

Bleak future for Bay area tidal marshes?

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A new study, led by PRBO Conservation Science (PRBO), projects a bleak future for San Francisco Bay's tidal marshes under high-end sea-level rise scenarios that are increasingly likely. PRBO and colleagues found that in the worst case scenario 93% of San Francisco Bay's tidal marsh could be lost in the next 50-100 years [with 5.4 feet or 1.65 meters of sea-level rise, low sediment availability and no significant restoration].

PRBO's study indicates, however, that not all marshes will be lost and that society's actions today, including restoration currently underway, can keep more marshes intact as sea levels rise.

This first-of-its-kind study assesses how sea-level rise, suspended sediment availability, salinity and other factors might impact San Francisco Bay's tidal marshes. The study was published this week in the high-impact journal [PLoS ONE](#). The study, which considered multiple scenarios to project possible future outcomes, was authored by researchers from PRBO as well as ESA PWA, University of San Francisco, UC Berkeley, and San Francisco State University.

Tidal marshes are vital to [migratory birds](#), [commercial fisheries](#), other wildlife and people. Marshes act like giant sponges, protecting highways, businesses, homes and other structures by reducing flood impacts in large storm events and as sea levels rise. Tidal marshes also filter out pollutants and sequester carbon.

"Tidal marshes are incredibly resilient to changes in sea level, depending

on how fast seas rise and how much sediment is available. Unfortunately, marshes cannot keep up with the high-end sea-level rise predictions on their own. They will need our help." said Diana Stralberg, the study lead author of PRBO and the University of Alberta.

Sediment is essential to the ability of marshes to grow as sea levels rise over time. With each tide, muddy waters are carried over the marsh surface and sediment is deposited. However, many acres of former baylands have limited or no tidal connection, cutting them off from this essential sediment supply. These degraded baylands, many of which have been used for agriculture or salt production, can be restored by re-connecting them to the tidal flow. Managers can help restore and preserve existing marsh by re-purposing non-polluted sediments from dredging projects.

"This study points to the need for improved bay-wide sediment management, including re-purposing dredge sediment to kick-start restoration or to feed existing marshes in San Francisco Bay," said co-author Matt Brennan of ESA PWA.

Public agencies such as the California Coastal Conservancy and the US Fish and Wildlife Service are already working to enhance and protect marshes into the future.

"Efforts to reuse dredged sediment from ports, marinas, and shipping channels for wetland restoration are underway, but large amounts of dredged sediment continue to be disposed of in the ocean or bay - not the best use of what we now realize is a valuable resource," explained Amy Hutzler, SF Bay Program Manager of the CA Coastal Conservancy.

When sea levels rose during pre-modern times, tidal marshes gradually migrated into adjacent uplands. Today levees, development, roads, parking lots and other barriers prevent that movement, threatening the

future of tidal marsh habitat and dependent wildlife.

"Our results indicate that we must start thinking now about where tidal marshes could move up to—the future potential wetlands. If we can't slow down sea-level rise, we will need to identify and protect areas where marshes can migrate to," Ms. Stralberg said.

The research team posted interactive maps with various scenarios of sea level rise impacts on tidal marsh online at www.prbo.org/sfbayslr. They are also sharing the findings with natural resource managers, local governments and policy makers to guide decision making and on-the-ground action.

"It's only under the high sea-level rise and low sediment scenarios that marsh losses are catastrophic. Hopefully people will wake up to the issues before sea-level rise starts to get really bad," said John Callaway, one of the study's authors from the University of San Francisco.

Scientists currently expect rates of sea-level rise to accelerate in the second half of this century. Therefore, the time to act is now.

"The real hope for San Francisco Bay's tidal marshes, for the birds and fish that depend upon them, and for the many benefits tidal marshes provide to our communities, is working together now to restore existing priority marshes and create new ones where feasible. We also must find win-win approaches to redirecting development, away from areas where tidal marshes could be restored and away from where marshes could move to over time," explained Ellie Cohen, PRBO's President and CEO.

The PRBO collaborative study uses 5.4 feet of sea level rise as the high end scenarios based on current scientific literature.

"Some scientists are now considering as much as 16.4 feet (5 m) of [sea](#)

[level](#) rise over the next 100 years due to accelerating rates of greenhouse gas pollution and new research about how ice sheet loss has occurred in the past. [Sea level rise](#) could increase much faster this century. From a development and societal perspective, making wise choices today will reduce future costs. Now is the time to incorporate nature-based solutions to these threats to society- for wildlife and for our communities," said Ms. Cohen.

Maintaining healthy tidal marshes over the next century will require protecting the remaining undeveloped adjacent lands throughout the Bay region, especially in sediment-rich areas around Petaluma River, Napa River and South San Francisco Bay.

"Our work doesn't end with this publication- it's just beginning. Now we need to use our results and work with land managers and policy-makers so they can make the best decisions," said co-author and PRBO biologist Julian Wood.

More information: <http://dx.plos.org/10.1371/journal.pone.0027388>

Provided by PRBO Conservation Science

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