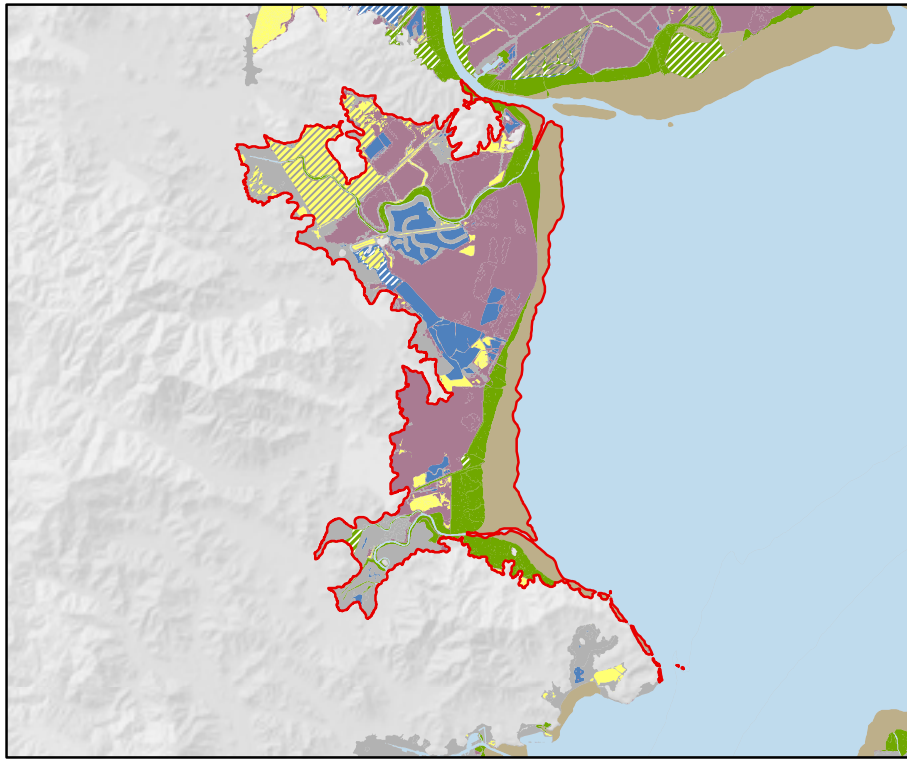


BAYLANDS SEGMENT G



NORTH MARIN

Western side of San Pablo Bay extending from the mouth of the Petaluma River to Point San Pedro

Baylands 2009

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

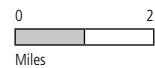
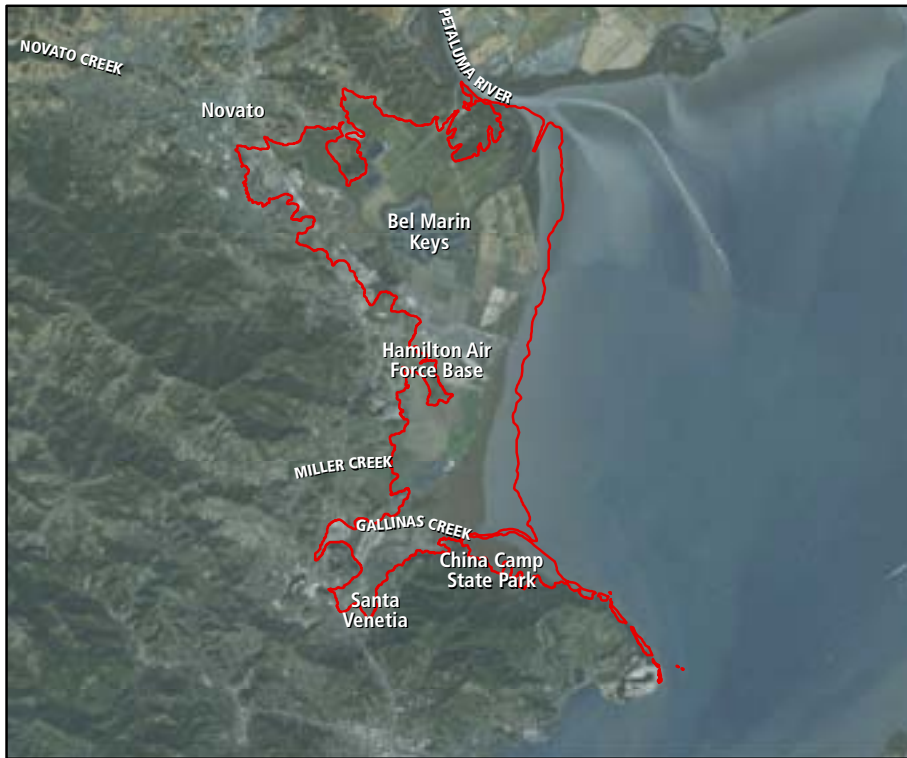
Red line shows the boundaries of Segment G.

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)



Unique Opportunities

Segment G provides a unique opportunity to enhance tidal marsh in areas where natural terrestrial transition zones exist (e.g., China Camp State Park). In addition, transition zones can be secured in areas of low-intensity development because these zones will become the platform for tidal marshes by the late 21st century. The upper edges of transition zones will provide the foundation for limited high-marsh and brackish-marsh zones. Furthermore, riparian and tidal restoration along Novato, Gallinas, and Miller Creeks could enhance tributary streams for fish and amphibians.

Segment Features and Setting

Historically, this segment supported large areas of tidal marsh that were bordered by the widest mudflats in San Pablo Bay. The most extensive marshes lay between Novato and Gallinas Creeks and were exposed to significant wave action due to the orientation of the shoreline. Marsh berms formed along the shoreline, and ponds were abundant within the marsh plain as a result of the minimal internal drainage. The marshes north and south of Novato and Gallinas Creeks are more sheltered from wave action and formed well-drained plains with complex, sinuous channels. While Novato and Gallinas Creeks were the largest of the streams that flowed into and through the marshes, numerous ephemeral streams draining smaller watersheds flowed into the back of tidal marshes. Wide alluvial valleys supported riparian habitats through which steelhead and possibly coho salmon passed. Oak woodlands dominated the upland landscape. The Coast Miwok had permanent as well as seasonal village sites in the valleys and along the bayshore. This segment provided significant habitats for a variety of threatened and endangered species, including steelhead, Ridgway's rail, salt marsh harvest mouse, black rail, and tidewater goby.

Presently, much of the area near the bay is pasture or cultivated for oat hay, and residential developments have been established at Bel Marin Keys and several sites to the south. Since the original Baylands Goals report, the restoration of approximately 750 acres of wetlands on the former Hamilton Air Force Base has been completed, with restoration plans progressing on the adjacent 1,700-acre Bel Marin Keys property. A fairly large remnant marsh remains at the mouth of Gallinas Creek, including China Camp, which supports what appears to be the largest population of Ridgway's rails in the North Bay. Large freshwater emergent marshes are found along the western side of Novato Creek north of Highway 37 and at Pacheco Pond.

Implications of Drivers of Change

The primary driver of change in this segment will likely be the impacts of sea-level rise on flood protection in the city of Novato, the Santa Venetia community, and the Bel Marin Keys residential areas, where pressure to build engineering defenses against flooding and wave erosion, regardless of habitat impacts, may increase. However, tidal marsh restoration could be used to enhance flood protection. Without enhancement, existing tidal marshes may be unable to keep up as the rate of sea-level rise increases, resulting in greater inundation of the marsh plain. High marsh that is flooded only during spring tides may downshift to mid and low marsh that is regularly flooded,

depending on sediment supply and accretion rates. Increasing tidal submergence coupled with wave erosion may ultimately result in the conversion of tidal marsh to mudflat and landward migration of the shoreline.

Considerations for Implementing the Actions

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

As restoration projects are implemented and suspended-sediment concentrations are still sufficient to sustain marsh-building processes, the near term presents significant opportunities to restore large areas of tidal marsh with wide transition zones from China Camp to the Petaluma River. Since wave erosion is likely to increase as the bay deepens, coarse sediment nourishment may be needed in front of marsh scarps to reduce shoreline retreat. Similarly, along developed residential or commercial shorelines, narrow transition zones could be created to provide buffers against wave erosion and high-tide refugia. Restoring tidal marsh would provide opportunities to expand and reintroduce populations of rare plant species, such as northern salt marsh bird's-beak and salt marsh owl's-clover. Ridgway's rail could also expand into wide marshes remote from predator outposts and corridors. Reengineering levees to create gently sloping transition zones will buffer storm-wave runup and erosion, and lower the flood risk as well as facilitate landward migration of the marsh.

Lower Novato Creek Watershed

Large areas of public lands could be restored to a combination of tidal, seasonal, and riparian wetlands to create a mosaic of habitat types, including a large transition zone and a mix of fluvial–tidal habitats. This restoration would expand the tidal prism and reduce the need for dredging to maintain flood-channel capacity. Large freshwater marshes along the western side of Novato Creek north of Highway 37 and at the Pacheco Pond could also be enhanced as transition zone features. Similarly, treated wastewater and stormwater discharges might be realigned for diffuse discharge along wide, sloping engineered terraces on flood-control levees to provide some surrogate transition zone biogeochemical functions (nutrient transformation, sequestration, etc.). Simmonds Slough baylands (Atherton), currently managed as nontidal seasonal wetlands, may be hydrologically modified to restore tidal flows and establish brackish marshes influenced by wastewater discharge if upgrades are made to Highway 37.

Lower Miller Creek Watershed

The undeveloped area between the bay and Highway 101 (excluding China Camp State Park) provides rare, appropriate topography for extensive transition zone and connected high marsh. Complete tidal wetland systems should be restored here to connect the Hamilton marshes to those to the south.

Lower Gallinas Creek Watershed

Complete tidal wetland systems should be restored here to connect the marshes to the north and south. Steep artificial slopes and transition zones bordering

the developed baylands of upper Gallinas Creek could be adapted to sea-level rise by engineering gentler slopes using suitable dredged flood-control-channel sediments. Again, treated wastewater could be used to create a seepage transition zone terrace and levee system, incorporating freshwater managed wetlands for waterfowl, within the existing and likely future transition zones near north Gallinas Creek baylands.

Long Term (latter half of the century, after SLR curve acceleration)

At some point the amount of sea-level rise may make it infeasible (cost ineffective) to maintain reliable flood protection for developed urban residential infrastructure in very low-lying areas. Land-use planning for a rising sea level will be imperative for cities to provide flood protection to the more densely populated areas while maintaining habitat benefits for a wide range of species. An important factor to consider while making such plans is whether it is possible to reestablish natural sediment transport from watersheds to tidal marsh areas to help maintain marsh elevations.

RECOMMENDED ACTIONS

For Habitats and the Landscape in General

- ◆ Restore an extensive transition zone and connected high marsh along the undeveloped area between the bay and Highway 101.
- ◆ Restore the large areas of public lands along lower Novato Creek to a combination of tidal, seasonal, and riparian wetlands to create a mosaic of habitat types, including a large transition zone and critical habitat at the fluvial–tidal interface.
- ◆ Protect and restore agricultural lands and other open space to reestablish transition zones and buffers adjacent to tidal marsh and provide space for landward migration, including oak woodlands and mixed evergreen forest along the entire ridge and hillslopes. Transition zone habitats can be created on gentle slopes in front of flood-risk-management levees.
- ◆ Consider ways to increase the sediment supply to tidal baylands. Improve the trapping efficiency of restored marshes to increase their accretion rates and reuse dredged sediments.

For Particular Wildlife Populations

- ◆ Identify, conserve, and manage selected refugia for native bayland plants. Focus on unique or core populations of uncommon plants, especially in low marshes.
- ◆ Continue to control invasive *Spartina* in the mouth of Gallinas Creek, Hamilton Field, and other tidal marshes and restoration areas.



China Camp State Park

Restoration Benefits

Restoring tidal marshes, transition zones, and the lower reaches of streams would expand suitable habitat for many tidal marsh species, including rare and endangered plant, fish, bird, and mammal species such as the Ridgway's rail. The conservation of valleys and their reconnection with the baylands ecosystem would provide critical space for high tidal marsh and brackish marsh to migrate as sea levels rise toward the end of the 21st century. Reconnection of groundwater and surface stream discharges to tidal marsh would also provide critical brackish buffers to increasing salinity, thereby supporting tall, emergent vegetation that forms essential high-tide cover. The reuse of coarse-grained dredged sediment could simulate natural alluvial sediment transport that could help provide and enhance this groundwater-marsh connection. Wastewater flows could also be used to enhance seasonal and brackish marsh habitat types that are rare in this part of the Bay.

Challenges

Challenges include the commercial and residential developments at Bel Marin Keys, Hamilton Field, and at several sites to the south; diked intensive recreational land uses (golf) in subsided baylands at Black Point; low-lying segments of Highway 37, State Highway 101, other roads, and a railroad that may be renovated for commuter use. In some areas the railroad grade parallels the shoreline within the transition zone, making it a challenge to future migration because in the near term it will, along with other roads on the bay edge, prevent any significant landward migration of the baylands. The highway is further inland than the railroad and therefore represents a longer-term constraint. Development between the railroad and the highway is a long-term constraint as well. Each drainage channel that enters the existing transition zone or passes through areas of future transition zone presents significant flood-protection challenges. Also, multiple cultural sites relating to Coast Miwok habitation and early European and Asian settlements within the existing, near-term, and long-term transition zone must be considered during any effort to enhance, restore, or create transition zone habitat. Planning will require coordination with local agencies and organizations, including Marin County and Caltrans.