

# San Francisco Bay Living Shorelines Project

## Coastal Conservancy & 17 regional partners

### Project Description

At two locations, the San Francisco Bay Living Shorelines Project is demonstrating the potential of establishing native eelgrass and oyster beds to protect the San Francisco Bay shoreline while creating biologically rich and diverse habitat that is resilient to changing environmental conditions.

Habitats created through the project were quickly shown to benefit a wide variety of wildlife while decreasing energy from wave action. The decreased wave energy reduces flooding and erosion of the shoreline and allows sediments to accrete, enabling the shoreline to rise along with sea levels.

Findings from this project are being used to design future projects and develop best practices for managing living shorelines and submerged habitats.

### Design

- **Oyster shell-bag mounds and eelgrass beds were planted 150-250 meters offshore and are being monitored to observe their biological and physical effects and impacts as living shorelines.**  
Monitored: Wave attenuation, sediment accretion, bird and fish utilization, and water quality

### Four alternatives to oyster shell-bag mounds were tested as structures for oyster settlement (due to scarcity of shells for shell-bag mounds).

- Monitored: Oyster recruitment and growth

### Construction

- Sites were chosen 150-250m offshore, dependent on slope, to achieve eelgrass’s preferred depth; oysters can tolerate higher tidal elevations.

- Site access had to be carefully planned in order to access shallow subtidal environments.
- More than half a million clean oyster half shells (six semi-truck loads) were used to build reefs.
- Eelgrass was transplanted from different sites to test which donors performed best.

Results

Oyster Settlement Results

- Over 3 million native oysters initially settled on the reefs, with some loss over time due to competition, predation, and recruitment fluctuations.
- Most oysters settled on vertical, north-facing elements at lower elevations, likely due to reduced heat stress (except at Hayward where deeper predators exist).
- Shell bags performed better than the four other structures tested, possibly due to more surface area; the lowest recruitment occurred on the layer cake and oyster block structures.
- Structures did not subside substantially in bay mud.

Physical Benefits

- Reefs reduced 30-50% of wave energy.
- Sediment accumulated 15 cm around oyster shell bags and 24 cm inside.

Biological Benefits

- Many rare and valuable species such as black oystercatchers, dungeness crabs, and steelhead were quickly attracted to the site.

Eelgrass Restoration Results

- Eelgrass transplanted from Point Molate was more successful than donors from Point San Pablo due to similar muddy conditions.
- The ephemeral nature of beds in San Francisco Bay may require ongoing restoration maintenance.

Combination of Oyster and Eelgrass Beds

- Combining oyster and eelgrass beds in one project site increases the diversity of fish and invertebrates using the site, but oyster beds should be spaced apart because of a trending negative impact on eelgrass (likely due to competition for space).

Each location is unique, and site-specific characterizations should be considered in the shoreline design.

Future Research: Test more locations and designs and test the reduction of wave energy at other locations with different slopes, fetch, and sediment types. Look for other sources for shells for shell bags (e.g., develop a shell recycling program).

Costs: \$2.1 million (\$400k for design and permitting, \$450k for construction, \$1.25M for monitoring)


Timeline: Design & Pre-project monitoring, 2011-12; Permitting, 2012; Construction, summer 2012; Monitoring, 2012-present

Partners: US EPA, NOAA, USGS, Coastal Conservancy, CA Dept. of Fish and Wildlife, Wildlife Conservation Board, UC Davis, SF State University Romberg Tiburon Center, San Francisco Estuary Partnership, The Nature Conservancy, CA Wildlife Foundation, ESA/PWA, Dixon Marine Services, Drakes Bay Oyster Company (shells)

For more information visit the [Living Shorelines Website](#) or contact [Marilyn Latta](#), State Coastal Conservancy on 510-286-4157


**Photo credits:** Marilyn Latta, Stephanie Kiriakolopolos, Susan de la Cruz

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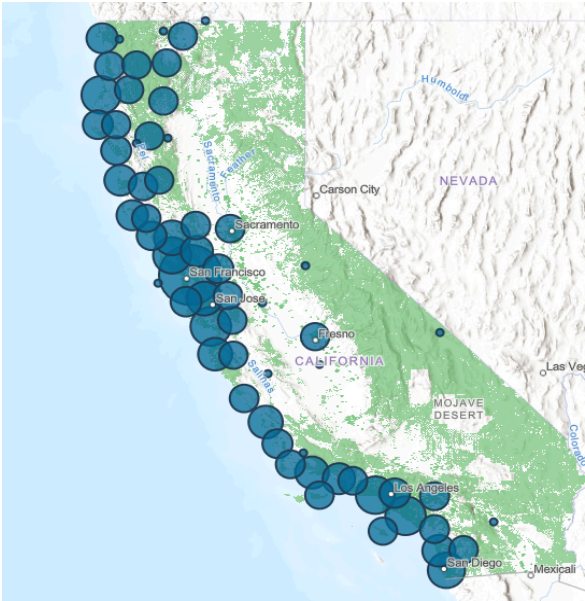


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