

COASTAL RISKS FOR GALVESTON, TX

Selected water level: 9 feet. May occur from sea level rise, coastal flooding, or both.

What's at risk on land below 9 feet?^{1,2}

- High social vulnerability population: 21,000
- Hazardous waste sites: 29
- Wastewater sites: 15
- Miles of road: 410 miles
- Hospitals: 6

9 feet in historical context ^{3,4}

- Statistical 1-in-100 year flood height: 8.6 feet

Unnatural Coastal Floods⁵

Since 1950, a tide station at "Galveston Bay Entrance" has recorded 15 days exceeding local National Weather Service flood thresholds. Without climate-driven sea level rise, the count would be 12. The station is 6 miles from Galveston.

Rising seas = more floods⁴

- Galveston, TX has already experienced about 13 inches of sea level rise over the last 54 years of records. Climate change is projected to drive much more rise this century.
- This raises the starting point for storm surges and high tides, making coastal floods more severe and more frequent.

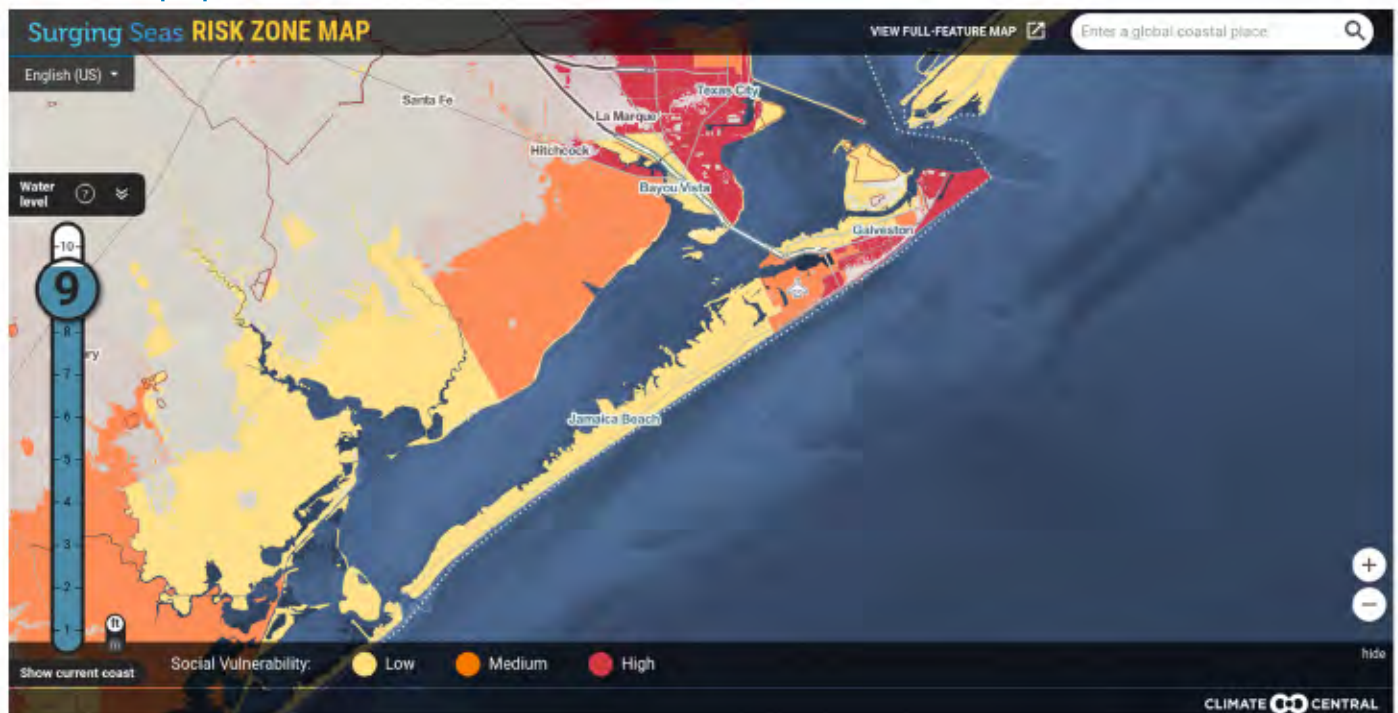
When could a 9-foot flood happen?^{3,4,6}

- Likelihood by 2030: 16% – 19%
- Likelihood by 2050: 37% – 45%
- Likelihood by 2100: 80% – 100%

The ranges shown derive from the intermediate low vs. intermediate high global sea-level scenarios from a 2017 NOAA technical report for use in the U.S. National Climate Assessment, which point to projected local rises of 3.3 vs. 7.7 feet by 2100. The more heat-trapping pollution emitted, the higher that sea-level rise is likely to be.

Find more places, water levels and downloads at riskfinder.org

Land and population below 9 feet in Galveston, TX



Social vulnerability (e.g. from low income) compounds coastal risk. Land below 9 feet is colored according to the legend. Surging Seas uses high-accuracy lidar elevation data supplied by NOAA. Map reflects a uniform sea level and/or flood height. Individual storm surge, tidal or rainfall events cause more complex and uneven water surfaces.

Email sealevel@climatecentral.org to ask about tailored analysis

1 Floods and sea level rise are relative to local high tide lines circa 1992 (mean higher high water across 1983-2001).

2 Values exclude sub-9-ft areas potentially protected by levees, natural ridges, and other features.

3 Climate Central estimates risk by combining local sea level rise projections with flood height risk statistics based on historic data.

4 Flood risk projections and history are based on records from the NOAA water level station at "Galveston Pleasure Pier - Gulf Of Mexico", 5 miles from Galveston, from 1957 to 2011.

5 Strauss, B. H., Kopp, R. E., Sweet, W. V. and Bittermann, K., 2016. Unnatural Coastal Floods. Climate Central Research Report.

6 Sea level projections are localized, and local flood risks projected, based on methods from Tebaldi et al. 2012 (Environmental Research Letters).

SEA LEVEL RISE AND COASTAL FLOODING FAQs

What causes sea level to rise?

- **A warming ocean:** Thermometer and satellite measurements show that the ocean has been warming for more than a century. Water expands as it warms, and the only way the ocean can go is up and out.
- **Shrinking ice:** Warmer air and water temperatures are causing global glaciers and ice sheets on Greenland and Antarctica to melt or to break off into the ocean. Adding water or ice from land to the ocean raises sea level, and is by far the biggest future threat.
- **Sinking land:** In some places, coastal land is sinking, due to a variety of slow, long-term processes not linked to current climate change, or due to pump extraction of water or fossil fuels from underground formations.

What causes climate change?

- The main activity causing climate change is the burning of fossil fuels, which emits heat-trapping pollution.
- Leading scientific bodies agree: *Observations throughout the world make it clear that climate change is occurring, and rigorous scientific research concludes that the greenhouse gases emitted by human activities are the primary driver.*⁷

Can sea level rise be slowed?

- Major cuts in heat-trapping pollution through measures such as a swift global transition to a clean energy economy, climate-friendly agriculture, and protecting forests would reduce future sea level rise.

Does sea level rise affect flooding?

- Sea level rise raises the starting point for waves, tides, and storm surge, making coastal floods more severe and more frequent.
- A February 2016 Climate Central analysis found that about two-thirds of U.S. coastal flood days since 1950 would not have met the National Weather Service's local definition of flooding without the few inches so far of human-caused, climate-driven global sea level rise.

What does the future hold?

- Some future sea level rise is inevitable due to pollution already in the atmosphere, forcing some adaptation.
- Rapid cuts in emissions of heat-trapping pollution would increase the chances of limiting global sea level rise to near 2 feet this century, but continuing unchecked pollution could lead to a rise of more than 6 feet.⁸
- A 2-foot rise would mean widespread, dramatic increases in flooding, and submergence of the very lowest coastal places. A 6-foot rise would pose severe and in cases existential threats to major coastal cities worldwide.
- Many places will be able to reduce sea level rise impacts by establishing defenses, accommodating floods, or relocating some development, at uncertain cost.
- Pollution this century will lock in sea level rise for hundreds of years to come – likely far more than 6 feet on the current path. The final amount will depend on how rapidly the world community can reduce and then stop heat-trapping pollution.

REDUCING YOUR RISK

Preparing yourself and your community

- Actions to curb heat-trapping pollution will reduce sea level rise, but some rise is unavoidable.
- Learn more about the actions you can take yourself at sealevel.climatecentral.org/flood-preparation
- Make sure leaders in your community know your area's risks by sharing this fact sheet and riskfinder.org
- Surging Seas can help your community participate in FEMA's Community Rating System. Contact us to learn more.
- Climate Central offers tailored mapping, projections and analysis to meet the specific needs of cities, counties, states and businesses, using scenarios and data you can choose: contact sealevel@climatecentral.org to learn more.

Resources available for Texas

- Texas Sea Grant: <http://texasseagrant.org/>
- Texas Coastal Watershed Program: <http://tcwp.tamu.edu/>
- Harte Research Institute: <http://www.harteresearchinstitute.org/>
- For a longer list see: sealevel.climatecentral.org/responses/plans



In the News

Our sea level research has been covered in USA Today, Time, the major networks, CNN, PBS, NPR, AP, Bloomberg, the Washington Post, the New York Times, and hundreds more outlets.

Climate Central

Climate Central is an independent nonprofit, nonadvocacy organization that researches climate impacts. Our web tools are based on peer-reviewed science and are included as resources on national portals such as NOAA's Digital Coast and the U.S. Climate Resilience Toolkit.

Get more analysis at riskfinder.org

⁷ Statement on climate change from 31 scientific associations (2016), <http://www.aas.org/sites/default/files/06282016.pdf> (Accessed July 7, 2016). Learn more at <http://climate.nasa.gov/scientific-consensus/>

⁸ Based on local sea level projections from Kopp et al. 2014 (Earth's Future) and more recent Antarctic research in DeConto and Pollard 2016 (Nature). For full citations and methods visit: riskfinder.org

Surging Seas

Sea Level Rise Tools & Analysis by

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