

Elevation Map of San Francisco Bay's Tidal Wetlands

Tidal marshes are an integral piece of the San Francisco Bay ecosystem that are threatened by accelerating sea-level rise. USGS scientists have been working to understand the sensitivities of tidal marsh ecological processes to sea-level rise and develop projections of how tidal marshes will behave in the future to help inform resource managers. The current elevation of the marsh surface, relative to tidal flooding, is critical baseline information that is necessary for a wide range of research and management activities throughout this region.

Airborne light detection and ranging (lidar) is a valuable tool for collecting elevation data across large areas. However, lidar is not able to penetrate the dense vegetation that covers most tidal marshes, introducing a positive bias in the elevation data that skews interpretation and analysis for managers and researchers. In tidal areas, relatively small vertical bias in elevation can have large ecological consequences, for example, when attempting to determine marsh flooding frequency for plant or wildlife species. In San Francisco Bay a vertical elevation bias of 25 cm can result in a >50% underestimation of flooding frequency during the tidal cycle or storms. Some form of correction is needed to account for this vegetation bias in lidar data, especially in areas with little elevation topography and hydrologically connected areas like tidal marshes.

Several methods to correct lidar elevation data are available, but a reliable method that requires limited field work and maintains high spatial resolution was lacking. In a paper published in 2016, USGS presented a novel method, the Lidar Elevation Adjustment with NDVI (LEAN), to correct lidar digital elevation models (DEMs) with vegetation indices from readily available multispectral airborne imagery (NAIP) and field real-time kinematic (RTK)-GPS elevation surveys. By using available imagery and with field RTK GPS elevation surveys, the paper showed that lidar-derived DEMs can be adjusted with greater accuracy while maintaining high (1 m) resolution.

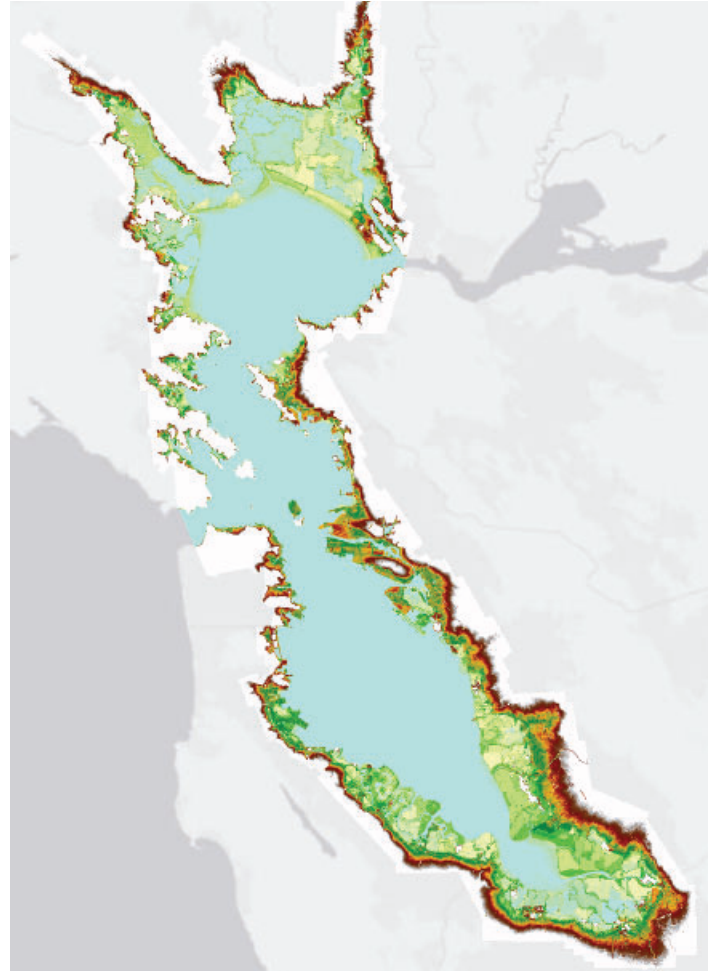
This newly available data release provides a [downloadable digital elevation model \(DEM\)](#) for tidal marsh areas around San Francisco Bay (west of the Carquinez Bridge) that can be used with geospatial software to map elevation. The product is a seamless DEM the combines the corrected elevation for tidal wetlands with the uncorrected DEM for adjacent upland areas.

To access the DEM go to: <https://doi.org/10.5066/P97J9GU8>

This Brief Refers To:

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MANAGEMENT IMPLICATIONS

- Accurate estimates of elevation data in the San Francisco Bay can be useful to managers planning strategies for restoration, wetland enhancement, and wildlife management.
- This product increases accuracy of flooding assessments and models that simulate effects of storm surge and sea-level rise to inform decision making.

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