

Could this major California city see mass ‘abandonment’? New risk model predicts just that

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The flood plains of Sacramento are a geologic world away from the more cinematic California of coastal crags and lofty peaks. Yet, that sometimes overlooked region could be home to one of California’s great disasters waiting to happen, according to a February [report](#) from First Street, a prominent climate risk prediction firm.

The firm’s models suggest that the mounting risks of catastrophic flooding will drive Sacramento County — the heart of California’s fourth-largest metro area, at about 2.4 million people — to lose, in the average scenario, 28% of its population by 2055. Increasingly bad air quality, higher insurance costs and demographic shifts could also be drivers of population decline.

But is this scenario, which First Street calls “climate abandonment,” actually likely?

Sacramento isn’t the only Central Valley locality with a dire outlook. First Street predicts that Fresno County, which anchors the Valley’s second largest metro area, will lose almost half its population. Together, those urban declines are two of the five largest predicted by First Street nationwide, and the largest predicted in the nation outside of low-lying coastal areas on the East and Gulf coasts.

First Street isn’t just doing academic research; their climate risk scores are their core commercial product. The firm counts among its customers real estate giants Zillow and Redfin. If you log into those sites and look at a property’s climate risk factors, those [highly granular ratings](#) come from First Street.

Experts have been skeptical of First Street’s claim to offer predictions at that [level of specificity](#). Many also found their double-digit out-migration forecasts for places like Sacramento and Fresno to be dubious.

After all, low-lying parts of the Central Valley like the cores of Sacramento and Fresno face relatively minor fire risk, unlike much of the Bay Area and Los Angeles. Sacramento also doesn’t stand to get nearly as hot as places like Las Vegas or Phoenix will — and like those inland areas, it’s been growing quickly as residents flee eye-watering home prices on the coasts.

But unlike Sacramento, First Street forecasts all of those metro areas to keep growing, alongside other hot places throughout the Sun Belt like Austin, Houston, Miami and Atlanta.

The “other big one”

Few places in the U.S., if any, are more at risk of catastrophic flooding than Sacramento.

After all, there’s a history of that.

In 1861, California had been suffering the effects of a long — possibly a 20-year long — drought. But in [December of that year](#), the dry spell abruptly ended. Storm after storm pummeled the state, causing nearly endless rains and prodigious mountain snows. Then, in January, a sudden warmup caused much of the snow to melt, almost instantly flowing into the Central Valley. As rivers overflowed their banks and the waters spread, the valley became a fishbowl. Forty days after the rains started, floods had inundated an area some 300 miles long and 30 miles wide, devastating the new state’s towns and farms and drowning hundreds of thousands of livestock.

Waters were particularly deep in Sacramento, which lies close to the Sacramento-San Joaquin Delta, the only outlet for all the streams that drain the Valley.

Since then, the [risk of a similar event](#) (what some have called “the [other big one](#)”) has only increased, not only because climate change is turning mountain snow into rain and making big precipitation events more likely, but also because the lowlands are [less capable of absorbing a deluge](#). In modern times, water has been corralled into aqueducts and dams and not allowed to pool into the fertile soil, drying out the wetlands and leaving hard, dusty earth that offers no buffer against floodwater.

“The Army Corps of Engineers and the (Sacramento River) levees have historically done quite a good job of providing protection,” said Daniel Swain, a UCLA climate scientist who has [pioneered research](#) on extreme precipitation events. “That’s probably thanks to good luck and probably thanks to good engineering, but that good luck probably won’t hold forever.”

In Swain’s assessment, brisk development in low-lying areas of the region, like West Sacramento and in the Natomas neighborhood, has spread the risk over an ever-expanding area. That development, Swain said, has made the Central Valley and Sacramento in particular one of the largest populations in the U.S. highly vulnerable to flood risk.

Experts whom the Chronicle spoke with across many disciplines broadly agreed with Swain’s characterization. In December, for example, a report from the U.S. Chamber of Commerce also [singled out](#) the Sacramento region as one of exceptionally high flood risk in need of mitigation.

From climate risk to depopulation

First Street's research finds that when flood risk mounts, people leave en masse. That's what the group believes will happen to Sacramento — even if the big one does not hit.

The idea that rising risk alone can drive residents to abandon a neighborhood is the key assumption behind First Street's migration analysis, according to Jeremy Porter, who leads climate impact modeling at First Street. In fact, said Porter, his team deliberately tried to filter out the effect of extreme weather events themselves — specifically to isolate the effects of worsening risk.

That analysis revealed that among the six major “perils” First Street studies, flood risk was the most substantial driver of migration nationwide, with bad air quality a distant second. Sacramento is vulnerable to both.

So how could rising risk, in and of itself, drive people to leave? Here, First Street engages in some abstraction. They and others agree that in the absence of disaster itself, it's mainly economic pressure that will push people to leave climate-vulnerable areas for more secure ones.

“Some people will no doubt be displaced by climate events,” said Jesse Keenan, who directs the Center on Climate Change and Urbanism at Tulane University, about climate migration as a general phenomenon. “But many more will be displaced, or at least steered by, the hand of the market.”

A share of residents might leave because energy costs are cheaper or job opportunities improve in more climate-resilient areas. Others will migrate because the potential cost of dealing with bad air or fireproofing their homes gets too onerous. The list of such reasons is myriad and complex, said Keenan.

First Street assumes that the major push factor will be insurance. The firm assumes that to properly account for rising risk, it should cost a whopping 137% more to insure homes in Sacramento by 2055.

But as First Street admitted, it's not as simple as homeowners paying more than double what they do today as premiums. Most of the rising risk comes from floods, which generally aren't covered by the private home insurance policies most owners have to buy to qualify for a mortgage.

Instead, FEMA runs the nation's largest [flood insurance program](#), and most buyers are those homeowners who live in the riskiest areas and are required to have it ([most of the city isn't](#): a Chronicle analysis suggests that just 12% of all Sacramento households that purchase home insurance also purchase flood insurance).

In any case, if climate signals will upend the Sacramento housing market, it hasn't happened yet.

Erin Stumpf, a Sacramento real estate agent and former president of the Sacramento Association of Realtors, said that flood risk doesn't come up much in conversations about insurability. An aging roof, plumbing, gas hookup or electrical panel? Maybe. A tree that might fall on a house

during a storm? Sure. Rates have risen, she said, but so has everything about homeownership in California.

Could First Street be right?

In the course of speaking with climate scientists, economists, demographers and real estate professionals for this story, the Chronicle asked whether the key assumption that First Street made in its migration model could be right: namely, that rising risk would translate to rising costs of living, and those costs of living would translate to mass climate migration from places like Sacramento, whether disaster actually struck.

Most were skeptical.

“What are they assuming about how people are moving — that’s where the methods aren’t really there yet,” said Fran Moore, an environmental economist at UC Davis.

Speaking generally about insurance models, Keenan of Tulane explained that modeling the future cost of insurance and how it will impact migration was near impossible. He said a million reasons, including shifting regulation and even unpredictable flows of global capital within the insurance market, can change that calculus.

There’s also the matter of what First Street *doesn’t* model. First Street’s climate work focuses on the risk of acute “perils” — but that doesn’t take into account slower-burning climate problems. Among those is water security. The drying of the Colorado River will create existential challenges for cities like Phoenix, but those possibilities exist outside of First Street’s model. Because the risks to Sacramento are captured well but the risks to Phoenix might not be, the latter city may “benefit” in the forecast at Sacramento’s expense.

Another key issue with the models, as First Street itself acknowledges, is that they don’t account for the ways a community might adapt to a changing climate. For one thing, policy can change the trajectory of the underlying risk.

“There is a lot of potential to solve flooding problems,” said Ángel Fernández-Bou, a climate scientist with the Union of Concerned Scientists based in Merced. “We can forecast better and optimize the water we need to release to prevent floods. We can mimic natural processes, like beaver dams, to disperse water to prevent flooding. We can do aquifer recharge to restore groundwater to wells.” Traditional water engineering projects have also progressed: Sacramento’s system of levees was upgraded significantly after Hurricane Katrina devastated New Orleans in 2005, and [improvements are ongoing](#).

Beyond climate issues, there are other ways a city can control whether people want to live there. The First Street climate model not only takes into account economic and demographic trends, but also neighborhood “amenities” — schools, government services and other measures of the “desirability” of a neighborhood. That’s partly why some fire-prone areas of coastal Los Angeles are still projected to grow — people love living there.

First Street's model assumes the appeal of a community is static, but in reality, cities can change. For example, policymakers told the Chronicle that Sacramento is actively trying to improve neighborhoods and lower heat risk by planting more trees and adding more dense, infill housing in desirable neighborhoods.

And even if the individual risk or migration models themselves are sound, combining them raised concerns for some observers.

First Street's prediction is the result of multiple individual models for different types of climate risks, plus models that predict migration as a function of risk and socioeconomic factors. Each of those models is a bit speculative and has assumptions built into it. But First Street elides the uncertainty that comes with each model by providing a single migration prediction for each place, rather than a range of possibilities.

Experts said an analysis like this, which synthesizes multiple models, can't necessarily be trusted to arrive at reasonable estimates. Underscoring the experimental and somewhat opaque nature of First Street's work (as a private company, First Street does not make public all its data and modeling parameters), a previous [Bloomberg article](#) found that different climate risk companies often reached different conclusions about the same places.

First Street acknowledged that some of that criticism was legitimate, and that combining models can lead to strange results — but that in a place where the risks were as clear-cut as Sacramento, the models' results were more dependable.

Skepticism of First Street's work wasn't universally shared. Some scholars singled the company out for praise.

"We think that First Street does first-rate data work," wrote Manuel Pastor, an economist at the University of Southern California who studies how low-income populations respond to climate risk, in an email to the Chronicle. Pastor said that his team incorporates First Street's scores directly into their own work on heat islands across America. Other scholars like Moore, at UC Davis, lauded the effort to reflect the complexity of both push and pull factors in driving migration, even when they disagreed with many of the methods.

But it remains to be seen whether First Street's core thesis — that climate risk will drive migration — will be borne out.

According to Stumpf, the Sacramento realtor, people shopping for homes barely think about the risk.

"Is (the risk) driving home buyers? It's not," said Stumpf. "If anything, I'm the one that's bringing up, 'Hey, you want to buy a home in Natomas? This is in a flood zone.'"