Measuring what burns

Rethinking wildfire measurement, insurance, and mitigation


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Ahead of the 2026 PREA Institute, University of California, Berkeley's Professor Nancy Wallace spoke with PREA's Jared Chase about wildfire risk, insurance markets, climate adaptation, and the growing need for better data and mitigation finance. Drawing from personal experience and decades of research, Wallace explains why accurate measurement matters, how California's insurance system is evolving, and why investors have a critical role to play in funding resilience.

NANCY WALLACE

Nancy Wallace holds the Lisle and Roslyn Payne Chair in Real Estate and Capital Markets at the Haas School of Business at the University of California, Berkeley. She is Co-Chair of the Fisher Center for Real Estate and Urban Economics and directs the Real Estate Financial Markets Laboratory. Her research focuses on mortgage and securitization markets, house price measurement, building energy efficiency, and climate-related financial risk.

KEY TAKEAWAYS

BETTER MEASUREMENT IS ESSENTIAL

Wildfire risk analysis remains constrained by coarse geographic data and inconsistent risk metrics. More granular, property-level analysis is increasingly necessary for accurate underwriting and investment decisions.

POLICY CAN HELP OR HINDER

Regulatory constraints on forward-looking insurance models and inconsistent federal support for climate-related research have complicated California's response to escalating wildfire risk.

MITIGATION IS INVESTABLE

Improved building materials, particularly roofs and windows, materially reduce wildfire losses. Institutional investors can play a major role in financing residential hardening efforts.

The economic and human costs of wildfires continue to rise across the United States. In addition to the devastating loss of life, injuries, and environmental damage, annual economic losses from wildfires are now estimated in the tens of billions of dollars. More than 2.3 million US homes are considered at risk from severe wildfires, with roughly half located in California.

For Professor Nancy Wallace at the University of California, Berkeley, faculty lead of the 2026 PREA Institute, wildfire risk is deeply personal. Wallace lost her home in the 1991 Oakland Hills firestorm, an experience that shaped decades of research into real estate risk, insurance markets, climate adaptation, and disaster recovery.

Today, Wallace's work spans wildfire forecasting, insurance regulation, mitigation finance, and the development of high resolution spatial risk models. Her research increasingly focuses on how investors, policymakers, and capital markets can better respond to climate-related risks.

Tell us about your experience during the 1991 Oakland Hills firestorm.

The fire began on my street shortly after my husband and I had moved into the neighborhood. At the time, we never considered wildfire risk when purchasing the property. There were no disclosures regarding prior fire exposure, even though portions of the area had burned before.

On the day of the fire, the winds coming from the Central Valley were extraordinarily strong and dry. We could feel the humidity collapsing and began packing almost immediately.

By the time we evacuated, we were driving through walls of fire. We initially tried to escape toward the ridgeline, but another driver emerged from the flames and warned us that the road ahead was blocked by a burning car. He told us plainly: "If you go any farther, you will die."

We turned around on a burning driveway and were fortunate to escape safely. Our home was ultimately destroyed. Rebuilding became its own challenge, including disputes over how reconstruction costs should be indexed and measured.

> If [home remodeling and expansion] changes are not properly captured in the data, measurement error becomes significant.

The measurement problem

Much of your academic work focuses on measurement — house price indices, risk models, and data quality. Why is measurement so central to understanding wildfire risk?

I began working on house price indices while studying in France and later as a visiting scholar at the University of Paris in Cergy-Pontoise. The French property transaction data available through the Paris Chamber of Notaries was remarkably detailed and carefully curated for statistical analyses. It included rich information on property characteristics alongside historical transaction prices.

Working with colleagues in France and at Berkeley, we developed house price indices using these data and later extended similar approaches to California housing markets.

In the United States, however, the available historical housing data were far more limited. Transaction histories existed, but detailed property characteristics were often only available for the current structure rather than historically over time. That limitation contributed to the dominance of repeat-sales methods such as the Case-Shiller index, which assume housing quality remains constant between transactions.

Why is that particularly problematic in California?

California's housing stock changes constantly. Remodeling and home expansion are major sources of incremental housing supply. Homes add square footage, foundations are expanded, and structures evolve over time. If those changes are not properly captured in the data, measurement error becomes significant.

Do similar problems affect wildfire risk indices?

Yes. Several major firms publish wildfire risk scores, including CoreLogic, Verisk, and RSMeans. Researchers at the Federal Reserve Bank of Dallas have shown that many of these indices are only weakly correlated with realized wildfire outcomes except at the extremes.

There is also an important geographic problem that many people underestimate. ZIP codes across the western United States are enormous. Some California ZIP codes cover thousands of square miles, while parts of Nevada and Alaska contain ZIP codes exceeding 10,000 or even 30,000 square miles. Measuring wildfire exposure at the ZIP-code level can therefore obscure enormous variation in actual risk.

What does your lab do differently?

We divide California into two-kilometer-by-two-kilometer grids and locate individual homes using latitude and longitude coordinates. We combine satellite-based meteorological data with raster data on slope, elevation, vegetation, and utility-line exposure.

We then estimate wildfire incidence using spatiotemporal convolutional neural networks that can capture both time-series dynamics and spatial spillovers. These tools are specifically designed to account for the externalities associated with wildfire risk and allow us to build much more granular forecasting models.

Policy failures and insurance market stress

Which regulatory challenges have compounded California's wildfire exposure?

Proposition 103 created substantial reluctance within the California Department of Insurance to use forward-looking probabilistic wildfire models in insurance rate setting. Regulators preferred backward-looking historical averages because they were easier to explain publicly and legally.

As a result, insurers were often required to rely on historical twenty-year averages of wildfire losses even though wildfire dynamics were changing rapidly.

That changed in late 2024, when California began allowing probabilistic catastrophe models as part of the rate-setting process.

And at the federal level?

Federal climate and energy policy has also been highly unstable. Much of my research funding has involved energy-efficiency standards through the Department of Energy.

At one point, we were instructed to remove the word "climate" from reports. Later, an entire energy-efficiency research division was temporarily disbanded before Congress partially restored the program.

That creates uncertainty for universities and researchers at exactly the moment when students and policymakers are increasingly focused on climate-related risks.


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What does the California insurance market look like today?

The residential property and casualty insurance market is increasingly fragile.

California effectively operates two systems: the admitted market and the residual market, which is the California FAIR Plan. Many insurers have reduced their exposure or withdrawn from the admitted market altogether.

At the same time, the FAIR Plan ultimately depends on assessments levied against admitted-market insurers when losses exceed available resources. Following the 2025 Southern California wildfires, the admitted market faced roughly $1 billion in assessments tied to FAIR Plan losses.

Mitigation and the economics of home hardening

What mitigation strategies appear most effective?

Roofs and windows are critically important.

In California, asphalt shingles are the dominant roofing material and are traditionally rated as class A fire resistant. However, research from the Insurance Institute for Business and Home Safety (IBHS) suggests that many shingles degrade significantly within seven to ten years.

Given that the average age of California homes is approximately 47 years, roof deterioration may represent a substantial but underappreciated source of wildfire vulnerability.

Using aerial imagery, we find that a significant share of residential roofs show visible deterioration, including curling shingles, water damage, and material loss.

Windows are equally important. In the Altadena fires, single-pane windows failed

rapidly under extreme heat exposure, allowing fires to penetrate structures. Double-pane windows perform far better under wildfire conditions and can materially reduce total losses.

Those interventions sound effective, but expensive.

Replacing roofs and windows can easily cost between $60,000 and $120,000 per property in California.

Traditional home-improvement financing is poorly structured for these investments because the loans are typically short-term, expensive, subordinate liens, and often due upon sale.

That is fundamentally a capital markets problem.

I have been working with financial institutions on mitigation financing products modeled after Property Assessed Clean Energy (PACE) structures. The key idea is that the financing remains attached to the property rather than the homeowner, allowing for long amortization periods and transferability upon sale.

We used a similar structure in my own Oakland neighborhood after the 1991 fires. Through a Community Facilities District created under the Mello-Roos Community Facilities Act, homeowners jointly financed underground utility lines and upgraded water infrastructure using long-term municipal-style financing.

What institutional investors should understand

What should institutional investors understand about wildfire risk today?

First, many widely used wildfire risk scores are still unreliable. Investors underwriting collateral, pricing securities, or evaluating portfolios need to understand that measurement quality varies enormously across providers. Better tools are emerging, but investors need to demand higher-quality risk analytics.

Second, mitigation finance is likely to become a major institutional asset class.

The opportunity is not simply in pricing wildfire risk, but in financing the reduction of that risk through residential hardening investments. These mitigation loans can be underwritten, securitized, and incorporated into broader real estate finance markets.

The alignment of incentives is straightforward: stronger homes create more resilient collateral.

Is geographic avoidance inevitable in some locations?

In some very high risk areas, capital allocation decisions will necessarily become more restrictive.

But the broader issue is not abandonment. Most of California is not going away. The more important question is whether existing housing stock becomes hardened and resilient over time.

Wildfire risk in California remains, in many ways, a solvable engineering and measurement challenge.

By contrast, climate risks associated with sea-level rise and saltwater intrusion in coastal regions present much more difficult adaptation problems.

Looking ahead

Where do you see the most promising areas of climate-risk research going forward?

Climate-risk research increasingly requires collaboration across disciplines — economists, engineers, climate scientists, insurers, and emergency-response professionals all need to work together.

I currently serve on a Brookings Institution task force focused on rethinking property and casualty insurance in the United States. One encouraging development is that useful mitigation programs already exist across the country.

For example, Alabama has developed promising programs to subsidize hurricane-resistant roof attachments, while Florida has implemented stronger approaches to evaluating insurance risk models.

I remain cautiously optimistic about California. Advances in satellite imaging, drone-based data collection, engineering research, and mitigation finance are creating entirely new tools for managing wildfire exposure.

California has an opportunity not only to adapt, but also to lead in the development of climate-resilience capital markets.

The 2026 PREA Institute was held on June 2 and 3 and hosted at the University of California, Berkeley's Haas School of Business, Fisher Center for Real Estate and Urban Economics.

Open to PREA members only, the PREA Institute is an academically oriented event held annually at a major university real estate center, with sessions on property investing and related topics led by real estate researchers and professionals in a classroom setting, with attendance capped at about 75 total GPs and LPs. For more information on the PREA Institute, please visit www.prea.org/events/prea-institute/.

PREA thanks Professor Nancy Wallace and the PREA Institute Committee for designing the 2026 program and the University of California, Berkeley for hosting the event.