

WATER FACTS

San Francisco, California: Identifying and Becoming More Resilient to Impacts of Climate Change



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Cities across the United States should anticipate significant water-related vulnerabilities based on current carbon emission trends because of climate change, ranging from water shortages to more intense storms and floods to sea level rise. To help cities become more resilient to the rising threats of climate change, NRDC reviewed more than 75 scientific studies and other reports to summarize the water-related vulnerabilities in 12 cities—including San Francisco. Although there may still be some uncertainty about what particular impacts threaten cities and how quickly or severely they might occur, action at the local level is the most effective method of reducing, mitigating, and preventing the negative effects of water-related climate change outlined in this fact sheet. NRDC urges cities to prepare for coming challenges relating to water resources. Fortunately, there are steps cities are already taking to become more resilient.

Based on research from the California Climate Change Center, Pacific Institute, and others, NRDC has compiled projected water-related vulnerabilities to the San Francisco Bay Area (comprising San Francisco, San Mateo, Santa Clara, Alameda, Contra Costa, Solano, Napa, Sonoma, and Marin counties) as a result of climate change throughout the 21st century:

Summary of water-related climate changes and impacts in San Francisco throughout the 21st century	
	Rising sea levels
	Increased erosion
	Increased saltwater intrusion
	Water supply challenges due to early snowmelt
	Increased flooding
	Decreased annual precipitation
	Increased impacts to fisheries
	Water supply challenges due to increased droughts
	More frequent and intense storm events

● Highly likely
 ● Likely
 ● Possible

Source: NRDC



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RISING SEA LEVELS

Projected sea level rise relative to the 2000 level ranges from about 12 to 18 inches by mid-century, and 20 to 55 inches by 2100. Rising sea levels could inundate critical infrastructure in the San Francisco Bay Area, such as power plants, roadways, railways, 2 international airports, and the Port of Oakland. In the Bay Area counties, a total of more than 640 miles of new levees, raised levees, or seawalls, at a cost of almost \$5.3 billion (in 2000 dollars), would be needed to protect against flooding in the event of a 55-inch rise in sea level. Some climate models project more intense and frequent storm events, which could exacerbate flooding from rising seas.

Projected high-sea-level events in San Francisco throughout the 21st century

Projected time frame	High sea level events per year with 11.8 inch (30 cm) sea level rise	High sea level events per year with 23.6 inch (60 cm) sea level rise
2005–2034	1.3	4.6
2035–2064	7	41
2070–2099	17	235

Source: Cayan et al., Climate change projections of sea level extremes along the California coast, Climatic Change 87 (Suppl 1):S57–S73 (2008).

SALTWATER INTRUSION AND EROSION

Salinity, which is already a problem in the Sacramento-San Joaquin River Delta, is highly likely to increase as a result of sea level rise, degrading the quality and reliability of the fresh water supply pumped from the southern edge of the Delta. Further, wetlands would need to have dramatically high accretion rates of sediment deposition to keep up with sea level rise. As highly tidally-sensitive habitat, sea level rise jeopardizes existing wetlands.

Sea level rise also contributes to coastal erosion. Bay Area counties are projected to lose 11 square miles due to erosion by processes associated with sea level rise if sea level rises by 55 inches.

RISING TEMPERATURES

Climate models for California project the range of warming by mid-century to be about 1.8°F to 5.4°F, rising by the end of the 21st century, from about 3.6°F to 9°F. There is quite a strong inclination for higher warming in summer than winter and greater warming inland than along the coast. According to a report to the California Energy Commission, “Higher temperatures will have several major effects: they will increase the ratio of rain to snow, delay the onset of the snow season, accelerate the rate of spring snowmelt, and shorten the overall snowfall season, leading to more rapid and earlier seasonal runoff.”

PRECIPITATION AND STREAM FLOW

Most climate models predict conditions that are drier than the historical average. The drying that is projected in these simulations rivals or exceeds the largest observed long-term dry periods since the late 1800s.

Even small increases in temperature with no change in precipitation changes the timing of flow patterns for rivers in California substantially, with more water flowing in the rivers during the winter, and less water during the dry season when demand, both agricultural and urban, is highest. Shifting stream flows may also have implications for the San Francisco region’s fisheries. For instance, the occurrence of peak flows in California’s rivers much earlier in the season due to climate change could result in a washout of the early stages of autumn-spawning salmonids.

ACTION

In the Bay Area, many organizations and government entities are working on strategies and policies to adapt to future climate change impacts, such as:

- San Francisco is forming an interagency task force to develop policies to address potential future flood risks associated with sea level rise.
- SFPUC is employing a “no regrets” approach to plan for potential water supply shortages by developing local water supplies, integrating water management with other nearby utilities, and pursuing regulatory reforms to support the use of greywater, stormwater, rainwater, and recycled water.
- San Francisco Bay Conservation and Development Commission (BCDC) is drafting state legislation that would direct the commission to develop a sea level rise adaptation strategy for San Francisco Bay and Suisun Marsh.