Belmont-Redwood OLU

Identifying Nature Based Solutions

SeaChange SMC released a Countywide Sea Level Rise Vulnerability Assessment in 2018 identifying San Mateo County's key vulnerabilities. Communities throughout the County are identifying potential adaptation strategies for the shoreline. Nature based strategies provide multiple benefits, but there are questions about what strategies work in which locations throughout the bay and how they integrate with engineered strategies. This fact sheet summarizes the types of strategies identified through a stakeholder driven process. Local communities and stakeholders can use this information as high level guidance to spur cross-jurisdictional collaboration and to identify potential project areas and concepts for further evaluation.

Types of Nature Based Solutions

Below are examples of nature based strategies. More information and details on adaptation strategies are available at: www.resilience.sfei.org/

Marsh: wetlands affected by daily tides that can decrease wave energy and erosion.

Mudflat: a stretch of mud exposed at low tides that can protect marshes from erosion.

Ecotone/Horizontal Levee: a gently sloping upland, and marsh habitat supported by a flood levee on the shoreline.

Nearshore Reef: mix of oyster shell and baycrete to support subtidal habitat and reduce wave energy.

Submerged Aquatic Vegetation: underwater vegetation such as eelgrass that traps sediment and slows erosion.

What are Operational Landscape Units (OLU)?

OLUs are areas of the shoreline extending from subtidal (i.e. areas that are always underwater, including during low tides) to inland areas in an OLU. The geology, hydrology and climate are similar so that adaptation planning in this area benefits from being aligned. OLUs, like watersheds, span across jurisdictions. More information and details on adaptation strategies are available at: www.resilience.sfei.org/

Belmont-Redwood OLU Summary

There are 5 OLUs in the County. The Belmont-Redwood OLU stretches along the shoreline between the San Mateo Bridge and Dumbarton Bridge. This OLU includes more than a third of the cities in the County. It touches the cities of Foster City, Redwood City, San Carlos, Belmont, Menlo Park, and East Palo Alto.

A majority of the OLU was once tidal marsh, resulting in this region being one of the most flatest and shallow areas of shoreline in the County of San Mateo. The area in the north was built on fill allowing for residential and commercial development, while the southern portion contains marshes that are among the last remaining intact wetlands in the San Francisco Bay. They are home to a variety of threatened and endangered species and serve as an important stop for birds on the Pacific Flyway.

A number of key community services and critical facilities exist within this OLU including emergency and outpatient healthcare facilities, fire and police stations, senior centers, schools, and a number of buildings with affordable rental units. The Sea Change SMC Sea Level Rise Vulnerability Assessment evaluated a number of key assets including the Silicon Valley Clean Water Wastewater Treatment Plant, Highway 101, San Carlos Airport, Port of Redwood City, Kaiser Permanente, Maple Street Homeless Shelter, Ravenswood Ponds, Foster City levee, Foster City Corporation Yard, Bayside STEM Academy, and the City of East Palo Alto. In addition, the San Mateo County Event Center and County Center Campus are in this OLU.

SEA LEVEL RISE VULNERABILITIES AND NATURE BASED SOLUTIONS

This map shows potential flooding from a 1% storm (baseline), and 3.3 (mid-level), or 6.6 feet (high-end) of sea level rise in blue. Potential nature based solutions are shown along the shoreline.

Foster City

Vulnerabilities
In the mid-level scenario, a number of built and natural assets would be affected including schools, outpatient health care facilities, communication towers, and storm drains and others.

Nature Based Solutions
The City is protected by a levee that is being raised to achieve FEMA accreditation and protect against projected future sea level rise. When the levee is expanded, coarse beaches could be included in the design to reduce wave energy. In the future, retention basins and lagoons, will need to be carefully managed as groundwater and sea levels rise.

San Carlos

Vulnerabilities
In the mid-level scenario, Highway 101 is flooded and the San Carlos Airport, Holly Street area, and Industrial Road area are flooded. Existing infrastructure to reduce flooding, such as levees, stormwater pump stations, outfalls, and storm drains, would be affected.

Nature Based Solutions
San Carlos receives protection from Bair Island. To protect from future sea level rise, the mudflats could be improved and beaches added along Bair Island and an ecotone levee added along 101 at the city's shoreline.

Redwood City

Vulnerabilities
The Roble Avenue area, the area east of East Bayshore Road, a portion of Sea Port Boulevard, the salt pond complex adjacent to Seaport, a part of Maple Street, and the area near Bair Island Road are flooded in a 1% storm today. In the mid-level scenario, Redwood Shores is flooded, Highway 101 is flooded, and portions of Woodside Road and downtown Redwood City are flooded. Key assets would be affected, including the power plant, substations and transmission lines, solid waste and wastewater treatment facilities, the County jail, outpatient health care facilities, and mobile home parks in Redwood City.

Nature Based Solutions
Large areas of tidal marshes, such as Inner and Outer Bair Island, have been restored, and more areas are planned in the Ravenswood Ponds. Hybrid measures, such as ecotone levees, may help manage flood risk while providing high tide refuge and upland habitat for marsh wildlife.
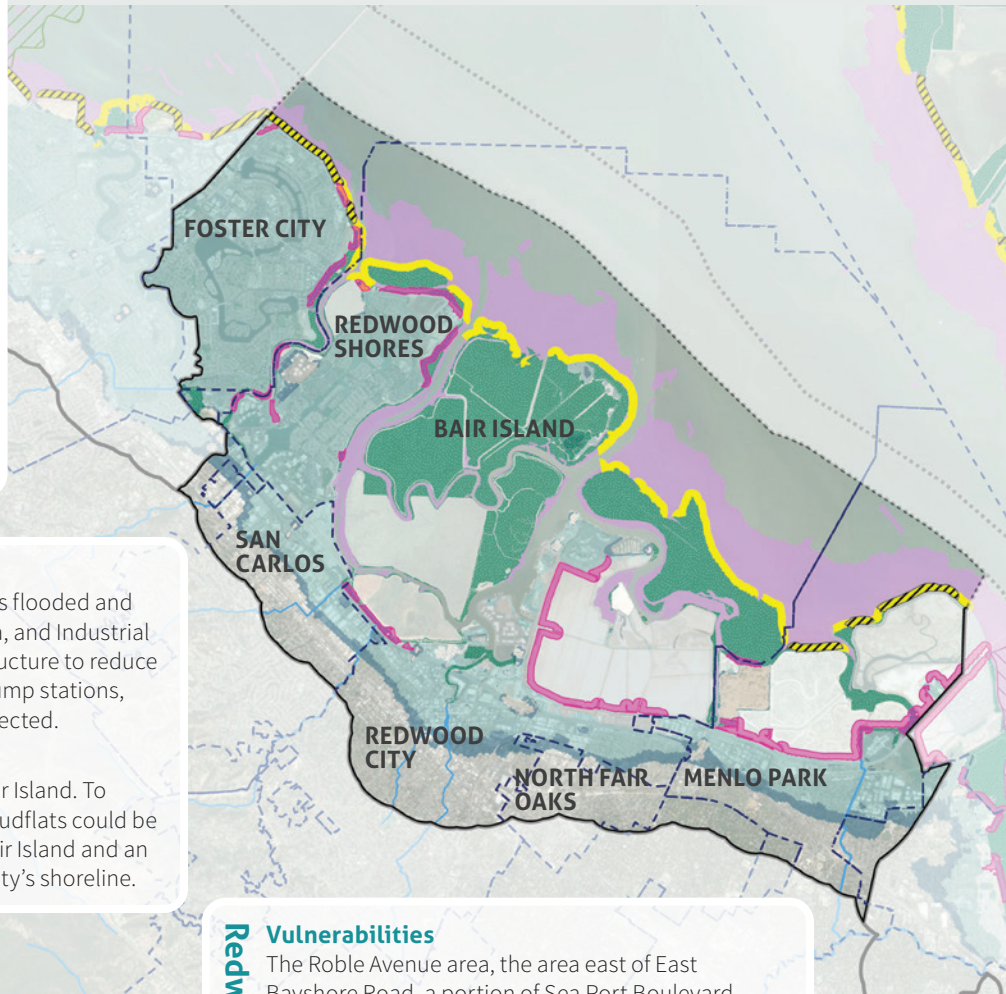
Belmont-Redwood OLU

- Baseline scenario*
- Mid-level scenario (Baseline + additional 3.3 ft of sea level rise)
- High-end scenario (Baseline + additional 6.6 ft of sea level rise)

Conditions suitable for:
- Mudflat augmentation
- Beach along natural shoreline
- Beach along fortified shoreline
- Horizontal levee
- Nearshore reefs

Existing features:
- City boundaries
- Operational landscape unit boundaries
- Major roads
- Creeks
- Tidal marsh

* Estimated impacts are based on 1% annual chance storm or 1 in 100 chance of a storm occurring in any given year.

North   .25 Miles   SFEI AQUATIC SCIENCE CENTER

Map labels: FOSTER CITY, REDWOOD SHORES, BAIR ISLAND, SAN CARLOS, REDWOOD CITY, NORTH FAIR OAKS, MENLO PARK

Belmont

Vulnerabilities
In the mid-level scenario, the area east of Highway 101 is flooded and Highway 101 is flooded in the area south of Belmont Creek. A number of Belmont's built and natural flood protection assets are vulnerable, including a single electrical substation, one of three hazardous material sites, and both outpatient facilities.

Nature Based Solutions
As sea levels rise, an ecotone levee and mudflat improvements could be implemented along Belmont Slough to protect the city from flooding.

Menlo Park

Vulnerabilities
In a 1% storm today, parts of the Haven Avenue area and Ravenswood Pond Complex are flooded. In the mid-level scenario, the Bayfront Expressway would flood, along with the Belle Haven neighborhood and the Bayfront area. The wastewater pump station, energy transmission infrastructure, outpatient health care facilities, and parks are vulnerable.

Nature Based Solutions
To protect from additional flooding, ecotone levees could be placed along Bayshore Freeway and beaches, and mudflats restored along the bay.

OLU-Wide Nature Based Solutions
Horizontal Levees along the Bay could be used for managing flood risk for low-lying communities and also creating high tide refuge for marsh wildlife, as no areas exist for natural marsh migration in this OLU.

Shell Hash Beaches already exist along much of this shoreline and should be considered as part of a hybrid option. Management of these beaches would have to take account of significant longshore movement of the shell and coarse material in the nearshore areas.

Mudflats are critical for buffering waves, reducing marsh edge erosion, and supplying shell and coarse material to the existing beaches.

Inland Flooding and Stormwater: Flooding could also occur due to rainfall in the hills flowing down the creeks to the flat Baylands, combining with sea level rise. Water that once was slowed by floodplains and marshes is now constrained by development and levees. The water is now concentrated in areas like the Bayfront Canal or stormwater systems and pumped to the bay, none of which are designed for climate change impacts.

Disconnected creeks could be reconnected to the marshes in their floodplains. Green stormwater infrastructure should continue to be implemented in the upper watershed to reduce creek flooding in the developed areas. The County of San Mateo is working with Belmont, San Carlos, Redwood City, Menlo Park, and Atherton on the development of flood solutions.

CO-BENEFITS

Not only do nature based shoreline protection strategies protect from rising sea levels, they support wildlife habitat, reduce erosion from waves, can store extra carbon from the atmosphere and reduce runoff of pollutants into the bay. Protecting existing marshes, restoring salt ponds to marsh as possible, and adding nature based features throughout the OLU would provide the following benefits. The values below assume that planned and existing marsh habitat will keep pace with sea level rise through 2050. After 2050 modeling in the Bay suggests that additional restoration and protection efforts will be required to sustain marsh.

Coastal Protection
Protecting and restoring tidal wetlands can reduce wave height and help protect communities and coastal structures. For example, Bair Island reduces wave heights during major storms by nearly a foot. Protecting and restoring marsh near Redwood City and Menlo Park, such as Greco Island, could further reduce risk from coastal hazards. Healthy coastal marsh can also help to lower crest height requirements and costs for levees.

Habitat
This OLU has nearly 10% of the Bay's tidal marsh and ridgway's rail habitat, and 15% of seal haul-out sites. Planned restoration will increase marsh and ridgway's rail habitat by more than 5 times; additional measures can maintain these benefits and increase them by 1.3 times. Beach restoration, could create over 54 acres of new beach.

Recreation
This OLU provides a wealth of recreation opportunities along its miles of shoreline and in parks and trails near the shore. Roughly 20% of the Bay shoreline recreation in San Mateo County occurs here. For example, Bair Island provides birding and boating opportunities as part of the Water Trail.

Carbon
Existing marshes in San Mateo County store as much carbon dioxide as is emitted by over 22,000 cars each year. By 2050, planned restoration efforts to add additional marsh will increase the amount of carbon stored and sequestered in Belmont-Redwood OLU to over 735,000 tons, which amounts to removing almost 160,000 cars from the road for a year. Additional potential marsh restoration measures could increase this to nearly 200,000 cars or over 925,000 tons of carbon for a total of 222,000 cars.

MOVING FORWARD ON REGIONAL SEA LEVEL RISE PLANNING

The Belmont-Redwood OLU is one of the most threatened areas of San Mateo County from sea level rise risks. At the same time, this region provides the greatest opportunity for implementing nature based solutions to address these risks. Through partnerships and the actions below, the County will continue to support strategies to reduce risks from sea level rise that protect vulnerable communities, enhance the use of nature based approaches, and address regional impacts.

Partner
early and often with community-based organizations to develop culturally competent and participatory outreach and engagement strategies based on community needs.

Develop and Coordinate
messaging and outreach to a variety of audiences including City Councils and inland neighborhoods.

Participate
in the Climate Ready SMC Collaborative, to learn and share information and best practices and engage community leaders in solving these multi-jurisdictional challenges.

Develop and Share
tools such as design guidelines, regulatory frameworks, and interactive mapping tools.

Submit
joint applications through the Flood and Sea Level Rise Resiliency District to grant programs for projects that will address sea level rise across jurisdictions, coordinate permitting, and pilot innovative strategies.

Monitor
existing and planned projects to inform future work and share with stakeholders, including updates to sea level rise risks based on planned and implemented adaptation projects.

Evaluate
existing plans and policies to encourage cross-jurisdictional planning and implementation of nature based sea level rise adaptation projects, and assess necessary changes to land use regulations to support adaptation projects.

Summaries of the other OLUs and workshops are available at
seachangesmc.org/current-efforts/nature-based-shoreline-protection-strategies/

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