FIRST STREET
FOUNDATION

Burned out cars and the remains of buildings are seen in Lahaina town in this image captured by U.S. Civil Air Patrol.
US Civil Air Patrol, Public domain, via Wikimedia Commons

The 9th National Risk Assessment

The Insurance Issue

FIRST STREET TECHNOLOGY

THE STANDARD FOR CLIMATE RISK FINANCIAL MODELING

Prior to March 2024, First Street referred to First Street Foundation, a non-profit focused on connecting climate risk to financial risk. To better serve our customers, increase our scientific velocity and widen our impact, we created First Street Technology, Inc. - a public benefit corporation (PBC) - that inherited the mission and assets of First Street Foundation. First Street now refers to that company, having unlocked the ability to raise the private capital necessary to increase our throughput, fuel the company's growth, and further the pursuit of our mission.

The research here is presented as it was originally published, referencing First Street Foundation and the versions of our models that were available at that time. In a spirit of continuous improvement, we are ceaselessly iterating on and improving those models, whether that means incorporating more external adaptation data, ingesting the latest government surveys, or simply adjusting model parameters to better reflect edge cases.

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To view our most recent reports that leverage our latest and greatest model versions, visit our research library. To find out more about how our data can help your company or institution's climate risk financial modeling, contact our team.

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Disclaimers

First Street Foundation's 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 climate change risks.

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To estimate physical building damage and time needed to repair that damage (downtime days), the Foundation collaborated with Arup in order to leverage their expertise as a leader in the environmental engineering and resilience space.

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Philanthropic Support

The work of the First Street Foundation is made possible thanks to the generous support of our funders, whose support goes directly towards the development of our national models, the First Street Foundation website, and to support our research, data, and administrative staff. With their help, First Street Foundation is able to continue its work in the creation and dissemination of data through Risk Factor to help quantify the risk that climate change poses to the country.

2040 FOUNDATION
Bill and Gigi Clements FOUNDATION
Grantham Foundation for the Protection of the Environment
HIGHTIDE FOUNDATION

Special Thanks to Our Valuable Data Partners

Without them, our analysis would not be possible.

LIGHTBOX

To define building characteristics and property parcel details, the Foundation leveraged data from LightBox, a leading provider of CRE data and workflow solutions.

aws

To AWS and the Amazon Sustainability Data Initiative (ASDI) for their support of our computing resources."

mapbox

To calculate precipitation exposure and incurred damage to the building structure, the Foundation leveraged building footprint data supplied by Mapbox. Mapbox also provided geocode lookups and map integrations for the Risk Factor experience.

State, Metropolitan Area, and County boundaries from the U.S. Census TIGER dataset is used on all pages showing maps. This report is not endorsed or certified by the Census Bureau.

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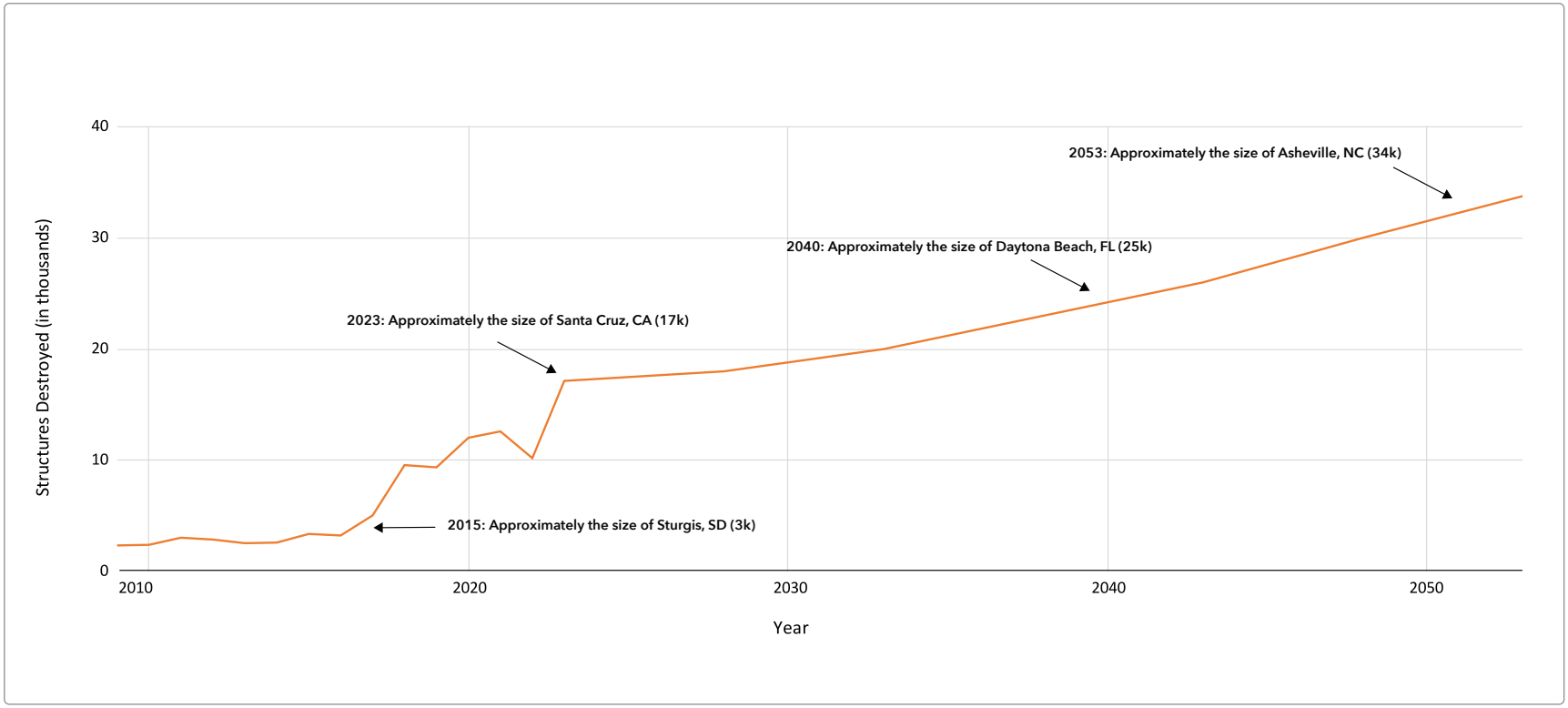
Executive Summary

There is a growing issue concerning the cost, affordability, and general insurability of many locations across the country due to the increasing risk of exposure to climate hazards. In the West there have been increasing costs and damage from wildfire events making their way into residential areas. Along the Gulf Coast, there are increasing rates of damage from tropical cyclones, which are getting stronger, causing an increase in damage from both wind and surge related events. Inland, there has been an increase in the intensity, duration, and frequency of precipitation-driven flooding, which overwhelms inadequate stormwater infrastructure and fills rivers beyond their capacity. For homeowners and businesses, the best way to protect themselves, their families, and their property is through insurance as a risk transfer mechanism. However, insurance companies that are seeing increased levels of exposure, inflation, and regulation are very quickly changing the ways in which they operate across much of the country. For example, just in the last few years, there has been a very public pullout of coverage across California, Florida, and Louisiana from well-known companies like Allstate, American International Group, Inc (AIG), Farmers, Nationwide, AAA Insurance, and State Farm from high-risk wildfire areas. In some cases, these companies are choosing to withdraw coverage completely, while in others they are very selectively avoiding the most at-risk properties in the state. In the void left behind, the state-mandated "insurer of last resort" programs have provided a structure from which homeowners can find coverage, although that premium is often multiple times the cost of their lost policy and generally provides much less coverage.

While there are both actuarial and political forces at play in the state-mandated insurance markets, in CA, recent disaster data shows that since 2009 there has also been a 270% increase in the cost of wildfires and a 335% increase in the number of structures destroyed by wildfires. Both of these statistics highlight the



Average Annual Structures Destroyed Nationally Based on First Street Foundation Wildfire Model (FSF-WFM) projections.

Executive Summary

the consequence of wildfire management practices and the fact that wildfires are happening more often in, and in closer proximity to, places where people live. This trend is not expected to slow based on climate projections built into the new version (v2) of the First Street Foundation - Wildfire Model (FSF-WFM) which finds that on average, 17,139 buildings are expected to be destroyed annually in the current environment, growing to about 33,753 average annual structures destroyed (AASD) in 30 years. For context, this means that by 2053, on average, a city the size of Asheville, NC (~34,000 buildings) is expected to burn down due to wildfire every year. The damages associated with that risk are further expected to increase significantly by growing from around $14 billion in forecasted damages today to around $24 billion in damages per year by 2053, in today's dollars. In California, properties in the most at-risk portions of the state are finding it almost impossible to find affordable homeowners insurance. In fact, recent data from the state suggest that between 2015 and 2021 some of the most at-risk zip codes have seen insurance policy non-renewals (insurer-driven) increase by nearly 800%. Underscoring this broader insurance issue, in Florida the "insurer of last resort", Citizens Property Insurance Corporation, has become the largest insurer in the state due to a number of bankruptcies and calculated business decisions to leave the market from some of the top providers. These bankruptcies and pull-outs have been driven by an increase in tropical cyclone risk, fraudulent claims, and series of large events generating billions in damage. The most at-risk areas in Florida are seeing a tripling in policies in force with Citizens and a nearly doubling in premium costs. In Louisiana, there has been a similar increase in rates through Citizens, with the most affected areas seeing homeowners rates increase by nearly 90% over just the last year and the entire state seeing an average increase in 2023 of ~63% compared to the previous year. Finally, in much of the country, the government-backed National Flood Insurance Program (NFIP) has increased rates in an attempt to keep up with the growing rate of payouts versus premiums due to increased exposure and climate disasters. Across the country, every state has seen a projected rate increase, but in 12 states the average premium has more than doubled. These states represent high risk coastal states like Florida (+231%), Louisiana (+234%), and Mississippi (+249%); but also less well-known inland states like Kentucky (+207%), South Dakota (+220%), and West Virginia (+272%). The consequences of the increases in premiums can be seen directly in the decrease in policies in force, which have fallen from a high of 5.7 million policies in 2009 to 4.7 million as of July 2023, representing a 21% decrease in coverage across the US over that time period. Over the past year, the states of Texas (-61k) and Louisiana (-52k) have seen the biggest decreases in numbers of NFIP policies with West Virginia (-9.5%) seeing the largest percent change in policies in force.

In total, there are huge numbers of properties at risk of rising insurance rates and non-renewals due to the growing risk of wildfires for nearly 5 million properties concentrated in the Western US, wind damage for around 27 million properties in high-risk coastal wind zones, and flooding for around 15 million properties across the US not covered by FEMA flood zones. These millions of properties across the US represent a significant subset of the larger real-estate market which has not adequately priced the cost of climate into its valuation. The unrealized climate-corrected valuation gap represents a growing climate bubble which is just starting to be recognized and quantified. Similar to past bubbles in the real-estate market, there are signals coming from industry highlighting the economic risks. Specifically, the insurance industry has a direct line to the economics of risk and serves as a medium to transfer that risk from property owners to a more distributed portfolio. When risk increases across that portfolio, insurance payouts begin to outpace premiums and require a risk correction which must come in the form of increased policy rates for homeowners. As homeowners see growing insurance rates tied back to their increasing climate risk, their cost of homeownership for the property increases. In some cases, this will lead to homeowners foregoing insurance and in others the value of their property will effectively become lower than the financing they took out to purchase it. These dynamics are visible in some areas of the country where rates are increasing, insurers of last resort are becoming the only option for many homeowners, and private insurance companies are effectively labeling areas as uninsurable. Without the ability to insure properties in high risk areas with relatively affordable policies, homeowners will not be able to afford the cost of ownership associated with homes in those areas and property values will deflate, leading to a realization of the current climate-driven overvaluation in the market.

Top 10 Key Takeaways

1. Wildfire risk is increasing across the US, with recent historic trends over the last decade showing increasing costs (+97%) and structures destroyed (+215%) in wildfire events, even though the total area burned has increased at a slower rate (+48%) Page 7

2. The recent launch of Version 2 of the First Street Foundation Wildfire Model (FSF-WFM) allows for the integration of property-specific building characteristics with damage curves to quantify the likelihood of economic damage and structure loss, for the current year and up to 30 years into the future under a changing climate in the same fashion as the First Street Foundation Flood Model (FSF-FM) and then First Street Foundation Hurricane Wind Model (FSF-HWM). Page 9

3. Nationally, risk estimated from the FSF-WFM is associated with over 17k structures destroyed on average each year in the current climate (2023), doubling to nearly 34k structures projected to be destroyed annually in 30 years due to climate change alone. Additionally, risk from the FSF-WFM is associated with around $14 billion in annual estimated economic damages today (2023), growing to nearly $24 billion in annualized loss in 2053. California lies at the center of much of this risk. Page 11

4. Insurance is required to protect homeowners from financial ruin. However, regulations in California have suppressed insurance prices for years. As a result, the insurance industry is limiting and withdrawing coverage in high-risk wildfire areas due to state regulatory policies, increasing risk from climate change, and recent economic shifts. In California, the most impacted areas have seen a nearly 800% increase in insurance-initiated non-renewals, driving homeowners to rely on the "insurer of last resort". Page 20

5. This insurance issue related to growing climate risk is not only occurring in regard to wildfire. In Louisiana this year, the "insurer of last resort" (Citizens Property Insurance Corporation) increased homeowners rates by 63% year-over-year, with the largest increases being in the Southeastern portion of the state near the state's largest population center New Orleans. The smallest increases in the state were still on the order of an over 20% increase of the rates from 2022. Page 26

6. In Florida, the state-sponsored "insurer of last resort" for wind storm insurance has become the largest insurer in the state, with Policies in Force growing by 168% between 2016 and 2023 to over 1.3 million, and the Average Premium growing by 61% from about $2,000 to about $3,300. Page 27

7. The NFIP has raised rates across the country, with the average premium doubling in 12 states and the number of policies in force (4.7 million) declining to 21% lower than the all-time high of 5.7 million. The largest percentage increases in premiums occurred in traditional flood plains in states like Florida and Louisiana, but also in more non-traditional inland areas, like West Virginia and Kentucky. Page 29

8. Using the First Street Foundation's various climate risk models, it can be estimated how many properties might be affected by changes in the insurance market. In the CONUS, there are approximately 12 million properties this year with insurance risk due to flooding, 23.9 million properties this year with insurance wind risk, and about 4.4 million properties today with insurance risk due to wildfire risk. Page 30

9. There are tens of millions of properties across the US that are just starting to see the impact of climate-adjusted insurance pricing on their cost of homeownership and property valuation. As risk continues to increase, the number of properties and communities faced with these pricing corrections will only grow into the future, resulting in a realization of the existing overvaluation due to unpriced climate risk and the deflation of the growing climate bubble in the housing market. Page 30

10. In the most severe cases, there are approximately 640k mortgages on properties that are already in delinquent status and are at risk of rising insurance costs, increasing the likelihood of default. Page 31

Introduction

Increasing Risk, Damage, and Costs Due to Wildfire

Wildfire risk across the United States has been increasing in recent years, as described by a number of studies of the observed increased wildfire incidence, and relatedly, the increasing threat to forests and communities (Burke et al., 2021; Westerling et al., 2006; Vose et al., 2018). This growing risk threatens the economic stability, natural resources, and quality of life for the communities and property owners affected. NOAA reports over $79.8 billion in costs associated with the occurrence of wildfires between 2018 and 2021. However, this estimate does not account for much of the cost associated with land management or long-term indirect and additional costs (NOAA Billion Dollar Weather and Climate Disasters, 2022). Direct cost estimates are simply a fraction of the larger economic costs associated with wildfires (Western Forestry Leadership Coalition, 2010). Nevertheless, the costs of wildfires are exceedingly high in recent years and are growing at a substantial rate. While between 2018 and 2021 there were almost $80 billion in costs, the previous damage estimates between 2012 and 2016 totaled only $8.5 billion (NOAA, 2022), representing nearly a 10-fold increase. This year, the wildfires in Maui caused mass destruction, destroying over 2,200 homes and buildings in Lahaina and totaling over $5.5 billion in estimated costs (The Guardian, 2023).

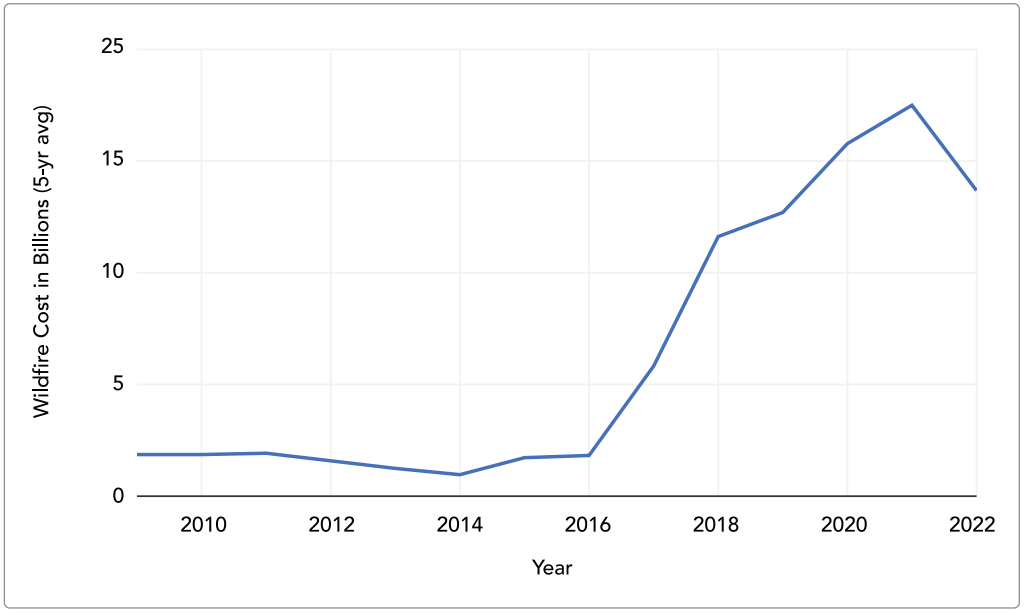


Figure 1. Annualized Occurrence and Costs of Billion Dollar Wildfire Events, NOAA

Figure 1 presents NOAA's Billion Dollar Disaster data to illustrate this growth in regard to the largest wildfire events, those with an associated cost equal to, or greater than, $1 billion (cost adjusted to 2023 USD). According to NOAA, the rolling 5-year average (which is used to accommodate the large interannual variability in wildfire impacts) highlights the fact that costs associated with those events were, on average, around one billion dollars per year through 2016. Since 2016, there has been a significant increase in the costs associated with these largest fires, culminating in a 5-year average of about $17 billion in 2021. The growing overall costs of the wildfires in NOAA's list align with data from the National Fire and Aviation Management FAMWEB database (2005 through Dec. 2022), and are assembled by Headwaters Economics. which show increasing costs associated with the containment/fighting of wildfires, the number of structures burned down by wildfires, and the area burned during those same events. While this data has some known limitations around reporting wildfire occurrence, severity, structure losses, and economic impacts, it is the best-compiled set of data around these indicators at an event level and gives insight into the growing risk and economic costs associated with wildfires.

	Cost of Containment (5 yr avg)	Structures Destroyed (5yr avg)	Acres Burned
2016 Value	$799,958,056	3,238	2,680,430
2022 Value	$1,575,967,102	10,194	3,974,454
Difference	+$776,009,046	+6,957	+1,294,024
% Change	+97%	+215%	+48%

Table 1. Change in Cost of Containment, Structures Destroyed, and Area Burned between 2016 and 2022. (Source: US Forest Service)

Introduction

Using the data collected by the US Forest Service, it can be seen that there has been dramatic growth in the amount of community resources being used to fight these increasingly severe wildfires throughout the country, especially in the West. Overall, there have been large increases in the cost of wildfire containment, the number of structures destroyed, and the area burned each year. Table 1 highlights this and shows that the cost of wildfire containment has increased by a factor of nearly double (97%) when comparing the rolling average in 2016 ($800 million) to the rolling average in 2022 value ($1.6 billion). Despite the massive increases in wildfire containment, there are still increases in the amount of acres burned, growing from a 5-year average of 2.7 million acres burned in 2016 to around 4 million acres in 2022 and a significant increase in structures destroyed growing over 3 times(215%) from a rolling average in 2016 of 3,238 to 10,194 in 2022. This shows that while spending has increased over 2 times to try and match the growing problem, there are still large increases in acres burned and exponential increases in structures destroyed. This is consistent with recent third-party reports in this space (Congressional Research Service, 2023). If spending had stayed the same, it is likely that the area burned by wildfires would have seen a much more significant increase as would the number of structures destroyed.

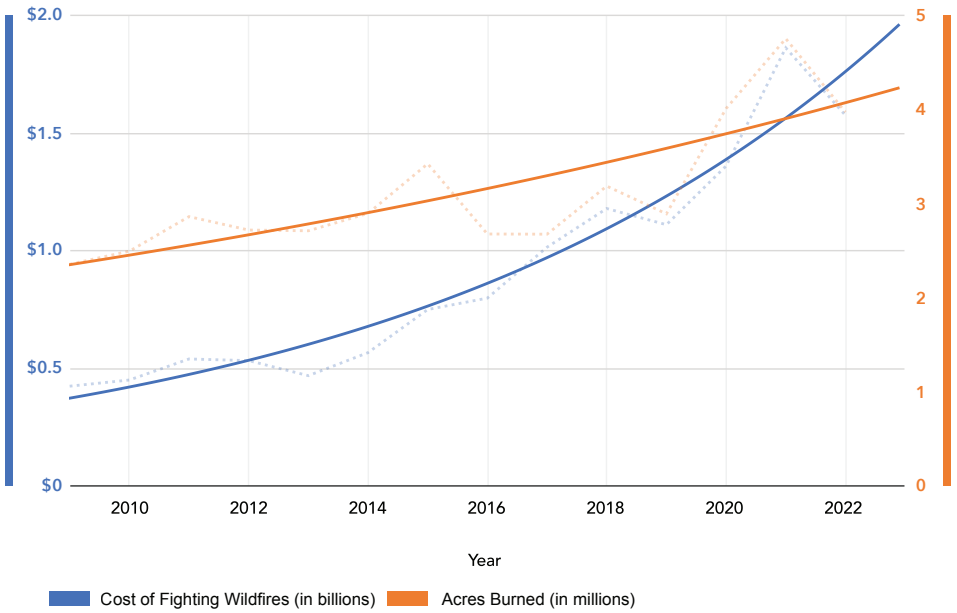


Figure 2. Trends comparison of Costs of Containment and Structures Destroyed Due to Wildfires, 2009-2022 (Source: US Forest Service)

Climate-fueled wildfires have grown more and more likely to penetrate the built environment. Although the increased wildfire risk is matched by billions in increased dollars for containment, thousands of structures are still destroyed each year, and this number is expected to continue to grow due to climate change. In the raw data collected by the US Forest Service, there is a dramatic increase in the 5-year rolling average of structures destroyed after 2016. Since 2016, four of the largest wildfires, in regard to structures destroyed, in US history have occurred including the Camp Fire, the Central LNU Complex Fire, the North Complex Fire, and the Chimney Tops 2 Fire. The middle of that decade serves as an inflection point in the time series, after which fires are happening in high proximity to properties and resulting in more structural damage. Again, these trends represent 5-year averages, but the underlying data highlight the variability in these metrics from year-to-year. In comparison to the largest wildfire years, 2022 is below average and the beginning of 2023 is looking to continue this below average trend in regard to these metrics. That being said, the 5-year averages and the trend lines clearly show an overall increase in wildfire risk over the time period being examined here.

When comparing the trend line of the number of structures destroyed from the US Forest Service data with the increases in total costs associated with wildfire costs from NOAA, the similarity in the corresponding increases is striking. This indicates that much of the increased costs are associated with the increased likelihood of wildfires occurring in more populated areas over time. Taken together with the increase in structures destroyed, this provides compelling evidence that wildfires are impacting residential areas more frequently than they have historically. This problem has been exacerbated by the rapid growth of new housing within the Wildland Urban Interface (WUI) (Radeloff et al., 2005). From 1990 to 2010, the US saw a 41% increase in the size of the WUI, and 97% of

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that increase can be attributed to new housing and only 3% attributable to an increase in wildland vegetation (Radeloff et al., 2018). Most of the growth during that time was in the South, particularly in the Southwestern portions of the country, with upwards of a 200% increase in the number of homes and people classified as being in the WUI. This combination of the increasing likelihood of wildfires due to the changing climate, and the growing population in the most wildfire-prone areas, has directly led to the increasing risk, cost, and damages associated with the hazard.

The First Street Foundation Wildfire Model

In this report, the fire risk across the country is examined using version 2 of the First Street Foundation Wildfire Model (FSF-WFM) built in partnership with the fire-science experts at the Pyregence Consortium as a way of understanding how historic patterns of wildfire exposure and current risk intersect with recent changes in insurance offerings, and how those may continue into the future given the increasing exposure to wildfire risk in a changing climate. The FSF-WFM is the result of a public-private collaboration whereby the open data and open science supported by federal, state, and local governments is used to enable private industry to create valuable new information products. This collaboration has enabled the creation of new wildfire risk estimates using a wildfire behavior model in a Monte Carlo simulation that assesses hyper-local climate risk at 30m horizontal resolution across the nation today, and for 30 years into the future (Kearns et al., 2022).

First Street Foundation democratizes this information through its publicly-accessible Risk Factor™ website to ensure that all individuals and communities have access to basic estimates of their wildfire risk, and makes their Fire Factor™ score readily understandable to effectively communicate that risk and inspire action. Most significantly, this hyper-local resolution allows for an extremely granular understanding of wildfire risk and empowers communities, states, and national government actors to take steps to mitigate wildfire risk above and beyond wildfire suppression efforts.

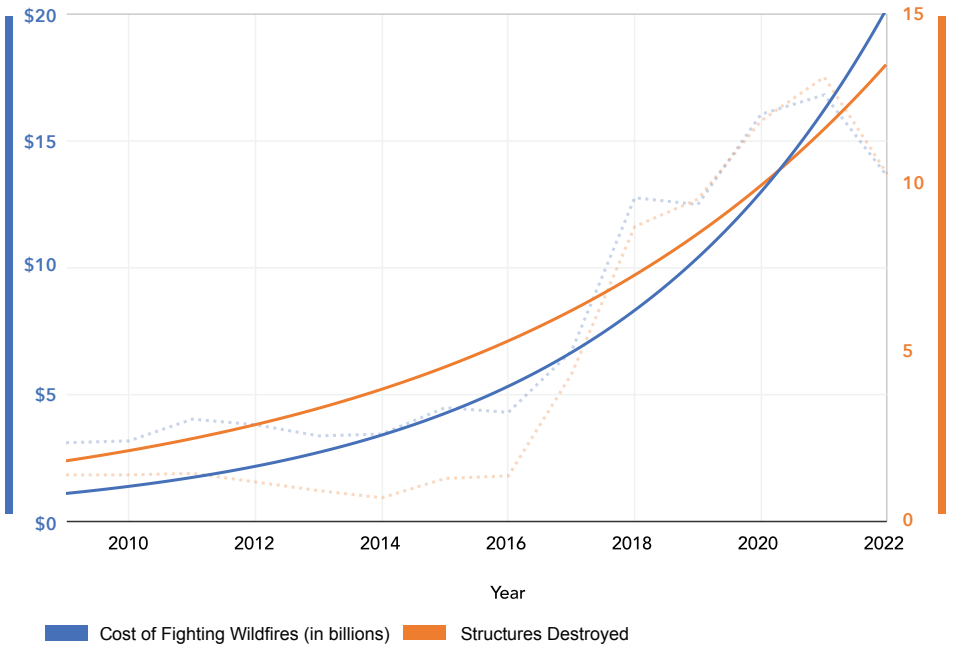

Figure 3. Trends comparison of Total Cost (Source: NOAA) and Structures Destroyed (Source: US Forestry) Due to Wildfires, 2009-2022

Integrating Wildfire Risk with Building Specific Property Characteristics

To understand losses from wildfire exposure at the property level, a novel risk modeling approach was developed in partnership with global engineering and consulting firm Arup. This approach allows the evaluation of wildfire risk to residential, commercial, and industrial buildings across the United States. Arup addressed an industry-wide gap in the quantification of wildfire risk by developing component-based fragility models which translate wildfire intensity to the ignition probability of a building based on its physical characteristics and first principles of engineering. When paired with FSF-WFM, the fragilities are used to estimate the extent and severity of potential fire damage to the building. Ultimately, the damage can be translated to both financial loss and downtime for repair. For version 2 of the FSF-WFM, the loss estimates have been refined and calibrated with the hazard and historical loss data to create updated wildfire risk estimates that will more accurately represent potential losses from wildfires throughout CONUS. The enhanced representation of embers in the model has also allowed a better representation of structural losses due to ember cast impacts, which is the dominant form of building loss in wildfires.

Arup defined 72 building archetypes, developed from data on building characteristics and surrounding vegetation, to characterize residential, commercial, and industrial buildings in the United States. The included characteristics are chosen as they are the key aspects contributing to structure ignition probability and the consequences of wildfire events. For each archetype, the vulnerability model determined the probability of ignition from (1) the flame front and (2) the ember attack. To model the financial consequences, damage data from past wildfires was used to develop three damage states: Total Loss, Major Damage, and Not Ignited. For each of these damage states, the financial loss and downtime were estimated using consequence curves developed from historical data and industry-standard cost values. This process results in a building-level loss curve for each archetype. These loss curves, when combined with the likelihood, intensity, and source of wildfire hazard at a site due to the flame front and/or embers, can be used to estimate the average annual loss (AAL) for each building. Similarly, this can be expressed in terms of structures lost in addition to total financial losses. Driving those financial losses are the conditional probabilities that structures ignite when exposed to wildfire, called ignition probabilities. Those ignition probabilities are derivatives of specific building characteristics and all of the understanding of how likely

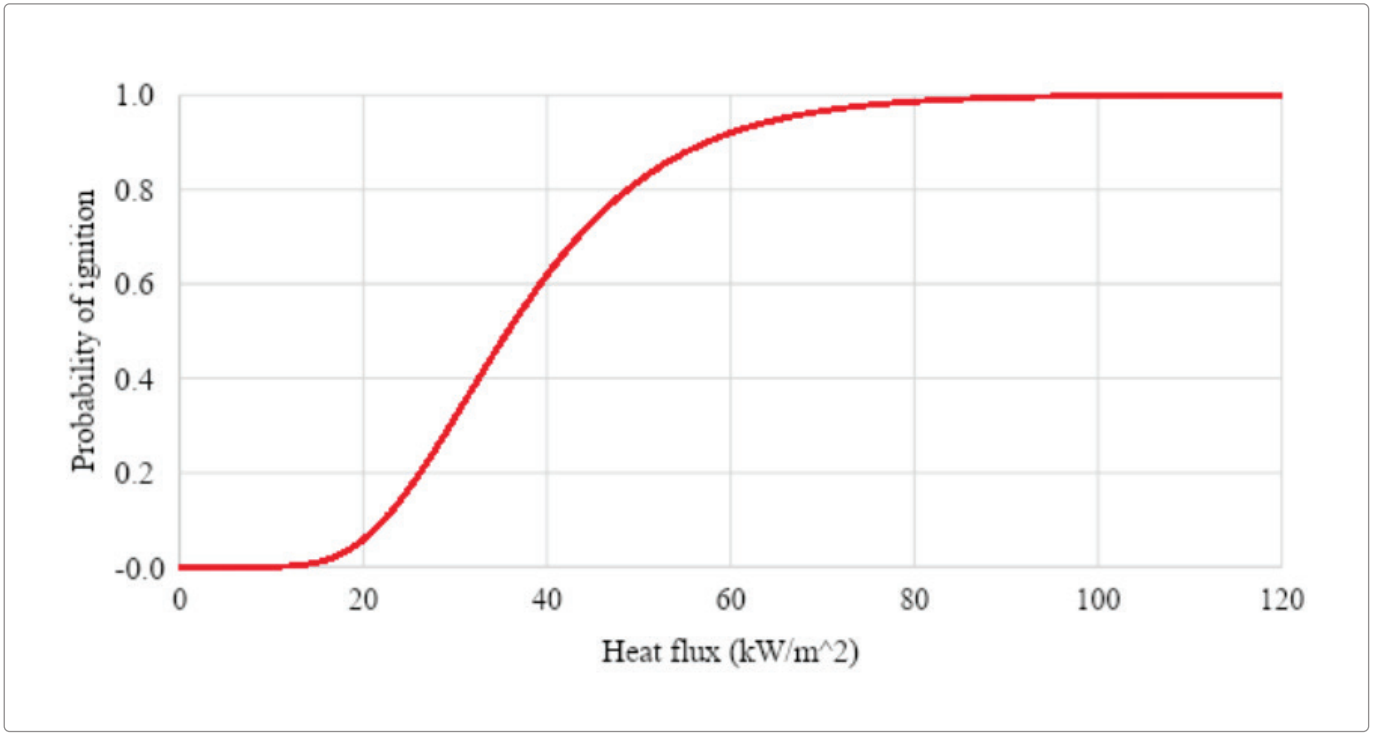

Figure 4. Example component fragility curve for estimating probability of ignition based on material characteristics and wildfire intensity.

Integrating Wildfire Risk with Building Specific Property Characteristics

a building is to be destroyed. The Average Annual Structures Destroyed (AASD) is constructed as the sum of all ignition probabilities across any given geo-unit (counties, for instance). These metrics (AAL and AASD) provide annualized estimates of risk, quantifying the anticipated financial impact over many years with those risk levels, and do not imply that the exact AAL or AASD amount will occur each year.

Average Annual Structures Destroyed (AASD)

The First Street Foundation Wildfire Model risk results are matched with building-specific fragility curves, allowing for the estimation of wildfire losses to properties across the United States. The data show that, on average, the equivalent of more than 17,000 structures are expected to be lost annually. This number grows to a projected almost 34,000 structures lost on average each year in 30 years, due only to the impacts of climate change. However, this number is likely to be conservative unless new construction in wildfire-prone areas is halted. This projected growth in losses would represent a near doubling (96% increase) of AASD due to the increasing wildfire risk from climate change over the next 30 years. For context, data from the US Forest Service shows that in a severe fire year, the US is already exceeding today's projections, as was the case in 2018 (over 24,000 structures destroyed) and 2020 (over 17,500 structures destroyed).

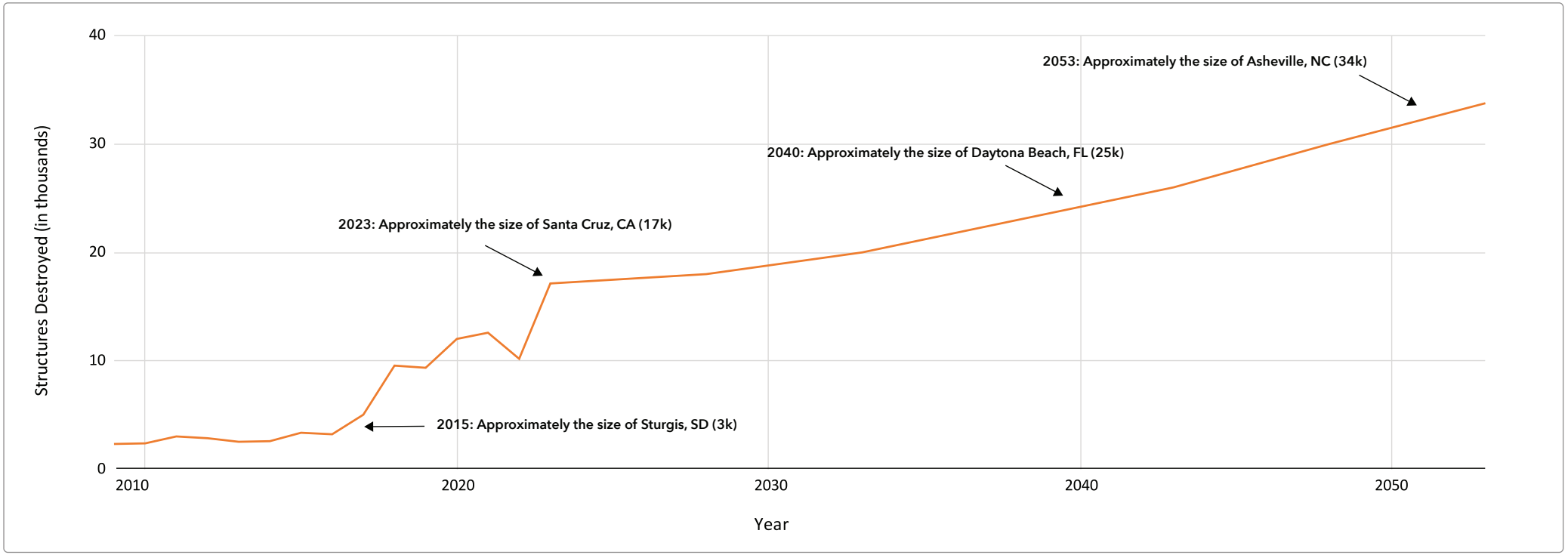

Figure 5. AASD Nationally Based on First Street Foundation Wildfire Model (FSF-WFM) projections.

Integrating Wildfire Risk with Building Specific Property Characteristics

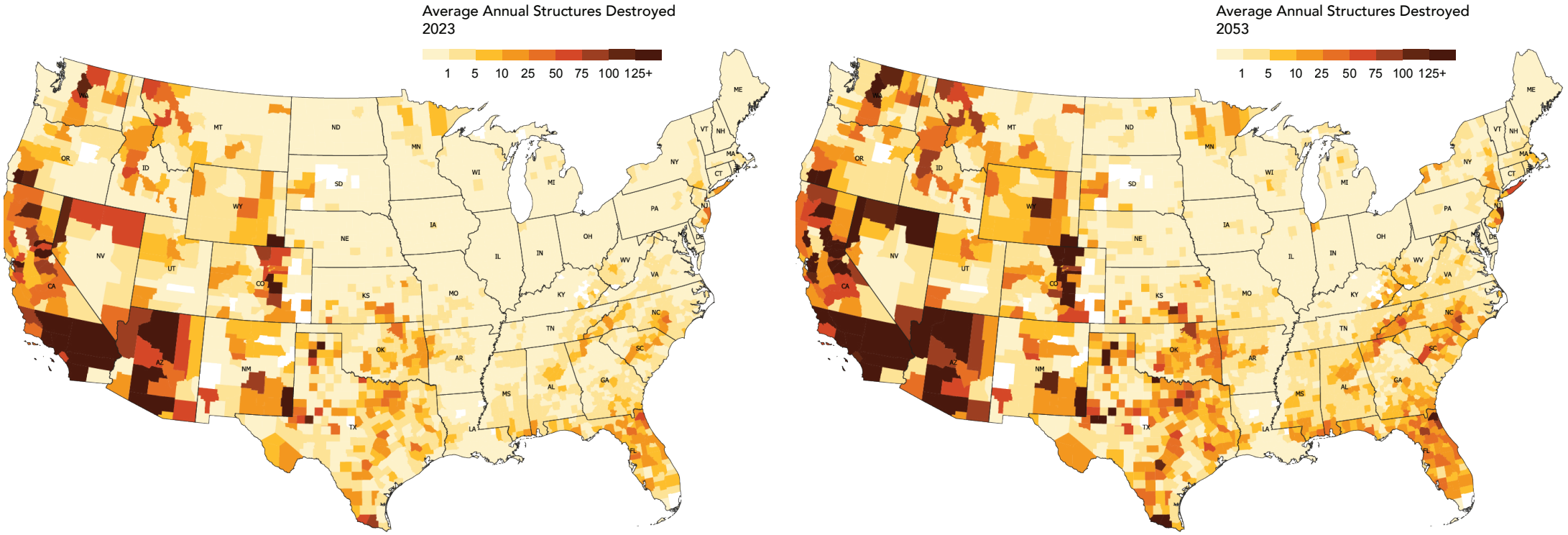

Figure 6. AASD, 2023 and 2053

When putting those numbers into context, the annualized expectation of structures destroyed has grown from the 5-year observed average of about 3,000 structures destroyed in 2016 (representing the number of homes in a town about the size of Sturgis, SD), to an expectation of around 17,000 structures that can be expected to be destroyed in 2023 (around the size of Santa Cruz, CA). Projecting that average loss into the future as climate change makes wildfire risk more prevalent, there are an estimated 25,000 properties a year that are expected to be destroyed in 2040 (about the size of Daytona Beach, FL), and as many as 34,000 properties that would be annually expected to be destroyed in 2053. This means that in 30 years, the expected annualized loss of properties to wildfire will be equivalent to a city the size of Asheville, NC. The spatial distribution of the AASD metric highlights a general clustering of high-risk areas in the southwestern portion of the country, along the West Coast, and, to a lesser degree, across the southern tier of the country. The county with the highest level of risk per the AASD metric is Riverside County, CA with an annualized expectation of 1,612 structures at risk of being destroyed in the current climate. Los Angeles

Integrating Wildfire Risk with Building Specific Property Characteristics

			Average Annual Structures Destroyed (AASD)			
Rank	County	State	AASD 2023	AASD 2053	Increase in AASD 2023 - 2053	Percent Increase in AASD 2023 - 2053
1	Riverside	CA	1,612	2,336	724	44.9%
2	Los Angeles	CA	1,450	2,272	822	56.7%
3	San Bernardino	CA	801	1,290	489	61.0%
4	El Paso	CO	528	1,010	482	91.3%
5	Pima	AZ	514	768	254	49.4%
6	Maricopa	AZ	442	834	392	88.7%
7	Contra Costa	CA	302	659	357	118.5%
8	San Diego	CA	294	574	280	95.5%
9	El Dorado	CA	264	487	223	84.6%
10	Hutchinson	TX	224	448	223	99.7%
11	Coconino	AZ	183	218	35	19.0%
12	Nevada	CA	151	309	158	104.7%
13	Lea	NM	147	268	121	82.6%
14	Laramie	WY	143	338	195	136.5%
15	Kern	CA	142	257	115	81.4%
16	Douglas	CO	139	405	266	191.0%
17	Ventura	CA	138	218	80	57.9%
18	Josephine	OR	126	259	132	104.9%
19	Jackson	OR	120	236	116	96.7%
20	Potter	TX	120	271	152	126.6%

Table 2. Top 20 counties by AASD in 2023

(1,449), San Bernardino (801), and El Paso (528) counties in California round out the top four, followed by Prima County, AZ (514), Maricopa County, AZ (442), and Contra Costa County, CA (301). The projections for the future look very similar in regard to distribution, with more severe risk in the Southwest and emerging risk across the Southeast. Again the largest risk exists in California, led by Riverside County (2,336). This is followed by Los Angeles County (2,272) and San Bernardino County (801). While they don't make the top ten list, it is worth noting that a cluster of counties across Texas and North Florida begin to emerge as areas with a growing risk of structures at risk of being destroyed due to the increases in modeled wildfire risk in the FSF-WFM, driven by more susceptible fuels due to warmer future weather conditions. The projected changes in expected average annual structures lost due solely to changing wildfire risk from climate change over the next 30 years reveal some significant hotspots, particularly in the Western United States.

Integrating Wildfire Risk with Building Specific Property Characteristics

While the western states have been known for their wildfire-prone conditions, other areas around Colorado, Texas, Florida, and New Jersey also stand out as regions experiencing considerable increases in potential structure destruction. One of the standout areas in terms of escalating structures lost is Los Angeles County, CA, with a projected increase of 822 AASD between 2023 and 2053. This large increase in expected damage underscores the growing vulnerability of this densely populated and fire-prone region. This is followed by Riverside County, CA (724); San Bernardino County, CA (489); El Paso County, CO (482); and Maricopa County, AZ (392) to round out the top 5. The rest of the top 20 list is made up of counties through California, Arizona, Colorado, Texas, Wyoming, Oregon, Washington, and New Mexico. These areas share common characteristics contributing to their heightened vulnerability, including arid climates, extensive wildland-urban interface development, and increasing temperatures driven by climate change.

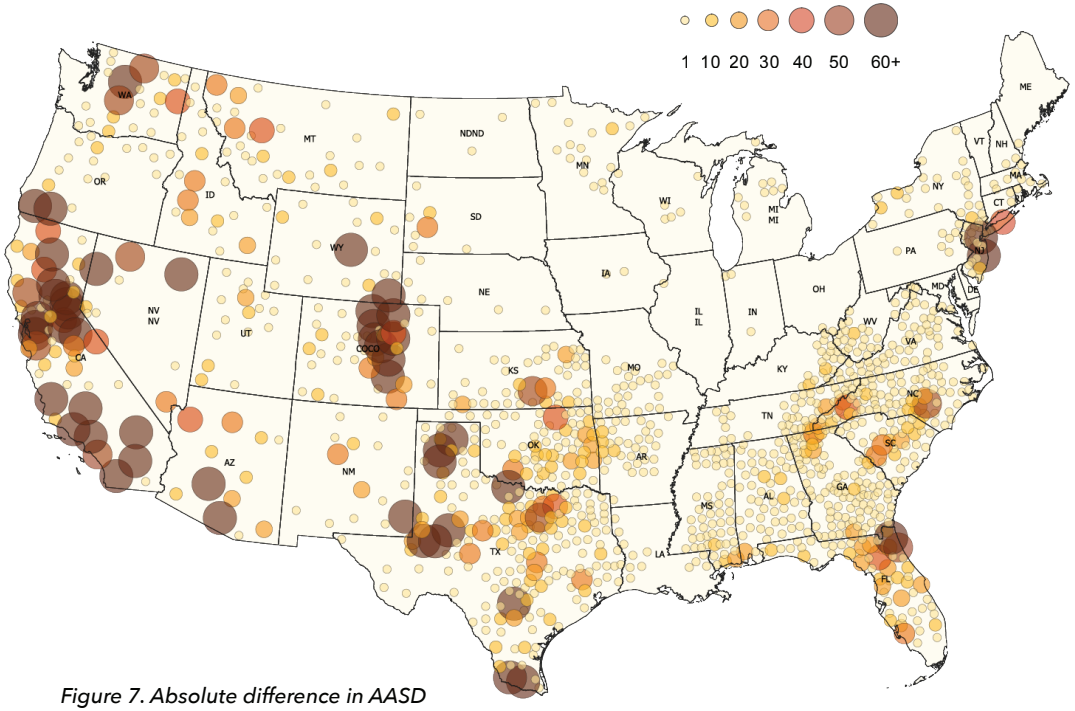

Figure 7. Absolute difference in AASD

Average Annual Loss (AAL)

The spatial distribution of the Average Annual Loss (AAL) due to changing wildfire risk reveals distinct clustering of high-risk areas, with a notable shift towards slightly

			Average Annual Structures Destroyed (AASD)			
Rank	County	State	AASD 2023	AASD 2053	Increase in AASD 2023 - 2053	Percent Increase in AASD 2023 - 2053
1	Riverside	CA	1,612	2,336	724	44.9%
2	Los Angeles	CA	1,450	2,272	822	56.7%
3	San Bernardino	CA	801	1,290	489	61.0%
4	El Paso	CO	528	1,010	482	91.3%
5	Pima	AZ	514	768	254	49.4%
6	Maricopa	AZ	442	834	392	88.7%
7	Contra Costa	CA	302	659	357	118.5%
8	San Diego	CA	294	574	280	95.5%
9	El Dorado	CA	264	487	223	84.6%
10	Hutchinson	TX	224	448	223	99.7%
11	Coconino	AZ	183	218	35	19.0%
12	Nevada	CA	151	309	158	104.7%
13	Lea	NM	147	268	121	82.6%
14	Laramie	WY	143	338	195	136.5%
15	Kern	CA	142	257	115	81.4%
16	Douglas	CO	139	405	266	191.0%
17	Ventura	CA	138	218	80	57.9%
18	Josephine	OR	126	259	132	104.9%
19	Jackson	OR	120	236	116	96.7%
20	Potter	TX	120	271	152	126.6%

Table 3. Top 20 counties by change in AASD

Integrating Wildfire Risk with Building Specific Property Characteristics

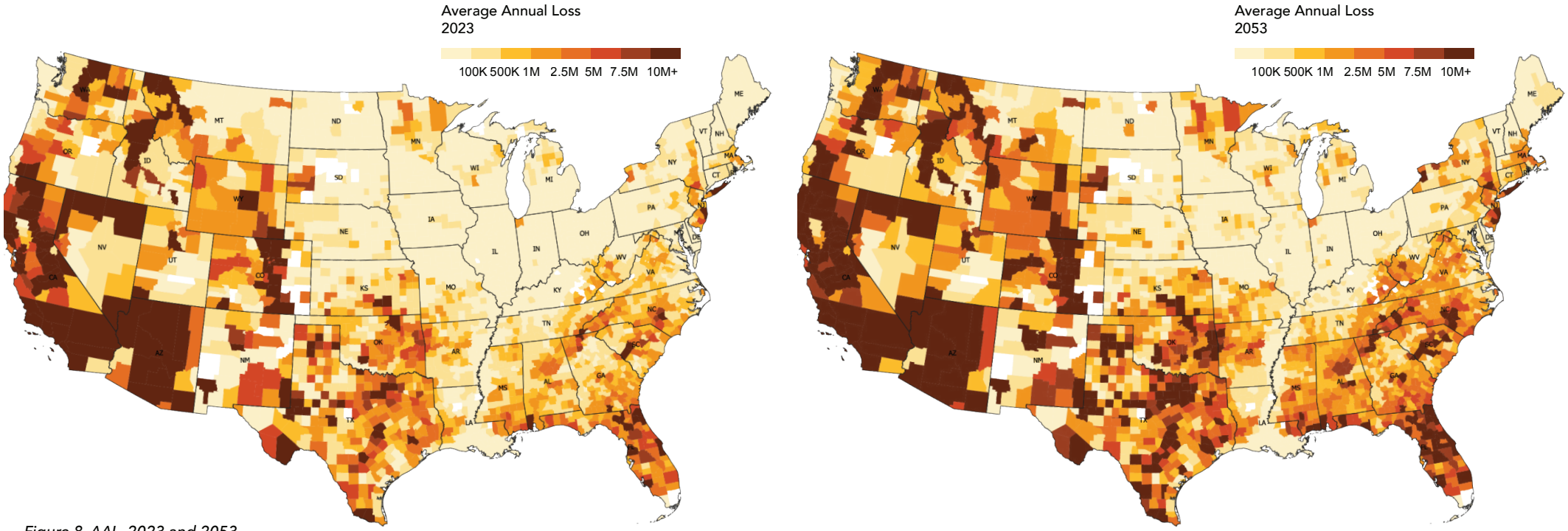

Figure 8. AAL, 2023 and 2053

higher AAL along the Atlantic and southern regions of the country. This becomes especially pronounced in the 2053 projections, due to the influence of increased air temperatures and reduced relative humidities driven by climate change that impact the state of the large amount of existing fuels in these regions. Currently, the highest AAL is observed in Los Angeles County, CA, and Riverside County, CA, where both counties exceed $1 billion in AAL, with $1.02 billion and $1.00 billion, respectively. Rounding out the top 5 include San Bernardino, CA ($484 Million); El Paso, TX ($280 Million); and Maricopa, AZ ($277 Million). The top 5 list for 2053 follows the same general pattern, except that Contra Costa, CA overtakes Maricopa County for the fifth spot with $298 million in AAL.

The projected increases in Average Annual Loss (AAL) due to changing wildfire risk over the next 30 years reveal a consistent pattern, with California and the rest of the Western United States experiencing the most significant impacts. Los Angeles County, CA, is projected to see the largest increase in AAL, with an estimated rise of $600 million. Following closely behind is Riverside County, CA, which is expected to see a $449 million increase in AAL, further emphasizing the severity of wildfire risk in Southern California. This is followed by Contra Costa County, CA ($298 Million) and San Bernardino County, CA ($284 Million).

Integrating Wildfire Risk with Building Specific Property Characteristics

Beyond California's borders, El Paso County, TX, stands out with an expected increase of $279 million in AAL, indicating that wildfire risk extends beyond the traditional wildfire-prone areas, necessitating attention and mitigation efforts in new regions. The top 10 counties with the highest projected increase in AAL over the next three decades continue to showcase the concentration of risk in the western states. The top 10 counties with the highest projected increase in AAL over the next 30 years are rounded out by Maricopa, AZ; San Diego, CA; Douglas, CO; Hutchison, TX; and El Dorado, CA.

Average Annual Loss

Rank	County	State	AAL 2023	AAL 2053	Increase in AAL 2023 - 2053	Percent Increase in AAL 2023 - 2053
1	Los Angeles	CA	$1,022,497	$1,622,887	$600,390	58.7%
2	Riverside	CA	$1,001,558	$1,450,646	$449,088	44.8%
3	San Bernardino	CA	$484,376	$768,413	$284,037	58.6%
4	El Paso	CO	$280,262	$559,492	$279,230	99.6%
5	Maricopa	AZ	$276,565	$521,866	$245,301	116.6%
6	Contra Costa	CA	$255,695	$553,906	$298,211	88.7%
7	Pima	AZ	$250,274	$376,435	$126,161	94.3%
8	San Diego	CA	$230,375	$447,556	$217,181	50.4%
9	El Dorado	CA	$158,459	$298,940	$140,481	190.0%
10	Hutchinson	TX	$155,063	$306,915	$151,852	97.9%
11	Douglas	CO	$108,936	$315,883	$206,947	88.7%
12	Coconino	AZ	$100,559	$119,626	$19,067	105.3%
13	Nevada	CA	$91,204	$187,260	$96,056	134.6%
14	Ventura	CA	$90,022	$141,410	$51,388	121.0%
15	Jackson	OR	$77,136	$151,382	$74,246	102.6%
16	Alameda	CA	$76,698	$155,425	$78,727	104.2%
17	Josephine	OR	$74,225	$151,581	$77,356	96.3%
18	Midland	TX	$70,525	$155,863	$85,338	57.1%
19	Kern	CA	$67,369	$122,172	$54,803	99.2%
20	Laramie	WY	$67,001	$157,162	$90,161	81.3%

Table 4. Top 20 counties by Average Annual Loss (AAL) in 2023

Integrating Wildfire Risk with Building Specific Property Characteristics

			Average Annual Loss			
Rank	County	State	AAL 2023	AAL 2053	Increase in AAL 2023 - 2053	Percent Increase in AAL 2023 - 2053
1	Los Angeles	CA	$1,022,497	$1,622,887	$600,390	58.7%
2	Riverside	CA	$1,001,558	$1,450,646	$449,088	44.8%
3	Contra Costa	CA	$255,695	$553,906	$298,211	58.6%
4	San Bernardino	CA	$484,376	$768,413	$284,037	99.6%
5	El Paso	CO	$280,262	$559,492	$279,230	88.7%
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7	San Diego	CA	$230,375	$447,556	$217,181	50.4%
8	Douglas	CO	$108,936	$315,883	$206,947	94.3%
9	Hutchinson	TX	$155,063	$306,915	$151,852	88.7%
10	El Dorado	CA	$158,459	$298,940	$140,481	97.9%
11	Pima	AZ	$250,274	$376,435	$126,161	190.0%
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14	Midland	TX	$70,525	$155,863	$85,338	57.1%
15	Alameda	CA	$76,698	$155,425	$78,727	96.3%
16	Josephine	OR	$74,225	$151,581	$77,356	102.6%
17	Jackson	OR	$77,136	$151,382	$74,246	104.2%
18	Washoe	NV	$63,435	$126,377	$62,942	121.0%
19	Chelan	WA	$51,795	$114,704	$62,909	81.3%
20	Hidalgo	TX	$37,853	$99,544	$61,691	134.6%

Table 5. Top 20 counties by change in AAL (in thousands)

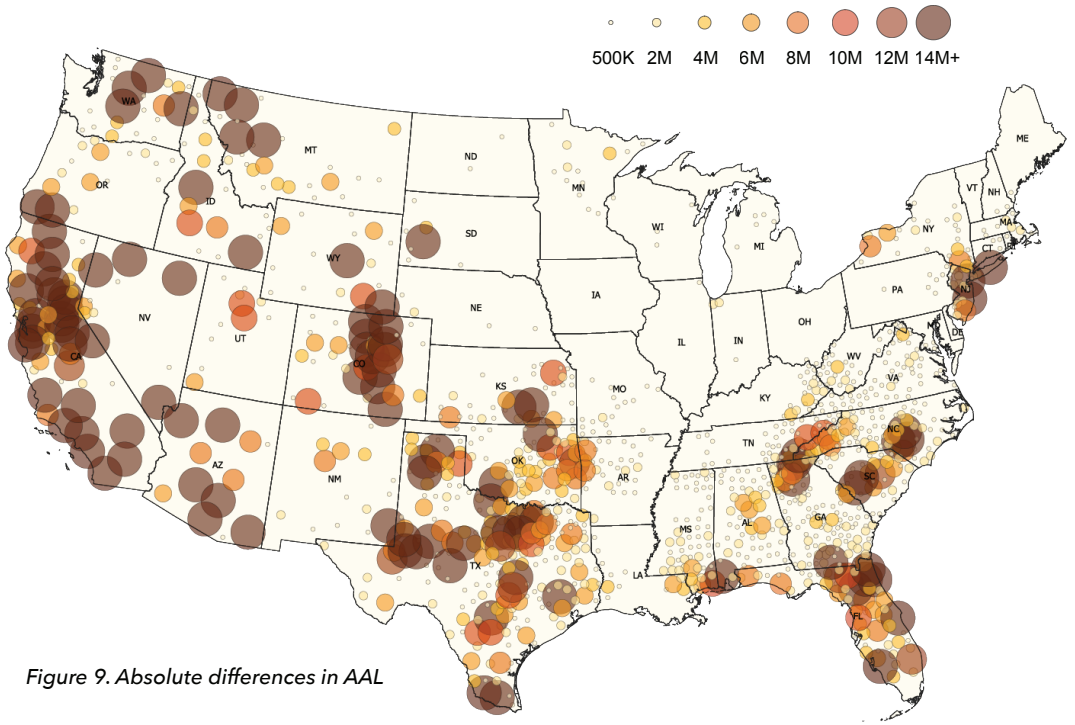


Figure 9. Absolute differences in AAL

Integrating Wildfire Risk with Building Specific Property Characteristics

California Sits at the Center of This Problem

Of the 17,147 projected average annual properties destroyed in the current year, 38.8%, or 6,654 of them, are anticipated to come from California alone. This underscores the extreme impact of wildfires on the state, highlighting the pressing need for comprehensive strategies to mitigate and adapt to this escalating risk. Across the state, the number of structures estimated to be destroyed each year from wildfire is set to increase to 11,252, an increase of 69.1% over the next 30 years. This risk is primarily concentrated in the southern half of California, with some additional areas in the foothills at high risk.

The county with the highest estimated AASD is Riverside County, with a count of 1,612 AASD, reflecting the immense challenge it faces in safeguarding its communities and properties from the destructive force of wildfires. The high risk in this area is due to not only the high likelihood of wildfire exposure in this area, but also the vulnerabilities of individual properties. Los Angeles County follows closely with 1,450 AASD, underscoring the extensive risks that densely populated urban areas in Southern California face.

The trend continues with San Bernardino County, with 801 AASD; Contra Costa County at 302 AASD; and San Diego County at 294 AASD, highlighting the widespread nature of the challenge across various parts of California. Rounding out the top 10, there is also a high risk in the El Dorado, Nevada, Kern, Ventura, and Shasta Counties.

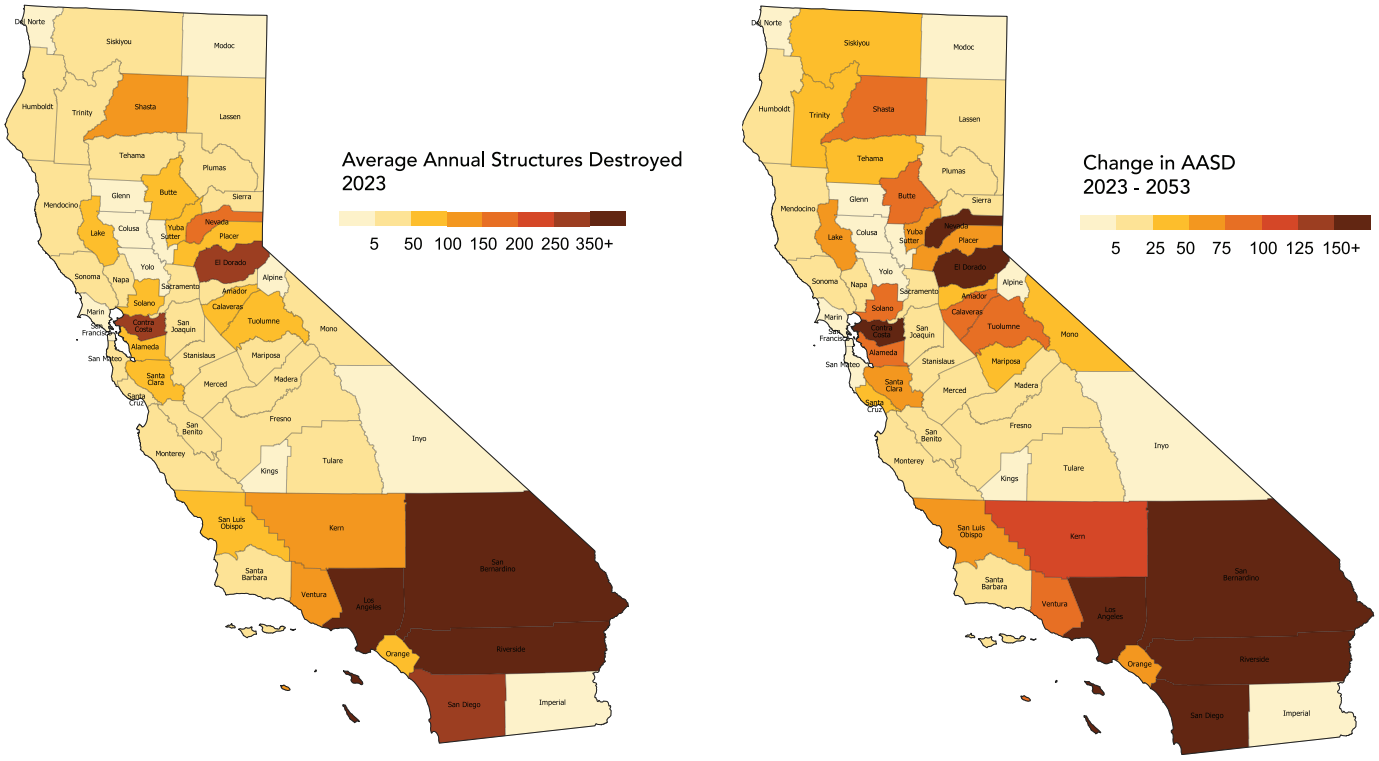


Figure 10. Average Annual Structures Destroyed (AASD) 2023 and Change between 2023-2053

Integrating Wildfire Risk with Building Specific Property Characteristics

In total, these 5 counties alone account for nearly 4,500 structures that can be expected to be destroyed on an annual basis in today's climate. That's more than every fire in the fire event database, with the exception of the Camp Fire and the Central LNU Complex of wildfires.

The California counties expected to see the greatest increases in AASD over the next 30 years follow a similar pattern as those with high risk currently. The top county list with the most change in AASD is topped by Los Angeles, which is expected to go from 1,450 AASD this year to 2,272 AASD in 30 years, an increase of 822 additional structures. This is followed by Riverside, with an increase of 724 structures destroyed annually; San Bernardino (489 additional structures); Contra Costa (357 structures); and San Diego (280 structures).

Average Annual Structures Destroyed (AASD)

Rank	County	AASD 2023	AASD 2053	Increase in AAL 2023 - 2053
1	Los Angeles	**1,450**	2,272	822
2	Riverside	**1,612**	2,336	724
3	San Bernardino	**801**	1,290	489
4	Contra Costa	**302**	659	357
5	San Diego	**294**	574	280
6	El Dorado	**264**	487	223
7	Nevada	**151**	309	158
8	Kern	**142**	257	115
9	Shasta	**100**	189	88
10	Alameda	**81**	166	85

Table 6. Top California Counties by AASD, 2023

Change in AASD

Rank	County	AASD 2023	AASD 2053	Increase in AAL 2023 - 2053
1	Los Angeles	1,450	2,272	**822**
2	Riverside	1,612	2,336	**724**
3	San Bernardino	801	1,290	**489**
4	Contra Costa	302	659	**357**
5	San Diego	294	574	**280**
6	El Dorado	264	487	**223**
7	Nevada	151	309	**158**
8	Kern	142	257	**115**
9	Shasta	100	189	**88**
10	Alameda	81	166	**85**

Table 7. Change in Top California Counties by AASD

Implications of Growing Levels of Risk and Damage on the Insurance Market

The Role of Insurance

The most accessible and efficient way to protect property owners from financial ruin and aid in recovery if their building is destroyed by a wildfire is through adequate insurance coverage. Unlike some natural disasters, wildfire damage is often covered through standard property insurance policies. Homeowners insurance typically covers damage to the property and contents from wildfire and wind events, and may also cover living costs if displacement occurs. All homes with a mortgage are required by lenders to have homeowners insurance.

That being said, the issue of affordable insurance as a realistic risk transfer mechanism for residential homeowners and commercial properties is becoming increasingly complicated as risk increases across the country in relation to a number of different climate hazards. In the commercial market, exposure from climate events in 2022 and 2023 have increased rates in some of the riskiest markets by as much as 50%. As a consequence of these increases, property development and sales have begun to stall (Heatmap). In the worst case scenarios commercial insurance is becoming as difficult to obtain as has been the case following recent trends in the single family market where the average cost of home insurance coverage is currently $1,899 annually across the US. In Lafitte, Louisiana, the 70067 zip code average insurance cost is almost $5,500 (with a median home value of $182,300). Just outside of Miami, Florida in the 33012 zip code, the average annual coverage costs approximately $5,900 (with a median home value of $277,500). Across the US, premiums increased approximately 12% between 2021 and 2022 (Policygenius). This year, homeowners insurance premiums are expected to rise by 9% (Insurify). On average, the city of Miami has the highest homeowner's insurance cost at an average of $5,003, followed by New Orleans ($3,983), both of which have historically had significant environmental catastrophes and high levels of associated damages (Policygenius).

Highest Cost of Covereage

Rank	City	Average annual cost	Median home value
1	Miami, FL	**$5,003**	$411,300
2	New Orleans, LA	**$3,983**	$279,100
3	Detroit, MI	**$3,779**	$69,300
4	Tulsa, OK	**$3,735**	$172,000
5	Fort Worth, TX	**$3,673**	$249,000
6	Dallas, TX	**$3,554**	$267,600
7	Odessa, TX	**$3,375**	$196,500
8	Kansas City, KS	**$3,209**	$140,200
9	Memphis, TN	**$3,191**	$142,800
10	Houston, TX	**$3,149**	$236,700

Table 8. Cities with the Highest Cost of Coverage (Source: Policygenius; ACS, 2021)

Regulation of the Insurance Market

To protect consumers against price gouging, each state is in charge of regulating the insurance market. By overseeing and regulating insurance companies' practices and rates, a state aims to prevent situations where insurers exploit vulnerabilities in the market to unreasonably increase prices. However, well-meaning but overly restrictive regulations aimed at protecting consumers may not allow insurance companies to raise their rates enough to keep up with these increasing costs in a rapidly changing climate. For example, in California, to address the issue of unaffordable insurance in some areas, Proposition 103 was enacted in 1988. This proposition mandated that insurance rates be based on factors such as the insured property's replacement cost, the insured's claims history, and the insurer's expenses, rather than solely on the location of the property. It also required insurance companies to get approval from the California Department of Insurance before implementing rate changes (California Department of Insurance) which may approve rate increases if the insurer files the underlying data that fully justifies the need for the rate increase. If there is a challenge to the rate increase at any step in the process, or if the rate increase requested is greater than 7%, it goes to a public hearing to dispute the increase. Proposition 103 aimed to promote fair and reasonable rates for all policyholders, regardless of their location or risk level.

However, the implementation of Proposition 103 restricts insurers from pricing their products based on the actual costs they face in a world where risks are increasing with climate change. The state that is the most active in terms of climate mitigation policy (CA.gov, 2022), does not allow insurance companies

Implications of Growing Levels of Risk and Damage on the Insurance Market

to account for the increased risk from climate change when calculating premiums. Insurance commissioners are often reluctant to approve significant rate hikes, perpetuating the problem. For example, this issue was illustrated in 2016 when State Farm sought to increase fire insurance rates by 6.9%. However, the insurance commissioner rejected this proposal and instead ordered a rate reduction of 7% (Los Angeles Daily News, 2023). This kind of decision-making, driven by intricate calculations – and possibly by political factors when state insurance commissioners hold elected positions – adds to the complexities of the insurance market, making it difficult for insurers to accurately reflect the risks they face and potentially hindering their ability to maintain profitability, or even break even. Coupled with a lack of public understanding of the many ways that climate change is changing the risk landscape across the US, it has proved difficult for states to introduce new information that would help set appropriate and fair rates in their insurance markets and for the public to have the will to approve these increases. For example, in the state of Oregon, the state's new, official maps of wildfire risk that were released on June 30, 2022 were withdrawn by the state on August 4, 2022 following significant public outcry, and have not yet been reissued (Oklahoma State University, 2023).

Premium Suppression is Driving Away Insurance Companies

In many high-risk areas, insurance providers are finding it difficult to provide affordable policies that are actuarially sound, as premiums are inappropriately suppressed – i.e. premiums should reflect, as accurately as possible, a quantifiable level of risk that can be independently verified. Insurance providers often face substantial losses when wildfires occur, as the costs associated with rebuilding damaged homes and compensating policyholders can be significant. These costs have become increasingly significant over recent years, and are associated with both direct and indirect impacts that have been observed and that are projected to occur. These impacts include 1) increases in exposure resulting in larger payouts from increasing exposure to climate-related disasters, 2) external economic influences resulting in higher payouts due to rising costs of construction and building materials, as well as increases in fraudulent claims, 3) prospective risk vulnerability directly impacting insurance costs due to intensifying climate hazards and higher resulting damages,

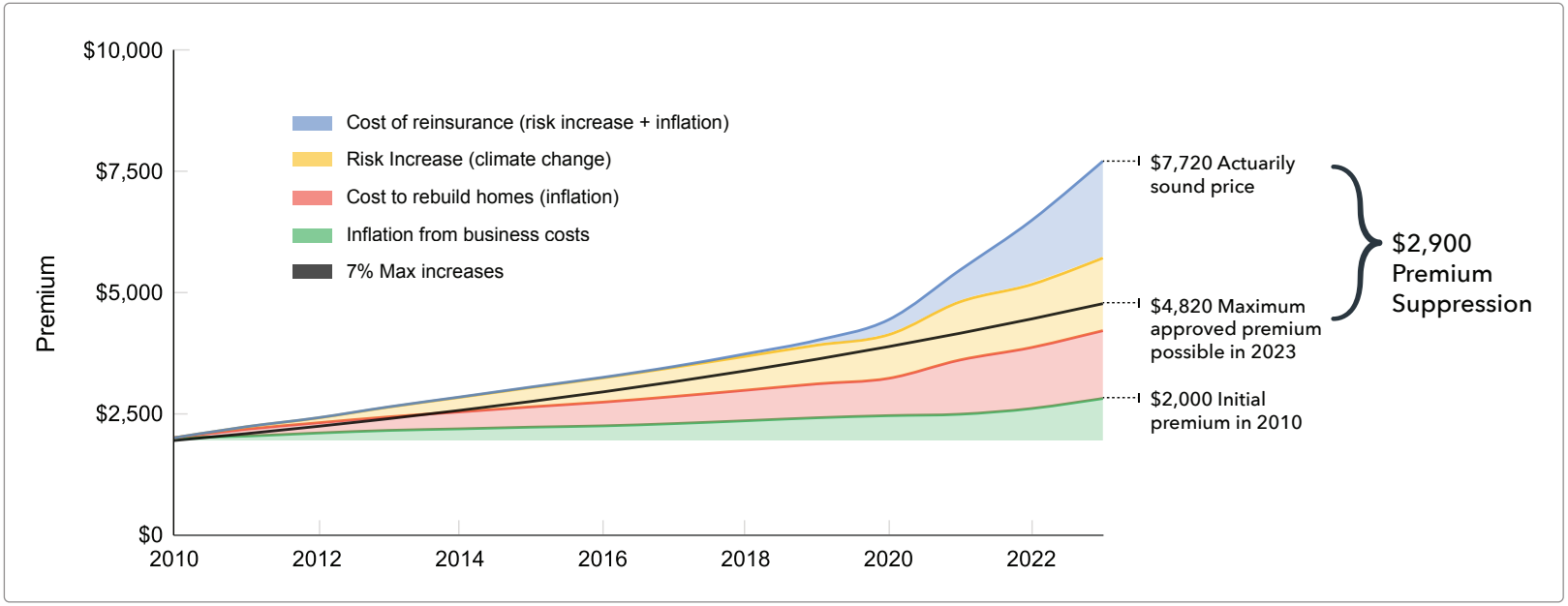


Figure 11. Example of allowable and actual costs of insurance using the CA FAIR plan as an example

Implications of Growing Levels of Risk and Damage on the Insurance Market

and 4) reinsurance rate increases indirectly impacting the "cost of business" for insurance companies as they seek to secure insurance on their own possible losses through risk transfer mechanisms that are not restricted from pricing for both increased risk from climate change and inflations impact on the cost to rebuild. One way to illustrate the issue is by following a hypothetical example of a homeowners policy in California that was $1,000 in 2010. If the insurer were allowed to increase rates at 7% per year (which was discussed previously as a very unlikely scenario), the premium would be $2,410 in 2023. Yet, during this period there has been a substantial increase in the wildfire acres burned and structures destroyed caused by climate change as well as increases in operating costs caused by inflation. When adding in the increase in payout exposure from climate, payout costs from inflation, and the associated increase in the cost of reinsurance from both of those same factors, it is understandable how the allowable premium increases are dwarfed by the actual costs to cover an aquarilly sound price.

These factors have led many insurance companies to limit their exposure by either increasing premiums or pulling out of certain high-risk regions altogether (State Farm, 2023), leaving homeowners and prospective home buyers with limited options. Properties located in high-risk areas, especially those surrounded by dense forests or brushlands, are generally considered more susceptible to wildfires and are therefore charged higher premiums or may even be denied coverage altogether. Over the last few years, there has been rapid growth in areas that insurance companies deem uninsurable. Among the companies that have ceased coverage in many areas are industry leaders such as State Farm, AIG, Allstate, Nationwide, and Farmers. As a result, affordable insurance options for consumers in high-risk areas can be hard to find due to the increased likelihood of property damage and the financial risks borne by insurance companies.

Some neighborhoods have seen insurer initiated non-renewals from 2015-2021 approach the count of total properties in the area. For example, zip code 94089 in Santa Clara has had 2,877 such non-renewals, making up about 87% of the 3,290 total properties in the zip code. In fact, among the top 10 zip codes by the percent of

High Percent Changes in Non-Renewals

Rank	ZIP Code	County	Number of Properties	Non-Renewals (2015)	Non-Renewals (2021)	% Change in Non-Renewals (2015-2021)
1	92325	San Bernardino	8,591	104	909	774.04
2	92352	San Bernardino	10,729	157	1,355	763.06
3	92391	San Bernardino	1,998	35	239	582.86
4	95709	El Dorado	2,545	42	217	416.67
5	92382	San Bernardino	6,516	85	413	385.88
6	96146	Placer	2,785	47	225	378.72
7	92386	San Bernardino	3,810	70	331	372.86
8	92549	Riverside	5,771	54	255	372.22
9	92315	San Bernardino	11,083	203	913	349.75
10	91390	Los Angeles	8,744	88	393	346.59

Table 9. Zip Codes with high percent changes in Insurer-initiated non-renewals.
**Limited to Zip Codes which have at least 500 insurer-initiated non-renewals over the time period ranging from 2015-2021*

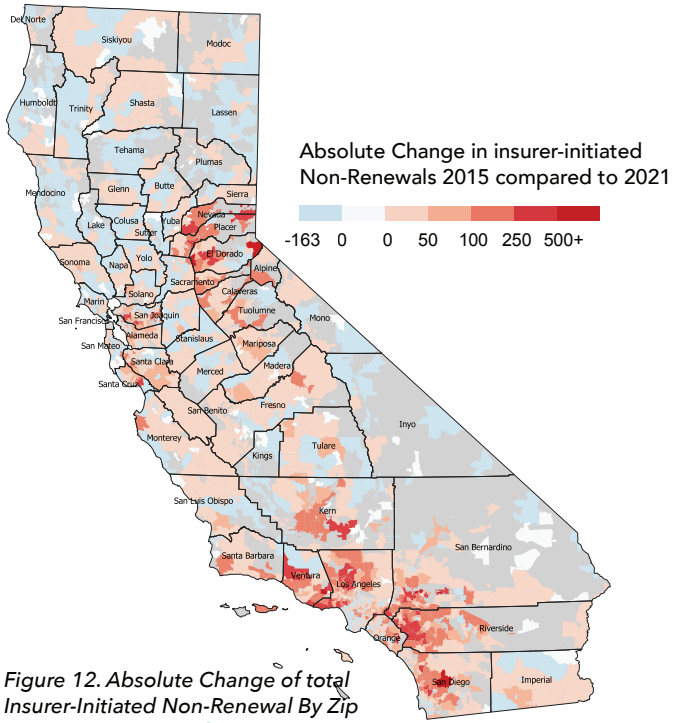


Figure 12. Absolute Change of total Insurer-Initiated Non-Renewal By Zip Code, 2015 - 2021 (CA.gov)

Implications of Growing Levels of Risk and Damage on the Insurance Market

total non-renewals (2015-2021) as a rate of the total properties in the area are all greater than 66%. This indicates that as many as two-thirds of the properties in the zip code are potentially deemed "uninsurable". It is also apparent from Table 9 and Figure 12 that these zip codes concentrate heavily in the foothills area of the state, along the Nevada state line, and Southwestern portion of the state around the Los Angeles metro area. These increases have led to concentrated areas in California that are becoming essentially "uninsurable" based on a very low level of insurer participation in the voluntary market, and high levels of policy non-renewals as insurance companies pull out of these areas.

Risk information held by the insurance companies is typically withheld as proprietary business information, but quantifying the levels of risk and expected losses in these high-risk areas for the broader public is a useful way to communicate the problem. When looking at the spatial location of high levels of AASD risk, the non-renewals across the state of California are primarily occurring in areas with relatively high levels of risk for buildings. From Figure 13, while there is significant variability in the data, there is an overall positive correlation between risk in the FSF-WFM and non-renewals. This allows a better understanding of risk in the current year and the ability to forecast risk 30 years into the future under a changing climate. Specifically, when comparing the FSF-WFM to the state's non-renewal data, the relationship shows that for every additional property at risk of destruction within a zip code, there have been 1.9 insurer-initiated non-renewals.

This provides evidence that the voluntary insurance market is responding to the growing risk and the limitations of policies in the state to control pricing, and that the FSF-WFM is finding the highest levels of risk in areas where the insurance market is already actively withdrawing.

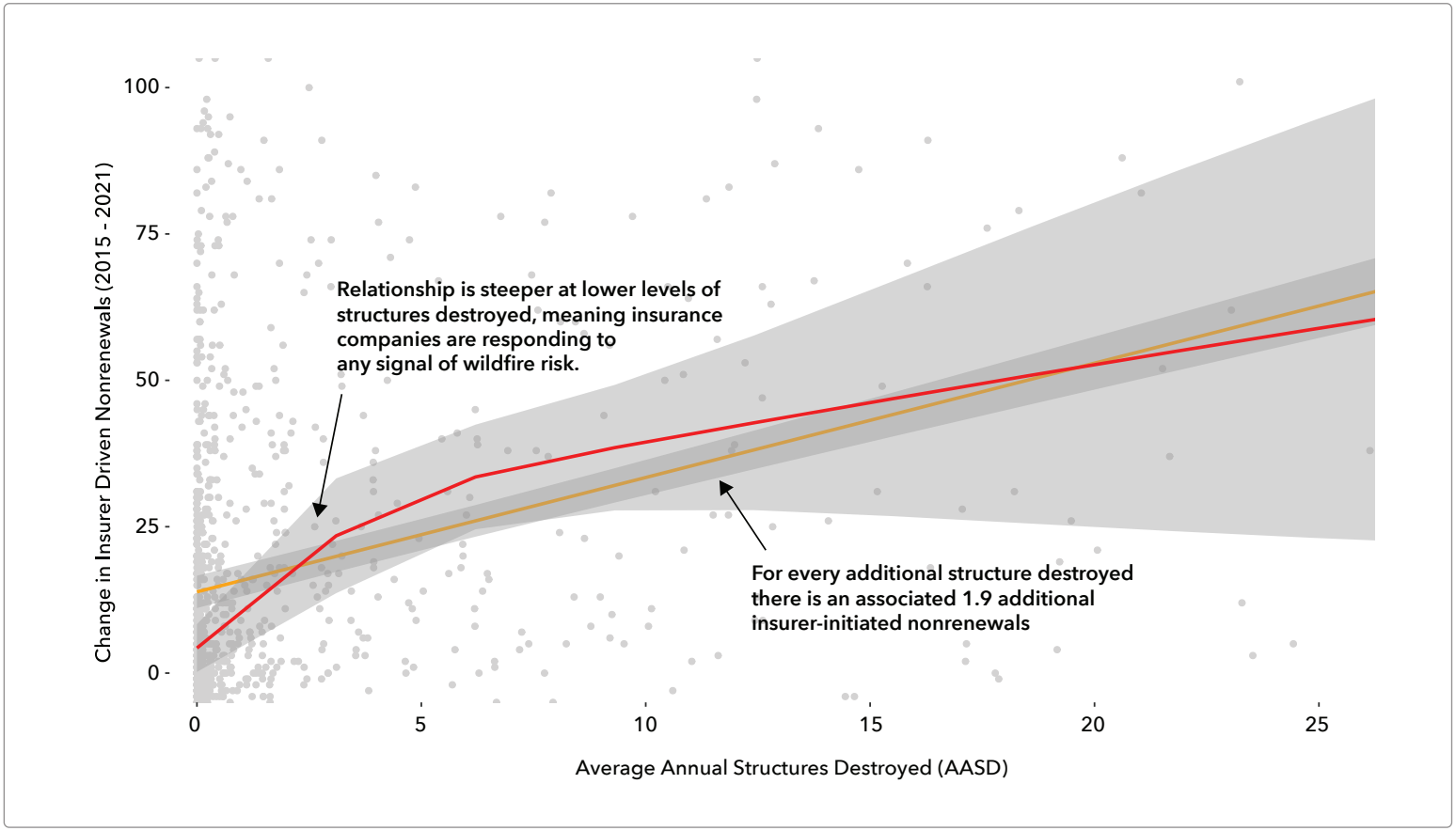


Figure 13. Correlation between Average Annual Structures Destroyed (AASD) and Recent Insurer-Initiated Non-Renewals (CA.gov)

Implications of Growing Levels of Risk and Damage on the Insurance Market

Insurers of Last Resort

The concentration of risk in some specific geographic areas, such as through the foothills east of the Sierra Nevada Mountain Range and much of Southern California, has left many regions of the state heavily dependent on the FAIR (Fair Access to Insurance Requirements) program for insurance coverage. The FAIR plan is an insurance program designed to provide basic property insurance to homeowners who are unable to obtain coverage through traditional means. It is not subsidized by taxpayers but instead is a mandate to be funded by participating insurance companies in the state (Orange County Register, 2023b). The consequence of this dependence creates a circumstance where if an exceptionally severe fire season were to cause significant losses that exhaust the resources of the FAIR Plan, the financial responsibility to cover those losses would then shift to the insurance companies still operating in the state, according to their market share. In such a scenario, these insurers would bear the financial burden of compensating policyholders and rebuilding damaged properties (Orange County Register, 2023a; 2023b). This underscores the need for comprehensive risk management strategies to ensure the sustainability and resilience of the insurance industry in the face of escalating wildfire risks.

The increase in costs of insurance, and the retreat of many insurance companies from areas with significant risk, will continue to drive more property owners to these types of insurers of last resort. In 2020, after several years of devastating wildfires, the number of homeowners who had to obtain policies from FAIR due to refusal of coverage from traditional insurance companies increased by 500% from 49,049 to 241,466 (Department of Insurance, 2021). Over that same time period, homeowners policies in the voluntary market increased by only 4% and insurer-initiated non-renewals were 11% higher than consumer-initiated non-renewals.

The Wildfire Housing Bubble

While California's FAIR plan can offer a safety net for homeowners in high-risk areas, its policies are typically more limited in coverage and come at much higher premiums. FAIR premiums may be triple or quadruple the price of premiums from other insurance providers, and homeowners often must buy supplemental policies (Orange County Register, 2023b; FAIR). The cost of homeowners insurance with a difference in conditions policy through the FAIR plan averages $3,200 across the state (Phil Irwin on KCRA), which is over twice as much as the average annual cost of homeowners insurance in the state ($1,436; Policygenius). This is driven by both different limitations on FAIR Plan premium pricing from the voluntary market and because difference in conditions policies are relatively more expensive than standard homeowners policies (California FAIR Plan vs Lara, 2021).

The additional expenses associated with insurance are significant, given their direct influence on the broader real estate market and the valuation of individual properties. Insurance costs serve as a critical factor that potential buyers and property owners consider when making real estate decisions. Elevated insurance premiums, especially in areas prone to natural disasters like wildfires, can lead to higher overall ownership expenses and may deter potential buyers from investing in those regions. Properties in areas with lower insurance premiums are often deemed more attractive and financially viable, contributing to higher demand and potentially boosting property values. Conversely, areas with higher insurance costs may experience decreased property values as buyers factor in these added financial burdens. Insurance costs have impacts on both the micro-level property valuations and the macro-level real estate market (Shu et al., 2022; Gourevitch et al., 2023).

Equation 1. Current home value before insurance increase

$$\text{Asset Value} = \frac{\text{Net Operating Income (NOI)}}{\text{Capitalization Rate}}$$

Equation 2. Home value after insurance increase

$$\text{Asset Value} = \frac{\text{(NOI - Increase in Insurance Cost)}}{\text{(Capitalization Rate + Investor Risk Premium Demanded)}}$$

Source: Delta Terra Capital

Equations 1 and 2 illustrate the impact of rising costs of

Implications of Growing Levels of Risk and Damage on the Insurance Market

home ownership, via insurance increases, on overall property values.

Using a Net Operating Income (NOI) relationship typically used by commercial real estate investors, the value of a property relative to "potential income" may be estimated in the form of annual rent. The potential income from that annualized rent is lessened by the cost of home ownership inputs, including home insurance and other operating costs. Assuming a capitalization rate of 5% (the ratio between annual net income and market value), NOI can be converted to the valuation of the asset. In the example shown in Table 10, the annual rent of approximately $21,000 is lessened by $1,436 (homeowners insurance) and $4,734 (other ownership costs), resulting in an NOI of $14,830. By dividing that NOI by the 5% capitalization rate, the estimated value of the asset is equal to $296,600. To illustrate the impact of increasing home insurance costs and holding all other costs constant, an adjustment to a $3,200 homeowners insurance policy would decrease the value of the asset by 11.9%, or $35,280. By pricing the impact of future risk, and raising the homeowner's insurance to $5,426 and adjusting the cap rate to 6%, the asset value is reduced by 39.1%, equating to a $180,667 home value. When considering future risk, investors may prefer a higher capitalization rate if they believe there is the potential for higher premiums. This example, from a real estate investor's perspective, effectively illustrates that even small, incremental increases in home ownership costs can have outsized impacts on the valuation of properties that, in turn, impact every property owner's finances. As the risk of catastrophic wildfires continues to increase in California, the cost of ownership burden for property owners grows accordingly.

Example Impact of Increased Cost

	Current	Repricing after insurance adjustment 2023	Repricing for estimated future insurance risk
Annual rent	$21,000	$21,000	$21,000
Homeowners Insurance	-$1,436	-$3,200	-$5,426
Other building costs	-$4,734	-$4,734	-$4,734
Net Operating Income (NOI)	$14,830	$13,066	$10,840
Cap rate	5%	5%	6%
Property Value (NOI/cap rate)	$296,600	$261,320	$180,667
Difference		-$35,280 (-11.9%)	-$115,933 (-39.1%)

Table 10. Example of increased cost of home ownership's impact on property values due to insurance rates in CA

The California fire insurance market operates in a challenging environment due to the state's susceptibility to wildfires. Affordability of insurance in high-risk areas is a significant concern, as insurance companies face increased financial risks and may limit coverage options or charge higher premiums. Proposition 103 aimed to ensure fair rates for all policyholders, while the FAIR plan provides an option for homeowners who cannot obtain coverage elsewhere. However, these policies, while protecting homeowners from large rate hikes and allowing them to have some source of insurance protection, are historically-based and do not accurately reflect the current levels of risk in the state, especially for high-risk areas – and do not include the rapidly rising risks from climate change in the future. As insurance companies are left to disproportionately bear the costs of these risks, they may increasingly pull back or pull out, leaving the market with few options and concentrated risk through the FAIR plan. Within California, there are approximately 5.9 million properties within counties that have an AASD of at least 100 properties, which qualitatively matches the patterns for areas with high non-renewals. This grows to more than 9.8 million properties by 2053. The First Street Foundation believes the first steps toward finding a fair and equitable solution include using open science to quantify the risks involved and democratizing this information to build a common understanding of the evolving levels of risk.

It's Not Just Wildfire - Pressure on Flood and Wind Insurance is Increasing Too

The California fire insurance market operates uniquely from the rest of the country due to the state's high risk of wildfires. As a result, the availability and affordability of fire insurance in high-risk areas have become significant concerns for residents and people looking to buy in the state. However, these types of insurance market situations are not unique to only California, as other areas around the United States grapple with various other climate risks, such as flood and wind storms, that have resulted in the rise of government-backed insurance programs.

The high environmental risk in other states results in insurance situations similar to California's. The Citizens Property Insurance Corporation, which is the insurer of last resort for wind storm insurance, has become the largest home insurance agency in the state of Florida, and recently increased rates in Louisiana by an average of 63% across the state. Figure 14 shows the variation in rates across Louisiana, which range from just over 20% to over 80% increases, with the largest increases being in the southern tier of the state.

In St. John the Baptist Parish residents will see increased rates by an average of 83% and in Orleans Parish, rates are expected to increase by an average of 76%. Table 11 highlights the impact of the increasing insurance costs using the same property valuation equation presented earlier in this report. In this example, the average cost of renting the state is approximately $11,000 annually and statewide average insurance cost is $2,507. With the recent 63% increase in home insurance rates, that rate will rise to $4,086, decreasing the net operating income (NOI) of the property at a cap rate of 5% to about $90,000, or a 26% decrease in overall property value. Scaling the insurance by 17.4%, consistent with the rate of increase in average annual losses in the state over the next 30 years, an annual insurance rate of $4,798 is expected, which would further reduce the property valuation to $63,133 (or a 48.1% decrease).

Example Impact of Increased Cost

	Current	Repricing after insurance adjustment 2023	Repricing for estimated future insurance risk
Annual rent	$11,088	$11,088	$11,088
Homeowners Insurance	-$2,507	-$4,086	-$4,798
Other building costs	-$2,502	-$2,502	-$2,502
Net Operating Income (NOI)	$6,079	$4,500	$3,788
Cap rate	5%	5%	6%
Property Value (NOI/cap rate)	$121,580	$90,000	$63,133
Difference		-$31,580 (-26.0%)	-$58,447 (-48.1%)

Table 11. Example of increased cost of home ownership's impact on property values due to insurance rates Louisiana.

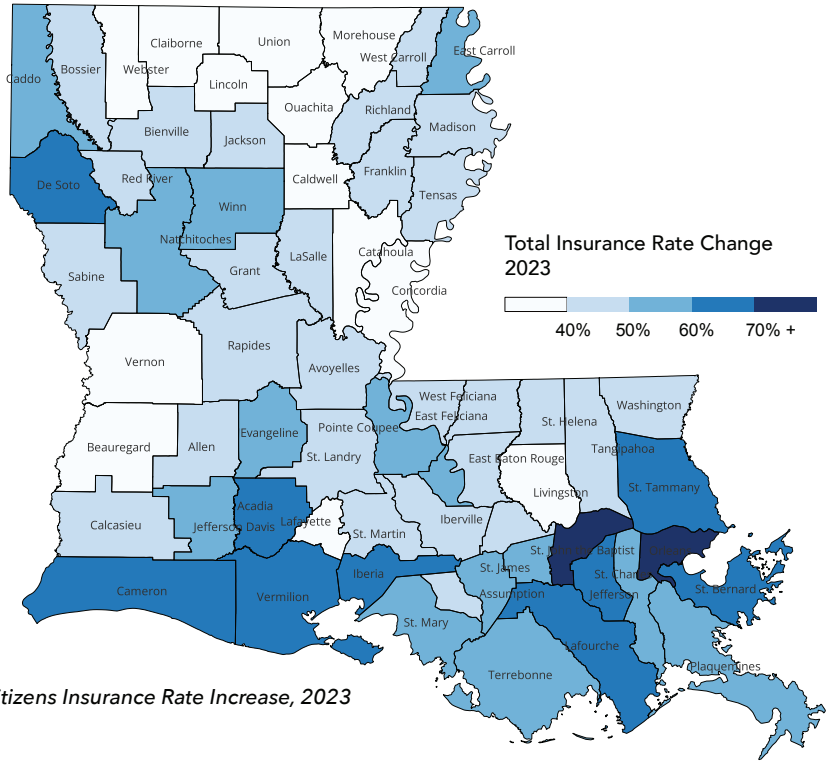


Figure 14. Citizens Insurance Rate Increase, 2023

It's Not Just Wildfire - Pressure on Flood and Wind Insurance is Increasing Too

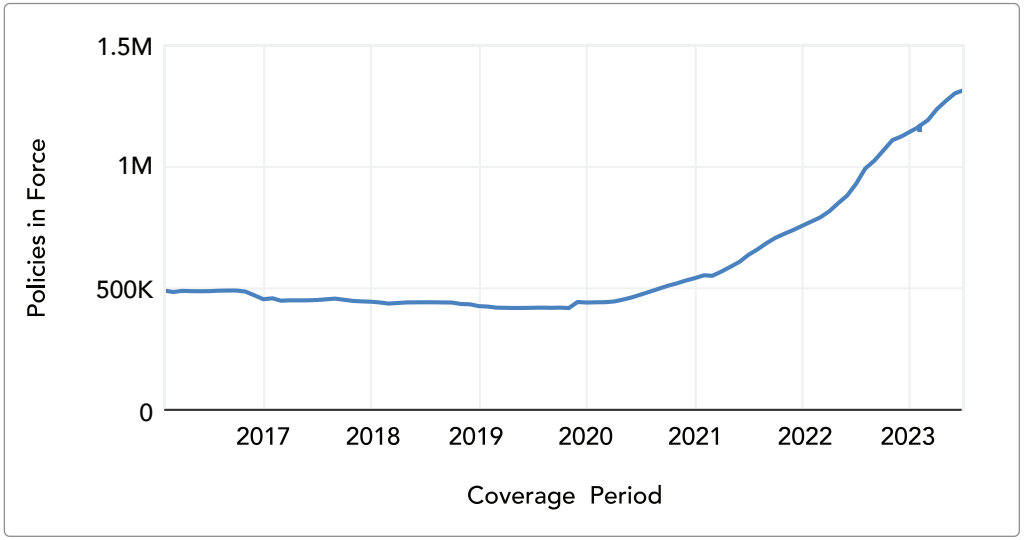


Figure 15. Policies in Force, Citizens Property Insurance Corporation-Florida (2016-2023)

Since 2020, the number of policies in force in Florida has grown from under 500,000 to about 1,300,000 today (168% increase). The largest percent increases have been in inland Florida, where Seminole (+2,992%), Orange (+2,818%), and Osceola (+2,491) counties all saw over a 20 times increase in the number of Citizens' policies in force from 2016-2023.

The largest increase in the number of policies occurred in southeastern Florida, where Miami-Dade County saw an increase of nearly 125,000 new policies over this time period (a 113% increase).

This heavy reliance on Citizens has significant implications for all residents of the state–even ones without homeowners insurance. Since Citizens is an insurer of last resort that is backed financially by the state, if a destructive event were to occur that surpassed the capital reserves that the company has, the costs would become the burden of the state. With a particularly bad hurricane, such as Hurricane Idalia, or with an intense hurricane season that produces multiple events and claims, there's a chance that the budget Citizens has might not be enough to cover the insured losses. Idalia, a major category 4 hurricane, ended up primarily hitting a relatively unpopulated area in the state of Florida which minimized the exposure to the program. If that same event were to have made landfall further south and hit the Tampa Bay area, the $4.8 billion that the insurer has saved would likely not be enough (Time, 2023). The intensification of Hurricane Idalia prior to landfall was fueled by climate related increases in water temperatures in the Gulf. As the climate continues to change, the intensification of hurricane events over the gulf will become the norm and one landfall into a populated area could spell disaster for the Citizens Insurance program.

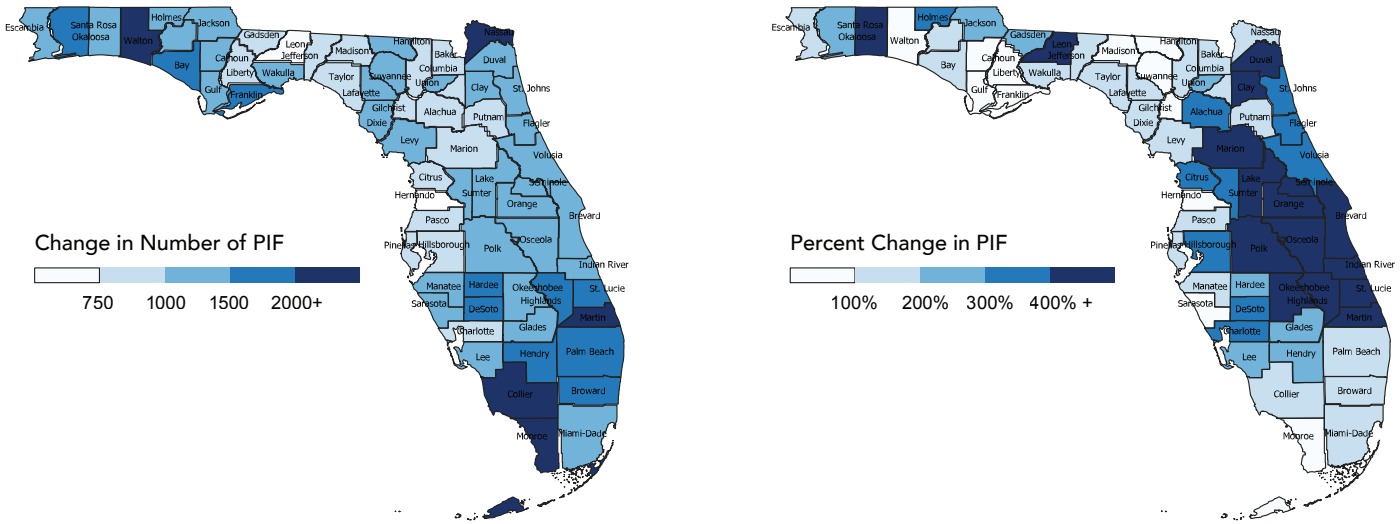


Figure 16. Change and Percent Change in Policies in Force, Citizens Property Insurance Corporation-Florida (2016-2023)

It's Not Just Wildfire - Pressure on Flood and Wind Insurance is Increasing Too

Along with increases in the number of policies in force, the average premium of a policy from Citizen's has increased from around $2,000 a year to over $3,300 a year from 2016-2023. The largest percent increases in average premiums have been in North Florida where increasing risk is raising premiums at a faster rate than other parts of the state. The fastest growing county in the state, Nassau County, saw a 448% percent increase in premium costs over this time period. The largest absolute cost increases are seen throughout the state with the largest increases occurring in Nassau County ($2,928), Hardee County ($1,622), and Suwannee County ($1,087).

Finally, many properties across the United States rely on flood insurance coverage from FEMA's National Flood Insurance Program (NFIP). In 2022, FEMA's NFIP released Risk Rating 2.0 as a way of employing a probabilistic flood risk model to estimate the risk to individual homeowners in order to account for the fact that the heavily government-subsidized program had gone $32 billion into the red following a series of extremely costly natural disasters. In doing so, the NFIP was in effect moving from a government-subsidized insurance program to one aimed to price insurance based on specific risk, in a more actuarially sound approach, in order to remain solvent. As a government-backed program, the issue of becoming "insolvent" was more theoretical than practical, however, the shift indicates the degree to which the program could no longer operate in a business-as-usual environment and needed to adjust its risk assessment practices. Although Risk Rating 2.0 does not yet explicitly include future climate change in its risk assessments, this move was inherently climate-driven as the program had not had a significant update in the pricing algorithm of insurance rates since the 1970s and could not keep up with the greatly increased risks of flooding under the current climate.

In Florida, homes which purchase wind coverage through Citizens must also enroll in flood insurance coverage. Table 11 highlights the impact of the increasing insurance costs using the same property valuation equation presented earlier in this report. In this example, the average cost of renting in the city of West Palm Beach is $18,720 annually and statewide average insurance cost

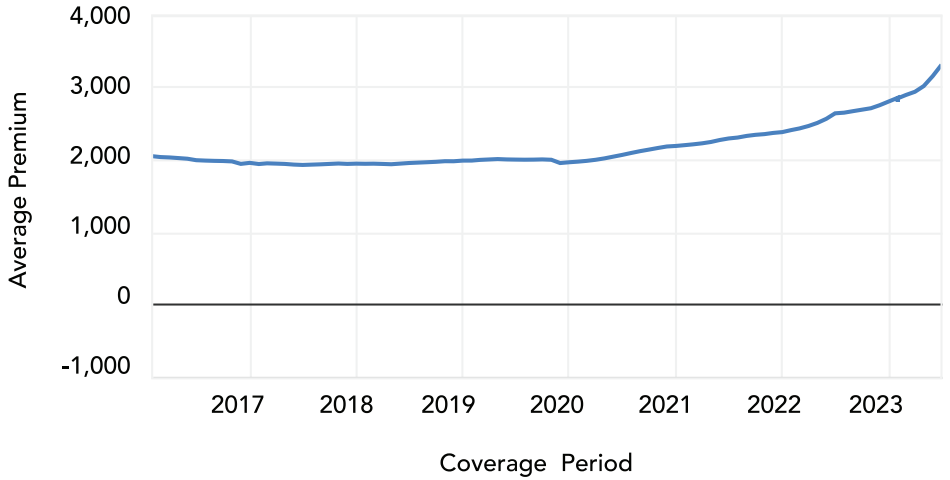


Figure 17. Average Premiums, Citizens Property Insurance Corporation-Florida (2016-2023)

Example Impact of Increased Cost

	Current	Repricing after insurance adjustment 2023	Repricing for estimated future insurance risk
Annual rent	$18,720	$18,720	$18,720
Homeowners Insurance (Citizens)	-$2,442	-$3,529	-$3,808
Flood Insurance		$1,191	$2,090
Other building costs	$4,225	-$4,225	-$4,225
Net Operating Income (NOI)	$12,053	$9,775	$8,597
Cap rate	$5%	5%	6%
Property Value (NOI/cap rate)	$251,060	$195,500	$143,283
Difference		**-$45,560 (-18.9%)**	**-$97,777 (-40.6%)**

Table 12. Example of increased cost of home ownership's impact on property values due to insurance rates West Palm Beach, FL.

It's Not Just Wildfire - Pressure on Flood and Wind Insurance is Increasing Too

is $2,442. With the recent rollout of Citizens future requirements that anyone with a Citizens' policy also have a flood insurance policy, that rate in West Palm Beach rises to $3,529 plus $1,191 (for NFIP in the city), decreasing the net operating income (NOI) of the property at a cap rate of 5% to about $195,500, or a 18.9% decrease in overall property value. By scaling the insurance by 8% and 75%, consistent with the rate of increase in average annual losses for wind and flood (respectively) in the state over the next 30 years, an insurance rate of $3,808 + the $2,090 flood insurance requirement would be expected annually, which would further reduce the property valuation to approximately $143,283 (or a 40.6% decrease).

Recently, FEMA has released new data on NFIP rate updates which captures current and future risk-based NFIP rates for all policies currently in force. When limiting that data to only counties with at least 500 policies in force, it is evident that the changes in insurance rates are expected to grow substantially as flood risk is priced using a risk-based approach. As seen in Table 13, the counties with the largest increases in absolute dollar value on their NFIP premiums lie primarily in the high-risk states of Louisiana and Florida, with counties from Maine, California, and Hawaii also making the top 10 list. The growth in the average premiums for these counties ranges from an increase of $4,590 in Plaquemines Parish, LA to $2,863 in Monroe County, FL. In almost every case, these increases represent at least a doubling of the current NFIP rate as new levels of risk are priced into the premium (Monroe, FL increases by 163%). When examining the percent increase, the top ten list looks relatively similar as it is dominated by counties from Florida and Louisiana, but a few different counties with lower current premiums in the list. Again, Plaquemines Parish, LA is at the top of the list with a 545% increase in current rates to the new risk-based premium. Joining Plaquemines is St. Mary, Lafourche, Terrebonne, Vermillion, and Iberia Parishes in Louisiana. Hawaii, HI, Collier and Brevard, FL, and York, ME round out the top 10. All 10 of these countries are expected to see at least a 244% average increase in the cost of NFIP insurance for policies in force in these areas.

By having access to the historic and new risk-based rate information from the NFIP, there is the ability to understand the impact that increasing flood risk has had on the program's ability to provide affordable insurance at a subsidized rate to property owners in relatively high-risk areas. However, the NFIP has the advantage of being a government program with immense federal resources behind it. No other climate peril risk is addressed by such a Federal program, although there are state-mandated programs like the FAIR program in California and the Citizens program in Florida. As a result, many

Absolute Dollar Increase

State	County	$ Change in NFIP Rate	Current NFIP Rate	Full Risk Based Rate
LA	Plaquemines Parish	**4,590**	842	5,431
HI	Hawaii County	**4,197**	1,199	5,396
LA	St. Mary Parish	**4,151**	1,074	5,226
FL	Franklin County	**3,532**	1,664	5,195
ME	York County	**3,118**	1,128	4,247
LA	Cameron Parish	**3,102**	1,352	4,454
CA	Sonoma County	**3,060**	1,404	4,464
LA	Lafourche Parish	**2,979**	929	3,909
FL	Collier County	**2,927**	1,053	3,980
FL	Monroe County	**2,863**	1,759	4,622

Table 13. Absolute dollar increase in NFIP premiums

Percent Change

State	County	% Change in NFIP Rate	Current NFIP Rate	Full Risk Based Rate
LA	Plaquemines Parish	**545**	842	5,431
LA	St. Mary Parish	**386**	1,074	5,226
HI	Hawaii County	**350**	1,199	5,396
LA	Lafourche Parish	**321**	929	3,909
LA	Terrebonne Parish	**305**	873	3,536
FL	Collier County	**278**	1,053	3,980
ME	York County	**276**	1,128	4,247
LA	Vermilion Parish	**255**	1,035	3,673
FL	Brevard County	**255**	668	2,367
LA	Iberia Parish	**244**	918	3,160

Table 14. Percent change in NFIP premiums

It's Not Just Wildfire - Pressure on Flood and Wind Insurance is Increasing Too

insurance companies are reconsidering their ability to cover hazards in high-risk areas. This includes what has been seen recently in California related to wildfires. When applying the property valuation equation (Table 15) to this increase in NOI for Plaquemines Parish, LA, the county with the highest percentage increase in premium in the new Risk Rating 2.0 program, the average rental property loses about half (54.1%) of its value with the current rate adjustment, going from a $169,760 valuation to $77,980. Furthermore, when accounting for growing risk within the NOI framework used to determine property value in this framework, the property essentially becomes valued at $0 from an investment standpoint given the additional cost-burden associated with the increased cost of flood insurance on the property.

Example Impact of Increased Cost

	Current	Repricing after insurance adjustment 2023	Repricing for estimated future insurance risk
Annual rent	$16,524	$16,524	$16,524
Homeowners Insurance (+ NFIP)	-$3,349	-$7,938	-$13,856
Other building costs	-$4,687	-$4,687	-$4,687
Net Operating Income (NOI)	$8,488	$3,899	$2,019
Cap rate	5%	5%	6%
Property Value (NOI/cap rate)	$169,760	$77,980	$0
Difference		-$91,780 (-54.1%)	-$169,760 (-100%)

Table 15. Example of increased cost of home ownership's impact on property values due to insurance rates in Plaquemines Parish, LA.

The Overall Climate Insurance Bubble

While information on insurance coverage, or lack thereof, is not readily available for all properties across the United States, how many properties are likely to be affected by changes in the insurance market due to various climate risks may be estimated. By combining high-resolution climate risk models and insights into insurance market behaviors, it becomes possible to estimate the potential amount of properties in insurance "bubbles", referring to where the need for insurance coverage significantly outpaces what is actually covered, leading to unsustainable pricing, underpriced premiums, and potential destabilization of the insurance market. These estimations serve as valuable tools for anticipating challenges, developing tailored policies, and fostering resilience to climate change within communities.

In total, 39,007,490 properties have risk of increasing insurance prices or reduced coverage due to high climate risk across the FSF Flood Model, Wind Model, and Wildfire Model. These 39 million properties make up 27.1% of the total properties across CONUS (~144 million). This is, nearly one-quarter of all properties across the country are in areas with high and similar climate risk from flood, wind, and wildfire to places where the insurance industry has already responded to high risk by requiring higher deductibles, raising rates, or withdrawing from the area. This one quarter of all properties represents the current Insurance Bubble of properties likely overvalued due to the underpricing or subsidization of climate risk in their insurance products. While regions across the United States are largely impacted by different types of climate risk, the insurance issue faced by these areas is similar and almost no area of the country is left untouched.

When looking at the properties at risk of future insurance related corrections across the three perils independently, there are approximately 12 million properties this year with exposure within the First Street Foundation Flood Model's 100 year return period that are not required to buy insurance, as they are not zoned within a FEMA Significant Flood Hazard Area (SFHA; within these areas, any federally-backed mortgage requires flood insurance). Additionally, there are 3.2 million properties in the FEMA SFHA which do not have a policy through the NFIP program. Due only to flood risk, it's estimated that properties in the US with such flood risk are overvalued today in total by about $121 billion to $237 billion (Gourevitch et al., 2023), which climate change is expected to only make worse. When considering tropical cyclone (e.g. hurricane) wind risk, there are

It's Not Just Wildfire - Pressure on Flood and Wind Insurance is Increasing Too

about 1.7 million properties that already have an insurer-of-last-resort wind policy and another 23.9 million properties in Zip Codes that have over $100,000 in AAL, which is the lowest amount of AAL for any Zip Code in the insurance wind zone (where AAL>$0). Due to wildfires, there are approximately 336k properties that already rely on higher insurance pricing through the state-backed FAIR plan. Additionally, there are another 4.4 million properties within Zip Codes where AASD is greater than or equal to 10 structures. As shown earlier, this threshold generally matches patterns in California for high increases in insurer-driven non-renewals.

Taken together, this means that there are approximately 6.8 million properties across the country that have already been hit by increasing insurance rates, canceled policies, and the realization of property value devaluation due to increased cost of ownership. That 6.8 million is a small fraction of the 39 million properties across that country that face similar insurance-related corrections based on their similar risk to those already being affected. This ultimately means that about a third of the country is currently grappling with insurance-related property devaluation or is part of the Insurance Bubble with unrealized overvaluation due to unpriced climate risk.

The range of property value loss for those 39million properties is large, ranging from as little as a single dollar to full devaluation with 100% decrease in overall investment value. Those most at risk are property owners that are already stretched to be able to pay for the mortgage and associated costs, even before accounting for the forthcoming increases in insurance. For those properties, the additional cost of home ownership that comes from increasing insurance premiums could potentially lead to an inability to pay and mortgage delinquecy. To align that risk with the growing Insurance Bubble, approximately 2.6 million, or 2.7%, of all mortgages and HELOC loans are already in delinquency (CoreLogic), of which ~967,000 are in serious delinquency and at risk of bankruptcy. Assuming similarly that 27.1% of them are within the Climate Insurance Bubble, this equates to approximately 704,000 mortgages already with delinquencies which would be in even further financial disrepair if insurance prices were to be adjusted for actuarially sound risk in the current year. This issue will only continue to grow, as these climate driven Insurance Bubble issues are only going to continue to grow along with the increased exposure of properties to climate hazards.

There is a growing crisis at the intersection of climate risk and the risk transfer mechanisms traditionally used to protect homes, businesses, and communities from that risk.

Properties at Risk of Insurance Increases/Non-Renewals

Peril	Number of properties already impacted by insurance adjustments	Number of properties at risk of future insurance related corrections
Flood	4,711,479	11,972,823
Wind	1,709,834	23,912,789
Wildfire	336,473	4,414,900
Unique Properties with Flood, Wind, or Wildfire Risk	**6,757,786**	**39,007,490**

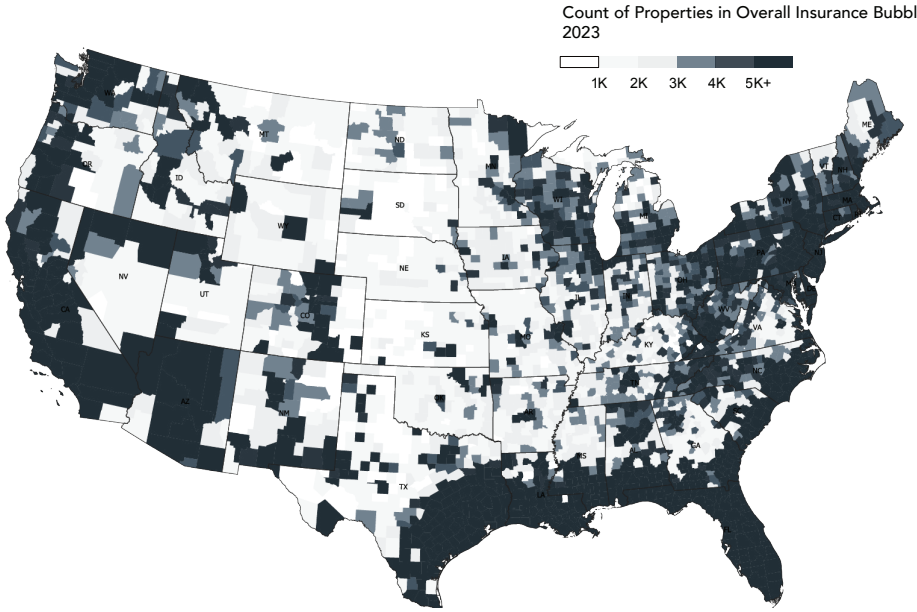
Flood: Number of properties in the 100 year flood zone, but not in the FEMA mandated SFHA. There are 12 million properties with FSF 100 year risk that are outside of FEMA's SFHA, there are also 3.2 million properties in FEMAs SFHA that do not have NFIP policies.

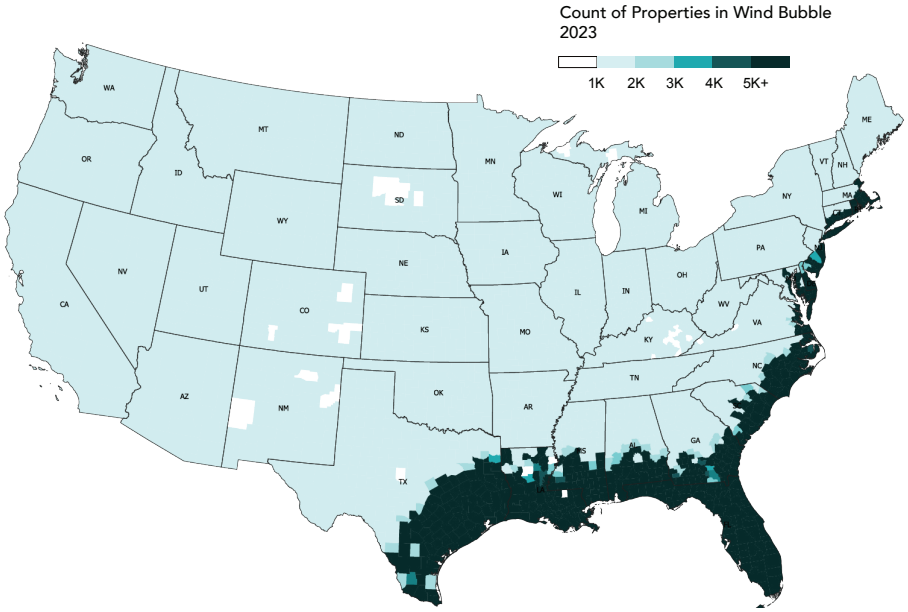
Wind: Number of properties in a Zip Code with AAL >= $100,000. This is the lowest amount of AAL in any Zip Code in the insurance wind zone
1.3 million in FL, 114k in LA, 231k in TX, 14.8k in SC, 31k in MS, 334 in GA, 18.7k in AL

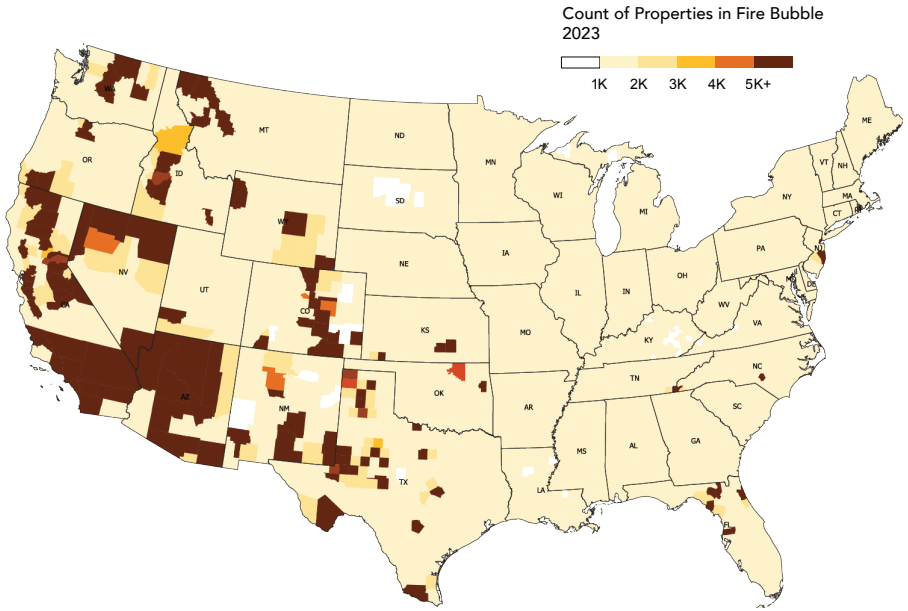
Wildfire: Number of properties in a Zip Code with average annual structures destroyed >= 10
270k in CA, 66k in TX, 473 in OR

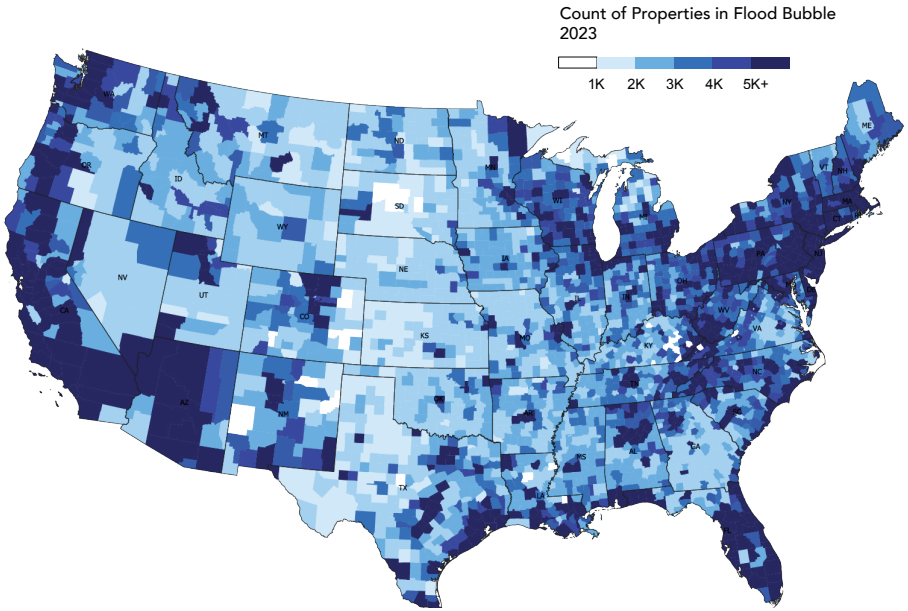
Table 16. Properties at risk of insurance increases/non-renewals based on First Street Foundation's Climate Models. Total property count is less than the sum of risk by climate hazards due to some properties having multiple risks

It's Not Just Wildfire - Pressure on Flood and Wind Insurance is Increasing Too









Conclusions & Policy Implications

The best way to protect property owners from financial ruin following disastrous climate exposure is through insurance. That being said, the rate at which insurance rates are increasing–and the rate at which the number of policy non-renewals are increasing–is indicative of the increased likelihood and costs of climate-related disasters. These events are occurring more frequently in places where development was once deemed safe, but the amount of risk is now known to be larger than was anticipated. While this phenomenon may be seen throughout the insurance industry and in regard to multiple climate hazards, the bulk of this report has focused on the example of recent shifts in the insurance market in California and that state's growing exposure to wildfire and reliance on their state-mandated insurer of last resort, the CA FAIR plan. As of June, 2023 there has been legislative acknowledgement regarding the unsustainability of the current structure of the FAIR plan and the restrictions placed on the private insurance companies. Discussions are in the works to re-evaluate the ways in which the FAIR plan is implemented in the state and to provide private insurance companies an opportunity to price policies based on their own actuarially sound methodologies (Politico, 2023). As of the time of this report (September, 2023), there had been no legislative outcomes that would change the process, but it is expected that some adjustments to the program are in the works and will be coming very shortly.

Understanding that specific risk at a property-level resolution and assessing the places where residential structures are in harm's way is one of the best ways of understanding the scope of the issue and where the homeowner's insurance issues will spread next. The First Street Foundation Wildfire Model represents a "first of its kind" national, climate-adjusted fire-behavior wildfire model at the property level, by calculating burn probabilities, flame lengths, and ember spread at 30m horizontal resolution across the US, with corresponding risk and loss estimates for this year as well as 30 years into the future. Estimates regarding burn probabilities and AAL are provided for each individual property, and metrics such as AASD allow for an improved understanding of community-scale risk that is consistently applied and comparable across the entirety of CONUS. This empowers property owners with crucial information to make informed decisions regarding risk mitigation, adaptation solutions, and property hardening measures to safeguard their assets against potential wildfire events. By providing data at such a granular level, this model complements existing community-level risk models, offering both property owners and communities the necessary tools to make well-informed decisions for mitigating wildfire risk today.

Furthermore, the model incorporates changing climate conditions as a way to estimate changes to wildfire risk over the next 30 years. Understanding how fire risks change over time with future environmental conditions at a high resolution is important for knowing how financial, human, and community resources should be allocated in order to mitigate the risks associated with each. That is, this high-resolution model which estimates fire risk now and 30 years into the future under changing environmental conditions allows property owners to undertake the necessary actions for protecting their assets and for investors to understand and price this risk into their decision-making processes.

Finally, this report illustrates that wildfire risk exists in areas of the country that are not typically thought of as having any wildfire risk, such as throughout the Great Plains, Midwest, and southern half of the country. Beyond the physical risk to wildfire, the cascading effects of smoke-driven poor air quality, increased landslide risk due to soil erosion, and larger downstream economic impacts to the community are also increasingly impacting areas outside of the Western US. The additional, and relatively unknown, risk of wildfire manifests itself in a count of nearly 50 million properties with some level of wildfire risk. The level of wildfire risk in these regions highlights the importance of expanding wildfire risk awareness and preparedness beyond the typical high-risk areas–with the recent example of Lahaina on Maui, Hawaii as a stark example of a community unaware of its level of wildfire risk. Given these new estimates of wildfire risk in CONUS, a number of challenges remain, including those related to reducing wildfire risk through land management practices, increasing wildfire suppression resources, mitigating insurance issues, and preparing for population migration in response to changing risk.

States face a dual challenge in effectively grappling with wildfire risk – understanding and communicating the current risk accurately, while also accounting for future projections under

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a changing climate. Understanding the current risk is crucial to effectively combat wildfire risk in the current environment, but this alone is insufficient if projected future risks are not understood as well. As climate change intensifies wildfire conditions, the risk landscape is constantly evolving, necessitating proactive responses. Failing to incorporate future risk increases into insurance and management strategies increases the probability that today's solutions will rapidly become inadequate in just a few years. By integrating future projections into decision-making processes, states can develop more resilient strategies, adapt their responses over time, and ensure that insurance and risk mitigation measures remain effective in the face of evolving wildfire threats.

As wildfire risk continues to rise in regions like the Southeast with a changing climate, a critical question arises concerning the adequacy of current fire suppression resources and tactics to cope with the escalating threat to properties in these locations in the coming decades. While fire suppression spending has seen significant increases in recent years, the area burned by wildfires has also grown during the same period, raising concerns about the effectiveness of existing strategies. The emerging increases in wildfire risk necessitate a comprehensive evaluation of fire management approaches, resource allocation, and preparedness measures. To effectively combat the intensifying wildfire threat, it is crucial for policymakers and fire management agencies to explore innovative strategies, invest in cutting-edge technologies, foster better coordination between federal, state, and local agencies, and prioritize proactive approaches such as forest management, prescribed burns, and community education. Building resilience against wildfires requires a multi-faceted approach that goes beyond mere suppression, emphasizing prevention, mitigation, and adaptation efforts, ensuring that communities and their properties are equipped to withstand and respond to the mounting challenges posed by the increasing number of wildfires--especially in areas such as the Southeast where the emerging level of risk is not well-recognized today. Wildfire is not just a western state problem, it is emerging as a national-scale risk due to our changing climate.

There is a potential opportunity for insurance companies to offer discounts to property owners who take proactive measures, such as clearing defensible space around structures, to reduce their homes' vulnerability to wildfire damage. This strategy may help to mitigate rising insurance costs and indirect impacts on home values, but may not be adequate for insurance companies to mitigate their own portfolio-scale risk. By incentivizing policyholders to implement wildfire-resistant measures, insurance companies can create a win-win situation, where homeowners and businesses benefit from reduced risk, and insurers decrease their potential exposure to costly wildfires. Offering discounts for risk reduction initiatives encourages property owners to invest in preventive measures, such as fire-resistant building materials, vegetation management, and fire-safe landscaping. This may then lead to a decline in the frequency and severity of wildfire-related losses, reducing the overall financial burden on insurance companies and communities alike. Moreover, as properties become more resilient to wildfires, home values in wildfire-prone areas may see less negative impact. This positive cycle of incentivized risk reduction and subsequent cost savings for both insurers and property owners can play a crucial role in increasing wildfire resilience and ensuring the long-term health of communities facing wildfire risk. Relatedly, this information also gives governments the opportunity to address and create policies that protect citizens with properties that are impacted by rising or non-renewed insurance policies, so that a transition to a market that better reflects high risk does not disproportionately impact communities.

As wildfire risks continue to escalate, there is an increased possibility of populations migrating away from high-risk areas towards lower-risk regions, such as urban centers that are easier to defend against wildfires. Such migrations could lead to significant impacts, such as impacts to property values, labor forces, and tax bases. In high-risk areas, decreased demand for properties might result in declining real estate values, and, conversely, urban centers experiencing an influx of residents may experience increased demand for housing, leading to rising property values. As has been the case in other climate related responses from populations, the ability to respond will not be consistent and is often tied to socioeconomic means and organizational capacities. As a result, local governments in high-risk areas could face reduced tax revenue from property taxes as property values decline or stagnate, while the opposite may occur in areas that

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see an influx of residents. Shifting populations will affect local government resource allocation to accommodate the needs of both declining and growing areas. Striking a balance between mitigating wildfire risks in risky areas, and managing the impacts of population shifts on property valuation and tax revenue will be essential for policymakers and governments when planning for future development.

While a number of challenges still remain to be addressed, the FSF-WFM model and the property-specific estimates of risk and loss add to the existing understanding of wildfire risk across the nation, so that decision-makers may be better informed regarding risk in the current year and 30 years into the future under climate change. First Street Foundation makes this property-level information publicly available through its Risk Factor™ website, where every property owner may find their Fire Factor™ score and the estimated damages associated with their risk. More broadly, this information is available for communities, states, and governments to help inform decisions regarding this wildfire risk, so that people, properties, and communities may be adequately protected from climate risks.