

King Tides Marshes talk
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Lauren Armstrong, CDA

Communities in Marin are among the many around the San Francisco Bay that are vulnerable to sea level rise (SLR). Annual high tides currently flood large areas of roadway, parking and infrastructure even without storms. When storms occur at high tides, flooding significantly increases. Under any likely future scenario of sea level rise, much larger urbanized areas will be impacted by deeper and more damaging coastal flooding.

Planning for sea level rise adaptation will have to come from the community working with the cities and County as well as with the permitting agencies and other stakeholders. To refine adaptation measures presented in this report, planners will need to consider direct coastal flooding as well as how sea level rise may exacerbate riverine flooding, including creeks overtopping levees and backwater flooding from storm drains, as well as how potential changes in rainfall patterns and intensity may worsen riverine flooding.

A number of locations along the Richardson Bay shoreline flood during the semi-annual, high king tides (technically known as the “perigean spring tides”). Roadways, trails, and parking lots flood, even without any storm-driven flows (which only worsen flooding). Direct bay coastal flooding and watershed flooding are expected to significantly worsen as the climate changes, bay tides rise, and rainfall patterns change. As discussed in detail in this study, higher bay tide levels also increase wave heights and associated shoreline erosion.

Many of the low-lying areas along the Richardson Bay shoreline were historic tidal marsh. Later they were filled for development and are now densely urbanized, with residential and commercial shopping areas, along with infrastructure such as sewer, water, and electrical utilities that may be impacted as sea level rises. These areas and infrastructure will need to be protected or relocated.

The Richardson Bay shoreline represents an opportunity for climate change adaptation planning. The make-up of the shoreline, with its mix of residential and commercial properties, businesses, parks, wetlands, trails, and utilities and infrastructure, make it an ideal laboratory and potential model for sea level rise adaptation strategies for the rest of the San Francisco Bay Area.

The depths and shoreline of the inner and outer bay reflect a balance between sediment supply derived from a combination of local watershed and open San Francisco Bay sources, and the forces of waves and tides that move and redistribute these sediments. Studies of Bothin Marsh have indicated a relatively low supply of suspended bay sediments which could limit the ability of the remaining tidal marshes to maintain their elevations as sea level rises.

Several watersheds in Mill Valley, Belvedere, Marin City, Sausalito, the Town of Tiburon, Tamalpais Valley, and Strawberry Point areas of unincorporated Marin drain into Richardson Bay.

Sea level in San Francisco Bay has gone up and down in accordance with the various ice ages. At points during past periods of ice age glaciation, the bay's sea level was over 200 feet lower than it is today; during other periods of warming it has been much higher. During past periods of sea level rise, habitats, plants, animals, and any people who were affected adapted by relocating upslope. The difference today is that we have built major infrastructure along the bay's edge that warrants protection, rebuilding, or relocation as sea levels rise.

Due to the steep topography of the land next to the bay, tidal marshes have always been limited along the shoreline (Habitat Goals Project 1999). Historic tidal areas were lost to development and channel realignment. Today, only a few tidal marshes remain in the watershed. The largest is the Bothin Marsh Open Space Preserve, a large salt marsh at the north end of Richardson Bay. Arroyo Corte Madera del Presidio enters this marsh near Camino Alto between Sycamore and Miller Avenues. Full of cordgrass and pickleweed, Bothin Marsh supports the California Ridgeway Rail and Salt Marsh Harvest Mouse, both endangered species, and a variety of shorebirds and waterfowl.

Pacific Herring, a valuable commercial fish, spawn in the shallow waters and eelgrass beds of Richardson Bay from December through February. The herring and herring eggs are also very important sources of food for birds that inhabit the bay during winter. Anadromous fish, including salmon, steelhead trout, striped bass, sturgeon, and shad, migrate through the marine environment of Richardson Bay upstream through the Delta to fresh water to spawn.

The Richardson Bay Audubon Center and Sanctuary manages 900 acres of submerged baylands. They also manage an 11-acre upland parcel directly adjacent to the bay, which includes beach, bluffs, grasslands, oak woodland, coastal scrub, and riparian woodland. The Center and Sanctuary operates a Monitoring Avian Productivity and Survivorship (MAPS) bird-banding station during the breeding season.

Large areas of residential and commercial development extend along the Richardson Bay shoreline from Marin City all the way to and around Mill Valley and along the Strawberry and Tiburon peninsulas. The commercial and business developments tend to be smaller scale retail and light industrial commercial. There are commercial shopping centers at Marin City and Tam Junction, both of which flood under current conditions.

While Highway 101 is generally elevated, the interchanges and frontage roads from Marin City to Coyote Creek, Shoreline Highway, and Almonte and Miller Avenues are at low elevations and subject to frequent flooding.

Utilities include the typical urban support infrastructure such as water, power, telephone, and sanitary system conveyance.

Marin DPW and Parks have been awarded a \$25,000 grant to develop a feasibility level assessment plans for the local beneficial reuse of dredge sediment from Coyote Creek to enhance Bothin Marsh for habitat and sea level rise adaptation. The grant will fund conceptual design alternatives and estimated costs including an evaluation of the constructability and permitting issues for Bothin Marsh. A draft report will be available in December 2015.