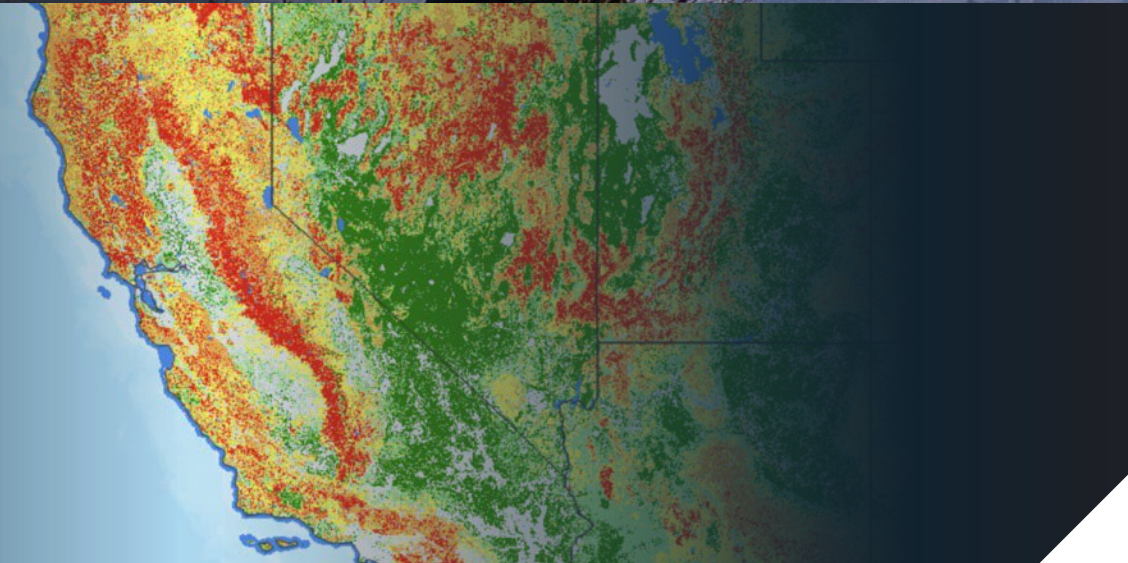


Looking forward: Insurance and catastrophe modeling

Joint Informational Hearing:
California Assembly Insurance Committee and
Assembly Emergency Management Committee

Nancy P. Watkins, FCAS, MAAA
Principal & Consulting Actuary

14 June 2023



California catastrophe ratemaking

Total premium for wildfire must be based on experience and not catastrophe models

According to the California Code of Regulations (2644.5):

- Catastrophe losses are based on a multi-year long-term average of catastrophe claims
- Minimum 20-year average is required for homeowners multiple peril fire



CA formula:

$$\text{Catastrophe load} = \frac{\$ \text{ insured losses of catastrophe claims}}{\$ \text{ insured losses of non-catastrophe claims}}$$



CA formula once represented the best available science

Very simple model that relies on the past as an accurate way of predicting the future



CA formula could be actuarially sound if certain conditions are met...

- Catastrophic risk is consistent over the long term
- Full spectrum of risk is captured by 20-year history
- Risk is sufficiently measured by insured losses from events
- Increase in cat risk corresponds to increase in non-cat risk



...but wildfire does not meet these conditions

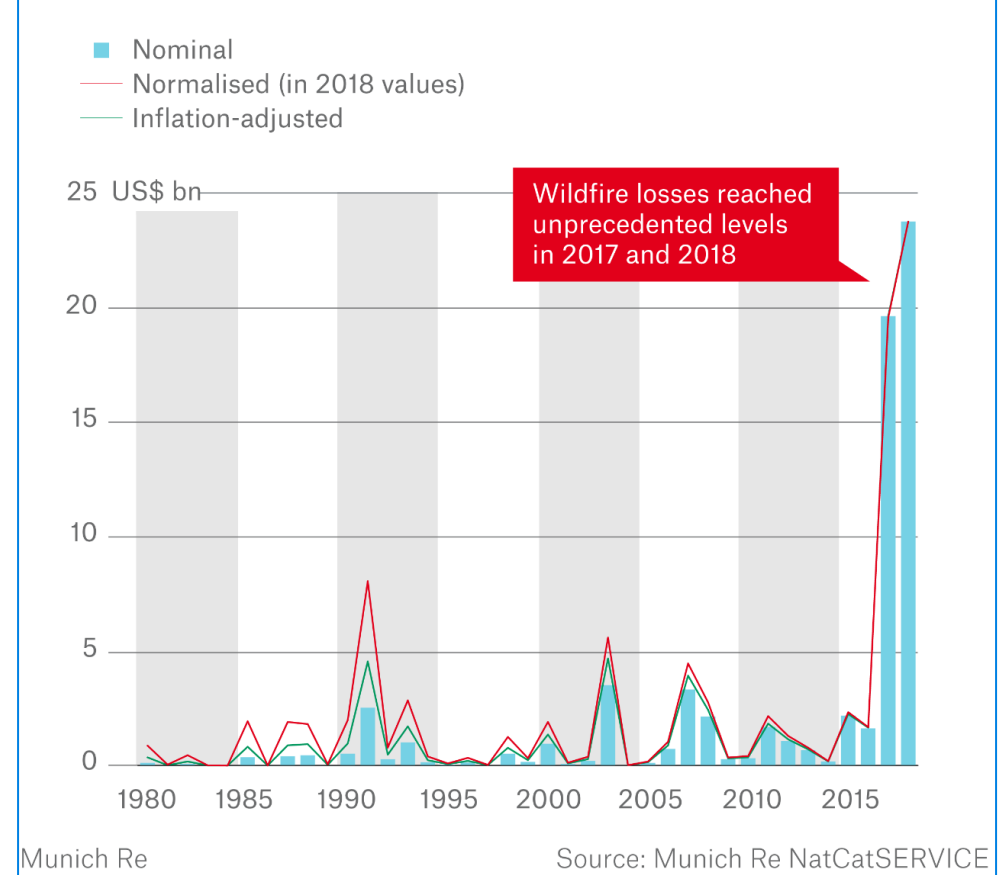
- Wildfire risk is not consistent over the long term
- Wildfire risk cannot be adequately captured in 20-year history
- Insured losses do not sufficiently measure wildfire risk
- Rise in wildfire risk does not correspond to rise in non-cat risk



Historical experience is not sufficient for wildfire ratemaking

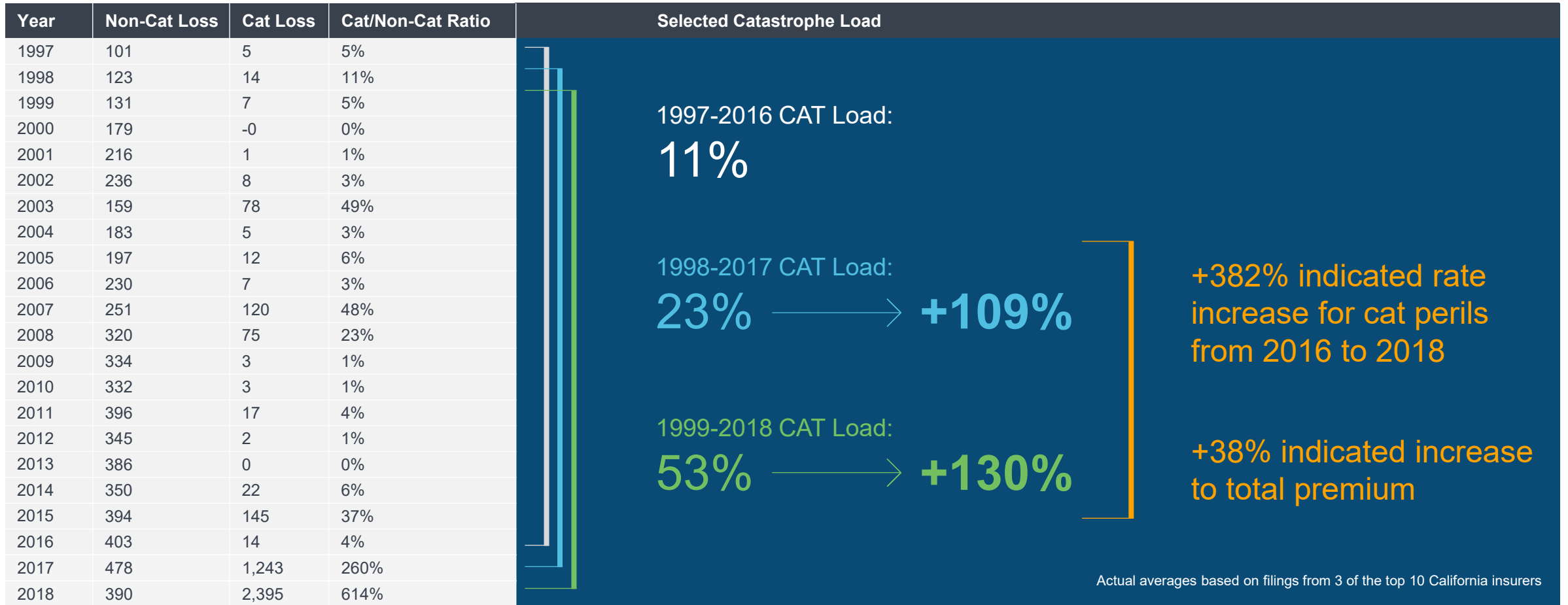
- Prior to 2017, 1991 Oakland Hills Fire was most destructive event in state history
- Extreme drought conditions occurred from 2012-2016, followed by unprecedented losses in 2017 and 2018.
- If past experience is assumed to be the best basis to predict the future, **how could this happen?**

California events fuel U.S. wildfire losses
Overall losses 1980-2018



Backwards-looking formula generated affordability shocks

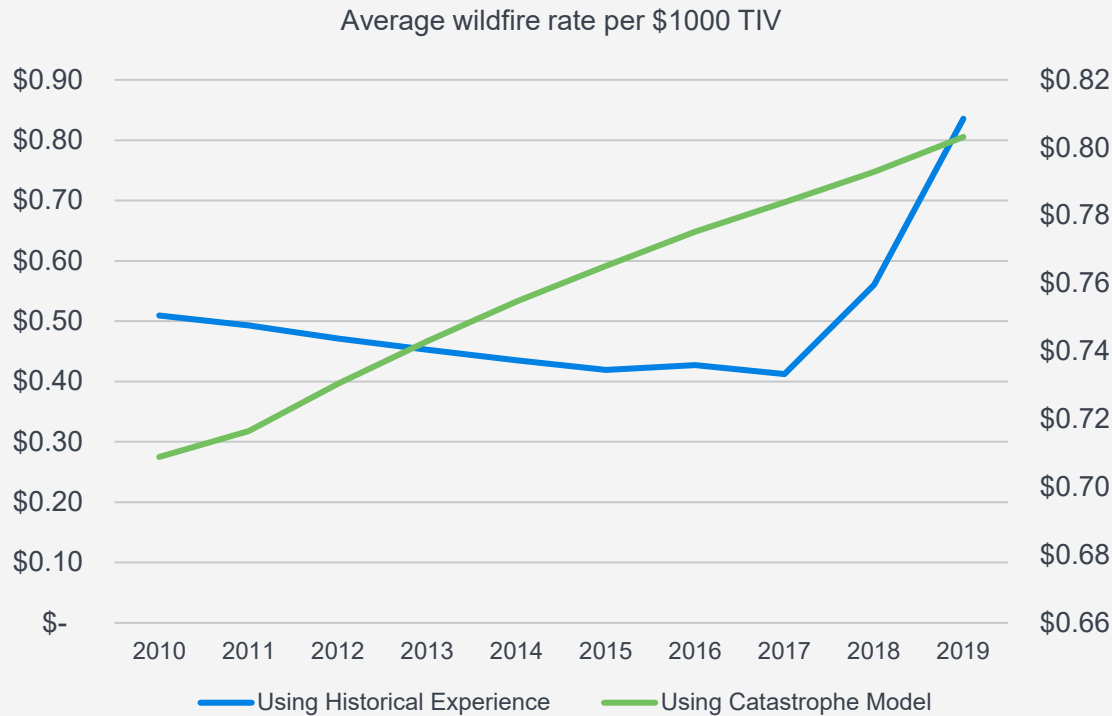
Adding 2017-2018 losses to history drastically increased CA rate indications beginning in 2019



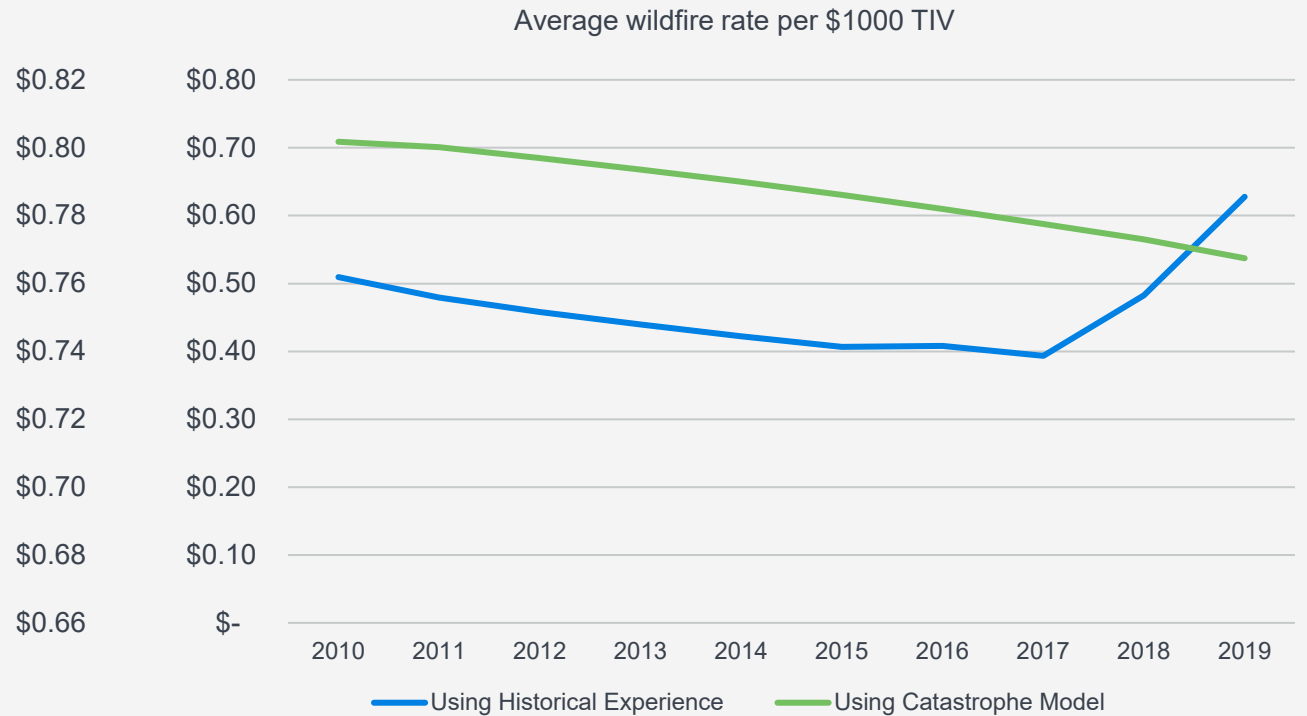
CDI formula does not reflect the underlying risk and is largely random

For insurers, shedding risks in the WUI helps avoid the shock that goes along with this randomness.

Growing in the WUI



Shrinking in the WUI



https://www.milliman.com/-/media/milliman/pdfs/2022-articles/10-19-22_pci-pifc-cdi-summary.ashx

California's catastrophe load formula is an outlier



California is in the minority of states prohibiting catastrophe models for ratemaking

- For many years, only two other states had this prohibition -- both recently reversed
- More states moving towards explicit model acceptance, especially for underserved markets
- California is the *only* state that requires a backward-looking formula for homeowners' catastrophe load

CDI's treatment of catastrophe models is inconsistent

- For earthquake and fire following earthquake perils, CDI generally allows catastrophe models
- CDI appears to be allowing catastrophe models for private flood insurance
- CDI allows wildfire cat models for mitigation credits and other risk classifications

Catastrophe models are gaining in usage outside the insurance industry

- FEMA and disaster planners
- Lenders and financial regulators
- Municipal bond rating agencies
- Real estate investors

What happens when the CA formula fails?

Backward-looking approach left us blind to the risk up ahead



What happens when the CA formula fails?

Backward-looking approach left us blind to the risk up ahead

Axios

State Farm, Allstate to stop insuring new homeowners in California due to climate change

Decisions by two major insurers to stop offering new homeowner's policies in California highlight the growing portion of America that's...

2 days ago



ABC30

Home insurance companies halting new policies in California due to wildfires

FRESNO COUNTY, Calif. (KFSN) – Large home insurance providers are no longer providing new home insurance policies for customers in...



Pasadena Weekly

Property insurance further restricted across California | News | pasadenaweekly.com

State Farm General Insurance Company will no longer accept new applications for homeowners insurance, including personal or business lines...

1 hour ago



TIME

Insurance Industry Needs to Evolve to Address Climate Change

State Farm and Allstate have stopped writing new property insurance policies in California. Still, insurance can help climate adaptation.

1 day ago



Catastrophe models are built to handle low-frequency, high-severity events

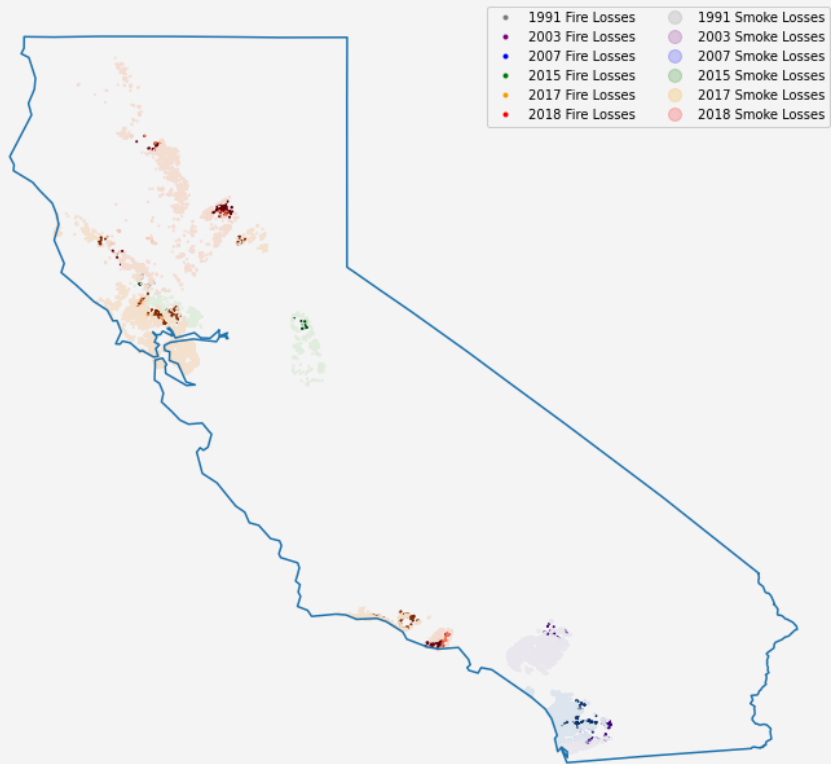
Insurers use the advanced scientific tools available to measure and manage otherwise uninsurable risks



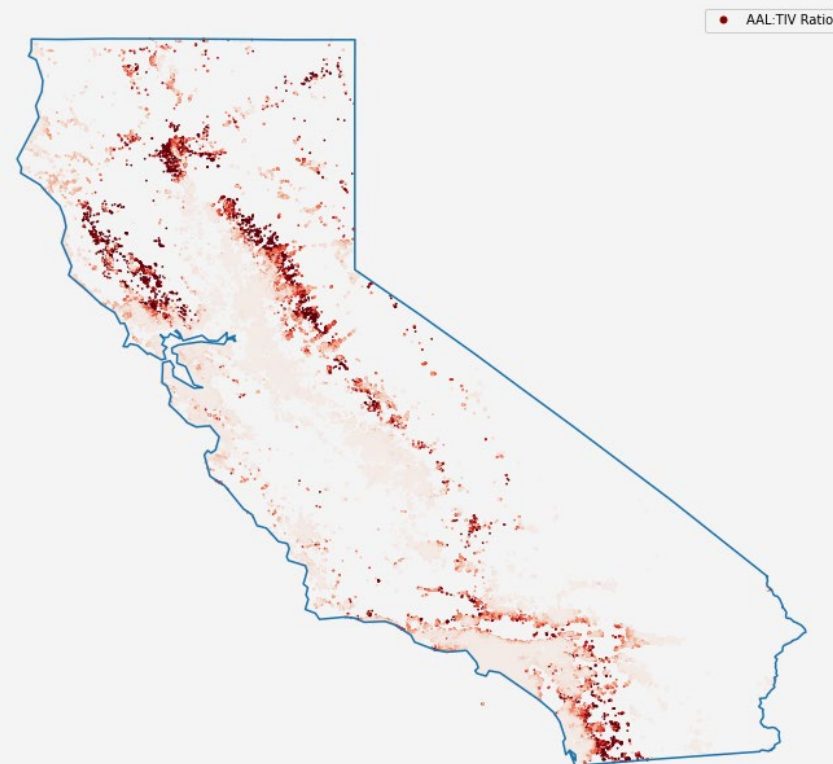
Comparison of historical fire footprints and model losses

History is just a small window looking into the total risk

Historical fire footprints



Model losses



Future benefits for consumers

Integrating catastrophe models into ratemaking process helps promote a sustainable insurance market



Increasing availability through:

- Matching price to risk to promote insurer interest in higher risk areas
- Reducing FAIR Plan exposure that threatens insurers' appetite to write even in less risky areas



Increase affordability through:

- Promoting price predictability and stability
- Fostering competition
- Encouraging effective risk reduction for existing homes and communities
- Disincentivizing future development in high-risk areas



Increasing reliability through:

- Protecting insurer solvency
- Informing communication of risk drivers for increased transparency
- Planning for climate change

We are not in Kansas anymore

13 of California's 20 most destructive wildfires have occurred since 2017

Top 20 Most Destructive California Wildfires

| FIRE NAME (CAUSE) | DATE | COUNTY | ACRES | STRUCTURES | DEATHS |
|---|----------------|---|-----------|---------------|--------|
| 1 CAMP (Powerlines) | November 2018 | Butte | 153,336 | 18,804 | 85 |
| 2 TUBBS (Electrical) | October 2017 | Napa & Sonoma | 36,807 | 5,636 | 22 |
| 3 TUNNEL - Oakland Hills (Rekindle) | October 1991 | Alameda | 1,600 | 2,900 | 25 |
| 4 CEDAR (Human Related) | October 2003 | San Diego | 273,246 | 2,820 | 15 |
| 5 NORTH COMPLEX (Lightning) | August, 2020 | Butte, Plumas, & Yuba | 318,935 | 2,352 | 15 |
| 6 VALLEY (Electrical) | September 2015 | Lake, Napa & Sonoma | 76,067 | 1,958 | 4 |
| 7 WITCH (Powerlines) | October 2007 | San Diego | 197,990 | 1,650 | 2 |
| 8 WOOLSEY (Electrical) | November 2018 | Ventura | 96,949 | 1,643 | 3 |
| 9 CARR (Human Related) | July 2018 | Shasta County, Trinity | 229,651 | 1,614 | 8 |
| 10 GLASS (Undetermined) | September 2020 | Napa & Sonoma | 67,484 | 1,520 | 0 |
| 11 LNU LIGHTNING COMPLEX (Lightning/Arson) | August 2020 | Napa, Solano, Sonoma, Yolo, Lake, & Colusa | 363,220 | 1,491 | 6 |
| 12 CZU LIGHTNING COMPLEX (Lightning) | August 2020 | Santa Cruz, San Mateo | 86,509 | 1,490 | 1 |
| 13 NUNS (Powerline) | October 2017 | Sonoma | 44,573 | 1,355 | 3 |
| 14 DIXIE (Under Investigation)* | July 2021 | Butte, Plumas, Lassen, & Tehama | 963,309 | 1,311 | 1 |
| 15 THOMAS (Powerline) | December 2017 | Ventura & Santa Barbara | 281,893 | 1,063 | 2 |
| 16 CALDOR (Human Related) | September 2021 | Alpine, Amador, & El Dorado | 221,835 | 1,005 | 1 |
| 17 OLD (Human Related) | October 2003 | San Bernardino | 91,281 | 1,003 | 6 |
| 18 BUTTE (Powerlines) | September 2015 | Amador & Calaveras | 70,868 | 965 | 2 |
| 19 JONES (Undetermined) | October 1999 | Shasta | 26,200 | 954 | 1 |
| 20 AUGUST COMPLEX (Lightning) | August 2020 | Mendocino, Humboldt, Trinity, Tehama, Glenn, Lake, & Colusa | 1,032,648 | 935 | 1 |

Increases in wildfire risk will continue to exacerbate issues of insurance availability and affordability.

California stakeholders need to work together to better understand the risk and ways to reduce it.

We will need to rely on the best available science to move forward.

"Structures" include homes, outbuildings (barns, garages, sheds, etc) and commercial properties destroyed. This list does not include fire jurisdiction. These are the Top 20 regardless of whether they were state, federal, or local responsibility.

*Numbers not final



10/24/2022

<https://www.fire.ca.gov/our-impact/statistics> accessed June 2023

Questions or comments?

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Appendix: Addressing common objections

Addressing common objections

Won't catastrophe models result in drastically higher premiums?



Addressing common objections

Won't catastrophe models result in drastically higher premiums?



Not necessarily

Drastic increases already happened using the CA formula. Model premiums might have been higher or lower. In other markets, catastrophe models have often resulted in lower premiums.



Addressing common objections

If different models
don't agree,
doesn't that mean
they must be wrong?



Addressing common objections

If different models don't agree, doesn't that mean they must be wrong?



No
Disagreement represents multiple views of risk, creating more opportunities for affordable premiums. Wildfire models are evolving quickly and will improve with usage.



Addressing common objections

Aren't models
black boxes that
insurers can
manipulate?



Addressing common objections

Aren't models black boxes that insurers can manipulate?



No

Models are not conducive to manipulation, although it requires expertise to interpret them. Modelers need to protect intellectual property, but they release information to the public on the drivers of risk.



Addressing common objections

Won't allowing
catastrophe models
undermine appropriate
regulatory oversight?



Addressing common objections

Won't allowing catastrophe models undermine appropriate regulatory oversight?



No

Most states allow the use of cat models in ratemaking and some have implemented comprehensive oversight. A clearinghouse would allow CDI to join forces with other states to secure rigorous expert reviews.



Appendix: Regulatory challenges and potential solution

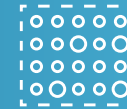
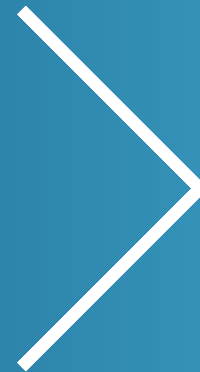
Background

Facilitating the use of catastrophe models in ratemaking to aid insurance availability, affordability



Challenge

How can regulators encourage and allow the use of catastrophe models, while maintaining appropriate regulatory oversight to ensure that rates are not excessive, inadequate, or unfairly discriminatory?



Historical data from natural catastrophes is sparse and volatile, so past experience may not be a sufficient basis for accurate expectations of the future



Catastrophe simulation models have been widely adopted in private insurance, along with other areas such as emergency management



Catastrophe ratemaking regulation can have an effect on insurance affordability and availability



Current regulatory framework presents challenges to regulators, modelers, and insurers

Catastrophe model treatment varies widely among states



Prohibition of the use of catastrophe models for some or all purposes in establishing rates



Silent on the use of catastrophe models



Regulations piggybacking on other state reviews

Questionnaires and case-by-case model validation



Statewide body for scientific and technical review of catastrophe models

Challenges for regulators

Lack of appropriate expertise and/or resources to review models comprehensively



Balancing needs of affordability, availability, insurance company solvency and consumer protection



Inability to protect proprietary information of modelers and insurers



Proposal for catastrophe model clearinghouse

Multi-disciplinary panel to develop standards, select expert reviewers and manage model review process



Voluntary participation by states who wish to rely on expert model review



Third-party experts chosen by panel to perform confidential reviews

- Consistent professional review team for all models for a given peril
- Expert team would depend on nature of model but could include engineers, scientists, technologists, actuaries, claims experts, other professionals



Potential clearinghouse deliverables

- Standardized modeler disclosures
- Market basket output for state level regulatory analysis, comparison
- Third-party expert reports reviewing model compliance with standards
- Model acceptability for specific purposes



Key questions to be addressed

Ownership/structure:

What organizational/control structure will be mutually acceptable to regulators, insurers and cat modelers?

Needs to be able to administer an independent, centralized, rigorous review process



Funding:

How should costs of the clearinghouse reviews be shared among the parties that benefit (states, insurers, cat modelers, others)?



Trade secret protection:

How will the clearinghouse ensure intellectual property and proprietary information of modelers and insurers will be protected?



Critical elements

Minimum requirements for success

Widespread buy-in
among regulators,
insurers, modelers

Cost and time
efficiency

Flexibility to allow
innovation and
multiple perspectives

1

2

3

Future of catastrophe models



Appendix: Insuring the uninsurable – Florida hurricane and flood

Florida hurricane

Situation



- Hurricane Andrew (1992) caused over \$27 billion in losses
- Insurers learned how seriously they had underestimated exposure
- Losses could have been much higher

Impact



- Insurer insolvencies
- Spike in reinsurance costs
- Cancellation and nonrenewal of policies
- Requests for large rate increases
- Availability and affordability crisis
- Deterioration in real estate market

Response



- FRPCJUA established in 1992, 1M policies by 1994
- FCHLPM created in 1995 to review/approve hurricane models
- Strengthened building codes
- Insurance mitigation discounts based on catastrophe models incentivized home hardening

Results



- Reduction of risk in state
- Reduced premiums
- More capital, formation of new domestics
- More price and product competition
- Better consumer choices
- Stabilization of real estate market as insurance availability and affordability improved

Florida flood

Situation



- NFIP \$18 billion in debt in 2012
- Biggert Waters (2012) required flood premiums to reflect the true cost of risk
- Subsidies and discounts on flood insurance premiums would be phased out
- Significant flood rate increases for many NFIP policyholders

Impact



- Rate increases shocked the real estate market
- Florida particularly impacted, with over 2 million NFIP policies
- Biggert Waters partially rolled back in 2014
- Concerns over NFIP affordability remained

Response



- FL SB 542 passed in 2014
- Provided private flood alternative to the NFIP
- Allowed additional freedom in flood rating
- Allowed open use of catastrophe models until FCHLPM developed review standards
- Freedom to experiment for multiple years, extended to 2025

Results



- Rapid growth in private flood insurance writers, currently:
 - 33 Primary
 - 6 Excess of NFIP
 - 2 Excess & Surplus
- Generally underwritten and/or rated based on cat models
- Increased availability, consumer choice
- Better coverage options
- Often more affordable than NFIP
- Closing protection gap