

# Climate Change Fact Sheet: Sea Level Rise

## Overview

- In the past 100 years, sea level rose by 8 inches in the Bay Area<sup>6</sup>.
- San Francisco will “likely” see an increase in sea level of 1.6 – 3.4 feet by 2100<sup>4</sup>.
- Potential threats to Valley Water include risks to imported water supply reliability, watershed stewardship, asset management, and coastal flooding.

(b) Relative sea level in San Francisco, California

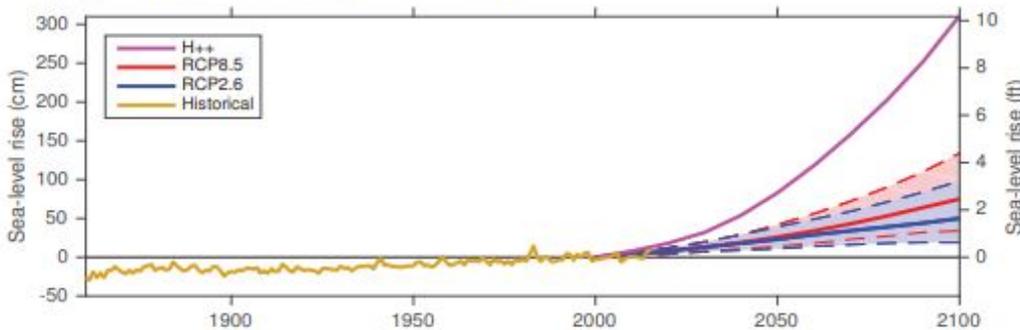


Figure 1. Source: Rising Seas in California: An Update on Sea-Level Rise Science (CA Ocean Protection Council, 2017)

## Background

Sea levels are rising because of rising global temperatures. These warmer temperatures cause glaciers to melt, ice loss from Greenland and West Antarctica, and oceanic thermal expansion, which is the process where water expands as it warms<sup>1</sup>. Because of these impacts, global mean sea level rose by 0.19 meters (about 7.5 inches) from 1901 to 2010, according to the U.N.’s Intergovernmental Panel on Climate Change<sup>2</sup>. Due to the residual warming of the oceans, sea levels will continue to rise across the world for centuries even if greenhouse gas emissions are drastically reduced today<sup>2</sup>. However, the rate of sea level rise and the resulting impacts will differ between regions<sup>2</sup>.

## Local Sea Level Rise to Date

Increases in sea level are already being observed along Santa Clara County’s coast. The California’s 4<sup>th</sup> Climate Change Assessment reported that sea levels rose 8 inches in the Bay Area over the past 100 years<sup>6</sup>. According to

NOAA’s Redwood City tidal gauge data, which is the closest NOAA tidal gauge to Santa Clara County, the relative sea level rise trend has been 2.3 mm per year based on 1974 to 2017 data,<sup>3</sup> where relative refers to the change compared with a fixed location. In comparison, the San Francisco sea level rise trend is 1.96 mm per year according to data from 1897 to 2017<sup>3</sup>.

## Projected Sea Level Rise

Sea levels are projected to rise throughout the world within the next century<sup>2</sup> and the San Francisco Bay is no exception. The California Ocean Protection Council published their 2018 State of California Sea-Level Rise Guidance document<sup>4</sup> that includes sea level rise projections for San Francisco. According to these projections, assuming a high greenhouse gas emissions scenario (RCP8.5), the “likely range” (with an estimated 66% probability) of sea level rise in San Francisco is 1.6 – 3.4 ft. by 2100 in comparison to a 2000 baseline. If GHG emissions are reduced (RCP2.6), the likely scenario drops to 1 – 2.4 ft. The worst-case scenario, called the H++ scenario, projects an

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increase of 10.2 feet by 2100. The H++ scenario is considered an extreme sea level rise scenario, includes melting of the Atlantic Ice sheet, and does not have a probability associated with it. Although the world is currently not on the H++ trajectory, it is included because of the

exponential nature of sea level rise, especially later on in the century, and because melting of the ice sheet would add a significant amount of sea level rise to California

### Impacts on Valley Water

Sea level rise has the potential to impact Valley Water functions in a variety of ways. Locally, sea level rise may inundate the low-lying areas of Santa Clara County that reside close to the San Francisco Bay. Fortunately, there is an existing (but not accredited) levee system along the bay that does offer some protection. The salt ponds (some converted to wetlands) that line the County's waterfront also provide some protection from coastal flooding. However, for unprotected areas and areas where the levees overtop or fail due to very high sea level rise (and/or coastal storm events), flooding can impact Santa Clara County communities and businesses and may pose a risk to Valley Water infrastructures. Sea level rise also increases the

risk of emergent shallow ground water flooding (groundwater that ponds on the surface); this is a relatively new research topic and the risks of this in Santa Clara County are still being quantified<sup>7</sup>. Rising sea levels can also damage natural habitats that currently thrive near the bay and place threatened species in further danger, such as the salt marsh harvest mouse. Valley Water's water supply is also at risk as sea level rise extends into the Delta. Not only could this cause reductions in the allocations of imported water due to increased salinity and as more and more fresh water is used to keep the ocean at bay, but it can also cause an increase in toxic bromide in the water.

### Valley Water Response

Valley Water is already taking steps to minimize the impacts of sea level rise along the South Bay through a variety of projects, the biggest of which is the South San Francisco Bay Shoreline Project. A partnership between the California State Coastal Conservancy, the U.S. Army Corps of Engineers, Valley Water and other stakeholders, this project will protect Alviso against a 1% coastal flood with up to 2.6 feet of sea level rise. Valley Water is also a partner of an effort in its early planning stages to extend similar protection to the remainder of the Santa Clara County coastline.

During the early planning for the Shoreline Project, Valley Water had flood protection projects on a few creeks and channels which flow to the Bay. These projects, for example, the Permanente and Sunnyvale East and West Channels flood protection projects, were directed to take sea level rise into consideration so that they could tie into the future potential Shoreline levee. Considering projections and designing flexible projects allows for increased resilience in the face of sea level rise. In addition to reducing the risk of inundation, these efforts can also restore habitat and protect both infrastructure and communities.

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### Sources

- <sup>1</sup> “Is sea level rising?” *National Oceanic and Atmospheric Administration*, [oceanservice.noaa.gov/facts/sealevel.html](http://oceanservice.noaa.gov/facts/sealevel.html).
- <sup>2</sup> “Climate Change 2014 Synthesis Report: Summary for Policymakers.” *Intergovernmental Panel on Climate Change*, 2014, [www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5\\_SYR\\_FINAL\\_SPM.pdf](http://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf).
- <sup>3</sup> “Sea Level Trends.” *National Oceanic and Atmospheric Administration*, [tidesandcurrents.noaa.gov/sltrends/sltrends.html](http://tidesandcurrents.noaa.gov/sltrends/sltrends.html).
- <sup>4</sup> “State of California Sea-Level Rise Guidance.” *California Ocean Protection Council and California Natural Resources Agency*, 2018, [www.opc.ca.gov/webmaster/ftp/pdf/agenda\\_items/20180314/Item3\\_Exhibit-A OPC SLR Guidance-rd3.pdf](http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180314/Item3_Exhibit-A OPC SLR Guidance-rd3.pdf).
- <sup>5</sup> “Project Description.” *South Bay Salt Pond Restoration Project*, [www.southbayrestoration.org/Project\\_Description.html](http://www.southbayrestoration.org/Project_Description.html).
- <sup>6</sup> California’s Fourth Climate Change Assessment, “San Francisco Bay Area Region Report,” 2018. <https://www.climateassessment.ca.gov/regions/>.
- <sup>7</sup> Plane, E., Hill, K. and May, C. 2019. A Rapid Assessment Method to Identify Potential Groundwater Flooding Hotspots as Sea Levels Rise in Coastal Cities. Water, MDPI. <https://www.mdpi.com/2073-4441/11/11/2228/pdf>

### Images

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<https://coast.noaa.gov/slr/#/layer/sce/6/-13582438.594043933/4497119.842530176/12/satellite/none/0.8/2050/interHigh/midAccretion>  
(3 ft of Sea Level Rise Selected)