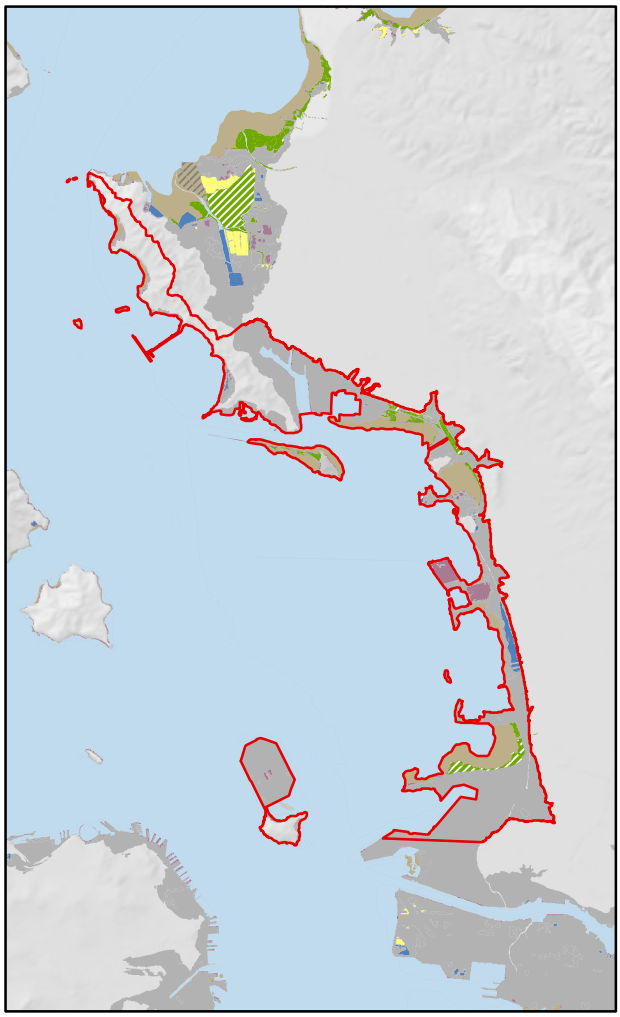

BERKELEY AREA

Eastern edge of San Francisco Bay between the Oakland outer harbor and Point San Pablo

Baylands 2009

- Bay/Channel
- Diked Wetland
- Salt Pond
- Managed Pond
- Tidal Flat
- Tidal Marsh
- Agriculture and Other Undeveloped Areas
- Developed Areas

Red line shows the boundaries of Segment L.

Hatching indicates areas where restoration activities had occurred as of 2009. For managed ponds this included habitat enhancement.

By: San Francisco Estuary Institute

Data: Wetland data from SFEI includes BAARI (v1, 2009) Baylands and Wetlands, NLCD 2006, and wetland tracker data.

Imagery: ESRI World Imagery (updated 2015)

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Unique Opportunities

Although very few large tracts are available for habitat acquisition or restoration, Segment L has multiple small habitat areas that include small but viable wildlife populations, such as the steelhead run on Codornices Creek. This segment will likely remain highly urbanized, with limited opportunities for large-scale restoration, but it presents many opportunities to develop small-scale restoration and green engineering projects toward meeting the co-objectives of improving habitat quality and protecting existing infrastructure, shorelines, and baylands. Critical infrastructure will need to be protected, but many improvements can be made to enhance habitat corridors and provide better linkages for species that use the bay and baylands. In several areas the ecological connections between creek mouths, tidal wetlands, and subtidal offshore habitats can be enhanced. Conditions at some sites are appropriate for native eelgrass and oyster restoration, and oysters are part of the rocky intertidal habitat being incorporated into a large-scale bank-stabilization project near Albany Beach and Brooks Island. Many tidal habitats can be restored and enhanced in this segment; examples include Hoffman Marsh, Emeryville Crescent, and the mouth of Codornices Creek. Moist grassland and seasonal wetlands such as the Richmond Field Station can also be protected and restored. Projects here could improve local water quality and environmental health, provide preliminary data to inform similar adaptation designs in other segments, and may provide benefits to the greater baylands.

The focus of the landscape vision for this segment is on creating a connection between urban residents and the environment and promoting demonstration projects that improve the health of the baylands and raise public awareness of baylands resources. Multiple creeks (Strawberry, Marin, Cordonices, etc.) are already the focus of community-based restoration efforts, and this work could be leveraged with other activities integrating climate-change-adaptation education and restoration activities. McLaughlin Eastshore State Park, the Berkeley Marina, Aquatic Park, and the Richmond shoreline provide unique, visible opportunities to educate the public about wildlife habitat needs.

Segment Features and Setting

Historically, this segment was characterized by a narrow shoreline band of small tidal marshes, sand dunes, beaches, and extensive tidal flats. The adjacent terrestrial areas supported extensive areas of moist grassland and were dissected by numerous small streams that originated in the hills to the east. Some of these streams were bordered by riparian corridors and provided spawning and rearing habitat for steelhead. Some had lagoons at their mouths, and others terminated in willow groves.

Today, this segment is highly developed with cities, industrial areas, ports, and transportation corridors, and many of its historical and unique habitat features are gone. Landfills, hotels, and other developments have taken over many sites that once were tidal flat or marsh. Several relatively small isolated tidal flats, adjoining marshes, and other features continue to provide important habitat functions. Examples of high-quality habitat in this segment are the tidal marsh and mudflats at the Emeryville Crescent and the small marshes and extensive mudflats north of Point Isabel. Small fringe beaches and rocky intertidal areas are present along almost the full

length of the segment, and intertidal and shallow subtidal areas support eelgrass, oyster, and macroalgal beds. This segment receives heavy marine influences and high salinity. It includes highly urbanized shorelines, a high-energy-wave environment, and limited sources of local sediment.

Implications of Drivers of Change

The developed areas in this segment will become increasingly difficult to protect as sea levels rise. Outboard levees and fringing marshes will be subject to greater wave action as water depths increase, allowing larger waves to propagate inshore. Increasing wave action will accelerate the erosion of the small remaining marsh edges, resulting in the narrowing and potential loss of marshes and other unique habitats such as coarse beaches. This urbanized segment has a great deal of development that directly abuts the shoreline, limiting the migration space and areas for restoration adaptation. More experimental approaches to address these limits might include vertical adaptation with new techniques such as living seawalls and breakwaters.

Considerations for Implementing the Actions

NEAR TERM (NOW TO MIDCENTURY, PRIOR TO SLR CURVE ACCELERATION)

This segment is highly urbanized and constrained by development directly adjacent to the baylands. In the near term, when sea-level rise rates will still be relatively low, enhancing the baylands will provide immediate ecological benefits and maximize their resilience. Living breakwaters could be created around fringing marshes to preserve and enhance unique features like native eelgrass and oyster beds. Introducing fine sediment through mudflat and marsh recharge could increase vertical accretion rates. There are limited opportunities for landward migration of marshland, and it is likely that the fringing tidal marshes will drown as sea levels rise. However, opportunities exist to partner with the industrial and residential communities along the shoreline to develop green infrastructure such as horizontal levees and living shorelines, which would create habitat bayward of the flood-protection levees.

Bay Trail in Richmond

Major land uses such as Highway 80 will remain largely in current configurations and will need to be protected, providing opportunities for approaches that haven't yet been tried locally, such as living seawalls. Diverse pocket habitats could be preserved, enhanced, and created, then linked together to create a subregional habitat corridor. Vertical enhancements (living seawalls, substrate improvements to docks, etc.) could be made in a few subtidal and intertidal areas where there is hardscape. Many existing habitats could be enhanced by improving tidegate management, removing contaminated soils and derelict boats, and reducing the amount of trash that terminates in the bay. Habitats could be created

along flood-control channels, floodplains, and off channels. Low-elevation marsh and wetland could be restored. Upstream opportunities should be explored wherever possible in order to reconnect watershed processes with the bay.

LONG TERM (LATTER HALF OF THE CENTURY, AFTER SLR CURVE ACCELERATION)

In the long term, sea-level rise rates will likely outpace vertical accretion rates, and marshes in this segment generally do not have enough space to migrate landward to survive. Prior to that point, a plan for restoring or relocating the functions within the existing tidal marshes should be implemented. Creating wetlands bayward of the flood-protection levees, possibly using wastewater to enhance habitat on the slope, could provide space for landward migration. The planned communities built over former wetlands and open bay at Powell Street in Emeryville, Marina Bay in Richmond, and other areas will be at risk for flooding as sea levels begin to rise. If opportunities for managed retreat become available, options should be pursued to restore areas to baylands or to connect bay habitats.

Recommended Actions

FOR HABITATS AND THE LANDSCAPE IN GENERAL

- Design and restore complete tidal wetland systems, even at a small scale, that include tidal marshes, beaches, and lagoons, broad transition zones, and develop techniques for implementing active revegetation, high-tide-refuge islands, and subtidal habitat restoration.
- Restore, enhance, and protect a diversity of habitats, including tidal marsh, shorebird roosting sites, and seasonal wetlands.
- Create transition zone habitat where feasible at the edges of existing marshes or where land becomes available.
- Protect and restore native oyster beds and eelgrass beds throughout this segment, including the area around the Bay Bridge.
- Protect land as it may become available in order to incorporate transition zones into restoration designs.

FOR PARTICULAR WILDLIFE POPULATIONS

- Protect gull, tern, and egret nesting habitat at Brooks Island, Red Rock, and Castro Rocks.
- Implement a pilot project with citizen involvement to hang oyster-shell bags off marina docks to use later in building reefs.
- Conduct pilot projects to assess the effectiveness of artificial floating islands for nesting and high-tide refugia for Ridgway's rail.

Restoration Benefits

The recommended projects for this segment would demonstrate innovative techniques to restore and enhance habitats for many populations of key fish, amphibian, reptile, insect, mammal, and bird species. Restoring wetlands would enhance habitat for endangered species such as the Ridgway's rail and salt marsh harvest mouse. Restoring beach habitat could improve conditions for sensitive plant species. Protecting islands would assure suitable sites for colonial nesting birds. Restoring native oyster and eelgrass beds offshore would provide habitat for birds and fish, and might enhance food and nursery resources for species that use both wetlands and offshore shallow subtidal habitats. Living-shorelines designs might provide wave attenuation, sediment stabilization, and some flood protection in the near term for tidal marsh habitats on the shoreline.

Including public education and awareness components in any restoration initiative is critical to building the public and financial support that is needed to test adaptation approaches and work toward large-scale implementation of innovative techniques.

Challenges

Major challenges in this segment are its large urban population, extensive fill along the shoreline, bridges, wastewater treatment plants, railroad tracks and spurs, major highways, exotic predators (e.g., rats and red fox), invasive *Spartina*, and on-site contaminants.