

Surging Seas RISK FINDER Downloads

Coastal flood and sea level rise risk analysis at riskfinder.org

Download Local Fact Sheets

- The fact sheet is a free customizable 2-page PDF handout of sea level and coastal flood risk information specific to the location water level and sea level rise model you choose in *Surging Seas*.
- The fact sheet incorporates the maps and information available within *Surging Seas*, as displayed in other parts of this guide.
- Below is a sample fact sheet for Miami, FL.

COASTAL RISKS FOR MIAMI, FL

Selected water level: 3 feet. May occur from sea level rise, coastal flooding, or both.

What's at risk on land below 3 feet?^{2,3}

- Population: 15,000
- High social vulnerability population: 6,300
- Homes: 9,200
- Property value: \$3 Billion
- Hazardous waste sites: 13

3 feet in historical context ⁴

- Highest observed area flood: 5.8 feet in 2005
- Statistical 1-in-100 year flood height: 2.6 feet
- Most recent flood over 3 feet observed in: not in record

Unnatural Coastal Floods⁵

About two-thirds of U.S. coastal flood days since 1950 would not have exceeded local National Weather Service flood thresholds without the few inches so far of human-caused, climate-driven sea level rise.

Rising seas = more floods⁶

- Miami, FL has already experienced about 5 inches of sea level rise over the last 34 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 3-foot flood happen?^{7,8}

- Likelihood by 2030: 15% – 20%
- Likelihood by 2050: 39% – 98%
- Likelihood by 2100: 100% – 100%

The ranges shown derive from the intermediate low vs. highest global sea level scenarios of the 2014 U.S. National Climate Assessment, which point to projected local rises of 2.1 vs. 6.6 feet by 2100. The lower scenario corresponds to low future levels of heat-trapping pollution, whereas the higher one aims to reflect uncut pollution and maximum ice sheet loss rates.

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.

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!
- 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.

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.

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 Florida

- Florida Sea Grant: Coastal Planning: <http://www.flseagrant.org/climatechange/coastalplanning/>
- The Southeast Florida Regional Climate Change Compact: <http://www.southeastfloridaclimatecompact.org/>
- Florida Division of Emergency Management: <http://www.floridadisaster.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

Surging Seas
Sea Level Rise Tools & Analysis by CLIMATE CENTRAL

1 Floods and sea level rise are relative to local high tide lines circa 1992 (mean higher high water across 1985-2001).
2 Values exclude sub-3-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 Boca Key - Florida Bay, 52 miles from Miami, from 1979 to 2013.
5 Strauss, B. H., Kopp, R. E., Sweet, W. V. and Bitensky, K., 2016. Unnatural Coastal Floods. Climate Central Research Report.
6 Sea level projections are localized, and local flood risks projected, based on methods from Takai et al., 2012 (Environmental Research Letters).

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.mea.gov/paris-climate-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

For more methods, limitations, full citations, see source: riskfinder.org

Citation: CoastalRisks for Miami, FL. Climate Central. 8/30/2016

To create your own fact sheet:

- Visit riskfinder.org
- Search for your location (zip code, town, city, county or state)
- You will be taken to a page with analysis for this location. Scroll to view all of the analysis.
- Set **water level slider**
- Select sea level rise projection in **When Are the Risks?** section (or leave the default setting)
- Click **Local Fact Sheet** button in the summary section at the top of the page.

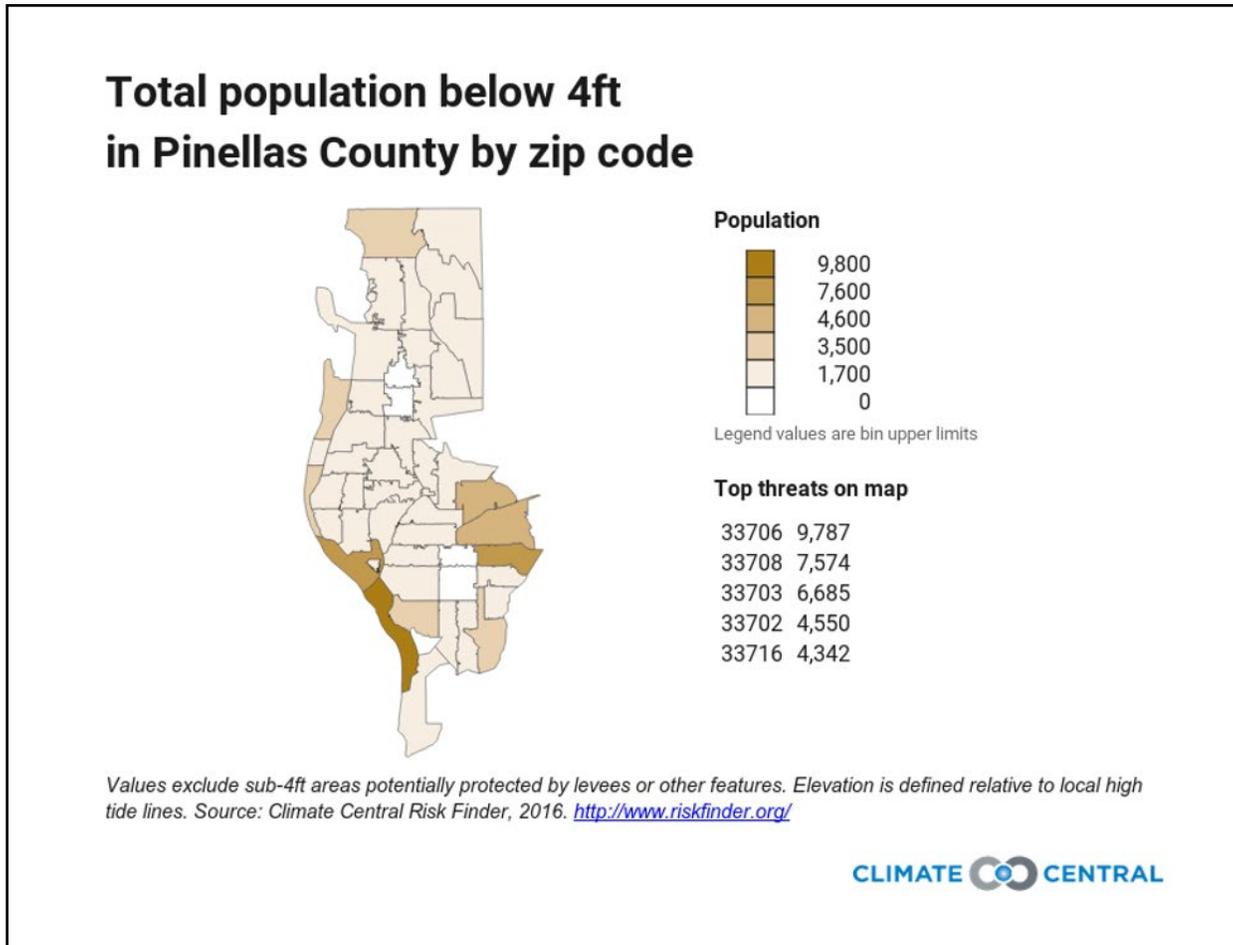
To request fact sheets for your location by email, write us at sealevel@climatecentral.org.

Surging Seas **RISK FINDER** Downloads

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Download PowerPoint Slides and Images

- Explore your location in *Surging Seas* compared to neighboring locations
- Export it as a PowerPoint slide or as an image (.png).
- Below is a sample fact sheet for Pinellas County, FL.



To create your own PowerPoint slide or image:

- Visit riskfinder.org
- Search for your location (zip code, town, city, county or state)
- Scroll down to the **What Is at Risk?** section
- Set **water level slider**
- Choose the impact variable (population, road miles, schools, etc.) & area type (ZIP code, county, town, etc.)
- Click the **PowerPoint** or **PNG icons**

To request slides or images by email, write us at sealevel@climatecentral.org.

Surging Seas RISK FINDER Downloads

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Download Spreadsheets: Summary Count and Percentage

- *Surging Seas* offers spreadsheets that contain summary analysis of what sits on land from 1-10 feet in a given zip code, town, city, or county.
- See list of all variables *Surging Seas* analyzes on page 25.
- Below is a sample spreadsheet for Charleston, SC.

	A	B	C	D	E	F	G	H	I	J	K	L
33	TABLE: SEA LEVEL RISE AND COASTAL FLOOD EXPOSURE IN CHARLESTON, SC ON LAND BELOW 1-10 FT											
34												
35			Elevation relative to local high tide line (Mean Higher High Water)									
36		Unit	< 1ft	< 2ft	< 3ft	< 4ft	< 5ft	< 6ft	< 7ft	< 8ft	< 9ft	< 10ft
37												
38	BY TOTALS											
39	High social vulnerability population	Count	63	223	582	1083	1594	2224	2783	3345	3988	4832
40	Medium social vulnerability population	Count	549	1125	2118	3470	4813	6218	7967	10361	13313	16107
41	Low social vulnerability population	Count	2628	5856	10273	15593	21932	29625	38304	47515	55630	63708
42	Property value	\$Million	692	1702	3227	4754	6273	7867	9528	11295	13036	14734
43	Population	Count	3240	7204	12973	20146	28339	38067	49054	61221	72930	84647
44	Caucasian population	Count	2643	5678	9884	14925	20779	27722	35708	44459	52443	60387
45	Population of color	Count	642	1620	3253	5472	7902	10794	13920	17490	21360	25277
46	African-American population	Count	510	1371	2819	4796	6946	9516	12254	15391	18860	22383
47	Asian population	Count	79	147	260	406	571	767	1005	1256	1487	1729
48	Hispanic population	Count	104	189	318	493	693	919	1184	1496	1783	2055
49	Native American population	Count	26	55	95	152	220	295	371	462	554	646
50	Homes	Count	1659	3785	6843	10519	14770	19721	25227	31435	37276	42850
51	Hospitals	Count	0	0	1	2	5	10	12	13	14	18
52	Schools	Count	0	3	5	7	11	16	25	30	32	33
53	Colleges and Universities	Count	0	0	1	2	3	3	3	8	10	11
54	Libraries	Count	0	0	2	2	3	3	3	4	4	6
55	Theater, music & arts buildings	Buildings	0	0	0	0	1	2	2	2	3	4
56	Museums	Count	0	0	1	1	3	4	4	5	6	6
57	Houses of worship	Count	0	5	10	17	23	29	41	66	86	107
58	Government buildings	Count	0	2	7	16	25	30	34	43	54	62
59	Roads	Miles	6	28	72	134	203	272	343	410	477	539
60	Federal roads	Miles	0	1	3	6	10	13	16	19	23	26
61	Local roads	Miles	4	25	66	123	186	251	315	377	437	492
62	Primary roads	Miles	0	0	1	1	1	2	3	4	5	7
63	Secondary roads	Miles	1	2	4	8	13	17	21	25	29	33
64	State roads	Miles	1	2	3	5	7	9	11	14	17	20
65	Railroads	Miles	0	0	0	1	1	1	1	1	1	2
66	Intermodal freight terminals	Count	0	0	0	1	1	1	1	1	1	1
67	Airports	COT	0	0	0	0	0	0	0	0	1	1
68	Public airports	COT	0	0	0	0	0	0	0	0	1	1
69	Heliports	Count	0	0	0	0	1	1	2	2	2	2
70	Brownfields	Count	0	0	0	0	0	0	0	1	1	1
71	EPA listed sites	Count	3	4	10	23	34	39	48	60	67	82
72	ACRES sites	Count	0	0	0	0	0	0	0	1	1	1
73	Biennial Reporters	Count	0	0	1	1	2	2	2	2	2	2
74	Superfund (CERCLIS) sites	Count	0	1	1	2	2	3	3	4	4	4

To download this spreadsheet:

- Visit riskfinder.org
- Search for your location (zip code, town, city, county or state)
- Scroll down to the **What Is at Risk?** section
- Set **water level slider**
- Click the **XLS icon**
- Select **All available categories in [location]: Summary** button
- Click **Get Download** button

To request spreadsheets by email, write us at sealevel@climatecentral.org.

Surging Seas RISK FINDER Downloads

Coastal flood and sea level rise risk analysis at riskfinder.org

Download Spreadsheets: Comparisons

- *Surging Seas* offers spreadsheets that contain comparative analyses for zip codes within a county, towns within a county, and other combinations.
- The example below is for population, but you can compare any of *Surging Seas*' 100 impact variables (homes, hospitals, hazardous waste facilities, etc.) in this way.

	A	B	C	D	E	F	G	H	I	J	K
33	TABLE: POPULATION EXPOSED IN GALVESTON COUNTY, TX ON LAND BELOW 1-10 FT (COUNT)										
34											
35		Elevation relative to local high tide line (Mean Higher High Water)									
36		< 1ft	< 2ft	< 3ft	< 4ft	< 5ft	< 6ft	< 7ft	< 8ft	< 9ft	< 10ft
37											
38	BY TOTALS										
39	77573	43	92	175	296	460	677	1001	1708	2635	4553
40	77510	0	0	1	2	5	11	19	32	51	78
41	77568	50	138	289	492	898	1641	2589	3696	4568	5540
42	77617	3	15	36	52	63	68	71	72	73	73
43	77650	54	201	461	872	1356	1686	1832	1881	1888	1891
44	77539	74	169	377	1072	2231	3202	4374	6081	8023	10628
45	77546	28	79	146	228	306	381	468	564	670	790
46	77623	22	33	46	63	81	93	104	113	121	130
47	77554	394	1028	2267	3760	5346	6565	7202	7690	8359	8571
48	77591	0	3	78	325	585	853	1097	1334	1449	1560
49	77590	112	429	2743	9018	18424	25344	28661	30135	30331	30350
50	77551	29	179	1112	2150	3169	4804	8461	11873	14988	16606
51	77550	13	40	185	1064	2679	4533	9421	14631	18880	21399
52	77518	4	10	17	24	33	42	52	68	123	236
53	77565	53	103	209	351	598	1087	1655	1966	2536	2955
54	77517	0	1	3	5	7	9	11	15	19	24
55	77563	235	447	800	1532	2260	2561	2821	3180	3983	5145
56											
57	BY PERCENTAGES										
58	77573	0.1%	0.1%	0.2%	0.4%	0.6%	0.9%	1.4%	2.4%	3.7%	6.4%
59	77510	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.4%	0.6%
60	77568	0.3%	1.0%	2.0%	3.4%	6.3%	11.5%	18.1%	25.8%	31.9%	38.7%
61	77617	3.6%	20.4%	49.9%	71.9%	86.2%	93.1%	97.2%	99.0%	99.7%	100.0%
62	77650	2.9%	10.6%	24.3%	46.0%	71.5%	88.9%	96.6%	99.2%	99.6%	99.7%
63	77539	0.2%	0.4%	1.0%	2.8%	5.7%	8.3%	11.3%	15.7%	20.7%	27.4%
64	77546	0.1%	0.2%	0.3%	0.5%	0.6%	0.8%	1.0%	1.2%	1.4%	1.7%
65	77623	5.0%	7.4%	10.3%	14.1%	18.0%	20.8%	23.2%	25.1%	27.1%	29.0%
66	77554	4.4%	11.6%	25.6%	42.4%	60.3%	74.1%	81.3%	86.8%	94.3%	96.7%
67	77591	0.0%	0.0%	0.6%	2.5%	4.5%	6.5%	8.4%	10.2%	11.0%	11.9%
68	77590	0.4%	1.4%	9.0%	29.7%	60.7%	83.4%	94.4%	99.2%	99.9%	99.9%

To download this spreadsheet:

A. Visit riskfinder.org

B. Search for your location (for example, county)

C. Scroll down to the **What Is at Risk?** section

D. Set the **water level slider**

E. Click on the text in the title above the choropleth map to select the area type you desire. If you searched for a state, your options include: county, city & legislative districts. If you searched for a county, your options include: ZIP code and town. If you searched for smaller area types, you are not given an option to choose.

E. Click the **XLS icon** above the choropleth map

F. Select **[variable] in [location]: Comparison by [area type]** button

G. Click **Get Download** button

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Surging Seas **RISK FINDER** Downloads

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Download Spreadsheets: Individual Facilities Lists

- *Surging Seas* offers spreadsheets that contain the names, coordinates, and water levels of individual facilities of a certain type, by state.
- The example below shows hazardous waste facilities at different water levels in California.

	A	B	C	D	E	F
586	SEA LEVEL RISE AND COASTAL FLOOD EXPOSURE OF HAZARDOUS WASTE SITES IN CALIFORNIA ON LAND BELOW 10FT: LIST					
587						
588	LEVEL	ID	NAME	LAT	LON	
589	3f	110000887684	KAISER FOUNDATION HOSPITALS	37.87053	-122.30325	
590	3f	110002146641	ADVALLOY INCORPORATED	37.42197	-122.1033	
591	3f	110002931720	J S ENTERPRISES	33.66111	-117.95526	
592	3f	110002790230	ATHENA NEURO SCIENCES INC	37.50617	-122.25063	
593	3f	110002709631	DUTHIE WALTER R ELECTRIC CORP	33.78174	-118.23305	
594	3f	110002678656	MARCOR OF CALIFORNIA INC	37.65522	-122.14229	
595	4f	110002647958	ASSOCIATED FREIGHT LINES	37.82006	-122.29059	
596	4f	110009545769	CALIFORNIA AUTOMOTIVE SEALING	37.61689	-122.05726	
597	4f	110002663207	UTAH INTERNATIONAL INC	37.40919	-122.02337	
598	4f	110002915267	HYDRO AGRI NORTH AMERICA	37.942485	-121.334951	
599	4f	110009536127	COSTELLI & PARDINI AUTO BODY	37.549167	-122.308355	
600	4f	110002926807	OAK HARBOR FREIGHT LINES	37.76152	-122.21885	
601	4f	110042165741	WARTSILA NORTH AMERICA INC.	33.7905	-118.22138	
602	4f	110002797867	OAKLAND SCAVERGER HAYWARD YARD	37.64989	-122.14404	
603	4f	110002766668	LA PUMPING PLANT #72	33.78247	-118.24006	
604	4f	110002643088	MORGAN ENVIRONMENTAL SERVICES	37.818142	-122.286411	
605	4f	110006481869	A 1 CLEARNERS	33.74323	-118.10034	
606	4f	110002831892	CALIFORNIA ADVANCED ENV TECH CORP	37.655863	-122.139813	
607	4f	110006473583	ARNESON MARINE INC	37.91754	-122.51073	
608	4f	110009547044	RAVEN RENEWAL COMPANY	37.91923	-122.36009	
609	4f	110041011883	CHEVRON #92239	32.74947	-117.20579	
610	4f	110002614715	J L SHELTON TRUCKING	37.49461	-122.21863	
611	4f	110002873374	P G AND E BURLINGAME SUBSTATION	37.58953	-122.3636	
612	4f	110009544225	SOLANO BODY SHOP II	38.13567	-122.25624	
613	4f	110013369997	ORYX TECHNOLOGY CORPORATION	37.475067	-121.936487	
614	4f	110008281288	TOSCO CORPORATION EUREKA TERMINAL	40.772228	-124.193738	
615	4f	110009529750	MISSION UNIFORM SERVICE	37.6023	-122.08213	
616	4f	110002687959	PG&E SAN RAFAEL SERVICE CENTER	37.96974	-122.52619	
617	4f	110002148248	ENVIRONMENTAL TECHNOLOGY INC	40.72262	-124.2187	

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B. Search for your location (for example, county)

C. Scroll down to the **What Is at Risk?** section

D. Set **water level slider**

E. Select an impact variable that is made up of individual facilities, such as EPA listed sites, schools, hospitals, or hazardous waste facilities

E. Click the **XLS icon** above the table

F. Select **[variable] in [state]: Individual facilities list** button

G. Click **Get Download** button

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Surging Seas **RISK FINDER** Downloads

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Download Spreadsheets: Breakdown by Protection Status and Social Vulnerability

- *Surging Seas* offers spreadsheets that breakdown which population, homes, or other variables may be potentially protected by levees or natural ridges.
- It also provides a social vulnerability breakdown.
- Below is a sample fact sheet for Bergen County, NJ.

TABLE: POPULATION EXPOSED IN BERGEN COUNTY ON LAND BELOW 1-10 FT (COUNT)											
Elevation relative to local high tide line (Mean Higher High Water)											
	< 1ft	< 2ft	< 3ft	< 4ft	< 5ft	< 6ft	< 7ft	< 8ft	< 9ft	< 10ft	
38	Total	3276	7815	12687	17404	22888	29020	35198	40771	45320	49234
39	Connected to the ocean	2201	6953	11749	16516	21698	28470	34669	40460	44982	48835
40	Not connected to the ocean	1075	862	938	888	1190	550	529	311	338	399
41	In high social vulnerability Census tracts	894	1678	2301	2599	2671	2701	2717	2721	2726	2748
42	In medium social vulnerability Census tracts	1872	4684	7708	10695	14234	18415	22401	26001	29401	32307
43	In low social vulnerability Census tracts	510	1453	2677	4109	5983	7903	10080	12050	13193	14179

To download this spreadsheet:

A. Visit riskfinder.org

B. Search for your location zip code, town, city, county, or state

C. Scroll down to the **What Is at Risk?** section

D. Set **water level slider**

E. Select an impact variable that is made up of individual facilities, such as EPA listed sites, schools, hospitals, or hazardous waste facilities.

E. Click the **XLS icon**

F. Select **[variable] in [location]: Breakdown by protection status and social vulnerability levels** radio button

G. Click **Get Download** button

To request spreadsheets by email, write us at sealevel@climatecentral.org.

Surging Seas RISK FINDER Downloads

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Download Local In-Depth Reports

- *Surging Seas* offers 4-page PDF reports on sea level and coastal flood risk for the area you choose, including a short description of methods and assumptions, as well as key takeaways.
- These reports are both more in-depth than and complementary to the local fact sheets.
- Below is a sample Local In-Depth Report for Virginia Beach, VA.



Sea level rise and coastal flood risk: Summary for Virginia Beach, VA

This document is meant as a one-stop summary and brief guide that integrates key findings, methods, interpretation and links from Climate Central's Surging Seas Risk Finder into one narrative. It stands alone or as a jumping-off point.

Sea level rise and flood forecast

Even small amounts of sea level rise make rare floods more common by adding to tides and storm surge. Climate Central has estimated risk by combining local sea level rise projections with historic flood statistics from the NOAA water level station at Chesapeake Bay Bridge Tunnel, VA, 14 miles from the center of Virginia Beach. For reference, our extreme values analysis indicates that the "100-year" flood height, is 4.9 feet above local Mean Higher High Water (high tide line)¹. The highest observed flood at this location, in records from 1975 to 2015, reached 4.66 feet MHHW in 2009. Taken all together, these values suggest that floods above 5 feet likely pose significant concerns.

Based on the National Climate Assessment intermediate high sea level rise scenario, [we project 5.2 feet of rise locally](#) by 2100, from a 1992 baseline. Our analysis translates this to 37 percent [multi-year risk](#) of at least one flood exceeding 5 feet from 2016 to 2030, a 93 percent risk by from 2016 to midcentury, and a 100 percent risk by 2100. Under the Assessment's highest scenario, these chances [increase](#) to 43, 100, and 100 percent, respectively, and we compute a 100 percent risk of at least one flood [exceeding 8 feet](#) by the end of the century.

Risk Finder's [forecast tool](#) allows exploration of a wide range of other flood heights (1-10ft), risk statistics (e.g., annual flood risk), and localized sea level projections (with choice of scientific models and climate pollution scenarios). See Methods section below for more discussion of the research approach used and important guidance on how to interpret results.

Map and exposure analysis

Understanding exposure to sea level rise and floods requires a good map. Climate Central combined tidal elevation models and lidar-based (laser-based) elevation data supplied by NOAA, plus levee location data from FEMA, to identify both fully exposed and potentially protected land less than 1-10 feet above the local high tide line.

Climate Central's [interactive, embeddable online Risk Zone Map](#) shows exposed areas and how they intersect with [population density](#), [social vulnerability](#), [property value](#), and more.

Risk Finder also shows [exposure](#) at each water level for dozens of variables, based on data from over ten federal agencies. Here are a few values for Virginia Beach on land below 5 feet MHHW, in total and excluding land that may be protected by levees or isolation:

Variable	Total Exposure	Excluding isolated areas
Acres of land	45,506	41,723
Population	26,852	20,321
High social vulnerability pop.	2,010	1,444
Housing units	11,176	8,502
Property (\$ billions)	6.8	5.7
Road miles	237	218
EPA-listed sites	32	11
Schools	0	0

At 8 feet, 87,039 people (19.9 percent of the total population in Virginia Beach) and \$17,384 million are exposed in total.

Risk Finder offers comprehensive downloads of exposure tables as well as lists of facilities that may be affected, and data sources and methods descriptions for each variable. See Methods section below for more discussion of the general research approach used and important guidance on how to interpret results.

Comparison

Threats vary from place to place. With heat maps and rankings, Risk Finder's [comparison module](#) supplies wider regional context for exposure of each variable analyzed, and at any water level.

However, we did not compute any simple comparisons for Virginia Beach, because there are no other exposed Towns in Virginia Beach city.

The comparison tool simply offers a different presentation of exposure analysis. Therefore the same methods and interpretative notes apply.

Methods and interpretation

Sea level rise and flood forecast

The projections described here and in Surging Seas Risk Finder are based on analysis specific to a selected water level station site. They may or may not indicate nearby area risks, such as a specific location in Virginia Beach. Local sea level rise projections are generally similar across neighboring areas. Flood risks can more easily vary across short distances, due to details of local topography and bathymetry and typical storm paths. Tool settings (under "When are the Risks?") allow comparison of results across multiple regional water level stations, to check for general consistency or differences.

The basic methods for this analysis follow Tebaldi et al (2012), plus simple extensions for [computing cumulative flood risk](#). Furthermore, the current analysis improves local accuracy by

2



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Surging Seas **RISK FINDER** Downloads

Coastal flood and sea level rise risk analysis at riskfinder.org

Download State Reports

- The state report is a comprehensive report for the state you choose, including sea level and coastal flood exposure analysis, risk projections, and detailed methodology.
- Below is a sample state report for Texas.

<h3>CONTENTS</h3> <p>References 19</p> <p>Appendix A: Methods 21</p> <ul style="list-style-type: none">Projecting local sea level rise 21Projecting coastal flood risk 22Estimating global warming flood risk multipliers 24Mapping low coastal areas 25Assessing social vulnerability 26Estimating exposure of people, property and infrastructure 28 <p>Appendix B: Glossary and Abbreviations 29</p> <p>4 TEXAS AND THE SURGING SEA CLIMATE CENTRAL</p>	<h3>EXECUTIVE SUMMARY</h3> <p>Low-range sea level projections lead to a greater than even chance of serious floods exceeding 5 feet above the high tide line by mid-century at most sites across the Texan coastline. Under mid-range projections and over the same time frame, record-breaking floods are likely from Freeport and south. Under high-range projections, there is an at least a 2 in 3 chance of floods above 10 feet by end of century at 5 of 6 sites analyzed statewide.</p> <p>More than 1,000 square miles of land lie less than 5 feet above the high tide line in Texas, unprotected by levees or ridges. Some \$9.6 billion in property value – more than half of which is concentrated in Galveston and Nueces Counties – sit on this area. In the same zone are more than 45,000 people living in nearly 37,000 homes – nearly 40% of which are located in Galveston County. These figures jump to more than \$33 billion and 320,000 people living in more than 175,000 homes on 2,400 square miles of land under 10 feet.</p> <p>The state has 1,619 miles of road on unprotected land below 5 feet, plus 9 museums; 11 schools; 55 houses of worship; 4 power plants; and 254 EPA listed sites such as hazardous waste dumps and sewage plants. At 10 feet, these numbers grow to some 5,914 miles of road, 16 museums, 128 schools, 310 houses of worship, 19 power plants, and 829 EPA-listed sites.</p> <p>Levees and ridges appear to protect a great deal of developed area below 5 feet – for example, population exposure more than doubles when potential protections are left out of the analysis, so risk may be significantly greater than how it appears.</p> <p>Sea levels are rising at an accelerating rate, and the scientific community is confident that global warming is the most important cause. Higher sea levels translate to more and higher coastal floods. To forecast future risk, this analysis integrates historic local sea level trends and flood statistics with global sea level rise scenarios, developed by a multi-agency federal task force led by NOAA in support of the recent U.S. National Climate Assessment.</p> <p>This report is being released as a high-level summary of findings and methods, coincident with the online launch of a Surging Seas Risk Finder tool for the state, providing much more detailed and localized findings, and accessible via http://sealevel.climatecentral.org/29ff/texas.</p> <p>The tool includes:</p> <ul style="list-style-type: none">• Interactive local projections of sea level rise and increasing coastal flood risk from 1-10 feet by decade;• A zooming, zip-searchable map of low-lying areas threatened, plus layers showing social vulnerability, population density and property value;• Detailed assessments of populations, property, infrastructure and contamination sources exposed, for each implicated county, city, town, zip code, planning district, legislative district and more;• State- and county-wide heat maps facilitating high-level vulnerability comparisons; and• Brief customized “fast look” reports that integrate key findings from across all analyses for each locality, and provide interpretation and context. <p>Detailed knowledge of vulnerability is a critical tool for communities seeking to build resiliency to the climate challenges of today and the future.</p> <p>7 TEXAS AND THE SURGING SEA CLIMATE CENTRAL</p>
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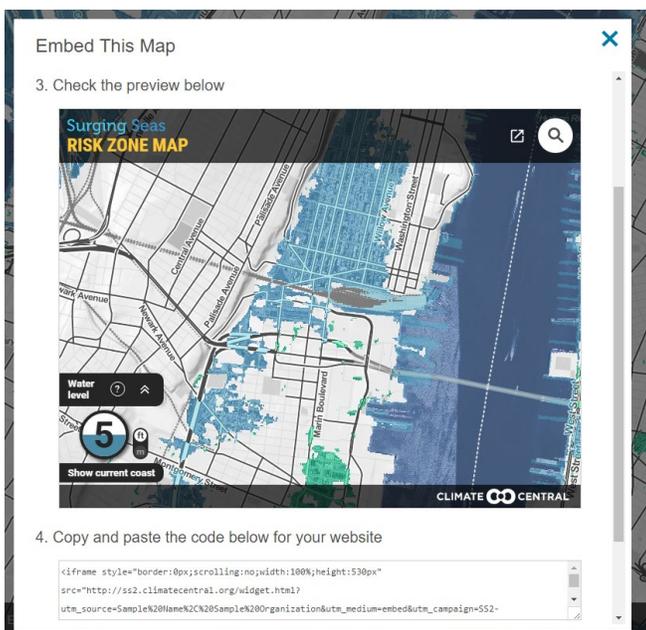
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