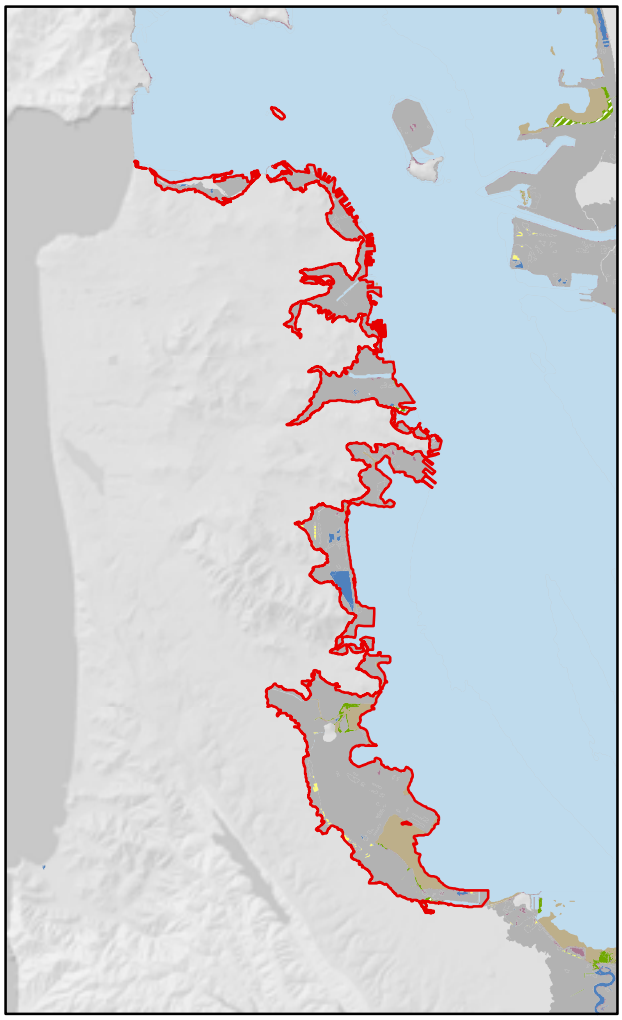
BAYLANDS SEGMENT J



SAN FRANCISCO AREA

Western side of central San Francisco Bay between the Golden Gate and Coyote Point

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 J.

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

Segment J provides an opportunity to restore tidal wetlands, beaches, sand dunes, intertidal rocky areas, and subtidal habitats that enhance its ecological connections. Tidal marshes at several sites south of San Francisco can also be restored or enhanced. The locally extirpated California seablite and associated rare or uncommon high-marsh plant species can be reestablished. West of the airport are opportunities to enhance freshwater marshes and adjacent seasonal wetlands for the San Francisco garter snake and red-legged frog. Conditions at some sites are appropriate for native eelgrass and oyster restoration. Other habitats, including several roosting sites, can also be protected and restored.

The segment is highly visible to the public. Demonstration projects could educate residents, strengthen their connection to the environment, raise awareness about the impacts of climate change, and promote solutions that improve the health of the baylands and its resources. Multiple creeks (including creeks in the Presidio and Colma Creek) are already the focus of community-based restoration efforts, and this work could be leveraged with other activities integrating climate-change-adaptation techniques. Crissy Field, the San Francisco waterfront, San Francisco International Airport (SFO), and multiple large marinas provide unique, visible opportunities to educate the public about wildlife habitat needs.

This segment will 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 improved habitat quality and the protection of existing infrastructure, shorelines, and baylands. Critical infrastructure, such as SFO will need to be protected, but there are ample opportunities for small improvements that may result in enhanced habitat corridors and better linkages for species that use the bay and baylands.

Segment Features and Setting

Historically, this segment supported many kinds of habitats. Barrier beaches and marshes existed in small coves between the local headlands, often in connection with the mouths of streams. Tidal marsh was also present along the lower reaches of streams and in several small embayments at sites such as China Basin, Islais Creek, and Hunters Point. A wide band of tidal marsh extended from near Candlestick Point southward to Coyote Point. This area was one of the major historical localities of the locally extirpated California seablite.

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. Today, cities, military bases, industrial sites, marinas, and port facilities line much of the shore. The Port of San Francisco and its piers cover much of the San Francisco shoreline. SFO is in the middle of a former large tidal marsh. West of the airport is an area of seasonal wetlands and permanent freshwater marsh. At several sites along the modern shoreline, shell and sand beaches have re-formed naturally. Restoration of tidal marsh and other habitats is under way at Crissy Field, Heron's Head Park, and Yosemite Slough. Much of the shoreline south of San Francisco has

been altered by Highway 101 and residential and industrial development. This area includes remnant fringe marshes, lagoons, mudflats, rocky intertidal areas, fragmented small native oyster populations, and other remnant habitats.

Implications of Drivers of Change

The developed areas in this segment will become increasingly difficult to protect as sea levels rise, and there are limited natural areas and elevations that could allow for the migration of baylands. Seawalls, piers, and communities offshore from Highway 101 in particular will be subject to greater wave action as water depths increase, allowing larger waves to propagate inshore. Increasing wave action will also accelerate the erosion of the remaining small marsh edges, resulting in the narrowing and potential loss of marshes and other unique habitats such as coarse beaches and rocky intertidal areas. This urbanized segment has a great deal of existing development that directly abuts the shoreline, limiting the migration space and areas for restoration adaptation. Innovative and experimental approaches need to be tested that may include sediment placement, the use of uncontaminated on-site fill in restorations, and integrated multihabitat designs with multiple biological and physical objectives.

Considerations for Implementing the Actions

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

This segment is highly urbanized and constrained by steep shorelines and development directly adjacent to the baylands. In the near term, when sea-level rise rates will still be relatively low, actions that enhance the existing baylands and provide immediate ecological benefits will maximize shoreline resilience. Living breakwaters could be created around fringing marshes to preserve and enhance unique features like native eelgrass and oyster beds. Partnerships should be pursued with the industrial and residential communities along the shoreline to create habitat bayward of their flood-protection levees (through horizontal levees, living shorelines, or other green infrastructure).

Major land uses such as the Port of San Francisco will remain largely in current configurations, and they 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 and removing contaminated soils and derelict boats. A stronger focus could be placed in removing 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 are limited but should be included in any plans.

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 persist. 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 in Millbrae and other areas will be at risk for flooding as sea levels 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

- Preserve, enhance, and create diverse pocket habitats that are linked in a subregional habitat corridor that encompasses sand beaches, eelgrass, oyster beds, macroalgal beds, mudflats, rocky intertidal areas, and tidal marsh.
- Design and restore complete tidal wetland systems, even at a small scale, that include tidal marshes, beaches, lagoons, and broad transition zones. Develop techniques for implementing active revegetation, high-tide-refuge islands, and subtidal habitat restoration.
- Consider ways to increase sediment supply to the tidal baylands, including reconnecting stream channels into marshes and augmenting the trapping efficiency of tidal baylands to foster accretion, as appropriate.
- Protect and restore native oyster and eelgrass beds in suitable areas.
- Protect land as it may become available to incorporate transition zones into restoration designs. This may include remediating contaminated land (wastewater treatment ponds, industrial areas, flat unfilled lands) to create habitat.

FOR PARTICULAR WILDLIFE POPULATIONS

- Protect and enhance Pacific herring spawning areas.
- Protect and enhance critical avian stopover sites.
- Reestablish the California seablite and the associated high salt marsh plant species on the sandy edges of "pocket" marshes.
- Eliminate core populations and advancing-edge populations of invasive *Spartina*.

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 tidal marsh would facilitate the dispersal of tidal-marsh-dependent birds, such as the Ridgway's rail and black rail, by providing roosting and foraging habitat. Restoring marsh–upland transition zones would benefit both plant and animal species, including populations of several rare

San Francisco Pier 94 restoration area

plants. Enhancing the habitats west of Highway 101 near SFO would benefit the San Francisco garter snake and the California red-legged frog. Reestablishing a tidal marsh corridor between the San Francisco and San Bruno Marshes would link these existing areas, increase tidal marsh acreage, and reduce the isolation of small-mammal populations. 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 might provide wave attenuation, sediment stabilization, and some flood protection in the near term for tidal marsh habitats on the shoreline.

Experimental pilot projects should be conducted using new approaches that are carefully tested in phases. Integrating native oyster and eelgrass restoration adjacent to tidal wetlands, creating living shorelines, and incorporating features such as high-tide-refuge islands might improve small areas of habitat. They would also provide information on how well these approaches succeed and whether they can be scaled up to larger areas in this segment. Such information could be applied to other segment adaptation planning.

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

The major challenges in this segment are its large urban population, extensive fill along the shoreline, on-site contaminants, port and military facilities, Highway 101, wastewater treatment facilities, SFO, many large shoreline fills, utility corridors, bridges, water-treatment plants, railroad tracks and spurs, landfills, flood-control considerations, exotic predators (e.g., rats and red fox), and invasive *Spartina*.