

New Data Reveals Hidden Flood Risk Across America

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Nearly twice as many properties may be susceptible to flood damage than previously thought, according to a new effort to map the danger.

Across much of the United States, the flood risk is far greater than government estimates show, new calculations suggest, exposing millions of people to a hidden threat — and one that will only grow as climate change worsens.

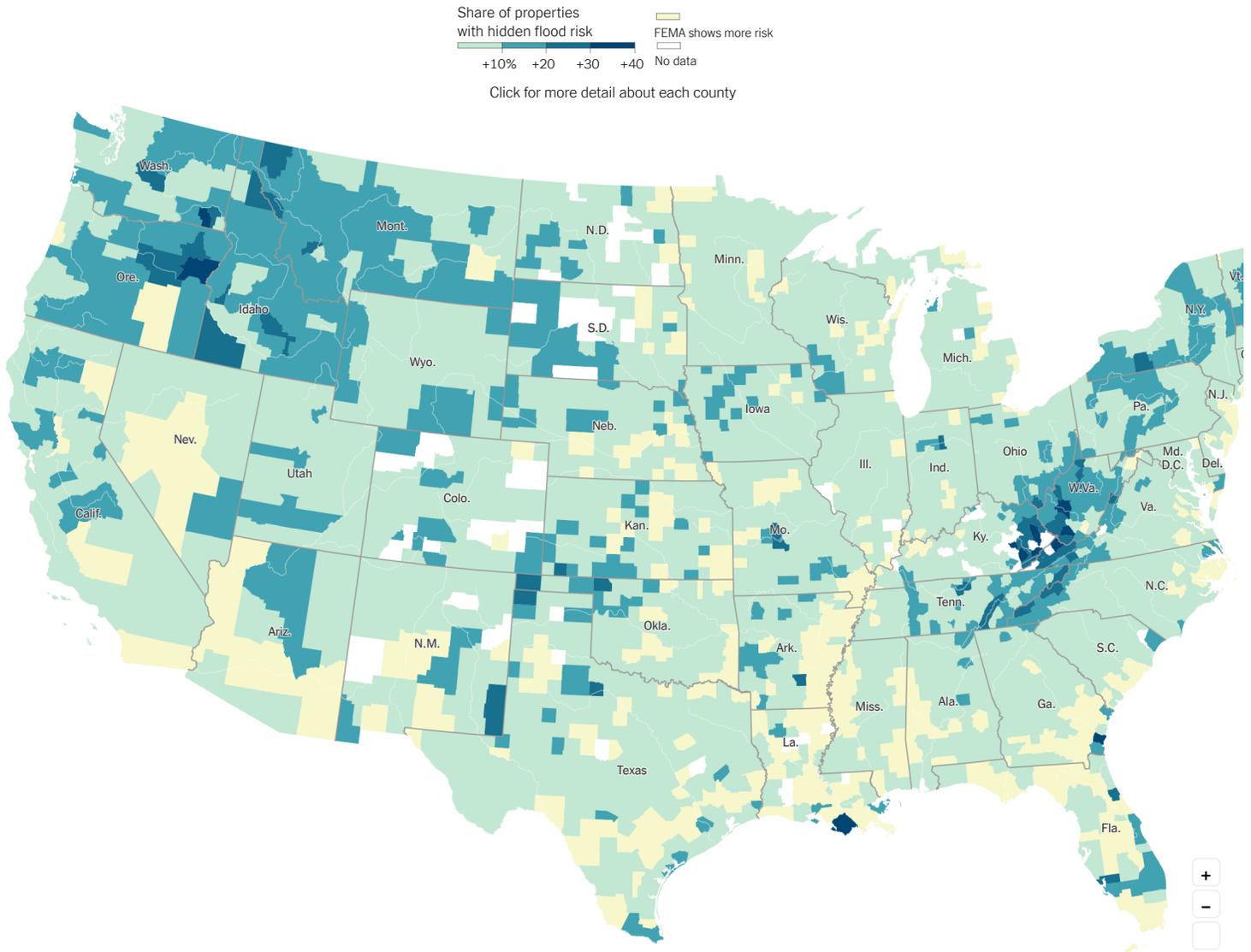
That new calculation, which takes into account sea-level rise, rainfall and flooding along smaller creeks not mapped federally, estimates that 14.6 million properties are at risk from what experts call a 100-year flood, far more than the 8.7 million properties shown on federal government flood maps. A 100-year flood is one with a 1 percent chance of striking in any given year.

The federal government's flood maps guide where and how to build, whether homeowners should buy flood insurance, and how much risk mortgage lenders take on. If the new estimates are broadly accurate, it would mean that homeowners, builders, banks, insurers and government officials nationwide have been making decisions with information that understates their true physical and financial risks.

Numerous cities nationwide — as diverse as Fort Lauderdale, Fla., Buffalo, N.Y., and Chattanooga, Tenn. — show the startling gap in the risks. In Chicago alone, 75,000 properties have a previously undisclosed flood risk. And minority communities often face a bigger share of hidden risk.

“Millions of home and property owners have had no way of knowing the significant risk they face,” said Matthew Eby, founder and executive director of the First Street Foundation, a group of academics and experts based in New York City who compiled the data, creating a website where people can check their own address.

[Explore where First Street found hidden flood risk by county](#)



Data available only for the contiguous United States. A "major storm" is defined as one with a 1 percent chance of occurring in any given year. | Source: First Street Foundation

Federal flood maps, managed by the Federal Emergency Management Agency, have long drawn concerns that they underestimate flood risk. Part of the problem is keeping the maps up to date, which is not only costly and labor intensive, but further complicated as climate change has worsened the dangers.

In addition, FEMA's maps aren't designed to account for flooding caused by intense rainfall, a growing problem as the atmosphere warms.

When FEMA does issue updated maps, politicians and homeowners often object, hoping to avoid higher federal flood insurance rates. "You can't appeal your rate. You can only fight your map," said Roy Wright, who ran the National Flood Insurance Program until 2018. "It turns it into house-by-house combat."

Cities with the greatest increase in flood risk in First Street's model

CITY	ADDITIONAL PROPERTIES AT RISK	SHARE OF PROPERTIES AT RISK (FEMA → FIRST STREET)
Chicago, Ill.	+75,623	0.3% → 12.8%
Los Angeles, Calif.	+75,580	0.7% → 12%
New York, N.Y.	+44,323	3.4% → 8.6%

Cape Coral, Fla.	+41,096	37.8%	→	69.5%
Philadelphia, Pa.	+30,038	0.5%	→	6%
Fresno, Calif.	+26,245	0.5%	→	19.1%
Portland, Ore.	+23,918	1.6%	→	12%
Chattanooga, Tenn.	+21,470	4.2%	→	32.5%
Port Charlotte, Fla.	+20,756	33%	→	79.3%
Detroit, Mich.	+20,455	0.3%	→	5.6%
Lehigh Acres, Fla.	+20,063	5%	→	21.1%
Tampa, Fla.	+19,381	17.6%	→	31.9%
Nashville, Tenn.	+17,687	2.9%	→	10%
Port St. Lucie, Fla.	+16,731	1.3%	→	18.3%
Buffalo, N.Y.	+16,010	0.4%	→	17.5%

Source: First Street Foundation

The First Street Foundation created its flood model, called Flood Factor, using federal elevation and rainfall data, and coastal flooding estimates from hurricanes. The foundation then checked its results against a national database of flood claims and historic flood paths.

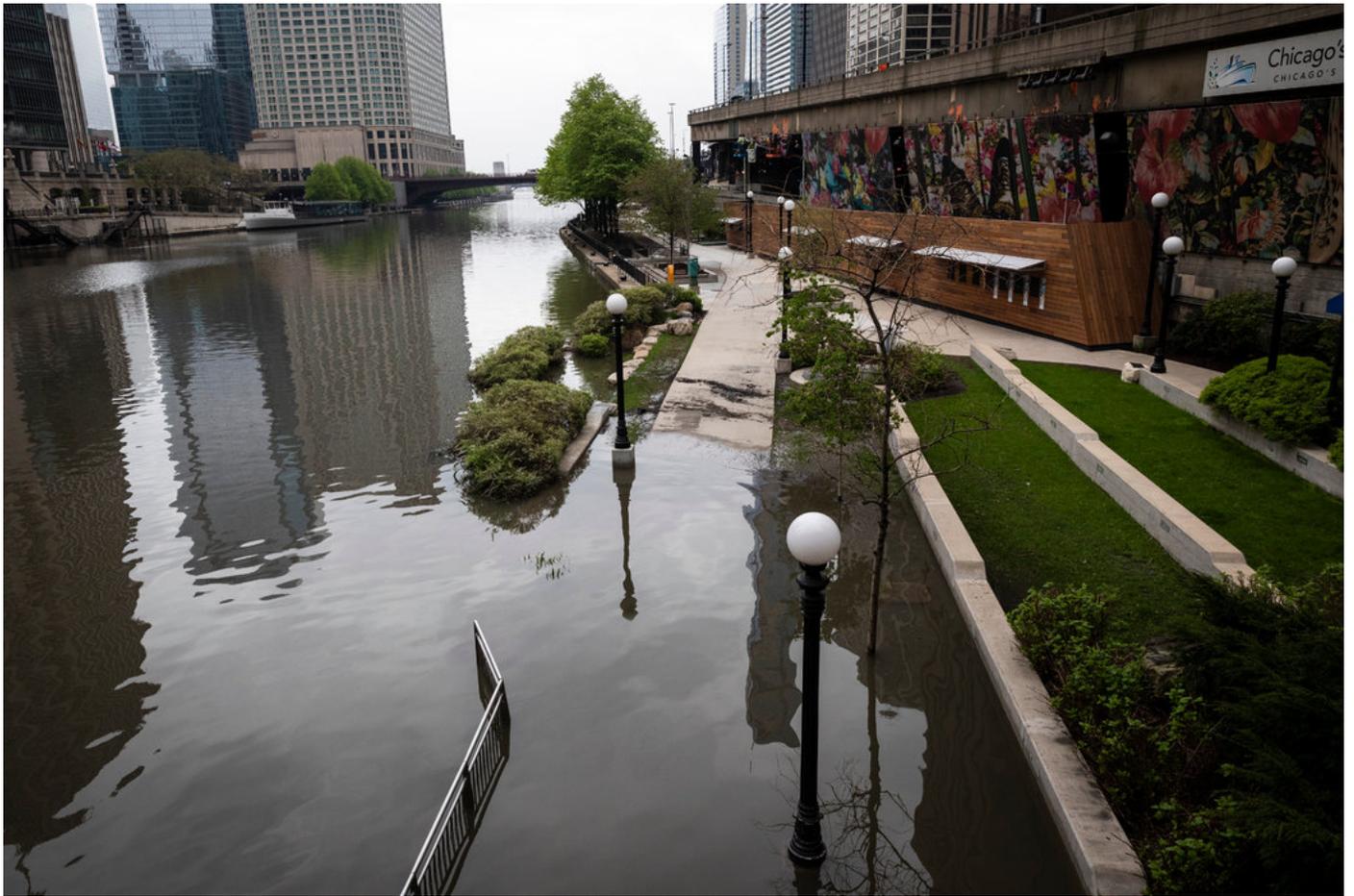
Overall, the results, which cover the contiguous United States — including areas the government hasn't yet mapped for flooding, and places where the federal maps are decades old — show a vast increase in risk compared with official estimates. Many inland areas, including swaths of Appalachia and numerous major cities, saw big jumps.

However, there are exceptions, particularly along the Mississippi River and the Gulf Coast, where the government has more thoroughly studied and planned for floods. There, the federal maps show more buildings at risk than the new model suggests.

First Street said that in some areas, including small municipalities, the model may overestimate flood risk because it doesn't capture every local flood-protection measure, such as pumps or catchment basins.

FEMA said it welcomed First Street's initiative, saying it would "complement FEMA's efforts."

"We know there is no perfect science to predict flooding," a spokeswoman said. "The Flood Factor product may help property owners with the critical decisions they must make and purchase necessary insurance."



Flooding along the Chicago River last month. Ashlee Rezin Garcia/Chicago Sun-Times, via Associated Press

Inland Cities Face Hidden Risks

First Street's calculations indicate that many cities have tens of thousands of properties facing risks not shown on government maps. At the top of that list is Chicago.

FEMA's maps show just 0.3 percent of Chicago's more than 600,000 properties inside the 100-year flood zone. But according to First Street, almost 13 percent of city properties face that risk — some 75,000 more than FEMA's maps show.

Officials with the Metropolitan Water Reclamation District of Greater Chicago, which oversees stormwater management, said they had not reviewed First Street's work in detail. But they agreed that significant flood damage occurs outside the areas marked by FEMA's flood maps, which are intended to show river-based flooding, rather than flooding caused by heavy rain.

The finding that almost 13 percent of Chicago properties are at risk from rain-based flooding "would not surprise me one bit," said Kevin Fitzpatrick, who supervises sewer infrastructure for the water district. He said the city's sewer system is generally intended to withstand rainfall from only a five-year storm, or a storm with 20 percent odds of happening in any given year.

The undisclosed risk isn't always evenly distributed.

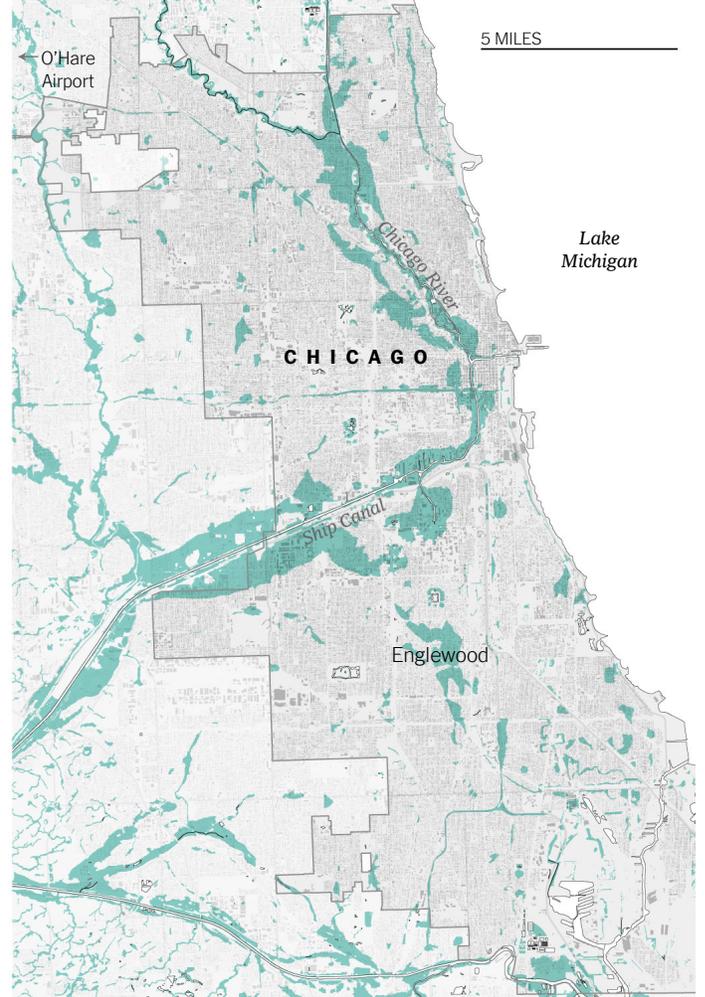
One of the Chicago-area ZIP codes with the greatest hidden risk is in Englewood, near the South Side, where almost 95 percent of residents are African-American. According to FEMA's maps, none of the properties

there are in the 100-year floodplain. But First Street says the number is almost one-third.

FEMA says 0.3 percent of properties at risk in Chicago



First Street says 13 percent of properties at risk in Chicago



Vulnerability to a storm with a 1 percent chance of occurring in a given year. | Sources: Flood zones from First Street Foundation, building footprints from Microsoft.

That disparity reflects a broader trend.

In more than two-thirds of states, First Street found that areas with more minority residents also had a greater share of unmapped flood risk than the statewide average. Jeremy Porter, First Street's director of research and development, said cities seem to invest more in flood protection in areas with higher incomes and property values.

Heightened flood risk in communities of color doesn't surprise Marcella Bondie Keenan, program director for climate planning at the Center for Neighborhood Technology. Last year her group found that 87 percent of insurance claims for Chicago flood damage between 2007 and 2016 went to people in communities of color. Among the many risks, residents of flood-prone areas often suffer more mold in their homes, which can worsen respiratory conditions, a danger in the current pandemic.

"We welcome any attention to the urban flooding issue that doesn't get talked about and is an environmental justice issue," Mx. Bondie Keenan said.

Vulnerability to a storm with a 1 percent chance of occurring in a given year. | Sources: Flood zones from First Street Foundation, building footprints from Microsoft.

FEMA is in the process of updating Fort Lauderdale area maps, Mr. Benton said, adding that some neighboring municipalities have told him that they intend to fight the new maps, out of concern that too many people would have to buy flood insurance. He declined to say which ones.

As with Illinois, the unmapped risk in Florida appears to disproportionately affect minority communities.

In one ZIP Code at the western edge of Fort Lauderdale that is 80 percent African-American, First Street's data puts more than 42 percent of properties in the floodplain, while FEMA puts the number at just 6.5 percent.

When Sasha Forbes bought a house nearby in 2016, she checked FEMA's database, which said the home wasn't in a floodplain. But after she moved in, local officials sent her a letter warning that her house was in an area that floods.

"There was no knowledge of that when we were purchasing the house," said Ms. Forbes, a member of the Broward County Climate Change Task Force and a policy expert at the Natural Resources Defense Council, where she works with community groups to make development in cities more inclusive.

Ms. Forbes pointed out that black families tend to be more exposed to flooding because their homes are often built on cheaper land in historically segregated areas. Investing in flood protection there would be a good start, she said, adding that the public discussion of climate change should address why minorities are more vulnerable in the first place. "We are really silent on the impact of race," Ms. Forbes said.

Correction: June 29, 2020

An earlier version of this article misidentified the agency responsible for treating wastewater in Chicago and the surrounding area. It is the Metropolitan Water Reclamation District of Greater Chicago, not the Municipal Water Reclamation District of Greater Chicago.

Appalachia also appears to face far greater risk than FEMA maps indicate. In both Chattanooga and Charleston, W.Va, FEMA's maps put well less than 10 percent of properties in the floodplain, while First Street suggests the proportion is one-third or greater. A Chattanooga zoning official said he thought First Street's numbers might be too high. Charleston officials didn't comment.

Flood maps can stir up political fights. For instance, when FEMA proposed updated maps last year for Buffalo, adding properties to the floodplain, residents objected. A member of the Buffalo Common Council, David Franczyk, said the updates would "foist unnecessary and unreasonable costs" on citizens.

FEMA identifies just 0.4 percent of the city's 93,583 properties as at risk, while First Street says 17.5 percent are at risk — a difference of 16,000 properties. Buffalo suffered heavy flooding in 2014 and again last summer. A city spokesman declined to comment.

On the Coasts: Poor Areas at Risk

Some of the hidden risk is by the shore. In Fort Lauderdale, Fla., a city of almost 200,000 people, FEMA puts about 41 percent of the city's 55,000 properties in the floodplain. But according to First Street, the figure is closer to two-thirds, or about 13,000 more properties.

"It seems plausible," said Richard Benton, Fort Lauderdale's floodplain manager, when shown First Street's map. He said the maps did accurately show areas that typically flood despite being outside FEMA's flood maps.

FEMA says 41 percent of properties at risk in Fort Lauderdale

First Street says 64 percent of properties at risk in Fort Lauderdale

2 MILES