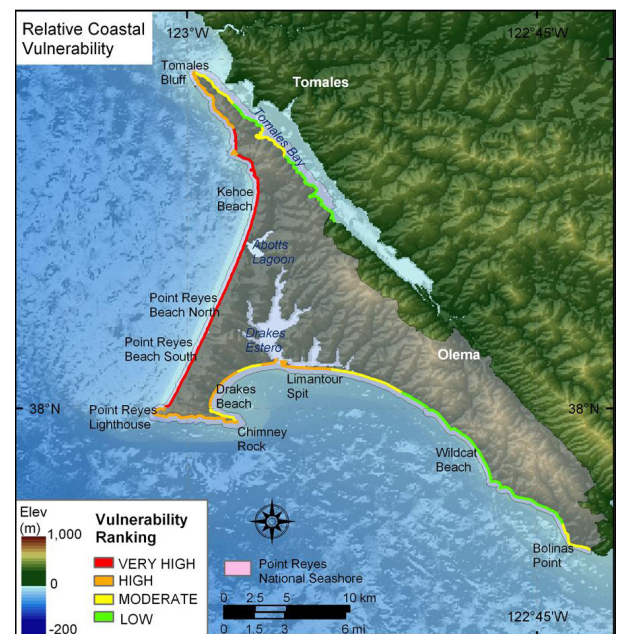
<http://pubs.usgs.gov/of/2005/1058/>

Pendleton, Elizabeth A. et al. 2005b. Coastal Vulnerability Assessment of Point Reyes National Seashore (PORE) to Sea-Level Rise. U.S. Geological Survey Open-File Report 2005-1059. <http://pubs.usgs.gov/of/2005/1059/>

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Coastal Vulnerability Assessment map of the Golden Gate National Recreation Area. From Pendleton et al. 2005a.



Coastal Vulnerability Assessment map of Point Reyes National Seashore. From From Pendleton et al. 2005b.