

4. FITZGERALD MARINE RESERVE

County of San Mateo

VULNERABILITY SUMMARY

Vulnerability of the James V. Fitzgerald Marine Reserve (Reserve) is **high**. The Reserve contains unique rocky intertidal habitat in the County, which hosts many rare species and habitats that are sensitive to sea level rise. The Reserve is highly exposed to erosion; sea level rise will reduce the availability of the intertidal habitat, bluff, and beach extent. Adaptive capacity is low due to the low occurrences of most protected species on site, and limited refuge habitat. The loss of this asset has high consequences, impacting the amount and distribution of biodiversity, recreational and educational opportunities, and adjacent private property.

SENSITIVITY High	EXPOSURE High	ADAPTIVE CAPACITY Low	CONSEQUENCES High
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ASSET CHARACTERISTICS

200 Nevada Avenue | Moss Beach

Asset Description and Function:

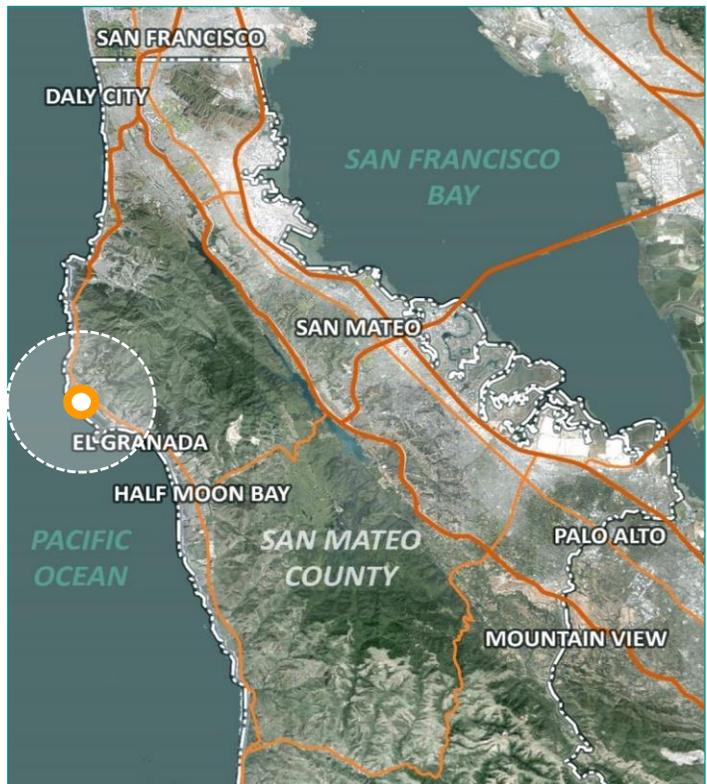
The Reserve is a popular natural and recreational asset that hosts a range of unique visitor opportunities, habitats, and protected species. It includes seal haul-out areas, tide pools, beach and shoreline access, and a visitor center. Ecosystems present include coastal strand habitat, a reef, grassland mosaics, central coast arroyo willow riparian forest, freshwater marsh, northern coastal scrub, northern coastal bluff scrub, and coastal terrace prairie. The foundation of a historical homestead is also onsite.



Asset Type	Marine Reserve
Asset Risk Class	1, N-Rocky Intertidal
Size	402 acres, 3 linear miles
Year of Construction	1969
Elevation	Tide pools & seal haul-out at grade; bluffs at 31-38 feet
Level of Use	175,584 year-round visitors
Annual O&M Cost	\$300,000 (2014-2015)
Special Flood Hazard Area	Asset is in SFHA
Physical Condition	Good
Landowner	County of San Mateo and nine other private owners
Underground Facilities	None

Environmental Considerations

The Reserve is one of the very few areas for harbor seal haul-out in Northern California. Other protected species include California red-legged frog, bluff and coastal leptosiphon, blasdales bent grass, johnny-nip, harlequin lotus, and various marine mammals.



FITZGERALD MARINE RESERVE

ASSET SENSITIVITY

The asset's diverse features are highly sensitive to the impacts of sea level rise. Higher sea levels will reduce beach for seal haul-out areas. Habitats of rare and/or protected species could vanish due to permanent inundation or bluff erosion. Many of the County's coastal species have limited occurrences, both the yellow leptosiphon and blasdale's bent grass have a record of one to two occurrences. Tide pools and species in the intertidal zone may not survive permanent inundation and warmer water temperatures. With sea level rise these dynamic habitats that sustain sessile and other intertidal species would no longer undergo tidal fluctuations. This may lead to further reduction to biodiversity or loss of habitat for species that depend on those variable conditions. It is expected that the bluff retreat will result in the loss of coastal prairie habitat, and could also impact the Smith-Dolger historic homestead.

Saltwater intrusion at the San Vicente Creek could threaten the California red-legged frog habitat and breeding areas farther upstream. The restoration area is sensitive to flooding and a portion was damaged by the king tides in 2016. Educational uses of the site are moderately sensitive to sea level rise impacts; the presence of tide pools, seal haul-outs, beach access, and protected species influence the visitation rates. Built structures on site, including a ramp access, are sensitive to flooding as they were damaged during recent storms (2016), making them unusable until they could be repaired.

Fitzgerald Visitors use the tide pools and access the beach.

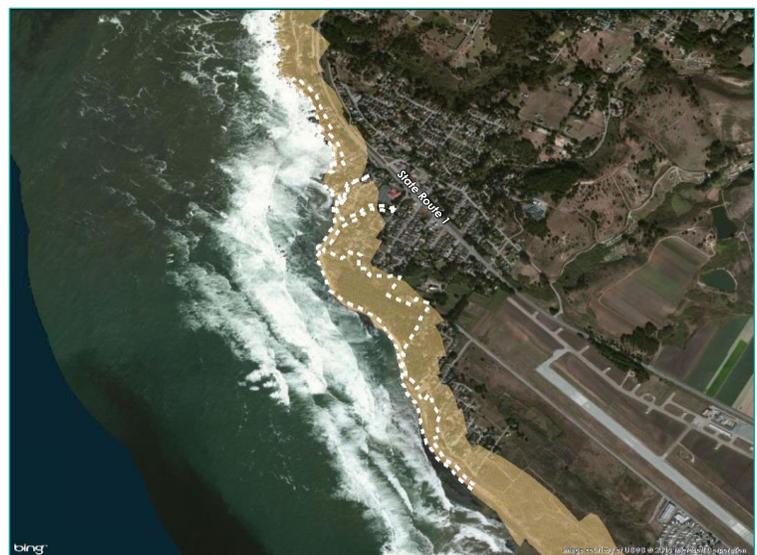


SHORELINE VULNERABILITY

Erosion Extent

The entire western boundary of the Reserve is located within the area identified by the Pacific Institute study (2012) as potentially exposed to erosion. The yellow band represents the eastern extent of erosion that can be expected by 2100. See the "Exposure Discussion" section for more details pertaining to the effects of coastal erosion on this asset.

Erosion Extent: Reserve is and will be exposed to coastal erosion.



Cross-Cutting Vulnerabilities

The native marine resources have recently been impacted by warmer ocean temperatures and as a result species; long term impacts could lead to reduced biodiversity. Sea star wasting syndrom has further simplified the marine tidepool ecosystem. The upland habitat has undergone significant invasion by noxious weeds over the last several years. These additional factors further contribute to the vulnerability of the asset's vegetation communities and their ability to adapt.

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SEA LEVEL RISE EXPOSURE ANALYSIS

Exposure Discussion

The Reserve is highly exposed to the impacts of sea level rise. The asset experiences daily wave action and erosion. In addition, the king and storm tides have historically eroded the bluff areas and inundated both the low-lying tide pools and seal haul-out areas on the beach. The 2016 storms affected the ramp access and the habitat restoration area. The visitor center and bluff habitats are not currently exposed to inundation, but may be subject to erosion as the bluffs retreat inland. Higher water levels will likely cause saltwater intrusion into San Vicente Creek, which supports California red-legged frogs (including their breeding area upstream outside of the reserve) and drains to the Pacific Ocean at the Reserve.

Seal haul-out areas at the reserve.



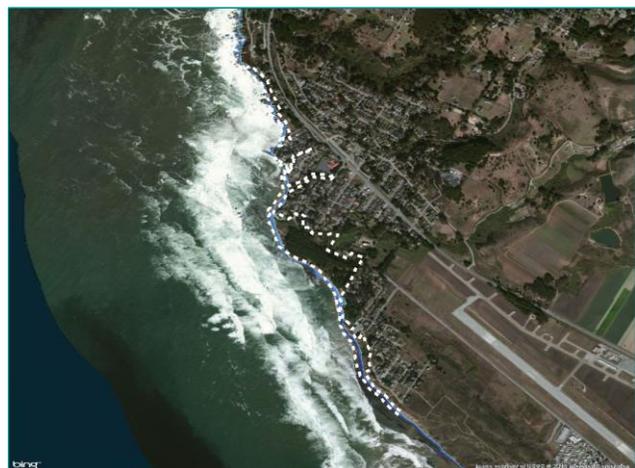
Baseline Scenario: Beach and tide pool inundation.



Mid-Level Scenario: Growing extent of inundation.



High-End Scenario: Reduced beach and tide pool area.



Exposure Analysis Results

Potential Inundation Depth (feet)		
Scenario	Minimum	Maximum
First significant impacts	Area not included in Overtopping Analysis	
Baseline 1% Flood	0	11
Mid-Level 1% + 3.3 feet	0	16
High-End 1% + 6.6 feet	0	17

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ADAPTIVE CAPACITY, CONSEQUENCES, AND POTENTIAL ADAPTATION

Adaptive Capacity

The Reserve's functions and habitats have low adaptive capacity. The beaches and bluff have limited space for retreat, causing permanent loss to any beach, bluff, or associated habitat. It is unclear whether the protected and/or rare occurrence species will be able to adapt to sea level rise. Furthermore, these species have limited or no options to move to another location at present. Specifically, additional haul-out areas for seals are limited, and establishing successful rare plant populations is also very difficult. Tide pools cannot be recreated because they were formed as the geologic result of a rocky shelf outcrop. As the California red-legged frog habitat is limited within the Reserve, these frogs would have to rely on nearby habitat on private property that may have alternate land management objectives. Beach and recreational access is available in other parts of the County; however, the environmental education opportunities associated with this unique reserve are not available in the immediate vicinity.

Consequences

The consequences of the loss of the Reserve are high. Inundation and erosion resulting from sea level rise will cause permanent loss of some site features, such as beach extent, the seal haul-out areas, and tide pools. Site infrastructure, including benches or tables, could also be damaged. While economic and structural damages to the asset caused by sea level rise would likely be low, environmental impacts from the loss of the Fitzgerald Marine Reserve and its features are high, and would be felt regionally. A loss of any of the critical habitats could cause permanent loss of a species in the immediate region if there aren't any, or are very limited, alternative habitats available for reintroduction or translocation. Educational or recreational opportunities tied to these essential features are also likely to decline in quality and quantity, thereby reducing the experiences of visitors in the long run. This would have associated economic impact and could reduce the fees that support the education and programs at the Reserve.

Additional Important Information

A habitat restoration plan is underway for the San Vicente Creek riparian corridor and buffer area. The Reserve and its environmental assets are also extremely vulnerable to other impacts associated with climate change including increasing water temperatures and the presence of invasive species. Management and permitting at the site are particularly challenging and could potentially involve many additional agencies including the California (CA) Coastal Commission, the CA State Lands Commission, the National Marine Fisheries Services, the US Army Corps of Engineers, and the CA Department of Fish and Wildlife.

Asset-Specific Adaptation

Adaptation is very challenging at this site as many of the vulnerabilities of species are tied to broader issues, including regional habitat loss and other impacts from climate change. A regional habitat management approach may be needed to address environmental concerns. However, opportunities to make species' habitat more resilient to sea level rise should be explored, and solutions will be needed to protect the long-term viability of habitats. Buildings on site can be elevated, relocated, or reinforced as needed.

Vulnerable Rocky Intertidal Areas

This is the only Asset Vulnerability Profile on vulnerable rocky intertidal areas in the County. At the time of this assessment, an exhaustive dataset of Rocky Intertidal Areas in San Mateo County is unavailable.

Bluff habitat at Fitzgerald Marine Reserve.

