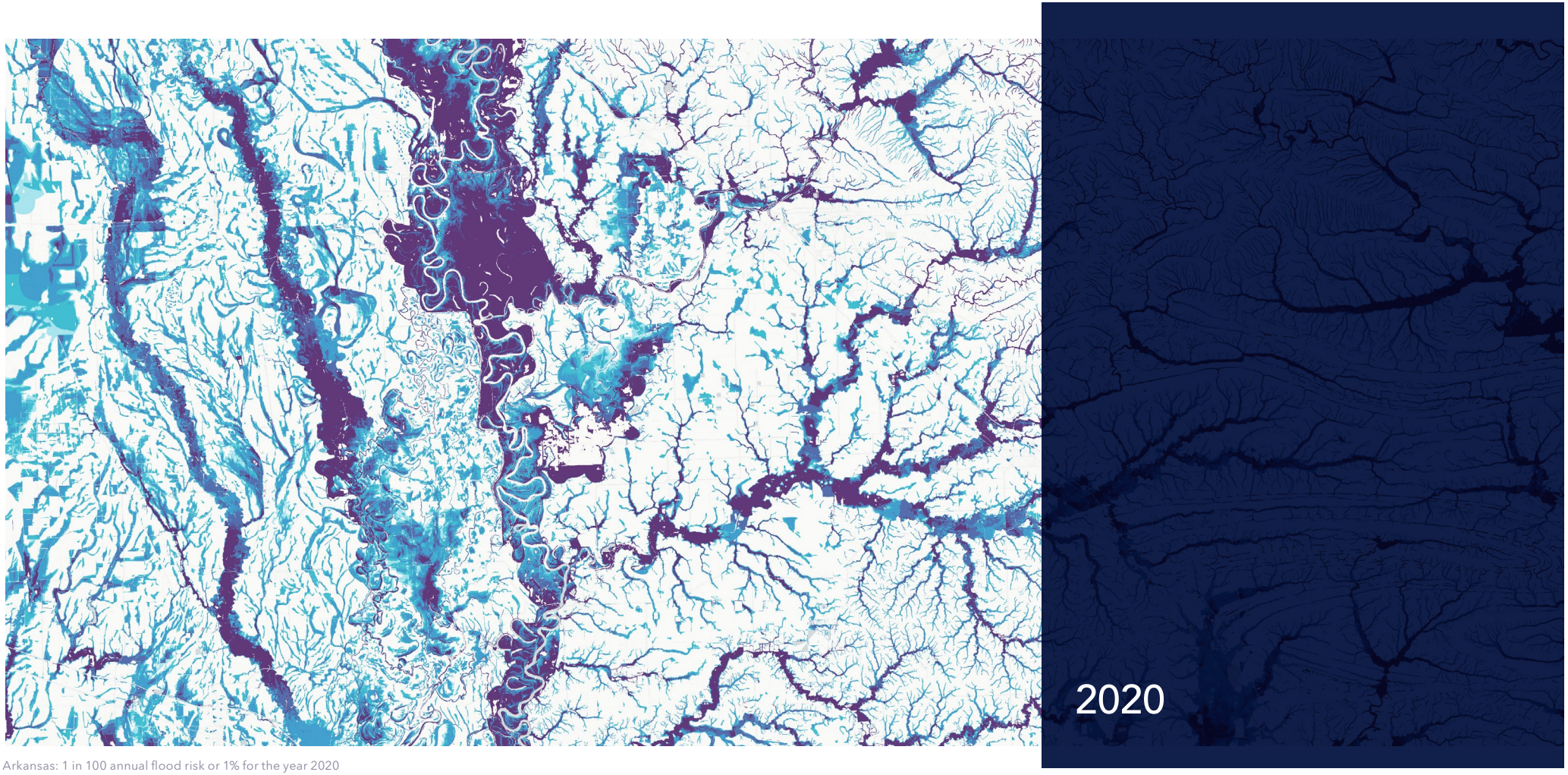
FIRST STREET FOUNDATION

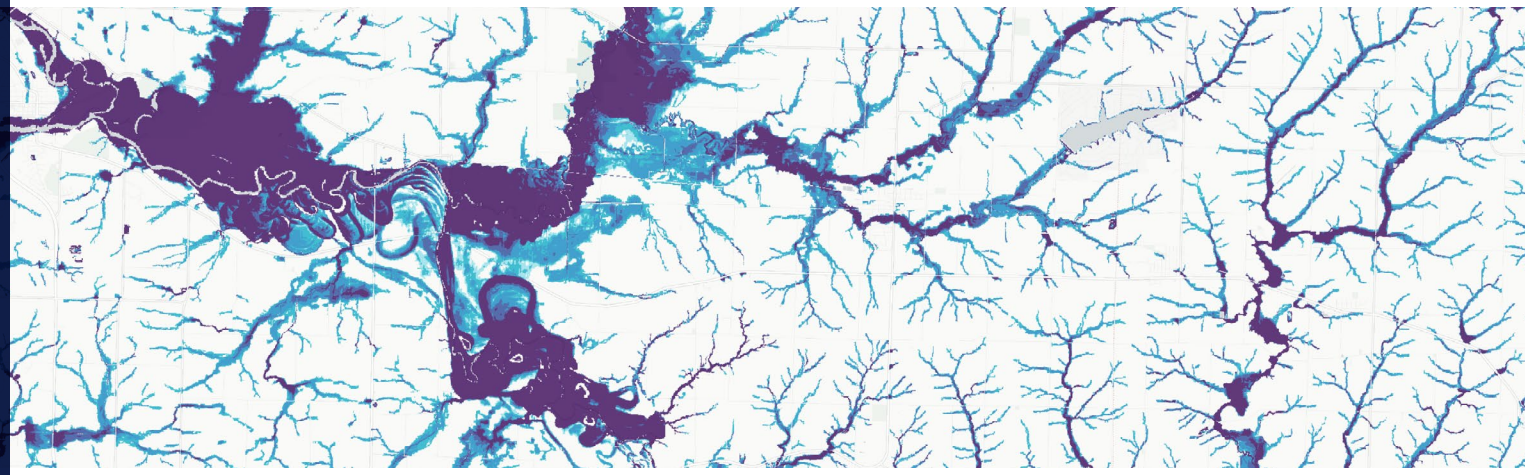


Arkansas: 1 in 100 annual flood risk or 1% for the year 2020

The First National Flood Risk Assessment

Defining America's Growing Risk

Contents



Illinois: 1 in 100 annual flood risk or 1% for the year 2020

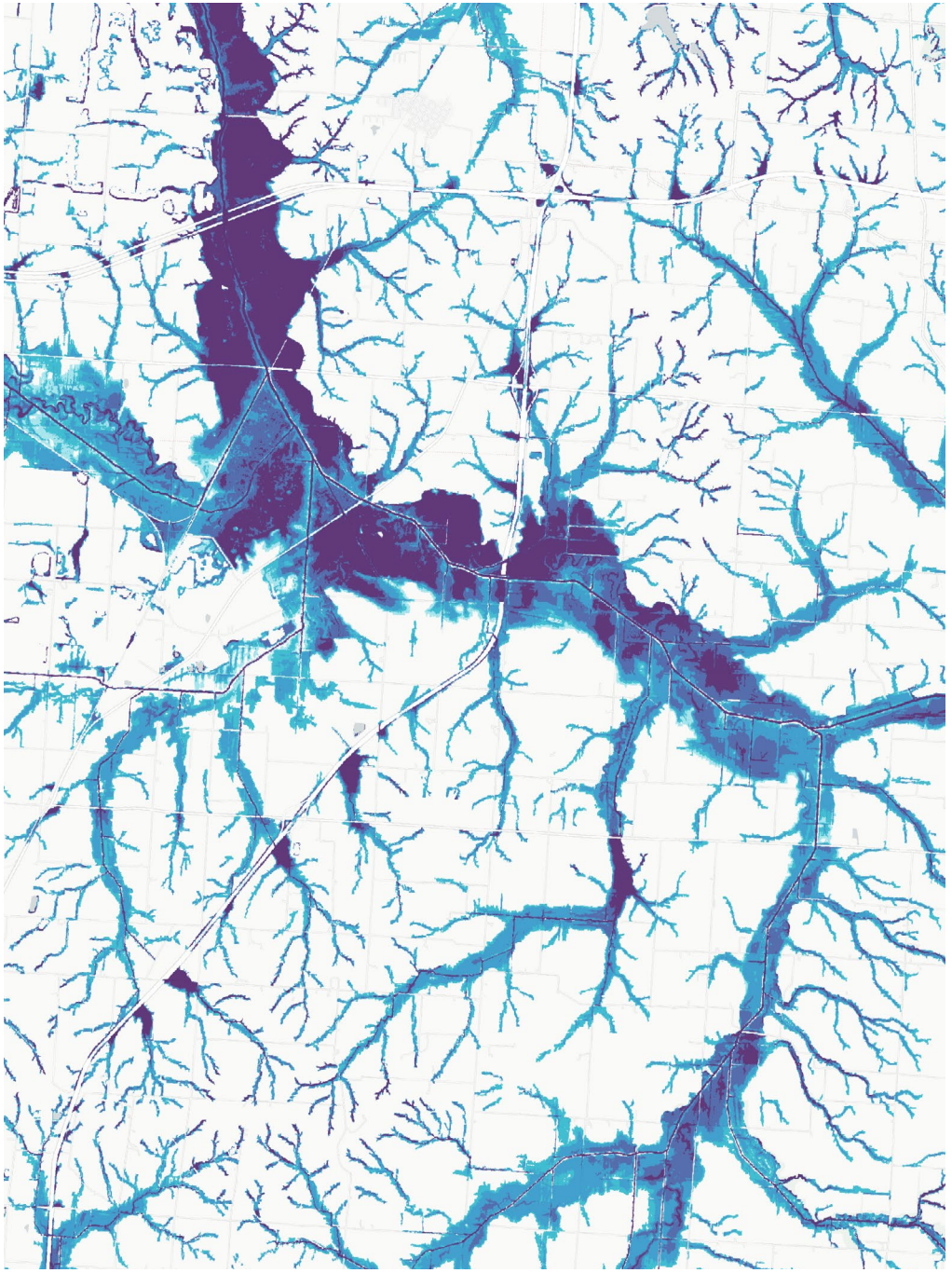
Overview

Contiguous United States

Abstract

The First Street Foundation Flood Model represents the culmination of decades of research and development made possible by building upon existing knowledge and frameworks regularly referenced in the identification of flood risk.

The outcome of this work is the development of a high precision, climate adjusted flood model that can be understood by individual property owners today and into the future. The high-level results indicate significantly more flood risk across the U.S. when compared to standard flood risk tools, nationally across the contiguous United States. These results are being made publicly available through a new tool, Flood Factor™, and represent the first free source of high-quality probabilistic flood risk information available to the public. This report provides a high-level national summary and a series of state reports with a focus on summarizing and providing insight into new findings around flood risk, adaptation, and changing environmental factors as they relate to flood risk.



Ohio: 1 in 100 annual flood risk or 1% for the year 2020

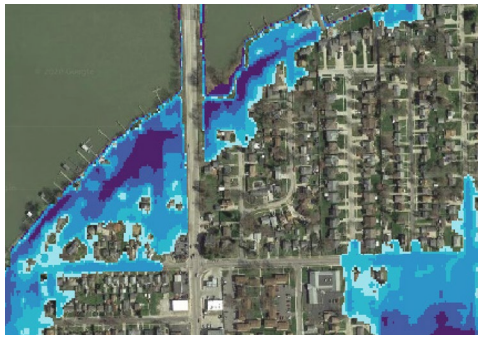
Introduction

The goal of the First Street Flood Model is to make flood risk transparent, easy to understand, informative, and available to everyone.

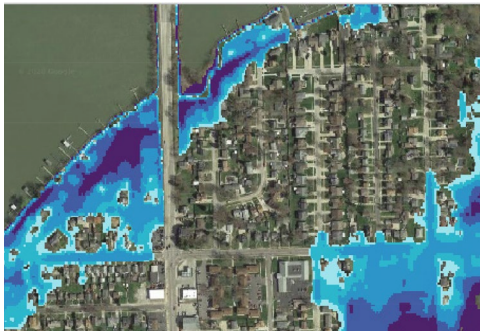
The model was produced in partnership with researchers and hydrologists from First Street Foundation; Columbia University; Fathom; George Mason University; Massachusetts Institute of Technology; Rhodium Group; Rutgers University; The University of California, Berkeley; and University of Bristol. This collaboration makes use of open government data and builds upon decades of research, modeling, and expertise, brought together to develop a high-resolution, property-specific flood risk information at a national scale.

First Street Foundation is a non-profit research and technology group committed to defining America's flood risk. The Foundation provides this information for every property in the contiguous U.S., in a format that is publicly and freely accessible via Flood Factor™, an online database and visualization tool (www.floodfactor.com). The tool presents past, present and future flood risk with particular attention paid to recent and projected environmental changes contributing to flood risk. The public availability of this data is a benefit for property owners, and the wider public, as it represents the first freely available data of its kind across the nation. The democratization of this data is also of benefit to government officials looking to develop adaptation/mitigation efforts, and researchers looking for high-resolution data on which to layer their research agenda.

Past Flood:
Toledo, Ohio, flooding event 2015

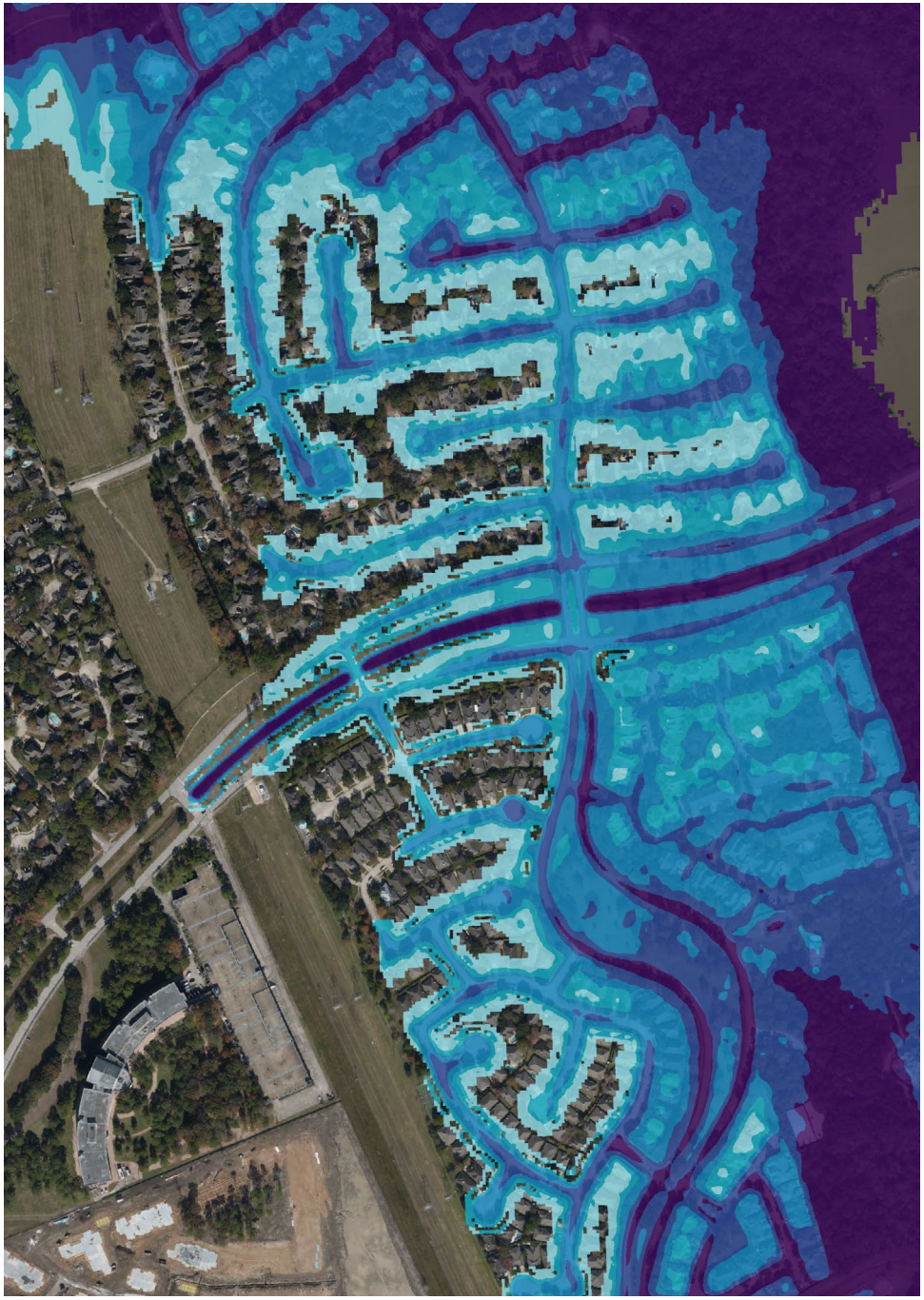


Current Risk:
Toledo, Ohio, 1 in 500 hazard annual flood risk, 2020



Future Risk:
Toledo, Ohio, 1 in 500 annual flood risk, 2050

The First Street Flood Model allows for the understanding of risk from any type of flooding event by taking into account inundation from fluvial (riverine), pluvial (rainfall), storm surge, and tidal sources. Each of these sources has been, and continues to be, impacted by changing environmental factors in different ways and the modeling process has integrated those considerations directly into the final risk statistics. These environmental factors are built into the model with guidance from the Intergovernmental Panel on Climate Change's (IPCC) Representative Concentration Pathway (RCP) curves and the Coupled Model Intercomparison Project 5 (CMIP5) global climate model ensemble. The inclusion of these global climate models, forward-facing climate considerations (based upon the RCP 4.5 curve), and high-resolution flood risk layers ultimately contribute to the uniqueness of the First Street Flood Model in terms of coverage, precision, and climate adaptability.



Houston, Texas: 3m resolution, 1 in 100 annual flood risk or 1% for the year 2020

While the First Street Foundation's Flood Model makes flood risk easily accessible, it is important to note that the model itself is state-of-the-art and builds upon decades of peer-reviewed research and modeling experience (see First Street Flood Flood Model (FSF-FM) Technical Documentation, v3).First Street and its partners have developed a methodology that relies on a return-period based probabilistic approach. The included scenarios represent flooding events ranging from frequent (1-in-2-year events) to less frequent (1-in-500-year events) and from today (2020) into the climate adjusted future (2050) in five-year intervals. The resulting inundation depths associated with each event are tracked at a three-meter spatial resolution across the contiguous United States.

Each return-period/year combination was modeled in order to estimate the flooding depth from fluvial, pluvial, or coastal sources and then combined in order to create an estimated flood depth from any source at any likelihood at a high resolution across the country. Modeling the data using this approach allows for the estimation of flood probabilities and likelihoods for any depth of water for any location in the country. For the initial launch of the data, First Street Foundation has focused on the probability of flooding specifically to the buildings located on a property, or property centroid where buildings do not exist, however, the raw model data allows for a more exhaustive understanding of risk associated with the probability of flooding on roads, parking lots, and other places of interest.

Ultimately, the First Street Foundation Flood Model is a one-of-a-kind model allowing for the accurate, probabilistic understanding of flood risk, and takes into account both future and current environmental considerations. The model allows for a new perspective and understanding around risk at the property, neighborhood, city, state, and other geographic levels in a way that is different from any existing government or private models. The methodology employed allows for continual improvement of our understanding of the country's current flood risk and that changing risk moving forward. Importantly, the model methodology is also transparent and available for review by the public. First Street Foundation is committed to openness in its methodology, including the public release of its technical methodology document, and several forthcoming peer-reviewed scientific papers on the methodologies and results in academic journals. The methodology has also been independently reviewed by an expert panel.

Methodology

The methodology used to create the First Street Flood Model brings together a multitude of resources and techniques in an innovative way and builds on previously peer-reviewed scientific research.

Pensacola, Florida: 1 in 100 annual flood risk or 1% for the year 2020

In doing so, the model represents flooding from multiple risks (fluvial, pluvial, and coastal sources) while also integrating current and future environmental considerations, all at a property level. This combination of high-resolution scale and national scope bring to the public a more exhaustive and comprehensive flood risk tool than currently available. Additionally, while the complex probabilities and flood depths make this model valuable to researchers, government officials, and industry, the clear communication of risk is distilled and accessible in a way that anyone can understand.

The most valuable component of the model used in the development of this national report is the comprehensive nature of having past, present, and future flood risk coupled with methods that have been refined to the property-level. The ability to produce these results at the scale in this report required the creative application of previously peer-reviewed hydrological modeling techniques

(Emanuel, 2018; Wing et. al, 2017; Khalid and Ferreira, 2020). Notably, the model provides the ability to capture flooding in areas of the country that do not have a gauge, are under-gauged, or are outside of typical flood risk models' purview.

The method used to create that flood risk relies on a novel Regionalized Flood Frequency Analysis (RFFA) approach that makes use of traditional statistical propensity matching techniques to model the characteristics of ungauged streams, river reaches, and country with known gauged characteristics to produce likely flow parameters with high confidence. Additionally, a core component of the model is the ability to also include pluvial (rainfall) events as probabilistic flood risks with depths and associated return periods. Both the RFFA and pluvial flooding integrations have allowed for a model that captures risk that is generally not captured in most traditional flood risk mapping. As a result, the statistics contained in this national report generally identify significantly more flood risk to properties in the U.S. than can be accounted for by existing data and models of a similar scale.

The Federal Emergency Management Agency (FEMA) Special Flood Hazard Area (SFHA) designation is the U.S. legal standard in flood-risk identification and is widely used throughout government, research, and private companies as the foundation to identify flood risk, price

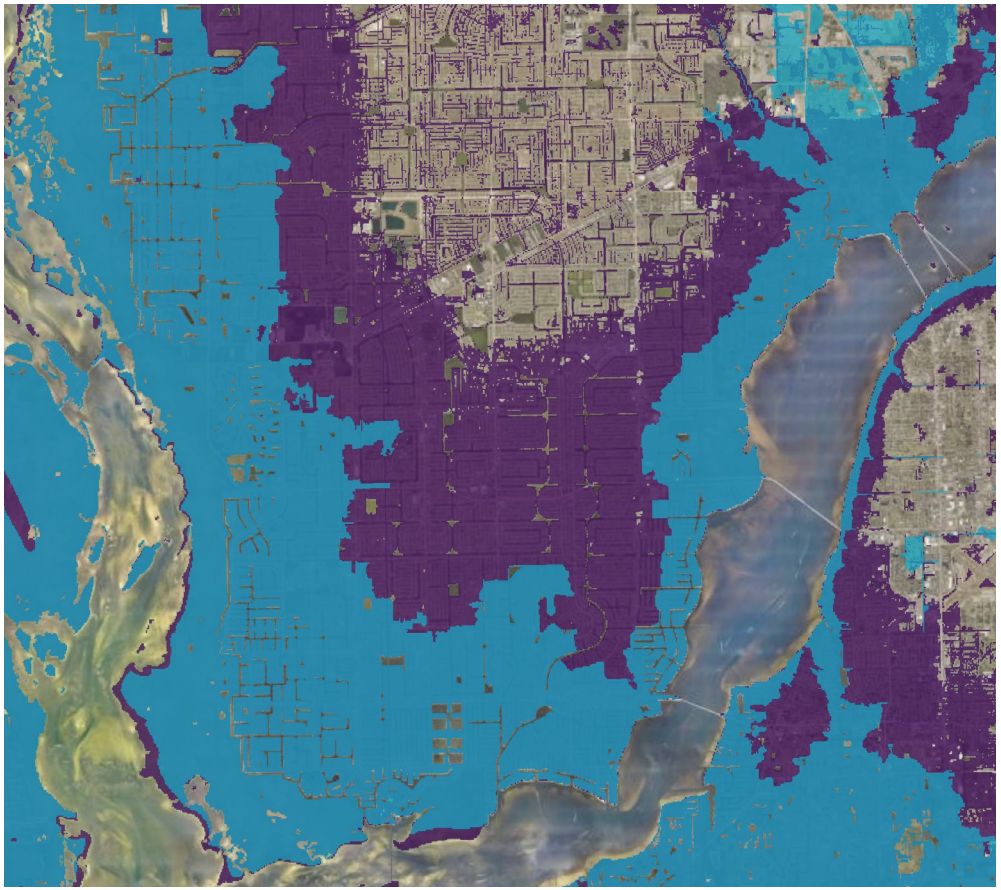
insurance premiums, as well as prepare for potential hazards. To highlight the additional coverage of the First Street Flood Model, its 1-in-100-year hazard layer (representing a 1% annual risk of occurrence) was compared to the same probability zones outlined by the FEMA SFHA models. The National results, beginning on page 5, indicate that the First Street Model generally captures around 1.7 times as many properties at risk as the FEMA SFHA designation. When digging into these differences, it is clear that the inclusion of pluvial flood risk, sea level rise, and ungauged streams are responsible for most of this additional risk.

In addition to the higher risk identified by the First Street Foundation Flood Model in comparison to standard SFHA flood risk definitions, the model also includes environmental factors to understand how flood risk has changed to date, and will change over the next 30 years. On average, the inclusion of these environmental factors show a nearly 11% increase in flood risk over the next 30 years (to 2050). These environmental factors are built into the model with guidance from the IPCC RCP curves and the CMIP5 global climate model ensemble. The combination of a more comprehensive, probabilistic approach coupled with the inclusion of environmental changes, highlights the significant risk that Americans are facing from flood risk today, and how that will increase into the future.

Importantly, the FEMA SFHAs and the First Street Foundation Flood Model align well along gauged river channels, and this agreement with FEMA SFHAs provides a source of validation for the fluvial risk identified in the model. However, the differences indicate the practical need for the more comprehensive approach that was used to produce the statistics in this report.

The comparison of the First Street results with SFHAs highlights the utility of the First Street Foundation Flood Model as a resource that pushes forward the country's understanding of national flood risk, and it does so by consistently building on trusted models, reports, and open data resources. To that point, this model relies heavily on data from the National Oceanic and Atmospheric Administration (NOAA), FEMA, the United States Geological Survey (USGS), the World Climate Research Programme (WCRP), and thousands of local government resources. As such, the results of this report should be seen as an extension of those resources that take new and creative methods of modeling flood risk to the next level by comprehensively including geographic areas that may have been left out of alternative-risk models.

In addition to the open government data resources, the First Street Foundation Flood Model is built in partnership with researchers that are world-renowned for their expertise in the areas of flood risk and environmental modeling. These partner researchers provide access to a vast amount of commercial and academic resources including Fathom's fluvial/pluvial models, Rhodium Group's coastal surge models, George Mason University's ADCIRC computational facilities, and Lightbox's parcel and property records. The coupling of open government data resources with expert modelers and third-party data sources has produced a model that pushes the understanding of flood risk forward, today and into the future. Environmental change considerations are a particularly important part of the First Street Foundation Flood Model due to the fact that they are included in a high-resolution and practical way, unlike many other previously existing models. Ultimately, making decisions about flood risk cannot be limited to our understanding of current climate, but must take into account future changes to our climate. As such, this report produces a comprehensive and consistent look at flood risk today and into the future across the country.



Cape Coral, Florida:
FEMA's 1 in 100 annual flood risk or 1% for the year 2020

Cape Coral, Florida:
First Street's 1 in 100 annual flood risk or 1% for the year 2020

While the First Street Foundation Flood Model is both high-resolution and comprehensive in spatial and temporal coverage, it is only the first release of the model. The high-accuracy flood layers will be periodically refined in a way that will allow the model to remain authoritative on property-level flood risk into the future. As part of that process the model will be updated annually with the most recent - and accurate - data resources, climate model output, and any significant quality and technical updates identified following discussions with users of the model results. As a non-profit, First Street Foundation is committed to defining America's flood risk. The data user feedback loop is a vital part of achieving this through a transparent and scientifically rigorous method. The following results represent First Street Foundation's initial report of the state of flood risk in the United States, based on the First Street Flood Model

Defining Flood Risk
National Overview

First Street definitions of risk that are used in this report.
***Substantial risk* is analogous to the FEMA SFHA designation.**

First Street Risk Description	Return Period	Annual Probability flooding at least 1cm	Cumulative Probability flooding at least once over 30 years	Properties at risk in 2020 48 U.S. States + D.C.	Percent of all properties
Almost Certain Risk	5 Year (1 in 5)	20.0%	>99%	**3.6 million**	**2.6%**
Substantial Risk	100 Year (1 in 100)	1.0%	>26%	**14.6 million**	**10.3%**
Any Risk	500 Year (1 in 500)	0.2%	>0%	**21.8 million**	**15.4%**

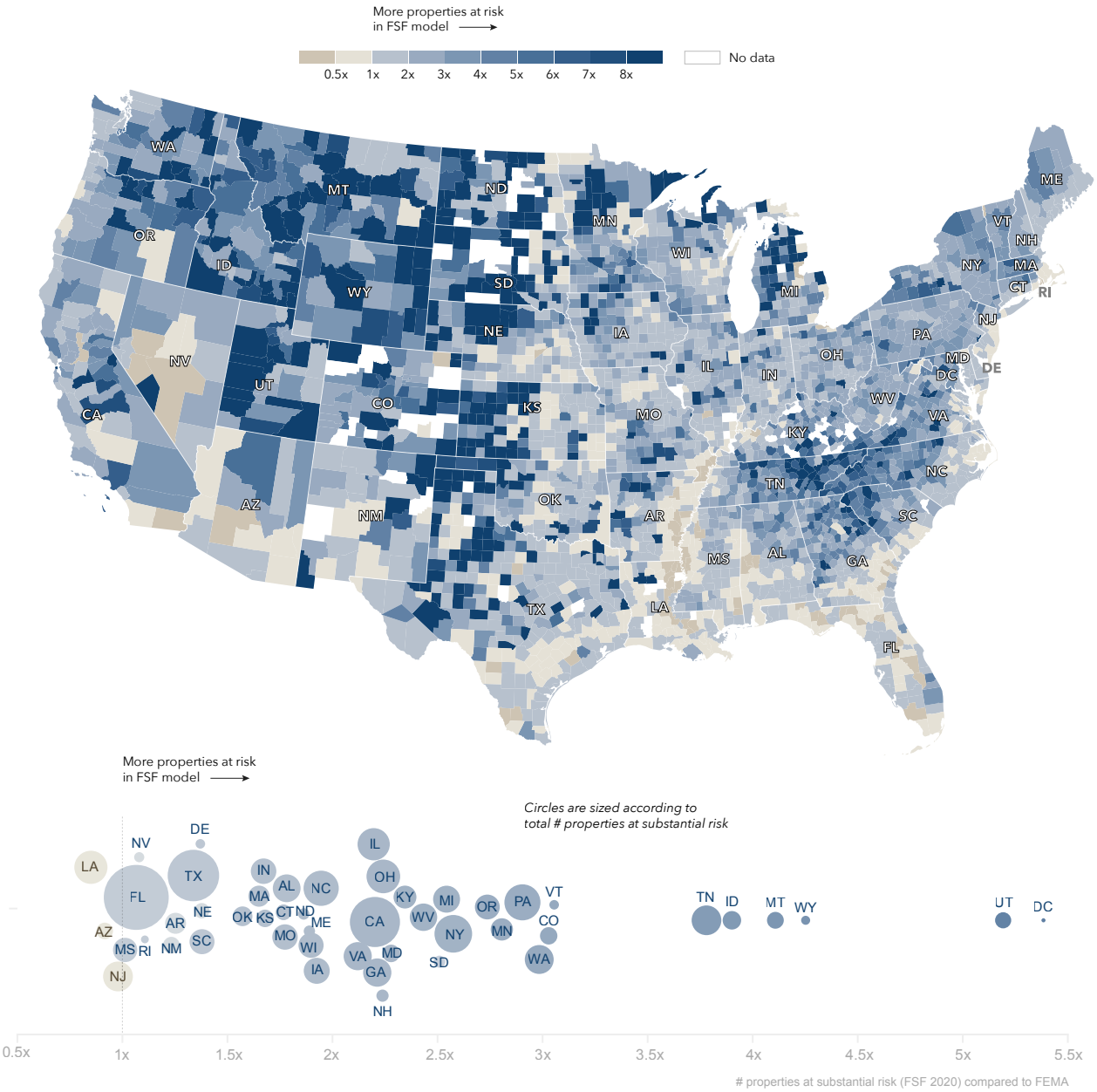
The risk identified by the First Street Foundation Flood Model highlights significant variation within and across regions, states, and cities in the U.S. Most relevant for this report is the uneven risk identified across and within these localities, but also the consistent differences shown by the First Street Foundation Flood Model's estimates of *substantial risk* in comparison to the FEMA SFHAs.

Difference from FEMA
National Overview

At the national level, the First Street Foundation Flood Model identifies around 1.7 times the number of properties as having *substantial risk** compared to the FEMA 1-in-100 SFHA designation. This equates to a total of 14.6 million properties across the country at *substantial risk*, of which 5.9 million properties and property owners are currently unaware of or underestimating the risk they face because they are not identified as being within the SFHA zone.

Washington D.C. (438%), Utah (419%), Wyoming (325%), Montana (311%), and Idaho (290%) show the greatest difference between the First Street Foundation Flood Model estimates and FEMA SFHA designation, due mainly to First Street's nationwide coverage while FEMA's mapping in some of these locations is not yet complete. There are locations where First Street estimates risk is less than that designated by the FEMA SFHA, and while there are differences in this deviation county-by-county and city-by-city, at a state-wide level Arizona, New Jersey, and Louisiana are the only states that show a lower count of properties currently with *substantial risk* in the First Street model in comparison to the FEMA SFHA. However, when adjusting for future environmental changes, in Arizona, additional properties fall into that risk categorization. In Louisiana, after adjusting for sea level rise that approaches or exceeds protective levee heights, the deviation shifts as the First Street methods uncover an additional 332,700 properties with *substantial risk* by the year 2050, in turn showing 248,800 more properties with *substantial risk* than FEMA defines currently. Similarly in New Jersey, adjusting for environmental changes shifts the First Street estimate from 8,100 fewer properties currently at *substantial risk* than FEMA, to identify73,600 more properties at *substantial risk* in 2050 than current FEMA estimates.

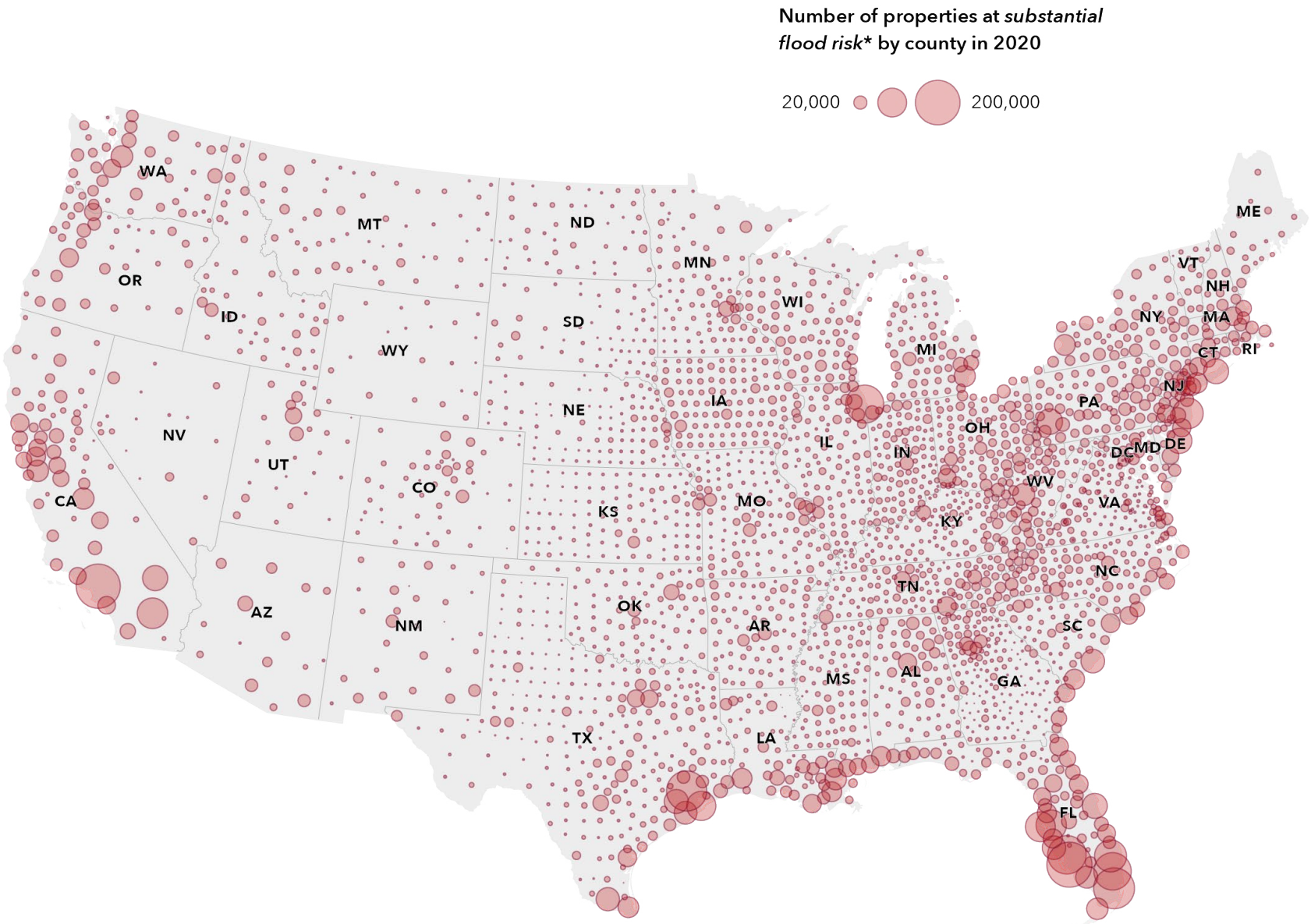
Difference in number of properties at *substantial flood risk (FSF) compared to FEMA****



* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk). See methodology for full model details.

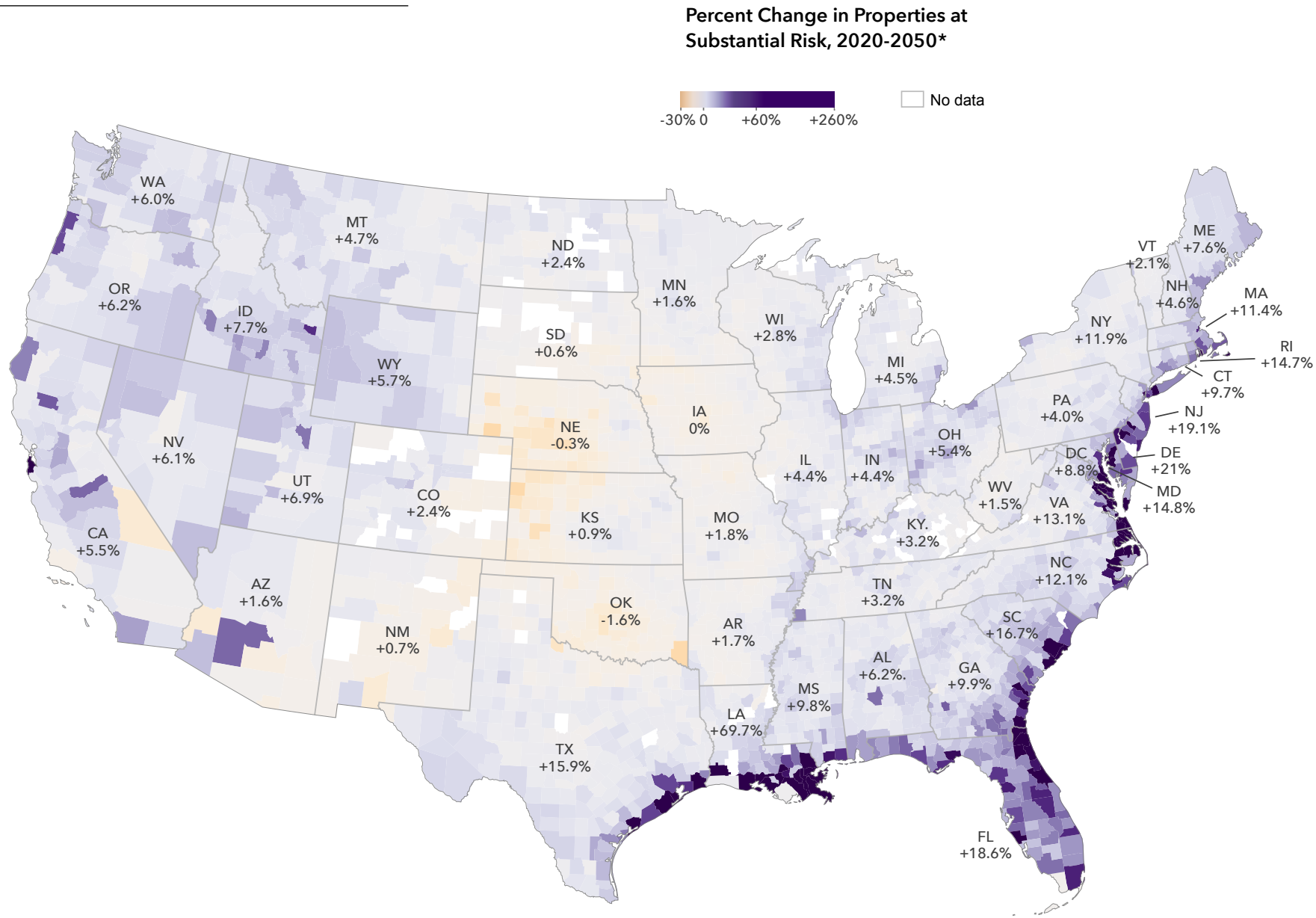
**Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context.

Properties with *substantial* flood risk
National Overview



* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk). See methodology for full model details.

Flood risk change over time
National Overview



* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk). See methodology for full model details.

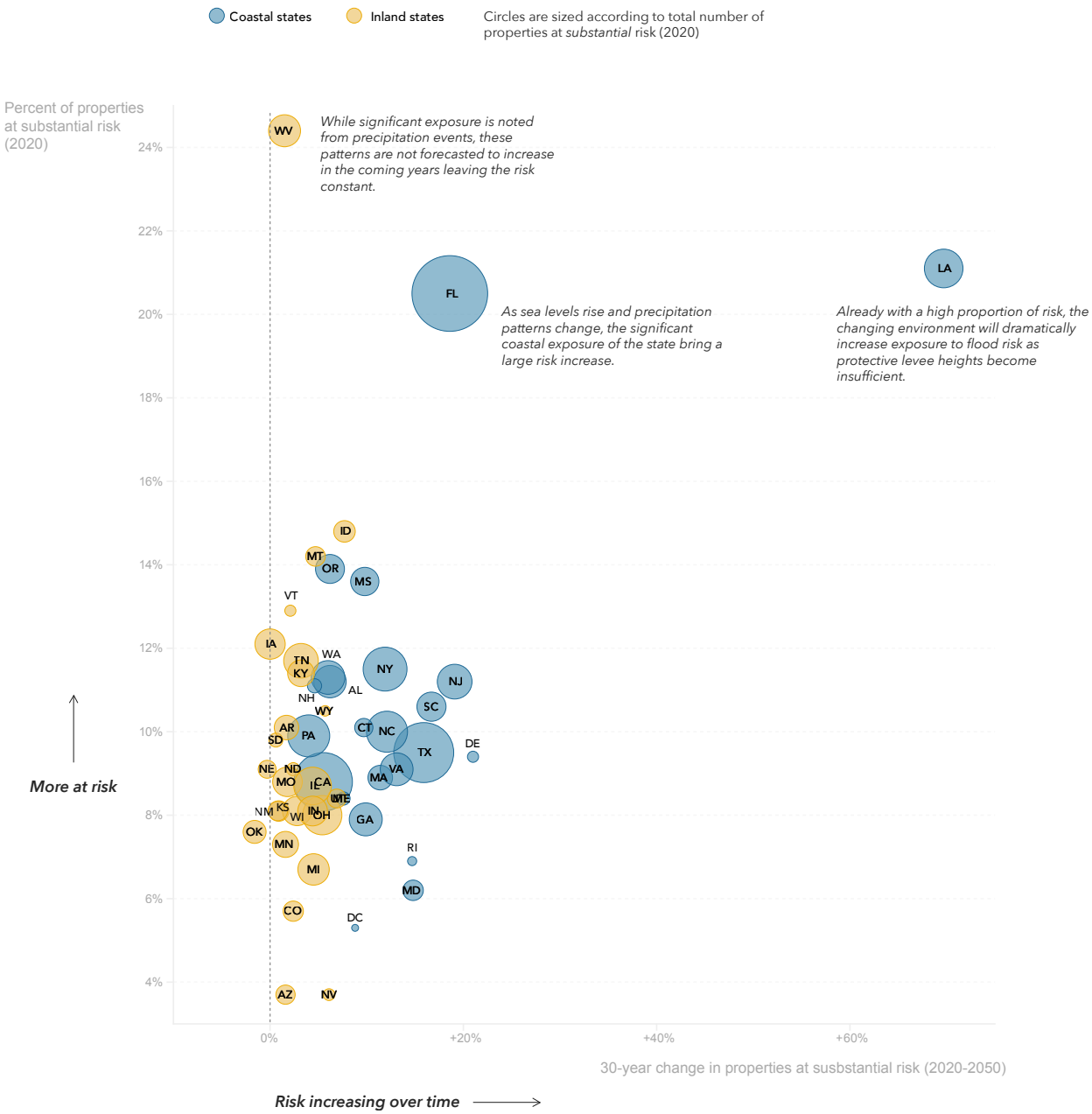
Properties with *substantial* flood risk
National Overview

The top five states showing the greatest proportion of properties currently with substantial flood risk* include West Virginia (24.4%), Louisiana (21.1%), Florida (20.5%), Idaho (14.8%) and Montana (14.2%), while Arizona (3.7%), Nevada (3.7%), Washington D.C. (5.3%), Colorado (5.7%), and Maryland (6.2%) have the lowest proportion of properties currently with *substantial risk*.

When adjusting for future environmental changes, by 2050 the number of properties with *substantial risk* across the country will increase by 10.9% to 16.2 million. Louisiana (69.7%), Delaware (21%), New Jersey (19.1%), Florida (18.6%), and South Carolina (16.7%) rank highest for the greatest proportional increase of properties with significant risk over the next 30 years.

While flood risk is changing for coastal and inland states due to the shift in precipitation patterns, the coastal states also face increased risk from sea level rise and surge due to changing hurricane patterns.

Proportion of properties at *substantial* flood risk and change over time



* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk). See methodology for full model details.

Top cities with *substantial risk*
National Overview

Greatest number of properties at substantial risk*

City	2020		2050		Change	
Cape Coral, FL	90,239	69%	108,710	84%	+18,471	+20.5%
Los Angeles, CA	80,323	12%	82,738	12%	+2,415	+3.0%
Chicago, IL	77,212	13%	84,019	14%	+6,807	+8.8%
Houston, TX	75,122	13%	87,951	15%	+12,829	+17.1%
New York, NY	73,490	9%	88,338	10%	+14,848	+20.2%
New Orleans, LA	48,064	32%	147,862	98%	+99,798	+207.6%
Tampa, FL	43,111	32%	52,756	39%	+9,645	+22.4%
Philadelphia, PA	32,859	6%	37,453	7%	+4,594	+14.0%
Jacksonville, FL	28,956	8%	47,948	14%	+18,992	+65.6%
Portland, OR	27,696	12%	30,478	13%	+2,782	+10.0%
Fresno, CA	26,964	19%	30,486	22%	+3,522	+13.1%
Lehigh Acres, FL	26,306	21%	28,395	23%	+2,089	+7.9%
Nashville-Davidson, TN	24,809	10%	25,687	10%	+878	+3.5%
San Jose, CA	22,932	10%	23,851	10%	+919	+4.0%
Corpus Christi, TX	22,857	21%	25,442	23%	+2,585	+11.3%
Detroit, MI	21,615	6%	23,262	6%	+1,647	+7.6%
Pittsburgh, PA	17,323	12%	18,211	13%	+888	+5.1%
Indianapolis, IN	17,246	6%	17,882	6%	+636	+3.7%
San Antonio, TX	16,439	4%	17,327	4%	+888	+5.4%
Cincinnati, OH	16,112	10%	17,427	11%	+1,315	+8.2%

Greatest proportion of properties at substantial risk*

City	2020		2050		Change	
Cape Coral, FL	90,239	69%	108,710	84%	+18,471	+20.5%
Tampa, FL	43,111	32%	52,756	39%	+9,645	+22.4%
New Orleans, LA	48,064	32%	147,862	98%	+99,798	+207.6%
Lehigh Acres, FL	26,306	21%	28,395	23%	+2,089	+7.9%
Corpus Christi, TX	22,857	21%	25,442	23%	+2,585	+11.3%
Fresno, CA	26,964	19%	30,486	22%	+3,522	+13.1%
Chicago, IL	77,212	13%	84,019	14%	+6,807	+8.8%
Houston, TX	75,122	13%	87,951	15%	+12,829	+17.1%
Pittsburgh, PA	17,323	12%	18,211	13%	+888	+5.1%
Los Angeles, CA	80,323	12%	82,738	12%	+2,415	+3.0%
Portland, OR	27,696	12%	30,478	13%	+2,782	+10.0%
San Jose, CA	22,932	10%	23,851	10%	+919	+4.0%
Nashville-Davidson, TN	24,809	10%	25,687	10%	+878	+3.5%
Cincinnati, OH	16,112	10%	17,427	11%	+1,315	+8.2%
Virginia Beach, VA	13,785	10%	22,457	16%	+8,672	+62.9%
Tulsa, OK	14,859	10%	15,040	10%	+181	+1.2%
New York, NY	73,490	9%	88,338	10%	+14,848	+20.2%
Atlanta, GA	11,204	9%	11,851	9%	+647	+5.8%
Jacksonville, FL	28,956	8%	47,948	14%	+18,992	+65.6%
Louisville, KY	10,016	8%	10,645	8%	+629	+6.3%

Greatest relative growing substantial risk*

City	2020		2050		Change	
New Orleans, LA	48,064	32%	147,862	98%	+99,798	+207.6%
Jacksonville, FL	28,956	8%	47,948	14%	+18,992	+65.6%
Virginia Beach, VA	13,785	10%	22,457	16%	+8,672	+62.9%
San Diego, CA	5,172	2%	6,450	2%	+1,278	+24.7%
Tampa, FL	43,111	32%	52,756	39%	+9,645	+22.4%
Cape Coral, FL	90,239	69%	108,710	84%	+18,471	+20.5%
New York, NY	73,490	9%	88,338	10%	+14,848	+20.2%
Cleveland, OH	6,516	4%	7,752	5%	+1,236	+19.0%
Henderson, NV	1,657	1%	1,961	2%	+304	+18.3%
Memphis, TN	15,508	6%	18,248	8%	+2,740	+17.7%
Houston, TX	75,122	13%	87,951	15%	+12,829	+17.1%
Columbus, OH	10,053	4%	11,580	4%	+1,527	+15.2%
Bakersfield, CA	1,561	1%	1,798	2%	+237	+15.2%
Philadelphia, PA	32,859	6%	37,453	7%	+4,594	+14.0%
Fresno, CA	26,964	19%	30,486	22%	+3,522	+13.1%
Seattle, WA	8,529	5%	9,621	5%	+1,092	+12.8%
Toledo, OH	5,872	5%	6,623	5%	+751	+12.8%
Corpus Christi, TX	22,857	21%	25,442	23%	+2,585	+11.3%
Portland, OR	27,696	12%	30,478	13%	+2,782	+10.0%
Raleigh, NC	6,515	5%	7,139	6%	+624	+9.6%

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk). See methodology for full model details. Threshold of at least 45,000 properties for cities shown.

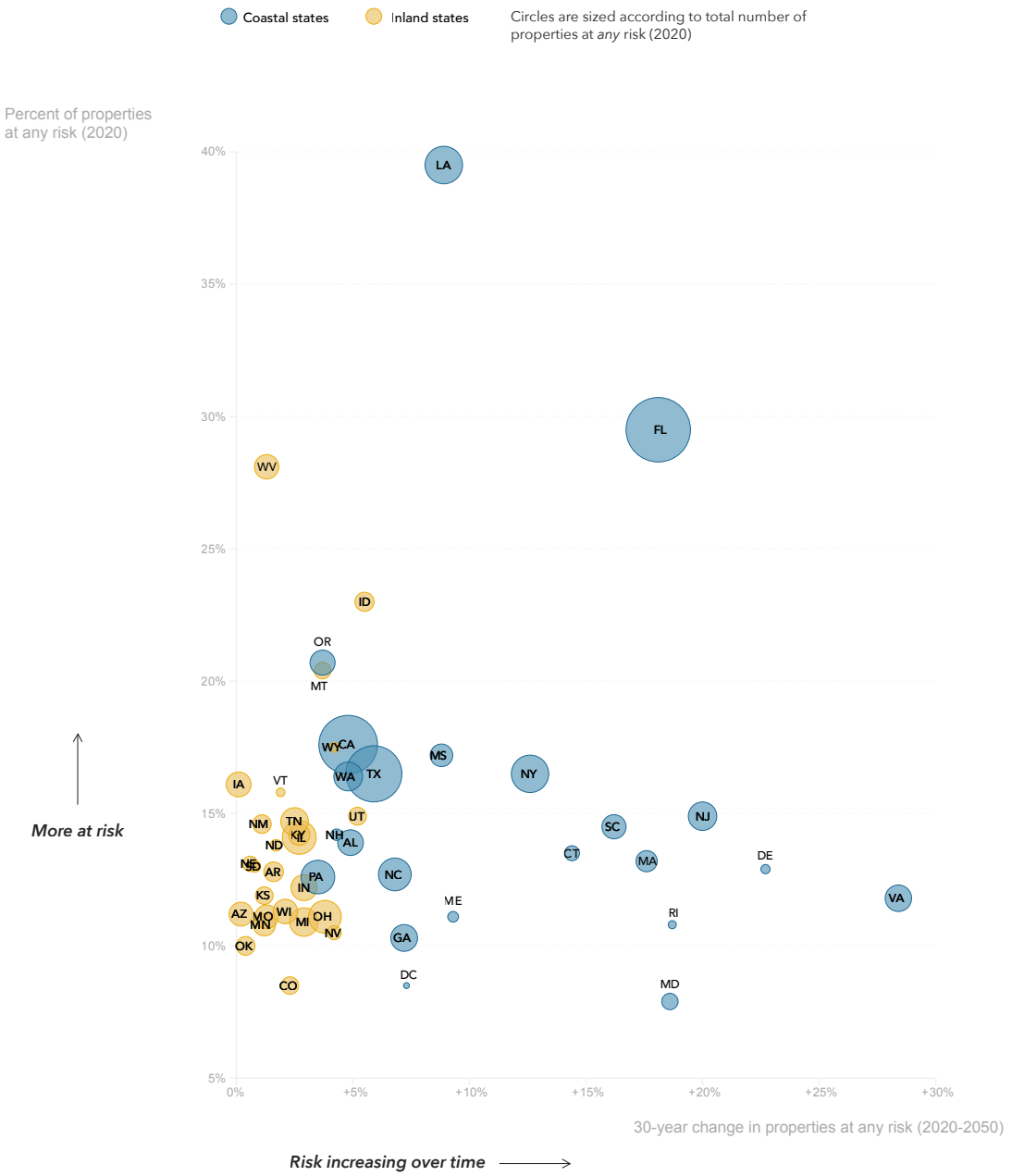
Properties with *any* flood risk
National Overview

The First Street Foundation Flood Model calculates the number of properties facing *any risk** of flooding. When looking at this broader level of risk, which is beyond the FEMA SFHA definition, the data identifies 23.5 million properties in the U.S. as at-risk over the next 30 years. Of these properties, 3.6 million were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

In current climate conditions, 21.8M properties are classified as at risk. The top five states showing the greatest proportion of properties currently with *any risk* are Louisiana (39.5%), Florida (29.5%), West Virginia (28.1%), Idaho (23%), and Oregon (20.7%), while Maryland (7.9%), Colorado (8.5%), Washington D.C. (8.5%), Oklahoma (10.0%) and Georgia (10.3%) have the lowest proportion of properties currently with *any risk*.

When adjusting for future environmental changes, by 2050, this will raise the number of properties with *any risk* across the country by 7.7% percent to 23.5 million. Virginia (28.4%), Delaware (22.7%), New Jersey (20.0%), Rhode Island (18.7%) and Maryland (18.6%) rank highest for the greatest percent increase of properties with *any risk* over the next 30 years.

Proportion of properties at *any* flood risk and change over time



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details.

Top cities with *any risk*
National Overview

Greatest number of properties at risk*

City	2020		2050		Change	
Houston, TX	186,481	32%	202,317	34%	+15,836	+8.5%
Chicago, IL	154,824	26%	160,068	27%	+5,244	+3.4%
New Orleans, LA	148,197	98%	148,232	98%	+35	+0.0%
Los Angeles, CA	132,046	20%	135,515	20%	+3,469	+2.6%
New York, NY	121,202	14%	166,875	19%	+45,673	+37.7%
Cape Coral, FL	111,237	86%	126,436	97%	+15,199	+13.7%
Sacramento, CA	101,792	68%	109,416	74%	+7,624	+7.5%
Phoenix, AZ	62,351	13%	61,466	13%	-885	-1.4%
Tampa, FL	58,414	43%	72,178	54%	+13,764	+23.6%
San Jose, CA	56,243	25%	59,298	26%	+3,055	+5.4%
Fresno, CA	54,255	39%	55,332	39%	+1,077	+2.0%
Philadelphia, PA	53,378	10%	60,561	11%	+7,183	+13.5%
Jacksonville, FL	48,408	14%	64,113	18%	+15,705	+32.4%
Portland, OR	45,951	20%	47,554	21%	+1,603	+3.5%
Detroit, MI	39,744	10%	41,672	11%	+1,928	+4.9%
Lehigh Acres, FL	37,289	30%	39,844	32%	+2,555	+6.9%
Corpus Christi, TX	36,952	34%	47,248	43%	+10,296	+27.9%
Indianapolis, IN	34,124	11%	34,808	11%	+684	+2.0%
Nashville-Davidson, TN	33,153	13%	33,813	14%	+660	+2.0%
Memphis, TN	32,455	14%	35,837	15%	+3,382	+10.4%

Greatest proportion of properties at risk*

City	2020		2050		Change	
New Orleans, LA	148,197	98%	148,232	98%	+35	+0.0%
Cape Coral, FL	111,237	86%	126,436	97%	+15,199	+13.7%
Sacramento, CA	101,792	68%	109,416	74%	+7,624	+7.5%
Tampa, FL	58,414	43%	72,178	54%	+13,764	+23.6%
Fresno, CA	54,255	39%	55,332	39%	+1,077	+2.0%
Corpus Christi, TX	36,952	34%	47,248	43%	+10,296	+27.9%
Houston, TX	186,481	32%	202,317	34%	+15,836	+8.5%
Lehigh Acres, FL	37,289	30%	39,844	32%	+2,555	+6.9%
Chicago, IL	154,824	26%	160,068	27%	+5,244	+3.4%
San Jose, CA	56,243	25%	59,298	26%	+3,055	+5.4%
Virginia Beach, VA	28,943	20%	52,125	37%	+23,182	+80.1%
Portland, OR	45,951	20%	47,554	21%	+1,603	+3.5%
Los Angeles, CA	132,046	20%	135,515	20%	+3,469	+2.6%
Bakersfield, CA	20,430	18%	21,051	19%	+621	+3.0%
Pittsburgh, PA	21,803	15%	22,373	16%	+570	+2.6%
Scottsdale, AZ	17,781	15%	18,769	16%	+988	+5.6%
New York, NY	121,202	14%	166,875	19%	+45,673	+37.7%
Tulsa, OK	21,727	14%	21,931	14%	+204	+0.9%
Jacksonville, FL	48,408	14%	64,113	18%	+15,705	+32.4%
Memphis, TN	32,455	14%	35,837	15%	+3,382	+10.4%

Greatest relative growing risk*

City	2020		2050		Change	
Virginia Beach, VA	28,943	20%	52,125	37%	+23,182	+80.1%
New York, NY	121,202	14%	166,875	19%	+45,673	+37.7%
Jacksonville, FL	48,408	14%	64,113	18%	+15,705	+32.4%
Corpus Christi, TX	36,952	34%	47,248	43%	+10,296	+27.9%
Tampa, FL	58,414	43%	72,178	54%	+13,764	+23.6%
San Francisco, CA	7,839	5%	9,321	6%	+1,482	+18.9%
Cape Coral, FL	111,237	86%	126,436	97%	+15,199	+13.7%
Philadelphia, PA	53,378	10%	60,561	11%	+7,183	+13.5%
Baltimore, MD	13,705	6%	15,378	7%	+1,673	+12.2%
Seattle, WA	13,977	8%	15,647	9%	+1,670	+11.9%
Memphis, TN	32,455	14%	35,837	15%	+3,382	+10.4%
San Diego, CA	10,434	4%	11,503	4%	+1,069	+10.2%
Cleveland, OH	12,261	7%	13,354	8%	+1,093	+8.9%
Houston, TX	186,481	32%	202,317	34%	+15,836	+8.5%
Mesa, AZ	5,447	3%	5,899	4%	+452	+8.3%
Columbus, OH	17,728	6%	19,117	7%	+1,389	+7.8%
Henderson, NV	11,706	9%	12,588	10%	+882	+7.5%
Sacramento, CA	101,792	68%	109,416	74%	+7,624	+7.5%
Washington, DC	11,692	9%	12,541	9%	+849	+7.3%
Lehigh Acres, FL	37,289	30%	39,844	32%	+2,555	+6.9%

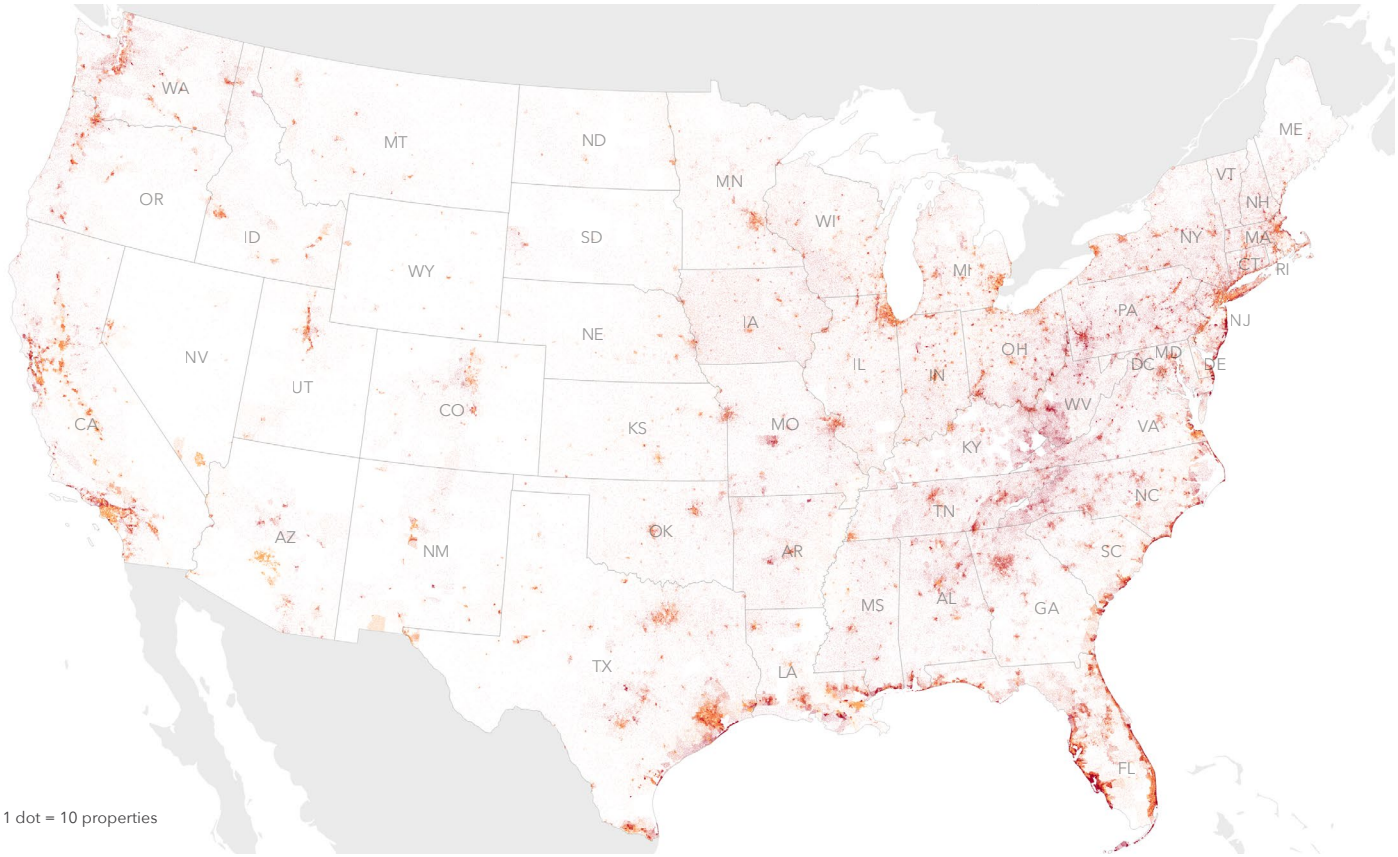
* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 45,000 properties for cities shown.

Flood Factors
National Overview

At a more granular level, the results shed light on the unevenness in which changing environmental factors will impact regions of the country. They also demonstrate the need to incorporate more localized data at a property level in order to fully understand flood risk. Viewing risk at a summarized city, county or state level looks very different than the property-level Flood Factor outputs. A property's Flood Factor is an indicator of its practical flood risk, ranging from 1–10. Properties with higher Flood Factors are either more likely to flood, more likely to experience high floods, or both. A property's Flood Factor is determined by its likelihood of flooding and the potential depth of that flood. Because flood risks accumulate over time, it specifically looks at the likelihood of water reaching the building, or center of an empty lot, at least once within the next 30 years.

Flood Factor scores increase as the 30-year cumulative flood likelihood increases, or as the projected depth of flooding increases. Properties with a less than 0.2% chance of experiencing any depth of flooding in any year within the next 30 years are considered to have minimal risk or a Flood Factor of 1. In totality, more than 16.5% of individual homes and properties in the U.S. are at *any risk* of flooding over the next 30 years. Out of those at risk, 64.1% are at major to extreme risk (Flood Factor 5 or above).

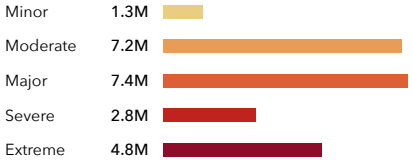
As with the national summaries, each region of the country also has a significant amount of unevenness associated with the current and future impact or risk. Detailed information for each state can be found at the end of the report.



Total properties at risk*

23.5M

Flood Factor distribution of properties at risk*



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details.

Policy Implications

Now and into the Future

The availability of the First Street property-level data on a national level informs a wide range of possible adaptation, mitigation, and policy efforts. Individuals, industry and governments have been seeking the kinds of widely-available and consistent tools necessary for informed decision-making, especially ones that incorporate risk and climate change information at a high resolution and are of a sufficiently high quality (Berman, 2019). Such information has a number of uses, including making it possible for:

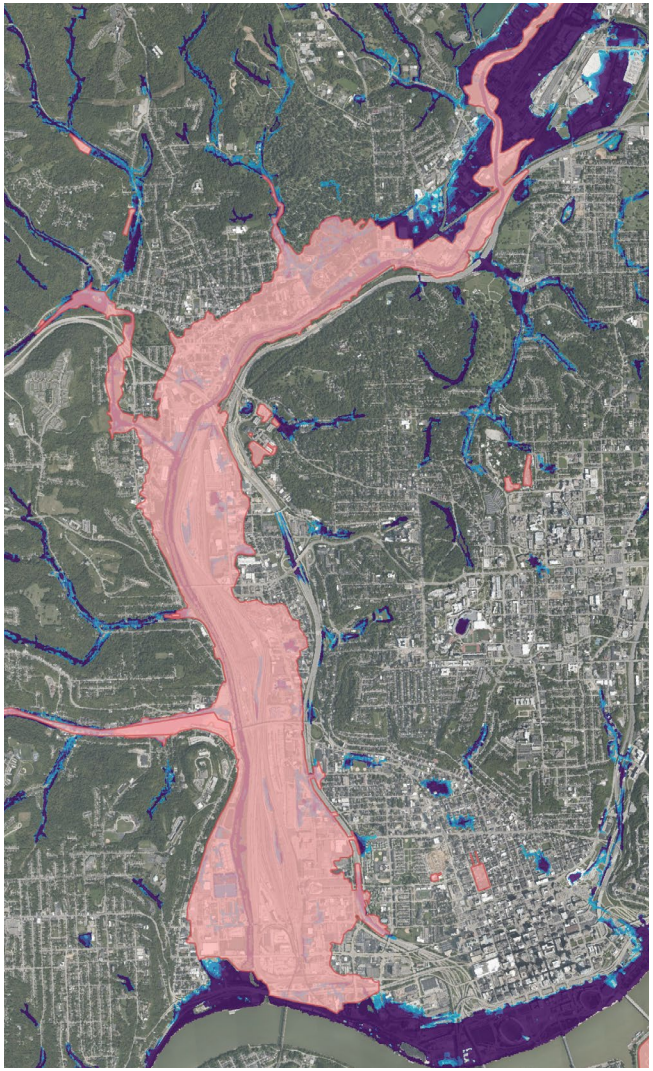
- Individual property owners in the U.S. (freely through floodfactor.com) to understand the risk associated with their property and mitigate their risk by buying insurance from federal or private providers, by seeking alternative properties with lower risk, or by adapting through modifications to their properties and/or the buildings on them.

- The real estate, mortgage, insurance, and investment communities have a consistent property-level dataset across the U.S. with which they can judge the severity and concomitant value of the risk associated with the properties under their control or consideration, and thus enable informed decision-making within and across those commercial communities. Actuarial estimates for specific buildings and structures could be built upon such property-level risk estimates.

- Governments at all levels, from the U.S. Federal Government to small towns, to have access to First Street's property-level flood risks that they need to drive informed policymaking and guide public investment in adaptations that will reduce the risk across wide swaths of properties. These adaptations include buyouts and public works that can reduce communities' risk for extended periods, as well as modifications of the operations of existing adaptation infrastructure.

Access to the First Street information is a necessary but insufficient condition for these sectors to make rapid progress on reducing flood risk. First Street intends to work with the entire community to further refine, update, and expand its Flood Model, to make the data more accurate and useful over time.

To begin to understand the flood risk exposure and its implications for our communities in the U.S., First Street has created the "First Street Foundation Flood Lab" through agreements with a collection of experienced academic and industry researchers who have secure access to the full suite of data used and produced by First Street. Flood Lab members will be able to drill into those data to derive the information products necessary to further understanding of flood risk, its consequences, and propose potential solutions. These experts represent a wide swath of disciplines, including finance, economics, public policy, risk management, hydrology and engineering, who will examine the implications of flood risk data on the mortgage industry, coastal communities, government policy, the National Flood Insurance Program, housing market, low-income and disadvantaged communities, and other related topics. Enabled by data sharing agreements among the data providers and participants, the insights generated by the Flood Lab researchers will enable the data to be applied more rapidly and to greatest effect.



Ohio: Cincinnati Leveed Area

State Overview
Alabama

Flood risk is increasing in the state of Alabama. 334,900 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 6.2%, bringing the total number of properties with substantial risk to 355,700.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 187,900 properties as having substantial risk in the state of Alabama. In comparison, the First Street Foundation Flood Model identifies 1.8 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 147,000 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 167,800 by the year 2050.

Total properties at substantial risk*

In 2020
334,900

In 2050
355,700

30-year change
▲ +20,800 (+6%)

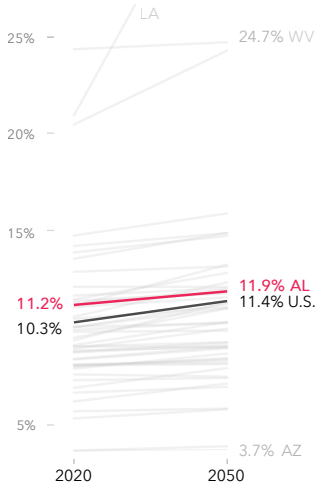
Difference in number of properties currently at substantial risk compared to FEMA**

▲ +147,000

More properties at risk in FSF model →

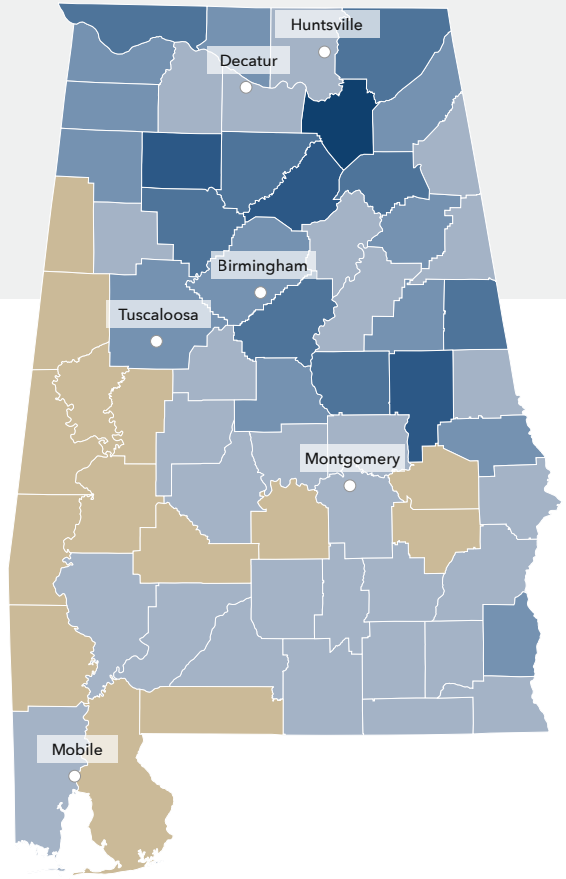
-50% 0 +200% +400%

Mobile Bay faces tidal, riverine, and rainfall flooding. Construction along the shoreline slows water absorption, leading to inland flooding. Montgomery is subject to floods when the Alabama River rises due to heavy rainfall. Significant portions of the business district and downtown face risk, along with low-lying suburban and agricultural areas nearby. Upgrades to storm sewers may not fully alleviate flooding.



Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Alabama has a greater proportion of properties at substantial risk, with 11.2% at substantial risk today and 11.9% at substantial risk in 2050.



* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Alabama

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 439,300 properties in Alabama as at risk over the next 30 years. Of these properties, 94,000 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Mobile has the greatest number of properties at risk of flooding in the state with 24,100 currently at risk, or 29% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 88% of properties in Dauphin Island are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Satsuma, for example, will see a 130% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Alabama at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Mobile	24,070	29%	26,101	32%	+2,031	+8.4%
Birmingham	16,932	17%	17,936	18%	+1,004	+5.9%
Huntsville	13,213	16%	13,564	16%	+351	+2.7%
Decatur	8,242	34%	8,361	35%	+119	+1.4%
Montgomery	7,936	10%	8,596	10%	+660	+8.3%
Selma	7,366	73%	7,860	78%	+494	+6.7%
Gadsden	6,405	26%	6,303	26%	-102	-1.6%
Gulf Shores	4,135	43%	5,266	55%	+1,131	+27.4%
Tuscaloosa	3,780	11%	3,990	12%	+210	+5.6%
Scottsboro	3,735	42%	3,785	42%	+50	+1.3%

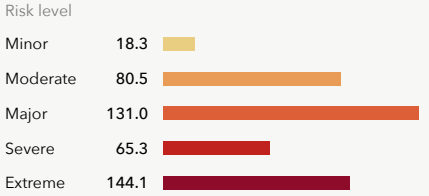
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Dauphin Island	3,071	88%	3,074	88%	+3	+0.1%
Selma	7,366	73%	7,860	78%	+494	+6.7%
Cedar Bluff	1,269	53%	1,275	53%	+6	+0.5%
Elba	1,342	47%	1,452	50%	+110	+8.2%
Orange Beach	3,020	44%	3,204	47%	+184	+6.1%
Gulf Shores	4,135	43%	5,266	55%	+1131	+27.4%
Rainbow City	2,544	43%	2,522	42%	-+22	-0.9%
Scottsboro	3,735	42%	3,785	42%	+50	+1.3%
Childersburg	1,134	40%	1,178	41%	+44	+3.9%
Decatur	8,242	34%	8,361	35%	+119	+1.4%

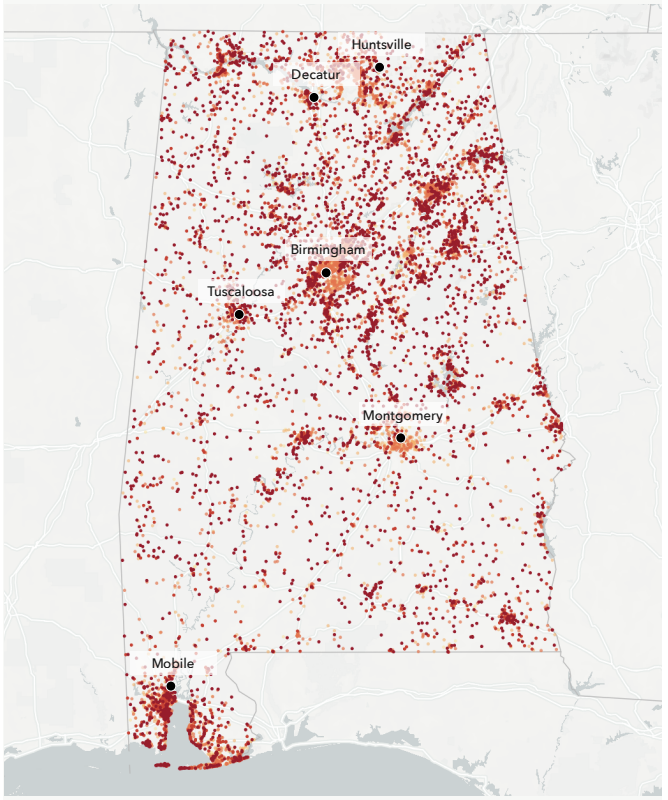
Greatest relative growing risk*

Municipality	2020		2050		Change	
Satsuma	772	25%	1,778	57%	+1006	+130%
Saraland	1,623	22%	2,232	31%	+609	+38%
Robertsdale	71	3%	91	4%	+20	+28%
Gulf Shores	4,135	43%	5,266	55%	+1,131	+27%
Pell City	885	12%	1,055	14%	+170	+19%
Daleville	147	6%	172	6%	+25	+17%
Chickasaw	719	24%	839	28%	+120	+17%
Theodore	153	6%	177	7%	+24	+16%
Fairhope	826	8%	952	9%	+126	+15%
Midfield	416	15%	474	17%	+58	+14%

Flood Factor distribution of properties at risk* (1000s)



More than 14.6% of individual properties and properties in Alabama are at any risk of flooding over the next 30 years. Out of those at risk 78% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Alabama

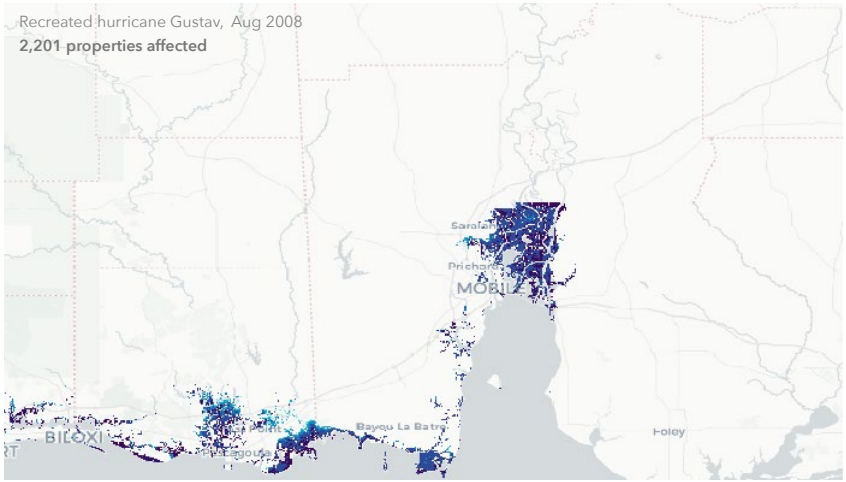
Claims History

548,600 home and property owners in Alabama have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Mobile, Baldwin, Jefferson, Conecuh, and Madison counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 3 flooding events that have occurred since the year 2000 in the state of Alabama. These events flooded around 21,010 properties across the state.**

Flood event	Date	# Properties affected
Hurricane Isidore	Sep 2002	6,244
Hurricane Katrina	Aug 2005	12,564
• Hurricane Gustav	Aug 2008	2,201



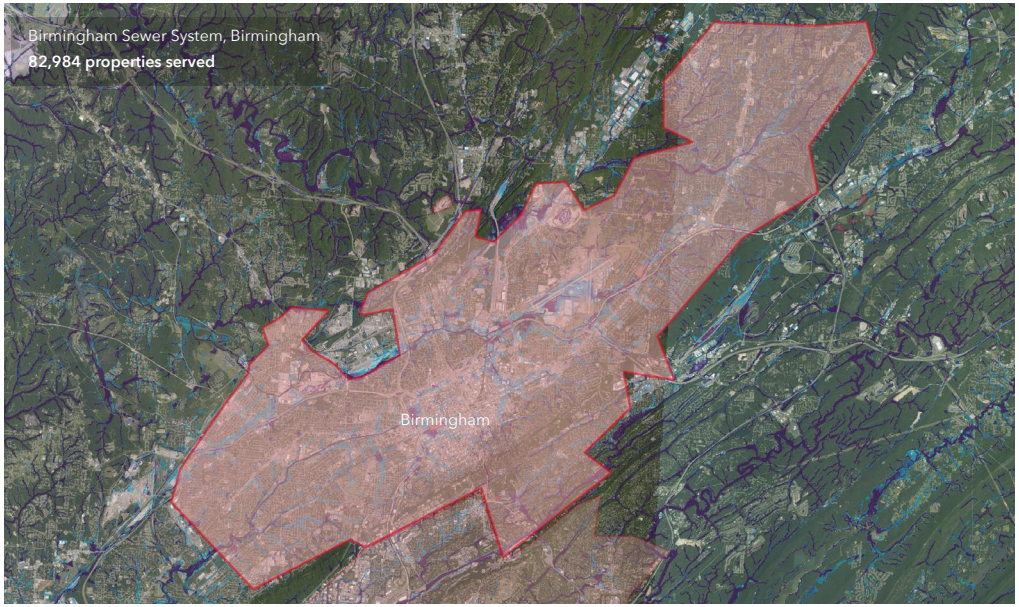
385,000

Properties served by protection measures

The First Street Foundation Flood Model incorporates 59 flood control measures throughout the state which protect 385,000 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Sewer upgrade • Birmingham Sewer System, Birmingham	281,568
Culvert Huntsville Sewer System A, Huntsville	86,565
Valve Eslava Creek Litter Trap, Mobile	12,753
Levee Geneva Protected Area, Geneva	2,262
Beach nourishment Gulf Shores Beach Replenishment, Gulf Shores	1,522



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Arizona

Flood risk is increasing in the state of Arizona. 118,700 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 1.6%, bringing the total number of properties with substantial risk to 120,600.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 129,500 properties as having substantial risk in the state of Arizona. In comparison, the First Street Foundation Flood Model identifies 10,800 fewer properties as facing this same level of risk. This discrepancy exists because of differences in the methods used to estimate risk. The Foundation's Flood Model uses the current climate data, maps precipitation as a stand-alone risk, and may include adaptation improvements not taken into account by FEMA. When adjusting for future environmental changes, the FEMA gap narrows to 8,900 by the year 2050.

Total properties at substantial risk*

In 2020
118,700

In 2050
120,600

30-year change
▲ +1,900 (+1.6%)

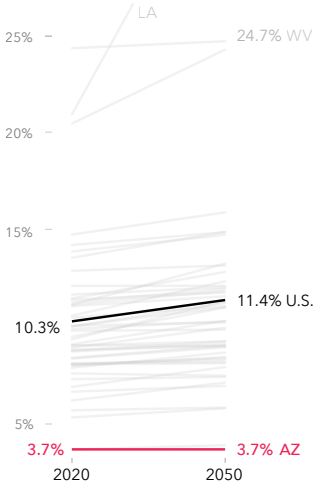
Difference in number of properties currently at substantial risk compared to FEMA**

▼ -10,800

More properties at risk in FSF model →

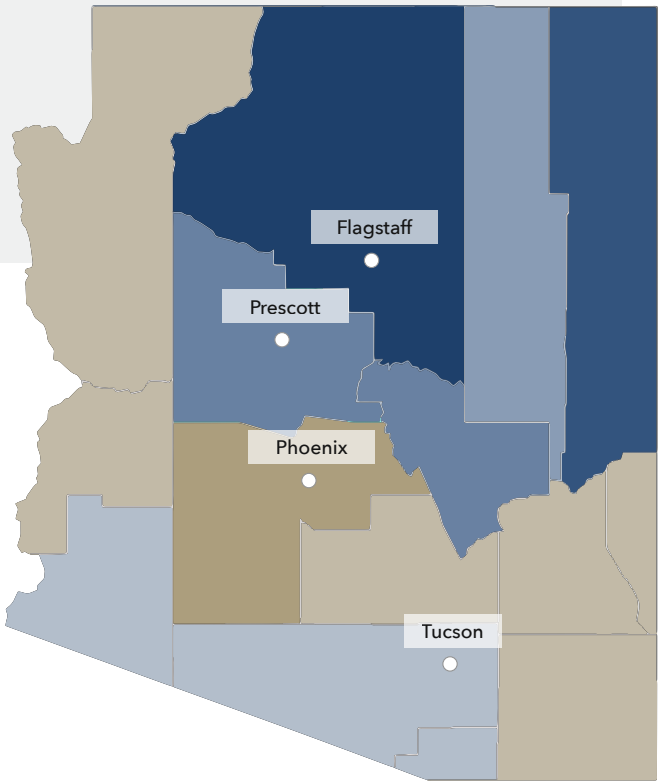
-50% 0 +50% +150% +250%

Phoenix sees floods from heavy rains in the mountains surrounding the Valley of the Sun. Runoff from winter and spring storms move rapidly downhill into developed areas, overflowing the city's rivers where the floodplains are heavily developed, flat, and wide. Known protections include dams and levees, a complex drainage and canal network, as well as river channel modifications.



Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Arizona has a smaller proportion of properties at substantial risk, with 3.7% at substantial risk today and 3.7% at substantial risk in 2050.



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** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Arizona

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 367,600 properties in Arizona as at risk over the next 30 years. Of these properties, 24,700 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Phoenix has the greatest number of properties at risk of flooding in the state with 62,400 currently at risk, or 13% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 65% of properties in Willcox are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Somerton, for example, will see a 15% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Arizona at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Phoenix	62,351	13%	61,466	13%	-885	-1.4%
Glendale	25,429	37%	24,517	36%	-912	-3.6%
Scottsdale	17,781	15%	18,769	16%	+988	+5.6%
Peoria	7,850	11%	7,661	11%	-189	-2.4%
Maricopa	7,479	26%	7,099	25%	-380	-5.1%
Mesa	5,447	3%	5,899	4%	+452	+8.3%
Tucson	5,404	3%	5,348	3%	-56	-1.0%
Surprise	5,236	8%	5,099	8%	-137	-2.6%
Lake Havasu City	4,762	12%	4,807	12%	+45	+0.9%
Flagstaff	4,466	20%	4,608	20%	+142	+3.2%

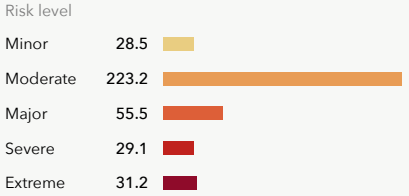
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Willcox	2,728	65%	2,707	64%	+3	+0.1%
Cienega Springs	988	43%	984	43%	+16	+0.8%
Tolleson	848	41%	821	40%	+1	+0.1%
Doney Park	842	41%	864	42%	+36	+2.1%
Glendale	25,429	37%	24,517	36%	+10	+0.7%
Williams	931	34%	950	35%	+11	+0.5%
Camp Verde	2,065	29%	2,082	30%	+15	+0.7%
Holbrook	714	27%	694	27%	+21	+0.3%
Gold Canyon	2,019	27%	2,089	27%	+26	+0.7%
Bisbee	1,119	26%	1,128	26%	+10	+0.4%

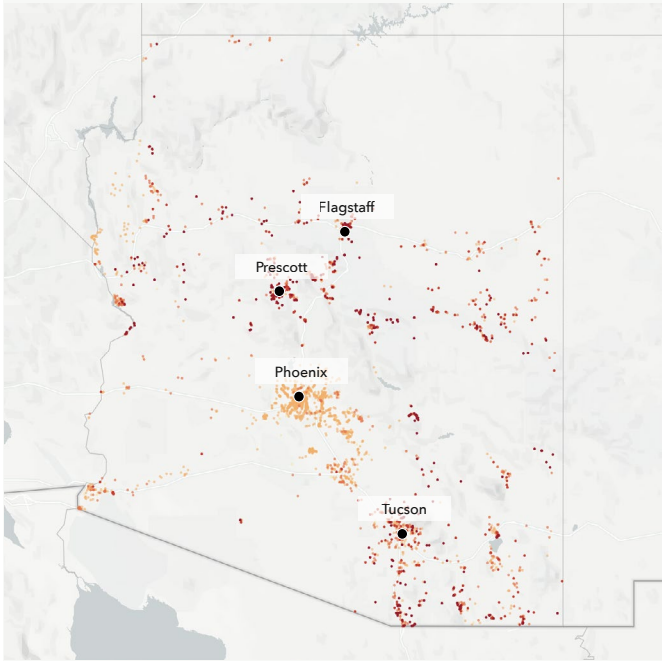
Greatest relative growing risk*

Municipality	2020		2050		Change	
Somerton	375	9%	431	11%	+56	+15%
Dolan Springs	855	6%	975	7%	+120	+14%
White Hills	130	3%	148	4%	+18	+14%
Sun Lakes	158	2%	179	2%	+21	+13%
Chandler	1,965	2%	2,178	2%	+213	+11%
Golden Valley	671	6%	741	7%	+70	+10%
Winslow	673	19%	741	21%	+68	+10%
Yuma	4,103	13%	4,504	14%	+401	+10%
New River	248	3%	272	3%	+24	+10%
Fort Mohave	856	8%	936	9%	+80	+9%

Flood Factor distribution of properties at risk* (1000s)



More than 11.2% of individual properties and properties in Arizona are at any risk of flooding over the next 30 years. Out of those at risk 32% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

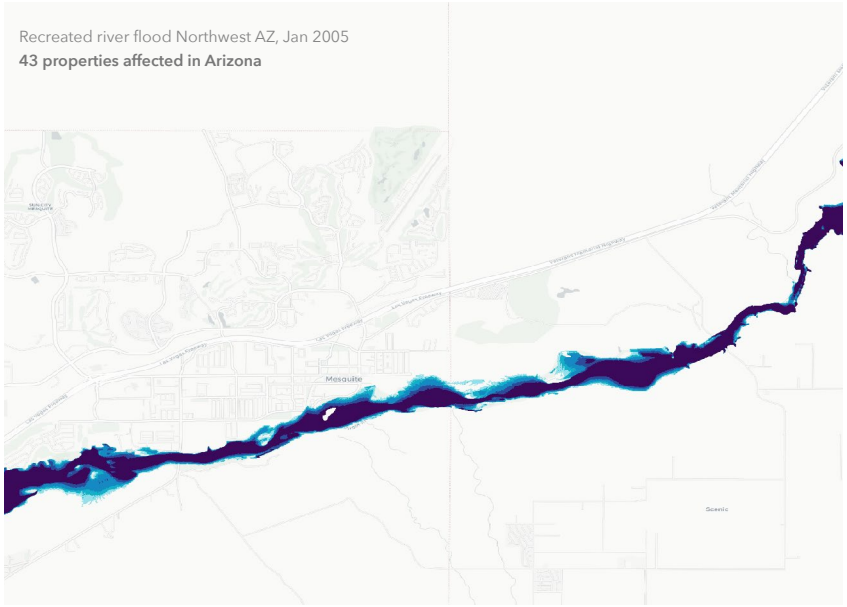
Flood History & Protection
Arizona

Claims History

1,900 home and property owners in Arizona have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Maricopa, Yavapai, Pima, Coconino, and Pinal counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 1 flooding event that occurred since the year 2000 in the state of Arizona. This event flooded around 40 properties across the state.**



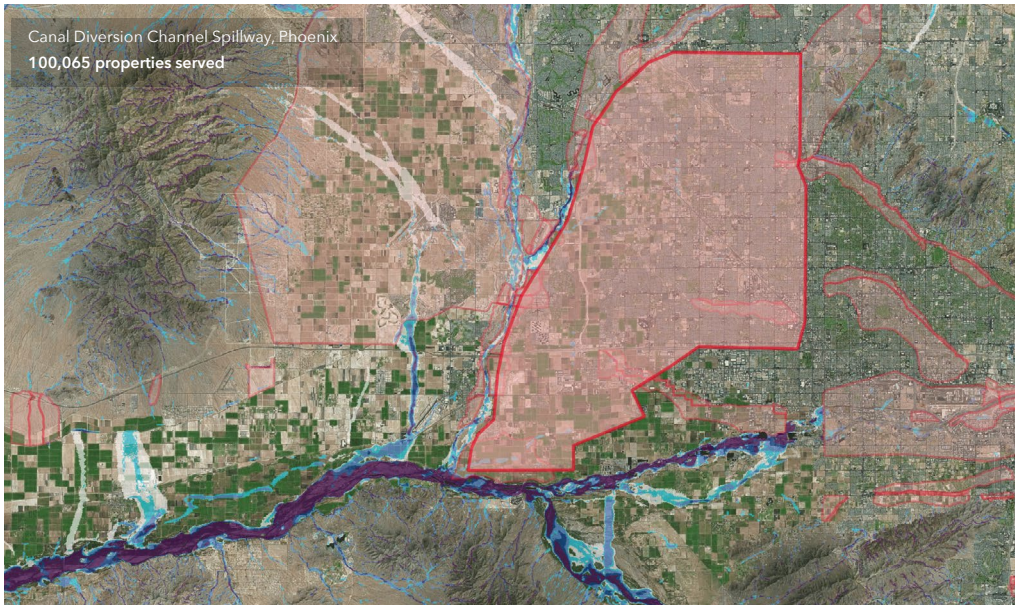
761,900

Properties served by protection measures

The First Street Foundation Flood Model incorporates 190 flood control measures throughout the state which protect 761,900 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Spillway Arizona Canal Diversion Channel, Phoenix	437,705
Dam McMicken Dam, Surprise	147,695
Levee Maricopa County Levee 30, Mesa	197,679
Culvert Culverts/structures along road, Cottonwood	24



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Arkansas

Flood risk is increasing in the state of Arkansas. 191,600 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 1.7%, bringing the total number of properties with substantial risk to 195,000.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 152,900 properties as having substantial risk in the state of Arkansas. In comparison, the First Street Foundation Flood Model identifies 1.3 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 38,700 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 42,100 by the year 2050.

Total properties at substantial risk*

In 2020
191,600

In 2050
195,000

30-year change
▲ +3,400 (+2%)

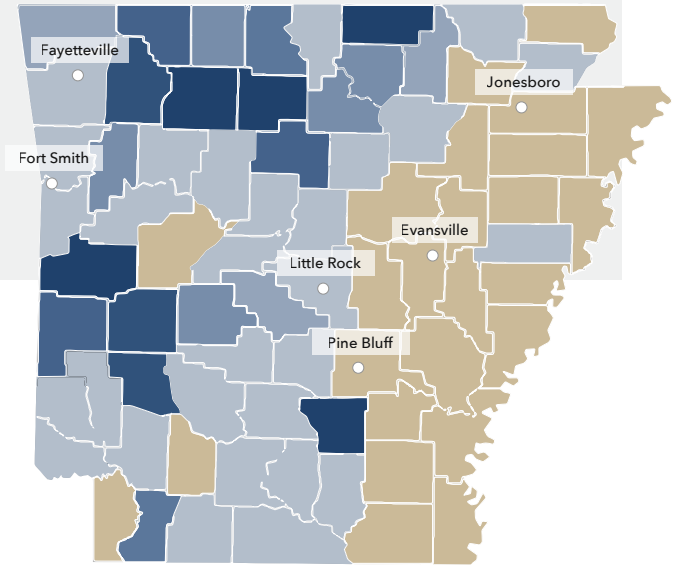
Arkansas experiences regular flooding when the Arkansas and Mississippi rivers overtop. Other parts of the state may experience heavy rainfall flooding derived from steep slopes and developed land.

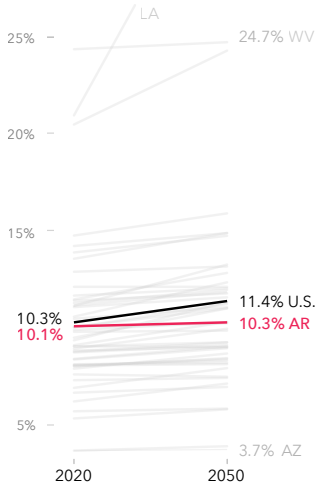
Difference in number of properties currently at substantial risk compared to FEMA**

▲ +38,700

More properties at risk in FSF model →

-50% 0 +100% +200% +300%





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Arkansas has a smaller proportion of properties at substantial risk, with 10.1% at substantial risk today and 10.3% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Arkansas

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 247,600 properties in Arkansas as at risk over the next 30 years. Of these properties, 79,400 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of North Little Rock has the greatest number of properties at risk of flooding in the state with 9,100 currently at risk, or 33% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 46% of properties in Rockwell are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Dermott, for example, will see a 15% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Arkansas at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
North Little Rock	9,140	33%	9,352	34%	+212	+2.3%
Little Rock	7,553	10%	7,754	10%	+201	+2.7%
Jonesboro	3,581	12%	3,800	13%	+219	+6.1%
Hot Springs	3,230	17%	3,246	17%	+16	+0.5%
Hot Springs Village	2,955	8%	3,003	8%	+48	+1.6%
Pine Bluff	2,599	9%	2,705	9%	+106	+4.1%
Fort Smith	2,435	7%	2,495	7%	+60	+2.5%
Fayetteville	1,860	6%	1,894	6%	+34	+1.8%
Paragould	1,788	23%	1,807	24%	+19	+1.1%
Helena-West Helena	1,490	22%	1,533	23%	+43	+2.9%

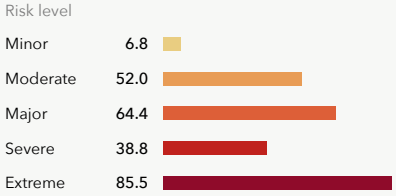
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Rockwell	1,004	46%	1,002	46%	-2	-0.2%
Piney	1,042	38%	1,043	38%	+1	+0.1%
North Little Rock	9,140	33%	9,352	34%	+212	+2.3%
Paragould	1,788	23%	1,807	24%	+19	+1.1%
Piggott	517	23%	543	25%	+26	+5.0%
Helena-West Helena	1,490	22%	1,533	23%	+43	+2.9%
Hardy	717	19%	717	19%	+0	+0.0%
Hot Springs	3,230	17%	3,246	17%	+16	+0.5%
Maumelle	1,090	14%	1,131	15%	+41	+3.8%
Newport	488	14%	496	14%	+8	+1.6%

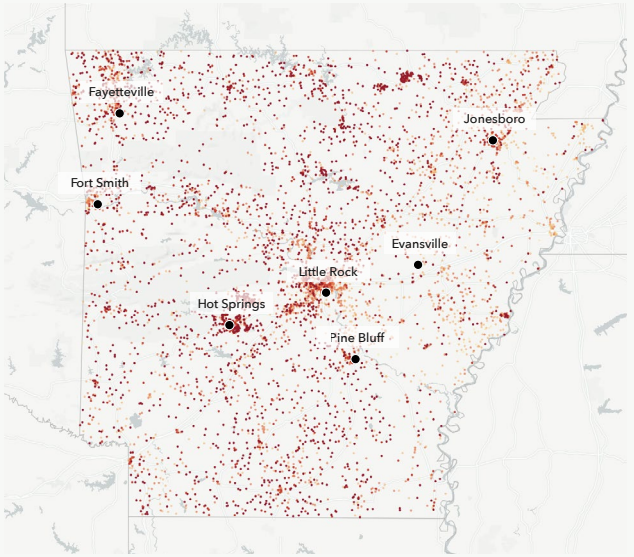
Greatest relative growing risk*

Municipality	2020		2050		Change	
Dermott	123	5%	141	6%	+18	+15%
Trumann	372	10%	418	11%	+46	+12%
Warren	156	4%	174	5%	+18	+12%
Marion	603	12%	658	13%	+55	+9%
Blytheville	722	8%	785	9%	+63	+9%
West Memphis	731	9%	780	10%	+49	+7%
Forrest City	211	7%	224	8%	+13	+6%
Jonesboro	3,581	12%	3,800	13%	+219	+6%
Russellville	1,164	11%	1,234	12%	+70	+6%
Brinkley	268	12%	283	13%	+15	+6%

Flood Factor distribution of properties at risk* (1000s)



More than 13% of individual properties and properties in Arkansas are at any risk of flooding over the next 30 years. Out of those at risk 76% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

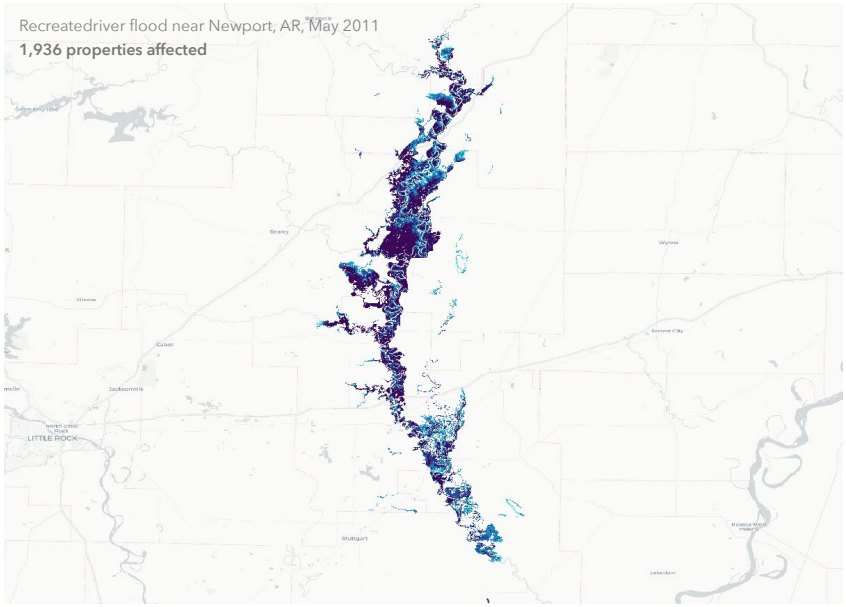
Flood History & Protection
Arkansas

Claims history

64,100 home and property owners in Arkansas have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Sebastian, Pulaski, Crawford, Faulkner, and Phillips counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 1 flooding events that have occurred since the year 2000 in the state of Arkansas. This event flooded around 1,90 properties across the state.**



0.5 1 2 3+ ft Depth of flooding

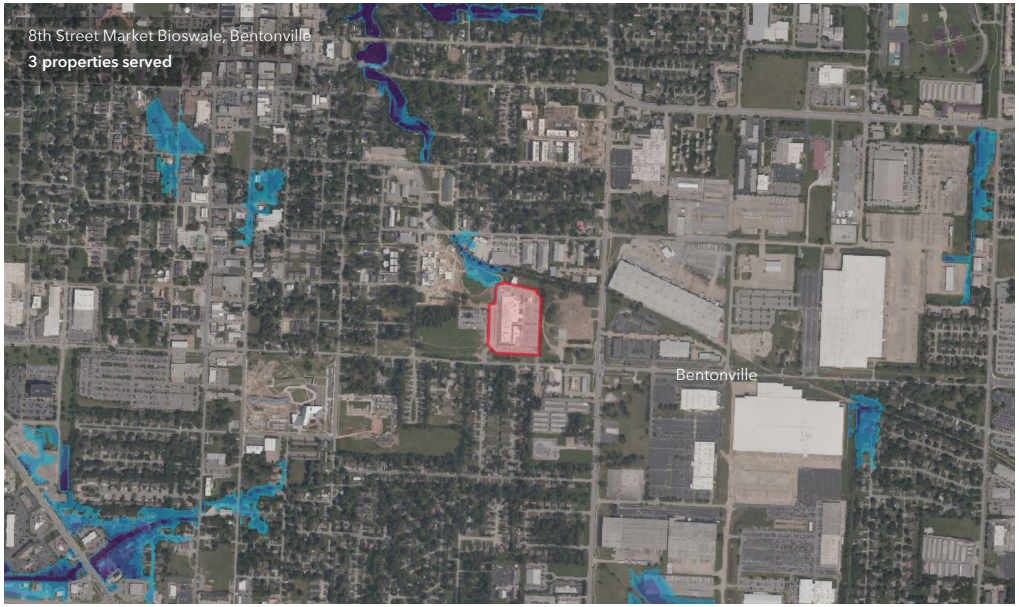
129,500

Properties served by protection measures

The First Street Foundation Flood Model incorporates 112 flood control measures throughout the state which protect 129,500 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee Commerce-St Francis River System	129,468
Pervious pavement Lake Atalanta, Rogers	7
Bioswale • 8th st market, Bentonville	3



Area of protection

0.5 1 2 3+ ft Depth of flooding for a simulated 1 in 100 flood event in 2020

* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
California

Flood risk is increasing in the state of California. 1,090,900 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 5.5%, bringing the total number of properties with substantial risk to 1,150,800.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 495,400 properties as having substantial risk in the state of California. In comparison, the First Street Foundation Flood Model identifies 2.2 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 595,500 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 655,400 by the year 2050.

Total properties at substantial risk*

In 2020
1.09M

In 2050
1.15M

30-year change
▲ +59,900 (+5.5%)

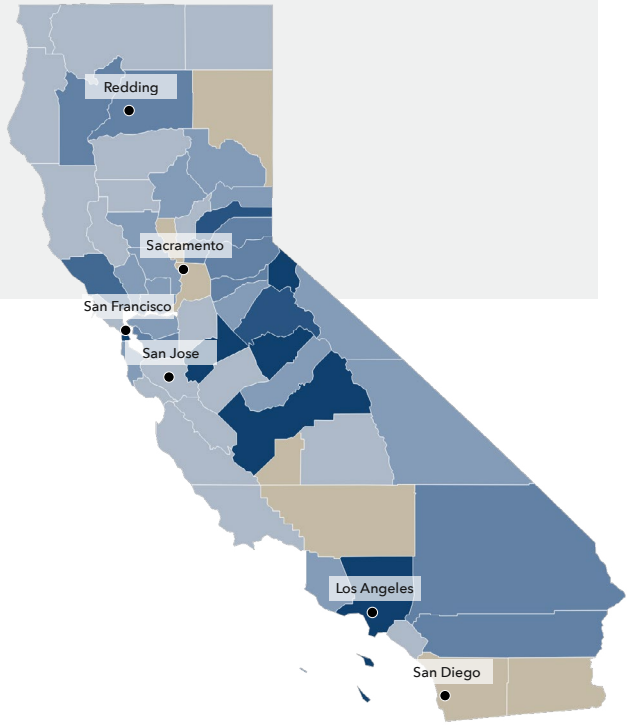
Difference in number of properties currently at substantial risk compared to FEMA**

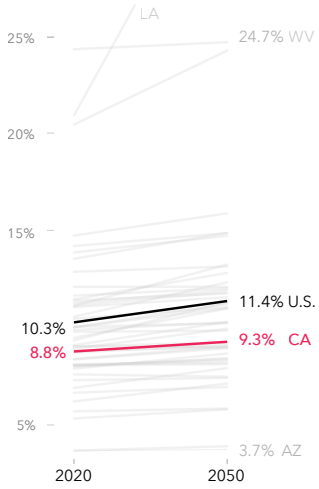
▲ +595,500

More properties at risk in FSF model →

-60% 0 +100% +300% +500%

Central Valley cities like Sacramento see riverine and stormwater flood risk. Dams and levees designed to protect the city often fail and drainage issues cause flooding in some areas during storms. San Bernardino County experiences rainfall flooding, causing flows and land erosion, posing risks to people and property. City and county projects seek urban stormwater improvement, reinforcement of the Rialto Channel, and regrading detention basins to address risks.





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. California has a smaller proportion of properties at substantial risk, with 8.8% at substantial risk today and 9.3% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
California

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 2,287,200 properties in California as at risk over the next 30 years. Of these properties, 108,500 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Los Angeles has the greatest number of properties at risk of flooding in the state with 132,000 currently at risk, or 20% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 100% of properties in Yuba City are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Wasco, for example, will see a % increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in California at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Los Angeles	132,046	20%	135,515	20%	+3,469	+2.6%
Sacramento	101,792	68%	109,416	74%	+7,624	+7.5%
Stockton	76,446	92%	77,918	94%	+1,472	+1.9%
San Jose	56,243	25%	59,298	26%	+3,055	+5.4%
Fresno	54,255	39%	55,332	39%	+1,077	+2.0%
Long Beach	31,565	36%	34,811	40%	+3,246	+10.3%
Bakersfield	20,430	18%	21,051	19%	+621	+3.0%
Santa Rosa	19,914	37%	20,917	39%	+1,003	+5.0%
Yuba City	19,174	100%	19,193	100%	+19	+0.1%
Visalia	18,946	43%	20,077	46%	+1,131	+6.0%

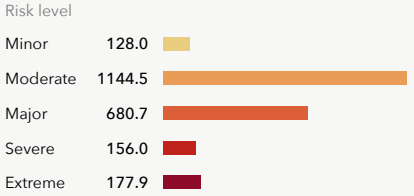
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Yuba City	19,174	100%	19,193	100%	+19	+0.1%
Orland	2,994	100%	3,004	100%	+10	+0.3%
Country Club	3,624	100%	3,625	100%	+1	+0.0%
Foster City	7,234	99%	7,236	99%	+2	+0.0%
August	2,089	98%	2,102	98%	+13	+0.6%
Lemon Hill	3,074	96%	3,105	97%	+31	+1.0%
Colusa	1,934	96%	1,947	97%	+13	+0.7%
Farmersville	2,595	96%	2,654	98%	+59	+2.3%
Linda	5,628	94%	5,705	96%	+77	+1.4%
Stockton	76,446	92%	77,918	94%	+1472	+1.9%

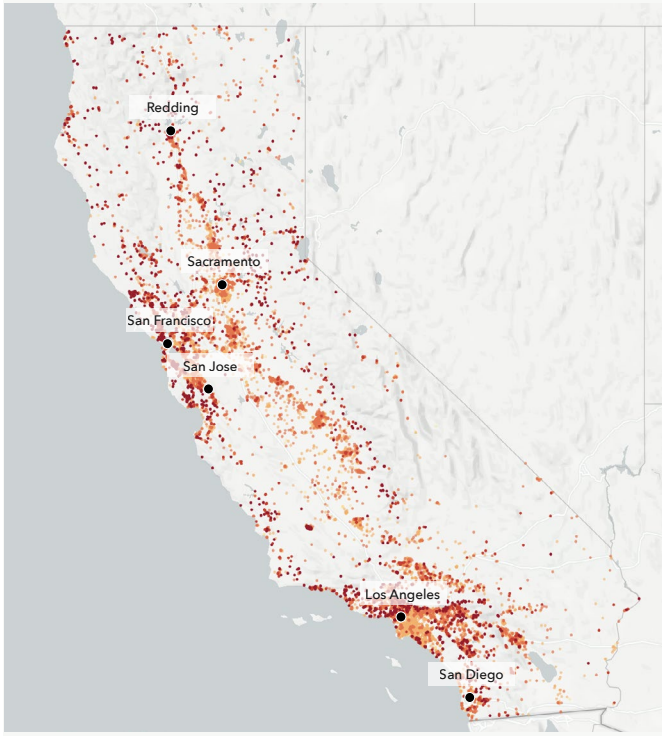
Greatest relative growing risk*

Municipality	2020		2050		Change	
Wasco	0	0%	314	6%	+314	+Inf
Coronado	103	2%	1,142	24%	+1039	+1009%
Newman	51	1%	150	4%	+99	+194%
Ripon	93	2%	267	5%	+174	+187%
Olivehurst	1,369	29%	2,767	59%	+1,398	+102%
Exeter	43	1%	82	3%	+39	+91%
Huntington Beach	11,343	22%	21,431	42%	+10,088	+89%
Vallejo	2,002	5%	3,671	10%	+1,669	+83%
Imperial Beach	149	3%	270	6%	+121	+81%
Alameda	824	4%	1,478	8%	+654	+79%

Flood Factor distribution of properties at risk* (1000s)



More than 18.5% of individual properties and properties in California are at any risk of flooding over the next 30 years. Out of those at risk 44% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
California

Claims History

155,600 home and property owners in California have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Los Angeles, Sonoma, Butte, San Diego, and Napa counties.

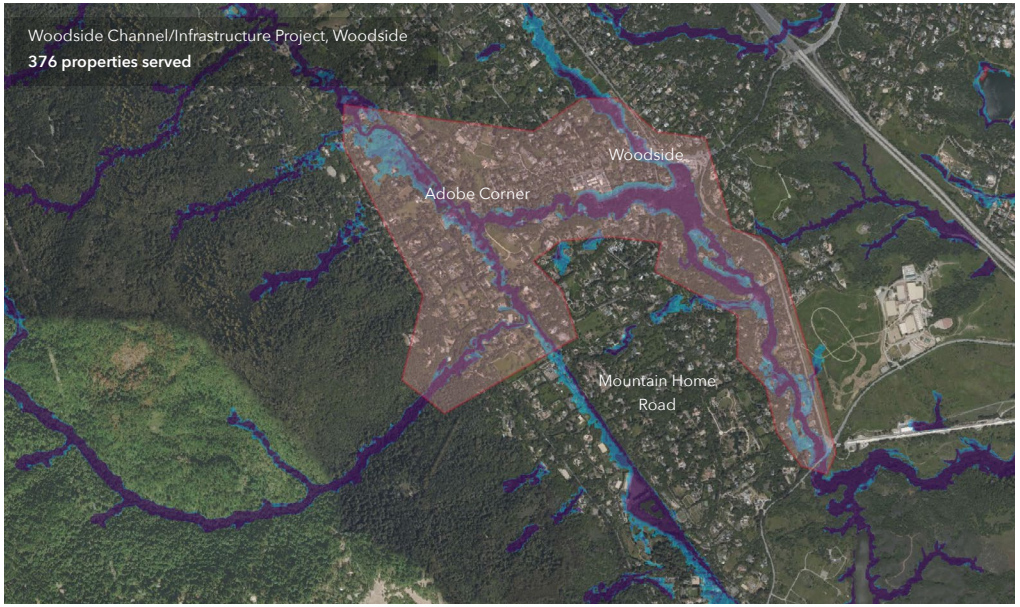
4.85M

Properties served by protection measures

The First Street Foundation Flood Model incorporates 3,815 flood control measures throughout the state which protect 4,854,200 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Channel • Woodside Channel/Infrastructure Project	3,205,787
Levee Sacramento and Elk Grove	1,689,870
Dam Don Pedro MD 0, Modesto	1,199,667
Sewer upgrade Conveyance Channels, San Bernardino	77,450
Marsh/wetland restoration Huntington Beach Wetland Restoration	20,989



* Source: Fema.gov

State Overview
Colorado

Flood risk is increasing in the state of Colorado. 131,200 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 2.4%, bringing the total number of properties with substantial risk to 134,400.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 43,300 properties as having substantial risk in the state of Colorado. In comparison, the First Street Foundation Flood Model identifies 3 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 87,900 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 91,100 by the year 2050.

Total properties at substantial risk*

In 2020
131,200

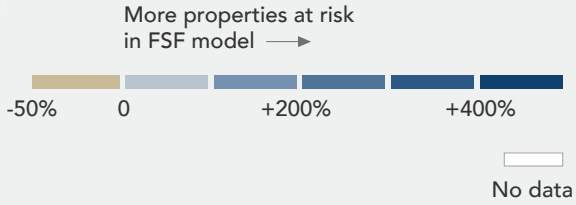
In 2050
134,400

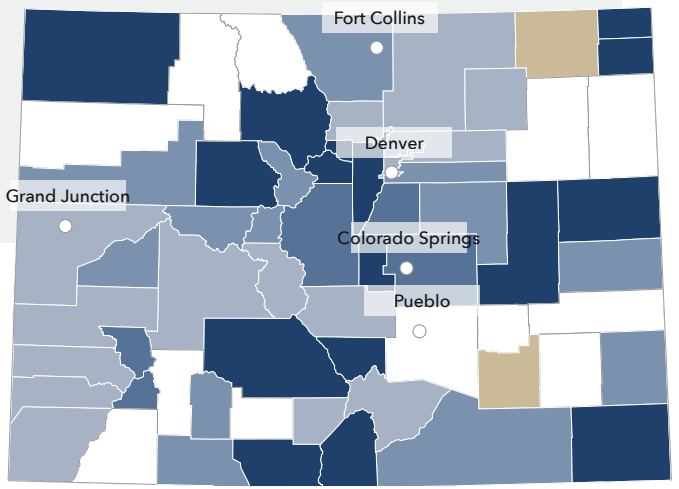
30-year change
▲ +3,200 (+2.4%)

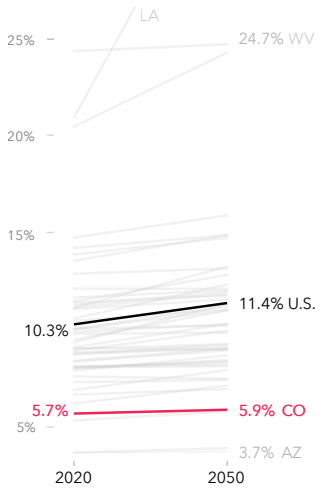
As the 2013 floods show, the Front Range from Fort Collins to South Denver are the most vulnerable to flooding due to its proximity to rivers and snowmelt. The western side of the state will also experience flooding primarily from the Colorado and Gunnison rivers.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +87,900







Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Colorado has a smaller proportion of properties at substantial risk, with 5.7% at substantial risk today and 5.9% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Colorado

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 200,400 properties in Colorado as at risk over the next 30 years. Of these properties, 16,900 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Colorado Springs has the greatest number of properties at risk of flooding in the state with 15,400 currently at risk, or 10% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 46% of properties in Lamar are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Edgewater, for example, will see a 23% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Colorado at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Colorado Springs	15,440	10%	15,443	10%	+3	0.0%
Denver	10,136	5%	10,677	6%	+541	+5.3%
Fort Collins	4,559	8%	4,755	8%	+196	+4.3%
Aurora	4,058	3%	4,171	3%	+113	+2.8%
Longmont	4,023	13%	4,151	13%	+128	+3.2%
Boulder	3,237	13%	3,319	13%	+82	+2.5%
Arvada	2,730	6%	2,856	6%	+126	+4.6%
Loveland	2,169	7%	2,221	7%	+52	+2.4%
Lakewood	1,949	4%	2,069	4%	+120	+6.2%
Greeley	1,838	6%	1,885	6%	+47	+2.6%

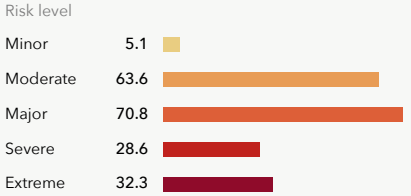
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Lamar	1,621	46%	1,626	46%	+5	+0.3%
Craig	1,434	38%	1,442	38%	+8	+0.6%
Vail	933	33%	975	35%	+42	+4.5%
Florence	818	30%	833	31%	+15	+1.8%
Wellington	1,337	27%	1,396	29%	+59	+4.4%
Manitou Springs	723	26%	723	26%	+0	+0.0%
Breckenridge	950	25%	977	26%	+27	+2.8%
Fort Morgan	907	24%	908	24%	+1	+0.1%
Fort Lupton	661	22%	672	23%	+11	+1.7%
Estes Park	900	19%	920	19%	+20	+2.2%

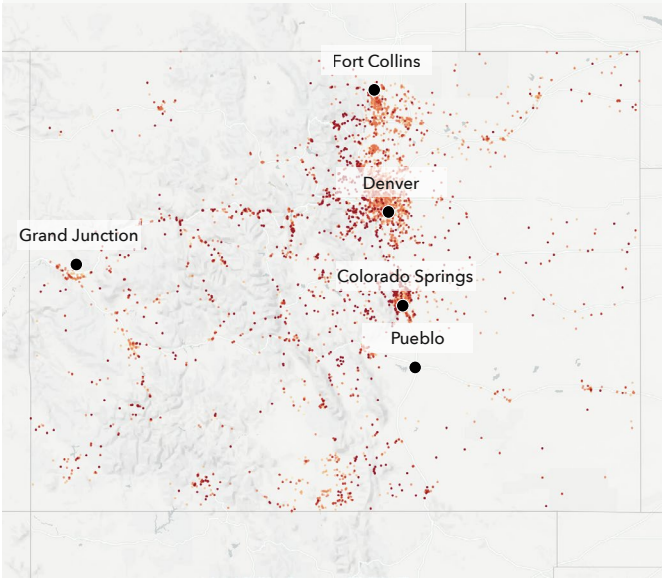
Greatest relative growing risk*

Municipality	2020		2050		Change	
Edgewater	1,626	15%	398	18%	+74	+23%
Fruitvale	1,442	0%	14	0%	+2	+17%
Carbondale	975	1%	23	1%	+3	+15%
Montrose	833	10%	1,156	11%	+110	+11%
New Castle	1,396	14%	346	16%	+30	+10%
Grand Junction	723	4%	1,247	4%	+100	+9%
Mead	977	3%	94	3%	+7	+8%
Clifton	908	3%	229	3%	+16	+8%
Columbine	672	2%	240	2%	+15	+7%
Orchard Mesa	920	2%	64	2%	+4	+7%

Flood Factor distribution of properties at risk* (1000s)



More than 8.7% of individual properties and properties in Colorado are at any risk of flooding over the next 30 years. Out of those at risk 66% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Colorado

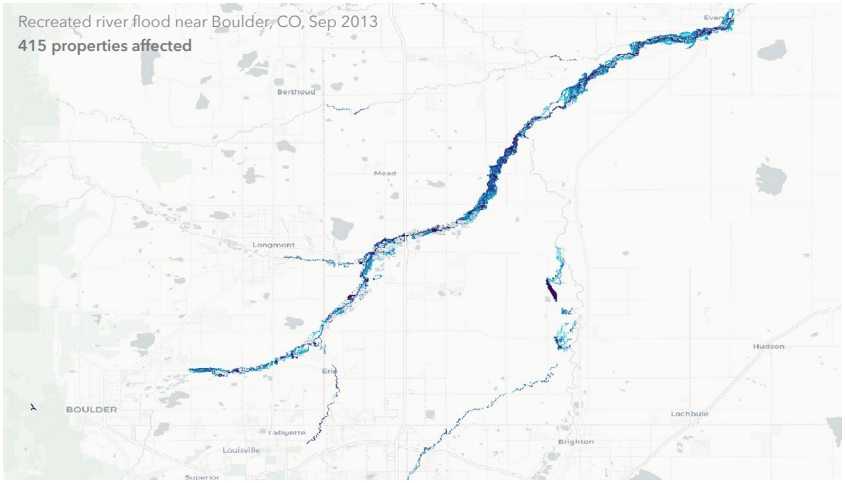
Claims History

49,700 home and property owners in Colorado have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Boulder, Larimer, Jefferson, Weld, and Arapahoe counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 2 flooding events that have occurred since the year 2000 in the state of Colorado. These events flooded around 960 properties across the state.**

Flood event	Date	# Properties affected
• River flood near Boulder, CO	Sep 2013	415
River flood near Fort Morgan, CO	Sep 2013	541



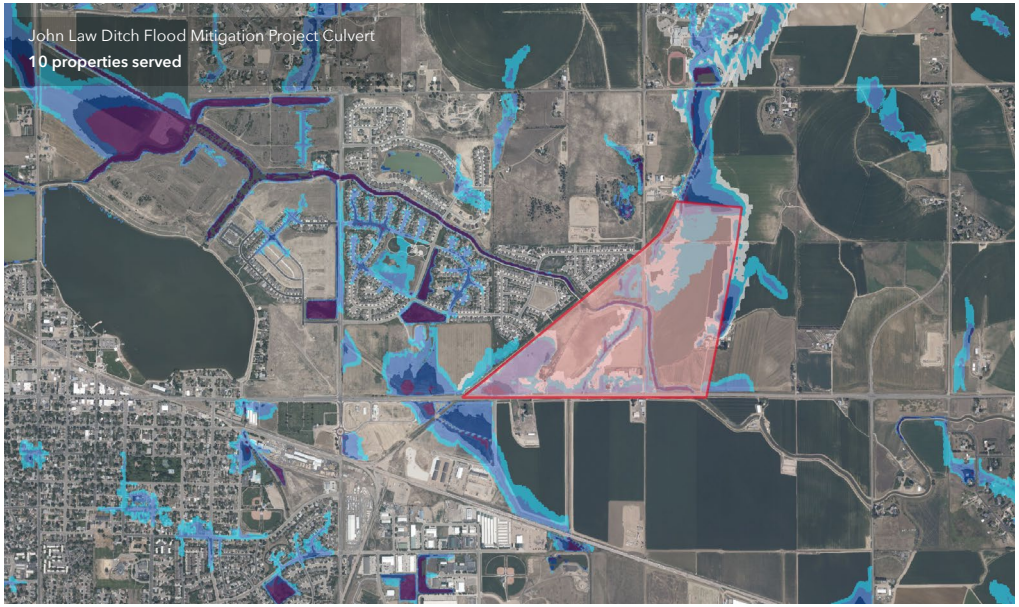
15,900

Properties served by protection measures

The First Street Foundation Flood Model incorporates 46 flood control measures throughout the state which protect 15,900 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee Alamosa Levees, Rio Grande, Right Levee, Alamosa	9,068
Sewer upgrade 33rd st outfal, Denver I	5,207
Detention basin Dry Gultch Park Service Area, Denver	1,404
Retention pond Drainage project, Broomfield	253
Culvert	12
• John Law Ditch Flood Mitigation Project	



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Connecticut

Flood risk is increasing in the state of Connecticut. 106,700 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 9.7%, bringing the total number of properties with substantial risk to 117,000.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 60,400 properties as having substantial risk in the state of Connecticut. In comparison, the First Street Foundation Flood Model identifies 1.8 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 46,300 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 56,600 by the year 2050.

Total properties at substantial risk*

In 2020
106,700

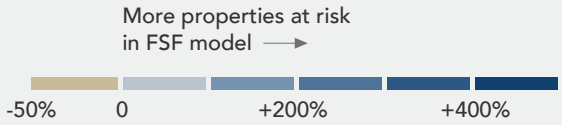
In 2050
117,000

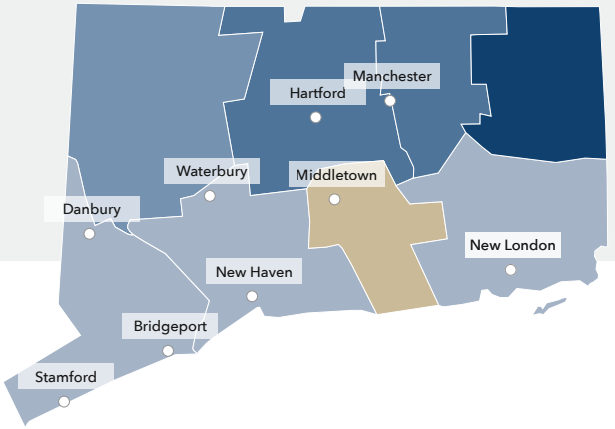
30-year change
▲ +10,300 (+10%)

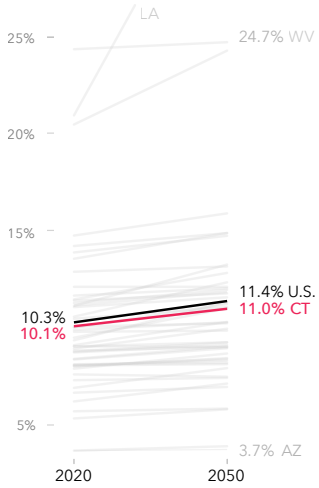
Coastal areas are vulnerable to wave action and storm surge. Low lying areas are susceptible to flooding from hurricanes and nor'easters. Hartford is subject to floods from intense rain and snowmelt. Authorities have built dikes, floodwalls, and conduits along the Connecticut River and improved the channel along the South Branch Park River.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +46,300







Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Connecticut has a similar proportion of properties at substantial risk, with 10.1% at substantial risk today and 11% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Connecticut

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 163,800 properties in Connecticut as at risk over the next 30 years. Of these properties, 29,600 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

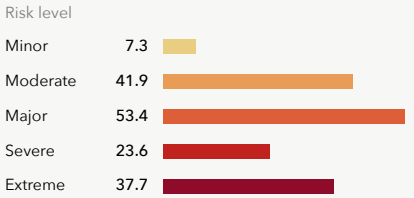
The city of Bridgeport has the greatest number of properties at risk of flooding in the state with 5,800 currently at risk, or 20% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 31% of properties in Old Greenwich are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. West Haven, for example, will see a 63% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Connecticut at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Bridgeport	5,836	21%	7,206	25%	+1,370	+23.5%
Stamford	4,803	19%	5,929	23%	+1,126	+23.4%
Norwalk	4,661	21%	5,238	24%	+577	+12.4%
Hartford	3,689	19%	3,975	21%	+286	+7.8%
Milford city	3,438	19%	4,344	23%	+906	+26.4%
Stratford	2,981	17%	4,015	23%	+1,034	+34.7%
New Haven	2,944	12%	3,593	15%	+649	+22.0%
East Haven	2,764	26%	3,411	32%	+647	+23.4%
Westport	2,533	26%	2,777	28%	+244	+9.6%
West Hartford	2,370	12%	2,443	12%	+73	+3.1%

Flood Factor distribution of properties at risk* (1000s)



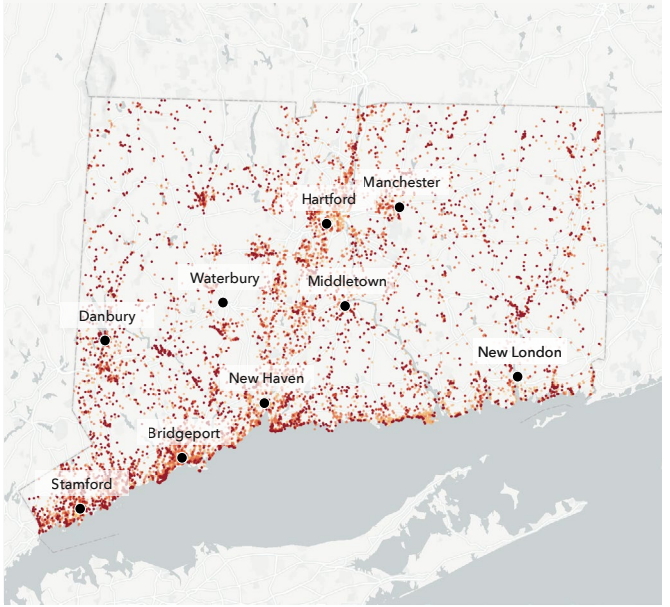
More than 15.4% of individual properties and properties in Connecticut are at any risk of flooding over the next 30 years. Out of those at risk 70% are at major to extreme risk.

Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Old Greenwich	725	31%	953	40%	+228	+31.4%
Cos Cob	632	29%	768	35%	+136	+21.5%
Branford Center	607	28%	812	38%	+205	+33.8%
East Haven	2,764	26%	3,411	32%	+647	+23.4%
Westport	2,533	26%	2,777	28%	+244	+9.6%
Darien	1,544	21%	1,683	23%	+139	+9.0%
Norwalk	4,661	21%	5,238	24%	+577	+12.4%
Bridgeport	5,836	21%	7,206	25%	+1,370	+23.5%
Greenwich	683	20%	741	22%	+58	+8.5%
Hartford	3,689	19%	3,975	21%	+286	+7.8%

Greatest relative growing risk*

Municipality	2020		2050		Change	
West Haven	1,824	13%	2,971	21%	+1147	+63%
Groton	184	8%	272	12%	+88	+48%
New London	521	8%	747	12%	+226	+43%
Stratford	2,981	17%	4,015	23%	+1,034	+35%
Branford Center	607	28%	812	38%	+205	+34%
Old Greenwich	725	31%	953	40%	+228	+31%
Milford city	3,438	19%	4,344	23%	+906	+26%
Bridgeport	5,836	21%	7,206	25%	+1,370	+24%
East Haven	2,764	26%	3,411	32%	+647	+23%
Stamford	4,803	19%	5,929	23%	+1,126	+23%



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Connecticut

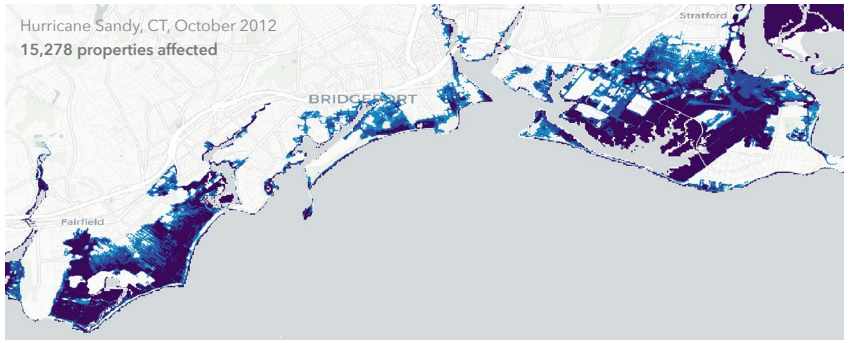
Claims History

45,200 home and property owners in Connecticut have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Fairfield, New Haven, New London, Hartford, and Middlesex counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 6 flooding events that have occurred since the year 2000 in the state of Connecticut. These events flooded around 26,320 properties across the state.**

Flood event	Date	# Properties affected
Nor'easter	Feb 2003	112
Nor'easter	Nov 2009	2,111
Nor'easter	Mar 2010	274
Hurricane Irene	Aug 2011	8,165
River flood across central CT	Aug 2011	376
• Hurricane Sandy	Oct 2012	15,278



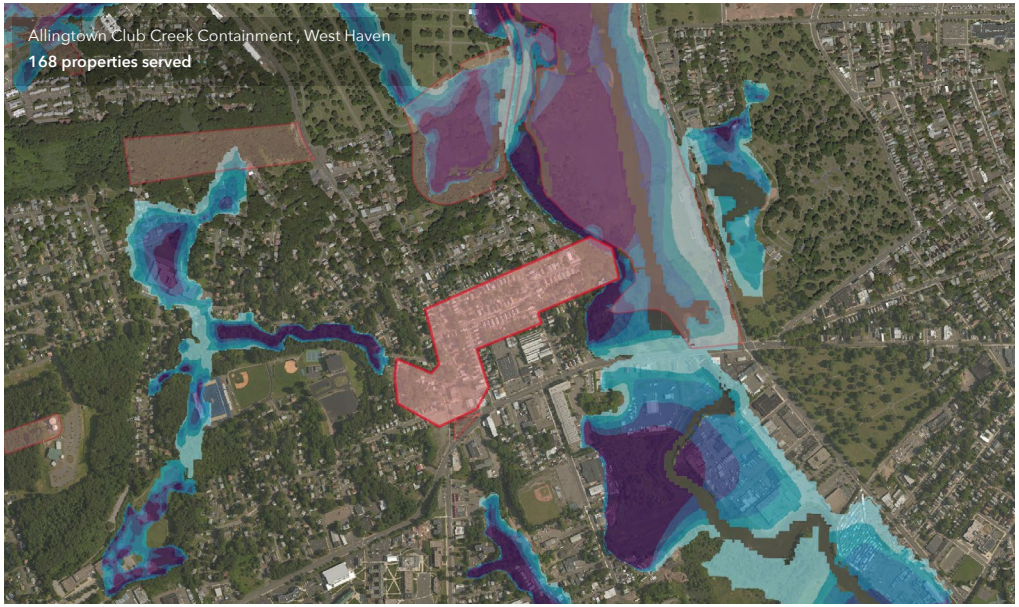
13,500

Properties served by protection measures

The First Street Foundation Flood Model incorporates 2,258 flood control measures throughout the state which protect 13,500 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Open space preserve Connecticut - State Protected Open Space, Milford city	9,263
Levee Stamford HSPP, Stamford	3,491
Tide gate Great Creek Outlet Improvements, Milford city	368
Channel • Allingtown Club Creek Containment Structure, West Haven	168
Pipe Old Greenwich Storm Drain Improvements, Old Greenwich	77



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview **Delaware**

Flood risk is increasing in the state of Delaware. 39,700 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 21%, bringing the total number of properties with substantial risk to 48,000.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 28,900 properties as having substantial risk in the state of Delaware. In comparison, the First Street Foundation Flood Model identifies 1.4 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 10,700 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 19,100 by the year 2050.

Total properties at substantial risk*

In 2020
39,700

In 2050
48,000

30-year change
▲ +8,300 (+21%)

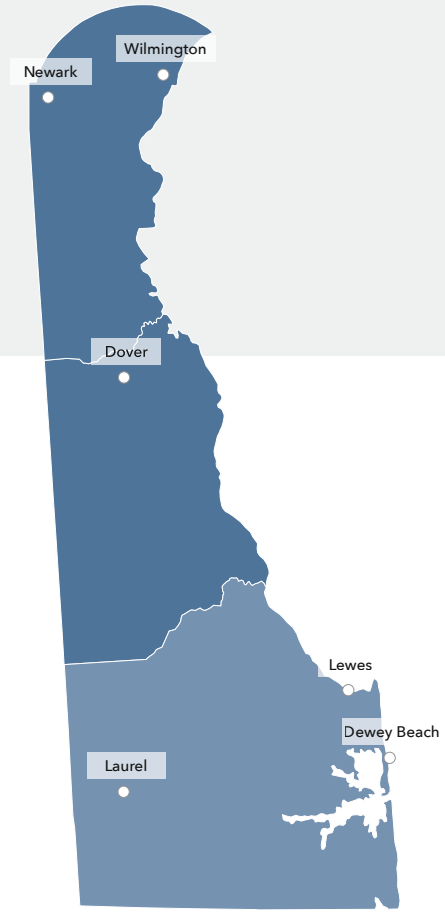
Delaware is threatened by tidal flooding from regular king tides and storm surges. Costly beach replenishment projects can reduce these effects in the short term, but long term flood protection may require a different approach. Stormwater is managed by a series of drainage ditches and stormwater channels to help divert and capture floodwaters.

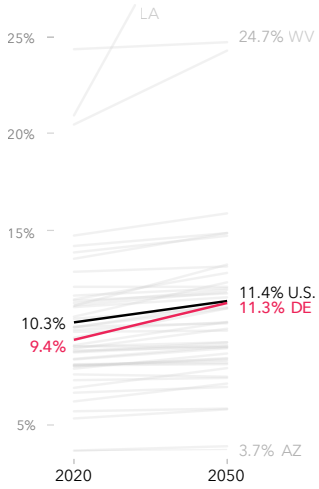
Difference in number of properties currently at substantial risk compared to FEMA**

▲ +10,700

More properties at risk in FSF model →

0 +20% +40%





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Delaware has a smaller proportion of properties at substantial risk, with 9.4% at substantial risk today and 11.3% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Delaware

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 66,900 properties in Delaware as at risk over the next 30 years. Of these properties, 14,200 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Bethany Beach has the greatest number of properties at risk of flooding in the state with 2,100 currently at risk, or 97% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 97% of properties in Bethany Beach are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Rehoboth Beach, for example, will see a 648% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Delaware at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Bethany Beach	2,135	97%	2,186	99%	+51	+2.4%
Wilmington	1,590	6%	2,099	8%	+509	+32.0%
Lewes	1,328	47%	2,252	80%	+924	+69.6%
Dover	1,046	9%	1,116	9%	+70	+6.7%
Ocean View	1,036	38%	1,698	63%	+662	+63.9%
Seaford	639	20%	660	21%	+21	+3.3%
Millsboro	564	23%	622	25%	+58	+10.3%
New Castle	522	20%	587	22%	+65	+12.5%
Milford	505	8%	721	12%	+216	+42.8%
Newark	488	7%	521	7%	+33	+6.8%

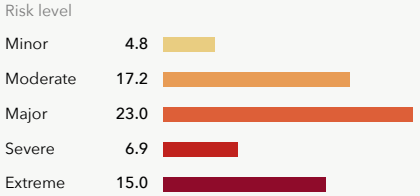
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Bethany Beach	2,135	97%	2,186	99%	+51	+2.4%
Lewes	1,328	47%	2,252	80%	+924	+69.6%
Ocean View	1,036	38%	1,698	63%	+662	+63.9%
Millsboro	564	23%	622	25%	+58	+10.3%
Seaford	639	20%	660	21%	+21	+3.3%
New Castle	522	20%	587	22%	+65	+12.5%
Georgetown	321	12%	333	12%	+12	+3.7%
Dover	1,046	9%	1,116	9%	+70	+6.7%
Milford	505	8%	721	12%	+216	+42.8%
Newark	488	7%	521	7%	+33	+6.8%

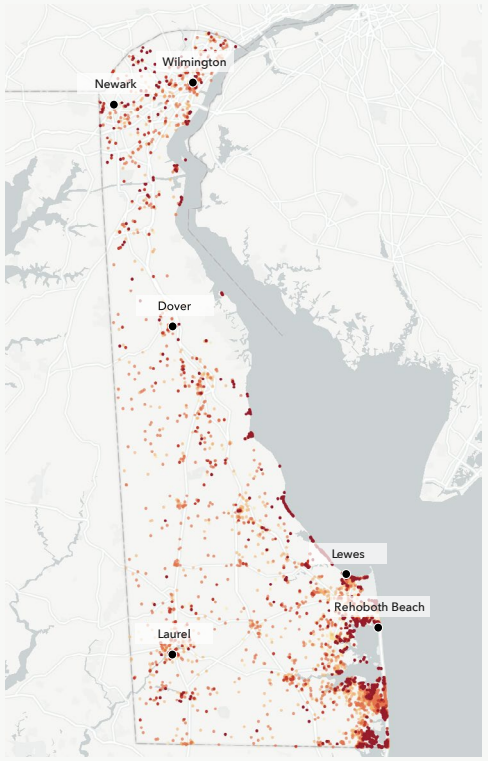
Greatest relative growing risk*

Municipality	2020		2050		Change	
Rehoboth Beach	33	2%	247	11%	+214	+649%
Lewes	1,328	47%	2,252	80%	+924	+70%
Ocean View	1,036	38%	1,698	63%	+662	+64%
Milford	505	8%	721	12%	+216	+43%
Wilmington	1,590	6%	2,099	8%	+509	+32%
Pike Creek Valley	50	2%	59	2%	+9	+18%
Pike Creek	30	1%	34	1%	+4	+13%
New Castle	522	20%	587	22%	+65	+13%
Brookside	193	4%	214	5%	+21	+11%
Millsboro	564	23%	622	25%	+58	+10%

Flood Factor distribution of properties at risk* (1000s)



More than 15.8% of individual properties and properties in Delaware are at any risk of flooding over the next 30 years. Out of those at risk 67% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Delaware

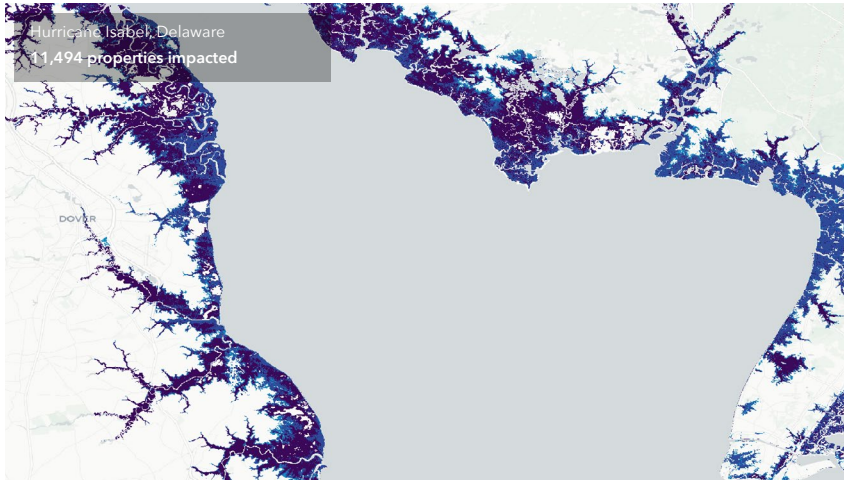
Claims History

3,300 home and property owners in Delaware have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Sussex, New Castle, Kent, NA, and NA counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 3 flooding events that have occurred since the year 2000 in the state of Delaware. These events flooded around 29,000 properties across the state.**

Flood event	Date	# Properties affected
• Hurricane Isabel	Sep 2003	11,494
Hurricane Irene	Aug 2009	9,384
Nor'easter	Nov 2009	8,125



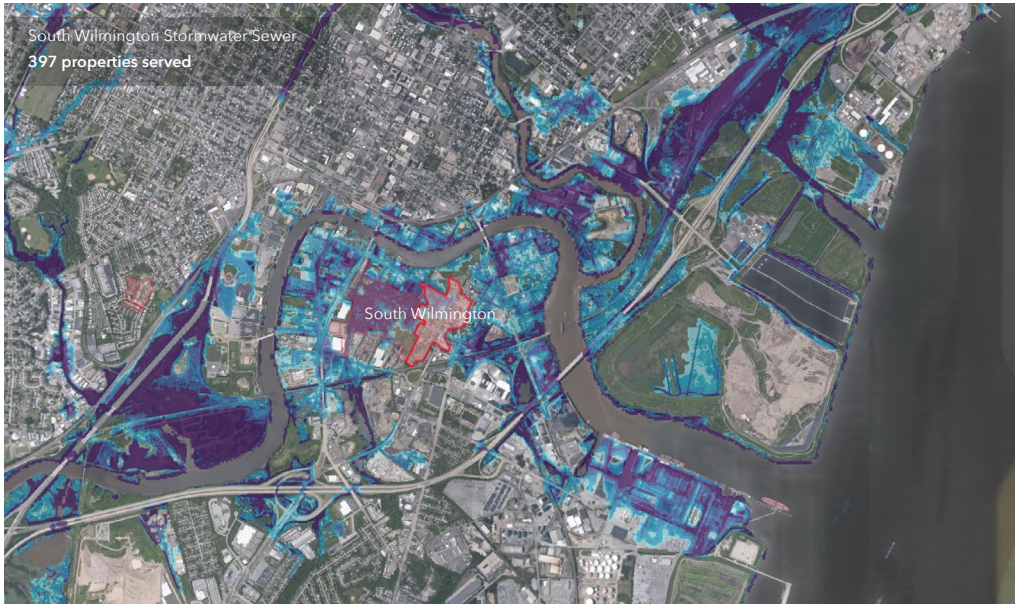
52,500

Properties served by protection measures

The First Street Foundation Flood Model incorporates 14 flood control measures throughout the state which protect 52,500 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Ditch Delaware Tax Ditch Network	51,427
Stormwater vault • South Wilmington Stormwater Sewer, Wilmington	397
Beach nourishment Fenwick Beach Renourishment, Fenwick Island	462
Levee New Castle, New Castle	217
Marsh/wetland restoration South Wilmington Wetlands Park, Wilmington	36



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Florida

Flood risk is increasing in the state of Florida. 1,833,300 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 18.6%, bringing the total number of properties with substantial risk to 2,174,400.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 1,719,400 properties as having substantial risk in the state of Florida. In comparison, the First Street Foundation Flood Model identifies 1.1 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 114,000 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 455,000 by the year 2050.

Total properties at substantial risk*

In 2020
1.8M

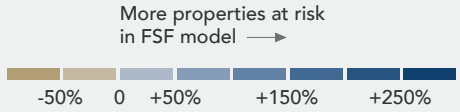
In 2050
2.2M

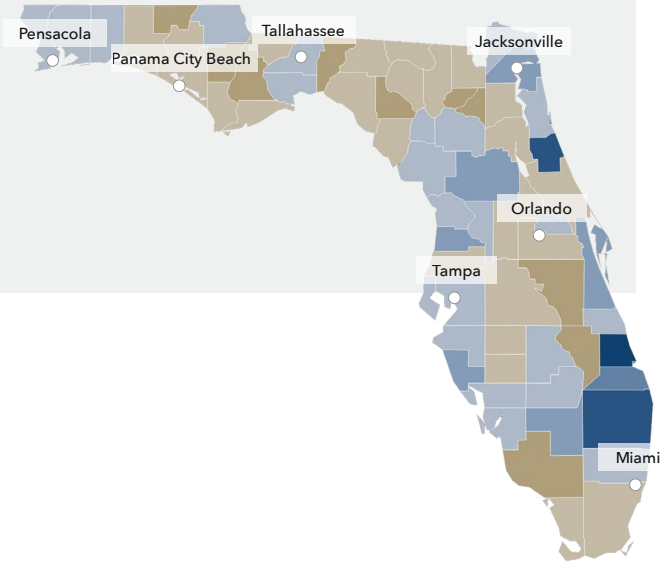
30-year change
▲ +341,000 (+19%)

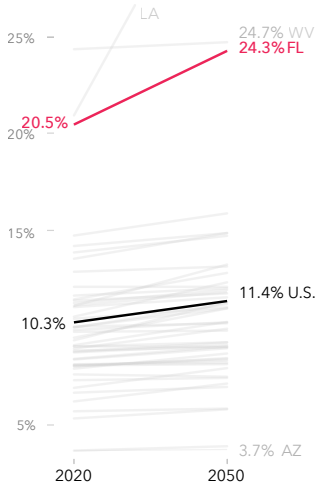
Florida's extensive coastline, low elevation, and reliance on extensive drainage systems make it vulnerable to flooding. Both king tide and storm surge events, exacerbated by sea level rise, threaten the long term stability of the state, especially in places like Miami and the Keys. During the rainy season, from May to October, inland parts of the state, like Orlando, experience heavy rain and rising lakes resulting in economic and social losses.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +114,000







Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Florida has a greater proportion of properties at substantial risk, with 20.5% at substantial risk today and 24.3% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Florida

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 3,112,400 properties in Florida as at risk over the next 30 years. Of these properties, 313,200 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Cape Coral has the greatest number of properties at risk of flooding in the state with 111,200 currently at risk, or 86% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 100% of properties in Lighthouse Point are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Golden Gate, for example, will see a 2514% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Florida at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Cape Coral	111,237	86%	126,436	97%	+15,199	+13.7%
Tampa	58,414	43%	72,178	54%	+13,764	+23.6%
Jacksonville	48,408	14%	64,113	18%	+15,705	+32.4%
Fort Lauderdale	43,762	80%	51,267	93%	+7,505	+17.1%
St. Petersburg	40,252	47%	44,867	52%	+4,615	+11.5%
Port Charlotte	38,938	87%	41,598	93%	+2,660	+6.8%
Lehigh Acres	37,289	30%	39,844	32%	+2,555	+6.9%
Miami	34,932	52%	39,628	59%	+4,696	+13.4%
Port St. Lucie	26,897	27%	32,320	33%	+5,423	+20.2%
North Port	24,083	32%	32,759	44%	+8,676	+36.0%

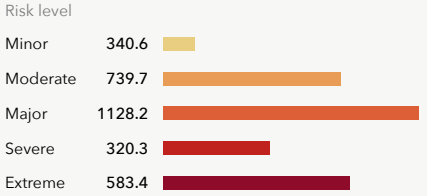
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Lighthouse Point	4,113	100%	4,122	100%	+9	+0.2%
Warm Mineral Springs	5,097	100%	5,098	100%	+1	+0.0%
Whiskey Creek	2,063	100%	2,063	100%	+0	+0.0%
South Patrick Shores	2,536	100%	2,542	100%	+6	+0.2%
Naples Park	3,188	99%	3,209	100%	+21	+0.7%
Siesta Key	2,517	99%	2,517	99%	+0	+0.0%
McGregor	2,877	99%	2,877	99%	+0	+0.0%
Wilton Manors	3,950	99%	3,983	100%	+33	+0.8%
Charlotte Park	1,992	99%	1,992	99%	+0	+0.0%
Cortez	2,504	99%	2,504	99%	+0	+0.0%

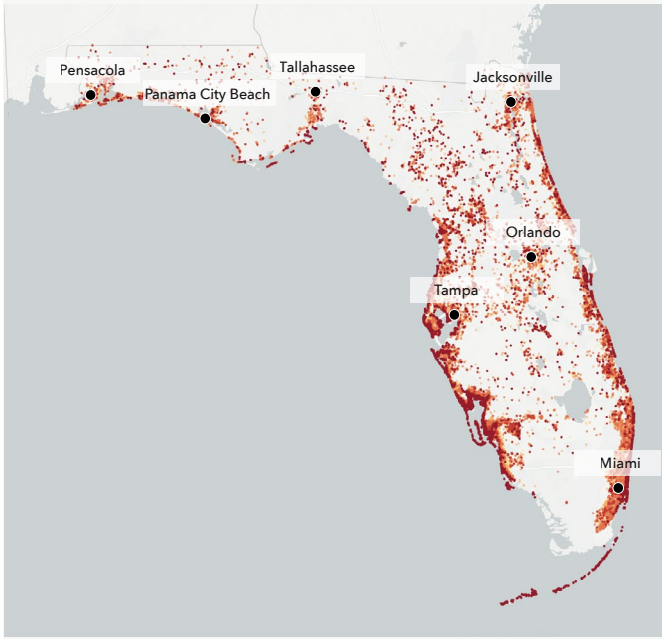
Greatest relative growing risk*

Municipality	2020		2050		Change	
Golden Gate	153	3%	4,000	76%	+3847	+2514%
Lauderdale Lakes	682	11%	4,555	76%	+3873	+568%
Ormond-by-the-Sea	1,504	34%	4,311	98%	+2,807	+187%
Holly Hill	1,676	33%	4,774	93%	+3,098	+185%
Edgewater	3,077	28%	8,360	75%	+5,283	+172%
West Perrine	676	25%	1,798	66%	+1,122	+166%
Lake Park	590	29%	1,536	76%	+946	+160%
Ocean City	653	26%	1,654	65%	+1,001	+153%
Fleming Island	1,310	11%	3,071	26%	+1,761	+134%
Crawfordville	771	35%	1,756	80%	+985	+128%

Flood Factor distribution of properties at risk* (1000s)



More than 34.8% of individual properties and properties in Florida are at any risk of flooding over the next 30 years. Out of those at risk 65% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Florida

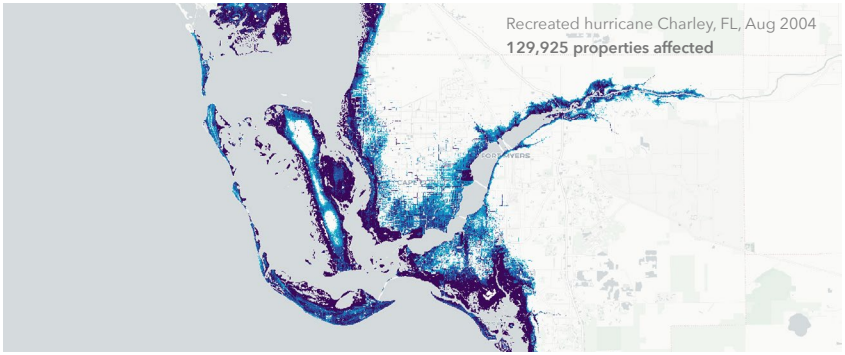
Claims History

4,850,500 home and property owners in Florida have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Miami-Dade, Broward, Palm Beach, Orange, and Polk counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 8 flooding events that have occurred since the year 2000 in the state of Florida. These events flooded around 364,420 properties across the state.**

Flood event	Date	# Properties affected
• Hurricane Charley	Aug 2004	129,925
Hurricane Jeanne	Sep 2004	34,521
Hurricane Katrina	Aug 2005	235
Hurricane Wilma	Oct 2005	66,959
Hurricane Matthew	Sep 2016	43,324
Hurricane Hermine	Aug 2016	42,946
Hurricane Irma	Sep 2017	16,156
Hurricane Michael	Oct 2018	30,352



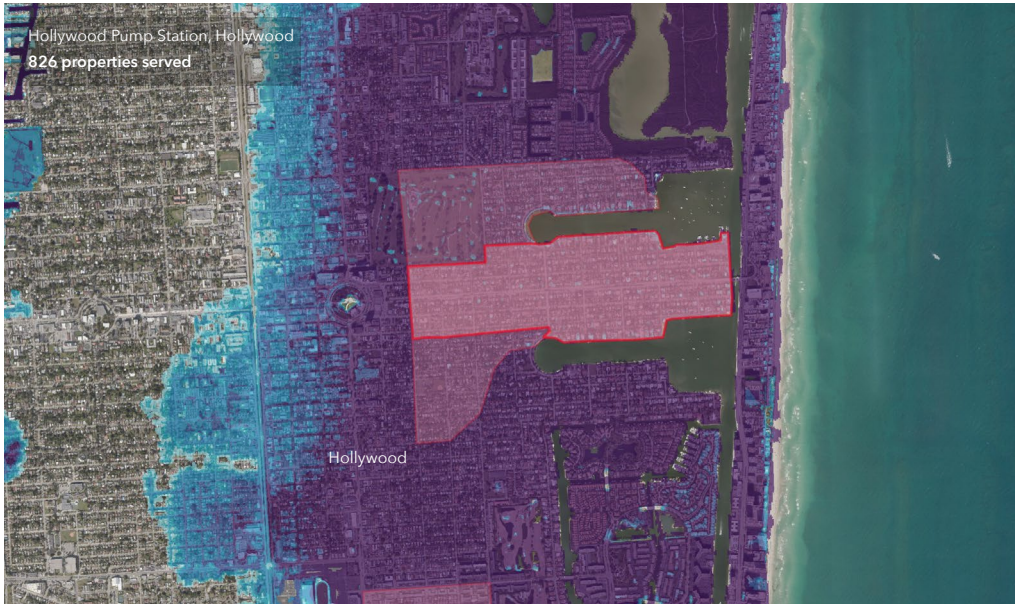
400,000

Properties served by protection measures

The First Street Foundation Flood Model incorporates 348 flood control measures throughout the state which protect 400,000 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee East Coast Protective Levees, Wellington	367,753
Pump station • Pump station, Hollywood	7,248
Beach nourishment Panama City Beach Renourishment	7,170
Sewer upgrade Hallandale Beach NE Quadrant Drainage Improvements	4,061
Retention pond Shore Acres, St. Petersburg	4,007



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Georgia

Flood risk is increasing in the state of Georgia. 347,700 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 9.9%, bringing the total number of properties with substantial risk to 382,100.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 157,100 properties as having substantial risk in the state of Georgia. In comparison, the First Street Foundation Flood Model identifies 2.2 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 190,600 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 225,000 by the year 2050.

Total properties at substantial risk*

In 2020
347,700

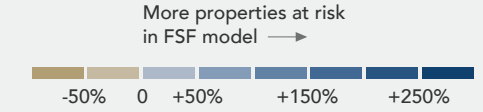
In 2050
382,100

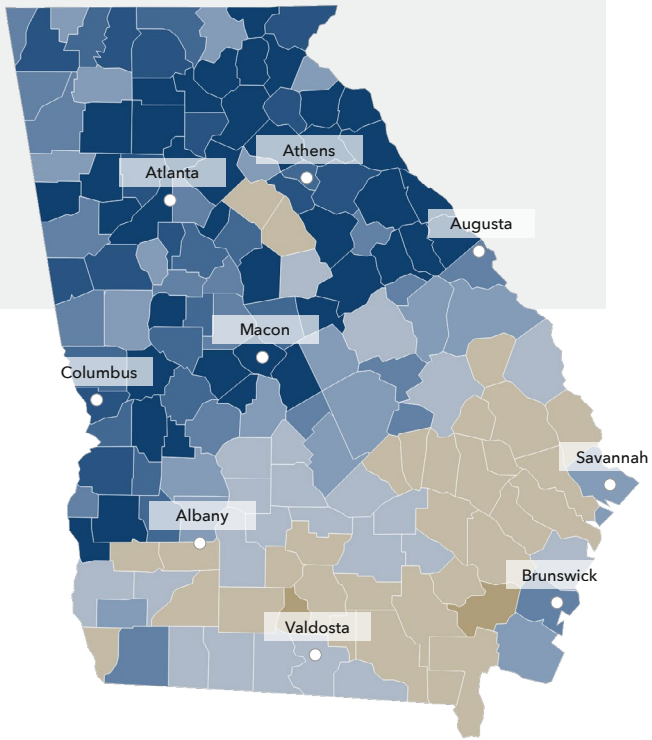
30-year change
▲ +34,400 (+10%)

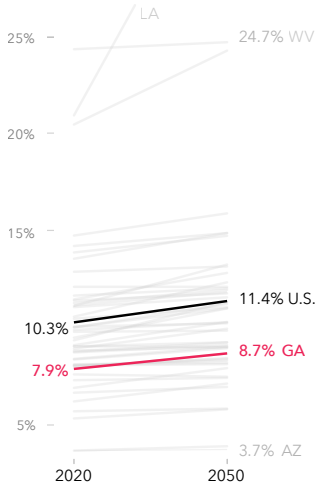
Difference in number of properties currently at substantial risk compared to FEMA**

▲ +190,600

Coastal communities see hurricanes, tropical storms, and heavy rains. Flooding around Atlanta occurs in winter and spring when storms blanket the area with rain. Floods also occur during the summer when thunderstorms bring intense rains. In 2009, moisture pulled from the Gulf of Mexico and the Atlantic Ocean caused rains that fell faster than local watersheds could handle, dropping an estimated 10-20 inches of rain in under 24 hours.







Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Georgia has a smaller proportion of properties at substantial risk, with 7.9% at substantial risk today and 8.7% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Georgia

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 487,400 properties in Georgia as at risk over the next 30 years. Of these properties, 70,500 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Atlanta has the greatest number of properties at risk of flooding in the state with 14,200 currently at risk, or 11% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 100% of properties in Brunswick are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Adel, for example, will see a 83% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Georgia at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Atlanta	14,227	11%	14,887	11%	+660	+4.6%
Savannah	13,488	24%	17,055	31%	+3,567	+26.4%
Augusta-Richmond	9,494	12%	9,967	13%	+473	+5.0%
Columbus	8,851	13%	9,558	14%	+707	+8.0%
St. Simons	8,442	96%	8,623	98%	+181	+2.1%
Brunswick	6,815	100%	6,815	100%	0	0.0%
St. Marys	6,797	73%	7,242	78%	+445	+6.5%
Wilmington Island	6,269	98%	6,274	98%	+5	+0.1%
Albany	5,961	21%	6,835	24%	+874	+14.7%
Macon-Bibb	5,932	9%	6,168	9%	+236	+4.0%

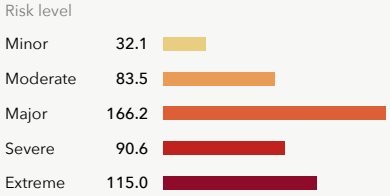
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Brunswick	6,815	100%	6,815	100%	0	0.0%
Skidaway Island	4,698	99%	4,698	99%	0	0.0%
Wilmington Island	6,269	98%	6,274	98%	+5	+0.1%
Whitemarsh Island	3,026	98%	3,033	98%	+7	+0.2%
St. Simons	8,442	96%	8,623	98%	+181	+2.1%
Tybee Island	3,661	95%	3,661	95%	0	0.0%
Country Club Estates	2,414	90%	2,631	98%	+217	+9.0%
Dock Junction	2,748	73%	3,482	93%	+734	+26.7%
St. Marys	6,797	73%	7,242	78%	+445	+6.5%
Georgetown	1,759	44%	2,304	58%	+545	+31.0%

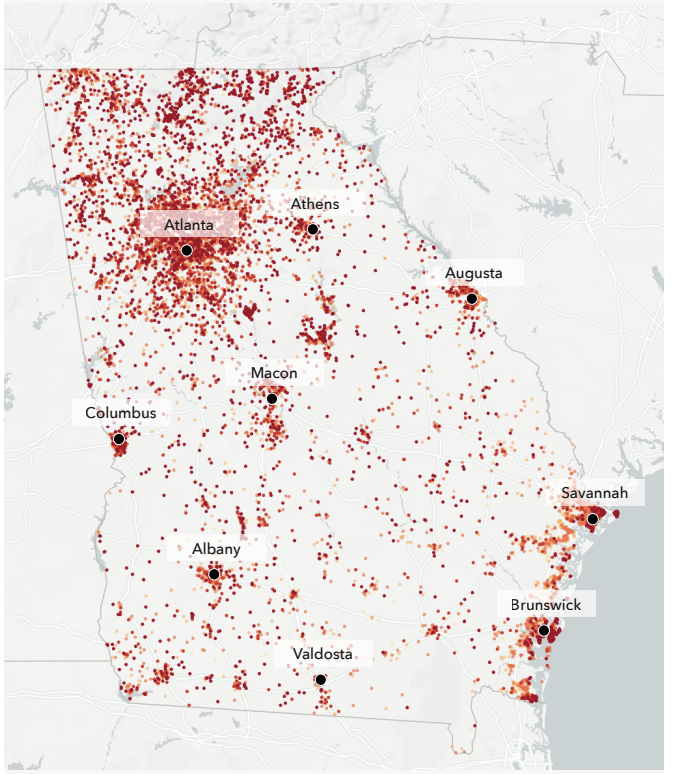
Greatest relative growing risk*

Municipality	2020		2050		Change	
Adel	80	3%	146	5%	+66	+83%
Lovejoy	28	1%	48	2%	+20	+71%
Richmond Hill	791	14%	1,179	21%	+388	+49%
Georgetown	1,759	44%	2,304	58%	+545	+31%
Rincon	103	3%	132	3%	+29	+28%
Dock Junction	2,748	73%	3,482	93%	+734	+27%
Savannah	13,488	24%	17,055	31%	+3,567	+26%
Hinesville	1,133	10%	1,411	12%	+278	+25%
Garden City	572	16%	698	20%	+126	+22%
Elberton	78	3%	95	4%	+17	+22%

Flood Factor distribution of properties at risk* (1000s)



More than 11.1% of individual properties and properties in Georgia are at any risk of flooding over the next 30 years. Out of those at risk 76% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Georgia

Claims History

277,700 home and property owners in Georgia have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Chatham, Dougherty, Glynn, Cobb, and Lee counties.

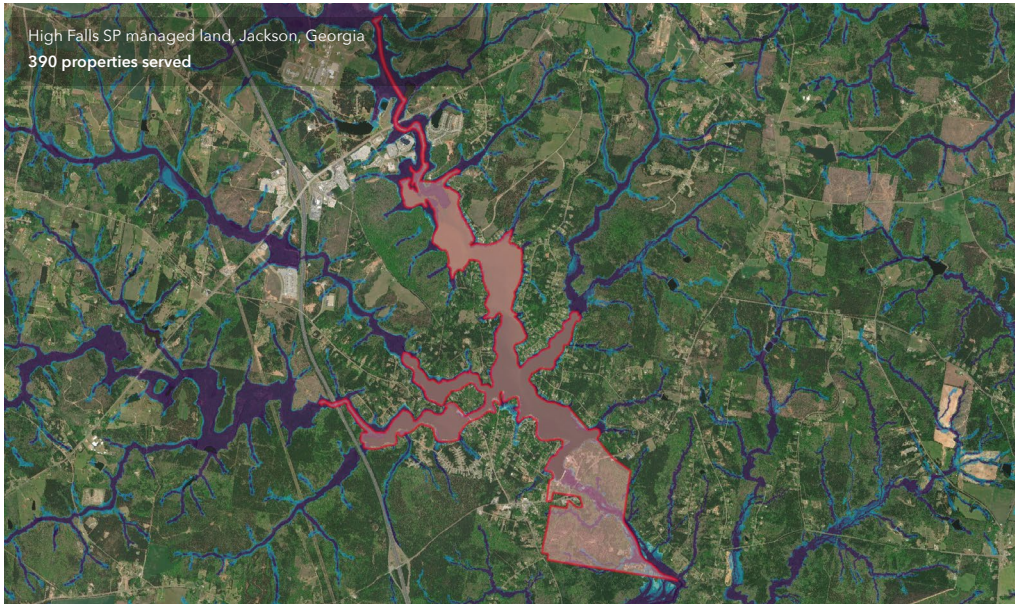
47,500

Properties served by protection measures

The First Street Foundation Flood Model incorporates 4,079 flood control measures throughout the state which protect 47,500 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Open space preserve • High Falls SP managed land, Jackson	38,303
Levee Augusta Levee Area of Protection	7,735
Beach nourishment Tybee Island Beach Renourishment	1,035
Marsh/wetland restoration Dunham Marsh, Richmond Hil	306
Sewer upgrade Tybee Island stormwater retrofits and backflow preventor	181



* Source: Fema.gov

State Overview
Idaho

Flood risk is increasing in the state of Idaho. 148,400 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 7.7%, bringing the total number of properties with substantial risk to 159,900.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 38,000 properties as having substantial risk in the state of Idaho. In comparison, the First Street Foundation Flood Model identifies 3.9 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 110,400 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 121,900 by the year 2050.

Total properties at substantial risk*

In 2020
148,400

In 2050
159,900

30-year change
▲ +11,500 (+8%)

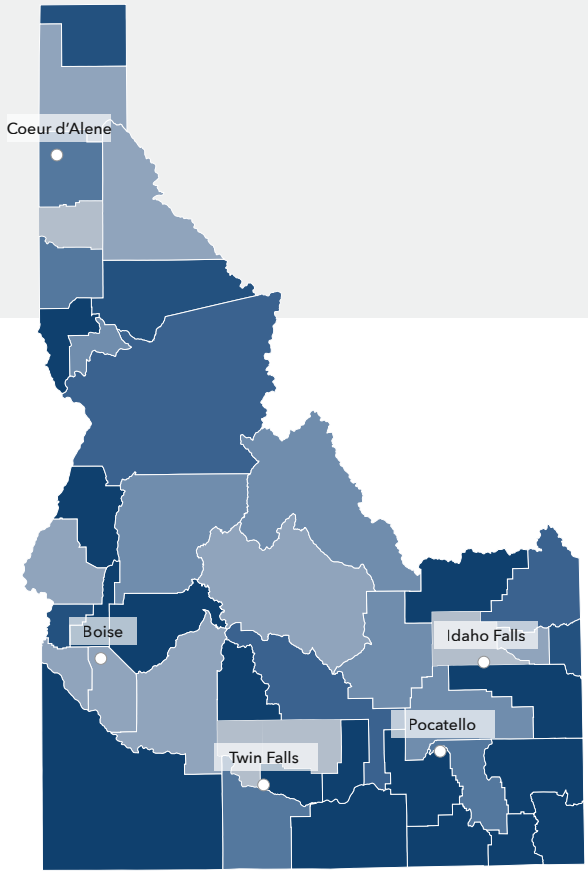
Difference in number of properties currently at substantial risk compared to FEMA**

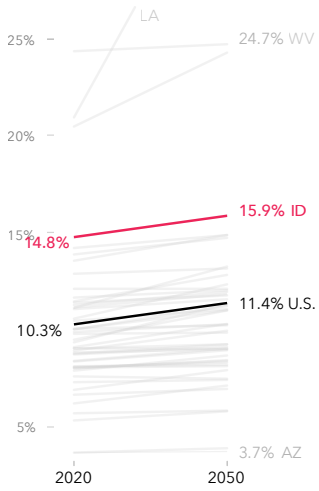
▲ +110,400

More properties at risk in FSF model →

0 +200% +400% +600%

Snowmelt, heavy rainfall, and summer flash floods pose seasonal risks to Idaho communities. Rapidly melting snowpack and heavy rains caused disastrous flooding on the Snake River in 1997, prompting Presidential and FEMA Disaster Declarations for the counties of Bingham, Bonneville, Buttle, Custer, Fremont, Jefferson, and Madison. These communities rely on levees, flood control dams and reservoirs to defend against severe flooding.





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Idaho has a greater proportion of properties at substantial risk, with 14.8% at substantial risk today and 15.9% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Idaho

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 243,800 properties in Idaho as at risk over the next 30 years. Of these properties, 34,000 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Boise City has the greatest number of properties at risk of flooding in the state with 15,500 currently at risk, or 19% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 81% of properties in Blackfoot are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Fruitland, for example, will see a 34% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Idaho at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Boise City	15,529	19%	17,179	21%	+1,650	+10.6%
Meridian	7,314	17%	7,965	18%	+651	+8.9%
Pocatello	5,647	26%	6,000	28%	+353	+6.3%
Idaho Falls	5,568	23%	6,110	25%	+542	+9.7%
Caldwell	5,172	28%	5,336	28%	+164	+3.2%
Nampa	5,056	16%	5,359	17%	+303	+6.0%
Eagle	5,054	38%	5,372	40%	+318	+6.3%
Blackfoot	3,881	81%	3,965	83%	+84	+2.2%
Garden City	3,202	60%	3,331	62%	+129	+4.0%
Ammon	3,105	54%	3,300	57%	+195	+6.3%

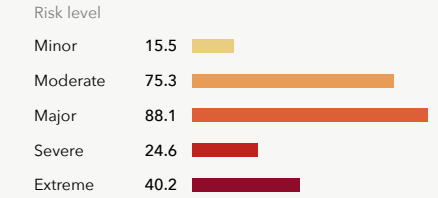
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Blackfoot	3,881	81%	3,965	83%	+84	+2.2%
Emmett	2,176	76%	2,200	77%	+24	+1.1%
Garden City	3,202	60%	3,331	62%	+129	+4.0%
Payette	1,845	58%	1,882	60%	+37	+2.0%
Ammon	3,105	54%	3,300	57%	+195	+6.3%
Star	2,546	50%	2,934	58%	+388	+15.2%
Middleton	1,512	44%	1,570	45%	+58	+3.8%
Hailey	1,808	42%	1,972	46%	+164	+9.1%
Eagle	5,054	38%	5,372	40%	+318	+6.3%
Salmon	767	37%	801	39%	+34	+4.4%

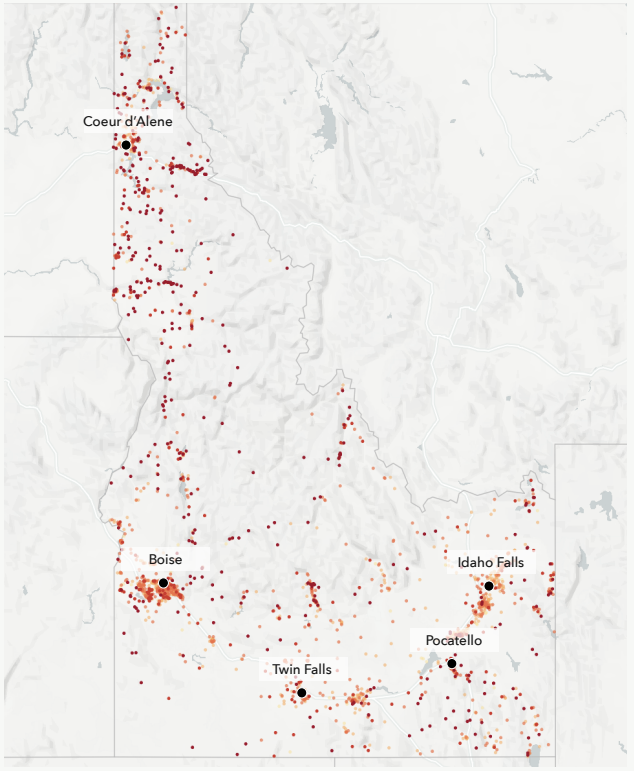
Greatest relative growing risk*

Municipality	2020		2050		Change	
Fruitland	77	4%	103	5%	+26	+34%
Mountain Home	1,338	23%	1,624	27%	+286	+21%
Star	2,546	50%	2,934	58%	+388	+15%
Sandpoint	403	11%	464	12%	+61	+15%
Rupert	422	17%	470	19%	+48	+11%
Boise City	15,529	19%	17,179	21%	+1,650	+11%
Chubbuck	860	16%	950	17%	+90	+11%
Twin Falls	1,325	6%	1,461	7%	+136	+10%
Idaho Falls	5,568	23%	6,110	25%	+542	+10%
Hailey	1,808	42%	1,972	46%	+164	+9%

Flood Factor distribution of properties at risk* (1000s)



More than 24.3% of individual properties and properties in Idaho are at any risk of flooding over the next 30 years. Out of those at risk 63% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Idaho

Claims History

700 home and property owners in Idaho have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Blaine, Ada, Kootenai, Shoshone, and Gem counties.

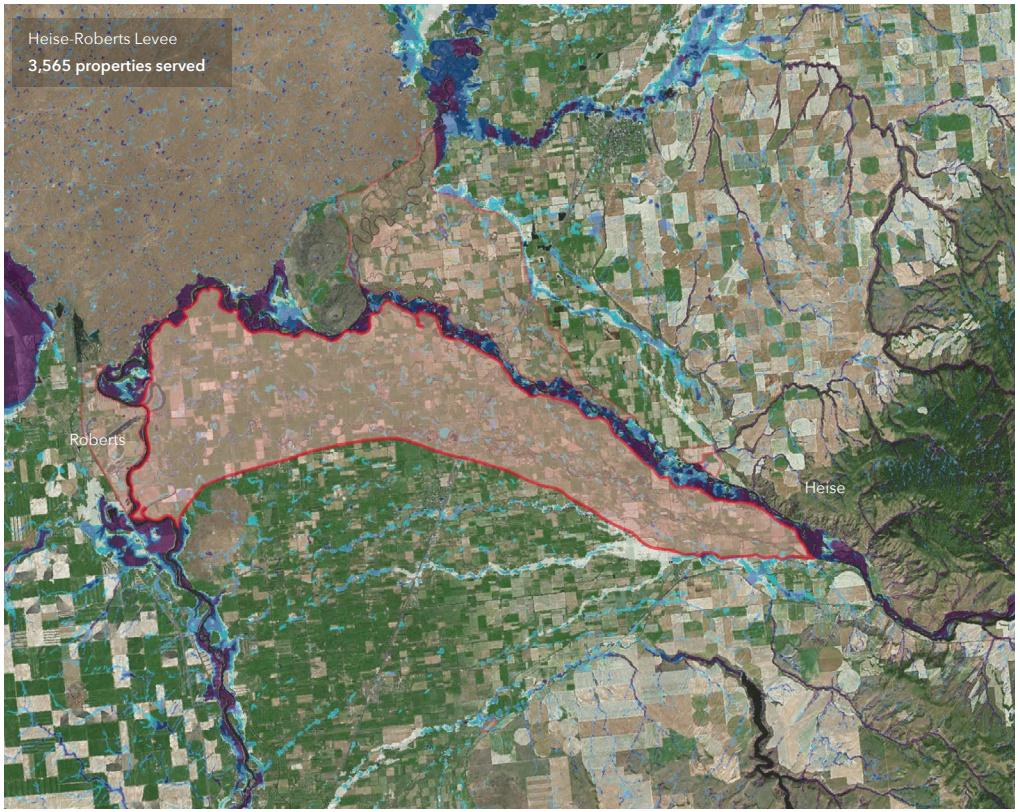
18,600

Properties served by protection measures

The First Street Foundation Flood Model incorporates 149 flood control measures throughout the state which protect 18,600 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee Heise-Roberts Levee, Jefferson	18,646



* Source: Fema.gov

State Overview
Illinois

Flood risk is increasing in the state of Illinois. 451,700 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 4.4%, bringing the total number of properties with substantial risk to 471,800.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 205,700 properties as having substantial risk in the state of Illinois. In comparison, the First Street Foundation Flood Model identifies 2.2 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 246,000 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 266,100 by the year 2050.

Total properties at substantial risk*

In 2020
451,700

In 2050
471,800

30-year change
▲ +20,100 (+4%)

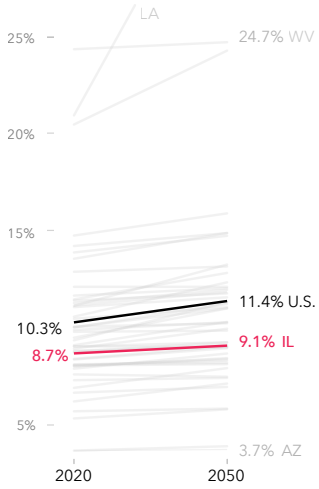
Difference in number of properties currently at substantial risk compared to FEMA**

▲ +246,000

More properties at risk in FSF model →

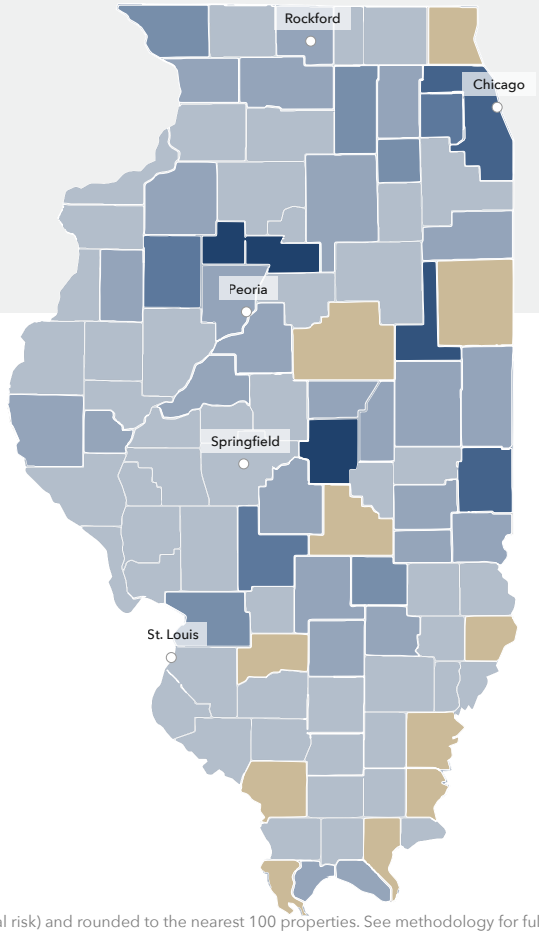
-50% 0 +200% +400% +600%

Frontal storms, snowmelt, runoff, and ice jams produce severe floods along major rivers, which are exacerbated in areas like Chicago. Urbanization in upland areas increases the rate and volume of stormwater runoff. Floodplain development increases the frequency of flooding by raising flood stages along critical waterways. The Tunnel and Reservoir Plan aims to reduce flooding in Chicago; completion is anticipated in 2029.



Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Illinois has a smaller proportion of properties at substantial risk, with 8.7% at substantial risk today and 9.1% at substantial risk in 2050.



* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Illinois

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 748,100 properties in Illinois as at risk over the next 30 years. Of these properties, 89,700 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Chicago has the greatest number of properties at risk of flooding in the state with 154,800 currently at risk, or 26% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 90% of properties in Stickney are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Morton Grove, for example, will see a 29% increase in the number of properties at risk..

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Illinois at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Chicago	154,824	26%	160,068	27%	+5,244	+3.4%
Joliet	7,438	15%	7,499	15%	+61	+0.8%
Calumet City	6,562	45%	6,647	46%	+85	+1.3%
Harvey	6,357	44%	6,401	44%	+44	+0.7%
Rockford	5,742	10%	5,953	11%	+211	+3.7%
East St. Louis	5,668	25%	5,979	26%	+311	+5.5%
Aurora	4,775	10%	4,897	10%	+122	+2.6%
Cicero	4,654	27%	5,554	33%	+900	+19.3%
Evanston	4,507	28%	4,593	28%	+86	+1.9%
Naperville	3,994	9%	4,148	10%	+154	+3.9%

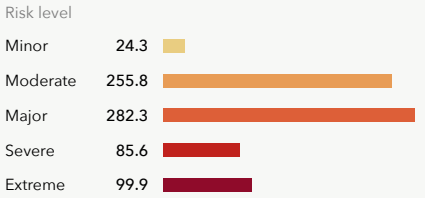
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Stickney	2,069	91%	2,138	94%	+69	+3.3%
Burnham	1,320	66%	1,320	66%	+0	+0.0%
Beardstown	1,627	60%	1,676	62%	+49	+3.0%
Palos Hills	2,522	54%	2,531	54%	+9	+0.4%
Midlothian	2,789	51%	2,814	51%	+25	+0.9%
Tuscola	1,111	51%	1,123	51%	+12	+1.1%
Milan	1,107	45%	1,109	45%	+2	+0.2%
Calumet City	6,562	45%	6,647	46%	+85	+1.3%
Harvey	6,357	44%	6,401	44%	+44	+0.7%
Rock Falls	1,809	44%	1,822	44%	+13	+0.7%

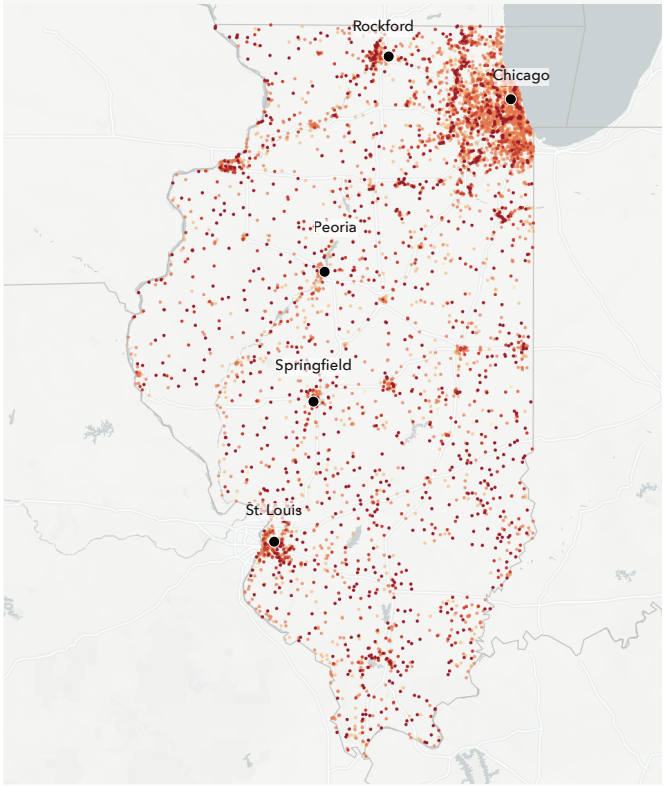
Greatest relative growing risk*

Municipality	2020		2050		Change	
Morton Grove	264	3%	340	4%	+76	+29%
Paxton	26	1%	33	2%	+7	+27%
Franklin Park	617	8%	741	10%	+124	+20%
Forest Park	171	5%	205	6%	+34	+20%
Cicero	4,654	27%	5,554	33%	+900	+19%
Dixmoor	265	13%	316	15%	+51	+19%
Crestwood	627	20%	741	24%	+114	+18%
Pana	83	3%	96	4%	+13	+16%
Bridgeview	199	4%	228	5%	+29	+15%
Maywood	393	5%	450	6%	+57	+15%

Flood Factor distribution of properties at risk* (1000s)



More than 14.5% of individual properties and properties in Illinois are at any risk of flooding over the next 30 years. Out of those at risk 63% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Illinois

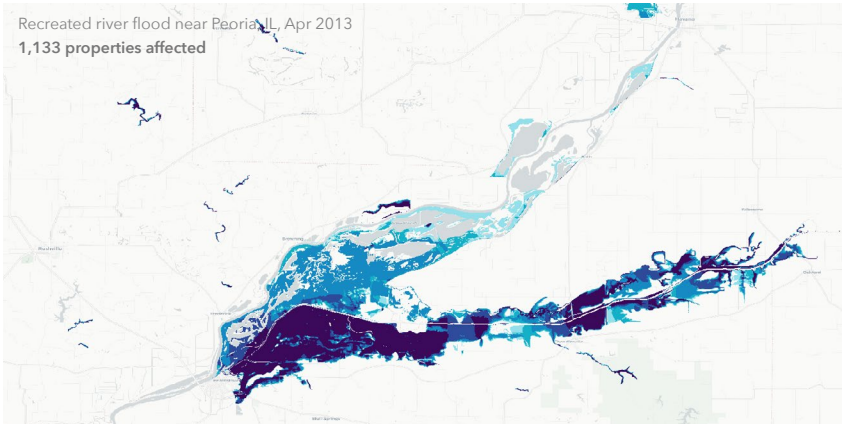
Claims History

378,800 home and property owners in Illinois have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Cook, Will, DuPage, Lake, and Peoria counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 4 flooding events that have occurred since the year 2000 in the state of Illinois. These events flooded around 3,770 properties across the state.**

Flood event	Date	# Properties affected
River flood in Northern IL	Apr 2001	229
River flood across Western IL	Jun 2008	2,330
• River flood near Peoria, IL	Apr 2013	1,133
River flood in Southwest IL	Dec 2015	81



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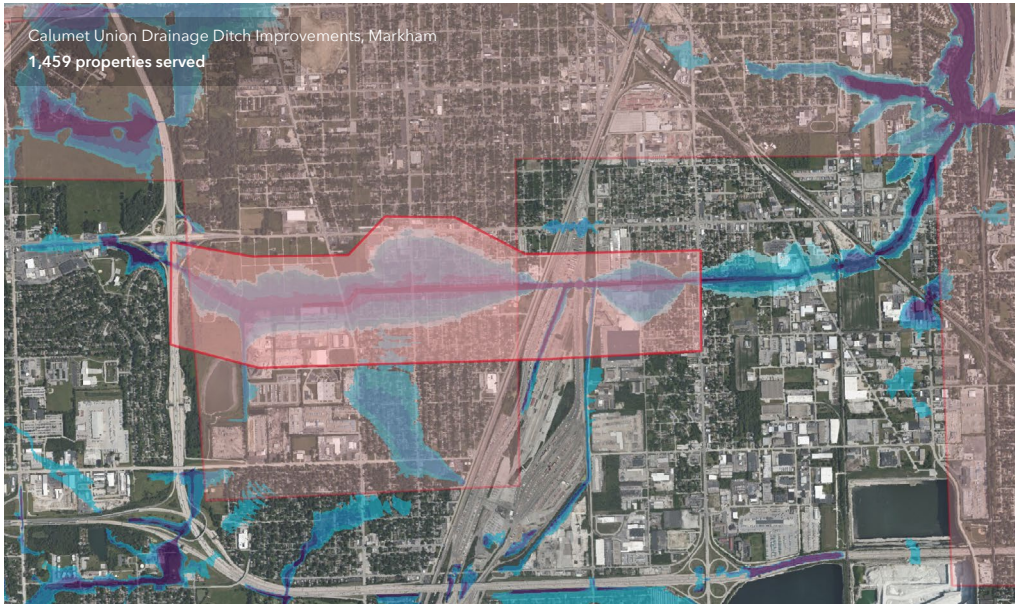
Properties served by protection measures

The First Street Foundation Flood Model incorporates 538 flood control measures throughout the state which protect 1,110,600 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Stormwater vault Tunnel and Reservoir Plan, Chicago	966,204
Levee Reservoir, East St. Louis	145,711
Ditch Metro East/ Chain of Rocks, Markham	2,552
Dam • Calumet Union Drainage Ditch Improvements, Markham	3,698



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Indiana

Flood risk is increasing in the state of Indiana. 282,500 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 4.4%, bringing the total number of properties with substantial risk to 295,000.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 169,000 properties as having substantial risk in the state of Indiana. In comparison, the First Street Foundation Flood Model identifies 1.7 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 113,600 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 126,000 by the year 2050.

Total properties at substantial risk*

In 2020
282,500

In 2050
295,000

30-year change
▲ +12,500 (+4%)

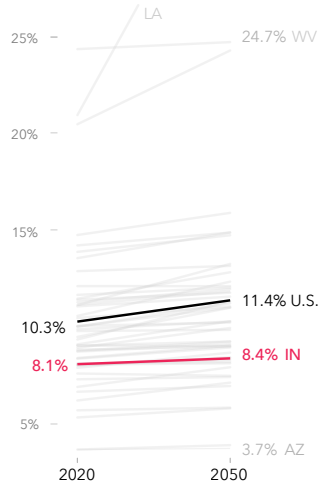
Difference in number of properties currently at substantial risk compared to FEMA**

▲ +113,600

More properties at risk in FSF model →

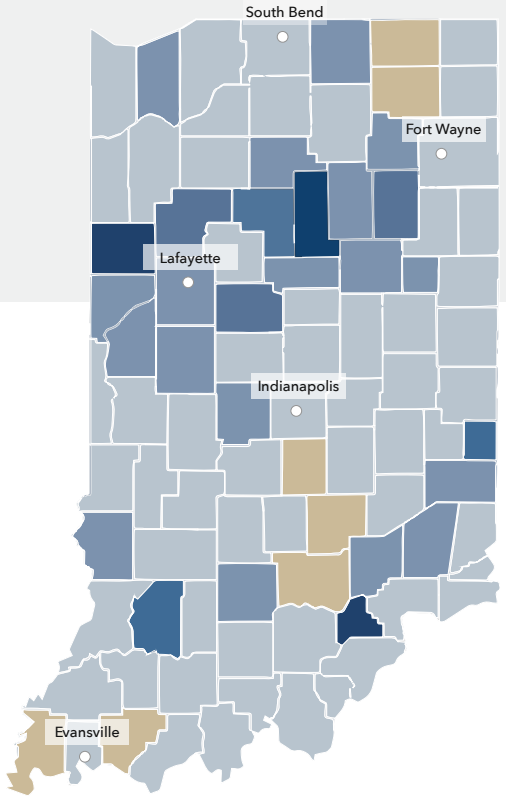
-50% 0 +200% +400%

Indianapolis, in the White River basin, sees flooding from snowmelt, rainfall, flash floods, and intense storms. Wide, flat floodplains and heavy development within the basin exacerbate risk. Protection efforts include levees, floodwalls, and retention basins. Fort Wayne faces heavy rain and snowmelt that overrun the St. Joseph, St. Marys and Maumee rivers. Structural and non-structural flood protections seek to limit risks.



Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Indiana has a smaller proportion of properties at substantial risk, with 8.1% at substantial risk today and 8.4% at substantial risk in 2050.



* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Indiana

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 440,800 properties in Indiana as at risk over the next 30 years. Of these properties, 73,100 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Indianapolis has the greatest number of properties at risk of flooding in the state with 34,100 currently at risk, or 11% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 81% of properties in Peru are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Brownsburg, for example, will see a 15% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Indiana at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Indianapolis	34,124	11%	34,808	11%	+684	+2.0%
Fort Wayne	11,210	11%	11,413	12%	+203	+1.8%
Hammond	10,339	35%	10,742	36%	+403	+3.9%
Gary	9,568	17%	10,037	18%	+469	+4.9%
South Bend	7,654	16%	7,847	17%	+193	+2.5%
Terre Haute	6,053	21%	6,292	22%	+239	+3.9%
Evansville	5,868	12%	6,389	13%	+521	+8.9%
Peru	4,859	81%	4,864	81%	+5	+0.1%
Mishawaka	4,712	27%	4,825	28%	+113	+2.4%
Logansport	4,505	51%	4,526	52%	+21	+0.5%

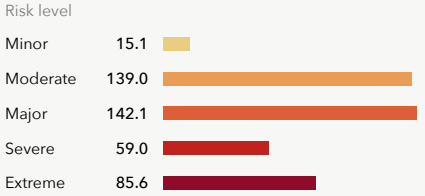
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Peru	4,859	81%	4,864	81%	+5	+0.1%
Logansport	4,505	51%	4,526	52%	+21	+0.5%
East Chicago	4,479	48%	4,663	50%	+184	+4.1%
Aurora	892	40%	906	41%	+14	+1.6%
Dyer	2,635	38%	2,659	39%	+24	+0.9%
Munster	3,581	37%	3,632	37%	+51	+1.4%
Tipton	1,140	36%	1,154	36%	+14	+1.2%
Portland	1,206	35%	1,213	36%	+7	+0.6%
Hammond	10,339	35%	10,742	36%	+403	+3.9%
Highland	3,240	32%	3,329	32%	+89	+2.7%

Greatest relative growing risk*

Municipality	2020		2050		Change	
Brownsburg	432	4%	496	5%	+64	+15%
Nappanee	195	7%	223	8%	+28	+14%
Lawrenceburg	270	12%	302	13%	+32	+12%
Mount Vernon	118	4%	130	4%	+12	+10%
Gas City	134	5%	147	5%	+13	+10%
Hidden Valley	129	4%	141	4%	+12	+9%
Vincennes	1,996	23%	2,181	25%	+185	+9%
Evansville	5,868	12%	6,389	13%	+521	+9%
Granger	774	7%	840	7%	+66	+9%
Simonton Lake	155	7%	168	7%	+13	+8%

Flood Factor distribution of properties at risk* (1000s)



More than 12.6% of individual properties and properties in Indiana are at any risk of flooding over the next 30 years. Out of those at risk 65% are at major to extreme risk.

* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

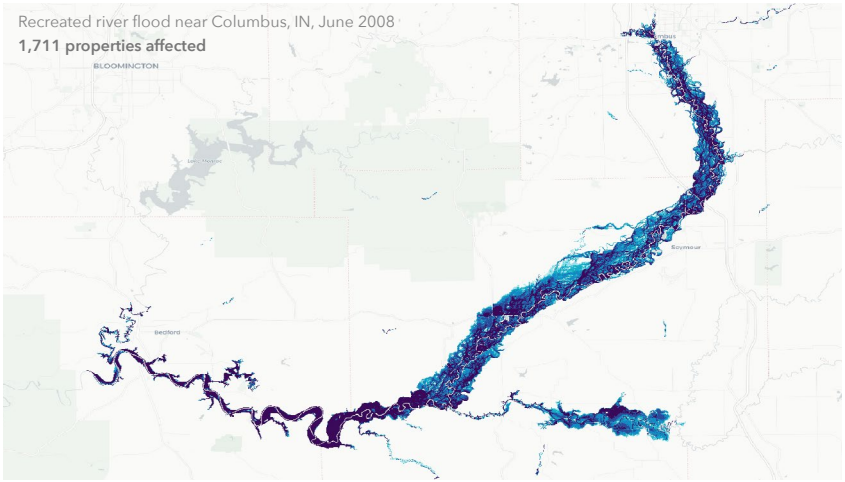
Flood History & Protection
Indiana

Claims History

158,300 home and property owners in Indiana have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Lake, Delaware, Marion, Clark, and Porter counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 1 flooding event that occurred since the year 2000 in the state of Indiana. This event flooded around 1,700 properties across the state.**



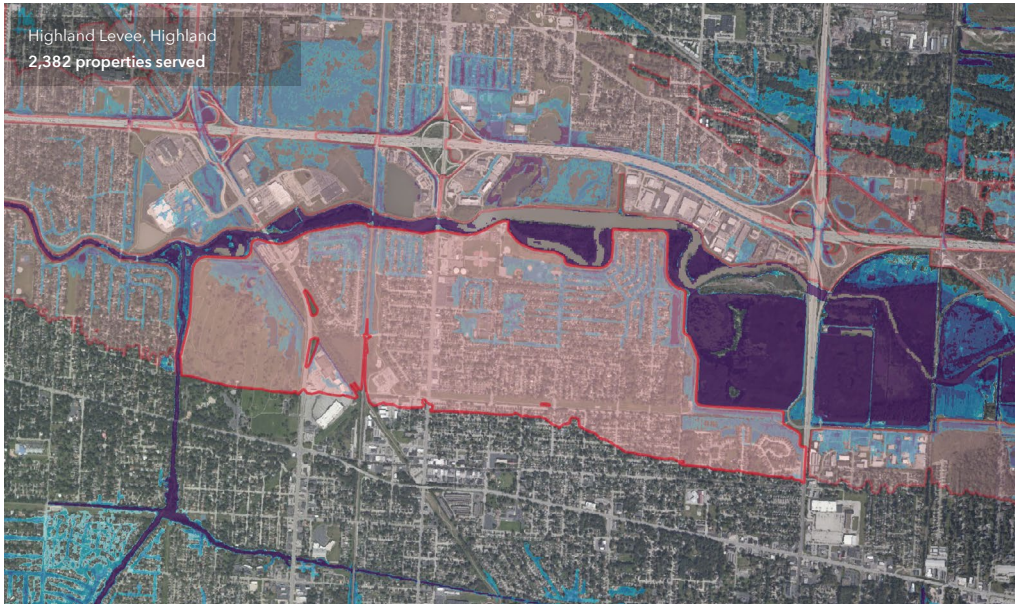
104,900

Properties served by protection measures

The First Street Foundation Flood Model incorporates 128 flood control measures throughout the state which protect 104,900 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee • Highland Levee, Highland	104,862
Earthen berm Fernwood Avenue Flood Mitigation, Fort Wayne	62
Acquisition Fernwood Avenue Flodo Mitigation - Acquisition, Fort Wayne	10
Dam Eagle Creek Dam, Indianapolis	5
Detention basin Pogue's Run Flood Control Project, Indianapolis city	3



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Iowa

Flood risk is increasing in some areas in the state of Iowa while decreasing in others. Over the next 30 years approximately 294,000 properties have a substantial risk* of flooding.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 152,700 properties as having substantial risk in the state of Iowa. In comparison, the First Street Foundation Flood Model identifies 1.9 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 141,300 properties currently not identified by FEMA as having substantial risk.

Total properties at substantial risk*

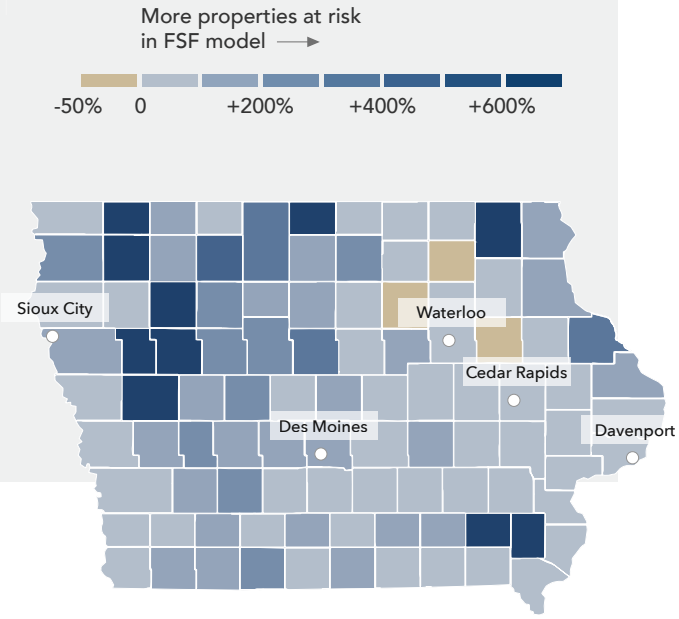
In 2020
294,000

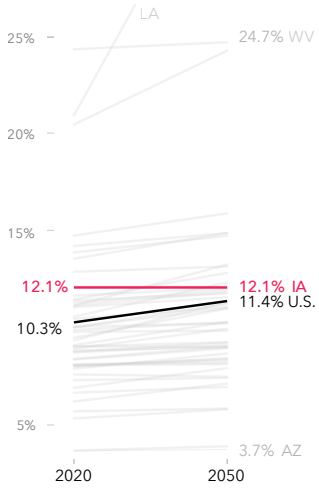
In 2050
294,000

Iowa is among the most impacted states from inland flooding. Several large rivers, including the Racoon, Des Moines, and Mississippi rivers regularly overflow, causing heavy floods in cities across the state. Many cities in Iowa have pioneered flood adaptation methods, which reduce the frequency and severity of flooding.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +141,300





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Iowa has a greater proportion of properties at substantial risk, with 12.1% at substantial risk today and 12.1% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Iowa

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 391,100 properties in Iowa as at risk over the next 30 years. Of these properties, 101,000 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Council Bluffs has the greatest number of properties at risk of flooding in the state with 11,000 currently at risk, or 37% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 62% of properties in Evansdale are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Shenandoah, for example, will see a 5% increase in the number of properties at risk.
Click here for a full breakdown of counties, cities, zip codes, neighborhoods, and congressional districts in Iowa at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Iowa at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Council Bluffs	10,989	13%	11,020	37%	+31	+0.3%
Des Moines	9,328	6%	9,236	11%	-92	-1.0%
Waterloo	9,245	7%	9,295	30%	+50	+0.5%
Sioux City	6,108	10%	6,025	19%	-83	-1.4%
Cedar Rapids	5,899	12%	5,969	13%	+70	+1.2%
Dubuque	5,012	52%	5,047	22%	+35	+0.7%
Clinton	4,918	7%	4,937	39%	+19	+0.4%
Davenport	4,327	13%	4,322	11%	-5	-0.1%
Ottumwa	3,876	30%	3,904	24%	+28	+0.7%
Mason City	2,343	51%	2,343	17%	+0	+0.0%

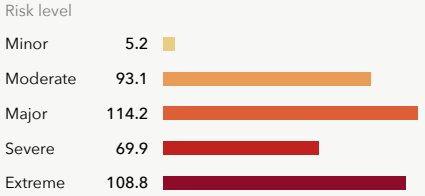
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Evansdale	1,550	62%	1,581	63%	+31	+2.0%
Clinton	4,918	39%	4,937	39%	+19	+0.4%
Decorah	1,267	37%	1,270	37%	+3	+0.2%
Council Bluffs	10,989	37%	11,020	37%	+31	+0.3%
Red Oak	1,006	31%	1,008	31%	+2	+0.2%
Camanche	675	31%	689	32%	+14	+2.1%
Waterloo	9,245	30%	9,295	30%	+50	+0.5%
Waverly	1,183	28%	1,194	28%	+11	+0.9%
Humboldt	808	24%	812	25%	+4	+0.5%
Ottumwa	3,876	24%	3,904	24%	+28	+0.7%

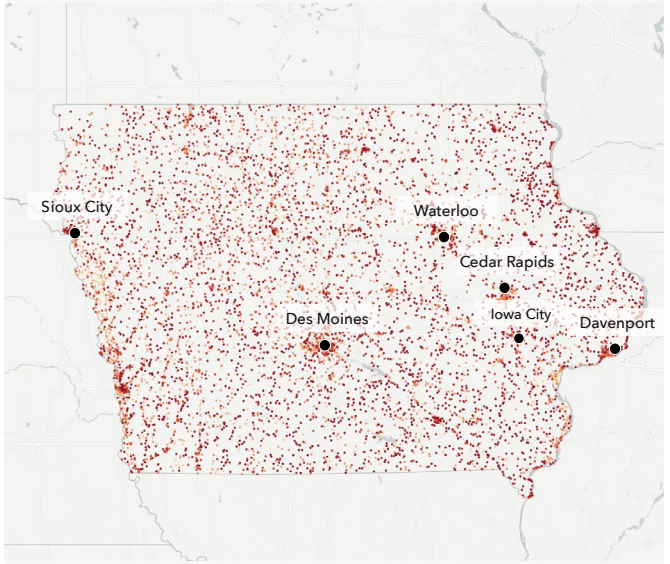
Greatest relative growing risk*

Municipality	2020		2050		Change	
Shenandoah	403	15%	422	15%	+19	+5%
Washington	163	5%	170	5%	+7	+4%
Manchester	643	23%	669	24%	+26	+4%
Fort Madison	768	14%	794	15%	+26	+3%
Dyersville	469	20%	482	20%	+13	+3%
Oelwein	301	9%	308	9%	+7	+2%
Camanche	675	31%	689	32%	+14	+2%
Evansdale	1,550	62%	1,581	63%	+31	+2%
Muscatine	1,856	20%	1,887	20%	+31	+2%
North Liberty	205	4%	208	4%	+3	+2%

Flood Factor distribution of properties at risk* (1000s)



More than 16.1% of individual properties and properties in Iowa are at any risk of flooding over the next 30 years. Out of those at risk 75% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Iowa

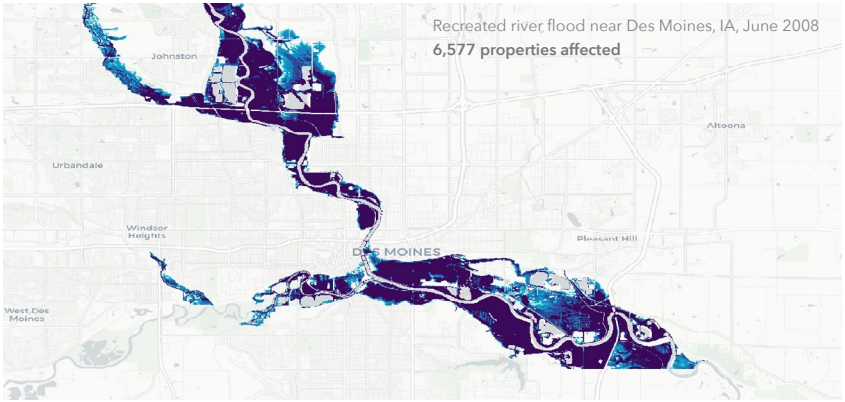
Claims History

120,300 home and property owners in Iowa have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Linn, Polk, Black Hawk, Johnson, and Benton counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 5 flooding events that have occurred since the year 2000 in the state of Iowa. These events flooded around 26,210 properties across the state.**

Flood event	Date	# Properties affected
River flood near Camanche, IA	Apr 2001	1,024
River flood in Northeast IA	Apr 2001 Jun	89
River flood across eastern Iowa	2008	13,483
• River flood near Des Moines, IA	Jun 2008	6,577
River flood near Ames, IA	Jul 2008	5,036



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

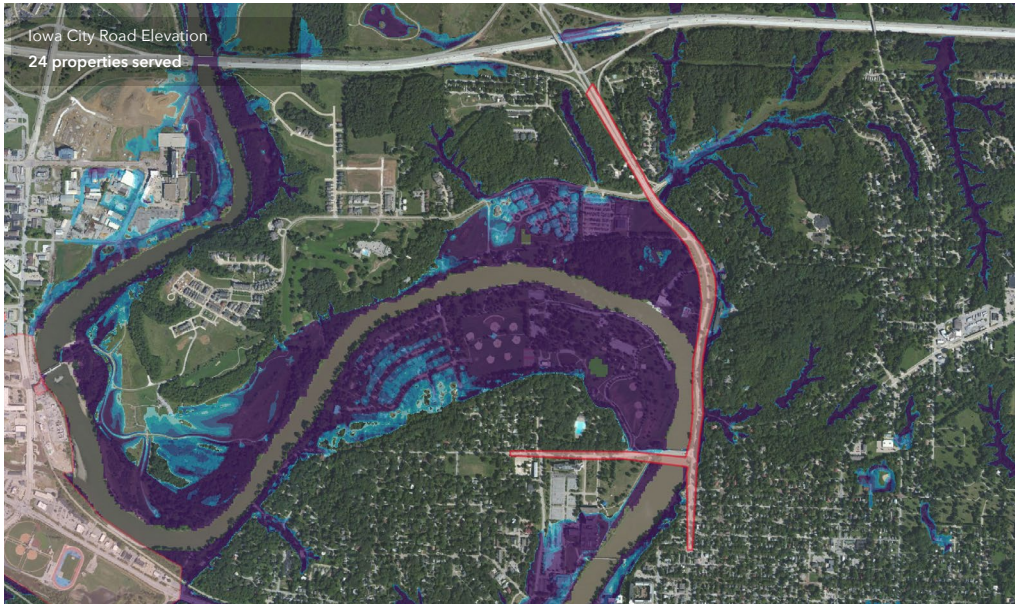
53,200

Properties served by protection measures

The First Street Foundation Flood Model incorporates 184 flood control measures throughout the state which protect 53,200 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee L-627 MO River LB & Indian Creek RB, Council Bluffs	48,968
Culvert Hamilton Drain Flood Control System, Des Moines	4,194
Detention basin Bee Branch Creek Restoration, Dubuque	279
Elevated road • Iowa City Road Elevation, Iowa City	24
Pervious pavement Dubuque washington st, Dubuque	8



State Overview **Kansas**

Flood risk is increasing in the state of Kansas. 133,400 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 0.9%, bringing the total number of properties with substantial risk to 134,600.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 79,500 properties as having substantial risk in the state of Kansas. In comparison, the First Street Foundation Flood Model identifies 1.7 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 54,000 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 55,200 by the year 2050.

Total properties at substantial risk*

In 2020

133,400

In 2050

134,600

30-year change

▲ +1,200 (+1%)

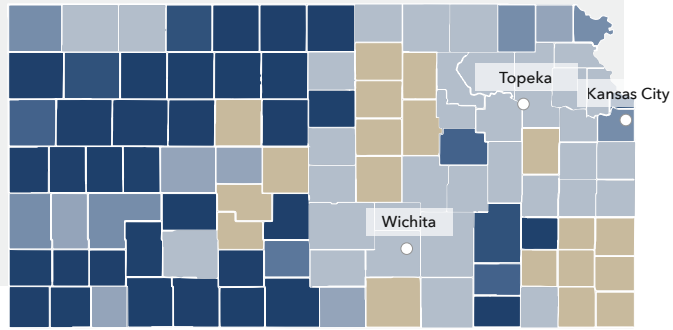
Difference in number of properties currently at substantial risk compared to FEMA**

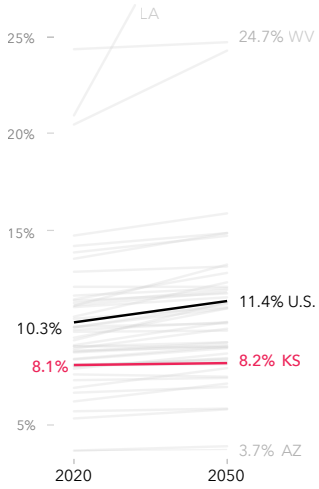
▲ +53,986

More properties at risk in FSF model →

-50% 0 +200% +400% +600%

Kansas City sees the worst flooding when the Missouri and Kansas Rivers overflow at the same time. Turkey Creek also poses a flood risk during heavy local rainfall. The Arkansas and Little Arkansas Rivers flow through the center of Wichita, which is susceptible to heavy rains that cause flash floods, overwhelming channels. Flooding is mitigated by the MS Mitch Mitchell Floodway, which diverts water into the Arkansas River.





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Kansas has a smaller proportion of properties at substantial risk, with 8.1% at substantial risk today and 8.2% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Kansas

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 198,000 properties in Kansas as at risk over the next 30 years. Of these properties, 29,900 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Wichita has the greatest number of properties at risk of flooding in the state with 16,000 currently at risk, or 10% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 34% of properties in Haysville are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Valley Center, for example, will see a 9% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Kansas at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Wichita	16,034	10%	16,528	10%	+494	+3.1%
Topeka	7,628	15%	7,759	16%	+131	+1.7%
Kansas City	6,627	10%	6,669	11%	+42	+0.6%
Overland Park	6,135	9%	6,227	9%	+92	+1.5%
Hutchinson	5,472	30%	5,594	31%	+122	+2.2%
Olathe	4,127	8%	4,181	8%	+54	+1.3%
Manhattan	2,273	15%	2,279	15%	+6	+0.3%
Shawnee	1,999	7%	2,007	7%	+8	+0.4%
Lawrence	1,793	7%	1,873	7%	+80	+4.5%
Liberal	1,715	24%	1,720	24%	+5	+0.3%

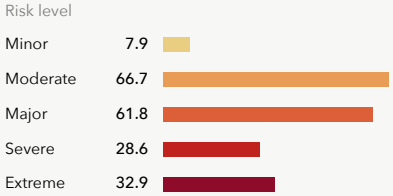
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Haysville	1,494	34%	1,505	34%	+11	+0.7%
Valley Center	1,085	33%	1,185	36%	+100	+9.2%
Hutchinson	5,472	30%	5,594	31%	+122	+2.2%
Liberal	1,715	24%	1,720	24%	+5	+0.3%
Abilene	729	23%	728	23%	-+1	-0.1%
Maize	506	20%	509	20%	+3	+0.6%
Iola	623	18%	626	18%	+3	+0.5%
Merriam	878	18%	878	18%	+0	+0.0%
Topeka	7,628	15%	7,759	16%	+131	+1.7%
Manhattan	2,273	15%	2,279	15%	+6	+0.3%

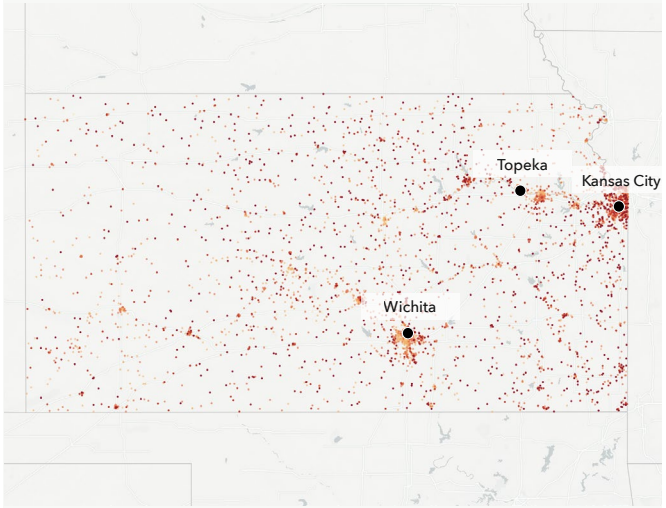
Greatest relative growing risk*

Municipality	2020		2050		Change	
Valley Center	1,085	33%	1,185	36%	+100	+9%
Roeland Park	214	7%	227	7%	+13	+6%
El Dorado	483	8%	507	9%	+24	+5%
Gardner	483	6%	505	7%	+22	+5%
Lawrence	1,793	7%	1,873	7%	+80	+5%
Emporia	548	6%	572	7%	+24	+4%
Pratt	277	8%	288	9%	+11	+4%
Bel Aire	79	2%	82	2%	+3	+4%
Eudora	108	4%	112	5%	+4	+4%
Winfield	425	9%	440	9%	+15	+4%

Flood Factor distribution of properties at risk* (1000s)



More than 12.1% of individual properties and properties in Kansas are at any risk of flooding over the next 30 years. Out of those at risk 62% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Kansas

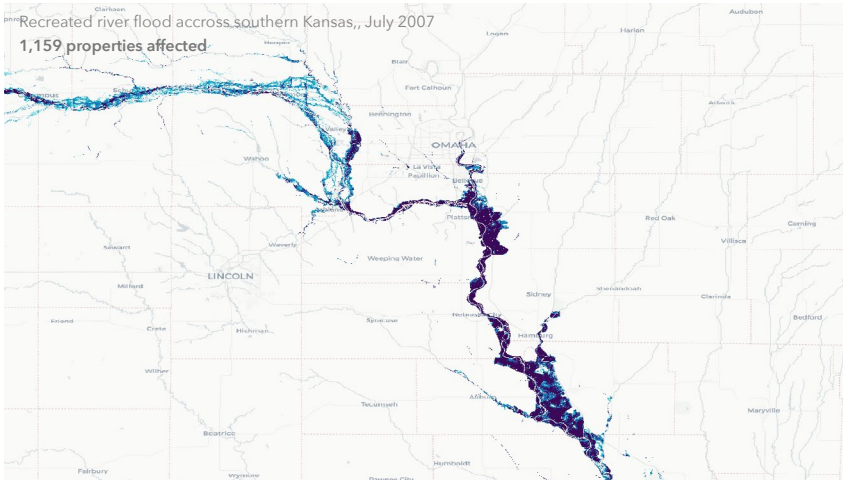
Claims History

21,900 home and property owners in Kansas have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Montgomery, Shawnee, Labette, Edwards, and Kiowa counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 2 flooding events that have occurred since the year 2000 in the state of Kansas. These events flooded around 1,380 properties across the state.**

Flood event	Date	# Properties affected
• River flood accross Southern Kansas	Jul 2007	1,159
River flood across Northern Kansas	Mar 2019	221



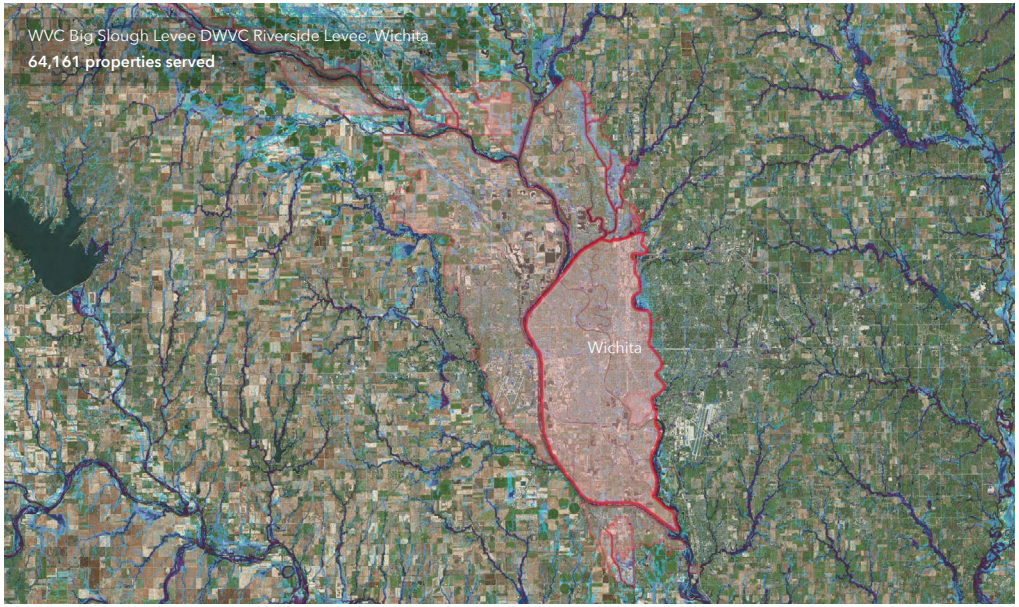
178,600

Properties served by protection measures

The First Street Foundation Flood Model incorporates 395 flood control measures throughout the state which protect 178,600 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee • WVC Big Slough Levee D/WVC Riverside Levee P, R, S, Wichita	173,343
Dam Clinton Dam, Lawrence	2,828
Channel Marion channel diversion and flood protection	2,443
Culvert Sherwood Dam, Topeka	485
Ditch Frisco Ditch, Wichita	57



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Kentucky

Flood risk is increasing in the state of Kentucky. 227,000 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 3.2%, bringing the total number of properties with substantial risk to 234,300.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 96,800 properties as having substantial risk in the state of Kentucky. In comparison, the First Street Foundation Flood Model identifies 2.3 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 130,200 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 137,500 by the year 2050.

Total properties at substantial risk*

In 2020
227,000

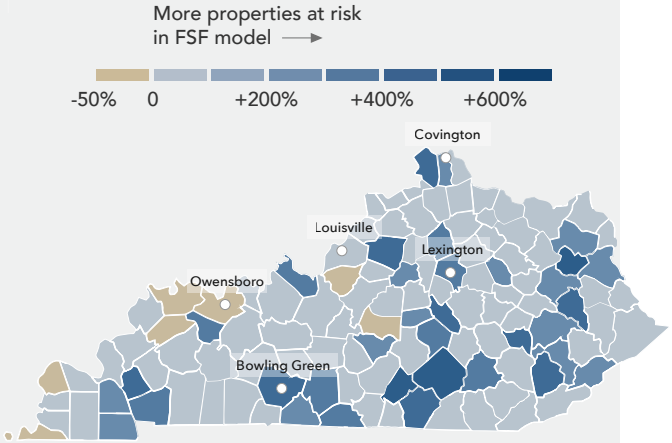
In 2050
234,300

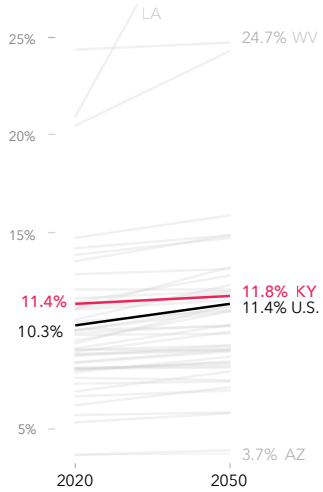
30-year change
▲ +7,300 (+3%)

Streams from Beargrass Creek flow through Jefferson County and eastern Louisville to the Ohio River causing overflows during rainstorms. Areas of Louisville at lower elevation and with poor drainage are especially at risk. Flood risk in Bowling Green and greater Warren County is highest in sinkhole depression areas when the Barren River and Drakes Creek flood. New development exacerbates floods as rain runoff flows easily over concrete.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +130,200





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Kentucky has a greater proportion of properties at substantial risk, with 11.4% at substantial risk today and 11.8% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Kentucky

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 290,300 properties in Kentucky as at risk over the next 30 years. Of these properties, 94,700 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The Louisville/Jefferson County metro area has the greatest number of properties at risk of flooding in the state with 15,500 currently at risk, or 11% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 32% of properties in Hazard are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Farley, for example, will see a 261% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Kentucky at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Louisville/Jefferson	14,956	11%	15,542	12%	+586	+3.9%
Louisville	13,620	14%	14,450	15%	+830	+6.1%
Lexington-Fayette	8,317	7%	8,721	8%	+404	+4.9%
Ashland	2,718	25%	2,761	25%	+43	+1.6%
Owensboro	2,333	10%	2,558	11%	+225	+9.6%
Bowling Green	2,127	11%	2,213	12%	+86	+4.0%
Frankfort	1,922	19%	1,953	19%	+31	+1.6%
Hopkinsville	1,736	13%	1,778	13%	+42	+2.4%
Covington	1,478	9%	1,533	10%	+55	+3.7%
Georgetown	1,166	9%	1,178	9%	+12	+1.0%

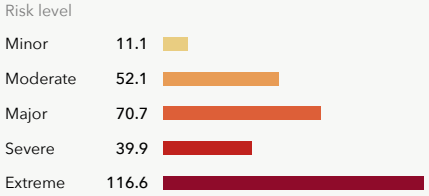
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Hazard	746	32%	759	33%	+13	+1.7%
Morehead	625	30%	637	30%	+12	+1.9%
Ashland	2,718	25%	2,761	25%	+43	+1.6%
Corbin	801	25%	808	25%	+7	+0.9%
Westwood	562	24%	575	24%	+13	+2.3%
Dayton	526	23%	533	23%	+7	+1.3%
Cynthiana	562	22%	568	22%	+6	+1.1%
Frankfort	1,922	19%	1,953	19%	+31	+1.6%
Shively	1,070	18%	1,137	19%	+67	+6.3%
Bellevue	455	18%	468	18%	+13	+2.9%

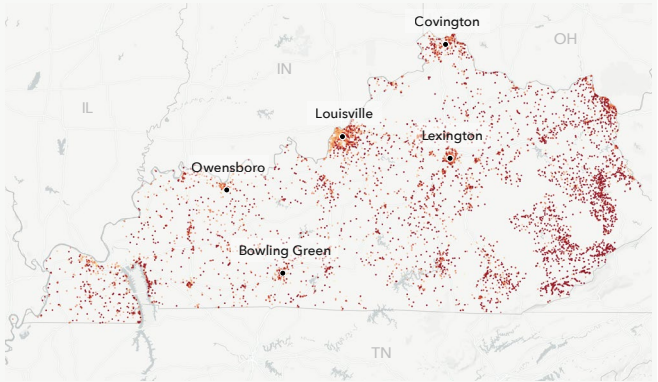
Greatest relative growing risk*

Municipality	2020		2050		Change	
Farley	135	6%	487	22%	+352	+261%
Fort Wright	135	6%	162	7%	+27	+20%
Elsmere	89	3%	99	3%	+10	+11%
Campbellsville	265	6%	292	6%	+27	+10%
Walton	149	7%	164	8%	+15	+10%
Owensboro	2,333	10%	2,558	11%	+225	+10%
Taylor Mill	240	10%	262	10%	+22	+9%
Newport	616	10%	670	11%	+54	+9%
Hendron	162	7%	176	8%	+14	+9%
Cold Spring	96	5%	104	5%	+8	+8%

Flood Factor distribution of properties at risk* (1000s)



More than 14.6% of individual properties and properties in Kentucky are at any risk of flooding over the next 30 years. Out of those at risk 78% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

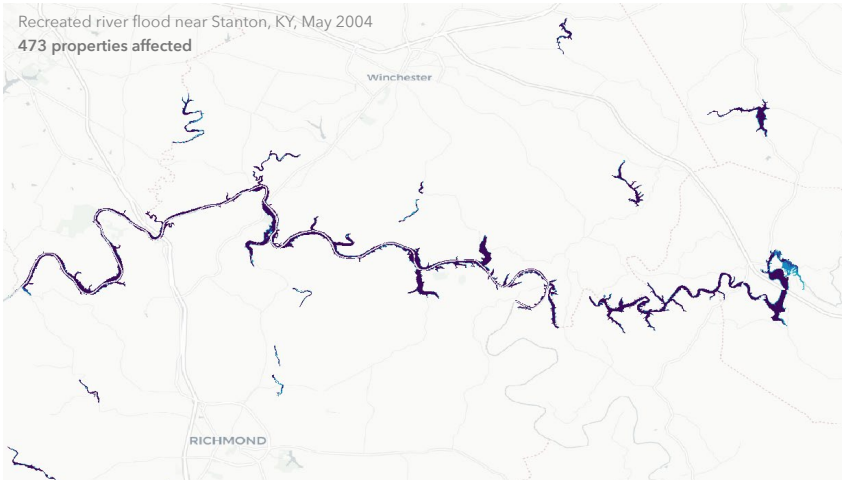
Flood History & Protection
Kentucky

Claims History

121,600 home and property owners in Kentucky have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Jefferson, Pike, Johnson, Floyd, and Rowan counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 1 flooding event that occurred since the year 2000 in the state of Kentucky. This event flooded around 470 properties across the state.**



119,000

Properties served by protection measures

The First Street Foundation Flood Model incorporates 44 flood control measures throughout the state which protect 119,000 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee Louisville Metro Leveed Area, Louisville	117,374
Dam North Fork Little River floodwater retarding structures, Hopkinsville	1,471
Detention basin UK Flood Mitigation Project, Lexington-Fayette	150
Acquisition FEMA buyout Shepherdsville, Shepherdsville	49
Marsh/wetland restoration Parkside Conservation Area, Alexandria	34

* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Louisiana

Flood risk is increasing in the state of Louisiana. 477,100 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 69.7%, bringing the total number of properties with substantial risk to 809,800.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 561,000 properties as having substantial risk in the state of Louisiana. In comparison, the First Street Foundation Flood Model identifies 83,900 fewer properties as facing this same level of risk. This discrepancy exists because of differences in the methods used to estimate risk. The Foundation's Flood Model uses the current climate data, maps precipitation as a stand-alone risk, and may include adaptation improvements not taken into account by FEMA. However, when adjusting for future environmental changes, particularly adjusting for sea level rise and levee height, the FEMA deviation shifts as the First Street methods uncover an additional 332,700 properties with substantial risk by the year 2050, in turn showing 248,800 more properties with substantial risk than FEMA defines currently.

Total properties at substantial risk*

In 2020
477,100

In 2050
809,800

30-year change
▲ +332,700 (+70%)

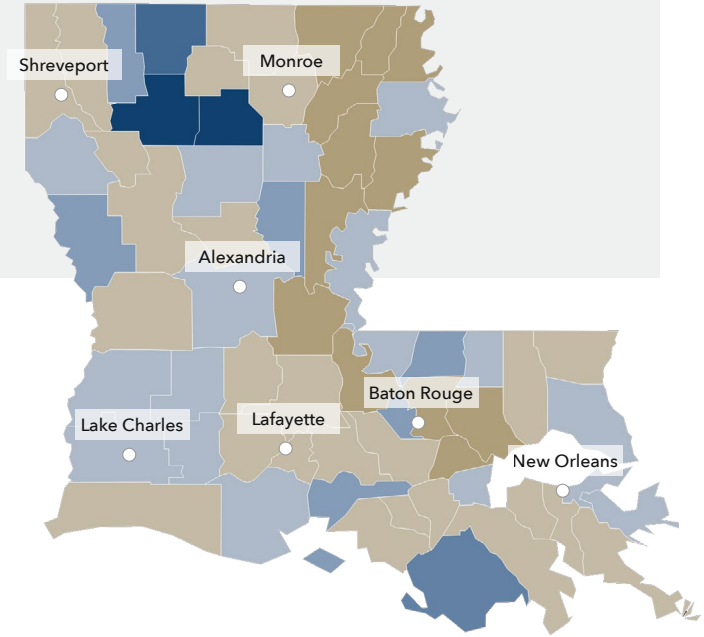
Difference in number of properties currently at substantial risk compared to FEMA**

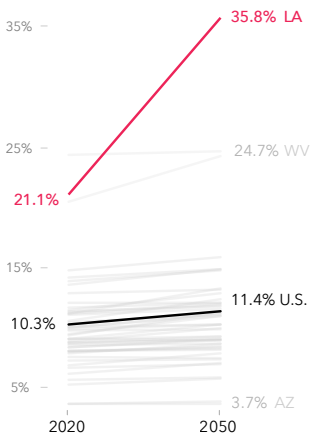
▼ -83,900

More properties at risk in FSF model →

-50% 0 +50% +150% +250%

New Orleans sees annual floods from rain, hurricanes, and tropical storms. Despite levees, pump stations, and stormwater infrastructure, hurricanes Katrina and Rita caused catastrophic damage. The area remains vulnerable due to low elevation, land subsidence, and sea level rise. Baton Rouge sees backwater flood and heavy rainfall. New measures to dredge and widen key waterways to reduce backwater floods are underway.





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Louisiana has a greater proportion of properties at substantial risk, with 21.1% at substantial risk today and 35.8% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Louisiana

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 973,000 properties in Louisiana as at risk over the next 30 years. Of these properties, 68,600 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of New Orleans has the greatest number of properties at risk of flooding in the state with 148,200 currently at risk, or 98% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 100% of properties in Arabi are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Franklin, for example, will see a 1028% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Louisiana at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
New Orleans	148,197	98%	148,232	98%	+35	0.0%
Metairie	64,424	100%	64,424	100%	0	0.0%
Lake Charles	17,866	36%	26,458	54%	+8,592	+48.1%
Lafayette	15,881	30%	16,762	32%	+881	+5.5%
Baton Rouge	15,561	16%	17,191	17%	+1,630	+10.5%
Marrero	14,591	99%	14,591	99%	0	0.0%
Houma	13,354	99%	13,355	99%	+1	0.0%
Shreveport	13,046	14%	14,230	15%	+1,184	+9.1%
Harvey	11,477	74%	11,478	74%	+1	0.0%
Laplace	10,386	89%	10,450	89%	+64	+0.6%

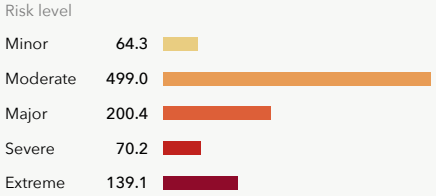
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Metairie	64,424	100%	64,424	100%	+0	0.0%
Chalmette	8,975	100%	8,976	100%	+1	0.0%
River Ridge	7,216	100%	7,216	100%	+0	0.0%
Terrytown	6,856	100%	6,856	100%	+0	0.0%
Jefferson	6,269	100%	6,286	100%	+17	+0.3%
Kenner	3,912	100%	3,912	100%	+0	0.0%
Timberlane	3,166	100%	3,166	100%	+0	0.0%
Meraux	3,148	100%	3,148	100%	+0	0.0%
Arabi	2,817	100%	2,817	100%	+0	0.0%
Violet	2,748	99%	2,748	99%	+0	0.0%

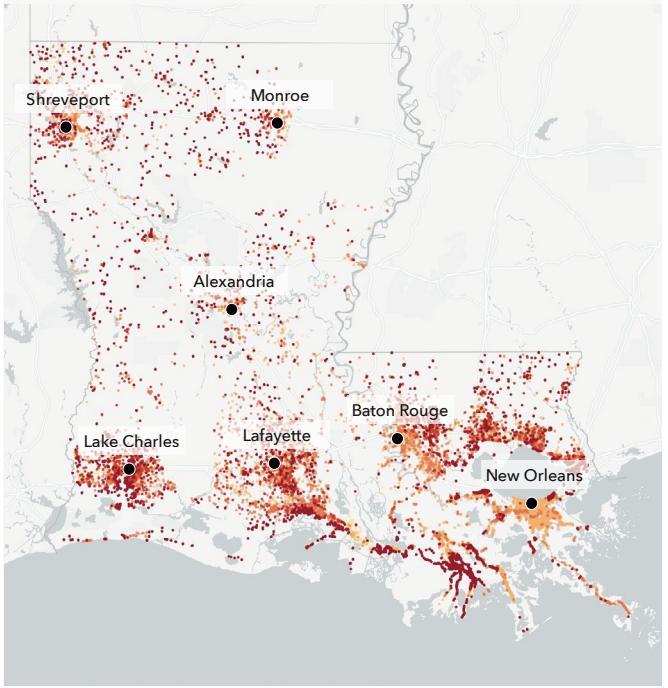
Greatest relative growing risk*

Municipality	2020		2050		Change	
Franklin	478	9%	5,390	98%	+4912	+1028%
Thibodaux	1,296	24%	3,454	64%	+2158	+167%
New Iberia	5,787	46%	10,682	85%	+4895	+85%
Schriever	1,285	49%	2,218	84%	+933	+73%
Vinton	1,954	67%	2,919	100%	+965	+49%
Lake Charles	17,866	36%	26,458	54%	+8,592	+48%
Lacombe	2,779	61%	3,941	86%	+1,162	+42%
Ponchatoula	1,627	41%	2,195	55%	+568	+35%
Sulphur	5,549	39%	7,072	50%	+1,523	+27%
Plaquemine	682	20%	843	24%	+161	+24%

Flood Factor distribution of properties at risk* (1000s)



More than 42.8% of individual properties and properties in Louisiana are at any risk of flooding over the next 30 years. Out of those at risk 43% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Louisiana

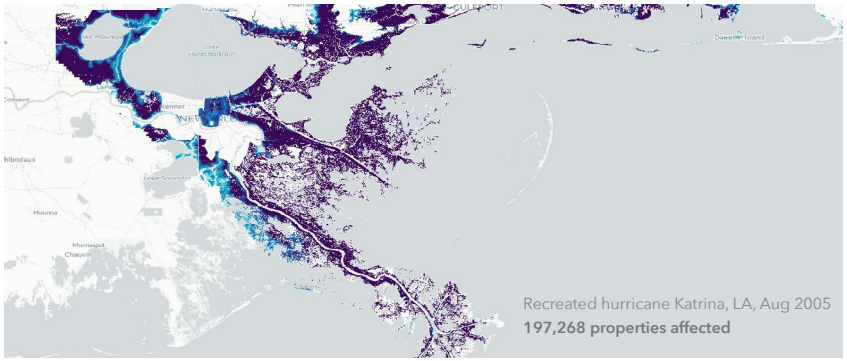
Claims History

3,125,400 home and property owners in Louisiana have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Orleans, Jefferson, East Baton Rouge, St. Tammany, and Calcasieu counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 6 flooding events that have occurred since the year 2000 in the state of Louisiana. These events flooded around 441,520 properties across the state.**

Flood event	Date	# Properties affected
Tropical Storm Allison Hurricane	Jun 2001	6,892
• Katrina	Aug 2005	197,268
Hurricane Gustav	Aug 2008	17,606
Hurricane Ike	Sep 2008	150,955
Hurricane Isaac	Aug 2012	64,696
River flood in Southwestern LA	Mar 2016	4,106



0.5 1 2 3+ ft Depth of flooding

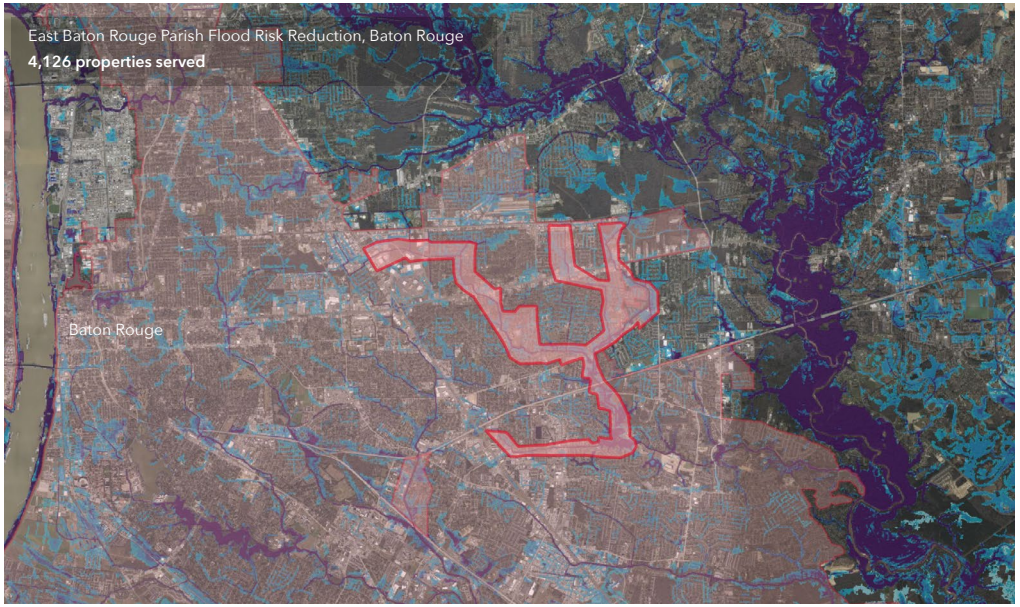
997,300

Properties served by protection measures

The First Street Foundation Flood Model incorporates 506 flood control measures throughout the state which protect 997,300 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee New Orleans East Bank, New Orleans	993,470
Pump station CPRA Hurricane Protection: Storm-Proofing of Interior Pumping, New Orleans	309,512
Channel • East Baton Rouge Parish Flood Risk Reduction Project, Baton Rouge	10,019
Living shoreline Holly Beach	1,786
Marsh/wetland creation Central Wetlands Marsh Creation - Component A, New Orleans	1,915



Area of protection

0.5 1 2 3+ ft Depth of flooding for a simulated 1 in 100 flood event in 2020

* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Maine

Flood risk is increasing in the state of Maine. 55,700 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 7.6%, bringing the total number of properties with substantial risk to 59,900.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 29,500 properties as having substantial risk in the state of Maine. In comparison, the First Street Foundation Flood Model identifies 1.9 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 26,200 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 30,400 by the year 2050.

Total properties at substantial risk*

In 2020
55,700

In 2050
59,900

30-year change
▲ +4,200 (+8%)

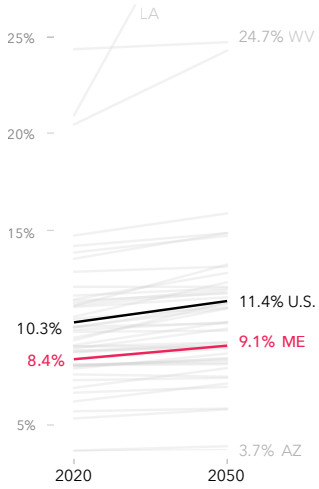
Difference in number of properties currently at substantial risk compared to FEMA**

▲ +26,200

More properties at risk in FSF model →

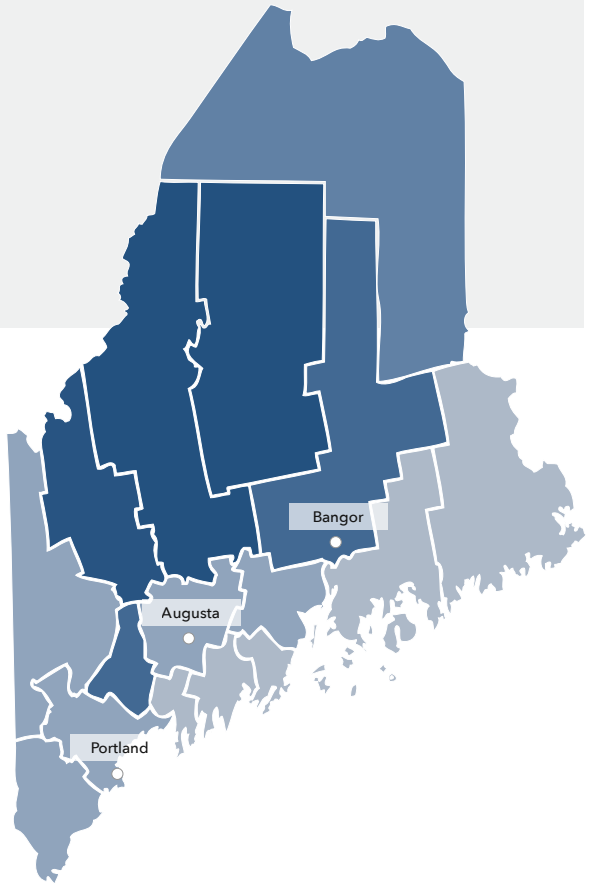
0 +50% +150% +250%

Coastal Maine faces some of the highest tidal flood risk in the country, with king tide and strong nor'easter risks threatening properties and industry. The Androscoggin River has been an historic flood threat. Rapid snowmelt brought about by heavy spring rain and warm temperatures can raise the level of this river and create substantial flash floods, threatening Livermore, Lewiston/Auburn, and Brunswick/Topsham.



Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Maine has a smaller proportion of properties at substantial risk, with 8.4% at substantial risk today and 9.1% at substantial risk in 2050.



* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Maine

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 81,800 properties in Maine as at risk over the next 30 years. Of these properties, 23,900 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Portland has the greatest number of properties at risk of flooding in the state with 2,400 currently at risk, or 8% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 22% of properties in Brewer are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Old Orchard Beach, for example, will see a 79% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Maine at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Portland	2,381	8%	2,795	9%	+414	+17.4%
Lewiston	1,471	13%	1,538	14%	+67	+4.6%
Biddeford	1,225	16%	1,435	19%	+210	+17.1%
Auburn	1,150	13%	1,186	14%	+36	+3.1%
Augusta	1,000	12%	1,039	12%	+39	+3.9%
South Portland	947	11%	1,176	14%	+229	+24.2%
Sanford	932	10%	956	11%	+24	+2.6%
Bangor	876	9%	914	9%	+38	+4.3%
Brewer	836	22%	888	23%	+52	+6.2%
Westbrook	795	13%	834	14%	+39	+4.9%

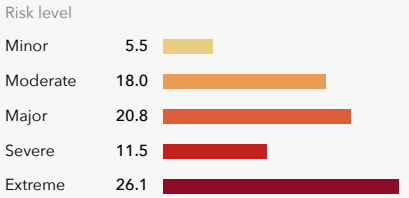
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Brewer	836	22%	2,588	87%	+3	+0.1%
Old Town	603	19%	2,147	83%	+16	+0.8%
Cape Neddick	525	17%	1,682	72%	+1	+0.1%
Biddeford	1,225	16%	1,738	67%	+36	+2.1%
Old Orchard Beach	643	16%	1,441	65%	+10	+0.7%
Skowhegan	420	16%	2,203	61%	+11	+0.5%
Bath	532	14%	2,079	59%	+15	+0.7%
Houlton	280	14%	6,778	52%	+21	+0.3%
Auburn	1,150	13%	3,812	51%	+26	+0.7%
Westbrook	795	13%	2,253	50%	+10	+0.4%

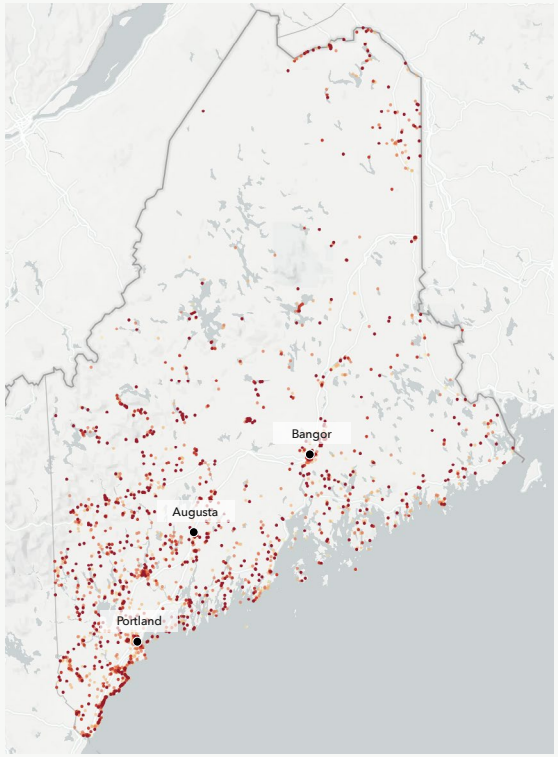
Greatest relative growing risk*

Municipality	2020		2050		Change	
Old Orchard Beach	643	16%	1,151	29%	+508	+79%
Saco	747	11%	981	14%	+234	+31%
South Portland	947	11%	1,176	14%	+229	+24%
Gorham	46	2%	57	3%	+11	+24%
Portland	2,381	8%	2,795	9%	+414	+17%
Biddeford	1,225	16%	1,435	19%	+210	+17%
Topsham	211	9%	243	10%	+32	+15%
Bath	532	14%	579	16%	+47	+9%
Skowhegan	420	16%	452	17%	+32	+8%
Yarmouth	151	7%	162	8%	+11	+7%

Flood Factor distribution of properties at risk* (1000s)



More than 12.1% of individual properties and properties in Maine are at any risk of flooding over the next 30 years. Out of those at risk 73% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Maine

Claims History

6,300 home and property owners in Maine have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in York, Cumberland, Aroostook, Oxford, and Lincoln counties.

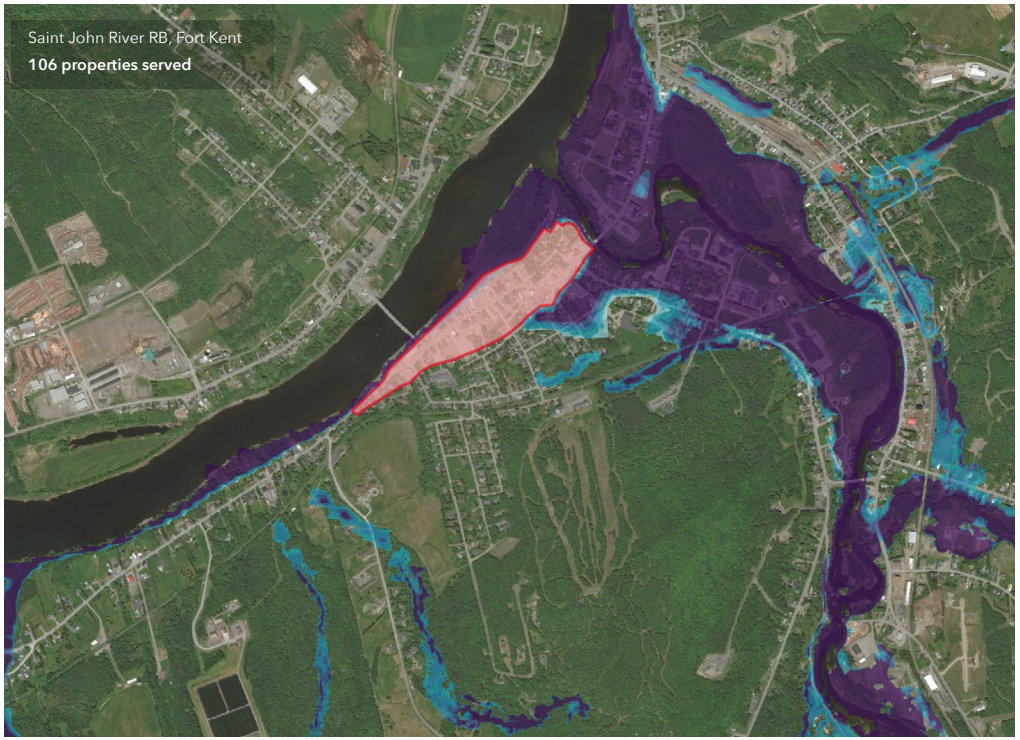
3,265

Properties served by protection measures

The First Street Foundation Flood Model incorporates 148 flood control measures throughout the state which protect 3,300 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Marsh/wetland restoration Webhannet River and Little River, Conserved Tidal Marsh	3,037
Levee • Saint John River RB & Fish Riv LB, Fort Kent	178
Flood wall New Auburn Redevelopment Project, Auburn	50



* Source: Fema.gov

State Overview
Maryland

Flood risk is increasing in the state of Maryland. 133,700 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 14.8%, bringing the total number of properties with substantial risk to 153,500.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 58,700 properties as having substantial risk in the state of Maryland. In comparison, the First Street Foundation Flood Model identifies 2.3 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 75,000 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 94,800 by the year 2050.

Total properties at substantial risk*

In 2020
133,700

In 2050
153,500

30-year change
▲ +19,800 (+15%)

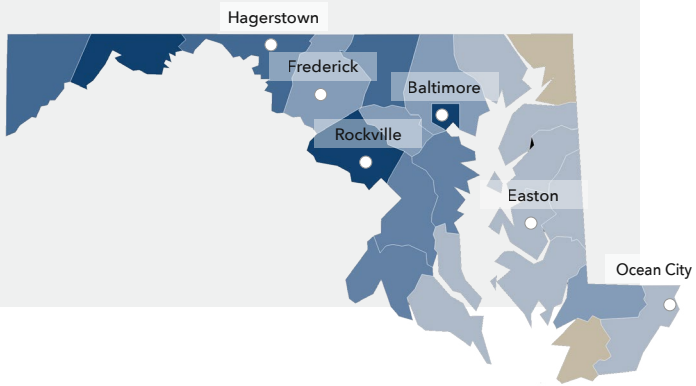
Difference in number of properties currently at substantial risk compared to FEMA**

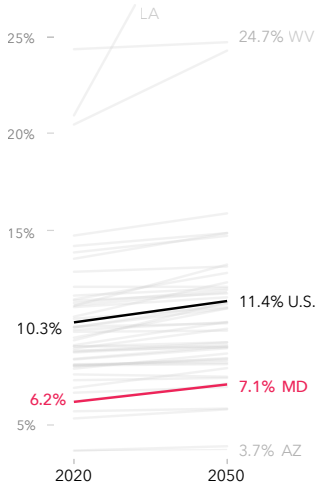
▲ +75,000

More properties at risk in FSF model →

-50% 0 +100% +300% +500%

Maryland is subject to localized flash flooding after short periods of heavy rainfall around small streams and creeks. Flooding along larger rivers such as the Potomac and Susquehanna comes from more prolonged and steady rains. Hurricanes and tropical storms can cause surges that create tidal flooding along bays and their tributaries. Hurricanes Fran (1996), Floyd (1999), and Isabel (2003) all caused significant floods.





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Maryland has a smaller proportion of properties at substantial risk, with 6.2% at substantial risk today and 7.1% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Maryland

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 202,600 properties in Maryland as at risk over the next 30 years. Of these properties, 40,700 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Baltimore has the greatest number of properties at risk of flooding in the state with 13,700 currently at risk, or 6% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 85% of properties in Ocean City are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Chester, for example, will see a 158% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Maryland at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Baltimore	13,705	6%	15,378	7%	+1,673	+12.2%
Ocean City	6,319	85%	7,190	97%	+871	+13.8%
Ocean Pines	4,148	43%	6,273	65%	+2,125	+51.2%
Dundalk	2,123	8%	3,731	14%	+1,608	+75.7%
West Ocean City	2,020	57%	3,128	89%	+1,108	+54.9%
Cumberland	1,848	18%	1,883	18%	+35	+1.9%
Crisfield	1,749	83%	1,780	84%	+31	+1.8%
Salisbury	1,742	15%	1,867	16%	+125	+7.2%
Bethesda	1,525	9%	1,614	9%	+89	+5.8%
Hagerstown	1,400	10%	1,499	11%	+99	+7.1%

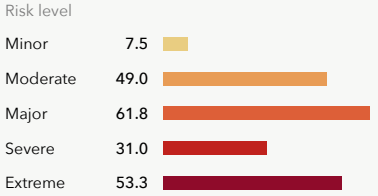
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Ocean City	6,319	85%	7,190	97%	+871	+13.8%
Crisfield	1,749	83%	1,780	84%	+31	+1.8%
West Ocean City	2,020	57%	3,128	89%	+1,108	+54.9%
Ocean Pines	4,148	43%	6,273	65%	+2,125	+51.2%
Shady Side	1,312	40%	1,578	48%	+266	+20.3%
Bowleys Quarters	1,163	37%	1,639	52%	+476	+40.9%
Deale	739	28%	1,010	38%	+271	+36.7%
Edgemere	1,220	28%	1,788	40%	+568	+46.6%
La Vale	512	25%	522	26%	+10	+2.0%
Pocomoke City	434	20%	459	21%	+25	+5.8%

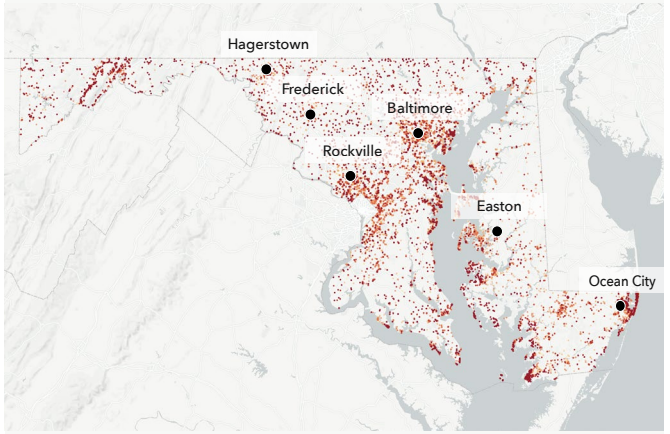
Greatest relative growing risk*

Municipality	2020		2050		Change	
Chester	260	10%	671	26%	+411	+158%
Riviera Beach	81	2%	186	4%	+105	+130%
Stevensville	558	18%	1,091	34%	+533	+96%
Essex	666	5%	1,250	9%	+584	+88%
Edgewater	421	10%	763	19%	+342	+81%
Annapolis Neck	788	16%	1,417	28%	+629	+80%
Dundalk	2,123	8%	3,731	14%	+1,608	+76%
Mayo	767	19%	1,234	30%	+467	+61%
Edgewood	159	2%	251	3%	+92	+58%
West Ocean City	2,020	57%	3,128	89%	+1,108	+55%

Flood Factor distribution of properties at risk* (1000s)



More than 9.4% of individual properties and properties in Maryland are at any risk of flooding over the next 30 years. Out of those at risk 72% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Maryland

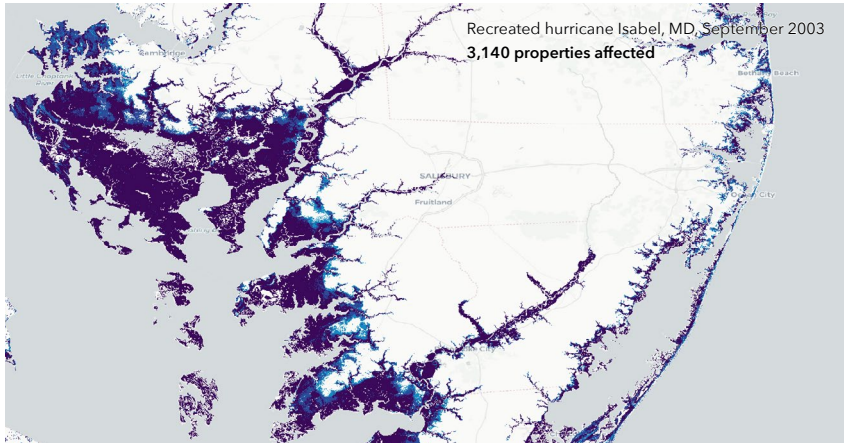
Claims History

15,700 home and property owners in Maryland have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Baltimore, Somerset, Anne Arundel, Baltimore, and Worcester counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 4 flooding events that have occurred since the year 2000 in the state of Maryland. These events flooded around 51,460 properties across the state.**

Flood event	Date	# Properties affected
• Hurricane Isabel	Sep 2003	35,613
Nor'easter	Nov 2009	3,669
Hurricane Irene	Aug 2011	11,851
River flood in Western MD	Dec 2018	330



144,900

Properties served by protection measures

The First Street Foundation Flood Model incorporates 531 flood control measures throughout the state which protect 144,900 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Retention pond • Maryland Dept. of Environment Best Managment Practice, Columbia	137,501
Levee Cumberland, Cumberland	5,079
Dune Atlantic Coast of Maryland Shoreline Protection, Ocean City	1,043
Seawall Atlantic Coast of Maryland Shoreline Protection, Ocean City	350
Marsh/wetland restoration North Beach Wetland Restoration, North Beach	409

* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Massachussets

Flood risk is increasing in the state of Massachusetts. 193,300 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 11.4%, bringing the total number of properties with substantial risk to 215,400.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 117,100 properties as having substantial risk in the state of Massachusetts. In comparison, the First Street Foundation Flood Model identifies 1.6 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 76,200 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 98,300 by the year 2050.

Total properties at substantial risk*

In 2020
193,300

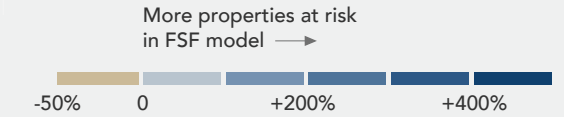
In 2050
215,400

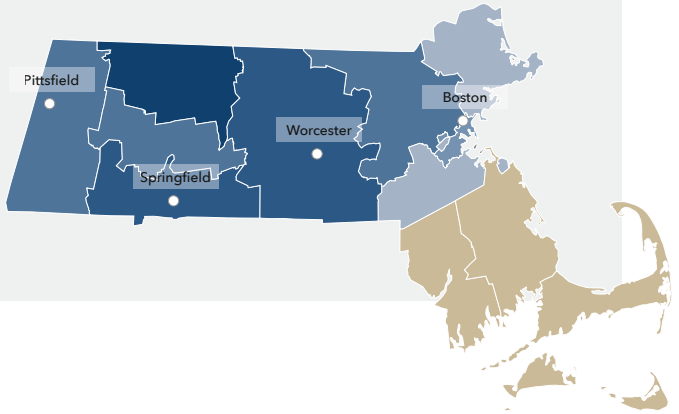
30-year change
▲ +22,100 (+11.4%)

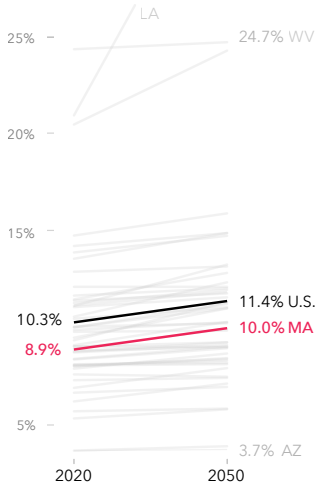
Many coastal towns see flooding from hurricanes, nor'easters, rain, snow, and tides. Protection measures include seawalls, barrier beaches, and zoning regulations in flood-prone areas. The Springfield area floods from nor'easters, hurricanes, and tropical storms that generate intense rain or snowfall. It is protected by upstream flood control projects and by levees and pumping stations that reduce flood and backwater risk.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +76,200







Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Massachusetts has a smaller proportion of properties at substantial risk, with 8.9% at substantial risk today and 10% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Massachussets

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 336,200 properties in Massachusetts as at risk over the next 30 years. Of these properties, 46,800 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Boston has the greatest number of properties at risk of flooding in the state with 19,200 currently at risk, or 19% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 64% of properties in Hull are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Dennis Port, for example, will see a 299% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Massachusetts at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Boston	19,177	19%	27,819	28%	+8,642	+45.1%
Worcester	5,424	13%	5,670	14%	+246	+4.5%
Springfield	4,766	11%	4,989	12%	+223	+4.7%
Lawrence	4,685	38%	4,963	41%	+278	+5.9%
Quincy	4,618	22%	6,574	31%	+1,956	+42.4%
Newton	4,417	18%	4,620	19%	+203	+4.6%
Lowell	4,291	20%	4,648	21%	+357	+8.3%
Revere	4,027	32%	5,034	39%	+1,007	+25.0%
Lynn	4,026	21%	4,681	24%	+655	+16.3%
Hull	3,056	65%	3,236	68%	+180	+5.9%

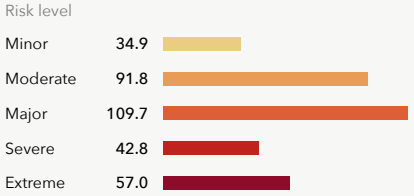
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Hull	3,056	65%	3,236	68%	+180	+5.9%
Ocean Bluff-Brant Rock	1,658	54%	1,927	63%	+269	+16.2%
Adams	1,070	48%	1,080	48%	+10	+0.9%
Salisbury	1,111	44%	1,383	55%	+272	+24.5%
Provincetown	906	40%	1,165	51%	+259	+28.6%
Lawrence	4,685	38%	4,963	41%	+278	+5.9%
Winthrop Town	1,575	35%	2,210	49%	+635	+40.3%
North Adams	1,676	32%	1,704	33%	+28	+1.7%
Revere	4,027	32%	5,034	39%	+1,007	+25.0%
Wareham Center	603	30%	1,023	50%	+420	+69.7%

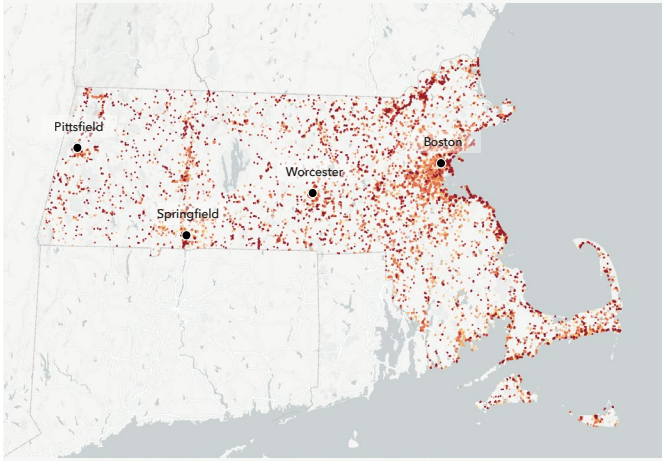
Greatest relative growing risk*

Municipality	2020		2050		Change	
Dennis Port	364	10%	1,452	38%	+1088	+299%
Falmouth	322	12%	903	34%	+581	+180%
Harwich Port	184	9%	445	21%	+261	+142%
Chelsea	691	14%	1,425	29%	+734	+106%
Cambridge	3,048	23%	5,595	43%	+2,547	+84%
West Yarmouth	705	16%	1,293	30%	+588	+83%
East Falmouth	668	13%	1,201	23%	+533	+80%
Salem	1,531	16%	2,728	29%	+1,197	+78%
Everett	662	8%	1,142	15%	+480	+73%
Wareham Center	603	30%	1,023	50%	+420	+70%

Flood Factor distribution of properties at risk* (1000s)



More than 15.5% of individual properties and properties in Massachusetts are at any risk of flooding over the next 30 years. Out of those at risk 63% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Massachussets

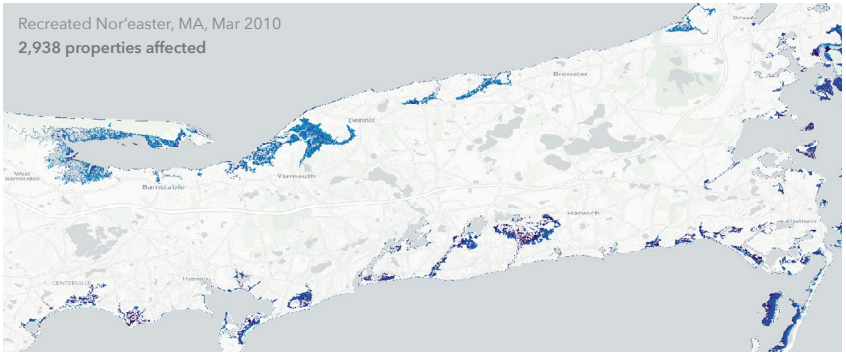
Claims History

88,000 home and property owners in Massachusetts have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Middlesex, Essex, Norfolk, Plymouth, and Bristol counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 6 flooding events that have occurred since the year 2000 in the state of Massachusetts. These events flooded around 17,790 properties across the state.**

Flood event	Date	# Properties affected
Nor'easter	Feb 2003	2,616
Nor'easter	Nov 2009	3,565
• Nor'easter	Mar 2010	2,938
River flood near Springfield, MA	Aug 2011	658
Hurricane Irene	Aug 2011	103
Hurricane Sandy	Oct 2012	7,910



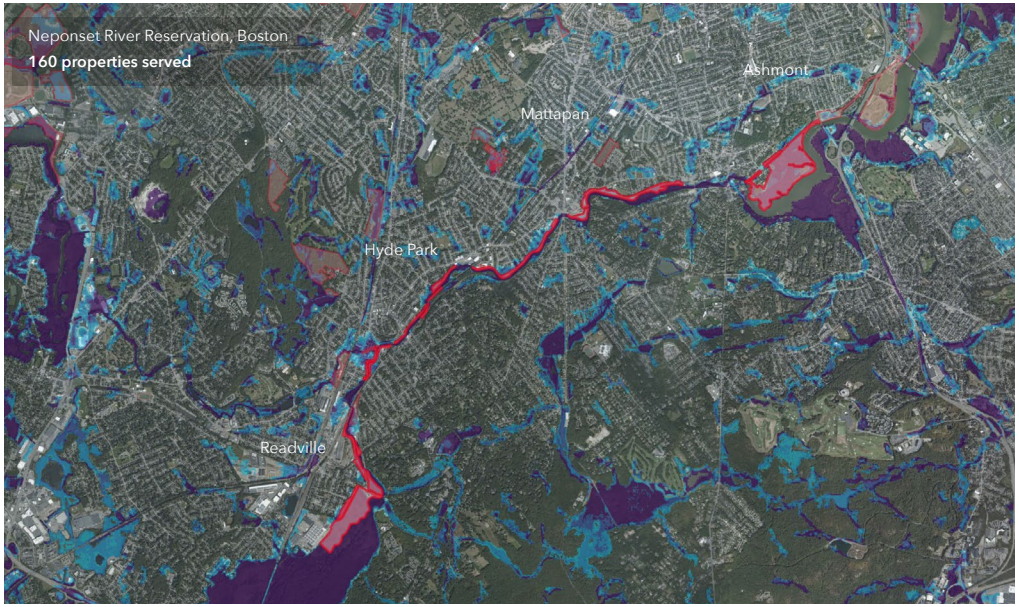
34,200

Properties served by protection measures

The First Street Foundation Flood Model incorporates 935 flood control measures throughout the state which protect 34,200 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee Chicopee Riv RB & CT Riv LB - Chicopee, MA	19,175
Living breakwater State of Massachusetts Beach Barrier,	12,716
Seawall Sumner Street Greenway Deployable Seawall, Chatham	902
Marsh/wetland Restoration • Neponset River Reservation, Boston	954
tide gate Hull-04, Boston	350



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Michigan

Flood risk is increasing in the state of Michigan. 315,600 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 4.5%, bringing the total number of properties with substantial risk to 329,700.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 124,100 properties as having substantial risk in the state of Michigan. In comparison, the First Street Foundation Flood Model identifies 2.5 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 191,500 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 205,600 by the year 2050.

Total properties at substantial risk*

In 2020
315,600

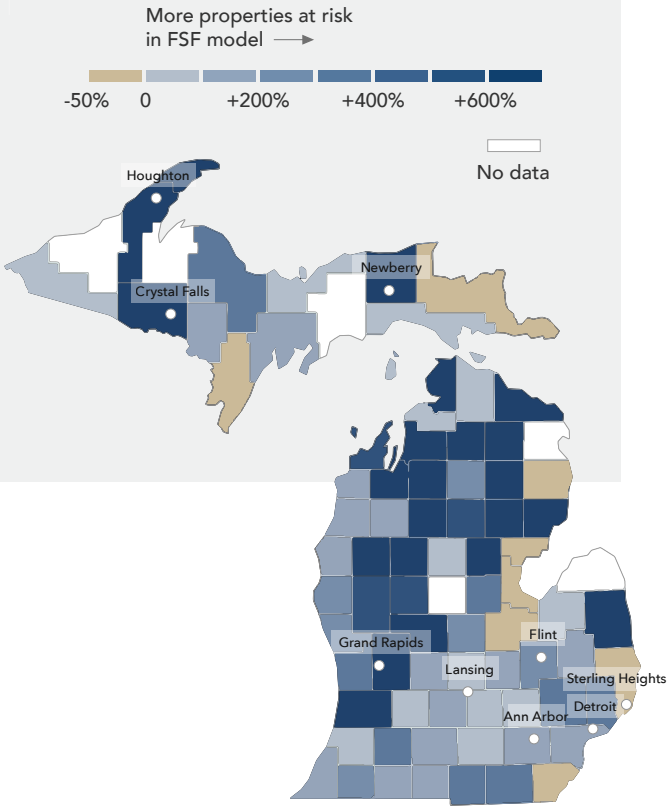
In 2050
329,700

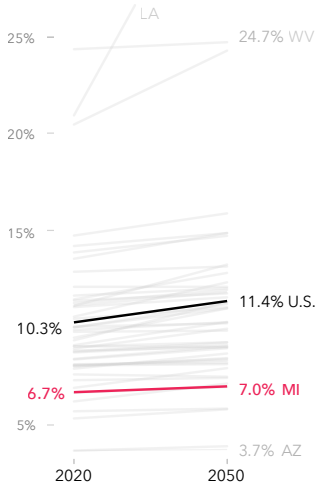
30-year change
▲ +14,100 (+5%)

Heavy rains in Michigan have often caused flash flooding across the state, and the last five years have been the wettest in history for the Great Lakes watershed. In 2014, heavy rains caused severe flooding and a great deal of damage in Detroit and surrounding metro areas. Flooding in Detroit is exacerbated by high levels of urbanization and an aging storm sewer network, often resulting in destructive storm sewer backups.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +191,500





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Michigan has a smaller proportion of properties at substantial risk, with 6.7% at substantial risk today and 7% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Michigan

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 531,800 properties in Michigan as at risk over the next 30 years. Of these properties, 51,700 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Detroit has the greatest number of properties at risk of flooding in the state with 39,700 currently at risk, or 10% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 81% of properties in River Rouge are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Milan, for example, will see a 26% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Michigan at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Detroit	39,744	10%	41,672	11%	+1,928	+4.9%
Warren	11,916	21%	12,276	22%	+360	+3.0%
Grand Rapids	9,448	15%	9,586	15%	+138	+1.5%
Sterling Heights	5,485	12%	5,753	13%	+268	+4.9%
Lansing	5,164	12%	5,263	12%	+99	+1.9%
Flint	5,161	9%	5,212	9%	+51	+1.0%
Dearborn	5,051	15%	5,266	15%	+215	+4.3%
Dearborn Heights	4,672	19%	4,824	20%	+152	+3.3%
St. Clair Shores	4,115	15%	4,289	16%	+174	+4.2%
Grosse Pointe Woods	4,102	60%	4,120	60%	+18	+0.4%

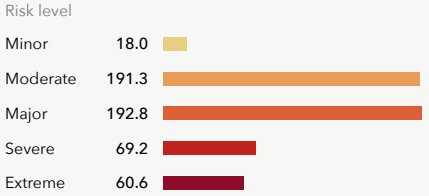
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
River Rouge	3,160	81%	3,175	81%	+15	+0.5%
Grosse Pointe Woods	4,102	60%	4,120	60%	+18	+0.4%
Melvindale	2,522	51%	2,566	52%	+44	+1.7%
Manitou Beach-Devils Lake	1,231	48%	1,256	49%	+25	+2.0%
Ecorse	2,109	42%	2,193	43%	+84	+4.0%
Grosse Pointe Park	1,789	42%	1,799	42%	+10	+0.6%
Monroe	2,687	36%	2,780	37%	+93	+3.5%
Eaton Rapids	656	31%	662	32%	+6	+0.9%
Mount Clemens	1,691	27%	1,714	28%	+23	+1.4%
Port Huron	3,293	26%	3,401	27%	+108	+3.3%

Greatest relative growing risk*

Municipality	2020		2050		Change	
Milan	157	6%	197	8%	+40	+26%
Southfield	1,294	5%	1,622	7%	+328	+25%
Center Line	200	7%	232	8%	+32	+16%
Riverview	169	4%	196	5%	+27	+16%
Grosse Pointe	141	6%	163	6%	+22	+16%
Hamtramck	749	11%	863	13%	+114	+15%
Garden City	693	6%	783	7%	+90	+13%
Rogers City	70	3%	79	4%	+9	+13%
Livonia	1,692	4%	1,901	5%	+209	+12%
Southgate	211	2%	237	2%	+26	+12%

Flood Factor distribution of properties at risk* (1000s)



More than 11.2% of individual properties and properties in Michigan are at any risk of flooding over the next 30 years. Out of those at risk 61% are at major to extreme risk.

* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Michigan

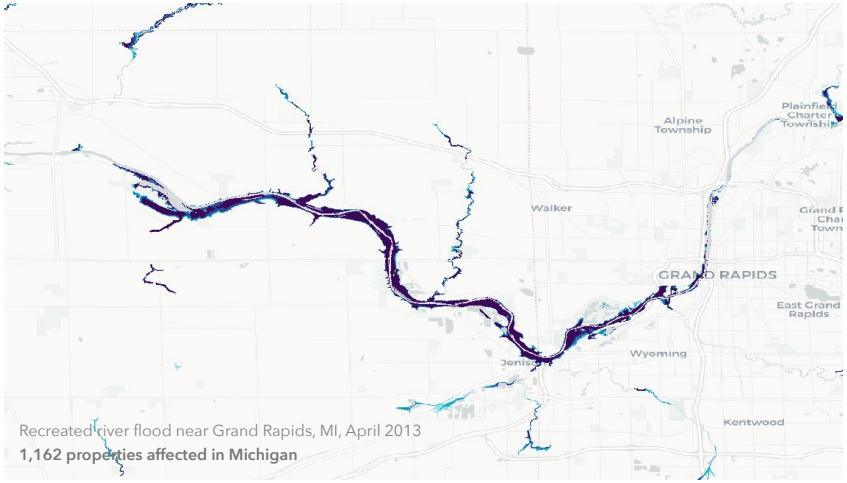
Claims History

238,900 home and property owners in Michigan have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Wayne, Oakland, Macomb, Midland, and Genesee counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 3 flooding events that have occurred since the year 2000 in the state of Michigan. These events flooded around 2,490 properties across the state.**

Flood event	Date	# Properties affected
River flood near Lansing, MI	May 2004	1,232
• River flood near Grand Rapids, MI	Apr 2013	1,162
River flood in Southeast MI	Jun 2015	90



0.5 1 2 3+ ft Depth of flooding

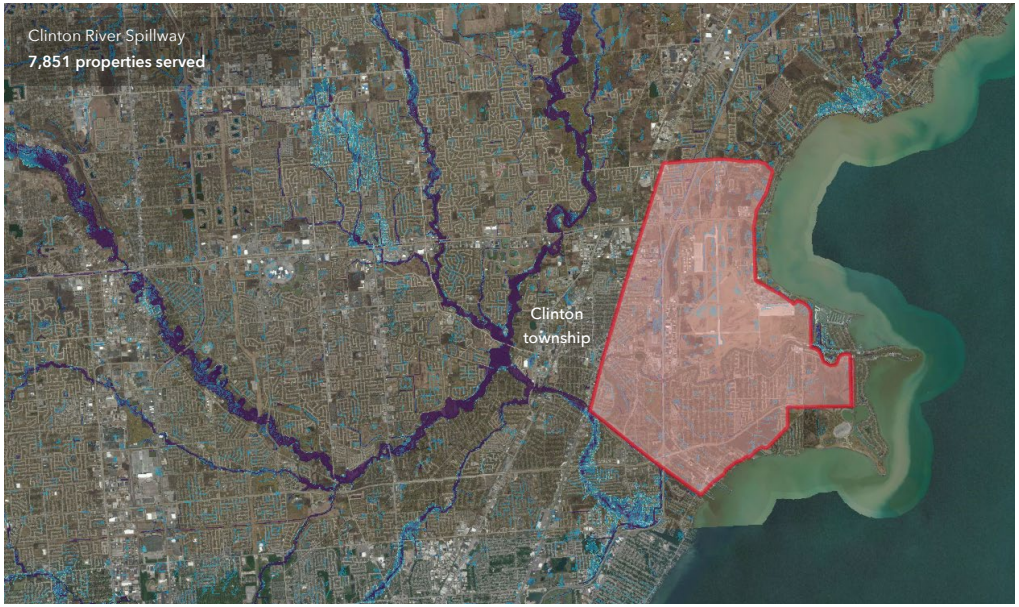
29,600

Properties served by protection measures

The First Street Foundation Flood Model incorporates 77 flood control measures throughout the state which protect 29,600 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Spillway • Clinton River Spillway	9,555
Tide gate Milk River Flood Control Structure, Grosse Pointe Woods	8,302
Levee Grand Rapids Levee/Floodwall, Grand Rapids	8,483
Culvert Mallets Creek improvement, Ann Arbor	1,026
Ditch Battle Creek Cut-Off Channel and Flood Control Improvements	1,953



Area of protection

0.5 1 2 3+ ft Depth of flooding for a simulated 1 in 100 flood event in 2020

* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview **Minnesota**

Flood risk is increasing in the state of Minnesota. 215,600 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 1.6%, bringing the total number of properties with substantial risk to 219,100.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 76,800 properties as having substantial risk in the state of Minnesota. In comparison, the First Street Foundation Flood Model identifies 2.8 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 138,800 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 142,300 by the year 2050.

Total properties at substantial risk*

In 2020
215,600

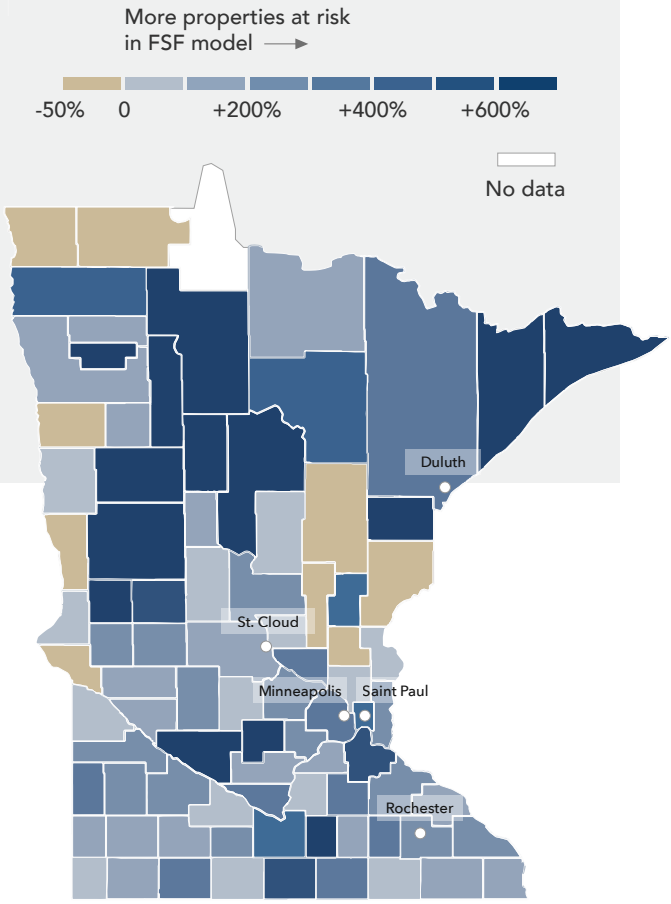
In 2050
219,100

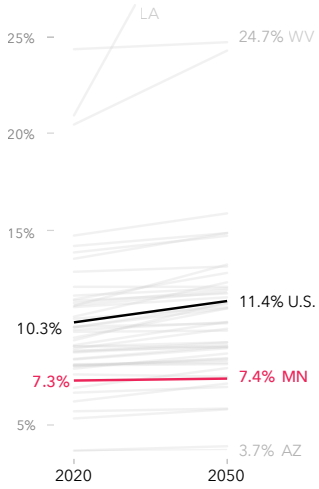
30-year change
▲ +3,500 (+2%)

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +138,764

Flash floods occur throughout the state. Southeastern Minnesota, including the twin cities, encounters thunderstorms and heavy rainfall, leading to large scale flooding which overwhelms roads and highways making areas inaccessible. On the western side of the state, the Red River regularly overtops its banks from heavy autumn and winter precipitation as well as early spring snow melt.





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Minnesota has a smaller proportion of properties at substantial risk, with 7.3% at substantial risk today and 7.4% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Minnesota

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 322,300 properties in Minnesota as at risk over the next 30 years. Of these properties, 43,000 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Minneapolis has the greatest number of properties at risk of flooding in the state with 10,700 currently at risk, or 10% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 55% of properties in East Grand Forks are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Waite Park, for example, will see a 8% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Minnesota at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Minneapolis	10,730	11%	10,860	11%	+130	+1.2%
St. Paul	7,345	10%	7,392	10%	+47	+0.6%
Duluth	5,445	11%	5,525	11%	+80	+1.5%
Rochester	5,088	12%	5,094	12%	+6	+0.1%
Winona	4,567	49%	4,650	49%	+83	+1.8%
Coon Rapids	2,975	13%	2,991	14%	+16	+0.5%
Brooklyn Park	2,928	13%	2,949	13%	+21	+0.7%
Champlin	2,921	36%	2,932	36%	+11	+0.4%
Lakeville	2,658	12%	2,697	12%	+39	+1.5%
St. Cloud	2,541	12%	2,630	13%	+89	+3.5%

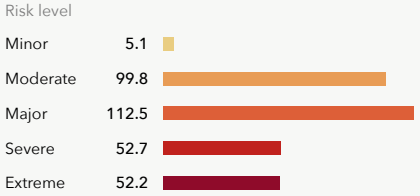
Greatest proportion of properties at risk*

Municipality	2020		2050		Change
East Grand Forks	1,960	55%	1,963	55%	+0.1%
Winona	4,567	49%	4,650	49%	+0.8%
Little Falls	1,698	37%	1,739	37%	+0.1%
Champlin	2,921	36%	2,932	36%	+2.1%
North Mankato	1,826	36%	1,830	36%	+0.7%
Crookston	1,016	31%	1,021	31%	+0.5%
Dayton	922	29%	926	29%	+0.7%
Anoka	1,624	28%	1,633	28%	+0.3%
Virginia	1,178	25%	1,183	25%	+0.7%
Monticello	1,120	22%	1,127	22%	+0.4%

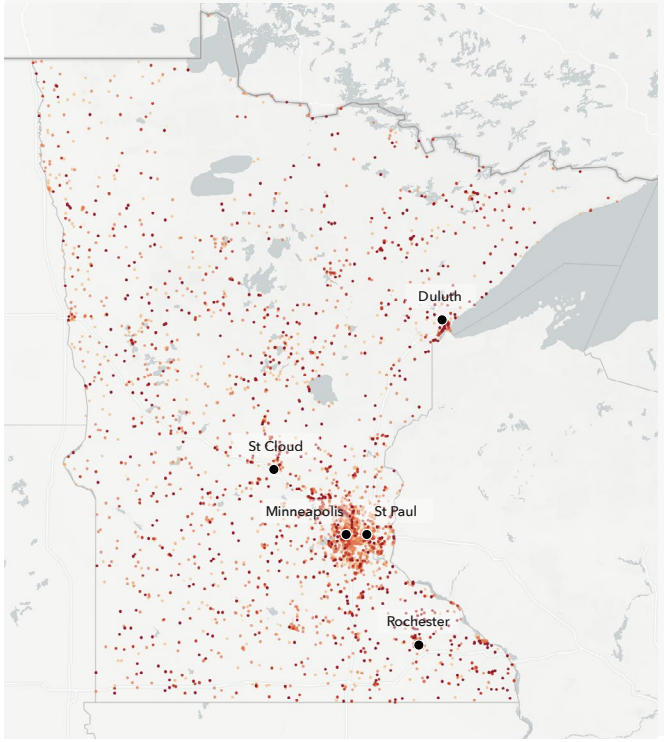
Greatest relative growing risk*

Municipality	2020	2050		Change	
Waite Park	11%	265	11%	+20	+8%
International Falls	8%	310	9%	+22	+8%
St. Joseph	4%	87	4%	+6	+7%
Princeton	10%	232	10%	+13	+6%
Hermantown	4%	185	4%	+9	+5%
Park Rapids	13%	307	14%	+15	+5%
Chanhassen	5%	509	5%	+23	+5%
West St. Paul	7%	430	7%	+19	+5%
Zimmerman	5%	114	5%	+5	+5%
Sauk Rapids	7%	362	8%	+14	+4%

Flood Factor distribution of properties at risk* (1000s)



More than 10.9% of individual properties and properties in Minnesota are at any risk of flooding over the next 30 years. Out of those at risk 67% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Minnesota

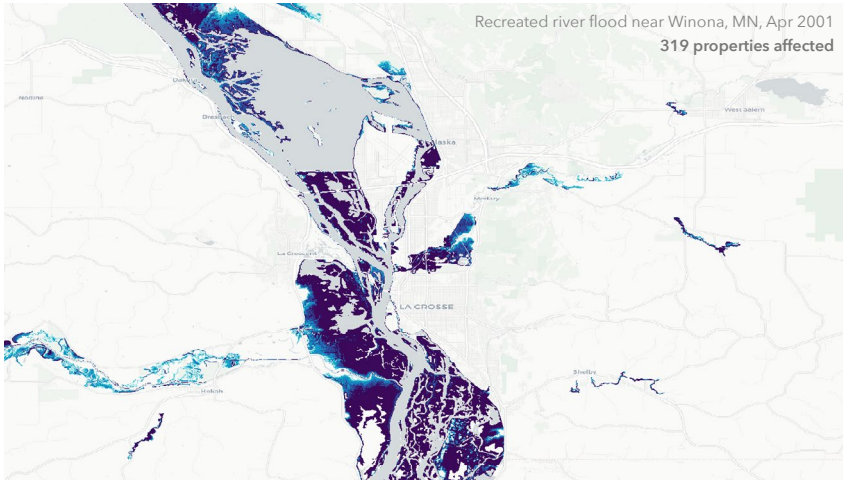
Claims History

22,600 home and property owners in Minnesota have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Winona, Olmsted, Freeborn, Houston, and Clay counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 2 flooding events that have occurred since the year 2000 in the state of Minnesota. These events flooded around 2,310 properties across the state.**

Flood event	Date	# Properties affected
River flood near Minneapolis, MN	Apr 2001	2,000
• River flood near Winona, MN	Apr 2001	311



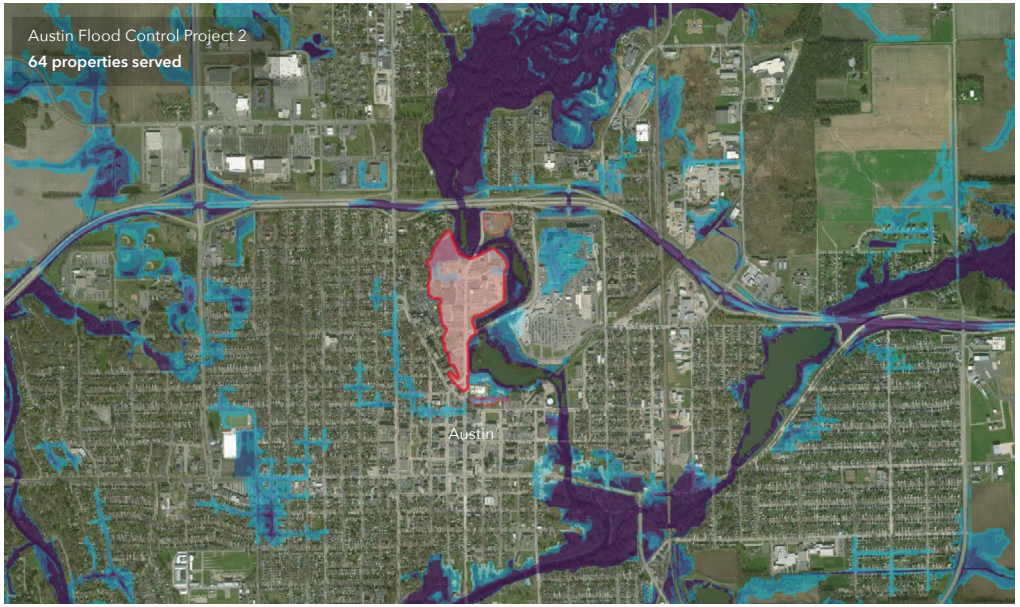
26,200

Properties served by protection measures

The First Street Foundation Flood Model incorporates 148 flood control measures throughout the state which protect 26,200 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee • Austin Flood Control Project 2	26,150
Dike Perley	144
Detention basin Browns Valley floodway project	9
Rain garden The Rose Apartments Stormwater Plan, Minneapolis	1



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Mississippi

Flood risk is increasing in the state of Mississippi. 255,700 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 9.8%, bringing the total number of properties with substantial risk to 280,700.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 249,700 properties as having substantial risk in the state of Mississippi. In comparison, the First Street Foundation Flood Model identifies nearly 6,000 properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 5,900 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 31,000 by the year 2050.

Total properties at substantial risk*

In 2020
255,700

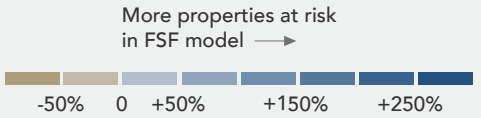
In 2050
280,700

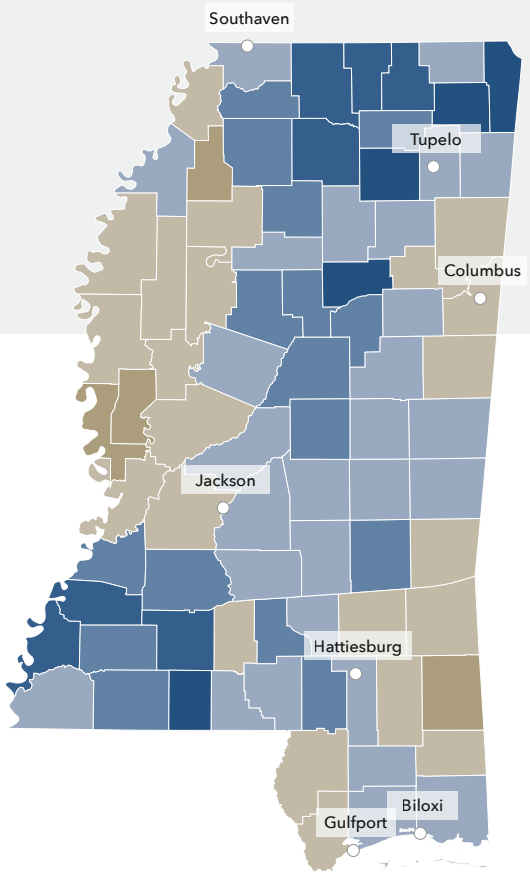
30-year change
▲ +25,000 (+10%)

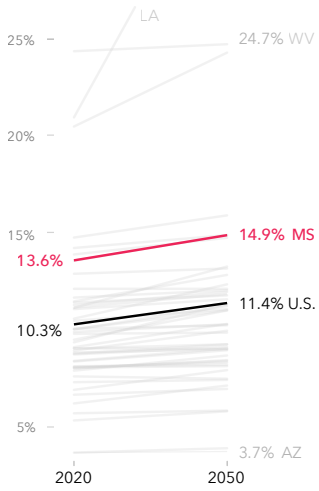
Biloxi and the Mississippi Gulf Coast are especially exposed to storm surge and wave action during hurricane season, when heavy rains and tropical storms cause rivers, streams, and tributaries to overflow. The Mississippi, Yazoo, and Big Black Rivers flow through and alongside Warren County, which is subject to recurrent, large-scale flooding from frequent overflow.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +5,900







Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Mississippi has a greater proportion of properties at substantial risk, with 13.6% at substantial risk today and 14.9% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Mississippi

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 352,100 properties in Mississippi as at risk over the next 30 years. Of these properties, 78,300 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Jackson has the greatest number of properties at risk of flooding in the state with 10,300 currently at risk, or 14% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 98% of properties in Pascagoula are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Ocean Springs, for example, will see a 166% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Mississippi at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Jackson	10,287	14%	10,918	15%	+631	+6.1%
Gulfport	10,079	30%	14,825	44%	+4,746	+47.1%
Bay St. Louis	9,826	84%	10,268	88%	+442	+4.5%
Pascagoula	9,706	98%	9,718	98%	+12	+0.1%
Biloxi	9,461	52%	13,359	73%	+3,898	+41.2%
Waveland	7,482	91%	7,649	93%	+167	+2.2%
Greenwood	6,427	90%	6,624	93%	+197	+3.1%
Moss Point	6,310	73%	7,167	83%	+857	+13.6%
Gautier	6,298	61%	7,194	70%	+896	+14.2%
Hattiesburg	5,685	27%	6,019	29%	+334	+5.9%

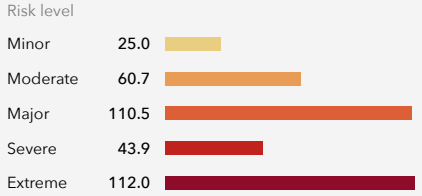
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Pascagoula	9,706	98%	9,718	98%	+12	+0.1%
Waveland	7,482	91%	7,649	93%	+167	+2.2%
Greenwood	6,427	90%	6,624	93%	+197	+3.1%
Bay St. Louis	9,826	84%	10,268	88%	+442	+4.5%
Pass Christian	5,010	79%	5,219	82%	+209	+4.2%
Moss Point	6,310	73%	7,167	83%	+857	+13.6%
Escatawpa	1,384	63%	1,865	84%	+481	+34.8%
Gautier	6,298	61%	7,194	70%	+896	+14.2%
D'Iberville	2,345	59%	3,034	76%	+689	+29.4%
Gulf Park Estates	2,154	56%	3,548	93%	+1,394	+64.7%

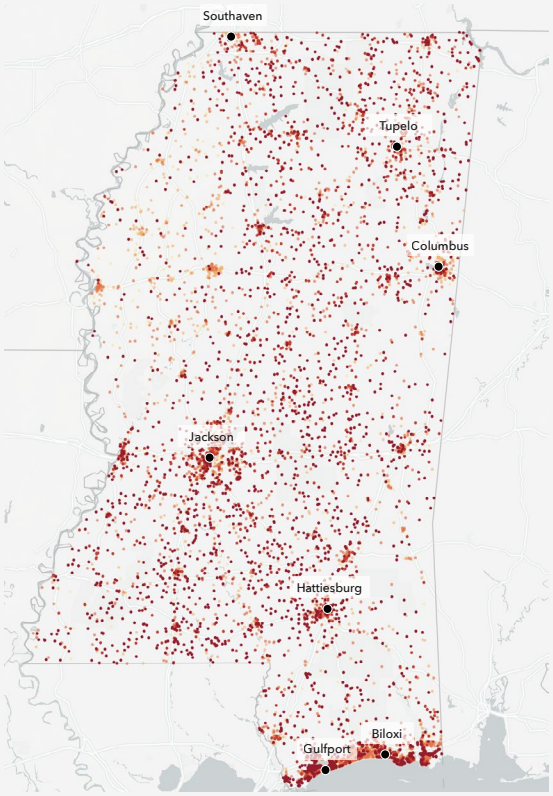
Greatest relative growing risk*

Municipality	2020		2050		Change	
Ocean Springs	1,824	21%	4,847	57%	+3023	+166%
Gulf Hills	709	18%	1,337	34%	+628	+89%
Gulf Park Estates	2,154	56%	3,548	93%	+1394	+65%
Gulfport	10,079	30%	14,825	44%	+4,746	+47%
Long Beach	2,810	37%	4,127	54%	+1317	+47%
Biloxi	9,461	52%	13,359	73%	+3,898	+41%
Latimer	347	10%	473	14%	+126	+36%
Escatawpa	1,384	63%	1,865	84%	+481	+35%
D'Iberville	2,345	59%	3,034	76%	+689	+29%
St. Martin	1,852	55%	2,326	69%	+474	+26%

Flood Factor distribution of properties at risk* (1000s)



More than 18.7% of individual properties and properties in Mississippi are at any risk of flooding over the next 30 years. Out of those at risk 76% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Mississippi

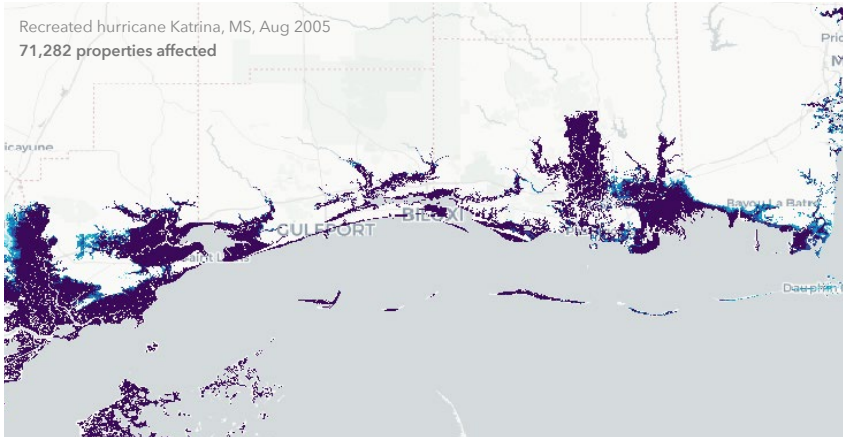
Claims History

1,087,200 home and property owners in Mississippi have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Harrison, Jackson, Hancock, Jones, and Forrest counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 4 flooding events that have occurred since the year 2000 in the state of Mississippi. These events flooded around 119,760 properties across the state.**

Flood event	Date	# Properties affected
Hurricane Isidore	Sep 2002	14,260
• Hurricane Katrina	Aug 2005	71,282
Hurricane Gustav	Aug 2008	17,519
Hurricane Isaac	Aug 2012	16,703



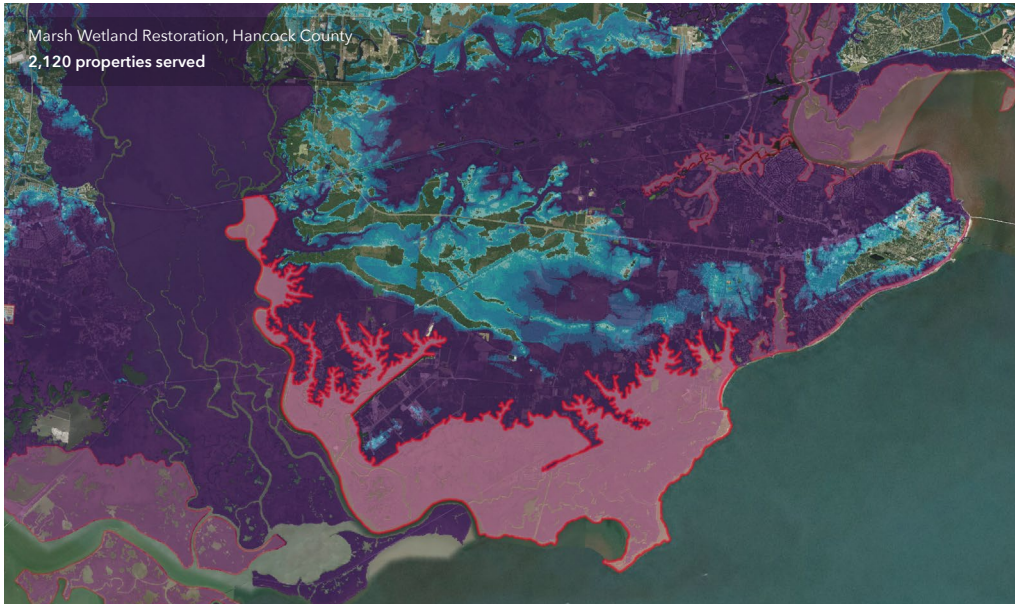
164,100

Properties served by protection measures

The First Street Foundation Flood Model incorporates 160 flood control measures throughout the state which protect 164,100 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee MS East	149,951
Marsh/wetland Restoration • Hancock County Marsh	6,860
Culvert Biloxi Infrastructure Repair Program North Contract, Biloxi	4,603
Channel Sowashee Flood Control Project, Meridian	1,771
Dune Waveland Dune System, Bay St. Louis	331



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Missouri

Flood risk is increasing in the state of Missouri. 280,200 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 1.8%, bringing the total number of properties with substantial risk to 285,400.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 157,900 properties as having substantial risk in the state of Missouri. In comparison, the First Street Foundation Flood Model identifies 1.8 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 122,300 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 127,500 by the year 2050.

Total properties at substantial risk*

In 2020
280,200

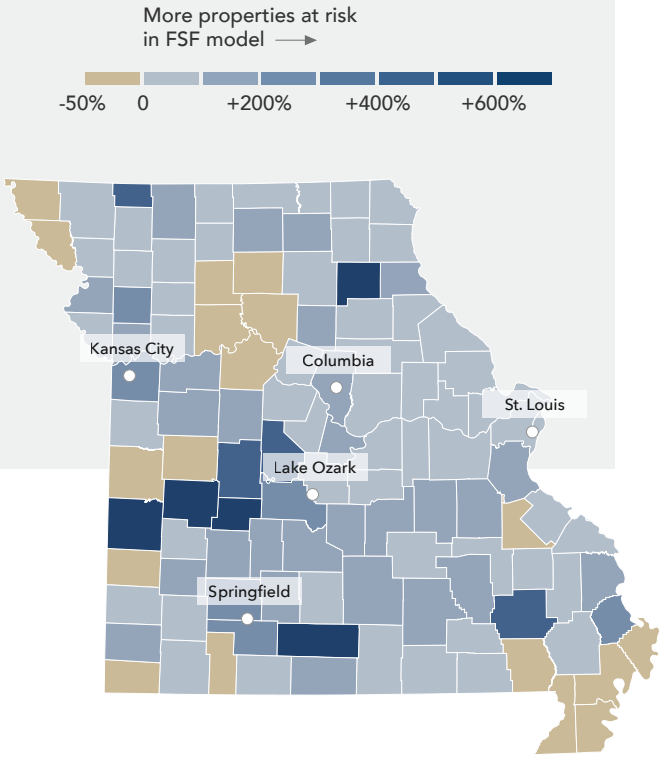
In 2050
285,400

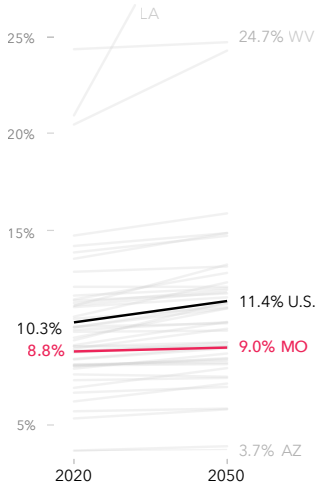
30-year change
▲ +5,200 (+2%)

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +122,300

St. Louis faces floods where the Missouri, Illinois, and Meramec rivers meet the Mississippi. Levees mitigate riverine flooding, but are frequently overwhelmed. Springfield and Greene counties see flooding from urbanization, and the rolling topography of Springfield, which allows runoff to gain momentum, causing flash floods. Inadequate drainage and clogged ditches and channels also contribute to flooding during intense rainfall.





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Missouri has a smaller proportion of properties at substantial risk, with 8.8% at substantial risk today and 9% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Missouri

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 355,200 properties in Missouri as at risk over the next 30 years. Of these properties, 96,700 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Kansas City has the greatest number of properties at risk of flooding in the state with 14,900 currently at risk, or 8% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 33% of properties in Valley Park are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Pacific, for example, will see a 14% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Missouri at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Kansas City	14,927	8%	14,937	8%	+10	+0.1%
St. Louis	13,149	10%	13,644	11%	+495	+3.8%
Springfield	3,623	6%	3,775	6%	+152	+4.2%
St. Joseph	3,549	11%	3,580	12%	+31	+0.9%
O'Fallon	3,451	11%	3,513	11%	+62	+1.8%
Independence	3,389	7%	3,383	7%	-6	-0.2%
St. Charles	3,150	12%	3,227	12%	+77	+2.4%
Jefferson City	2,369	14%	2,400	14%	+31	+1.3%
Columbia	2,338	6%	2,344	6%	+6	+0.3%
Lee's Summit	2,280	6%	2,270	6%	-10	-0.4%

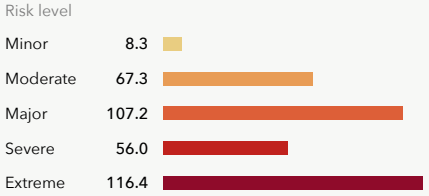
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Valley Park	918	33%	926	34%	+8	+0.9%
Osage Beach	1,104	28%	1,109	28%	+5	+0.5%
Waynesville	496	22%	499	22%	+3	+0.6%
Poplar Bluff	1,823	21%	1,890	22%	+67	+3.7%
Charleston	440	21%	468	22%	+28	+6.4%
Lake Ozark	578	21%	580	21%	+2	+0.3%
Scott City	442	20%	459	20%	+17	+3.8%
De Soto	557	18%	564	19%	+7	+1.3%
Hannibal	1,459	18%	1,451	18%	-8	-0.5%
Branson	1,534	16%	1,536	16%	+2	+0.1%

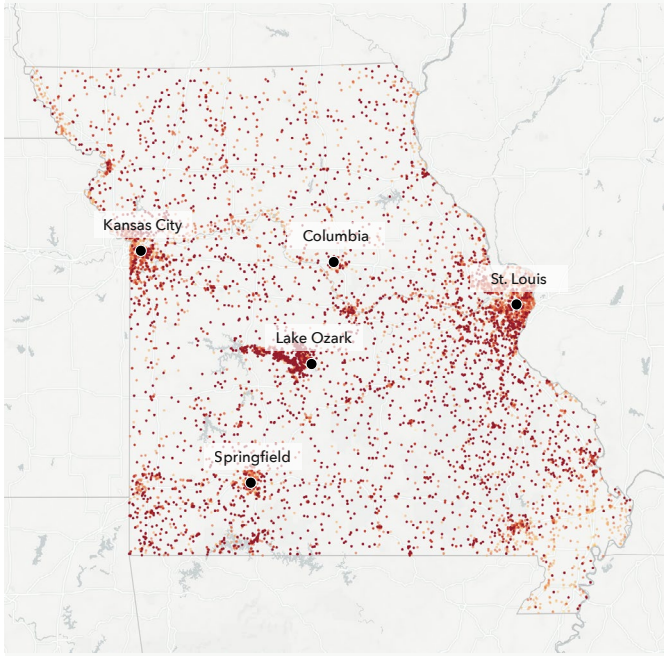
Greatest relative growing risk*

Municipality	2020		2050		Change	
Pacific	413	14%	470	16%	+57	+14%
Caruthersville	294	10%	328	11%	+34	+12%
Herculaneum	175	9%	193	9%	+18	+10%
Ellisville	202	6%	220	6%	+18	+9%
Marshfield	149	5%	162	5%	+13	+9%
Butler	61	3%	66	3%	+5	+8%
Malden	288	11%	311	12%	+23	+8%
Kennett	741	15%	798	16%	+57	+8%
Richmond Heights	429	12%	459	13%	+30	+7%
Farmington	310	6%	331	6%	+21	+7%

Flood Factor distribution of properties at risk* (1000s)



More than 11.2% of individual properties and properties in Missouri are at any risk of flooding over the next 30 years. Out of those at risk 79% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Missouri

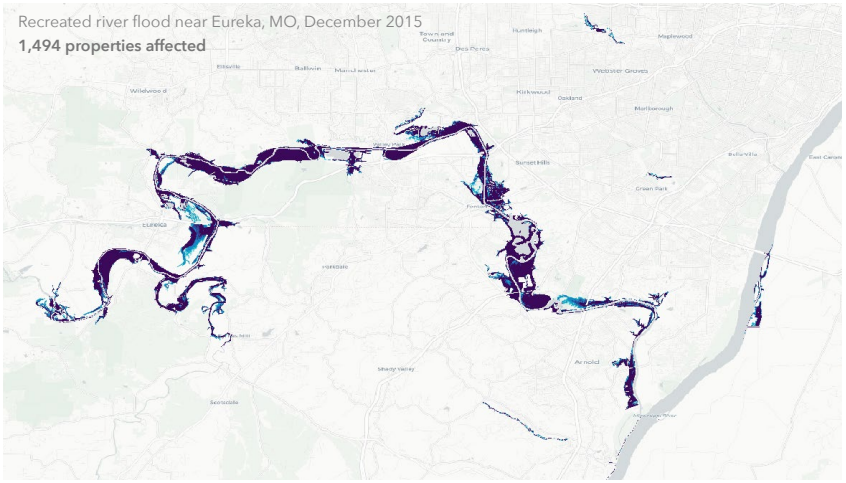
Claims History

106,400 home and property owners in Missouri have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in St. Louis, Jasper, Newton, Jefferson, and St. Louis counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 2 flooding events that have occurred since the year 2000 in the state of Missouri. These events flooded around 3,300 properties across the state.**

Flood event	Date	# Properties affected
• River flood near Eureka, MO	Dec 2015	1,494
River flood in Northwest MO	Mar 2019	1,812



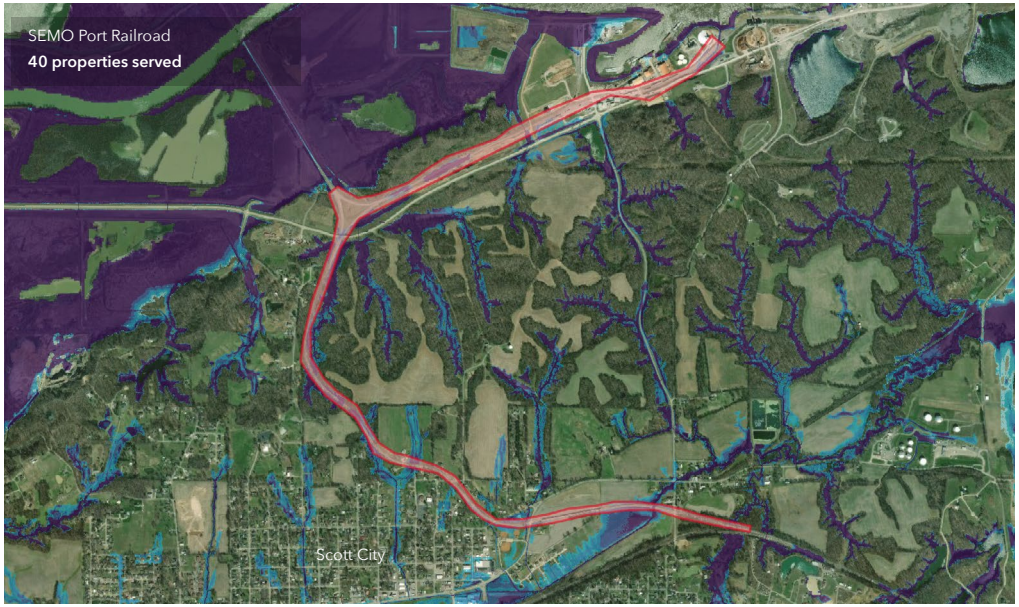
116,600

Properties served by protection measures

The First Street Foundation Flood Model incorporates 372 flood control measures throughout the state which protect 116,600 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee Commerce-St Francis River System	109,570
Channel Blue River Channel	6,590
Rain garden Middle Blue River Basin Green Solutions Pilot Project	445
Elevated road • SEMO Port Railroad	53
Detention basin Drury Basin	32



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Montana

Flood risk is increasing in the state of Montana. 122,600 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 4.7%, bringing the total number of properties with substantial risk to 128,300.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 29,800 properties as having substantial risk in the state of Montana. In comparison, the First Street Foundation Flood Model identifies 4.1 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 92,700 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 98,400 by the year 2050.

Total properties at substantial risk*

In 2020
122,600

In 2050
128,300

30-year change
▲ +5,700 (+5%)

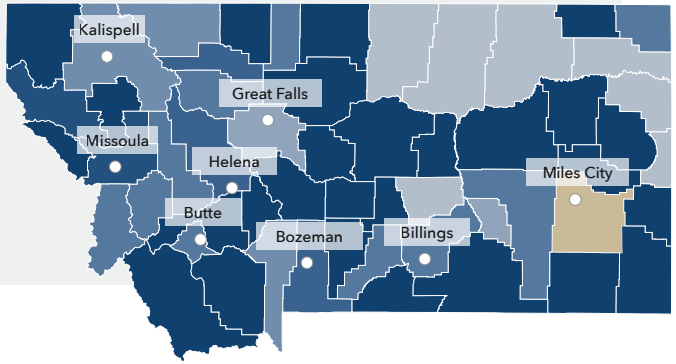
Difference in number of properties currently at substantial risk compared to FEMA**

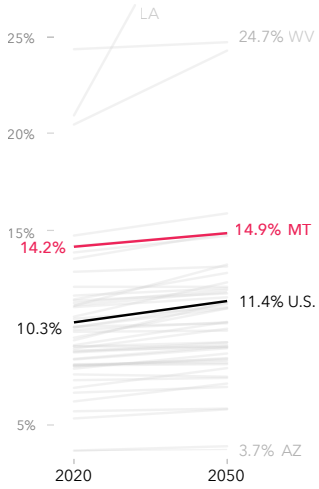
▲ +92,700

More properties at risk in FSF model →

-50% +200% +400% +600%

Missoula sees severe floods in spring and summer from snowmelt runoff and rainfall that overwhelms Clark Fork River. Four levees protect it, but low-lying areas and those with poor drainage face riverine flooding and rainwater runoff. Yellowstone River threatens nearby Billings in spring and summer from snowmelt and rainfall runoff. Snowmelt from surrounding mountains inundates creeks and ice jams to overwhelm drainage systems.





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Montana has a greater proportion of properties at substantial risk, with 14.2% at substantial risk today and 14.9% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Montana

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 181,700 properties in Montana as at risk over the next 30 years. Of these properties, 26,000 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Missoula has the greatest number of properties at risk of flooding in the state with 6,600 currently at risk, or 27% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 81% of properties in Evergreen are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Belgrade, for example, will see a 26% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Montana at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Missoula	6,607	27%	7,063	29%	+456	+6.9%
Billings	6,506	14%	6,881	15%	+375	+5.8%
Great Falls	3,405	15%	3,489	15%	+84	+2.5%
Butte-Silver Bow	2,756	13%	2,929	14%	+173	+6.3%
Bozeman	2,610	19%	2,727	20%	+117	+4.5%
Anaconda	2,458	33%	2,554	34%	+96	+3.9%
Evergreen	2,338	81%	2,389	83%	+51	+2.2%
Kalispell	1,924	19%	2,023	20%	+99	+5.1%
Helena Valley West Central	1,598	44%	1,668	46%	+70	+4.4%
Miles City	1,581	40%	1,698	43%	+117	+7.4%

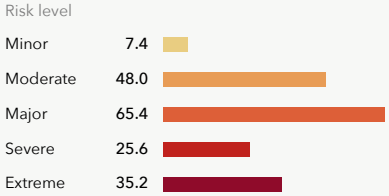
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Evergreen	2,338	81%	2,389	83%	+51	+2.2%
Red Lodge	1,071	51%	1,105	53%	+34	+3.2%
Helena Valley West Central	1,598	44%	1,668	46%	+70	+4.4%
Miles City	1,581	40%	1,698	43%	+117	+7.4%
Lewistown	1,015	33%	1,054	35%	+39	+3.8%
Anaconda	2,458	33%	2,554	34%	+96	+3.9%
Four Corners	777	32%	817	33%	+40	+5.1%
Helena Valley Southeast	836	30%	906	33%	+70	+8.4%
Missoula	6,607	27%	7,063	29%	+456	+6.9%
Orchard Properties	522	26%	561	28%	+39	+7.5%

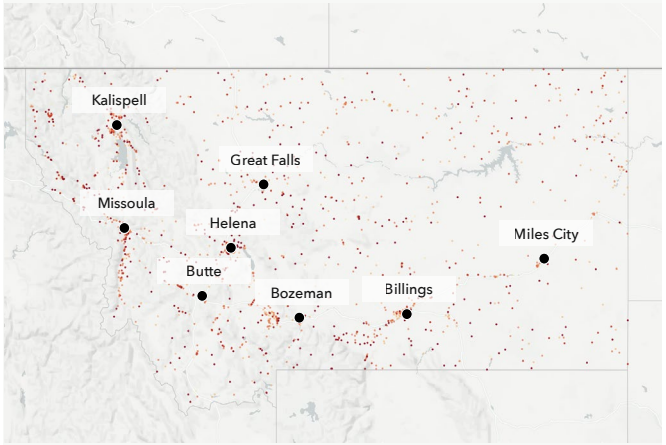
Greatest relative growing risk*

Municipality	2020		2050		Change	
Belgrade	275	7%	346	9%	+71	+26%
Polson	334	12%	369	13%	+35	+11%
Big Sky	379	11%	411	12%	+32	+8%
Helena Valley Southeast	836	30%	906	33%	+70	+8%
Orchard Homes	522	26%	561	28%	+39	+8%
Miles City	1,581	40%	1,698	43%	+117	+7%
Missoula	6,607	27%	7,063	29%	+456	+7%
Hamilton	356	17%	380	18%	+24	+7%
Butte-Silver Bow	2,756	13%	2,929	14%	+173	+6%
Whitefish	1,068	18%	1,134	20%	+66	+6%

Flood Factor distribution of properties at risk* (1000s)



More than 21.1% of individual properties and properties in Montana are at any risk of flooding over the next 30 years. Out of those at risk 69% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Montana

Claims History

6,300 home and property owners in Montana have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Big Horn, Fergus, Valley, Blaine, and Yellowstone counties.

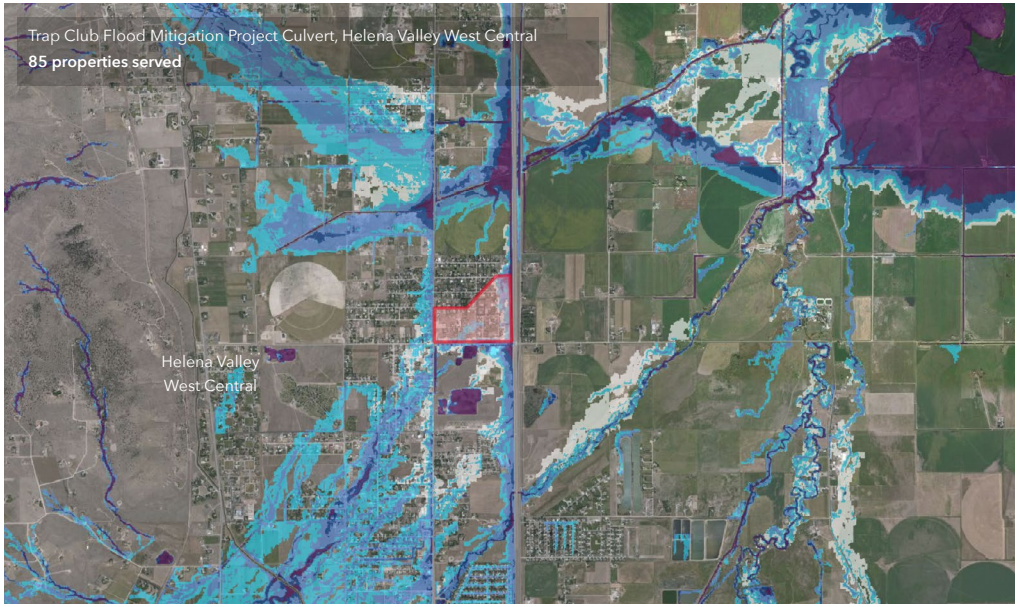
10,600

Properties served by protection measures

The First Street Foundation Flood Model incorporates 86 flood control measures throughout the state which protect 10,600 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee Tongue River Levee - Pacific Av to Yellowstone Riv, Miles City	10,167
Dike Belt Creek Dike, Belt	178
Culvert Trap Club Flood Mitigation Project, Helena Valley West Central	85
Ditch Nutting Ditch, Laurel	107
Channel Edwards Gulch, Drummond	30



* Source: Fema.gov

State Overview
Nebraska

Flood risk is increasing in some areas in the state of Nebraska while decreasing in others. Over the next 30 years approximately 102,000 properties have a substantial risk* of flooding.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 74,400 properties as having substantial risk in the state of Nebraska. In comparison, the First Street Foundation Flood Model identifies 1.4 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 28,100 properties currently not identified by FEMA as having substantial risk.

Total properties at substantial risk*

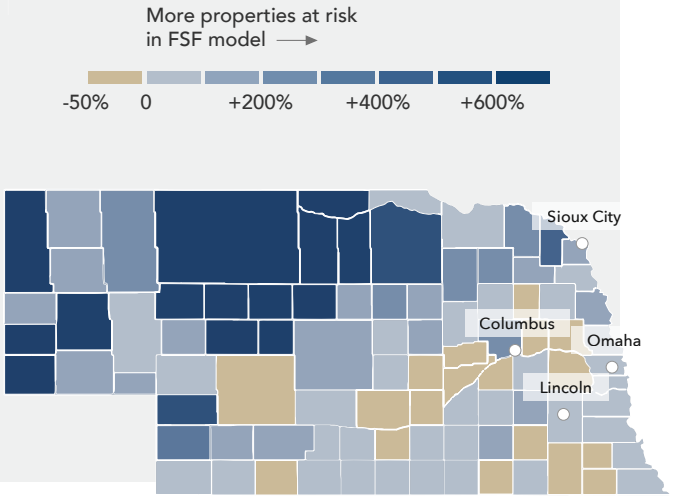
In 2020
102,000

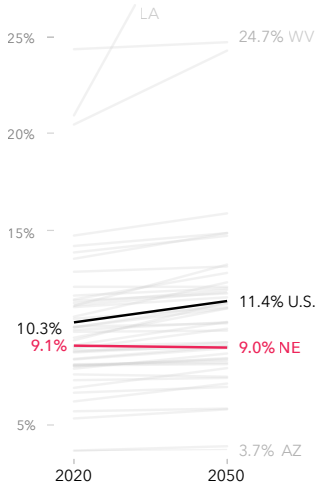
In 2050
102,000

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +28,100

Nebraska's flat terrain results in wide floodplains. Most floods occur from April to June, when rapid snowmelt and rainfall runoff are aggravated by ice jams. The Missouri River was a major flood threat for eastern Omaha that a series of dams and reservoirs upstream have helped mitigate. The completion of the Omaha levee and floodwall along the river also protects the area.





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Nebraska has a smaller proportion of properties at substantial risk, with 9.1% at substantial risk today and 9% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Nebraska

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 149,300 properties in Nebraska as at risk over the next 30 years. Of these properties, 23,600 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Omaha has the greatest number of properties at risk of flooding in the state with 12,600 currently at risk, or 8% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 45% of properties in Columbus are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Schuyler, for example, will see a 56% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Nebraska at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Omaha	12,616	8%	12,630	8%	+14	+0.1%
Lincoln	7,923	9%	7,970	9%	+47	+0.6%
Columbus	4,171	45%	4,185	45%	+14	+0.3%
Fremont	4,092	40%	4,188	41%	+96	+2.3%
Grand Island	2,991	15%	3,098	16%	+107	+3.6%
Norfolk	2,305	23%	2,329	23%	+24	+1.0%
Bellevue	1,840	10%	1,843	10%	+3	+0.2%
South Sioux City	1,288	30%	1,325	31%	+37	+2.9%
Scottsbluff	962	15%	986	15%	+24	+2.5%
Cozad	921	45%	927	45%	+6	+0.7%

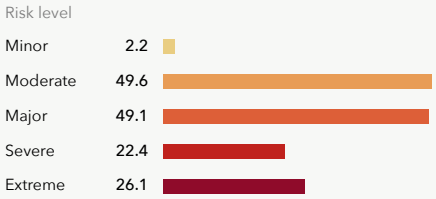
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Columbus	4,171	45%	4,185	45%	+14	+0.3%
Cozad	921	45%	927	45%	+6	+0.7%
Fremont	4,092	40%	4,188	41%	+96	+2.3%
South Sioux City	1,288	30%	1,325	31%	+37	+2.9%
Crete	684	28%	684	28%	+0	+0.0%
Norfolk	2,305	23%	2,329	23%	+24	+1.0%
Ogallala	494	18%	494	18%	+0	+0.0%
Sidney	667	18%	674	18%	+7	+1.0%
Plattsmouth	508	17%	508	17%	+0	+0.0%
Grand Island	2,991	15%	3,098	16%	+107	+3.6%

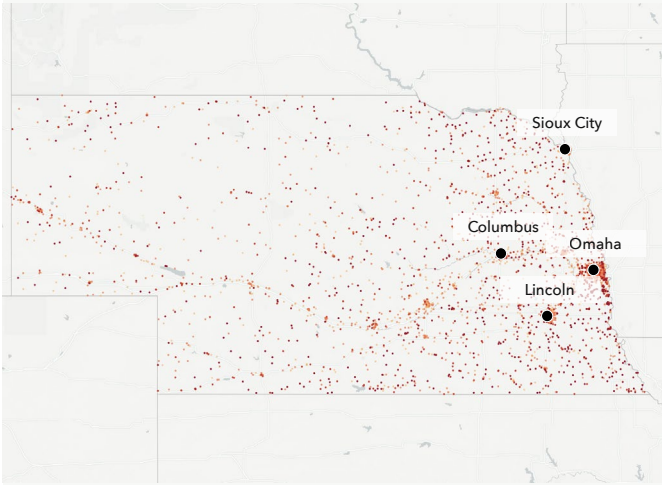
Greatest relative growing risk*

Municipality	2020		2050		Change	
Schuyler	41	2%	64	3%	+23	+56%
Grand Island	2,991	15%	3,098	16%	+107	+4%
Falls City	68	3%	70	3%	+2	+3%
South Sioux City	1,288	30%	1,325	31%	+37	+3%
Scottsbluff	962	15%	986	15%	+24	+3%
Fremont	4,092	40%	4,188	41%	+96	+2%
Blair	370	10%	375	10%	+5	+1%
Lexington	442	13%	448	14%	+6	+1%
Wayne	187	9%	189	9%	+2	+1%
York	445	12%	450	12%	+5	+1%

Flood Factor distribution of properties at risk* (1000s)



More than 13.2% of individual properties and properties in Nebraska are at any risk of flooding over the next 30 years. Out of those at risk 65% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Nebraska

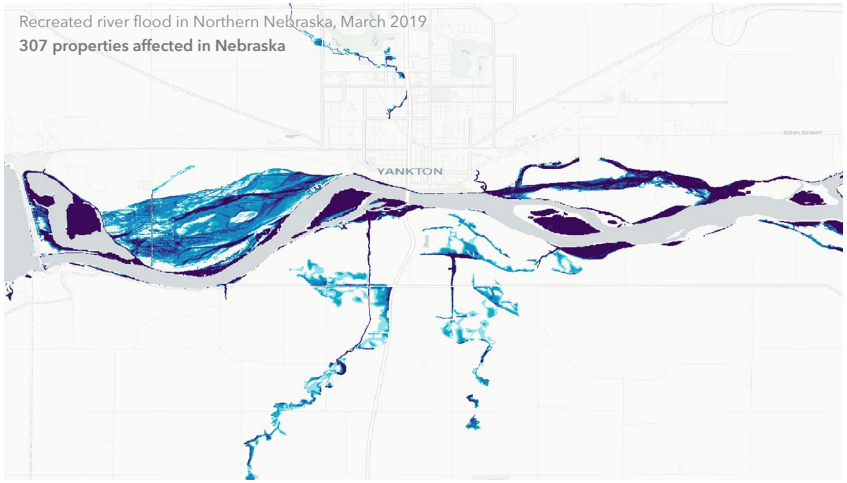
Claims History

25,300 home and property owners in Nebraska have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Douglas, Dodge, Washington, Saunders, and Sarpy counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 3 flooding events that have occurred since the year 2000 in the state of Nebraska. These events flooded around 13,130 properties across the state.**

Flood event	Date	# Properties affected
River flood in Northeast Nebraska	Jun 2014	96
River Flood across eastern Nebraska	Mar 2019	12,727
• River flood in Northern Nebraska	Mar 2019	307



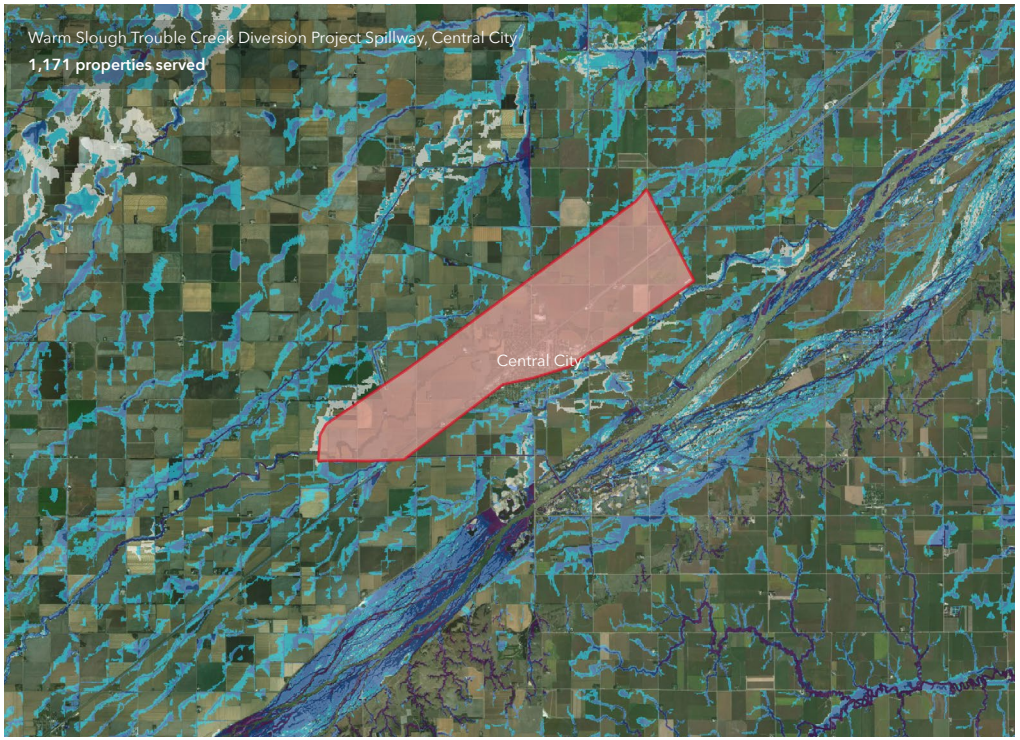
38,600

Properties served by protection measures

The First Street Foundation Flood Model incorporates 152 flood control measures throughout the state which protect 38,600 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee Norfolk - Elkhorn RB, Norfolk	37,263
Spillway • Warm Slough/Trouble Creek diversion project, Central City	1,346
Dam Gavins Point Dam, Crofton	3



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Nevada

Flood risk is increasing in the state of Nevada. 44,600 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 6.1%, bringing the total number of properties with substantial risk to 47,300.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 41,300 properties as having substantial risk in the state of Nevada. In comparison, the First Street Foundation Flood Model identifies 1.1 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 3,300 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 6,000 by the year 2050.

Total properties at substantial risk*

In 2020
44,600

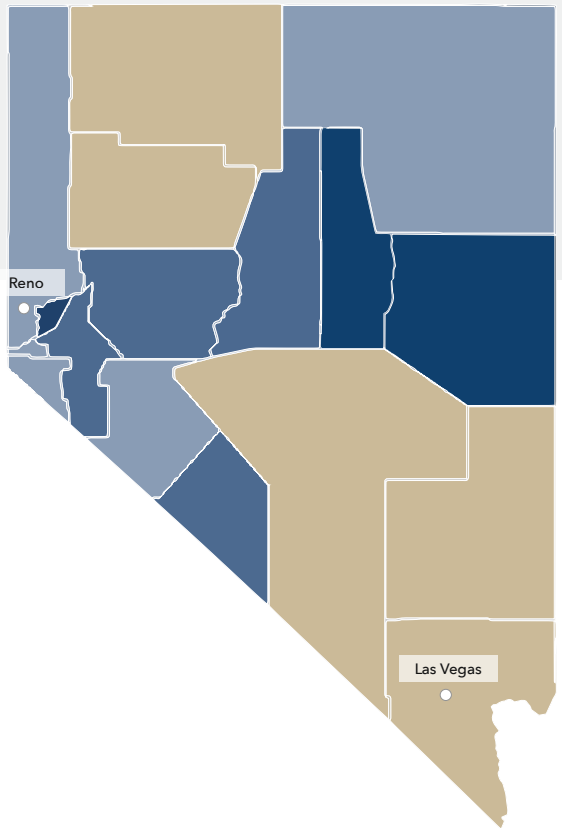
In 2050
47,300

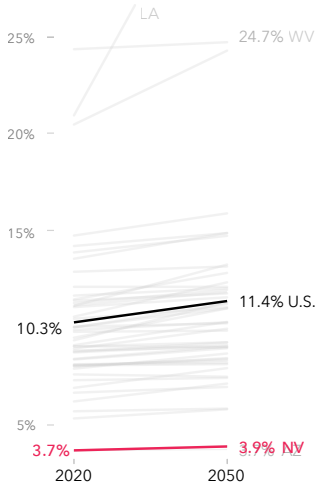
30-year change
▲ +2,700 (+6%)

Flooding in Nevada typically arrives in the form of flash floods caused by sudden and intense rainfall events. The southern part of the state, including Las Vegas, experiences flooding all year round but the hot summer months bring lightning, thunder, and rain, which lead to dramatic runoff events that concentrate in the urbanized areas at lower elevations.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +3,296





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Nevada has a smaller proportion of properties at substantial risk, with 3.7% at substantial risk today and 3.9% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Nevada

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 132,000 properties in Nevada as at risk over the next 30 years. Of these properties, 1,000 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Reno has the greatest number of properties at risk of flooding in the state with 14,200 currently at risk, or 17% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 30% of properties in Gardnerville are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Humboldt River Ranch, for example, will see a 19% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Nevada at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Reno	14,214	17%	14,850	18%	+636	+4.5%
Pahrump	12,864	25%	13,348	26%	+484	+3.8%
Las Vegas	11,947	6%	12,235	6%	+288	+2.4%
Henderson	11,706	9%	12,588	10%	+882	+7.5%
North Las Vegas	6,670	8%	6,756	8%	+86	+1.3%
Sparks	5,065	14%	5,670	16%	+605	+11.9%
Enterprise	4,875	7%	5,168	7%	+293	+6.0%
Sunrise Manor	4,031	8%	4,120	8%	+89	+2.2%
Carson City	3,718	19%	3,832	19%	+114	+3.1%
Spring Valley	3,635	6%	3,729	6%	+94	+2.6%

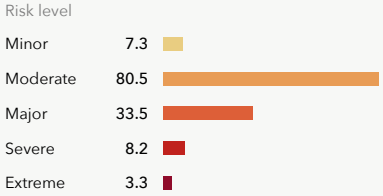
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Gardnerville	749	30%	745	30%	-+4	-0.5%
Lemmon Valley	593	29%	594	29%	+1	+0.2%
Sandy Valley	661	26%	682	27%	+21	+3.2%
Pahrump	12,864	25%	13,348	26%	+484	+3.8%
Ely	580	23%	588	24%	+8	+1.4%
Fernley	1,952	21%	2,147	23%	+195	+10.0%
Carson City	3,718	19%	3,832	19%	+114	+3.1%
Cold Springs	696	18%	738	19%	+42	+6.0%
Laughlin	568	17%	577	18%	+9	+1.6%
Reno	14,214	17%	14,850	18%	+636	+4.5%

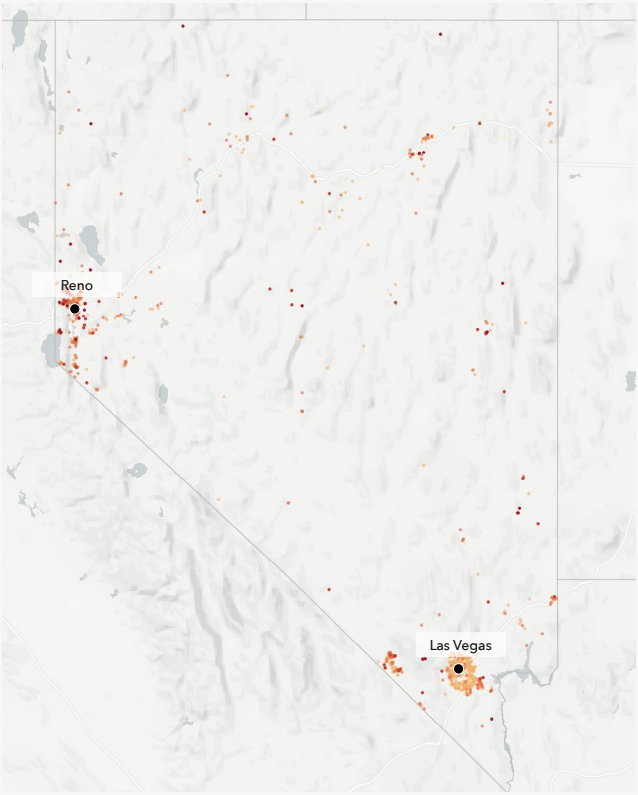
Greatest relative growing risk*

Municipality	2020		2050		Change	
Humboldt River Ranch	117	6%	139	7%	+22	+19%
Winnemucca	103	3%	119	3%	+16	+16%
Sparks	5,065	14%	5,670	16%	+605	+12%
Fernley	1,952	21%	2,147	23%	+195	+10%
Fallon	89	2%	97	3%	+8	+9%
Spring Creek	390	6%	425	7%	+35	+9%
Silver Springs	920	16%	995	17%	+75	+8%
Whitney	501	4%	540	4%	+39	+8%
Winchester	128	2%	138	3%	+10	+8%
Henderson	11,706	9%	12,588	10%	+882	+8%

Flood Factor distribution of properties at risk* (1000s)



More than 10.9% of individual properties and properties in Nevada are at any risk of flooding over the next 30 years. Out of those at risk 34% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

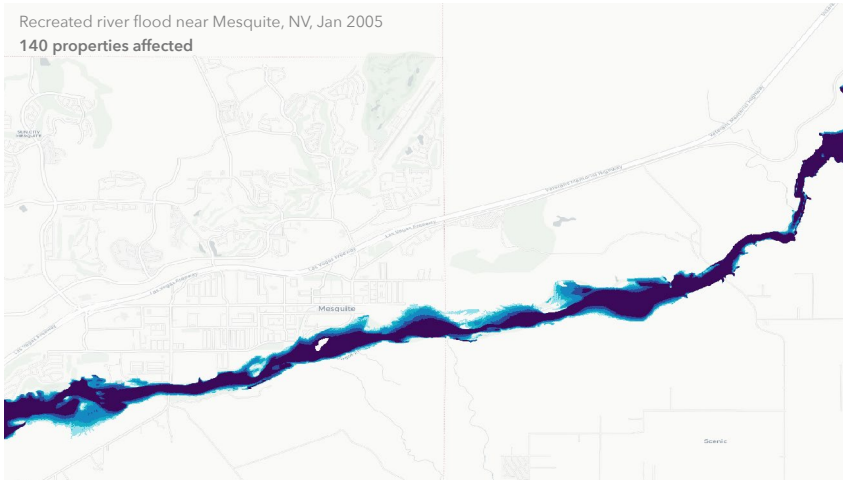
Flood History & Protection
Nevada

Claims History

1,500 home and property owners in Nevada have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Lyon, Churchill, Washoe, Clark, and Douglas counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 1 flooding event that occurred since the year 2000 in the state of Nevada. This event flooded around 140 properties across the state.**



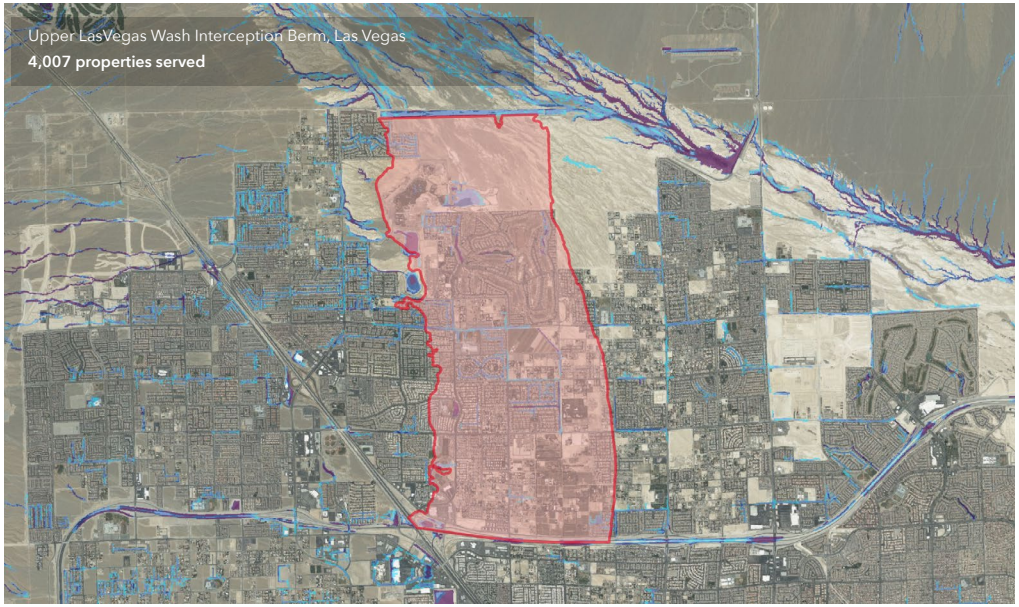
132,800

Properties served by protection measures

The First Street Foundation Flood Model incorporates 17 flood control measures throughout the state which protect 132,800 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Channel North Las Vegas	127,428
Levee • Upper Las Vegas Wash Interception Berm	9,105
Flood wall HESCO structure, Lemmon Valley	1,020
Culvert The rainbow canyon debris flow diversion structure project	96
Earthen berm Swan Lake Berm/Barrier Protection Project, Lemmon Valley	50



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
New Hampshire

Flood risk is increasing in the state of New Hampshire. 64,900 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 4.6%, bringing the total number of properties with substantial risk to 67,900.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 29,000 properties as having substantial risk in the state of New Hampshire. In comparison, the First Street Foundation Flood Model identifies 2.2 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 35,900 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 38,900 by the year 2050.

Total properties at substantial risk*

In 2020
64,900

In 2050
67,900

30-year change
▲ +3,000 (+5%)

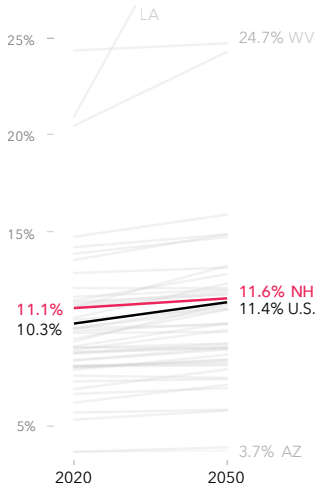
Difference in number of properties currently at substantial risk compared to FEMA**

▲ +35,900

More properties at risk in FSF model →

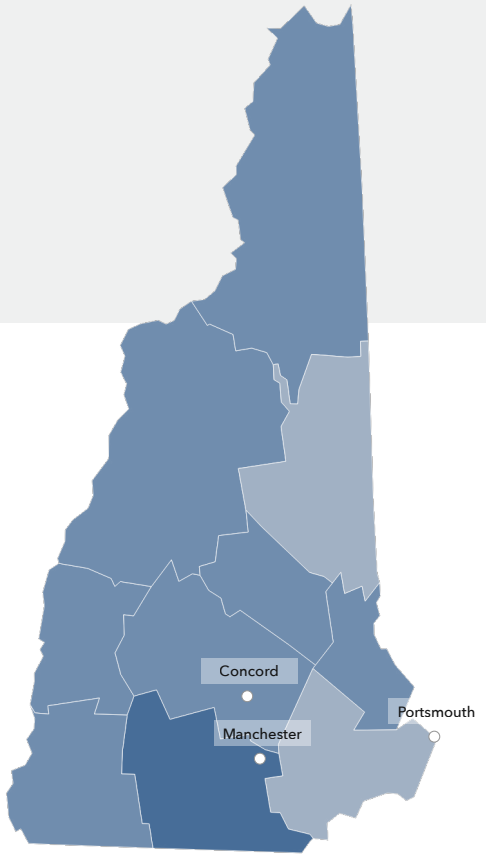
0 +100% +200%

The coast of Rockingham County is susceptible to recurrent flooding from wave action and surge from the Atlantic Ocean, especially during nor'easters and hurricanes. Upstate, the Dead River meets the Androscoggin River in the city of Berlin. Major flooding occurs in Berlin from the Dead River and Androscoggin River in the spring due to rainfall combined with snowmelt particularly in years of heavy snow and rain.



Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. New Hampshire has a greater proportion of properties at substantial risk, with 11.1% at substantial risk today and 11.6% at substantial risk in 2050.



* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
New Hampshire

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 86,800 properties in New Hampshire as at risk over the next 30 years. Of these properties, 28,400 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Manchester has the greatest number of properties at risk of flooding in the state with 4,200 currently at risk, or 14% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 27% of properties in Littleton are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Portsmouth, for example, will see a 36% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in New Hampshire at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Manchester	4,184	14%	4,301	15%	+117	+2.8%
Nashua	2,648	13%	2,770	14%	+122	+4.6%
Keene	1,643	24%	1,684	25%	+41	+2.5%
Concord	1,483	12%	1,526	12%	+43	+2.9%
Laconia	1,481	22%	1,502	22%	+21	+1.4%
Portsmouth	815	13%	1,104	17%	+289	+35.5%
Lebanon	809	19%	820	19%	+11	+1.4%
Claremont	695	14%	707	14%	+12	+1.7%
Dover	648	8%	724	9%	+76	+11.7%
Derry	646	9%	690	10%	+44	+6.8%

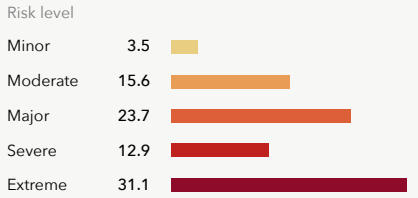
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Littleton	555	27%	567	28%	+12	+2.2%
Keene	1,643	24%	1,684	25%	+41	+2.5%
Laconia	1,481	22%	1,502	22%	+21	+1.4%
Hudson	429	20%	440	20%	+11	+2.6%
Lebanon	809	19%	820	19%	+11	+1.4%
Franklin	496	15%	507	16%	+11	+2.2%
Claremont	695	14%	707	14%	+12	+1.7%
Manchester	4,184	14%	4,301	15%	+117	+2.8%
Berlin	601	13%	606	14%	+5	+0.8%
Hampton	411	13%	549	17%	+138	+33.6%

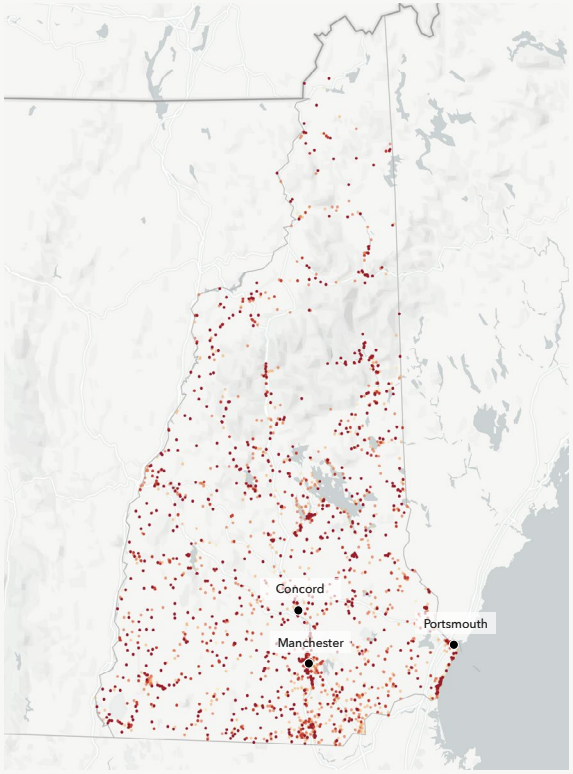
Greatest relative growing risk*

Municipality	2020		2050		Change	
Portsmouth	815	13%	1,104	17%	+289	+36%
Hampton	411	13%	549	17%	+138	+34%
Dover	648	8%	724	9%	+76	+12%
Derry	646	9%	690	10%	+44	+7%
Nashua	2,648	13%	2,770	14%	+122	+5%
Exeter	235	10%	245	10%	+10	+4%
Milford	303	13%	316	13%	+13	+4%
Rochester	609	6%	632	6%	+23	+4%
Londonderry	255	6%	263	6%	+8	+3%
Concord	1,483	12%	1,526	12%	+43	+3%

Flood Factor distribution of properties at risk* (1000s)



More than 14.8% of individual properties and properties in New Hampshire are at any risk of flooding over the next 30 years. Out of those at risk 78% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

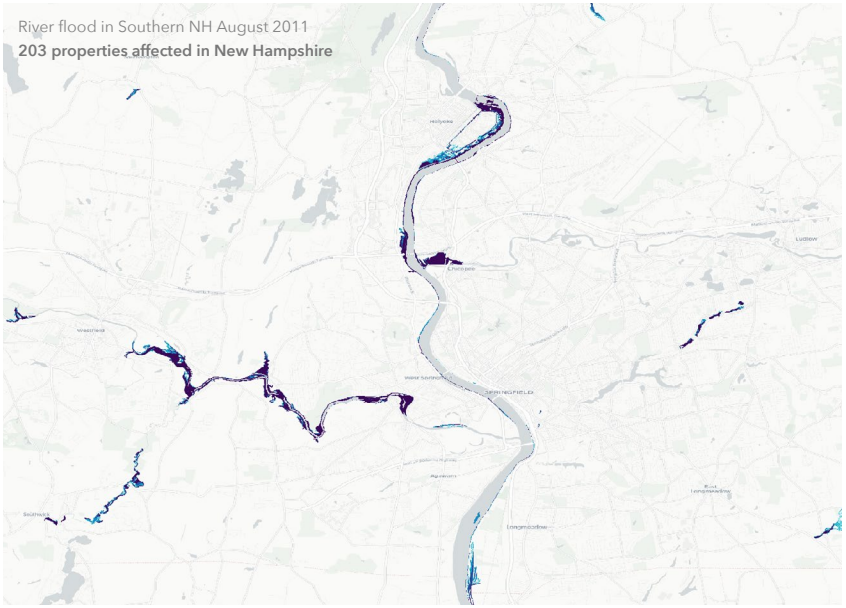
Flood History & Protection
New Hampshire

Claims History

13,800 home and property owners in New Hampshire have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Rockingham, Hillsborough, Strafford, Merrimack, and Cheshire counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 1 flooding event that has occurred since the year 2000 in the state of New Hampshire. This event flooded around 200 properties across the state.**



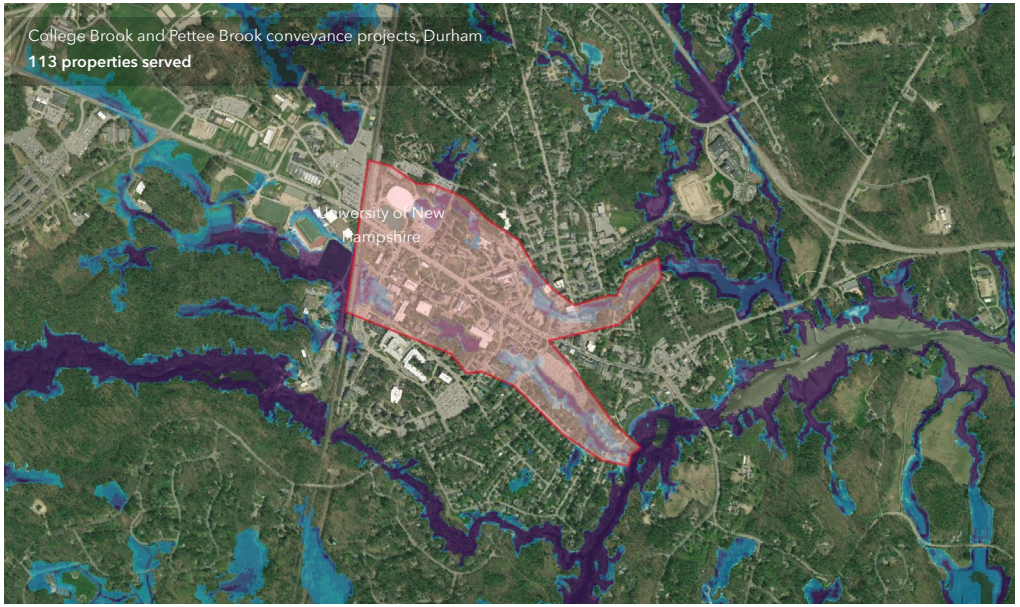
2,000

Properties served by protection measures

The First Street Foundation Flood Model incorporates 17 flood control measures throughout the state which protect 2,000 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee Beaver Bk Dam & Levees & Downtown CI, Keene	1,370
Dike Bartlett Dike	202
Culvert • College Brook and Pettee Brook conveyance projects, Durham	194
Marsh/wetland restoration Awcomin Salt Marsh, Rye	146
Earthen berm Rye Berm along 1A to protect highway	35



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
New Jersey

Flood risk is increasing in the state of New Jersey. 385,400 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 19.1%, bringing the total number of properties with substantial risk to 459,000.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 393,600 properties as having substantial risk in the state of New Jersey. In comparison, the First Street Foundation Flood Model identifies 8,100 fewer of properties as facing this same level of risk. This discrepancy exists because of differences in the methods used to estimate risk. The Foundation's Flood Model uses the current climate data, maps precipitation as a stand-alone risk, and may include adaptation improvements not taken into account by FEMA. When adjusting for future environmental changes, the FEMA gap reverses, with the Foundation model identifying 65,500 properties at risk by the year 2050.

Total properties at substantial risk*

In 2020
385,400

In 2050
459,000

30-year change
▲ +73,600 (+19%)

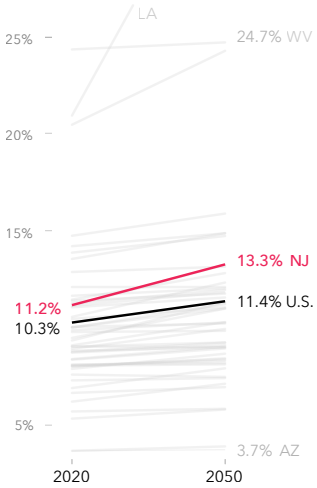
Difference in number of properties currently at substantial risk compared to FEMA**

▼ -8,100

More properties at risk in FSF model →

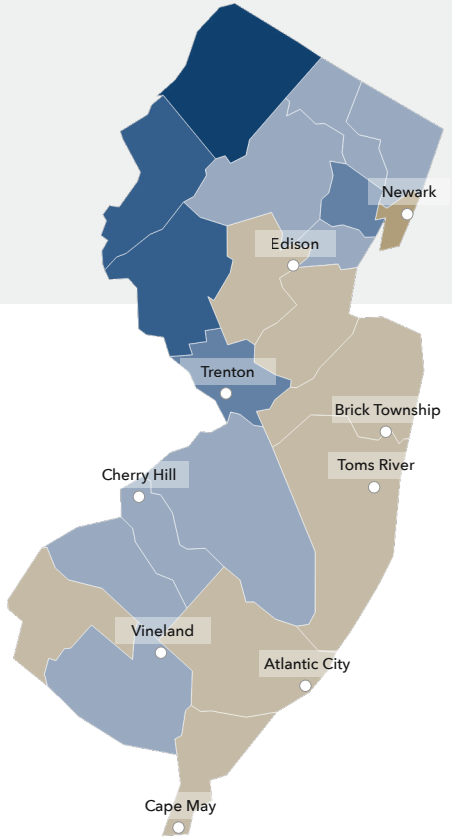
-50% 0 +50% +150%

The Jersey Shore is threatened by major recurrent flooding including nuisance flooding with high tides as well as devastating regional flooding from strong storms, like Hurricane Sandy. The densely populated Raritan River region is threatened by rainfall and riverine flooding. The US Army Corps of Engineers is constructing a massive series of levees to reduce the threat, but a number of towns remain at risk.



Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. New Jersey has a greater proportion of properties at substantial risk, with 11.2% at substantial risk today and 13.3% at substantial risk in 2050.



* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
New Jersey

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 617,300 properties in New Jersey as at risk over the next 30 years. Of these properties, 150,700 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Ocean City has the greatest number of properties at risk of flooding in the state with 17,300 currently at risk, or 81% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 98% of properties in Wildwood are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Bradley Beach, for example, will see a 4140% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in New Jersey at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Ocean City	17,255	81%	19,876	94%	+2,621	+15.2%
Toms River	11,675	26%	14,764	33%	+3,089	+26.5%
Sea Isle City	11,495	86%	12,427	93%	+932	+8.1%
Avalon	10,055	80%	11,880	95%	+1,825	+18.2%
Atlantic City	9,726	79%	11,234	92%	+1,508	+15.5%
Browns Mills	7,195	25%	7,338	25%	+143	+2.0%
Camden	7,000	25%	8,005	28%	+1,005	+14.4%
Newark	6,790	15%	7,818	17%	+1,028	+15.1%
Trenton	6,405	20%	6,725	21%	+320	+5.0%
Margate City	6,188	93%	6,449	97%	+261	+4.2%

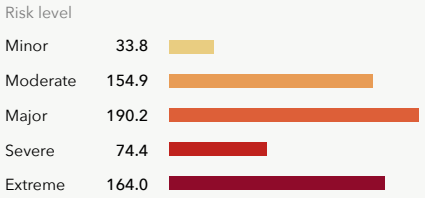
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Wildwood	4,371	98%	4,417	99%	+46	+1.1%
Dover Beaches South	3,456	95%	3,494	96%	+38	+1.1%
Margate City	6,188	93%	6,449	97%	+261	+4.2%
Lavallette	2,732	93%	2,839	96%	+107	+3.9%
Surf City	2,334	91%	2,415	94%	+81	+3.5%
North Wildwood	5,978	90%	6,416	97%	+438	+7.3%
Seaside Heights	2,045	89%	2,247	98%	+202	+9.9%
Burlington	5,133	87%	5,213	88%	+80	+1.6%
Sea Isle City	11,495	86%	12,427	93%	+932	+8.1%
Ship Bottom	1,924	85%	2,119	94%	+195	+10.1%

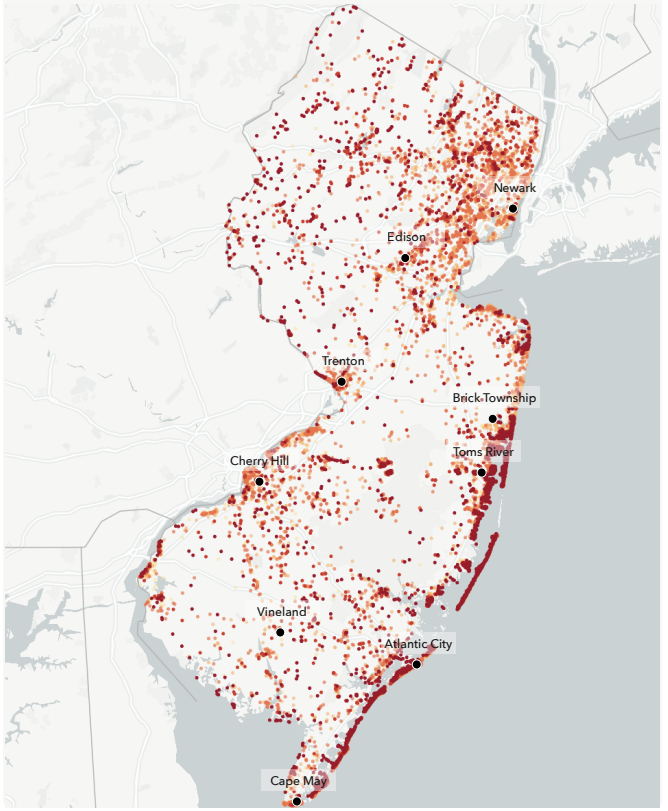
Greatest relative growing risk*

Municipality	2020		2050		Change	
Bradley Beach	20	1%	848	38%	+828	+4140%
Ocean Grove	74	3%	699	32%	+625	+845%
Belmar	243	9%	1,878	68%	+1,635	+673%
Edgewater	250	6%	1,581	40%	+1,331	+532%
Paulsboro	222	8%	1,200	44%	+978	+441%
Asbury Park	343	7%	1,465	32%	+1122	+327%
South Amboy	56	2%	179	6%	+123	+220%
Jersey City	4,668	9%	14,253	26%	+9,585	+205%
Hoboken	4,837	26%	13,672	73%	+8,835	+183%
Pine Beach	161	5%	385	13%	+224	+139%

Flood Factor distribution of properties at risk* (1000s)



More than 17.9% of individual properties and properties in New Jersey are at any risk of flooding over the next 30 years. Out of those at risk 69% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
New Jersey

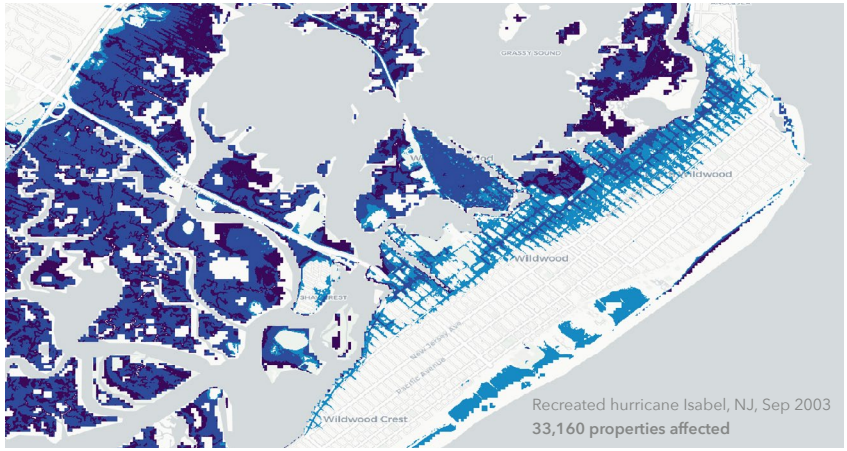
Claims History

588,700 home and property owners in New Jersey have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Ocean, Monmouth, Middlesex, Union, and Essex counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 4 flooding events that have occurred since the year 2000 in the state of New Jersey. These events flooded around 406,870 properties across the state.**

Flood event	Date	# Properties affected
• Hurricane Isabel	Sep 2003	33,160
Nor'easter	Nov 2009	78,650
Hurricane Irene	Aug 2011	86,418
Hurricane Sandy	Oct 2012	208,639



Depth of flooding
0.5 1 2 3+ ft

50,200

Properties served by protection measures

The First Street Foundation Flood Model incorporates 370 flood control measures throughout the state which protect 50,200 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee Raritan Bay & Sandy Hook Bay, Keansburg	15,962
Open space preserve • Clamming Park Preserve,Berkeley Township	14,514
Dune Avalon Dunes 2, Avalon	7,760
Pump station Baltic Avenue Canal, Atlantic City	4,849
Beach nourishment Cape May Beach Nourishment	3,677

Area of protection

Depth of flooding for a simulated 1 in 100 flood event in 2020
0.5 1 2 3+ ft

* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
New Mexico

Flood risk is increasing in the state of New Mexico. 128,800 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 0.7%, bringing the total number of properties with substantial risk to 129,700.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 98,200 properties as having substantial risk in the state of New Mexico. In comparison, the First Street Foundation Flood Model identifies 1.3 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 30,500 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 31,500 by the year 2050.

Total properties at substantial risk*

In 2020
128,800

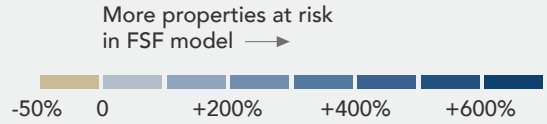
In 2050
129,700

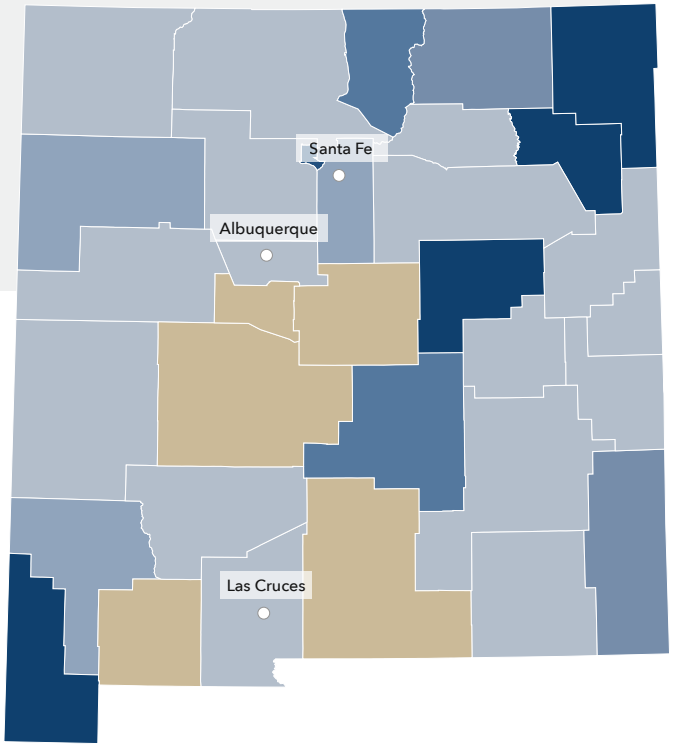
30-year change
▲ +900 (+0.7%)

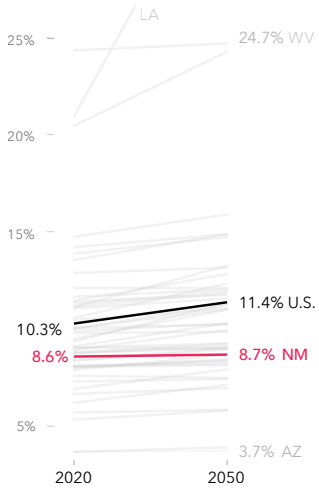
While Albuquerque slopes towards the Rio Grande, rain and thunderstorms can overwhelm a network of arroyos, diversion channels, and stormwater systems, thus leading to flash flooding. To the south, Las Cruces also slopes towards the Rio Grande, but faces monsoons and remnants of tropical storms causing flash floods down those slopes.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +30,500







Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. New Mexico has a smaller proportion of properties at substantial risk, with 8.6% at substantial risk today and 8.7% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
New Mexico

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 219,000 properties in New Mexico as at risk over the next 30 years. Of these properties, 22,000 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Albuquerque has the greatest number of properties at risk of flooding in the state with 16,500 currently at risk, or 9% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 85% of properties in Lovington are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. North Valley, for example, will see a 8% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in New Mexico at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Albuquerque	16,540	9%	17,502	9%	+962	+5.8%
Las Cruces	6,601	18%	6,492	17%	-109	-1.7%
Hobbs	5,152	36%	5,186	36%	+34	+0.7%
Rio Rancho	4,190	6%	4,179	6%	-11	-0.3%
Lovington	4,053	85%	4,131	87%	+78	+1.9%
Carlsbad	3,639	23%	3,618	22%	-21	-0.6%
Artesia	3,281	43%	3,311	43%	+30	+0.9%
Roswell	2,369	11%	2,373	11%	+4	+0.2%
Ruidoso	2,310	20%	2,301	20%	-9	-0.4%
Santa Fe	2,053	6%	2,075	6%	+22	+1.1%

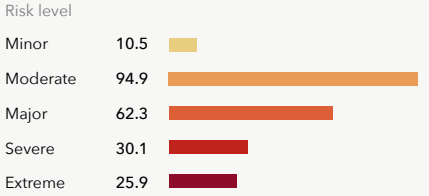
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Lovington	4,053	85%	4,131	87%	+78	+1.9%
Los Ranchos de Albuquerque	1,497	62%	1,539	63%	+42	+2.8%
North Hobbs	1,713	61%	1,725	61%	+12	+0.7%
Artesia	3,281	43%	3,311	43%	+30	+0.9%
Socorro	1,549	38%	1,540	38%	-+9	-0.6%
Hobbs	5,152	36%	5,186	36%	+34	+0.7%
Portales	1,661	32%	1,711	33%	+50	+3.0%
Los Chaves	900	32%	904	32%	+4	+0.4%
North Valley	1,432	30%	1,553	32%	+121	+8.4%
Corrales	1,443	29%	1,483	30%	+40	+2.8%

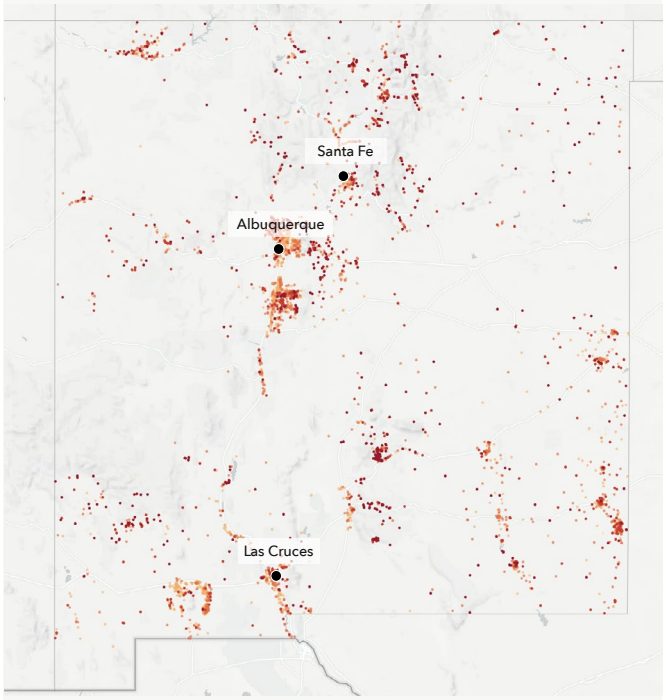
Greatest relative growing risk*

Municipality	2020		2050		Change	
North Valley	1,432	30%	1,553	32%	+121	+8%
Ventura	394	8%	423	9%	+29	+7%
Albuquerque	16,540	9%	17,502	9%	+962	+6%
Aztec	141	5%	149	5%	+8	+6%
Grants	672	13%	700	14%	+28	+4%
Sunshine	246	4%	254	4%	+8	+3%
Farmington	1,225	7%	1,263	7%	+38	+3%
South Valley	1,440	10%	1,484	10%	+44	+3%
Deming	880	6%	906	6%	+26	+3%
Portales	1,661	32%	1,711	33%	+50	+3%

Flood Factor distribution of properties at risk* (1000s)



More than 14.8% of individual properties and properties in New Mexico are at any risk of flooding over the next 30 years. Out of those at risk 53% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

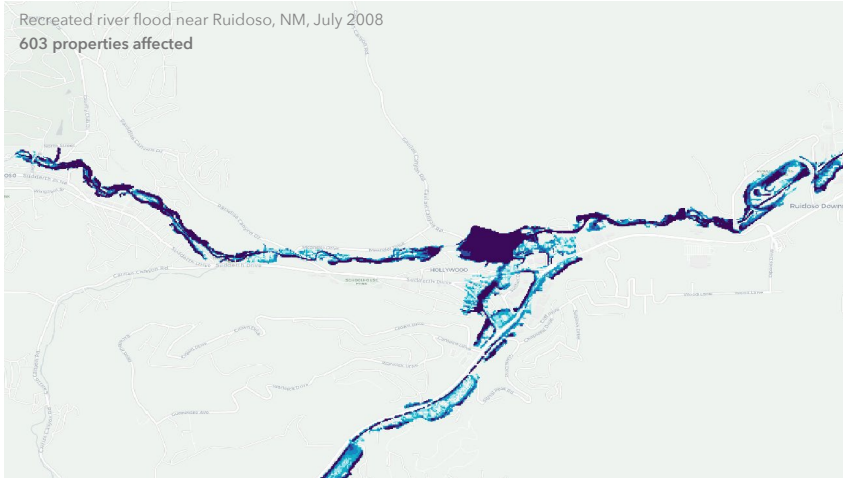
Flood History & Protection
New Mexico

Claims History

3,900 home and property owners in New Mexico have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Curry, Roosevelt, Otero, and Quay counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 1 flooding event that occurred since the year 2000 in the state of New Mexico. This event flooded around 600 properties across the state.**



145,300

Properties served by protection measures

The First Street Foundation Flood Model incorporates 228 flood control measures throughout the state which protect 145,300 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Channel Albuquerque conveyance / drainage system	67,984
Levee Albuquerque Middle Rio Grande, East Levee	76,976
Dam Las Cruces Flood Control Dam	4,961
Detention basin Albuquerque system of storm drains, detention basins, and pump stations	2,159
Pump station • Albuquerque drainage system	3,339

* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
New York

Flood risk is increasing in the state of New York. 615,500 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 11.9%, bringing the total number of properties with substantial risk to 688,800.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 239,000 properties as having substantial risk in the state of New York. In comparison, the First Street Foundation Flood Model identifies 2.6 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 376,500 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 449,800 by the year 2050.

Total properties at substantial risk*

In 2020
615,500

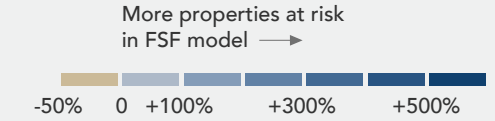
In 2050
688,800

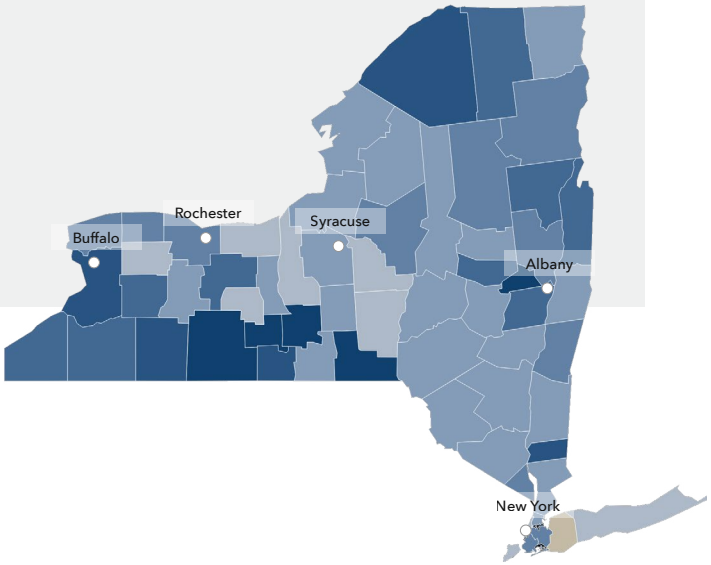
30-year change
▲ +73,300 (+12%)

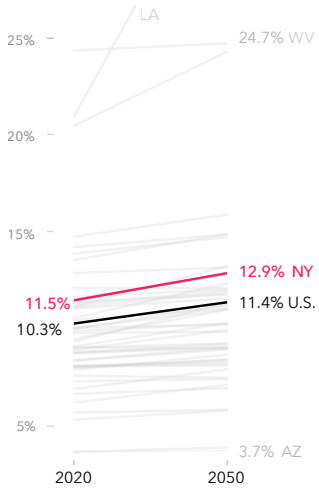
NYC and Long Island are vulnerable to hurricanes and tidal floods. Poor drainage in urbanized areas leaves them susceptible to intense rains. The area is rebuilding infrastructure after Hurricane Sandy, and working on other protection efforts. Upstate, the Great Lakes face rising water levels impacting a number of communities. Flood protection efforts include levees, floodwalls, managed open space, and pervious surfaces to increase infiltration.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +376,500







Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. New York has a greater proportion of properties at substantial risk, with 11.5% at substantial risk today and 12.9% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
New York

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 998,600 properties in New York as at risk over the next 30 years. Of these properties, 172,800 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of New York has the greatest number of properties at risk of flooding in the state with 121,200 currently at risk, or 14% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 75% of properties in Hornell are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Merrick, for example, will see a 172% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in New York at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
New York	121,202	14%	166,875	19%	+45,673	+37.7%
Buffalo	24,613	26%	25,144	27%	+531	+2.2%
Syracuse	7,968	19%	8,264	20%	+296	+3.7%
North Tonawanda	7,590	59%	7,822	61%	+232	+3.1%
Cheektowaga	6,999	25%	7,168	25%	+169	+2.4%
Rochester	6,953	11%	7,150	11%	+197	+2.8%
Binghamton	6,499	41%	6,802	43%	+303	+4.7%
Tonawanda	5,913	26%	5,997	26%	+84	+1.4%
Niagara Falls	5,426	24%	5,654	25%	+228	+4.2%
Elmira	5,380	55%	5,614	57%	+234	+4.3%

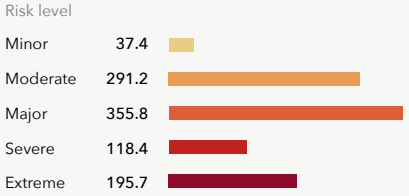
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Hornell	2,757	75%	2,766	75%	+9	+0.3%
Fire Island	2,846	68%	3,222	76%	+376	+13.2%
Port Jervis	2,022	66%	2,051	67%	+29	+1.4%
Conesus Lake	1,237	60%	1,251	61%	+14	+1.1%
North Tonawanda	7,590	59%	7,822	61%	+232	+3.1%
Southport	2,208	59%	2,261	60%	+53	+2.4%
Elmira	5,380	55%	5,614	57%	+234	+4.3%
Ithaca	2,858	53%	2,864	53%	+6	+0.2%
Long Beach	3,750	47%	7,879	99%	+4,129	
Olean	3,028	47%	3,098	48%	+70	

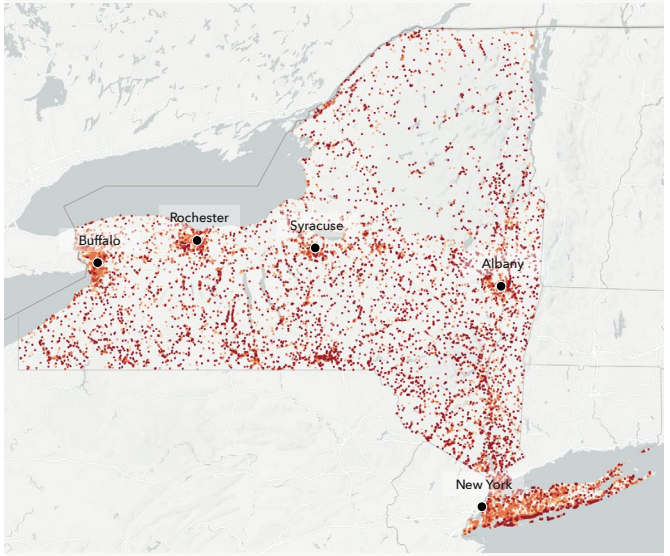
Greatest relative growing risk*

Municipality	2020		2050		Change	
Merrick	1,847	23%	5,016	63%	+3,169	+172%
Baldwin Harbor	940	33%	2,459	87%	+1,519	+162%
Inwood	550	24%	1,222	53%	+672	+122%
East Rockaway	756	27%	1,649	59%	+893	+118%
Oceanside	3,557	33%	7,529	69%	+3,972	+112%
Long Beach	3,750	47%	7,879	99%	+4,129	+110%
Bellmore	2,112	36%	4,260	73%	+2,148	+102%
Woodmere	1,930	36%	3,609	67%	+1,679	+87%
Sag Harbor	294	14%	522	24%	+228	+78%
Massapequa	2,694	35%	4,717	61%	+2,023	+75%

Flood Factor distribution of properties at risk* (1000s)



More than 18.6% of individual properties and properties in New York are at any risk of flooding over the next 30 years. Out of those at risk 67% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
New York

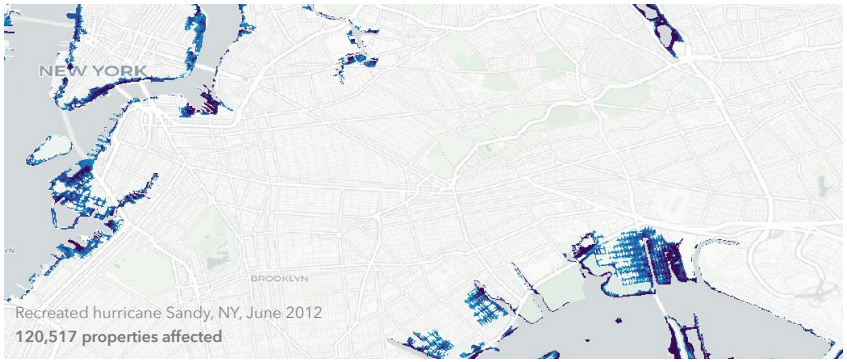
Claims History

571,600 home and property owners in New York have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Nassau, Queens, Kings, Suffolk, and Richmond counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 6 flooding events that have occurred since the year 2000 in the state of New York. These events flooded around 182,580 properties across the state.**

Flood event	Date	# Properties affected
Nor'easter	Feb 2003	1,647
Nor'easter	Nov 2009	20,641
Nor'easter	Mar 2010	1,870
River flood near Albany, NY	Apr 2011	2,194
Hurricane Irene	Aug 2011	35,716
• Hurricane Sandy	Oct 2012	120,517



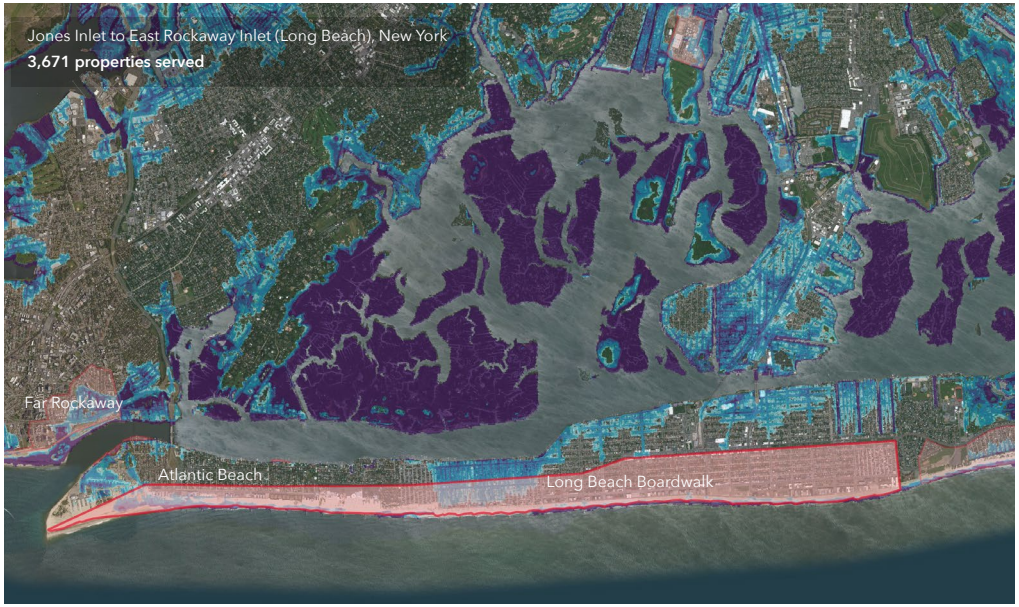
60,000

Properties served by protection measures

The First Street Foundation Flood Model incorporates 179 flood control measures throughout the state which protect 60,000 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee North Elmira	42,224
Channel Lackawanna Flood Damage Reduction Project	5,833
Earthen berm • Jones Inlet to East Rockaway Inlet (Long Beach), New York	5,686
Rain garden Niagara Street Phase 3 & 4, Buffalo	2,378
Beach nourishment Sea Gate Area - Coney Island Coastal Storm Risk Reduction Project	1,200



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
North Carolina

Flood risk is increasing in the state of North Carolina. 538,900 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 12.1%, bringing the total number of properties with substantial risk to 604,000.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 276,900 properties as having substantial risk in the state of North Carolina. In comparison, the First Street Foundation Flood Model identifies 1.9 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 262,000 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 327,100 by the year 2050.

Total properties at substantial risk*

In 2020
538,900

In 2050
604,000

30-year change
▲ +65,100 (+12%)

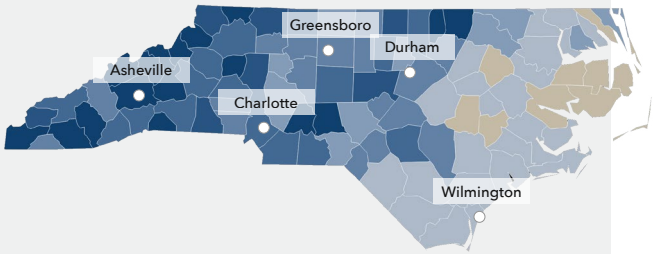
Difference in number of properties currently at substantial risk compared to FEMA**

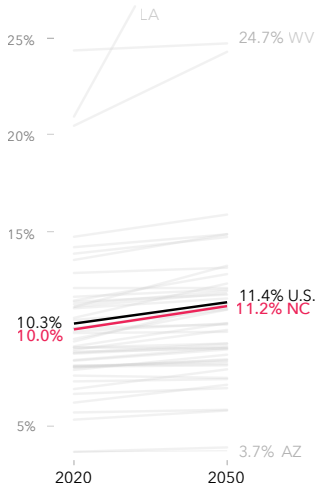
▲ +262,000

More properties at risk in FSF model →

-50% 0 +100% +300% +500%

Coastal areas face risk of storm surge from tropical storms and hurricanes; wave action results in flood damage to coastal towns. Storm surge reaches inland through creeks and rivers. The state protects wetlands and coastal open space to limit flooding in urban areas. Charlotte faces risk from rain, thunderstorms, stationary frontal-storms, hurricanes, and flash floods that fill the Catawba River basin, threatening streets and properties.





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. North Carolina has a smaller proportion of properties at substantial risk, with 10% at substantial risk today and 11.2% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
North Carolina

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 729,200 properties in North Carolina as at risk over the next 30 years. Of these properties, 182,300 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Charlotte has the greatest number of properties at risk of flooding in the state with 17,500 currently at risk, or 7% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 94% of properties in Avon are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Plymouth, for example, will see a 103% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in North Carolina at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Charlotte	17,545	7%	18,562	7%	+1,017	+5.8%
Wilmington	11,184	27%	13,153	32%	+1,969	+17.6%
Raleigh	8,469	7%	8,835	7%	+366	+4.3%
Fayetteville	7,957	11%	8,390	11%	+433	+5.4%
New Bern	7,940	48%	8,313	51%	+373	+4.7%
Durham	5,958	7%	6,168	7%	+210	+3.5%
Elizabeth City	5,510	64%	6,375	74%	+865	+15.7%
Winston-Salem	5,494	6%	5,843	6%	+349	+6.4%
Oak Island	5,141	42%	6,202	51%	+1,061	+20.6%
Greensboro	5,121	5%	5,431	6%	+310	+6.1%

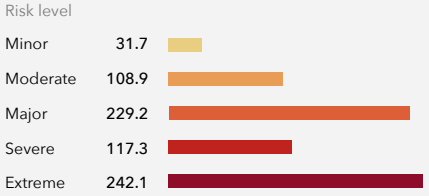
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Avon	2,052	94%	2,086	96%	+34	+1.7%
Holden Beach	2,908	86%	2,948	88%	+40	+1.4%
Ocean Isle Beach	3,015	80%	3,040	80%	+25	+0.8%
Bald Head Island	1,906	77%	1,999	81%	+93	+4.9%
Washington	3,992	77%	4,044	78%	+52	+1.3%
Fairfield Harbour	1,982	76%	1,985	76%	+3	+0.2%
River Road	1,996	75%	2,069	78%	+73	+3.7%
Beaufort	2,588	75%	2,909	84%	+321	+12.4%
Surf City	4,001	72%	4,100	74%	+99	+2.5%
Moyock	1,492	71%	1,773	85%	+281	+18.8%

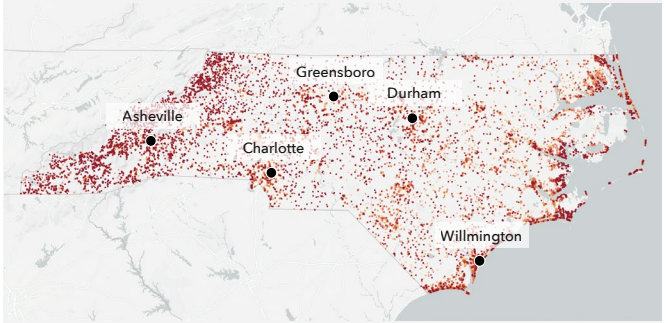
Greatest relative growing risk*

Municipality	2020		2050		Change	
Plymouth	429	18%	872	36%	+443	+103%
Ogden	771	21%	1,188	33%	+417	+54%
Emerald Isle	2,681	36%	4,057	55%	+1,376	+51%
Kure Beach	722	33%	1,011	47%	+289	+40%
Shallotte	453	14%	612	19%	+159	+35%
Havelock	1,334	27%	1,793	37%	+459	+34%
Duck	932	35%	1,249	47%	+317	+34%
Edenton	474	19%	632	25%	+158	+33%
Kitty Hawk	1,394	40%	1,776	51%	+382	+27%
Nags Head	2,843	52%	3,511	65%	+668	+24%

Flood Factor distribution of properties at risk* (1000s)



More than 13.6% of individual properties and properties in North Carolina are at any risk of flooding over the next 30 years. Out of those at risk 81% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
North Carolina

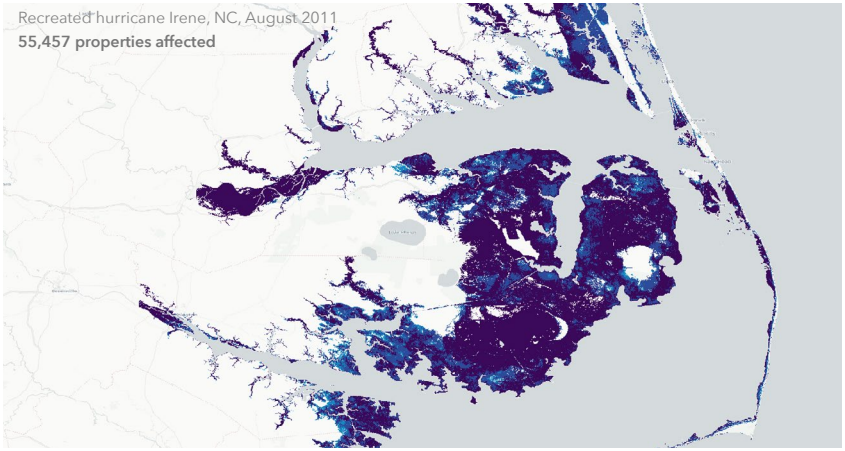
Claims History

545,800 home and property owners in North Carolina have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Robeson, Cumberland, Onslow, Craven, and Bladen counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 4 flooding events that have occurred since the year 2000 in the state of North Carolina. These events flooded around 140,190 properties across the state.**

Flood event	Date	# Properties affected
Hurricane Isabel	Sep 2003	84,224
Nor'easter	Nov 2009	107
• Hurricane Irene	Aug 2011	55,457
River flood near Rocky Mount, NC	Oct 2016	404



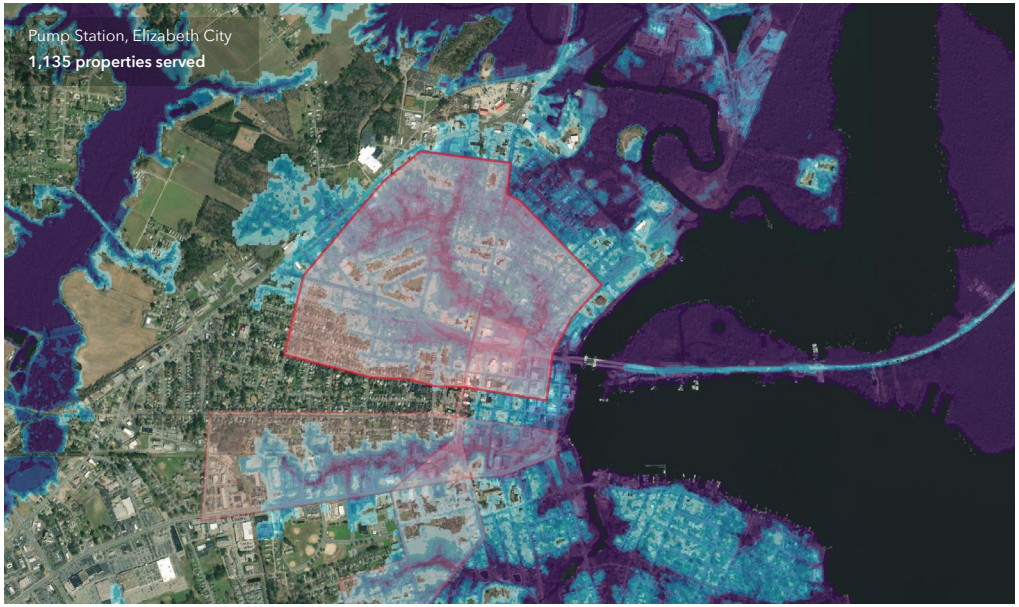
47,800

Properties served by protection measures

The First Street Foundation Flood Model incorporates 296 flood control measures throughout the state which protect 47,800 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Marsh/wetland restoration NC Salt/Brackish Marsh Wetland	24,689
Beach nourishment Oak Island	14,673
Levee Lumberton Levee	4,593
Pump station • Elizabeth City NC Pump Station 2	1,883
Marsh/wetland creation CM Buckridge Coastal Reserve, Gum Neck	1,068



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
North Dakota

Flood risk is increasing in the state of North Dakota. 56,400 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 2.4%, bringing the total number of properties with substantial risk to 57,700.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 30,300 properties as having substantial risk in the state of North Dakota. In comparison, the First Street Foundation Flood Model identifies 1.9 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 26,100 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 27,400 by the year 2050.

Total properties at substantial risk*

In 2020
56,400

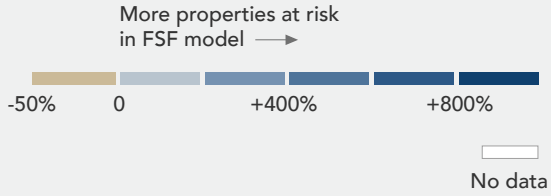
In 2050
57,700

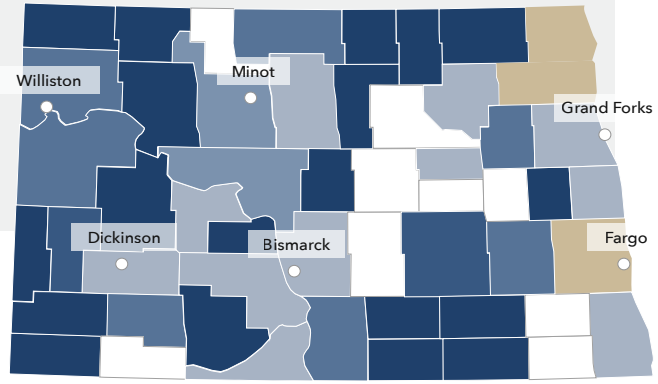
30-year change
▲ +1,300 (+2.4%)

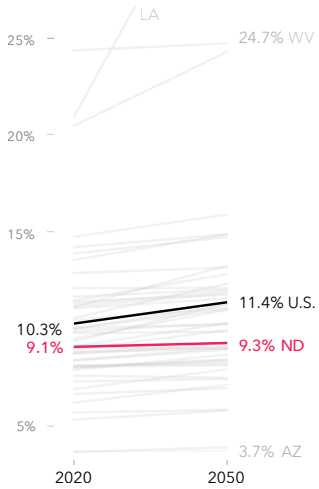
The Red River Valley experiences springtime flooding when snow around the river's tributaries melts into flat and low-lying farmland. Heavy snows in the fall and winter lead the banks of the Red River to overflow in spring. This predictable cycle of precipitation and flooding has enabled protection efforts, but ice jams and the region's unique topography leave many vulnerable.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +26,100







Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. North Dakota has a smaller proportion of properties at substantial risk, with 9.1% at substantial risk today and 9.3% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
North Dakota

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 87,100 properties in North Dakota as at risk over the next 30 years. Of these properties, 12,400 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of West Fargo has the greatest number of properties at risk of flooding in the state with 5,200 currently at risk, or 41% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 41% of properties in West Fargo are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Mandan, for example, will see a 9% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in North Dakota at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
West Fargo	5,248	41%	5,256	41%	+8	+0.2%
Fargo	3,891	12%	3,959	12%	+68	+1.7%
Grand Forks	2,567	17%	2,598	17%	+31	+1.2%
Bismarck	2,297	9%	2,384	10%	+87	+3.8%
Minot	1,252	6%	1,292	6%	+40	+3.2%
Dickinson	1,154	11%	1,187	11%	+33	+2.9%
Mandan	1,146	14%	1,253	15%	+107	+9.3%
Williston	778	8%	806	8%	+28	+3.6%
Devils Lake	227	7%	234	8%	+7	+3.1%
Wahpeton	219	8%	230	8%	+11	+5.0%

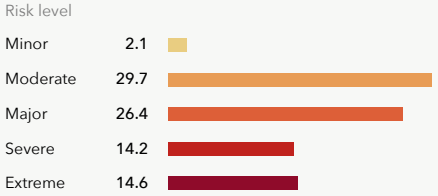
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
West Fargo	5,248	41%	5,256	41%	+8	+0.2%
Grand Forks	2,567	17%	2,598	17%	+31	+1.2%
Mandan	1,146	14%	1,253	15%	+107	+9.3%
Fargo	3,891	12%	3,959	12%	+68	+1.7%
Dickinson	1,154	11%	1,187	11%	+33	+2.9%
Cannon Ball	212	11%	212	11%	+0	+0.0%
Bismarck	2,297	9%	2,384	10%	+87	+3.8%
Williston	778	8%	806	8%	+28	+3.6%
Wahpeton	219	8%	230	8%	+11	+5.0%
Watford City	157	8%	168	8%	+11	+7.0%

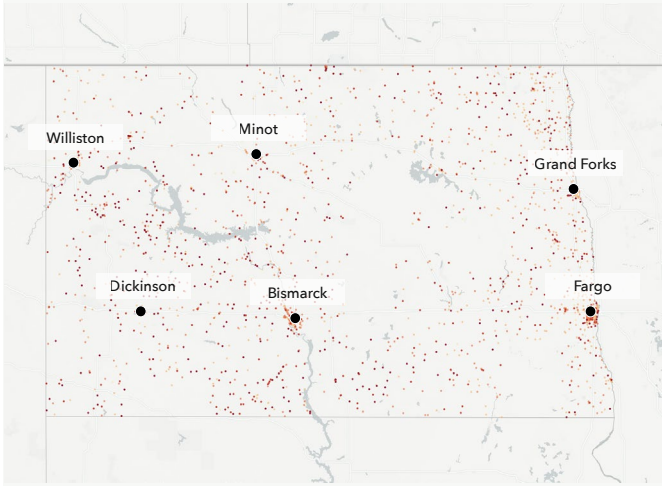
Greatest relative growing risk*

Municipality	2020		2050		Change	
Mandan	1,146	14%	1,253	15%	+107	+9%
Watford City	157	8%	168	8%	+11	+7%
Wahpeton	219	8%	230	8%	+11	+5%
Bismarck	2,297	9%	2,384	10%	+87	+4%
Williston	778	8%	806	8%	+28	+4%
Minot	1,252	6%	1,292	6%	+40	+3%
Devils Lake	227	7%	234	8%	+7	+3%
Dickinson	1,154	11%	1,187	11%	+33	+3%
Fargo	3,891	12%	3,959	12%	+68	+2%
Grand Forks	2,567	17%	2,598	17%	+31	+1%

Flood Factor distribution of properties at risk* (1000s)



More than 14% of individual properties and properties in North Dakota are at any risk of flooding over the next 30 years. Out of those at risk 63% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
North Dakota

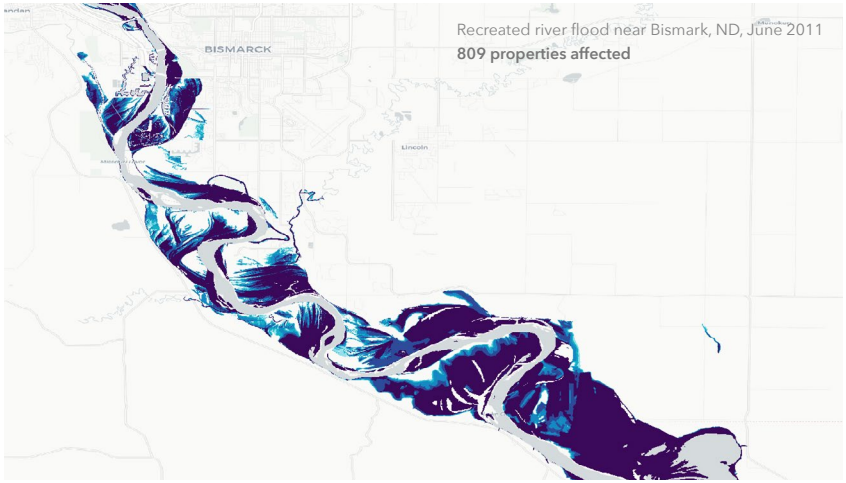
Claims History

30,400 home and property owners in North Dakota have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Ward, Cass, Burleigh, Emmons, and Benson counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 2 flooding events that have occurred since the year 2000 in the state of North Dakota. These events flooded around 1,160 properties across the state.**

Flood event	Date	# Properties affected
• River flood near Bismark, ND	Jun 2011	809
River flood near Towner, ND	Jun 2011	356



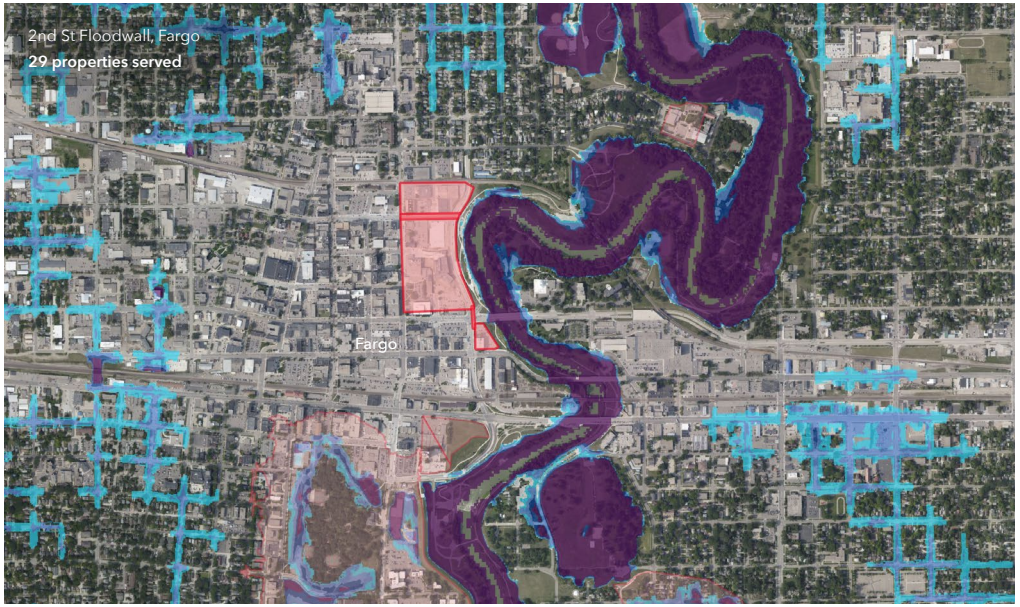
47,700

Properties served by protection measures

The First Street Foundation Flood Model incorporates 222 flood control measures throughout the state which protect 47,700 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee Red River of the North - Grand Forks	47,363
Earthen berm Belmont Park Area Flood Risk Reduction Project, Fargo	295
Acquisition Drain 27/Prairie Rose Flood Risk Reduction, Fargo	76
Buyout Red River Ridgewood Neighborhood, Fargo	29
Flood wall • 2nd Street North Floodwall, Fargo	27



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Ohio

Flood risk is increasing in the state of Ohio. 493,000 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 5.4%, bringing the total number of properties with substantial risk to 519,700.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 219,900 properties as having substantial risk in the state of Ohio. In comparison, the First Street Foundation Flood Model identifies 2.2 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 273,100 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 299,800 by the year 2050.

Total properties at substantial risk*

In 2020

493,000

In 2050

519,700

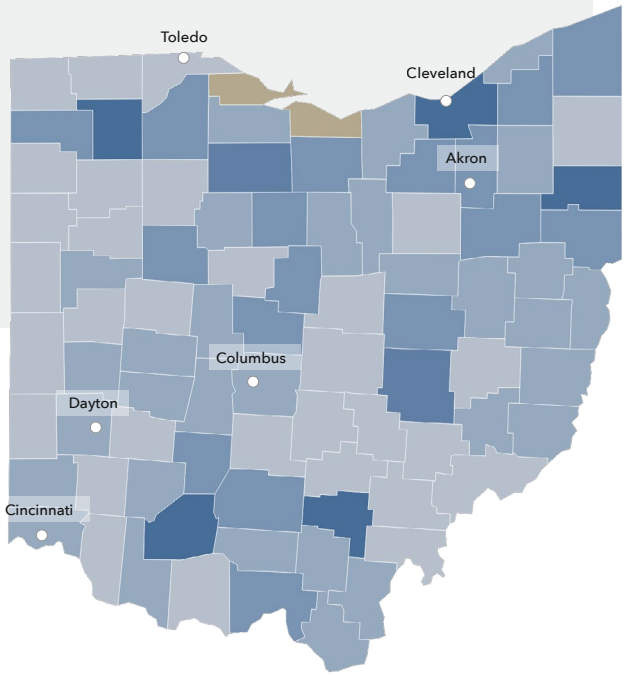
30-year change

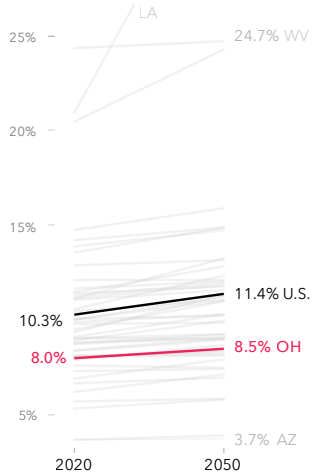
▲ +26,700 (+5%)

High rainfall and heavy storms over Lake Erie drive wave actions that are the major flood risk for Ohio communities. Rising lake water levels cause inland streams to overtop, resulting in the flooding of surrounding areas. Cincinnati and other river communities are most at risk from heavy rainfall, as the river backwater inundates streams and creeks causing waterways to overtop and flood surrounding communities and low-lying areas.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +273,100





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Ohio has a smaller proportion of properties at substantial risk, with 8% at substantial risk today and 8.5% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Ohio

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 708,400 properties in Ohio as at risk over the next 30 years. Of these properties, 142,400 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Cincinnati has the greatest number of properties at risk of flooding in the state with 21,200 currently at risk, or 13% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 87% of properties in Gallipolis are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Delhi Hills, for example, will see a 23% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Ohio at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Cincinnati	21,236	13%	22,321	14%	+1,085	+5.1%
Columbus	17,728	6%	19,117	7%	+1,389	+7.8%
Cleveland	12,261	7%	13,354	8%	+1,093	+8.9%
Toledo	12,166	10%	12,830	11%	+664	+5.5%
Dayton	10,770	12%	11,911	13%	+1,141	+10.6%
Marietta	6,757	52%	6,778	52%	+21	+0.3%
Akron	6,563	7%	6,870	7%	+307	+4.7%
Canton	5,098	13%	5,355	13%	+257	+5.0%
Findlay	4,937	30%	5,067	31%	+130	+2.6%
Athens	3,786	51%	3,812	51%	+26	+0.7%

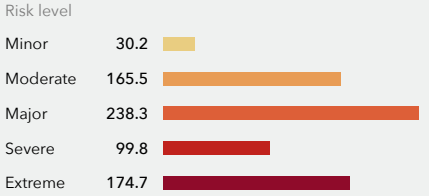
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Gallipolis	2,585	87%	2,588	87%	+3	+0.1%
Middleport	2,131	83%	2,147	83%	+16	+0.8%
New Richmond	1,681	72%	1,682	72%	+1	+0.1%
Wellsville	1,702	66%	1,738	67%	+36	+2.1%
Shadyside	1,431	65%	1,441	65%	+10	+0.7%
Bellaire	2,192	60%	2,203	61%	+11	+0.5%
Pomeroy	2,064	58%	2,079	59%	+15	+0.7%
Marietta	6,757	52%	6,778	52%	+21	+0.3%
Athens	3,786	51%	3,812	51%	+26	+0.7%
Belpre	2,243	50%	2,253	50%	+10	+0.4%

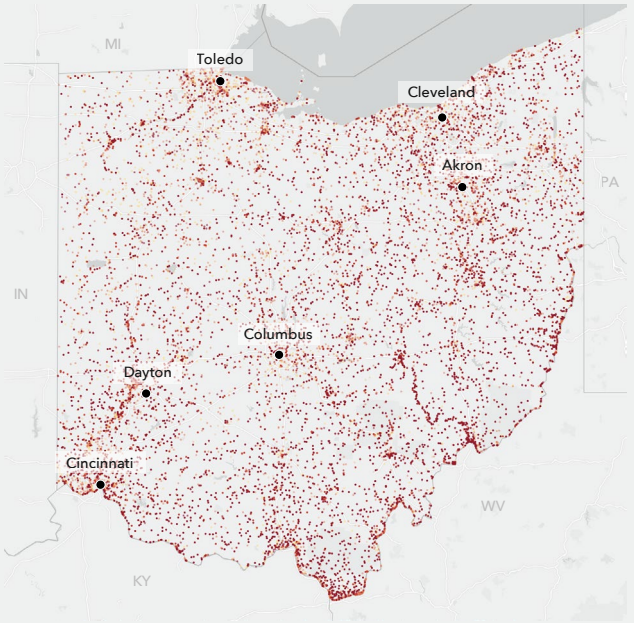
Greatest relative growing risk*

Municipality	2020		2050		Change	
Delhi Hills	120	5%	148	7%	+1,085	+23%
Drexel	74	3%	89	4%	+1,389	+20%
Highland Heights	120	3%	143	4%	+1,093	+19%
Lima	782	5%	930	6%	+664	+19%
Bowling Green	579	6%	677	7%	+1,141	+17%
Harrison	526	10%	612	12%	+21	+16%
Springboro	256	3%	296	4%	+307	+16%
Willowick	386	6%	445	7%	+257	+15%
Mack	200	4%	230	4%	+130	+15%
Canfield	116	3%	133	4%	+26	+15%

Flood Factor distribution of properties at risk* (1000s)



More than 11.5% of individual properties and properties in Ohio are at any risk of flooding over the next 30 years. Out of those at risk 72% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Ohio

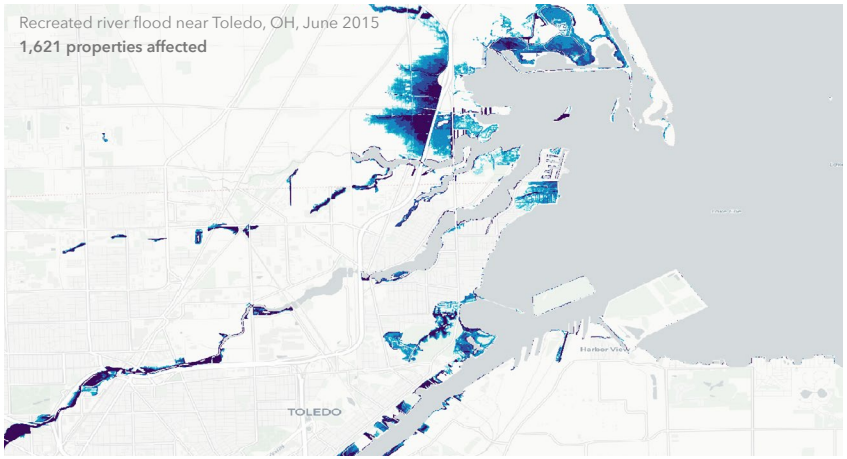
Claims History

143,000 home and property owners in Ohio have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Cuyahoga, Richland, Lake, Mahoning, and Lucas counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 3 flooding events that have occurred since the year 2000 in the state of Ohio. These events flooded around 9,000 properties across the state.**

Flood event	Date	# Properties affected
River flood in Eastern OH	Sept 2004	6,240
River flood near Piketon, OH	Jan 2005	870
River flood near Zanesville, OH	Jan 2005	274
• River flood near Toledo, OH	Jun 2015	1,621



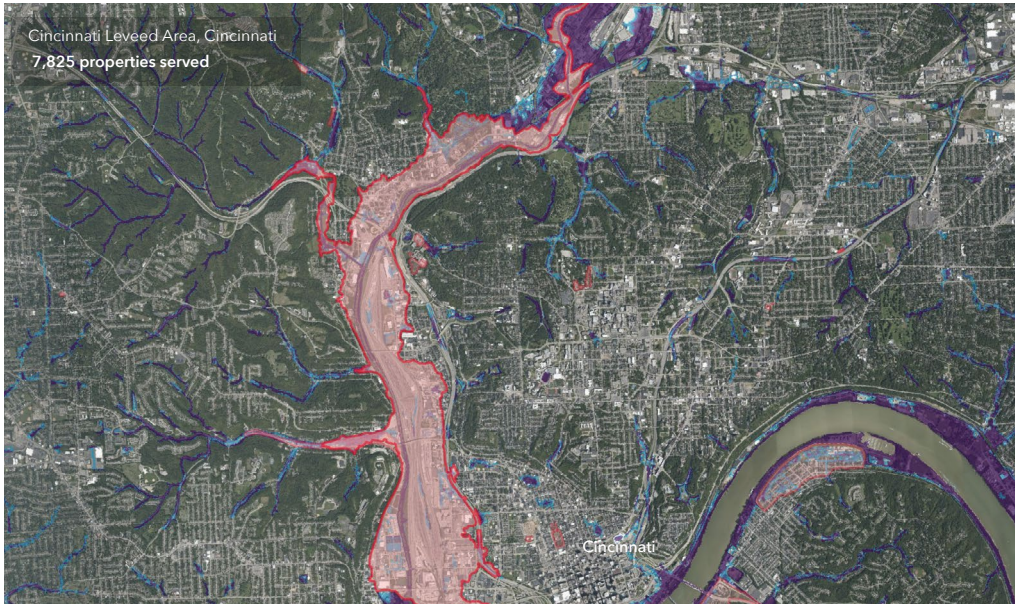
78,400

Properties served by protection measures

The First Street Foundation Flood Model incorporates 299 flood control measures throughout the state which protect 78,400 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee • Cincinnati Leveed Area, Cincinnati	73,579
Dam Mosquito Creek Dam, Niles	3,350
Earthen berm Newport Earthen Berm, Newport	627
Ditch New Lexington Diversion, New Lexington	475
Retention pond Lick Run Greenway, Cincinnati	341



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Oklahoma

Flood risk is decreasing in the state of Oklahoma. 168,900 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will decrease by 1.6%, shifting the total number of properties with substantial risk to 166,200.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 107,400 properties as having substantial risk in the state of Oklahoma. In comparison, the First Street Foundation Flood Model identifies 1.6 times fewer properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 61,500 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap narrows to 58,800 by the year 2050.

Total properties at substantial risk*

In 2020
168,900

In 2050
166,200

30-year change
▼ -2,700 (-1.6%)

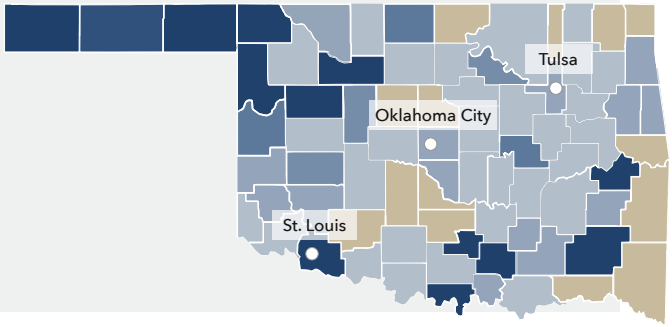
Difference in number of properties currently at substantial risk compared to FEMA**

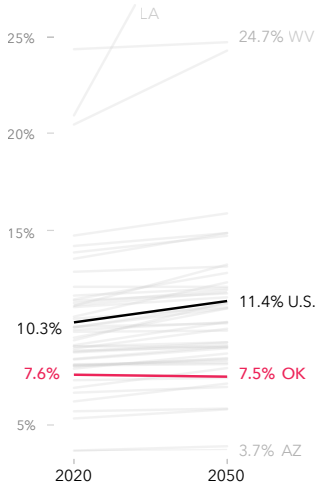
▲ +61,500

More properties at risk in FSF model →

-50% 0 +200% +400% +600%

Tulsa floods when rains overtop the Arkansas River, Cherry Creek, Mingo Creek, and Joe Creek. Channel modifications, levee systems, detention basins, and non-structural regulations have been implemented. Lawton floods with spring and summer rainfall, impacting property in the wide, flat, East Cache Creek floodplain. Flood protection efforts include removing structures in the floodplain, channeling streams, and detention basins.





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Oklahoma has a smaller proportion of properties at substantial risk, with 7.6% at substantial risk today and 7.5% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Oklahoma

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 222,800 properties in Oklahoma as at risk over the next 30 years. Of these properties, 49,800 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Tulsa has the greatest number of properties at risk of flooding in the state with 21,700 currently at risk, or 14% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 40% of properties in Copeland are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Pawhuska, for example, will see a 4% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Oklahoma at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Tulsa	21,727	14%	21,931	14%	+204	+0.9%
Oklahoma City	19,852	8%	19,867	8%	+15	+0.1%
Bixby	3,587	31%	3,610	31%	+23	+0.6%
Norman	3,272	8%	3,286	8%	+14	+0.4%
Broken Arrow	3,118	7%	3,132	7%	+14	+0.4%
Lawton	2,694	8%	2,696	8%	+2	+0.1%
Jenks	2,296	23%	2,320	23%	+24	+1.0%
Moore	2,284	10%	2,284	10%	+0	+0.0%
Enid	2,060	9%	2,065	9%	+5	+0.2%
Edmond	1,894	5%	1,894	5%	+0	+0.0%

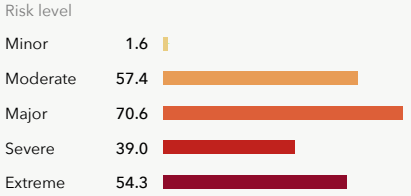
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Copeland	818	40%	819	40%	+1	+0.1%
Bixby	3,587	31%	3,610	31%	+23	+0.6%
Jenks	2,296	23%	2,320	23%	+24	+1.0%
Pawhuska	612	22%	637	23%	+25	+4.1%
Grove	1,042	21%	1,047	21%	+5	+0.5%
Chickasha	1,526	19%	1,527	19%	+1	+0.1%
Pauls Valley	571	17%	573	18%	+2	+0.4%
Cleora	516	16%	516	16%	+0	+0.0%
Tulsa	21,727	14%	21,931	14%	+204	+0.9%
Mangum	301	13%	301	13%	+0	+0.0%

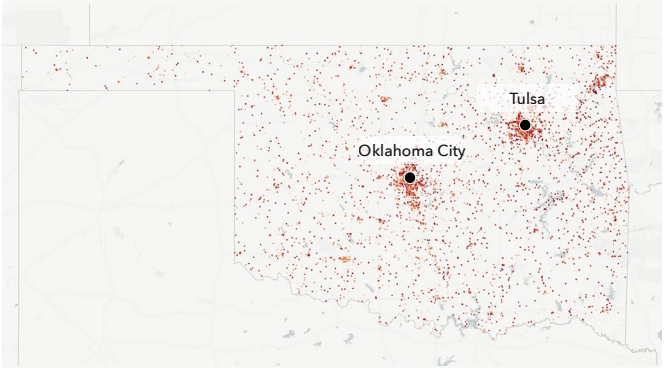
Greatest relative growing risk*

Municipality	2020		2050		Change	
Pawhuska	612	22%	637	23%	+25	+4%
Bartlesville	1,232	7%	1,265	7%	+33	+3%
Claremore	779	10%	798	10%	+19	+2%
Pocola	166	7%	170	7%	+4	+2%
Skiatook	402	10%	410	10%	+8	+2%
Pryor Creek	180	4%	183	4%	+3	+2%
Nowata	263	10%	267	10%	+4	+2%
Sand Springs	1,061	12%	1,076	13%	+15	+1%
Blackwell	313	7%	317	8%	+4	+1%
Oakhurst	170	8%	172	8%	+2	+1%

Flood Factor distribution of properties at risk* (1000s)



More than 10.1% of individual properties and properties in Oklahoma are at any risk of flooding over the next 30 years. Out of those at risk 74% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

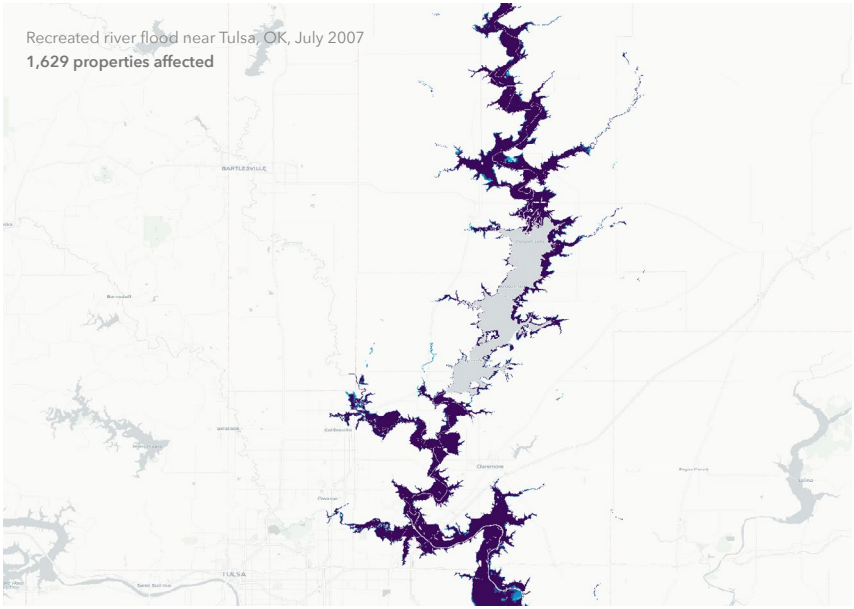
Flood History & Protection
Oklahoma

Claims History

74,200 home and property owners in Oklahoma have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Oklahoma, Cleveland, Pottawatomie, Canadian, and Grady counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 1 flooding event that occurred since the year 2000 in the state of Oklahoma. This event flooded around 1,630 properties across the state.**



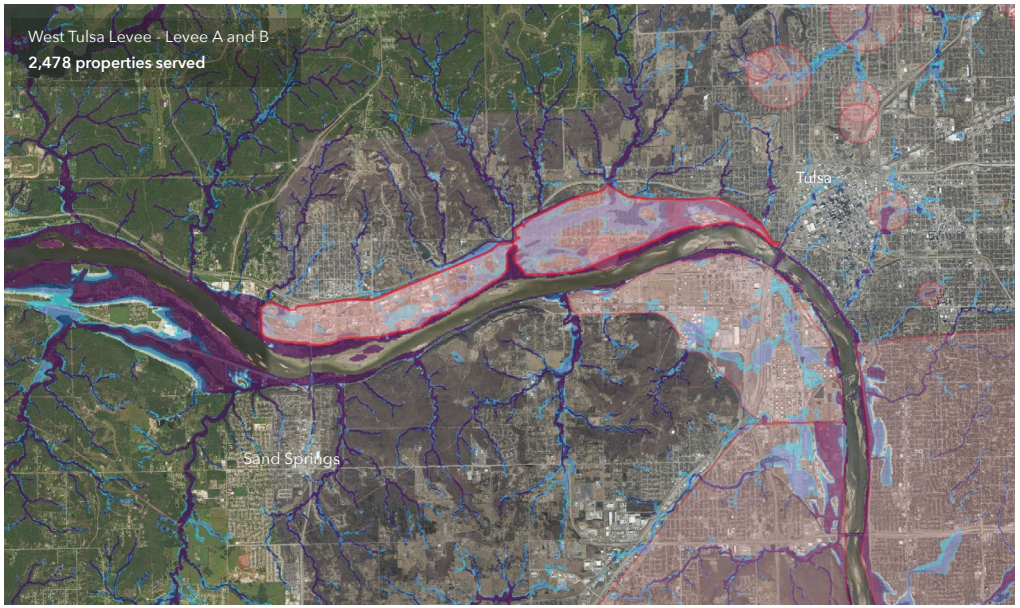
78,400

Properties served by protection measures

The First Street Foundation Flood Model incorporates 263 flood control measures throughout the state which protect 78,400 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Channel City of Tulsa Channels	44,913
Levee • Tulsa-West Tulsa Levee - Levee A and B	10,007
Detention basin City of Tulsa Detention Basin / Bishop Tract Detention Facility MS-2	24,547



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Oregon

Flood risk is increasing in the state of Oregon. 268,000 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 6.2%, bringing the total number of properties with substantial risk to 284,600.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 97,900 properties as having substantial risk in the state of Oregon. In comparison, the First Street Foundation Flood Model identifies 2.7 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 170,100 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 186,700 by the year 2050.

Total properties at substantial risk*

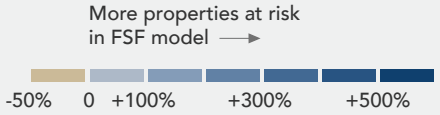
In 2020
268,000

In 2050
284,600

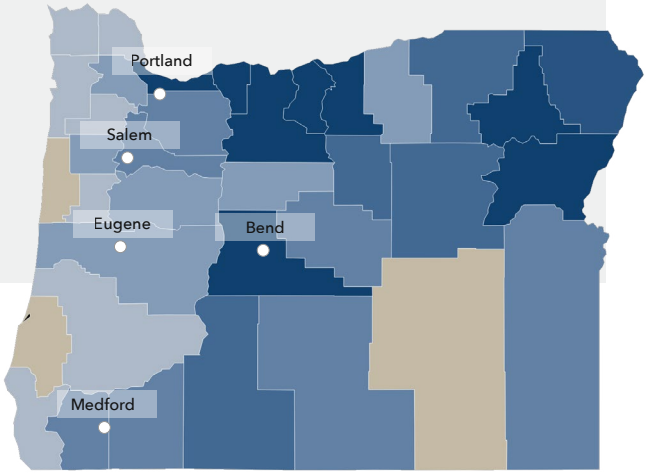
30-year change
▲ +16,600 (+6%)

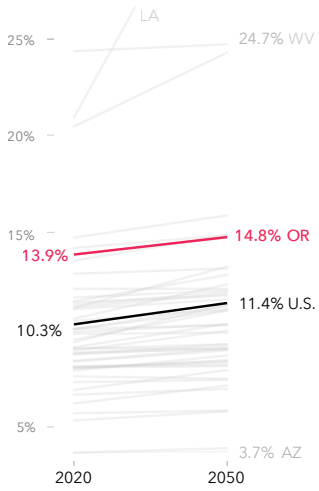
Difference in number of properties currently at substantial risk compared to FEMA**

▲ +170,100



Willamette Valley, which includes the major cities of Portland, Salem, and Eugene, is home to 70% of Oregon's population. It is surrounded by mountains on three sides, and prone to flooding from springtime melting of snowpack. To reduce flood risk, the Army Corps of Engineers began the Willamette Valley Project to build a series of flood control dams in the surrounding mountains.





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Oregon has a greater proportion of properties at substantial risk, with 13.9% at substantial risk today and 14.8% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Oregon

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 398,500 properties in Oregon as at risk over the next 30 years. Of these properties, 69,100 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

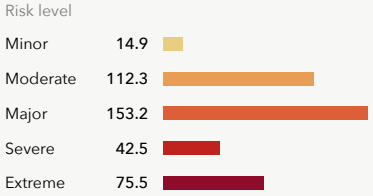
The city of Portland has the greatest number of properties at risk of flooding in the state with 46,000 currently at risk, or 20% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 90% of properties in Milton-Freewater are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Astoria, for example, will see a 95% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Oregon at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Portland	45,951	20%	47,554	21%	+1,603	+3.5%
Eugene	26,264	48%	27,426	50%	+1,162	+4.4%
Salem	10,648	21%	11,011	22%	+363	+3.4%
Springfield	8,469	43%	9,023	46%	+554	+6.5%
Bend	6,885	17%	7,066	17%	+181	+2.6%
Medford	6,661	23%	6,860	23%	+199	+3.0%
Keizer	6,471	57%	6,601	59%	+130	+2.0%
Grants Pass	5,795	40%	5,890	40%	+95	+1.6%
Baker City	4,506	86%	4,556	87%	+50	+1.1%
Albany	4,037	22%	4,223	23%	+186	+4.6%

Flood Factor distribution of properties at risk* (1000s)



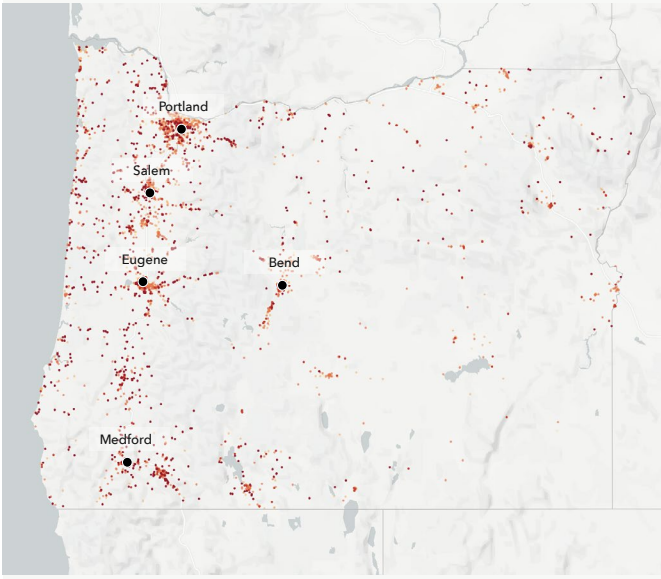
More than 21.5% of individual properties and properties in Oregon are at any risk of flooding over the next 30 years. Out of those at risk 66% are at major to extreme risk.

Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Milton-Freewater	2,176	90%	2,196	91%	+20	+0.9%
Baker City	4,506	86%	4,556	87%	+50	+1.1%
La Grande	3,802	75%	3,837	76%	+35	+0.9%
Keizer	6,471	57%	6,601	59%	+130	+2.0%
Junction City	1,292	55%	1,348	58%	+56	+4.3%
Sisters	1,205	54%	1,237	55%	+32	+2.7%
Seaside	2,639	51%	2,772	53%	+133	+5.0%
Prineville	2,382	51%	2,407	51%	+25	+1.0%
Eugene	26,264	48%	27,426	50%	+1,162	+4.4%
Mount Hood Village	2,455	48%	2,516	49%	+61	+2.5%

Greatest relative growing risk*

Municipality	2020		2050		Change	
Astoria	247	4%	482	8%	+235	+95%
Newport	324	5%	545	9%	+221	+68%
Warrenton	1,353	33%	1,867	45%	+514	+38%
Cannon Beach	122	5%	168	7%	+46	+38%
Pacific City	442	21%	598	28%	+156	+35%
Lincoln Beach	80	3%	101	4%	+21	+26%
Rockaway Beach	596	20%	746	25%	+150	+25%
Brookings	92	3%	113	3%	+21	+23%
Lincoln City	706	9%	841	10%	+135	+19%
Ontario	1,309	32%	1,530	37%	+221	+17%



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Oregon

Claims History

7,400 home and property owners in Oregon have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Clatsop, Columbia, Washington, Tillamook, and Polk counties.

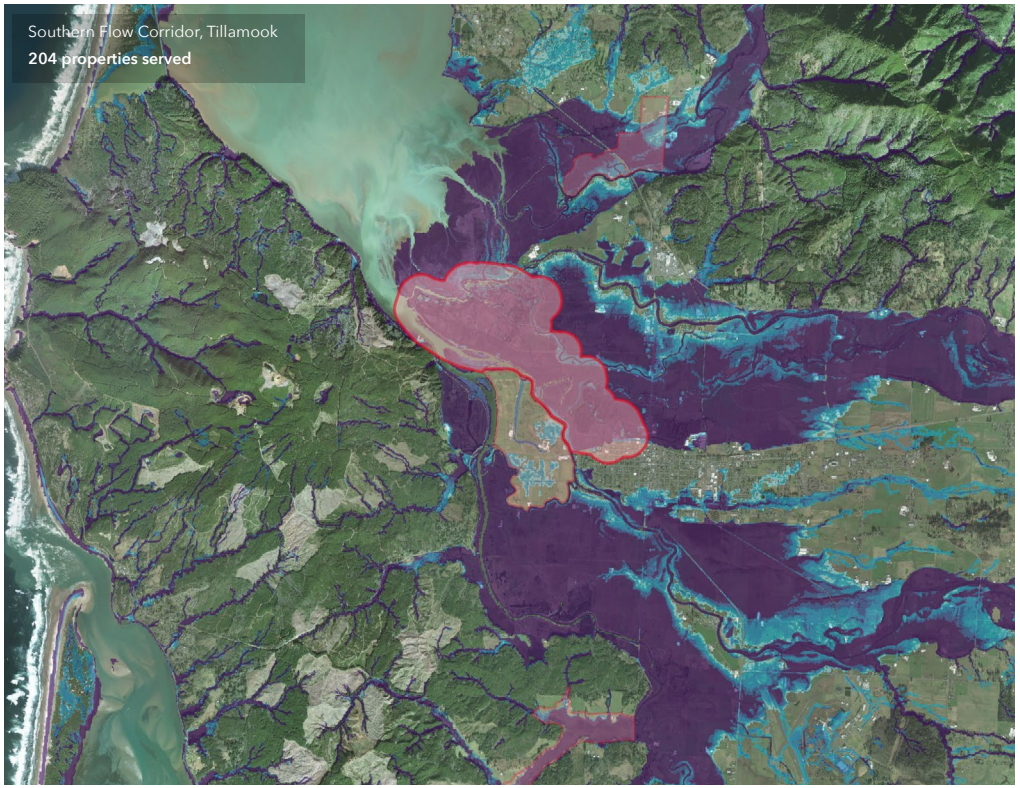
30,900

Properties served by protection measures

The First Street Foundation Flood Model incorporates 251 flood control measures throughout the state which protect 30,900 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee Springfield Levee	30,597
Marsh/wetland restoration • Southern Flow Corridor, Tillamook	255



* Source: Fema.gov

State Overview
Pennsylvania

Flood risk is increasing in the state of Pennsylvania. 564,600 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 4%, bringing the total number of properties with substantial risk to 587,400.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 194,400 properties as having substantial risk in the state of Pennsylvania. In comparison, the First Street Foundation Flood Model identifies 2.9 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 370,200 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 393,000 by the year 2050.

Total properties at substantial risk*

In 2020
564,600

In 2050
587,400

30-year change
▲ +22,800 (+4%)

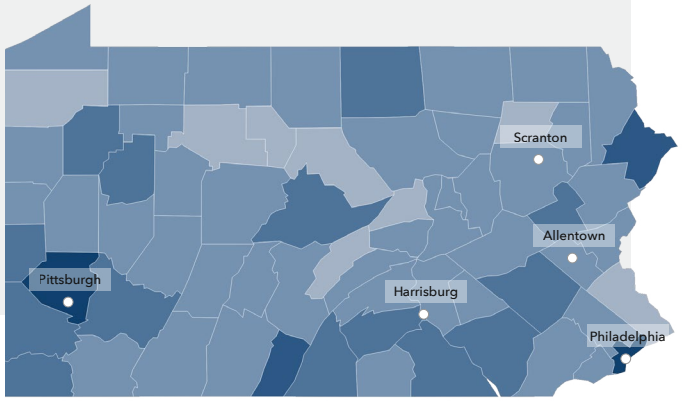
Difference in number of properties currently at substantial risk compared to FEMA**

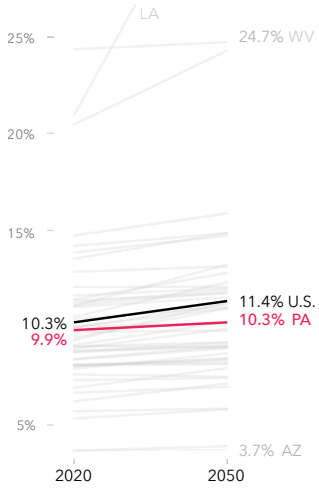
▲ +370,200

More properties at risk in FSF model →

0 +200% +400%

Pittsburgh faces flooding from snowmelt and rainfall. Winter ice jams both cause and intensify backwater flooding along upstream tributaries of the Allegheny and Monongahela rivers. Upstream dams attempt to manage their flows. Philadelphia sees riverine, storm surge, and high tide flood events from hurricanes and tropical storms. It has focused on stabilizing streams and improving infrastructure to reduce flood risk.





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Pennsylvania has a smaller proportion of properties at substantial risk, with 9.9% at substantial risk today and 10.3% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Pennsylvania

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 743,600 properties in Pennsylvania as at risk over the next 30 years. Of these properties, 202,700 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Philadelphia has the greatest number of properties at risk of flooding in the state with 53,400 currently at risk, or 10% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 98% of properties in Kingston are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Folcroft, for example, will see a 56% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Pennsylvania at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Philadelphia	53,378	10%	60,561	11%	+7,183	+13.5%
Pittsburgh	21,803	15%	22,373	16%	+570	+2.6%
Harrisburg	7,395	37%	7,686	39%	+291	+3.9%
Wilkes-Barre	6,919	44%	6,984	44%	+65	+0.9%
Williamsport	5,039	53%	5,152	55%	+113	+2.2%
Kingston	4,869	98%	4,906	99%	+37	+0.8%
Johnstown	4,532	41%	4,586	41%	+54	+1.2%
Scranton	3,558	13%	3,652	14%	+94	+2.6%
Erie	3,287	9%	3,405	9%	+118	+3.6%
Altoona	3,276	15%	3,386	15%	+110	+3.4%

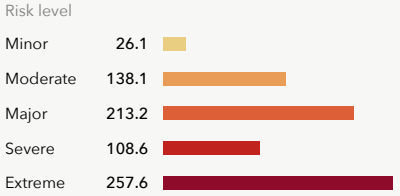
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Kingston	4,869	98%	4,906	99%	+37	+0.8%
Swoyersville	2,002	78%	2,028	79%	+26	+1.3%
Exeter	1,652	70%	1,693	72%	+41	+2.5%
Danville	1,278	62%	1,325	64%	+47	+3.7%
McKees Rocks	1,775	60%	1,804	61%	+29	+1.6%
West Pittston	1,250	60%	1,303	62%	+53	+4.2%
Honesdale	1,247	55%	1,260	55%	+13	+1.0%
Bristol	2,040	54%	2,269	60%	+229	+11.2%
Williamsport	5,039	53%	5,152	55%	+113	+2.2%
Lock Haven	2,147	53%	2,178	54%	+31	+1.4%

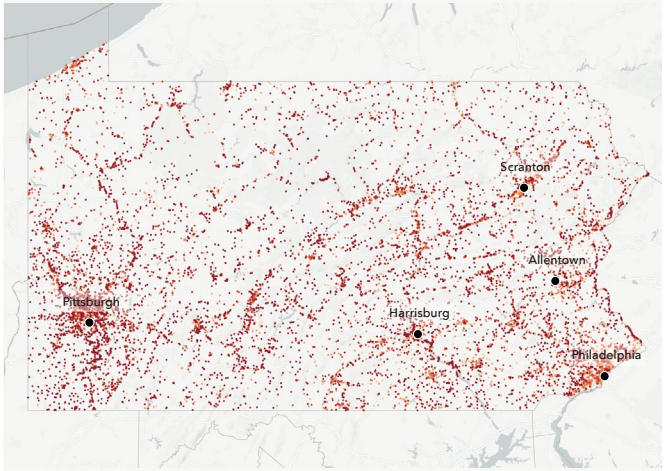
Greatest relative growing risk*

Municipality	2020		2050		Change	
Folcroft	99	4%	154	6%	+55	+56%
Arnold	367	16%	563	24%	+196	+53%
Wilson	28	1%	40	1%	+12	+43%
Carnot-Moon	211	5%	279	7%	+68	+32%
Richboro	48	2%	58	3%	+10	+21%
Ancient Oaks	130	6%	155	7%	+25	+19%
Hemlock Farms	85	2%	98	3%	+13	+15%
Fairless Hills	40	2%	46	2%	+6	+15%
Levittown	1,461	8%	1,670	10%	+209	+14%
Philadelphia	53,378	10%	60,561	11%	+7,183	+14%

Flood Factor distribution of properties at risk* (1000s)



More than 13% of individual properties and properties in Pennsylvania are at any risk of flooding over the next 30 years. Out of those at risk 78% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Pennsylvania

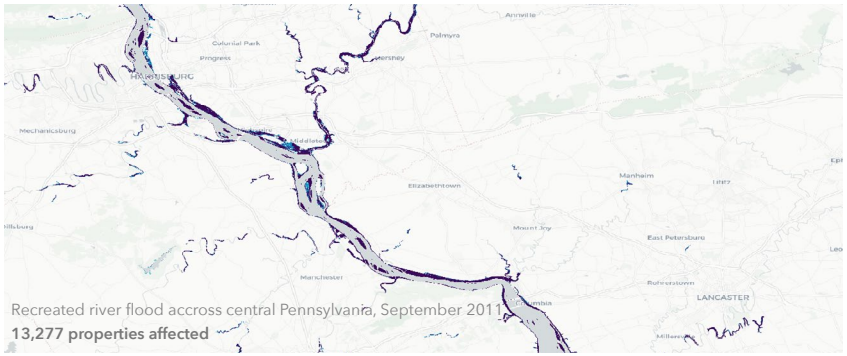
Claims History

257,100 home and property owners in Pennsylvania have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Philadelphia, Luzerne, Dauphin, Allegheny, and Montgomery counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 6 flooding events that have occurred since the year 2000 in the state of Pennsylvania. These events flooded around 27,100 properties across the state.**

Flood event	Date	# Properties affected
Hurricane Isabel	Sep 2003	160
River flood near Harrisburg, PA	Sep 2004	8,565
River flood near Pittsburgh, PA	Sep 2004	5,020
Nor'easter	Nov 2009	69
Hurricane Irene	Aug 2011	10
• River flood across central Pennsylvania	Sep 2011	13,277



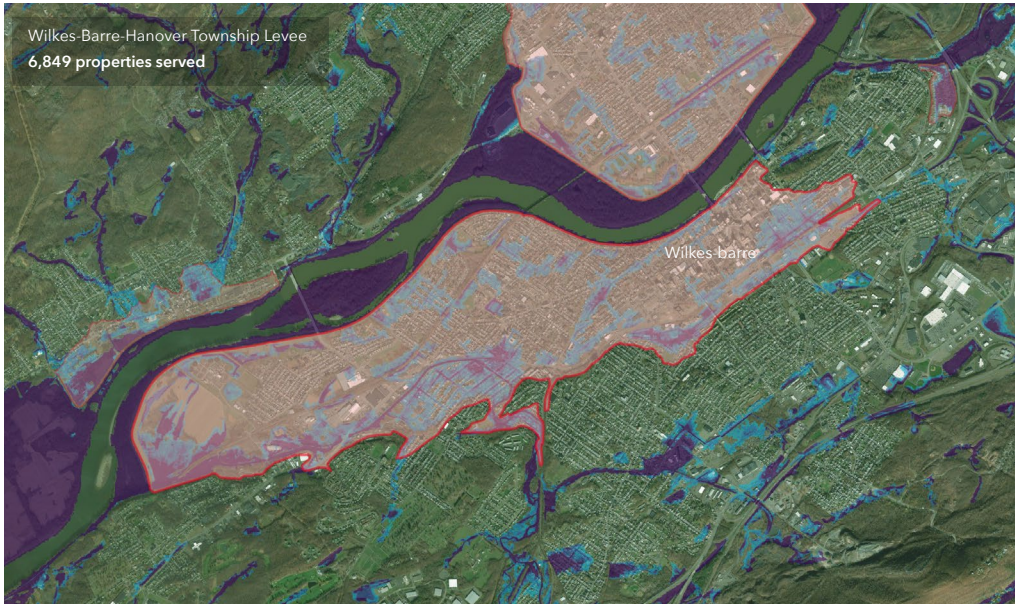
55,100

Properties served by protection measures

The First Street Foundation Flood Model incorporates 231 flood control measures throughout the state which protect 55,100 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee • Wilkes-Barre-Hanover Township Levee	54,965
Retention pond Melwood and Finland Stormwater Project	63
Bioswale Centre Avenue and Herron Avenue Green Infrastructure Project	32



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Rhode Island

Flood risk is increasing in the state of Rhode Island. 26,500 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 14.7%, bringing the total number of properties with substantial risk to 30,400.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 23,900 properties as having substantial risk in the state of Rhode Island. In comparison, the First Street Foundation Flood Model identifies 1.1 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 2,600 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 6,400 by the year 2050.

Total properties at substantial risk*

In 2020
26,500

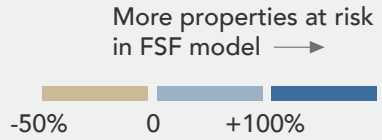
In 2050
30,400

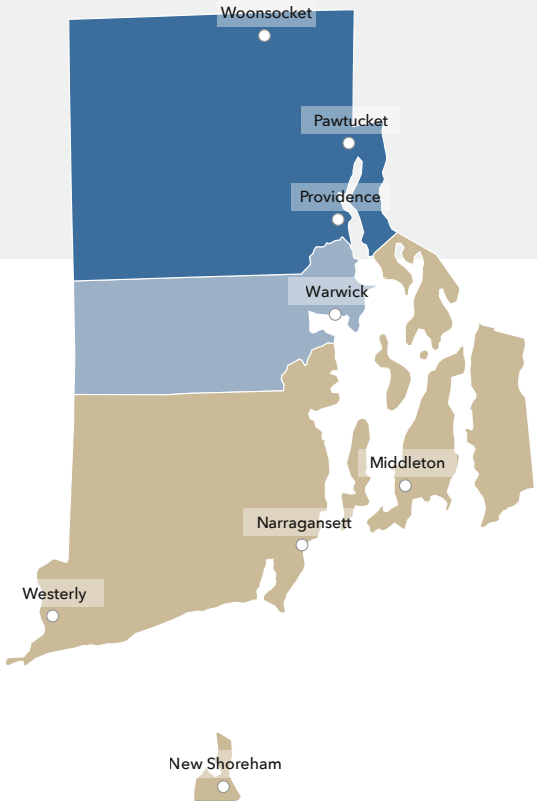
30-year change
▲ +3,900 (+15%)

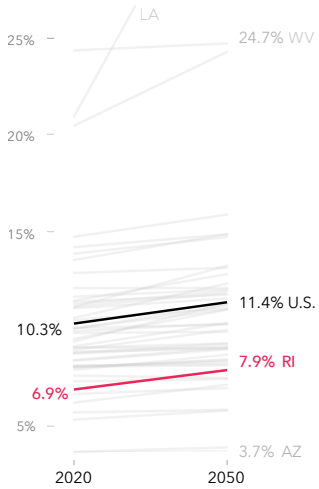
Rhode Island faces year-round floods, with high impact tropical storms and hurricanes in late summer and early fall. Winter and spring flooding is caused by storms in combination with snowmelt or ice jams. Mid-spring and fall thunderstorms produce localized flooding. Most rivers in Providence County rose above flood stage in 2010 when moderate to heavy rainfall events resulted in about 20 inches of rainfall.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +2,600







Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Rhode Island has a smaller proportion of properties at substantial risk, with 6.9% at substantial risk today and 7.9% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Rhode Island

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 49,000 properties in Rhode Island as at risk over the next 30 years. Of these properties, 6,600 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Providence has the greatest number of properties at risk of flooding in the state with 5,200 currently at risk, or 13% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 27% of properties in Charlestown are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Tiverton, for example, will see a 64% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Rhode Island at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Providence	5,176	13%	5,519	14%	+343	+6.6%
Warwick	4,095	11%	5,580	15%	+1,485	+36.3%
Cranston	2,875	9%	3,047	10%	+172	+6.0%
Pawtucket	2,117	11%	2,319	12%	+202	+9.5%
East Providence	1,454	10%	1,606	11%	+152	+10.5%
Woonsocket	1,253	12%	1,287	12%	+34	+2.7%
Newport	985	13%	1,403	19%	+418	+42.4%
Westerly	720	10%	827	11%	+107	+14.9%
Charlestown	570	27%	733	34%	+163	+28.6%
Central Falls	464	16%	487	17%	+23	+5.0%

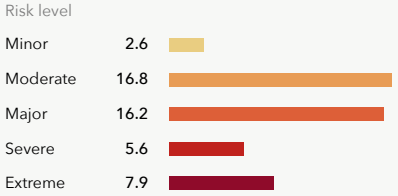
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Charlestown	570	27%	733	34%	+163	+28.6%
Central Falls	464	16%	487	17%	+23	+5.0%
Newport	985	13%	1,403	19%	+418	+42.4%
Providence	5,176	13%	5,519	14%	+343	+6.6%
Woonsocket	1,253	12%	1,287	12%	+34	+2.7%
Pawtucket	2,117	11%	2,319	12%	+202	+9.5%
Warwick	4,095	11%	5,580	15%	+1,485	+36.3%
Wakefield-Peacedale	321	10%	338	11%	+17	+5.3%
Westerly	720	10%	827	11%	+107	+14.9%
East Providence	1,454	10%	1,606	11%	+152	+10.5%

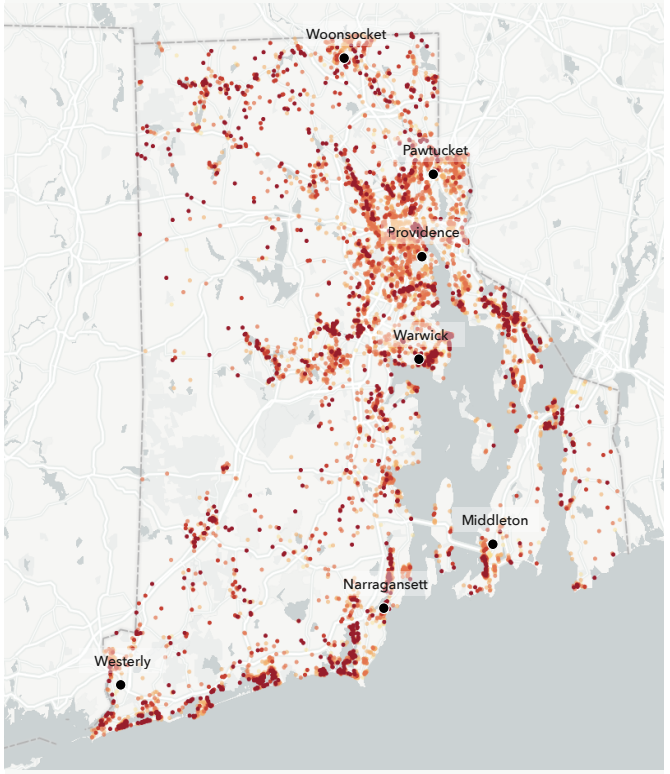
Greatest relative growing risk*

Municipality	2020		2050		Change	
Tiverton	105	3%	172	5%	+67	+64%
Narragansett Pier	174	7%	255	10%	+81	+47%
Newport	985	13%	1,403	19%	+418	+42%
Warwick	4,095	11%	5,580	15%	+1,485	+36%
Charlestown	570	27%	733	34%	+163	+29%
Newport East	140	3%	175	4%	+35	+25%
Westerly	720	10%	827	11%	+107	+15%
East Providence	1,454	10%	1,606	11%	+152	+11%
Pawtucket	2,117	11%	2,319	12%	+202	+10%
Providence	5,176	13%	5,519	14%	+343	+7%

Flood Factor distribution of properties at risk* (1000s)



More than 12.8% of individual properties and properties in Rhode Island are at any risk of flooding over the next 30 years. Out of those at risk 61% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Rhode Island

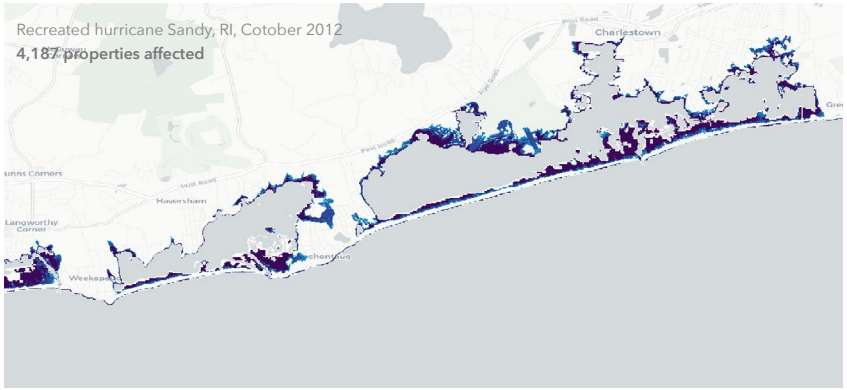
Claims History

35,700 home and property owners in Rhode Island have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Kent, Providence, Washington, Bristol, and Newport counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 5 flooding events that have occurred since the year 2000 in the state of Rhode Island. These events flooded around 12,790 properties across the state.**

Flood event	Date	# Properties affected
Nor'easter	Feb 2003	825
Nor'easter	Nov 2009	1,929
Nor'easter	Mar 2010	1,566
Hurricane Irene	Aug 2011	4,284
• Hurricane Sandy	Oct 2012	4,187



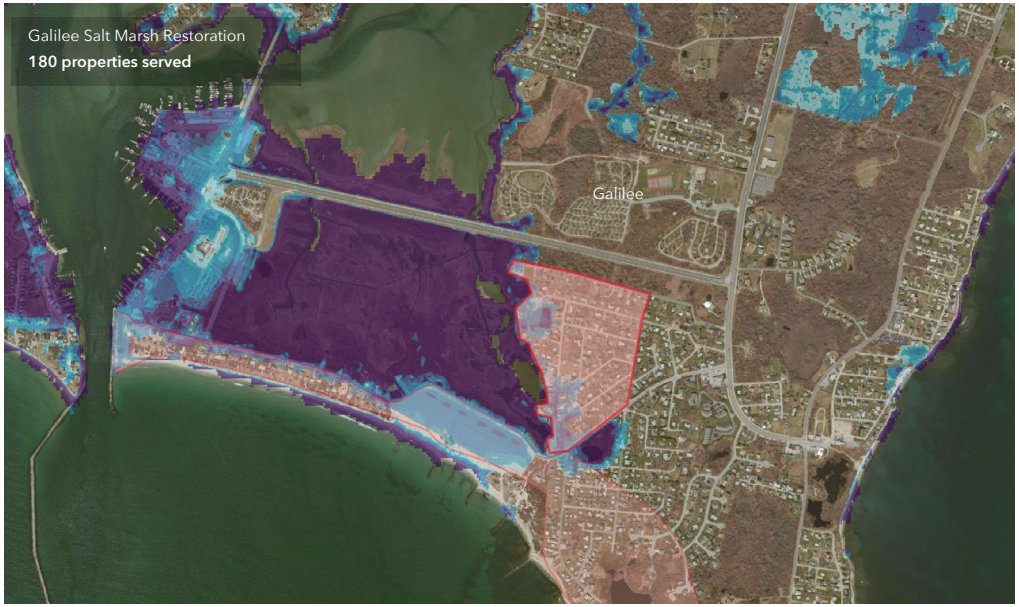
2,600

Properties served by protection measures

The First Street Foundation Flood Model incorporates 17 flood control measures throughout the state which protect 2,600 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee Fox Point HSPP - Providence	1,575
Breakwater Point Judith Harbor of Refuge	643
Marsh/wetland restoration • Galilee Salt Marsh Restoration	180
Culvert Baker Street Brook channel improvements, West Warwick	118
Dam Pawtucket dam	114



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
South Carolina

Flood risk is increasing in the state of South Carolina. 271,500 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 16.7%, bringing the total number of properties with substantial risk to 316,900.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 196,900 properties as having substantial risk in the state of South Carolina. In comparison, the First Street Foundation Flood Model identifies 1.4 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 74,600 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 120,000 by the year 2050.

Total properties at substantial risk*

In 2020
271,500

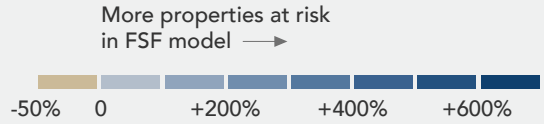
In 2050
316,900

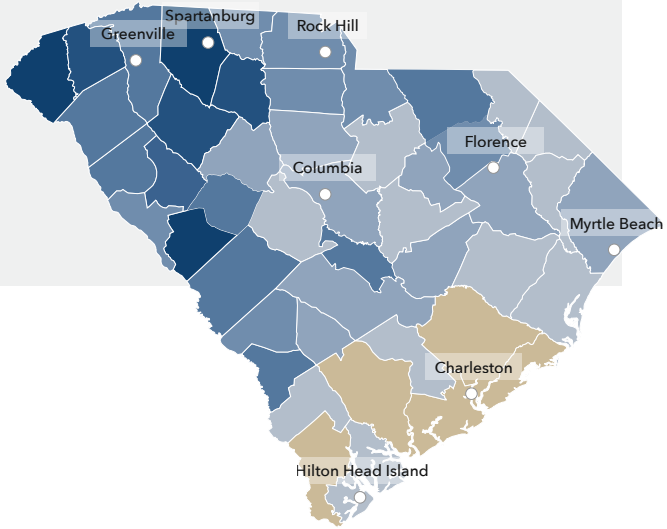
30-year change
▲ +45,400 (+17%)

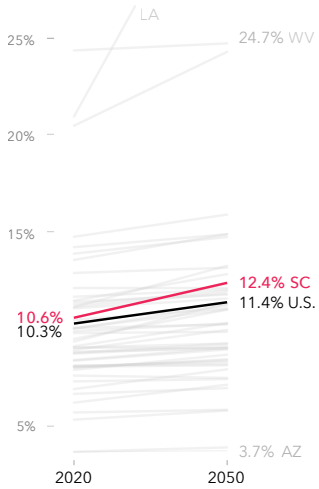
Charleston floods from tides, storm surge, and heavy rains, given its low elevation, proximity to the ocean, and increases in extreme rain events. To the west, areas around the Blue Ridge Mountains flood from river overflow due to heavy rain and the steep slope of the land. Columbia and surrounding areas see flooding from intense rains, which can cause dam failures and flash floods, making the flooding extremely dangerous.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +74,600







Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. South Carolina has a greater proportion of properties at substantial risk, with 10.6% at substantial risk today and 12.4% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
South Carolina

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 430,800 properties in South Carolina as at risk over the next 30 years. Of these properties, 55,900 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Charleston has the greatest number of properties at risk of flooding in the state with 29,500 currently at risk, or 59% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 97% of properties in Seabrook Island are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Bluffton, for example, will see a 181% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in South Carolina at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Charleston	29,469	59%	33,074	67%	+3,605	+12.2%
Hilton Head Island	18,699	91%	20,131	98%	+1,432	+7.7%
Mount Pleasant	12,306	39%	21,534	68%	+9,228	+75.0%
North Charleston	5,855	16%	7,988	22%	+2,133	+36.4%
North Myrtle Beach	5,548	36%	5,808	38%	+260	+4.7%
James Island	4,279	82%	5,072	97%	+793	+18.5%
Columbia	3,927	10%	4,123	10%	+196	+5.0%
Isle of Palms	3,783	96%	3,835	97%	+52	+1.4%
Myrtle Beach	3,764	25%	4,240	28%	+476	+12.6%
Kiawah Island	3,428	95%	3,437	96%	+9	+0.3%

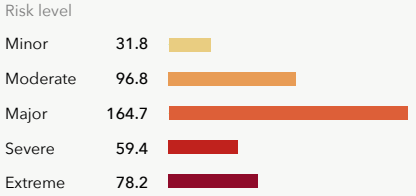
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Seabrook Island	2,296	97%	2,303	98%	+7	+0.3%
Isle of Palms	3,783	96%	3,835	97%	+52	+1.4%
Kiawah Island	3,428	95%	3,437	96%	+9	+0.3%
Edisto Beach	2,246	93%	2,250	93%	+4	+0.2%
Hilton Head Island	18,699	91%	20,131	98%	+1,432	+7.7%
Folly Beach	1,829	90%	1,831	90%	+2	+0.1%
James Island	4,279	82%	5,072	97%	+793	+18.5%
Andrews	1,466	73%	1,576	78%	+110	+7.5%
Charleston	29,469	59%	33,074	67%	+3,605	+12.2%
Port Royal	1,927	54%	2,770	77%	+843	+43.7%

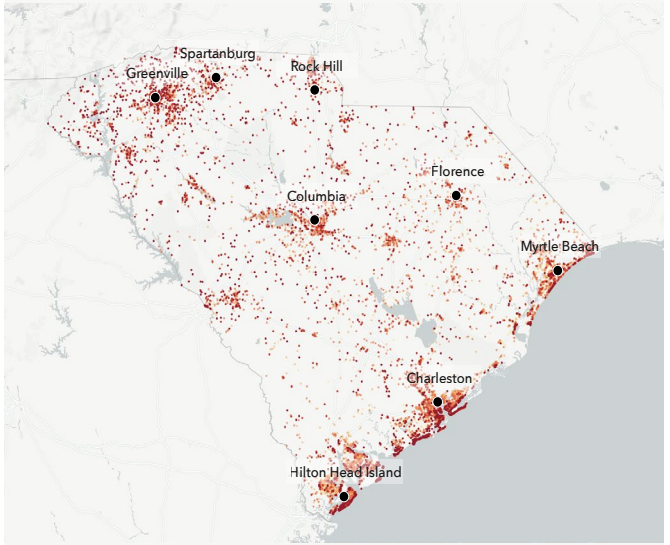
Greatest relative growing risk*

Municipality	2020		2050		Change	
Bluffton	2,703	20%	7,600	57%	+4,897	+181%
Beaufort	2,064	34%	4,970	81%	+2,906	+141%
Burton	1,035	35%	2,074	71%	+1,039	+100%
Mount Pleasant	12,306	39%	21,534	68%	+9,228	+75%
Georgetown	2,222	39%	3,732	65%	+1,510	+68%
Port Royal	1,927	54%	2,770	77%	+843	+44%
Hollywood	858	24%	1,214	34%	+356	+42%
Hanahan	444	7%	608	10%	+164	+37%
North Charleston	5,855	16%	7,988	22%	+2133	+36%
Murrells Inlet	376	8%	478	10%	+102	+27%

Flood Factor distribution of properties at risk* (1000s)



More than 16.8% of individual properties and properties in South Carolina are at any risk of flooding over the next 30 years. Out of those at risk 70% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
South Carolina

Claims History

294,100 home and property owners in South Carolina have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Charleston, Horry, Richland, Williamsburg, and Florence counties.

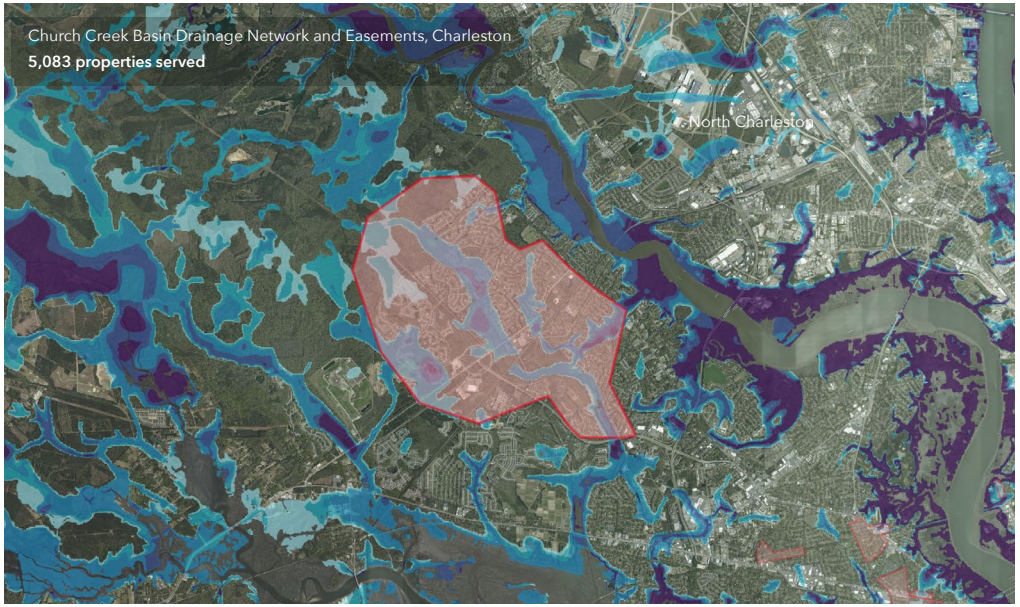
14,700

Properties served by protection measures

The First Street Foundation Flood Model incorporates 47 flood control measures throughout the state which protect 14,700 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Channel • Church Creek Basin Drainage Network and Easements, Charleston	6,639
Beach nourishment Hilton Head Island Beach Renourishment Pt 4, Hilton Head Island	2,916
Sewer upgrade BelleGrove Sewer Improvements, Myrtle Beach	1,841
Retention pond Hillside Drive Retention Basins, North Myrtle Beach	1,330
Culvert Byrnes Down Drainage Improvement Project, Charleston	601



* Source: Fema.gov

State Overview
South Dakota

Flood risk is increasing in some areas in the state of South Dakota while decreasing in others. Over the next 30 years approximately 63,000 properties have a substantial risk* of flooding.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 24,900 properties as having substantial risk in the state of South Dakota. In comparison, the First Street Foundation Flood Model identifies 2.5 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 37,600 properties currently not identified by FEMA as having substantial risk.

Total properties at substantial risk*

In 2020
62,600

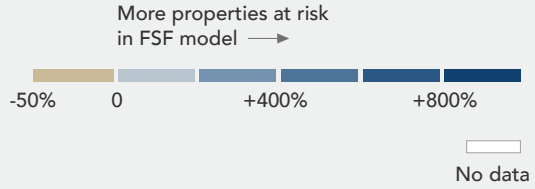
In 2050
63,000

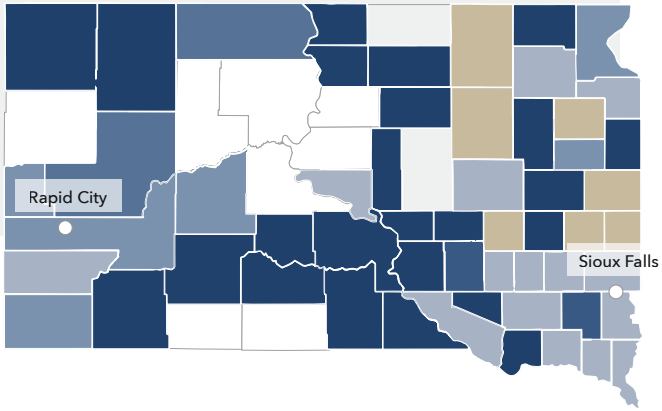
30-year change
▲ +400 (+0.6%)

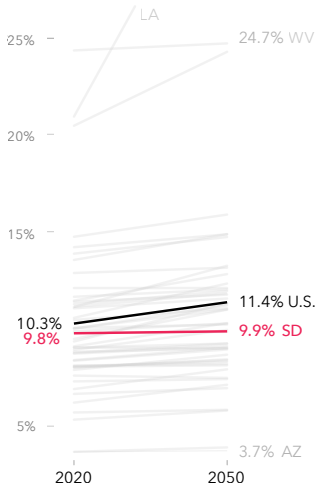
Many areas throughout South Dakota are vulnerable to flooding due to its many big waterways, including the Big Sioux, Missouri, and Rapid Creek rivers. Many bigger cities along these river systems, including Sioux Falls, Pierre and Rapid City, are regularly impacted by flooding.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +37,600







Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. South Dakota has a smaller proportion of properties at substantial risk, with 9.8% at substantial risk today and 9.9% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
South Dakota

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 83,400 properties in South Dakota as at risk over the next 30 years. Of these properties, 17,700 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Rapid City has the greatest number of properties at risk of flooding in the state with 4,600 currently at risk, or 18% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 40% of properties in Sturgis are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Aberdeen, for example, will see a 4% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in South Dakota at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Rapid City	4,594	18%	4,642	18%	+48	+1.0%
Sioux Falls	3,150	5%	3,164	5%	+14	+0.4%
Sturgis	1,267	40%	1,273	40%	+6	+0.5%
Watertown	1,221	13%	1,231	13%	+10	+0.8%
Spearfish	1,093	22%	1,124	22%	+31	+2.8%
Aberdeen	1,048	10%	1,092	11%	+44	+4.2%
Pierre	823	15%	843	16%	+20	+2.4%
Mitchell	562	8%	562	8%	+0	+0.0%
Rapid Valley	560	17%	569	18%	+9	+1.6%
Huron	528	8%	528	8%	+0	+0.0%

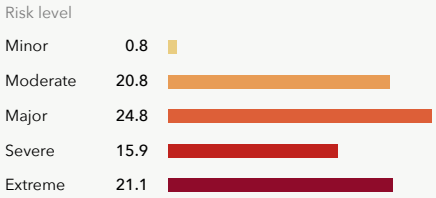
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Sturgis	1,267	40%	1,273	40%	+6	+0.5%
Hot Springs	517	22%	522	22%	+5	+1.0%
Spearfish	1,093	22%	1,124	22%	+31	+2.8%
Box Elder	479	20%	487	20%	+8	+1.7%
Rapid City	4,594	18%	4,642	18%	+48	+1.0%
Rapid Valley	560	17%	569	18%	+9	+1.6%
Madison	453	16%	456	16%	+3	+0.7%
Pierre	823	15%	843	16%	+20	+2.4%
Watertown	1,221	13%	1,231	13%	+10	+0.8%
Aberdeen	1,048	10%	1,092	11%	+44	+4.2%

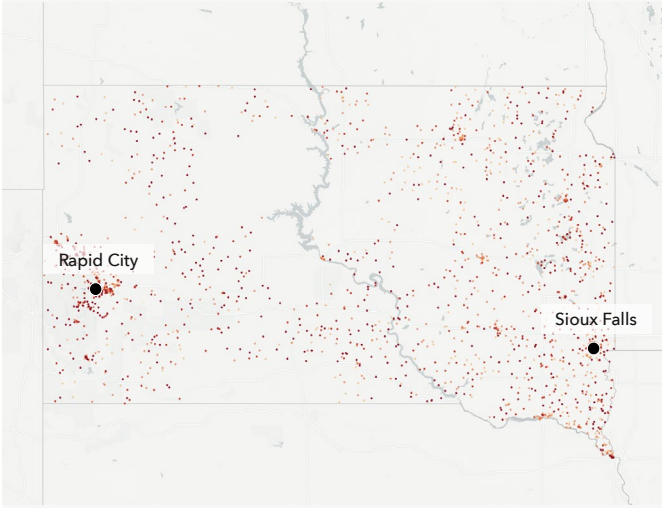
Greatest relative growing risk*

Municipality	2020		2050		Change	
Aberdeen	1,048	10%	1,092	11%	+44	+4%
Spearfish	1,093	22%	1,124	22%	+31	+3%
Pierre	823	15%	843	16%	+20	+2%
Brookings	294	4%	300	5%	+6	+2%
Box Elder	479	20%	487	20%	+8	+2%
Rapid Valley	560	17%	569	18%	+9	+2%
Hot Springs	517	22%	522	22%	+5	+1%
Rapid City	4,594	18%	4,642	18%	+48	+1%
Yankton	428	7%	432	7%	+4	+1%
Watertown	1,221	13%	1,231	13%	+10	+1%

Flood Factor distribution of properties at risk* (1000s)



More than 13.1% of individual properties and properties in South Dakota are at any risk of flooding over the next 30 years. Out of those at risk 74% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
South Dakota

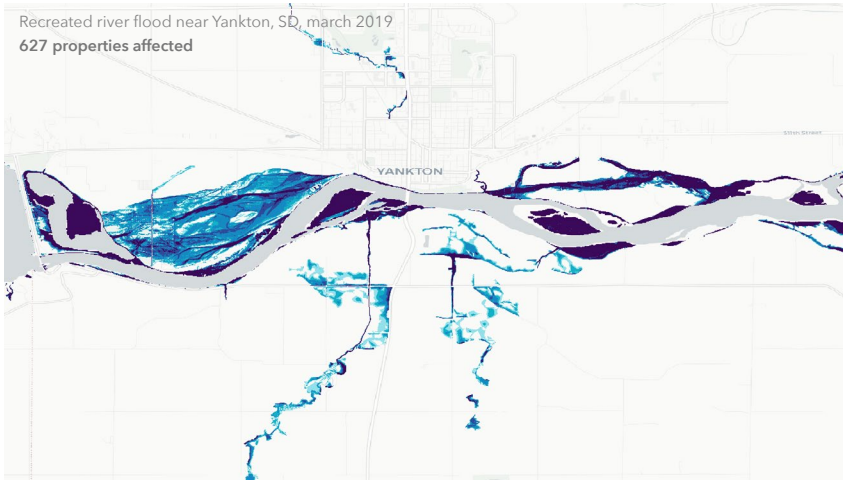
Claims History

13,100 home and property owners in South Dakota have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Brown, Union, Spink, Day, and Lyman counties.

Storm Simulation

Storm Simulation: The First Street Foundation Flood Model has recreated 3 flooding events that have occurred since the year 2000 in the state of South Dakota. These events flooded around 1,080 properties across the state.**

Flood event	Date	# Properties affected
River flood in Northern SD	Jun 2011	3
River flood near Sioux City, SD	Jun 2014	449
• River flood near Yankton, SD	Mar 2019	627



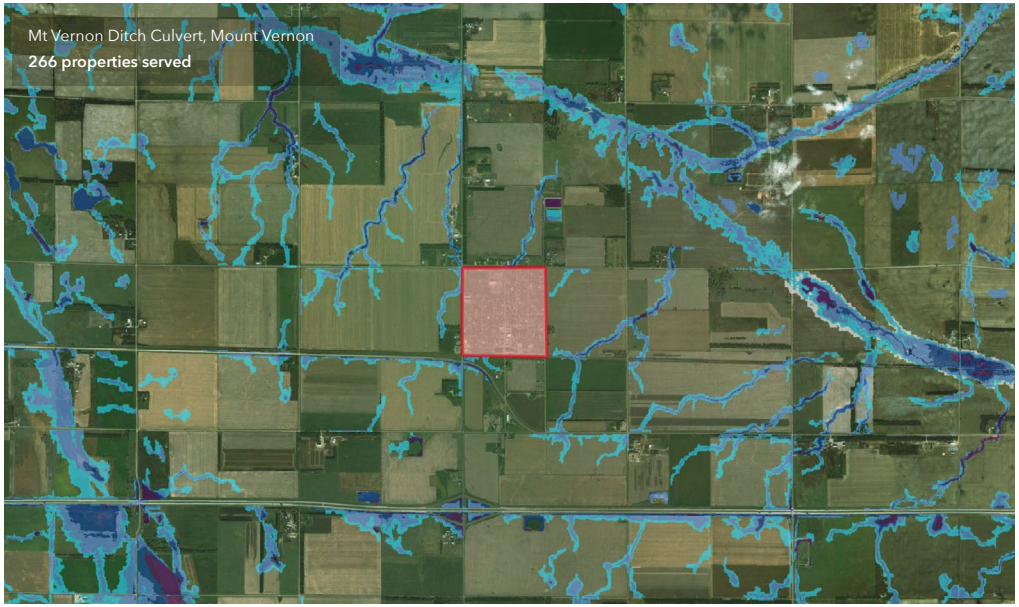
17,400

Properties served by protection measures

The First Street Foundation Flood Model incorporates 111 flood control measures throughout the state which protect 17,400 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Dam Gavins Point Dam, Yankton	8,777
Levee Moccasin Creek RB, Aberdeen	8,542
Culvert • Mt Vernon Ditch, Mount Vernon	351
Detention basin Browns Valley MN floodway channel, Becker Township	3
Elevated road Browns Valley Elevated Bridge, Becker Township	3



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Tennessee

Flood risk is increasing in the state of Tennessee. 383,200 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 3.2%, bringing the total number of properties with substantial risk to 395,600.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 101,400 properties as having substantial risk in the state of Tennessee. In comparison, the First Street Foundation Flood Model identifies 3.8 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 281,800 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 294,300 by the year 2050.

Total properties at substantial risk*

In 2020
383,200

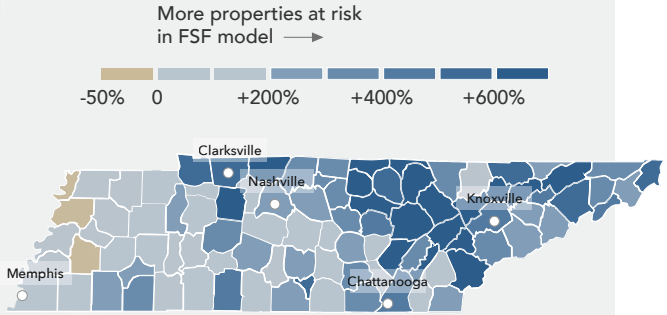
In 2050
395,600

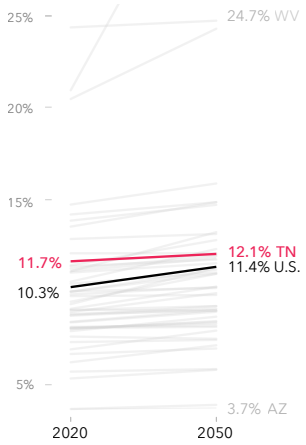
30-year change
▲ +12,400 (+3%)

Riverine flooding has been the major flood threat facing Tennessee for well over a century, so much so that the famous Tennessee Valley Authority was created in 1933 to manage the flow of water along the Tennessee Valley watershed. An intricate system of dams protects valuable farmland and large population centers like Chattanooga from the 100 year flood events, but an increase in dramatic rain events still poses risk for the state.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +281,800





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Tennessee has a greater proportion of properties at substantial risk, with 11.7% at substantial risk today and 12.1% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Tennessee

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 495,300 properties in Tennessee as at risk over the next 30 years. Of these properties, 135,500 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The Nashville-Davidson metropolitan area has the greatest number of properties at risk of flooding in the state with 33,200 currently at risk, or 13% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 42% of properties in Chattanooga are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Lakewood Park, for example, will see a 17% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Tennessee at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Nashville-Davidson	33,153	13%	33,813	14%	+660	+2.0%
Memphis	32,455	14%	35,837	15%	+3,382	+10.4%
Chattanooga	31,575	42%	31,868	42%	+293	+0.9%
Knoxville	10,565	14%	10,763	14%	+198	+1.9%
Clarksville	5,548	10%	5,827	11%	+279	+5.0%
Murfreesboro	3,833	10%	4,057	11%	+224	+5.8%
Kingsport	3,483	14%	3,576	15%	+93	+2.7%
Hendersonville	3,313	16%	3,351	17%	+38	+1.1%
East Ridge	2,928	35%	2,982	35%	+54	+1.8%
Johnson City	2,731	11%	2,876	12%	+145	+5.3%

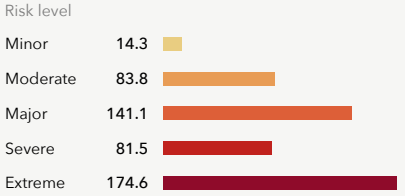
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Chattanooga	31,575	42%	31,868	42%	+293	+0.9%
Kingston	1,252	41%	1,258	41%	+6	+0.5%
Louisville	1,032	40%	1,033	40%	+1	+0.1%
Dayton	1,257	39%	1,269	39%	+12	+1.0%
Erwin	1,073	39%	1,116	40%	+43	+4.0%
Middle Valley	1,905	38%	1,920	38%	+15	+0.8%
East Ridge	2,928	35%	2,982	35%	+54	+1.8%
Lenoir City	1,662	34%	1,674	34%	+12	+0.7%
Pigeon Forge	1,114	32%	1,145	33%	+31	+2.8%
Soddy-Daisy	1,890	31%	1,906	31%	+16	+0.8%

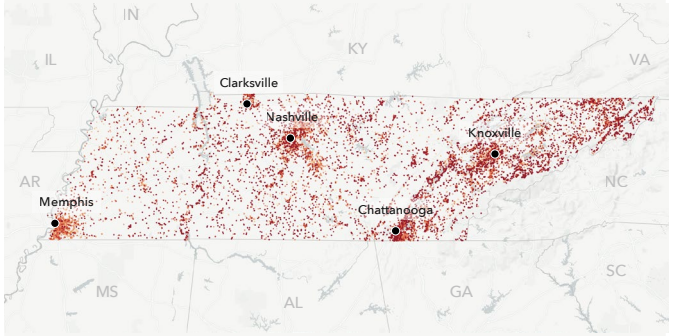
Greatest relative growing risk*

Municipality	2020		2050		Change	
Lakewood Park	201	6%	235	7%	+1,085	+17%
Memphis	32,455	14%	35,837	15%	+1,389	+10%
Jefferson City	350	11%	384	12%	+1,093	+10%
Millington	400	10%	436	11%	+664	+9%
Lakeland	266	5%	287	6%	+1,141	+8%
Collierville	642	4%	691	4%	+21	+8%
Bartlett	1,078	5%	1,149	5%	+307	+7%
Oak Ridge	1,528	11%	1,621	12%	+257	+6%
Germantown	1,200	8%	1,272	8%	+130	+6%
Manchester	468	9%	496	10%	+26	+6%

Flood Factor distribution of properties at risk* (1000s)



More than 15.1% of individual properties and properties in Tennessee are at any risk of flooding over the next 30 years. Out of those at risk 80% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Tennessee

Claims History

157,100 home and property owners in Tennessee have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Davidson, Shelby, Williamson, Hamilton, and Sumner counties.

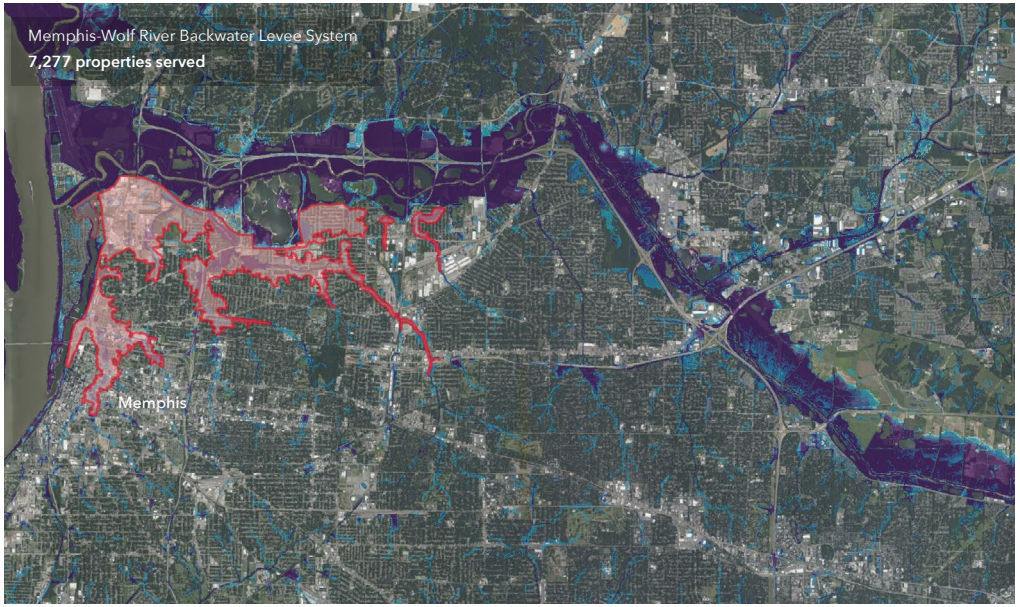
20,000

Properties served by protection measures

The First Street Foundation Flood Model incorporates 41 flood control measures throughout the state which protect 20,000 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee • Memphis-Wolf River Backwater Levee System	19,226
Dam TVA Dam System, Kingsport	358
Detention basin Founders and Kings Parks, Johnson City	188
Culvert Jonesborough Culvert Project, Jonesborough	152
Pervious pavement Johnson Street pervious pavement project, Chattanooga	40



* Source: Fema.gov

State Overview
Texas

Flood risk is increasing in the state of Texas. 1,150,900 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 15.9%, bringing the total number of properties with substantial risk to 1,333,700.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 860,000 properties as having substantial risk in the state of Texas. In comparison, the First Street Foundation Flood Model identifies 1.3 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 290,900 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 473,700 by the year 2050.

Total properties at substantial risk*

In 2020
1.15M

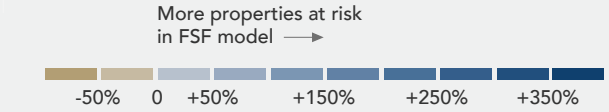
In 2050
1.33M

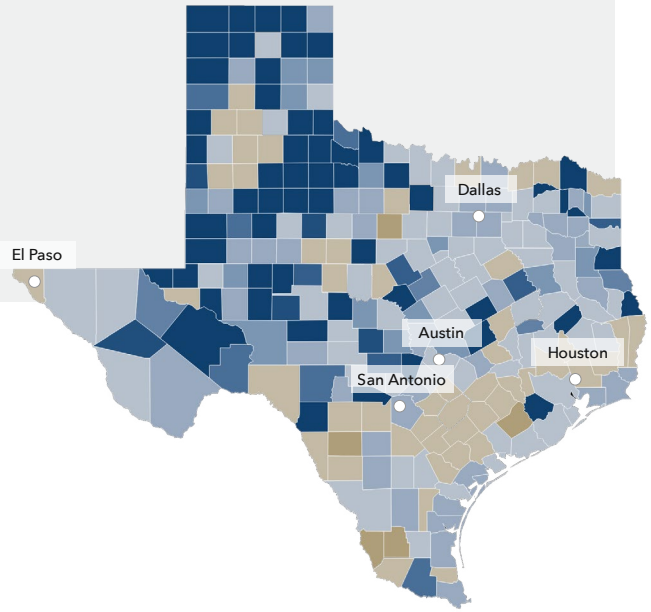
30-year change
▲ +182,800 (+16%)

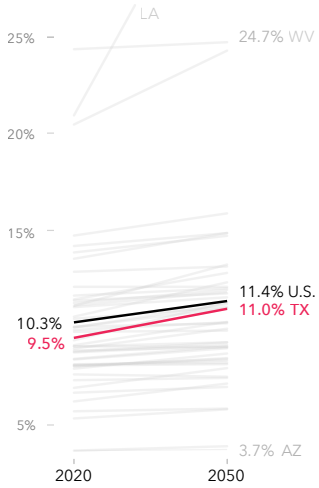
The Gulf of Mexico makes Southeast Texas vulnerable to tropical storms, and urbanization exacerbates the risk of runoff. To mitigate, networks of drainage channels move and store flood water. In western Texas, El Paso faces a monsoon season with heavy rains that flood waterways and the Rio Grande. Urban infrastructure increases runoff and limits natural infiltration. Flood storage projects can reduce flash flood risks from heavy rainfall.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +860,000







Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Texas has a smaller proportion of properties at substantial risk, with 9.5% at substantial risk today and 11% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Texas

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 2,116,800 properties in Texas as at risk over the next 30 years. Of these properties, 218,700 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Houston has the greatest number of properties at risk of flooding in the state with 186,500 currently at risk, or 32% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 100% of properties in Groves are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Ingleside, for example, will see a 194% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Texas at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Houston	186,481	32%	202,317	34%	+15,836	+8.5%
Corpus Christi	36,952	34%	47,248	43%	+10,296	+27.9%
San Antonio	30,587	7%	31,777	8%	+1,190	+3.9%
Port Arthur	27,723	96%	27,731	96%	+8	+0.0%
League City	27,419	70%	31,858	82%	+4,439	+16.2%
Galveston	26,651	97%	26,662	97%	+11	+0.0%
El Paso	24,306	12%	24,105	12%	-201	-0.8%
Sugar Land	22,044	66%	22,309	66%	+265	+1.2%
Dallas	21,687	7%	22,045	7%	+358	+1.7%
Fort Worth	20,648	8%	21,132	8%	+484	+2.3%

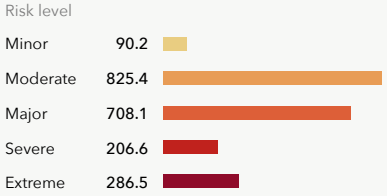
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Groves	7,074	100%	7,074	100%	+0	+0.0%
Dickinson	7,553	99%	7,564	100%	+11	+0.1%
Bacliff	4,019	99%	4,020	99%	+1	+0.0%
Palacios	2,092	99%	2,100	99%	+8	+0.4%
Bridge City	4,017	99%	4,017	99%	+0	+0.0%
Holiday Beach	2,683	98%	2,698	99%	+15	+0.6%
San Leon	4,667	98%	4,669	98%	+2	+0.0%
Port O'Connor	2,682	97%	2,685	97%	+3	+0.1%
Galveston	26,651	97%	26,662	97%	+11	+0.0%
Clute	3,832	96%	3,850	97%	+18	+0.5%

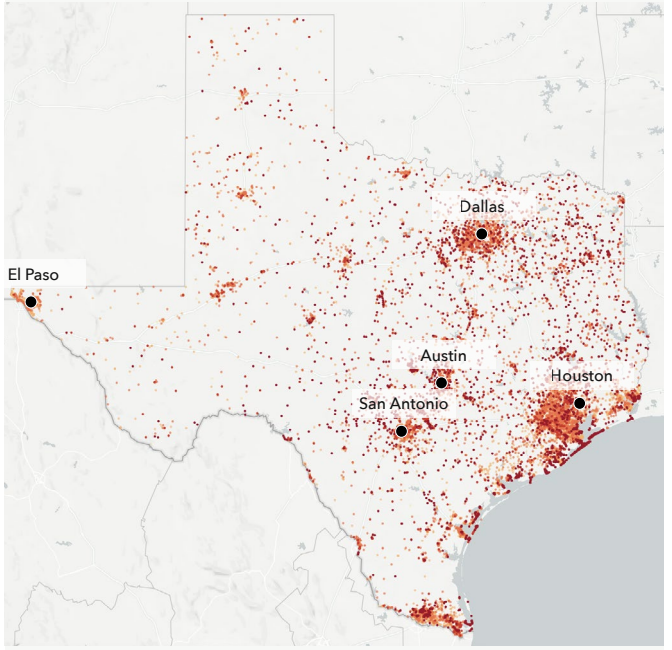
Greatest relative growing risk*

Municipality	2020		2050		Change	
Ingleside	629	17%	1,852	49%	+1,223	+194%
Channelview	2,583	20%	4,847	38%	+2,264	+88%
Baytown	11,220	44%	18,724	74%	+7,504	+67%
La Porte	8,793	63%	13,261	95%	+4,468	+51%
Vidor	1,172	22%	1,767	33%	+595	+51%
Deer Park	2,016	18%	2,907	26%	+891	+44%
Port Lavaca	3,430	70%	4,819	99%	+1,389	+41%
Friendswood	6,805	46%	9,328	64%	+2,523	+37%
Nederland	5,639	74%	7,445	98%	+1,806	+32%
Corpus Christi	36,952	34%	47,248	43%	+10,296	+28%

Flood Factor distribution of properties at risk* (1000s)



More than 17.5% of individual properties and properties in Texas are at any risk of flooding over the next 30 years. Out of those at risk 57% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Texas

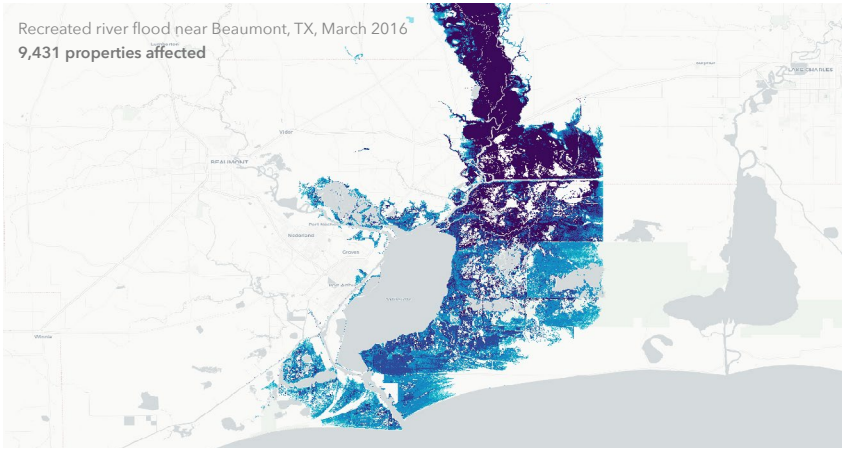
Claims History

2,900,700 home and property owners in Texas have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Harris, Jefferson, Galveston, Fort Bend, and Brazoria counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 4 flooding events that have occurred since the year 2000 in the state of Texas. These events flooded around 107,920 properties across the state.**

Flood event	Date	# Properties affected
Tropical Storm Allison	Jun 2001	1,124
Hurricane Ike	Sep 2008	95,749
River flood near Dallas, TX	May 2015	1,612
• River flood near Beaumont, TX	Mar 2016	9,431



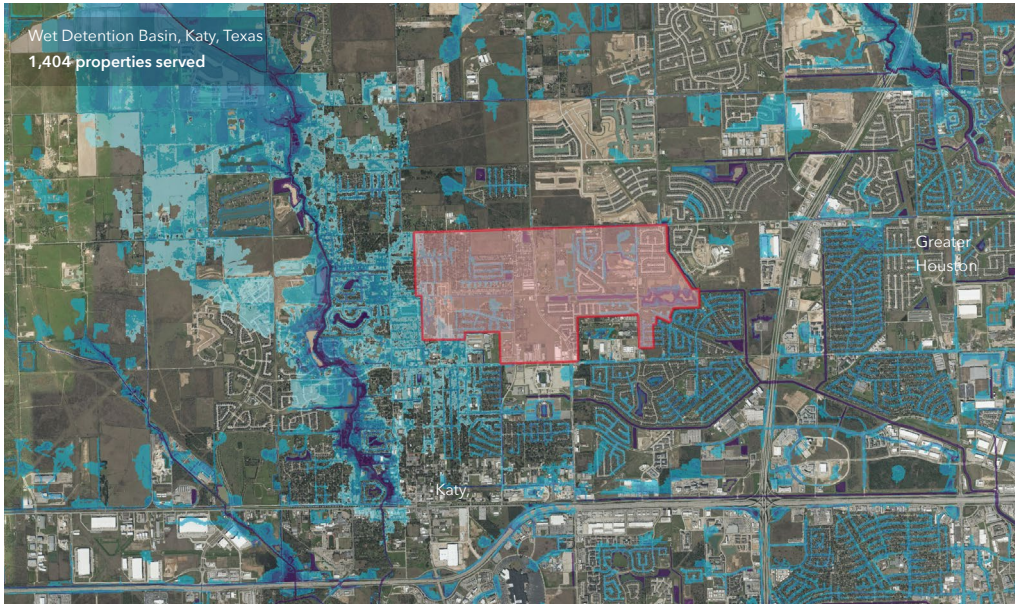
555,000

Properties served by protection measures

The First Street Foundation Flood Model incorporates 492 flood control measures throughout the state which protect 555,000 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee Valley Authority Canal Levee, Beaumont	73,579
Marsh/wetland Restoration D500-06-00 Compartment Four Wetland Basin, Houston	3,350
Seawall Galveston Seawall 2, Galveston	627
Buyout Harris County Flood Control District property buyouts within Coastal Zone Boundary	475
Detention basin • T501-01-00 Wet Detention Basin, Katy, TX	341



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Utah

Flood risk is increasing in the state of Utah. 113,100 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 6.9%, bringing the total number of properties with substantial risk to 120,900.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 21,800 properties as having substantial risk in the state of Utah. In comparison, the First Street Foundation Flood Model identifies 5.2 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 91,300 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 99,100 by the year 2050.

Total properties at substantial risk*

In 2020
113,100

In 2050
120,900

30-year change
▲ +7,800 (+7%)

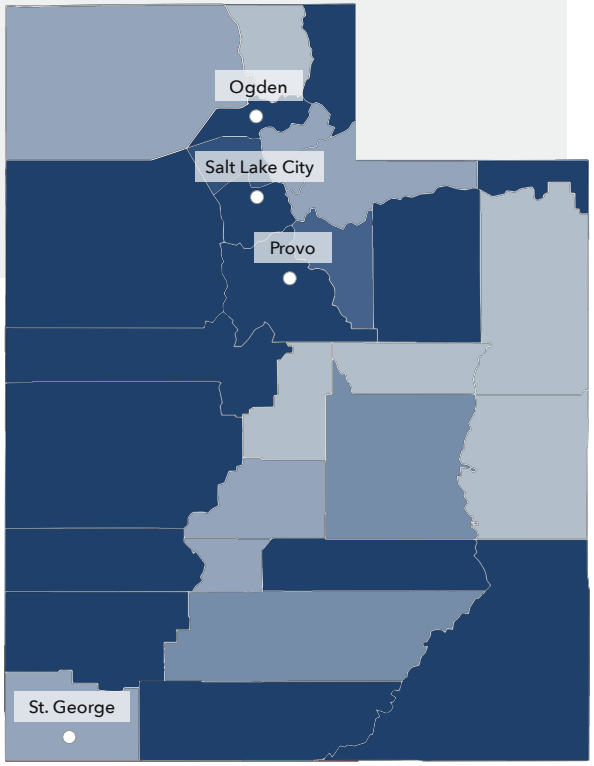
Difference in number of properties currently at substantial risk compared to FEMA**

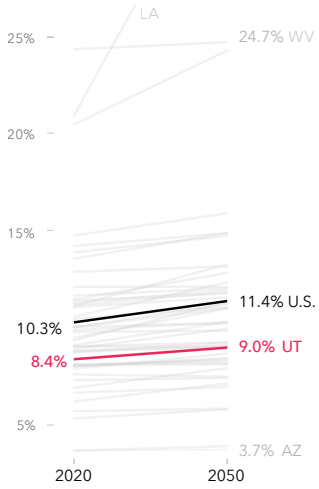
▲ +91,300

More properties at risk in FSF model →

0 +200% +400% +600%

Salt Lake Valley floods when snowmelt and storms raise Utah Lake, flooding the Jordan River. USACE and Salt Lake County regulate development in the floodplain, while projects like the Surplus Canal divert runoff upstream. The City of St. George in Washington County manages the floodplain through land-use regulations and dredging to mitigate flash floods from summer storms that overflow the Virgin and Santa Clara rivers.





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Utah has a smaller proportion of properties at substantial risk, with 8.4% at substantial risk today and 9% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Utah

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 210,800 properties in Utah as at risk over the next 30 years. Of these properties, 6,600 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Salt Lake City has the greatest number of properties at risk of flooding in the state with 15,600 currently at risk, or 23% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 51% of properties in Parowan are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Clearfield, for example, will see a 318% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Utah at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Salt Lake City	15,584	23%	16,167	24%	+583	+3.7%
Ogden	8,243	27%	8,568	28%	+325	+3.9%
Millcreek	4,583	22%	5,002	24%	+419	+9.1%
West Jordan	4,496	14%	4,758	15%	+262	+5.8%
Springville	4,150	36%	4,251	37%	+101	+2.4%
Provo	4,032	15%	4,217	16%	+185	+4.6%
West Valley City	3,496	10%	3,913	11%	+417	+11.9%
Riverton	3,342	25%	3,420	25%	+78	+2.3%
Murray	3,267	18%	3,440	19%	+173	+5.3%
Bountiful	3,204	22%	3,461	24%	+257	+8.0%

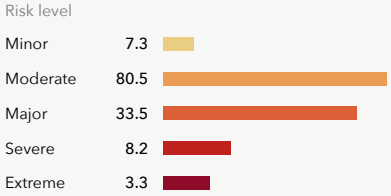
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Parowan	1,139	51%	1,164	52%	+25	+2.2%
Harrisville	1,164	44%	1,193	45%	+29	+2.5%
Stansbury Park	1,215	39%	1,269	41%	+54	+4.4%
West Bountiful	794	36%	843	38%	+49	+6.2%
Springville	4,150	36%	4,251	37%	+101	+2.4%
North Ogden	2,704	35%	2,842	37%	+138	+5.1%
Lindon	1,536	35%	1,578	36%	+42	+2.7%
Heber	2,127	35%	2,227	36%	+100	+4.7%
South Salt Lake	2,931	35%	2,949	35%	+18	+0.6%
Centerville	1,988	34%	2,081	36%	+93	+4.7%

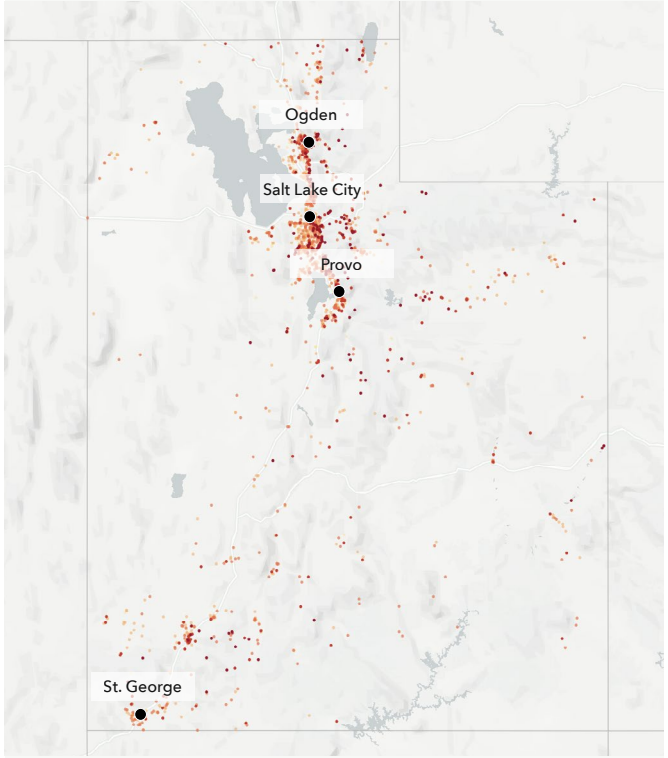
Greatest relative growing risk*

Municipality	2020		2050		Change	
Clearfield	11	0%	46	1%	+35	+318%
Clinton	150	2%	195	3%	+45	+30%
Midvale	414	4%	527	6%	+113	+27%
Washington Terrace	31	1%	38	1%	+7	+23%
Vineyard	56	2%	67	2%	+11	+20%
Woods Cross	729	18%	846	21%	+117	+16%
Plain City	139	4%	161	5%	+22	+16%
Layton	2,001	8%	2,316	10%	+315	+16%
Nibley	79	3%	91	4%	+12	+15%
Roosevelt	100	3%	115	4%	+15	+15%

Flood Factor distribution of properties at risk* (1000s)



More than 15.3% of individual properties and properties in Utah are at any risk of flooding over the next 30 years. Out of those at risk 56% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

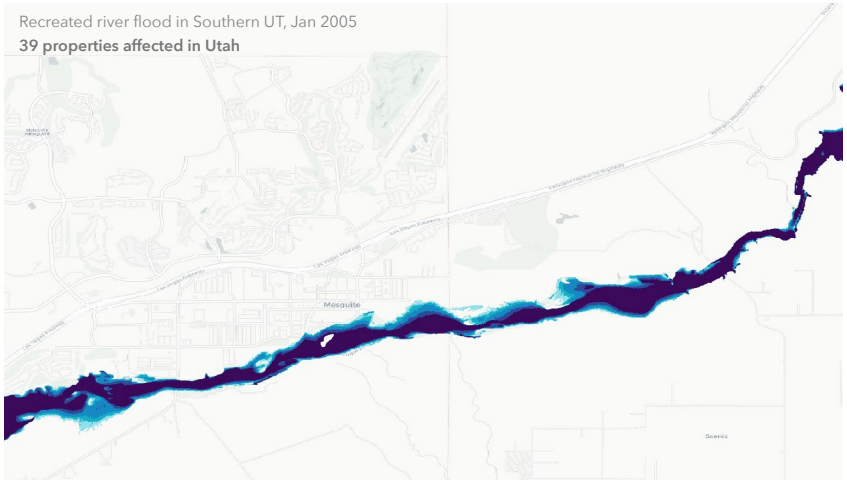
Flood History & Protection
Utah

Claims History

300 home and property owners in Utah have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Salt Lake, Davis, Washington, Utah, and Weber counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 1 flooding event that has occurred since the year 2000 in the state of Utah. This event flooded around 40 properties across the state.**



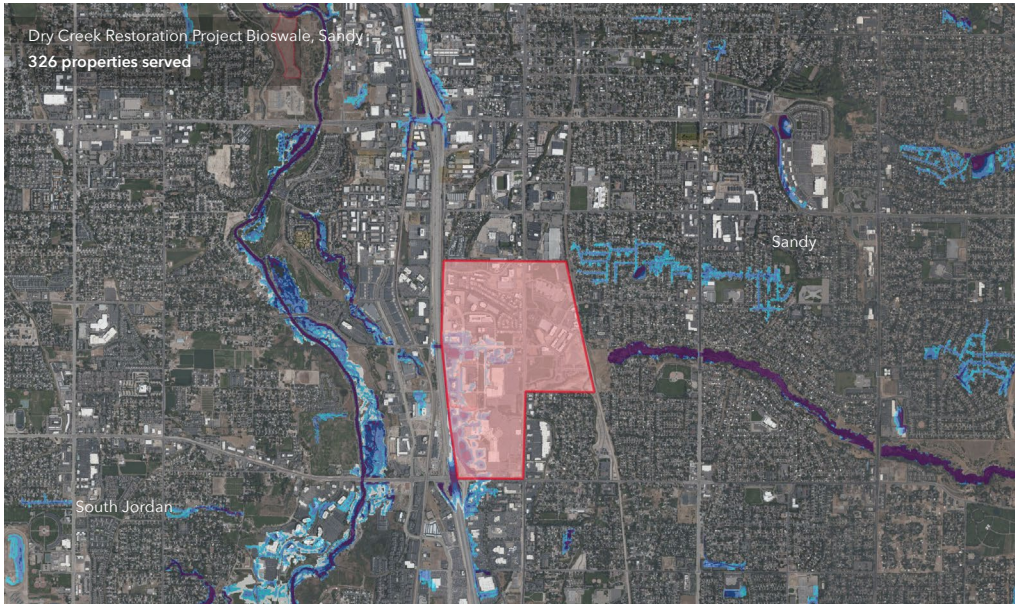
14,600

Properties served by protection measures

The First Street Foundation Flood Model incorporates 38 flood control measures throughout the state which protect 14,600 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee Surplus Canal East Bank, Salt Lake City	14,314
Bioswale • Dry Creek Restoration Project, Sandy	326
Dam American Fork Debris Basin Inundation Area	5



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Vermont

Flood risk is increasing in the state of Vermont. 39,700 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 2.1%, bringing the total number of properties with substantial risk to 40,600.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 13,000 properties as having substantial risk in the state of Vermont. In comparison, the First Street Foundation Flood Model identifies 3.1 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 26,700 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 27,600 by the year 2050.

Total properties at substantial risk*

In 2020
39,700

In 2050
40,600

30-year change
▲ +900 (+2%)

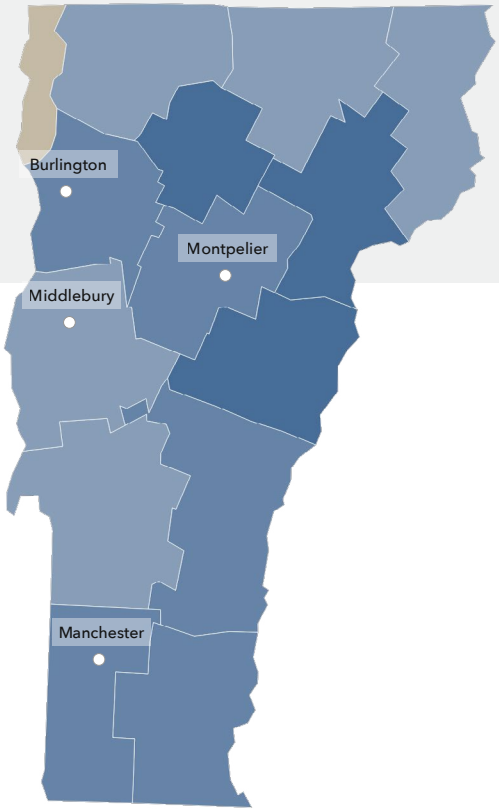
Difference in number of properties currently at substantial risk compared to FEMA**

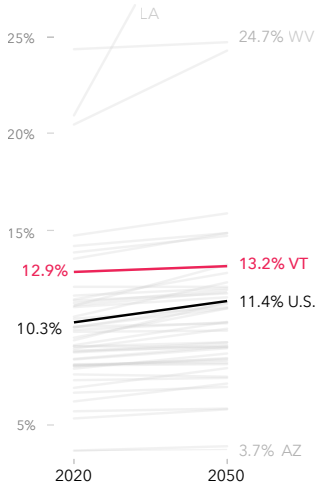
▲ +26,700

More properties at risk in FSF model →

-70% 0 +100% +200%

While landlocked, Vermont faces flood risk from rainfall in some areas. Burlington and surrounding Lake Champlain towns face flood risk from rain and snowmelt that raise lake elevation. Low-lying areas face greater risk. Rainstorms can overwhelm infrastructure in urban areas. Stormwater ponds and storage tanks reduce the risk of rainfall flooding. Common sources of flooding in the southern region include spring ice jams and snowmelt.





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Vermont has a greater proportion of properties at substantial risk, with 12.9% at substantial risk today and 13.2% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Vermont

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 52,300 properties in Vermont as at risk over the next 30 years. Of these properties, 20,200 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Bennington has the greatest number of properties at risk of flooding in the state with 1,300 currently at risk, or 43% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 43% of properties in Bennington are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Rutland, for example, will see a 6% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Vermont at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Bennington	1,292	43%	1,306	44%	+14	+1.1%
Barre	1,052	33%	1,060	33%	+8	+0.8%
Montpelier	1,045	35%	1,058	35%	+13	+1.2%
Rutland	768	13%	813	14%	+45	+5.9%
Burlington	460	5%	464	6%	+4	+0.9%
St. Johnsbury	442	20%	454	20%	+12	+2.7%
Brattleboro	362	15%	363	15%	+1	+0.3%
South Burlington	285	4%	292	4%	+7	+2.5%
St. Albans	251	11%	253	11%	+2	+0.8%
Essex Junction	130	5%	131	5%	+1	+0.8%

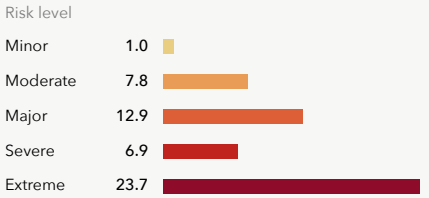
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Bennington	1,292	43%	1,306	44%	+14	+1.1%
Montpelier	1,045	35%	1,058	35%	+13	+1.2%
Barre	1,052	33%	1,060	33%	+8	+0.8%
St. Johnsbury	442	20%	454	20%	+12	+2.7%
Brattleboro	362	15%	363	15%	+1	+0.3%
Rutland	768	13%	813	14%	+45	+5.9%
St. Albans	251	11%	253	11%	+2	+0.8%
Burlington	460	5%	464	6%	+4	+0.9%
Essex Junction	130	5%	131	5%	+1	+0.8%
South Burlington	285	4%	292	4%	+7	+2.5%

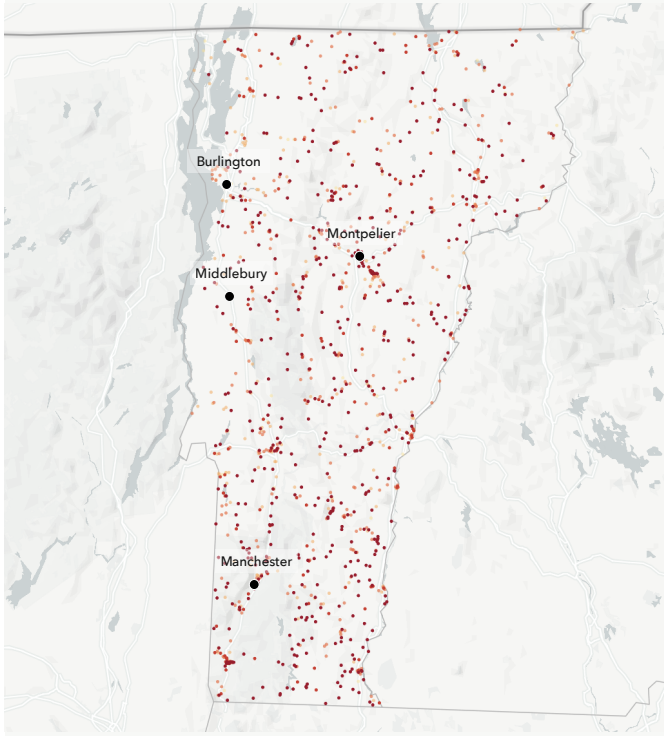
Greatest relative growing risk*

Municipality	2020		2050		Change	
Rutland	768	13%	813	14%	+45	+6%
St. Johnsbury	442	20%	454	20%	+12	+3%
South Burlington	285	4%	292	4%	+7	+3%
Montpelier	1,045	35%	1,058	35%	+13	+1%
Bennington	1,292	43%	1,306	44%	+14	+1%
Burlington	460	5%	464	6%	+4	+1%
Barre	1,052	33%	1,060	33%	+8	+1%
Essex Junction	130	5%	131	5%	+1	+1%
St. Albans	251	11%	253	11%	+2	+1%
Brattleboro	362	15%	363	15%	+1	+0%

Flood Factor distribution of properties at risk* (1000s)



More than 16.1% of individual properties and properties in Vermont are at any risk of flooding over the next 30 years. Out of those at risk 88% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

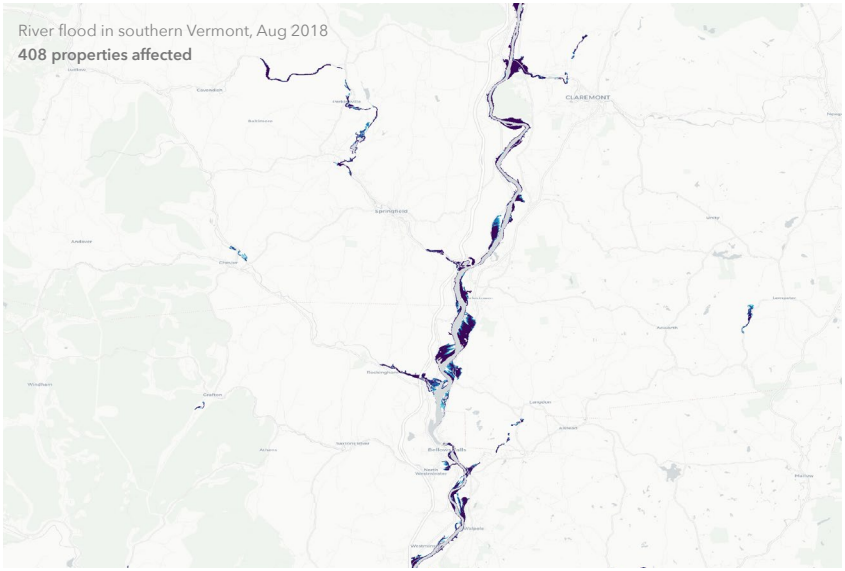
Flood History & Protection
Vermont

Claims History

16,100 home and property owners in Vermont have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Windsor, Washington, Windham, Rutland, and Orange counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 1 flooding event that has occurred since the year 2000 in the state of Vermont. This event flooded around 410 properties across the state.**



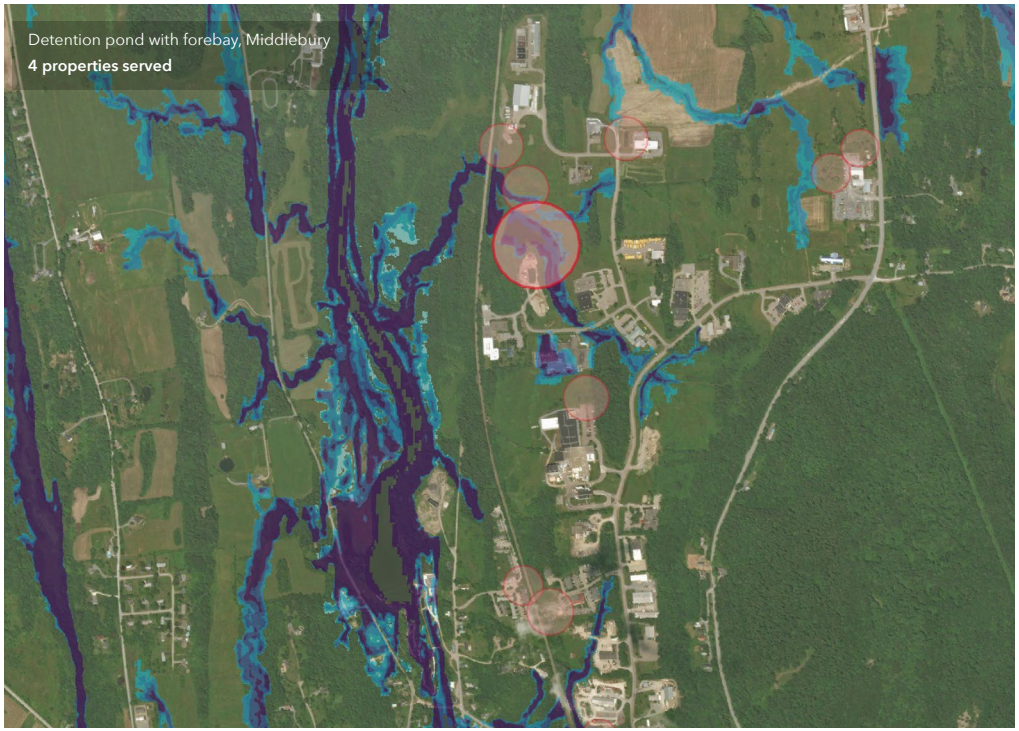
3,400

Properties served by protection measures

The First Street Foundation Flood Model incorporates 984 flood control measures throughout the state which protect 3,400 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Detention basin • Detention pond with forebay, Middlebury	2,628
Levee Roaring Branch Left Bank, Bennington	763



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Virginia

Flood risk is increasing in the state of Virginia. 344,400 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 13.1%, bringing the total number of properties with substantial risk to 389,700.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 162,500 properties as having substantial risk in the state of Virginia. In comparison, the First Street Foundation Flood Model identifies 2.1 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 181,900 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 227,200 by the year 2050.

Total properties at substantial risk*

In 2020
344,400

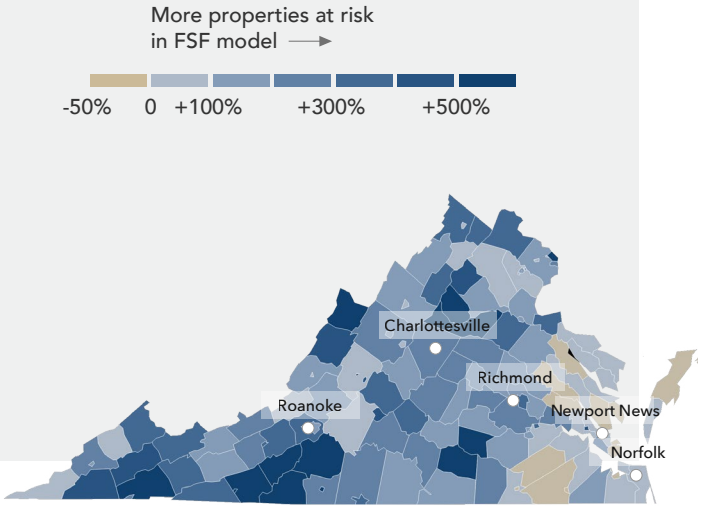
In 2050
389,700

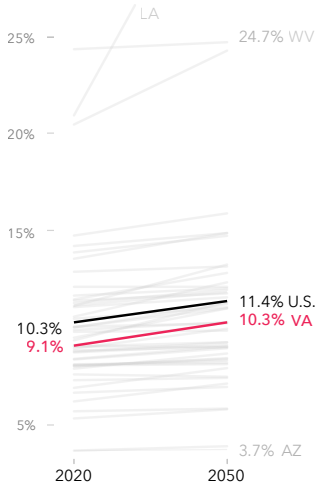
30-year change
▲ +45,300 (+13%)

Coastal cities face risk from rising sea levels and more frequent tidal flooding. Hurricanes and other storms cause erosion and destruction from storm surge. Hampton Roads has worked to enhance existing infrastructure built to protect coastal communities. Inland areas are most often flooded from heavy rainfall. Richmond is particularly flood prone on the James River. It is protected by levees to limit the destruction of infrastructure.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +181,934





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Virginia has a smaller proportion of properties at substantial risk, with 9.1% at substantial risk today and 10.3% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Virginia

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 570,800 properties in Virginia as at risk over the next 30 years. Of these properties, 133,700 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Virginia Beach has the greatest number of properties at risk of flooding in the state with 28,900 currently at risk, or 20% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 80% of properties in Chincoteague are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Norfolk, for example, will see a 200% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Virginia at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Virginia Beach	28,943	20%	52,125	37%	+23,182	+80.1%
Norfolk	18,042	27%	54,054	80%	+36,012	+199.6%
Hampton	16,820	33%	34,085	67%	+17,265	+102.6%
Chesapeake	16,543	19%	25,418	29%	+8,875	+53.6%
Portsmouth	8,543	24%	21,736	60%	+13,193	+154.4%
Newport News	7,285	14%	8,999	17%	+1,714	+23.5%
Roanoke	6,444	15%	6,530	15%	+86	+1.3%
Richmond	5,067	7%	5,245	8%	+178	+3.5%
Chincoteague	4,514	80%	4,517	80%	+3	+0.1%
Poquoson	3,907	73%	4,946	92%	+1,039	+26.6%

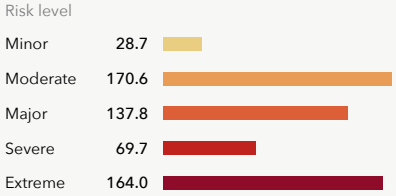
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Chincoteague	4,514	80%	4,517	80%	+3	+0.1%
Poquoson	3,907	73%	4,946	92%	+1,039	+26.6%
Glasgow	1,908	50%	1,940	51%	+32	+1.7%
Big Stone Gap	1,165	43%	1,168	43%	+3	+0.3%
Bridgewater	894	43%	926	45%	+32	+3.6%
Buena Vista	2,533	39%	2,564	40%	+31	+1.2%
Tazewell	1,017	36%	1,029	36%	+12	+1.2%
Deltaville	872	35%	1,196	48%	+324	+37.2%
Richlands	1,056	33%	1,079	34%	+23	+2.2%
Hampton	16,820	33%	34,085	67%	+17,265	+102.6%

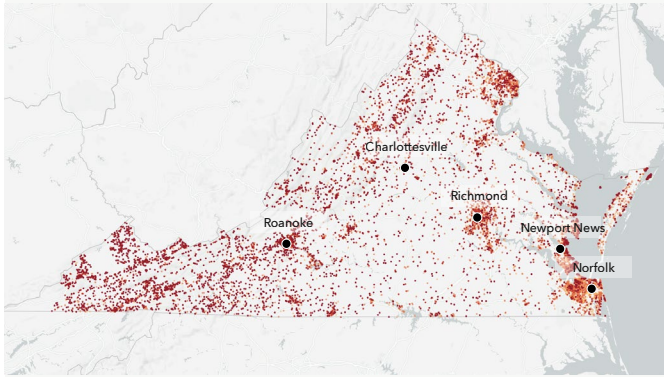
Greatest relative growing risk*

Municipality	2020		2050		Change	
Norfolk	18,042	27%	54,054	80%	+36,012	+200%
Portsmouth	8,543	24%	21,736	60%	+13,193	+154%
West Point	660	16%	1,449	35%	+789	+120%
Hampton	16,820	33%	34,085	67%	+17,265	+103%
Gloucester Point	998	18%	1,910	34%	+912	+91%
Stone Ridge	53	1%	97	3%	+44	+83%
Virginia Beach	28,943	20%	52,125	37%	+23,182	+80%
Horntown	433	14%	709	23%	+276	+64%
Chesapeake	16,543	19%	25,418	29%	+8,875	+54%
Belle Haven	374	18%	535	26%	+161	+43%

Flood Factor distribution of properties at risk* (1000s)



More than 15.1% of individual properties and properties in Virginia are at any risk of flooding over the next 30 years. Out of those at risk 65% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Virginia

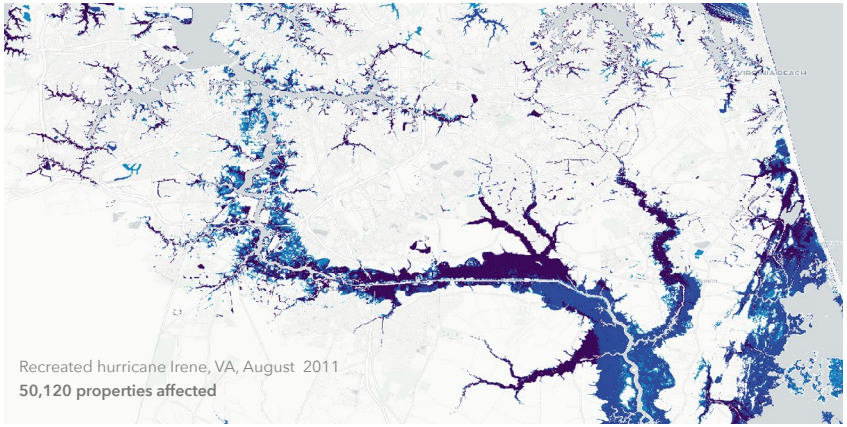
Claims History

95,900 home and property owners in Virginia have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Virginia Beach, Hampton, Norfolk, York, and Louisa counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 4 flooding events that have occurred since the year 2000 in the state of Virginia. These events flooded around 169,930 properties across the state.**

Flood event	Date	# Properties affected
Hurricane Isabel	Sep 2003	105,638
Nor'easter	Nov 2009	14,055
• Hurricane Irene	Aug 2011	50,120
River flood near Northern VA	Dec 2018	115



0.5 1 2 3+ ft Depth of flooding

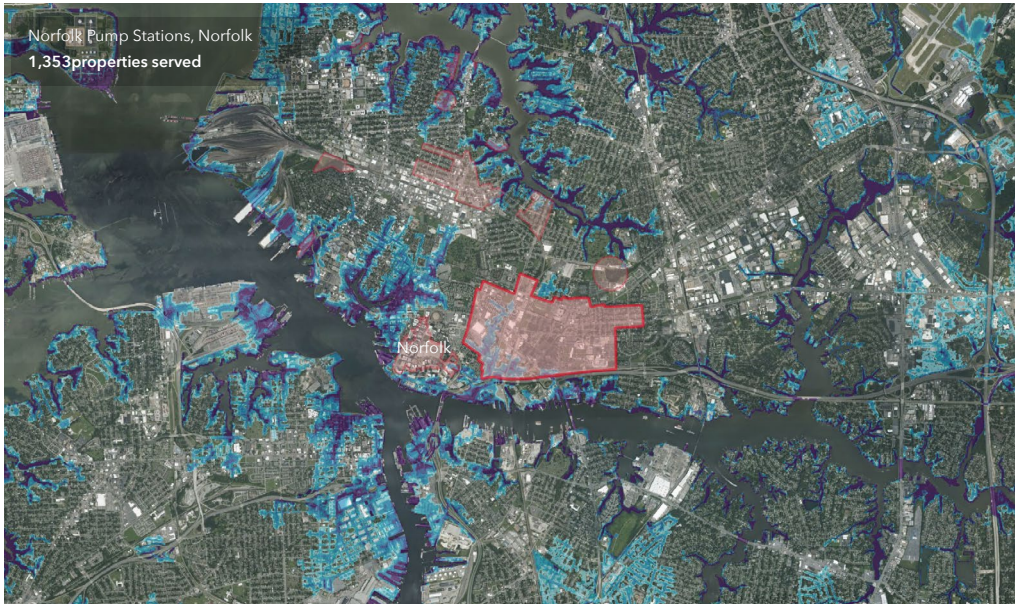
17,600

Properties served by protection measures

The First Street Foundation Flood Model incorporates 107 flood control measures throughout the state which protect 17,600 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Pump station • Norfolk Pump Stations	5,682
Levee Buena Vista	4,273
Channel Government Ditch and Newmarket Creek Channel Improvement	2,299
Dam Lee Hall, Newport News	1,757
Detention basin USACE Beaver Creek Restoration Project, Bristol	983



Area of protection

0.5 1 2 3+ ft Depth of flooding for a simulated 1 in 100 flood event in 2020

* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Washington

Flood risk is increasing in the state of Washington. 362,600 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 6%, bringing the total number of properties with substantial risk to 384,400.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 121,500 properties as having substantial risk in the state of Washington. In comparison, the First Street Foundation Flood Model identifies 3 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 241,100 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 262,900 by the year 2050.

Total properties at substantial risk*

In 2020
362,600

In 2050
384,400

30-year change
▲ +21,800 (+6%)

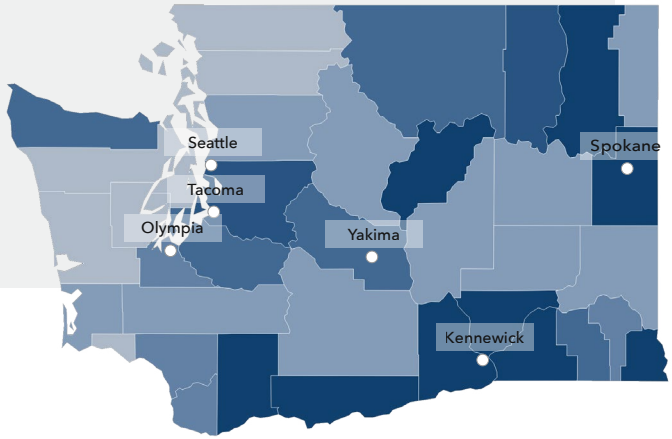
Difference in number of properties currently at substantial risk compared to FEMA**

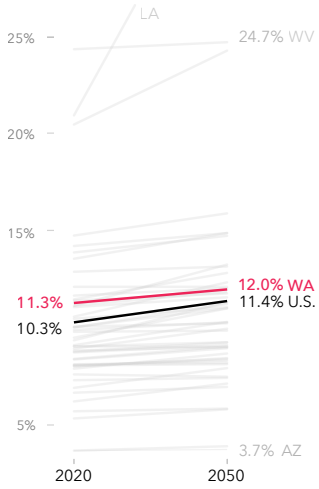
▲ +241,100

More properties at risk in FSF model →

0 +100% +300% +500%

Urbanization along Seattle's Thornton Creek brings backwater flooding and overflow of channel banks. In the upper Snoqualmie Valley, a combination of seasonal winter storms as well as warmer spring and summer temperatures causes snow to melt which contributes to high impact annual flooding from increased flow. Without protection of flood control reservoirs, communities along the Snoqualmie River are vulnerable to severe flooding.





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Washington has a greater proportion of properties at substantial risk, with 11.3% at substantial risk today and 12% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Washington

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 543,400 properties in Washington as at risk over the next 30 years. Of these properties, 100,700 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Seattle has the greatest number of properties at risk of flooding in the state with 14,000 currently at risk, or 8% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 100% of properties in Toppenish are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Indianola, for example, will see a 63% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Washington at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Seattle	13,977	8%	15,647	9%	+1,670	+11.9%
Longview	12,524	87%	12,532	87%	+8	+0.1%
Spokane	9,493	12%	10,389	13%	+896	+9.4%
Walla Walla	7,107	60%	7,268	61%	+161	+2.3%
Spokane Valley	6,880	21%	7,386	22%	+506	+7.4%
Tacoma	6,652	9%	7,198	10%	+546	+8.2%
Puyallup	6,324	48%	6,381	48%	+57	+0.9%
Vancouver	6,038	12%	6,411	13%	+373	+6.2%
Centralia	4,867	75%	4,945	76%	+78	+1.6%
Aberdeen	4,710	58%	4,789	59%	+79	+1.7%

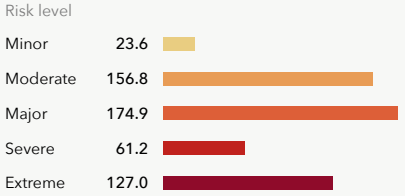
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Toppenish	2,438	100%	2,438	100%	0	0.0%
Fife	2,954	96%	2,956	96%	+2	+0.1%
Finley	2,011	88%	2,044	90%	+33	+1.6%
Pacific	1,937	88%	1,940	88%	+3	+0.2%
Longview	12,524	87%	12,532	87%	+8	+0.1%
Hoquiam	3,458	82%	3,469	82%	+11	+0.3%
North Bend	2,258	81%	2,262	81%	+4	+0.2%
Orting	2,442	79%	2,601	84%	+159	+6.5%
Centralia	4,867	75%	4,945	76%	+78	+1.6%
Sedro-Woolley	3,049	74%	3,157	76%	+108	+3.5%

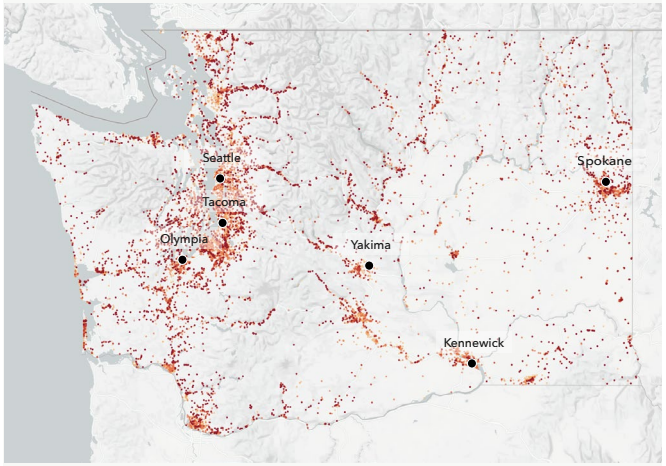
Greatest relative growing risk*

Municipality	2020		2050		Change	
Indianola	110	5%	179	8%	+69	+63%
Ocean Shores	1,434	13%	2,133	19%	+699	+49%
Point Roberts	137	4%	201	6%	+64	+47%
Birch Bay	652	12%	851	15%	+199	+31%
Oak Harbor	266	5%	342	6%	+76	+29%
Port Townsend	487	7%	621	9%	+134	+28%
Port Ludlow	99	5%	126	6%	+27	+27%
Anacortes	609	7%	773	9%	+164	+27%
Bainbridge Island	821	7%	1,040	9%	+219	+27%
Clarkston	249	9%	309	11%	+60	+24%

Flood Factor distribution of properties at risk* (1000s)



More than 17.1% of individual properties and properties in Washington are at any risk of flooding over the next 30 years. Out of those at risk 66% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Washington

Claims History

32,000 home and property owners in Washington have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Grays Harbor, Lewis, King, Snohomish, and Thurston counties.

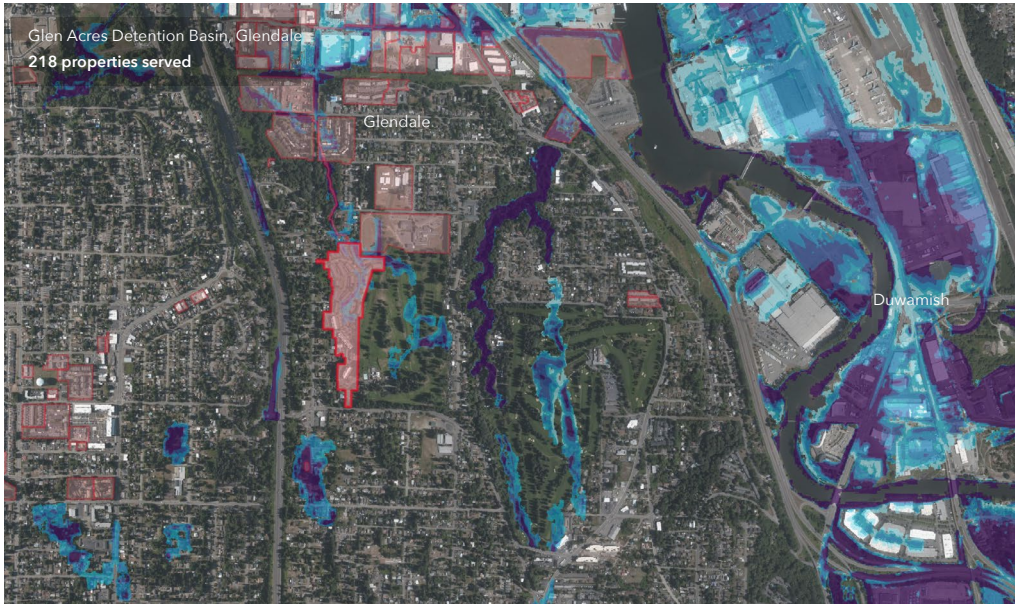
101,600

Properties served by protection measures

The First Street Foundation Flood Model incorporates 2,169 flood control measures throughout the state which protect 101,600 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee Cowlitz CDID 1 Protected Area, Longview	89,772
Detention basin Glen Acres, Glendale	4,175
Channel Sammamish River Channelization Project	2,929
Stormwater vault Griffis Seattle South at Brookside-Vault 1	2,212
Infiltration basin Park Place Estates, Auburn	1,216



* Source: Fema.gov

Overview
Washington, D.C.

Flood risk is increasing in the federal district Washington D.C. 7,300 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 8.8%, bringing the total number of properties with substantial risk to 8,000.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 1,400 properties as having substantial risk in the state of Washington D.C.. In comparison, the First Street Foundation Flood Model identifies 5.4 times the number of properties as facing this same level of risk**. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 6,000 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 6,600 by the year 2050.

Total properties at substantial risk*

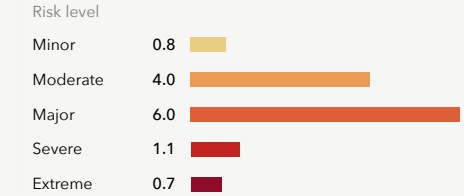
In 2020
7,300

In 2050
8,000

30-year change
▲ +700 (+9%)

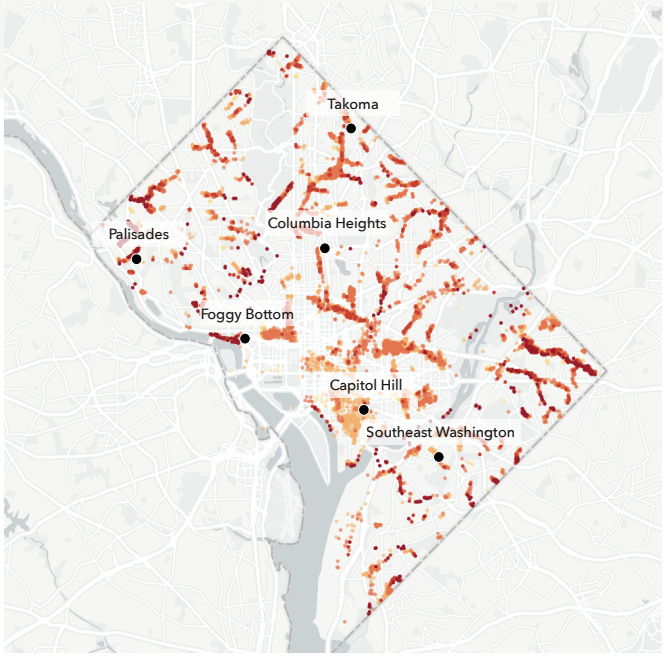
Low-lying Foggy Bottom and Buzzard Point face risk from river flooding and rainfall runoff coming from other areas of the city. Widespread flooding persists despite D.C's substantial stormwater management systems. The National Mall and surrounding government buildings are protected by a large levee that holds riverine flood waters at bay. Plans for joint parking structures and floodwater basins beneath the Mall are currently in the concept phase.

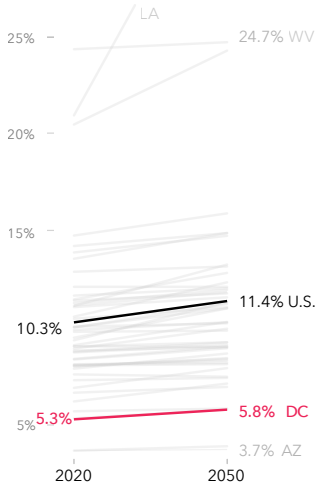
Flood Factor distribution of properties at risk* (1000s)**



The First Street Foundation Flood Model calculates the number of properties facing any risk*** of flooding. When looking at this broader level of risk, the data identifies 12,500 properties in Washington D.C. as at risk over the next 30 years. Of these properties, 100 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

More than 9.2% of individual properties and properties in Washington D.C. are at any risk of flooding over the next 30 years. Out of those at risk 62% are at major to extreme risk.





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Washington D.C. has a smaller proportion of properties at substantial risk, with 5.3% at substantial risk today and 5.8% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.
*** Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

State Overview
West Virginia

Flood risk is increasing in the state of West Virginia. 326,600 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 1.5%, bringing the total number of properties with substantial risk to 331,500.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 134,200 properties as having substantial risk in the state of West Virginia. In comparison, the First Street Foundation Flood Model identifies 2.4 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 192,400 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 197,300 by the year 2050.

Total properties at substantial risk*

In 2020
326,600

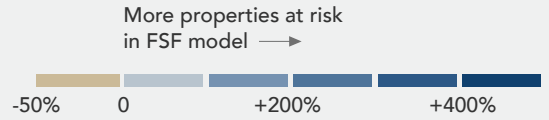
In 2050
331,500

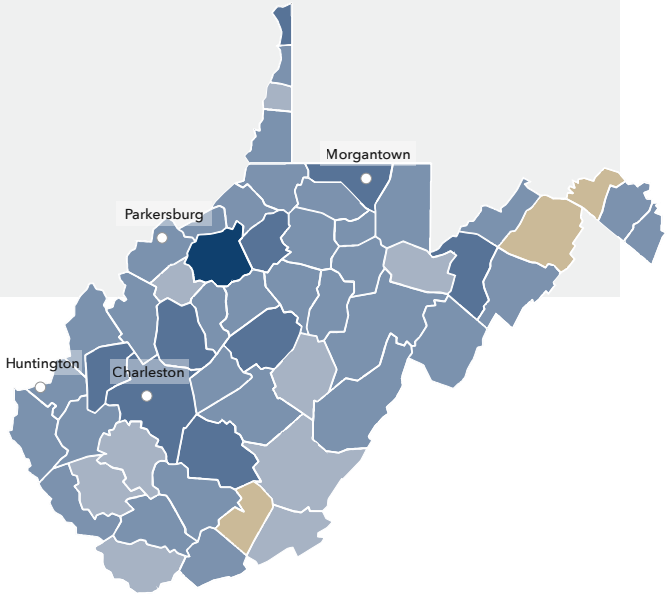
30-year change
▲ +4,900 (+1%)

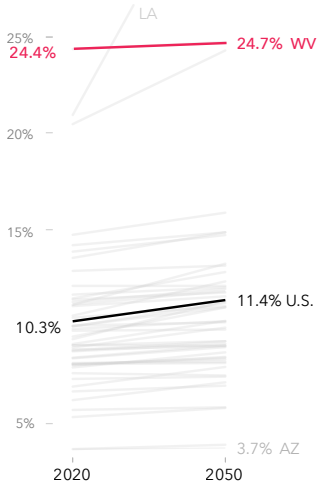
Frequent large rainfall events cause the banks of the Kanawha and Ohio rivers to overflow, posing the largest flood risk to population centers like Huntington and Charleston. The state's flood protection efforts stem primarily from its extensive system of dams, including the Stonewall Jackson Dam, Tygart River Dam, and Burnsville Dam.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +273,100







Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. West Virginia has a greater proportion of properties at substantial risk, with 24.4% at substantial risk today and 24.7% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
West Virginia

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 381,500 properties in West Virginia as at risk over the next 30 years. Of these properties, 174,300 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Charleston has the greatest number of properties at risk of flooding in the state with 12,800 currently at risk, or 44% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 76% of properties in Dunbar are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Huntington, for example, will see a 18% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in West Virginia at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Charleston	12,767	44%	12,834	44%	+67	+0.5%
Wheeling	9,018	56%	9,056	56%	+38	+0.4%
Parkersburg	7,927	39%	8,053	40%	+126	+1.6%
St. Albans	3,954	66%	3,979	66%	+25	+0.6%
Huntington	3,724	15%	4,402	18%	+678	+18.2%
South Charleston	3,105	44%	3,123	44%	+18	+0.6%
Dunbar	3,090	76%	3,097	76%	+7	+0.2%
Vienna	2,758	46%	2,795	46%	+37	+1.3%
Nitro	2,752	72%	2,761	73%	+9	+0.3%
Moundsville	2,641	52%	2,705	53%	+64	+2.4%

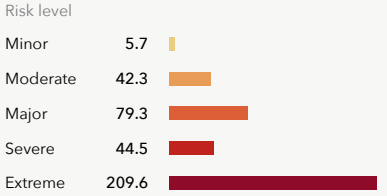
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Dunbar	3,090	76%	3,097	76%	+7	+0.2%
New Martinsville	2,376	76%	2,387	76%	+11	+0.5%
Nitro	2,752	72%	2,761	73%	+9	+0.3%
St. Albans	3,954	66%	3,979	66%	+25	+0.6%
Weston	1,802	59%	1,813	60%	+11	+0.6%
Mount Gay-Shamrock	1,184	58%	1,184	58%	+0	+0.0%
Wheeling	9,018	56%	9,056	56%	+38	+0.4%
Moundsville	2,641	52%	2,705	53%	+64	+2.4%
Buckhannon	1,511	49%	1,512	49%	+1	+0.1%
Vienna	2,758	46%	2,795	46%	+37	+1.3%

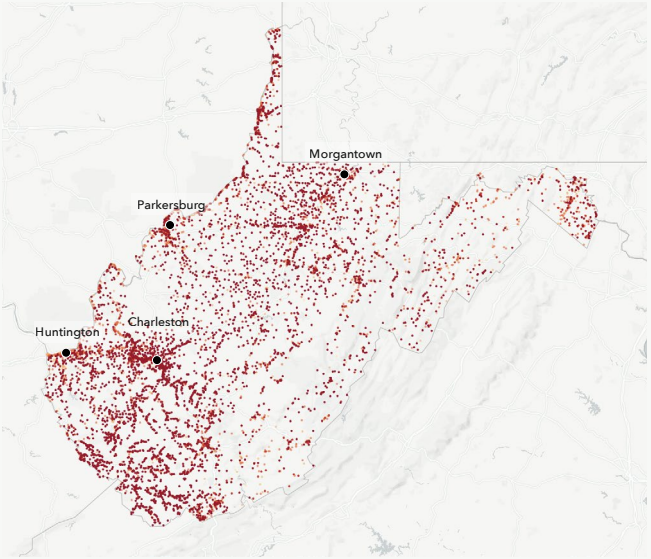
Greatest relative growing risk*

Municipality	2020		2050		Change	
Huntington	3,724	15%	4,402	18%	+678	+18%
Elkins	672	17%	728	18%	+56	+8%
Shady Spring	166	7%	178	8%	+12	+7%
Hurricane	328	9%	351	10%	+23	+7%
Lewisburg	147	6%	155	7%	+8	+5%
Grafton	190	5%	200	5%	+10	+5%
Teays Valley	660	10%	690	11%	+30	+5%
Princeton	993	23%	1,037	24%	+44	+4%
Cross Lanes	717	16%	744	16%	+27	+4%
Martinsburg	934	12%	968	13%	+34	+4%

Flood Factor distribution of properties at risk* (1000s)



More than 28.5% of individual properties and properties in West Virginia are at any risk of flooding over the next 30 years. Out of those at risk 87% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
West Virginia

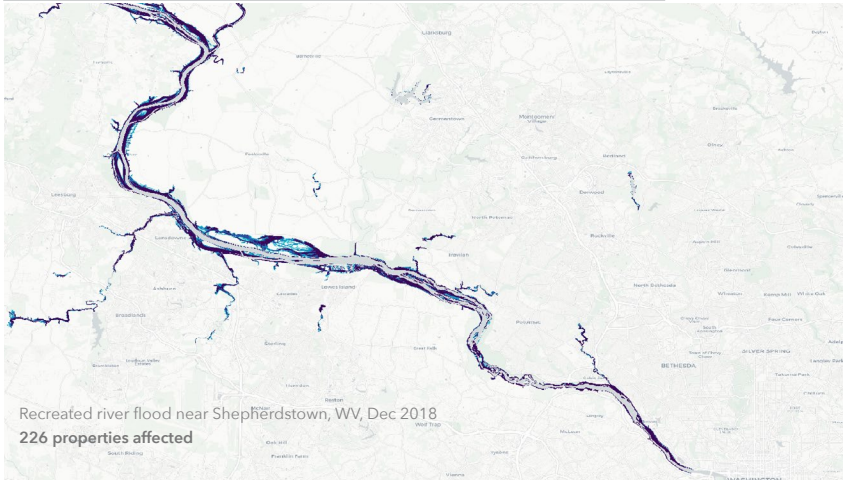
Claims History

91,700 home and property owners in West Virginia have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Mingo, Kanawha, Ohio, Brooke, and Marshall counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 2 flooding events that have occurred since the year 2000 in the state of West Virginia. These events flooded around 8,020 properties across the state.**

Flood event	Date	# Properties affected
River flood in Northern, WV	Sept 2004	7,802
• River flood near Shepherdstown, WV	Dec 2018	226



0.5 1 2 3+ ft Depth of flooding

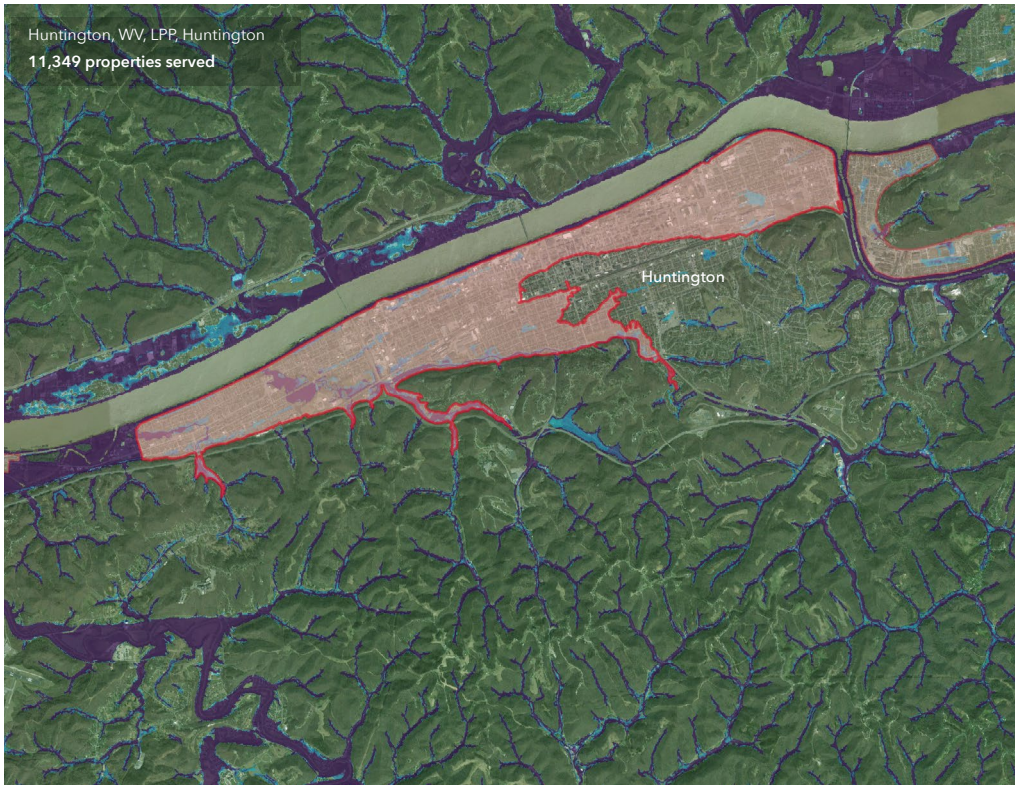
33,700

Properties served by protection measures

The First Street Foundation Flood Model incorporates 29 flood control measures throughout the state which protect 33,700 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee • Huntington, WV, LPP	24,653
Dam Stonewall Jackson Dam, Weston	9,045



Area of protection

0.5 1 2 3+ ft Depth of flooding for a simulated 1 in 100 flood event in 2020

* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Wisconsin

Flood risk is increasing in the state of Wisconsin. 273,400 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 2.8%, bringing the total number of properties with substantial risk to 281,100.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 144,000 properties as having substantial risk in the state of Wisconsin. In comparison, the First Street Foundation Flood Model identifies 1.9 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 129,400 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 137,100 by the year 2050.

Total properties at substantial risk*

In 2020
273,400

In 2050
281,100

30-year change
▲ +7,700 (+3%)

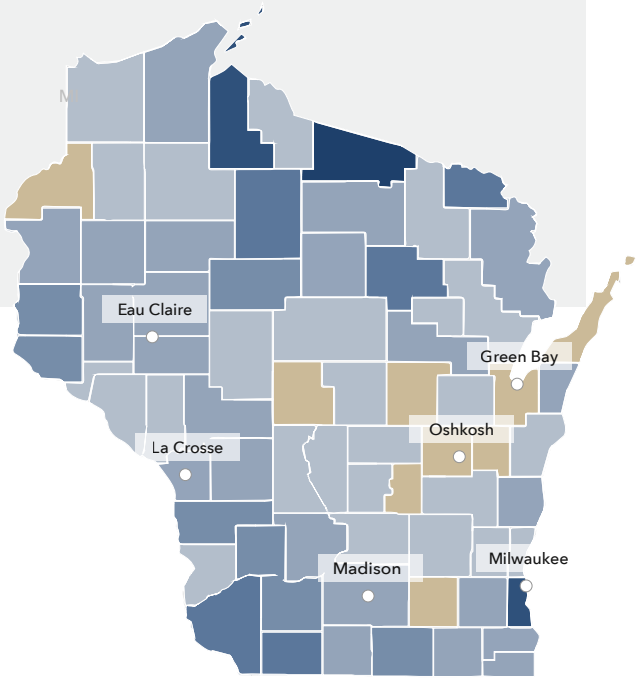
Difference in number of properties currently at substantial risk compared to FEMA**

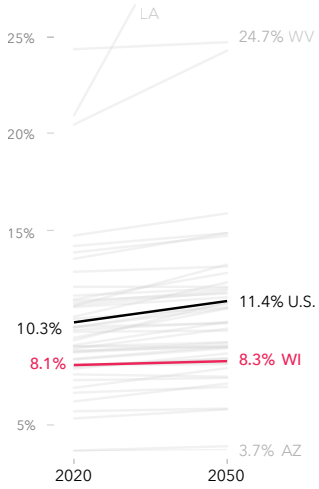
▲ +129,400

More properties at risk in FSF model →

-50% 0 +200% +400% +600%

Milwaukee sees floods from rainfall and snowmelt flowing into the watersheds of surrounding rivers. Development has reduced absorption which overwhelms stormwater systems. Protection efforts include channel improvements, natural storage, and regulation. Madison sees flash floods and overflow from surrounding lakes, threatening low-lying areas. The city has improved stormwater systems and reinforced shorelines.





Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Wisconsin has a smaller proportion of properties at substantial risk, with 8.1% at substantial risk today and 8.3% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Wisconsin

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 389,700 properties in Wisconsin as at risk over the next 30 years. Of these properties, 71,100 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Milwaukee has the greatest number of properties at risk of flooding in the state with 12,200 currently at risk, or 8% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 58% of properties in Oconto are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Milton, for example, will see a 23% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Wisconsin at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Milwaukee	12,203	8%	12,499	8%	+296	+2.4%
Madison	5,755	9%	5,932	10%	+177	+3.1%
La Crosse	5,699	35%	5,746	35%	+47	+0.8%
Fond du Lac	4,963	33%	5,112	34%	+149	+3.0%
Eau Claire	4,270	19%	4,312	19%	+42	+1.0%
Kenosha	3,748	13%	3,943	13%	+195	+5.2%
Racine	3,677	14%	3,817	15%	+140	+3.8%
Green Bay	3,120	9%	3,231	9%	+111	+3.6%
Wausau	2,807	18%	2,843	19%	+36	+1.3%
Janesville	2,718	11%	2,818	12%	+100	+3.7%

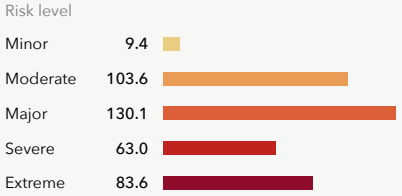
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Oconto	1,351	58%	1,364	59%	+13	+1.0%
Lake Wisconsin	1,311	37%	1,316	38%	+5	+0.4%
Ladysmith	728	35%	731	35%	+3	+0.4%
La Crosse	5,699	35%	5,746	35%	+47	+0.8%
Fond du Lac	4,963	33%	5,112	34%	+149	+3.0%
Richland Center	778	33%	796	33%	+18	+2.3%
Prairie du Chien	1,006	32%	1,025	33%	+19	+1.9%
Rhinelander	1,214	32%	1,218	32%	+4	+0.3%
Tichigan	846	30%	855	30%	+9	+1.1%
Merrill	1,271	26%	1,275	26%	+4	+0.3%

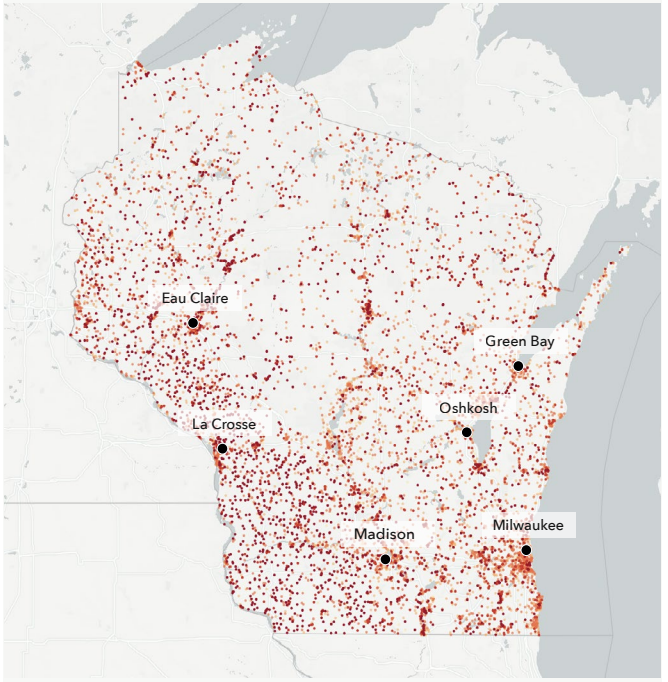
Greatest relative growing risk*

Municipality	2020		2050		Change	
Milton	205	9%	252	11%	+47	+23%
Cottage Grove	200	8%	225	10%	+25	+13%
Camp Lake	263	12%	293	14%	+30	+11%
Sturgeon Bay	188	4%	208	4%	+20	+11%
Verona	332	8%	364	9%	+32	+10%
Oshkosh	1,670	8%	1,829	8%	+159	+10%
DeForest	271	7%	296	8%	+25	+9%
Evansville	235	10%	256	11%	+21	+9%
Menasha	475	7%	514	8%	+39	+8%
Ripon	272	9%	291	10%	+19	+7%

Flood Factor distribution of properties at risk* (1000s)



More than 11.6% of individual properties and properties in Wisconsin are at any risk of flooding over the next 30 years. Out of those at risk 71% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Wisconsin

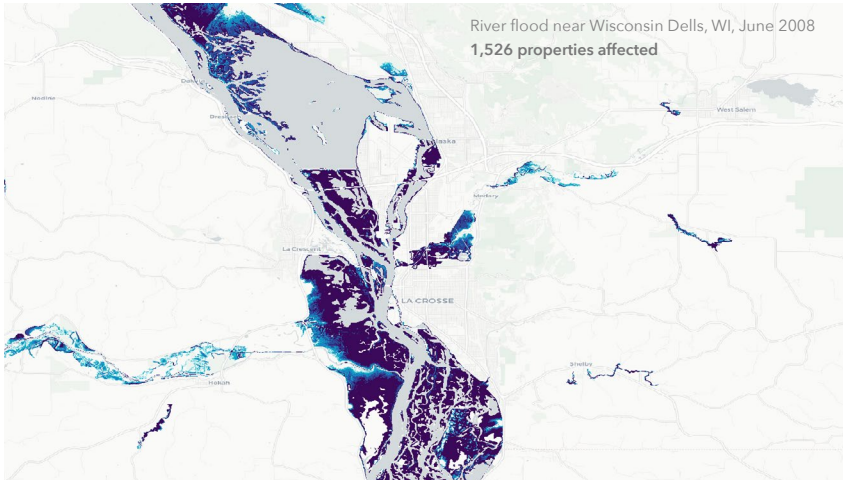
Claims History

124,500 home and property owners in Wisconsin have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Milwaukee, Waukesha, Dane, Fond du Lac, and Vernon counties.

Storm Simulation

The First Street Foundation Flood Model has recreated 3 flooding events that have occurred since the year 2000 in the state of Wisconsin. These events flooded around 2,860 properties across the state.**

Flood event	Date	# Properties affected
River flood in Western WI	Apr 2001	101
River flood in Northwest WI	Apr 2001	1,526
• River flood near Wisconsin Dells, WI	Jun 2008	1,238



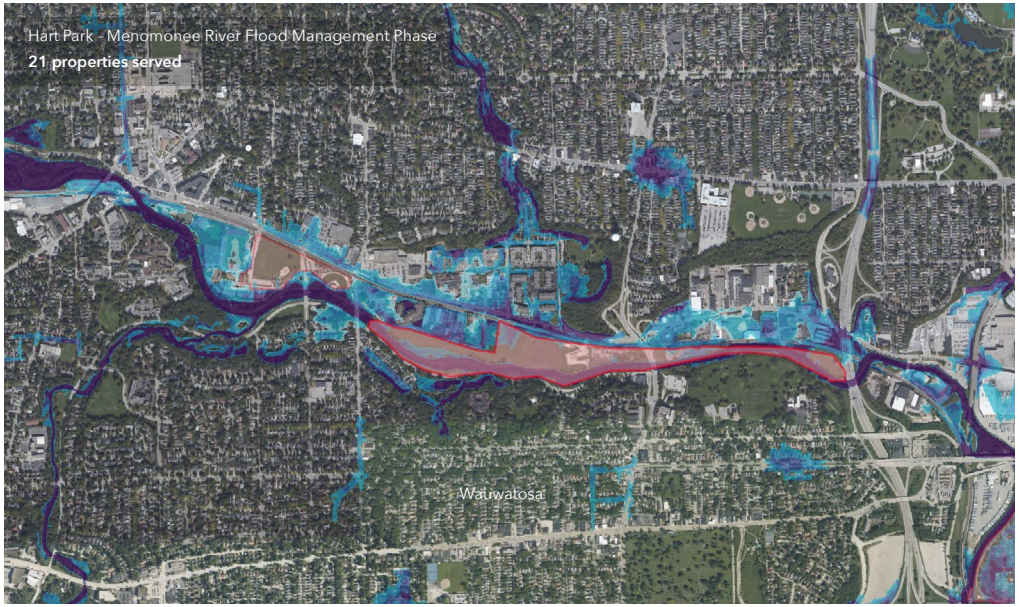
3,600

Properties served by protection measures

The First Street Foundation Flood Model incorporates 42 flood control measures throughout the state which protect 3,600 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Levee Portage levee	3,497
Acquisition • Hart Park - Menomonee River Flood Management Phase 2	44
Detention basin Lincoln Creek Flood Management, Milwaukee	17
Retention pond Freshwater Plaza near School of Freshwater Sciences	1



* Source: Fema.gov

** Based on model simulation of historic events. Historic recreations do not include precipitation. See methodology for full model details.

State Overview
Wyoming

Flood risk is increasing in the state of Wyoming. 35,200 properties currently have a substantial risk* of flooding. Over the next 30 years, the number of properties with this risk will increase by another 5.7%, bringing the total number of properties with substantial risk to 37,200.

To understand personal flood risk, Americans leverage the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These maps identify 8,300 properties as having substantial risk in the state of Wyoming. In comparison, the First Street Foundation Flood Model identifies 4.3 times the number of properties as facing this same level of risk. This discrepancy exists because the Foundation uses the current climate data, maps precipitation as a stand-alone risk, and includes areas that FEMA has not mapped. These new methods uncover an additional 26,900 properties currently not identified by FEMA as having substantial risk. When adjusting for future environmental changes, the FEMA gap further widens to 29,000 by the year 2050.

Total properties at substantial risk*

In 2020
35,200

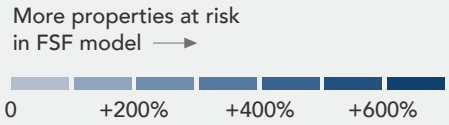
In 2050
37,200

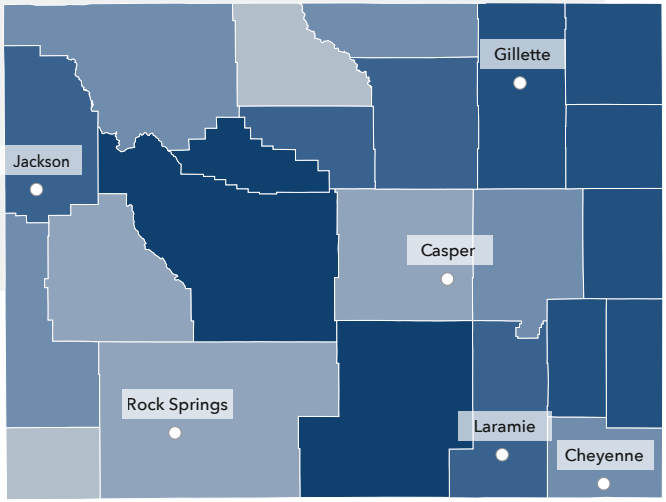
30-year change
▲ +2,000 (+6%)

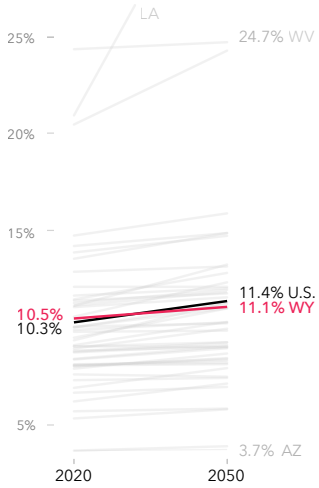
Much of Wyoming is susceptible to flash flooding due to storms and heavy rainfall. Cheyenne is vulnerable to heavy thunderstorms as well as riverine and flash flooding between late spring and fall. Since the Cheyenne Flood in 1985, the City has rerouted the Dry Creek channel and enacted non-structural policies to regulate floodplain development in order to reduce flood risk.

Difference in number of properties currently at substantial risk compared to FEMA**

▲ +26,900







Percent of properties at substantial risk compared to other states

The First Street Foundation Flood Model finds 10.3% of all properties across the contiguous United States at substantial risk of flooding today, and 11.4% at substantial risk in 30 years. Wyoming has a similar proportion of properties at substantial risk, with 10.5% at substantial risk today and 11.1% at substantial risk in 2050.

* Substantial risk is calculated as inundation 1 cm or more to the building in the 100 return period (1% annual risk) and rounded to the nearest 100 properties. See methodology for full model details.
** Comparison of count of properties within a Special Flood Hazard Area (1 in 100 layer) versus those with 1% risk from the First Street Foundation Flood Model. Some counties may show higher FEMA counts due to a variety of factors, including the generalization of SFHAs, assumptions around flood protection measures, and local context. FEMA zones are estimated by MassiveCert, Inc.

Local details
Wyoming

The First Street Foundation Flood Model calculates the number of properties facing any risk* of flooding. When looking at this broader level of risk, the data identifies 61,200 properties in Wyoming as at risk over the next 30 years. Of these properties, 4,000 were categorized as facing almost certain risk, with a 99% chance of flooding at least once over the next 30 years.

The city of Casper has the greatest number of properties at risk of flooding in the state with 4,700 currently at risk, or 19% of its total number of properties. However, smaller cities or municipalities in the state, with fewer properties, may have a greater proportion of their total properties at risk. For example, 34% of properties in Jackson are at risk of flooding. Other municipalities will see the greatest increase in risk over the next 30 years. Worland, for example, will see a 22% increase in the number of properties at risk.

Click here for a full breakdown of counties, cities, zip codes, and congressional districts in Wyoming at risk.

Greatest number of properties at risk*

Municipality	2020		2050		Change	
Casper	4,718	19%	4,963	20%	+245	+5.2%
Laramie	2,470	25%	2,535	25%	+65	+2.6%
Cheyenne	2,400	9%	2,563	10%	+163	+6.8%
Sheridan	2,089	25%	2,159	26%	+70	+3.4%
Rock Springs	1,831	22%	1,864	22%	+33	+1.8%
Jackson	1,812	34%	2,036	38%	+224	+12.4%
Gillette	1,535	13%	1,569	14%	+34	+2.2%
Lander	906	27%	939	28%	+33	+3.6%
Rawlins	818	22%	860	23%	+42	+5.1%
Evanston	748	14%	763	15%	+15	+2.0%

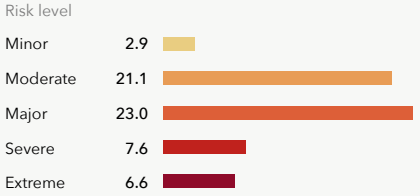
Greatest proportion of properties at risk*

Municipality	2020		2050		Change	
Jackson	1,812	34%	2,036	38%	+224	+12.4%
Lander	906	27%	939	28%	+33	+3.6%
Mills	598	27%	612	27%	+14	+2.3%
Sheridan	2,089	25%	2,159	26%	+70	+3.4%
Laramie	2,470	25%	2,535	25%	+65	+2.6%
Torrington	622	24%	622	24%	+0	+0.0%
Rawlins	818	22%	860	23%	+42	+5.1%
Rock Springs	1,831	22%	1,864	22%	+33	+1.8%
Worland	526	19%	639	23%	+113	+21.5%
Casper	4,718	19%	4,963	20%	+245	+5.2%

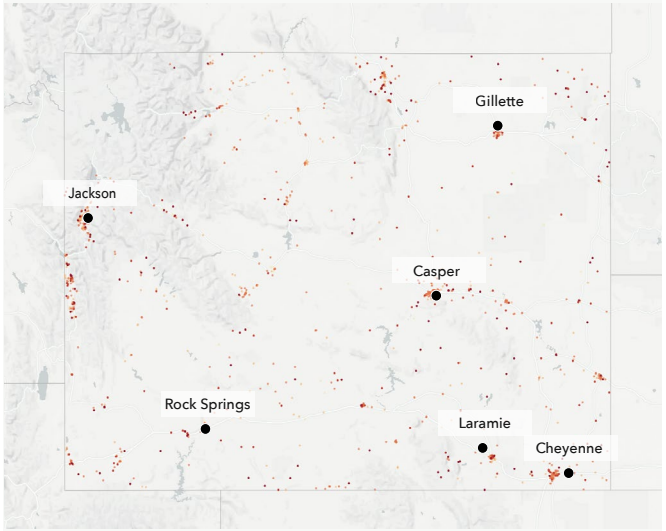
Greatest relative growing risk*

Municipality	2020		2050		Change	
Worland	526	19%	639	23%	+113	+22%
Cody	276	6%	316	6%	+40	+15%
Jackson	1,812	34%	2,036	38%	+224	+12%
Powell	69	3%	76	3%	+7	+10%
Riverton	93	2%	101	2%	+8	+9%
Cheyenne	2,400	9%	2,563	10%	+163	+7%
Casper	4,718	19%	4,963	20%	+245	+5%
Rawlins	818	22%	860	23%	+42	+5%
Ranchettes	222	8%	231	8%	+9	+4%
Lander	906	27%	939	28%	+33	+4%

Flood Factor distribution of properties at risk* (1000s)



More than 18.2% of individual properties and properties in Wyoming are at any risk of flooding over the next 30 years. Out of those at risk 61% are at major to extreme risk.



* Risk is calculated as inundation of 1 cm or more to the building in the 500 return period (0.2% annual risk). See methodology for full model details. Threshold of at least 2,000 properties for municipalities shown.

Flood History & Protection
Wyoming

Claims History

900 home and property owners in Wyoming have made flood damage claims through FEMA since the year 2000.* These claims for reimbursement were made through either the National Flood Insurance Program (NFIP) or Individual Assistance Program (IAP). The greatest number of claims since the year 2000 have been concentrated in Campbell, Niobrara, Goshen, Johnson, and Laramie counties.

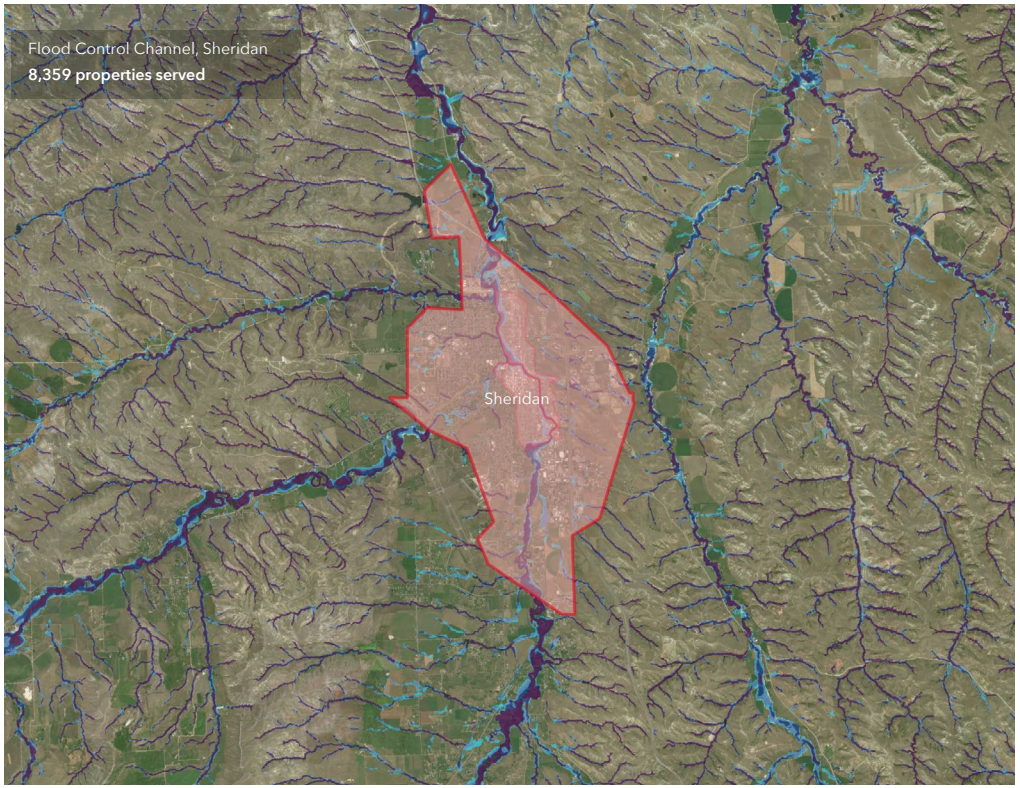
15,000

Properties served by protection measures

The First Street Foundation Flood Model incorporates 34 flood control measures throughout the state which protect 15,000 properties.

Top protection measures in state by quantity

Type Example	# Properties served by type
Channel • Sheridan City Flood Control, Sheridan	10,226
Levee Jackson Hole Upper Right Bank, Moose Wilson Road	7,353



* Source: Fema.gov

Contributors to the First Street Foundation Flood Model and "First National Flood Risk Assessment"

The following First Street Foundation current and past personnel contributed to the preparation of this report, data or First Street products supporting this report. Our First Street Foundation Flood Model partners, First Street Foundation Flood Lab members, Advisory Board members and many others also deserve credit for their valuable contributions.

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Map and Data Contributions

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State and county boundaries from the US Census TIGER dataset on pages
9, 10, 11, 18-161

This report is not endorsed or certified by the Census Bureau.

National boundaries from Natural Earth on page 16

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Disclaimers

First Street's flood and climate change risk estimates are based on one or more models designed to approximate risk and are not intended as precise estimates, or to be a comprehensive analysis of all possible flood-related and climate change risks.