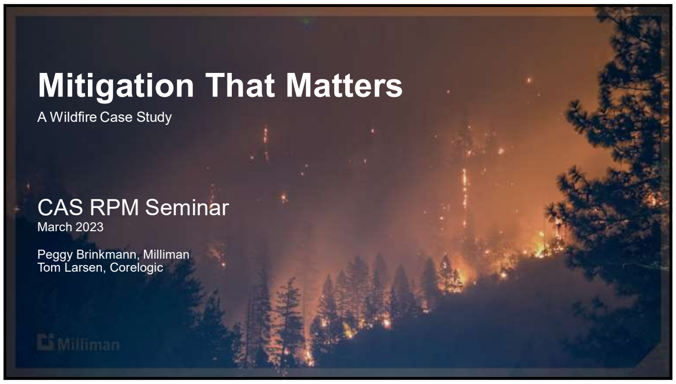


Mitigation That Matters

A Wildfire Case Study

CAS RPM Seminar
March 2023

Peggy Brinkmann, Milliman
Tom Larsen, Corelogic

1

Agenda

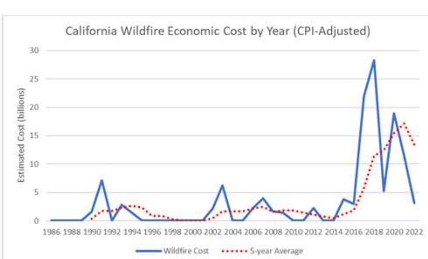
- Why Wildfire Mitigation is a Hot Topic
- Mitigation Approaches
- CAS White Paper
  - Data
  - Methodology
  - Findings
- Lessons Learned and Future Work

Milliman 2

2

Economic Cost of Wildfire

Most Destructive Wildfires Have Occurred in Recent Decades



Milliman 3

3

CDI Regulation on Wildfire Mitigation

- California Code of Regulations effective October 14, 2022
- New mandatory rating factors for
  - Community-level mitigation designations
  - Property-level mitigation
- Insurance companies have 180 days to submit rate filings that incorporate the new requirements

Milliman 4

4

Live Poll #1

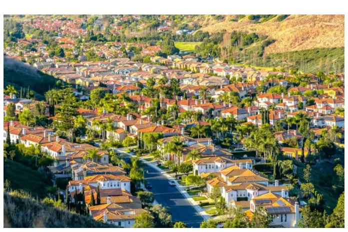
How has CCR 2644.9 impacted you?

A. We've already submitted our California mitigation credit filing!
B. We are still working on our California mitigation credit filing!
C. Wait, what is CCR 2644.9?
D. No California property programs, I'm good!

Milliman 5

5

Actuarially Sound Mitigation Credits Are Important



Important to match rate to risk and incentivize homeowners and communities to mitigate

Doing it wrong can adversely impact availability, affordability, reliability (i.e., market stability and solvency)

Milliman 6

6

But It's Not Easy

- The risk are not independent
- There is not a consensus about what works
- Some exposure data is not readily available
- Exposure data may change quickly
- Mitigation may be expensive or impossible due to existing built environment
- Regulatory environment may be unfavorable

Milliman 7

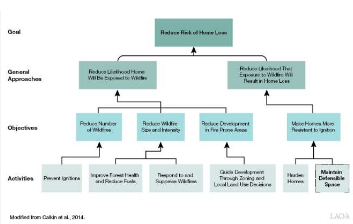
7

Mitigation approaches

8

Types of Wildfire Mitigation

- Parcel landscaping to improve defensible space
- Infrastructure / home hardening
- Creation of buffer areas surrounding a community
- Dedensification
- Water supply development
- Firefighter access improvement

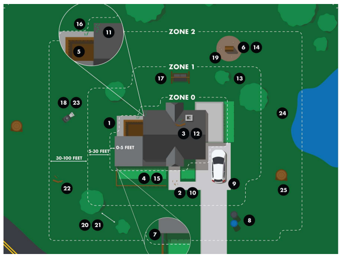


https://lao.ca.gov/Publications/Report/4457

Milliman 9

9

Defensible Space



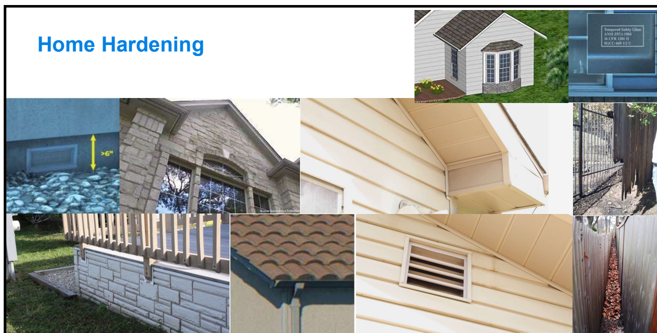
- Zone 0 (0-5 feet)
  - Ember-Resistant Zone (CALFIRE)
  - Home Ignition Zone (IBHS)
  - Non-combustible Zone (NFPA)
- Zone 1 (5-30 feet)
  - Lean, Clean and Green (CALFIRE)
- Zone 2 (30-100 feet)
  - Reduce Fuel (CALFIRE)

https://wildfireprepared.org/wildfire-prepared-home-overview/

Milliman 10

10

Home Hardening



Sources: Wildfire Ready – DISASTERSAFETY.ORG

Milliman 11

11

Live Poll #2

Which of these is NOT a mandatory factor under CCR 2644.9?

A. fire-resistant vents
B. 6” noncombustible vertical clearance
C. enclosed eaves
D. noncombustible gutters

Milliman 12

12

Community Mitigation

- Coordinated planning and action to reduce fire risk throughout a community
- Fuels and vegetation management beyond the individual parcel
- Building codes and ordinances
- Citizen fire councils
- Community Wildfire Protection Plans
- CDI Mandatory factors:
  - FireWise USA Site
  - Fire Risk Reduction Community

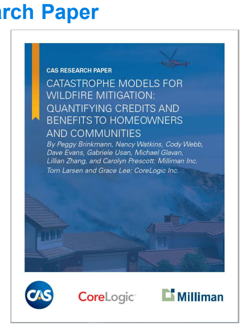
13

Mitigation that Matters: A Wildfire Case Study

14

Casualty Actuarial Society Research Paper

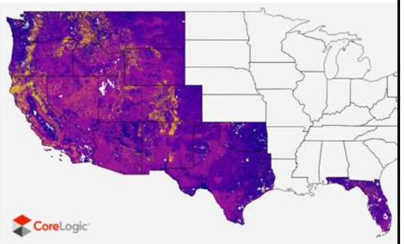
- Produced by Milliman, and Corelogic on behalf of Casualty Actuarial Society
- Published October 25, 2022
- https://www.casact.org/publications-research/publications/cas-research-papers-and-briefs
- Discusses wildfire mitigation, catastrophe models, actuarial considerations for mitigation credits
- Case studies to illustrate analysis methodology and compare effects of different types of mitigation



15

CoreLogic RQE® Wildland Fire model

- Over 3 million simulated events + all major historical wildfires
- Covers attritional and catastrophe wildland fire
- Fire and smoke modeling
- Geo-spatial wildfire behavior model integrates surface and crown fire spread
- Weather simulation captures spatial-temporal variability and extremes



Milliman 16

16

Why Use a Catastrophe Model?

- Historical data is sparse and extreme
- Historical data may not capture status of pre-event mitigation
- Historical data may not reflect future conditions
- Catastrophe models can incorporate latest technologies, data, and research

Milliman 17

17

Live Poll #3

How do you use Wildfire catastrophe simulation models?

A. I use them for ratemaking
B. I use them for exposure management
C. I use other data for assessing wildfire risk
D. I don't analyze wildfire risk

Milliman 18

18

ASOP 38 Considerations

Appropriate reliance on experts
- Are the developers experts in the field?
- Has the model been reviewed by other experts?
- Are there applicable industry or regulatory standards?

Understanding the model
- Model components
- Model inputs
- Model outputs

Appropriateness of model for project
- What are the limitations of the model?

Appropriate validation
- How historical observations compare to model results
- Consistency and reasonableness of output
- Sensitivity of model outputs to model inputs

Milliman 19

19

Model Validation

Typical Model Validation:

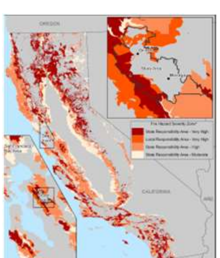
Validate separate model components on past data to see if the model reproduces event losses reasonably well

Also Consider:
- Model error
- Parameter error
- Sampling error
- Logical relationships between inputs and outputs
- Transparency

Milliman 20

20

Case Study Data



California Department of Forestry and Fire Protection

Model Inputs
- Census block centroids + all combinations of mitigation for a base risk
- Actual parcels + best estimates of actual distribution of mitigation characteristics, Coverage A, Year Built

Model Outputs
CoreLogic Wildfire Model Average Annual Loss (AAL)

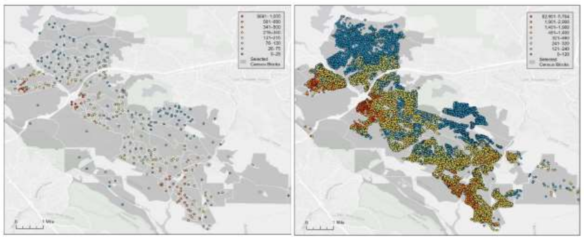
Study Area
City of Orinda and Town of Moraga

Milliman 21

21

Model Inputs: Locations

Census Block Centroids — *Parcels*



Source: Esri basemap data, 2010 U.S. Census Bureau TIGER, CoreLogic model

Milliman 22

22

ASOP 12 Considerations

Selection of risk characteristics
- Related to expected outcomes
- Can be objectively determined
- Practical to obtain (time, cost)
- Compliant with applicable law

Establishing risk classes
- Appropriate for intended use
- Credibility
- Practicality (to assign appropriate class)
- Reasonableness of results

Testing long-term viability
- Assess potential effects of adverse selection
- Consider sub-classes
- Effects of changes

Milliman 23

23

Model Inputs: Mitigation Characteristics

Model Input Data		
Model Variable	Centroid Locations	Parcel Locations
Occupancy	Residential	Residential
Coverage A (Dwelling)	$400,000	Actual
Coverage B (Other Structures)	$40,000	7.5% of A
Coverage C (Contents)	$200,000	60.0% of A
Coverage D (Loss of Use)	$100,000	20.0% of A
Deductible	$1,000	0.5% of A
Structure Type	Frame, Noncombustible, Fire Resistive	Estimated Distribution
Year Built	1955	Actual
Number of Stories	1, 2	Estimated Distribution
Roofing Fire Class	Classes A, B, C, and Unrated	Estimated Distribution
Clearance—Noncombustible Zone	Yes, No	Estimated Distribution
Clearance—Lean, Clean, and Green Zone	Yes, No	Estimated Distribution
Clearance—Reduced Fuel Zone	Yes, No	Estimated Distribution
Fire-Resistive Siding	Yes, No	Estimated Distribution
External Fire Extinguisher	No	Estimated Distribution
Combustible Attachments	Yes, No	Estimated Distribution
Fire-Resistive Windows	Yes, No	Estimated Distribution

Milliman 24

24

Case Study 1 – Individual Mitigation Credits

Methodology:

- Analyze losses relative to the base, unmitigated risk
- Use GLMs to determine which variables interact with each other to design mitigation factor table
- Examine interactions between geography and mitigation variables to create territories

25

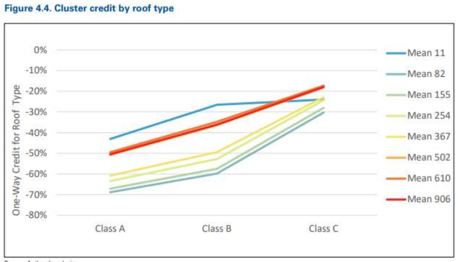
Selecting Interaction Effects

Interaction Number	Variable—Level	Coefficient	Standard Error	Pr(>|t|)
1	Roofing Fire Class B: Clearance—Lean, Clean, and Green (No)	-0.13	0.00	0.0000
1	Roofing Fire Class C: Clearance —Lean, Clean, and Green (No)	-0.15	0.00	0.0000
1	Roofing Fire Class U: Clearance—Lean, Clean, and Green (No)	-0.15	0.00	0.0000
2	Roofing Fire Class B: Clearance—Reduced Fuel Zone (No)	-0.11	0.00	0.0000
2	Roofing Fire Class C: Clearance—Reduced Fuel Zone (No)	-0.14	0.00	0.0000
2	Roofing Fire Class U: Clearance—Reduced Fuel Zone (No)	-0.13	0.00	0.0000
3	Roofing Fire Class B: Clearance—Noncombustible Zone (No)	-0.07	0.00	0.0000
3	Roofing Fire Class C: Clearance—Noncombustible Zone (No)	-0.09	0.00	0.0000
3	Roofing Fire Class U: Clearance—Noncombustible Zone (No)	-0.09	0.00	0.0000
4	Roofing Fire Class B: Combustible Attachments (No)	0.07	0.00	0.0000
4	Roofing Fire Class C: Combustible Attachments (No)	0.09	0.00	0.0000
4	Roofing Fire Class U: Combustible Attachments (No)	0.09	0.00	0.0000
5	Clearance—Lean, Clean, and Green (No): Clearance—Reduced Fuel Zone (No)	-0.26	0.00	0.0000
6	Clearance—Lean, Clean, and Green (No): Clearance—Noncombustible Zone (No)	-0.05	0.00	0.0000
7	Clearance—Lean, Clean, and Green (No): Combustible Attachments (No)	0.05	0.00	0.0000
8	Clearance—Reduced Fuel Zone (No): Clearance—Noncombustible Zone (No)	-0.04	0.00	0.0000
9	Clearance—Reduced Fuel Zone (No): Combustible Attachments (No)	0.04	0.00	0.0000
10	Clearance—Noncombustible Zone (No): Combustible Attachments (No)	0.37	0.00	0.0000

26

Interactions with Geography

Figure 4.4. Cluster credit by roof type



- K-means cluster of census block base risk AALs
- Test interactions with census block clusters
- Further group similar clusters into territories

27

Case Study 1 – Findings

- Roof replacements are the most impactful mitigation action, but roof replacements are expensive and infrequent
- If the roof cannot be replaced, maintaining the clearance zones is the next most impactful action. Largest risk reductions were observed from clearing the 5-30 feet zone, then the 0-5 feet zone, then the 30-100 feet zone
- Incremental effect of any given mitigation action is sensitive to geographic location and other mitigation actions

Milliman 28

28

Case Study 2 – Community Mitigation Credits

The risk to a community is based on its layout and fuel characteristics. If layout is a given, what can be done at a community level to impact fuel?

Methodology:

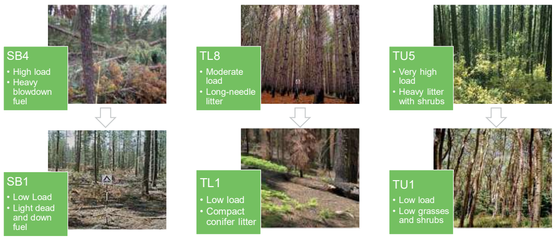
- Modify underlying fuel story to use main fuel type but decrease "load". For example, moderate and high timber litter load were modified to be low timber litter load
- Compare expected losses to scenario with current fuel load

This represents an aggressive community fuel maintenance project in which the fundamental nature of the landscape wasn't changed

Milliman 29

29

Examples of Fuel Category Modifications



Milliman 30

30

Case Study 2 – Findings

Table 5.2. Mitigation credits: Additional benefit of community mitigation beyond individual mitigation

Individual Mitigation Credits—Benefit of Modified Fuel Scenario Compared to Standard									
Mitigation Variables				Percentage Credit			AAL Dollar Difference		
Clearance—Reduced Fuel Zone (30–100 feet)	Clearance—Lean, Clean, and Green Zone (5–30 feet)	Clearance—Noncombustible Zone (0–5 feet)	Roof Fire Class	Territory Group A Low Risk	Territory Group B Medium Risk	Territory Group C High Risk	Territory Group A Low Risk	Territory Group B Medium Risk	Territory Group C High Risk
Yes	Yes	Yes	Class A	1%	2%	5%	$0	$4	$26
			Class B	4%	6%	11%	0	11	64
			Class C	6%	13%	21%	1	23	121
			Unrated	9%	18%	28%	1	32	155
		No	Class A	3%	5%	9%	0	9	50
			Class B	6%	10%	16%	1	17	90
			Class C	9%	16%	25%	1	29	143
			Unrated	13%	22%	31%	1	40	177
	No	Yes	Class A	2%	4%	8%	0	8	46
			Class B	5%	9%	15%	0	16	85
			Class C	9%	16%	25%	1	28	139
			Unrated	13%	21%	31%	1	38	173
		No	Class A	7%	12%	20%	1	22	114
			Class B	11%	19%	28%	1	34	159
			Class C	17%	27%	36%	1	48	201
			Unrated	24%	34%	41%	2	61	234

Milliman

31

31

Case Study 3 – Community vs Individual Mitigation

How can we prioritize various mitigation projects?

Methodology:

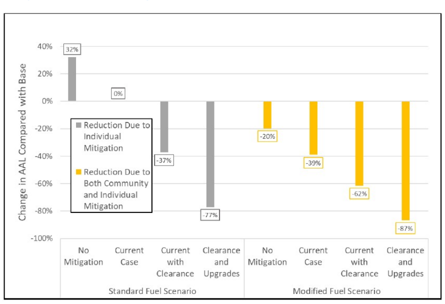
- Use representative locations/property characteristics
- Compare expected losses under various scenarios

Milliman

32

32

Case Study 3 – Findings



Milliman

33

33

Implementation Challenges

- Need to start with adequate rates!
- Getting data on property-level mitigations
- Getting current data on defensible space
- Getting data on community-level mitigation, and translating it into model inputs
- Avoiding overlap with territory and other rating plan factors

Milliman 34

34

How to Move Forward

Problem	Solution
The risks are not independent	Model at a community level
There is not a consensus about what works	Consider multiple methodologies
Exposure data is not available/changes quickly	Open data commons
Mitigation may be expensive or impossible	Apply mitigation with best cost/benefit
Regulatory environment may be unfavorable	Promote regulation allowing rate adequacy and all costs reflected in rates

Milliman 35

35

Lessons Learned

Wildfire is a complex risk that needs to be understood and mitigated by a variety of stakeholders including actuaries, catastrophe modelers, community leaders and fire experts, and policymakers. Mitigation matters, but it's important to quantify the impact of any efforts through a scientific methodology.

Catastrophe models are the best way currently to quantify and understand mitigation efforts, but transparency is key in order to understand the results of these models.

This study presents illustrative results only and is intended as a road map to better understanding the cost-benefit of mitigation credits; it is not prescriptive. Different geographies, property data, catastrophe models and other variables will affect the findings of this study.

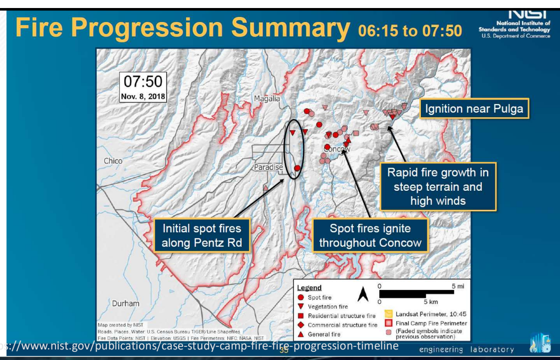
Milliman 36

36

Wildfires and Risk Modeling

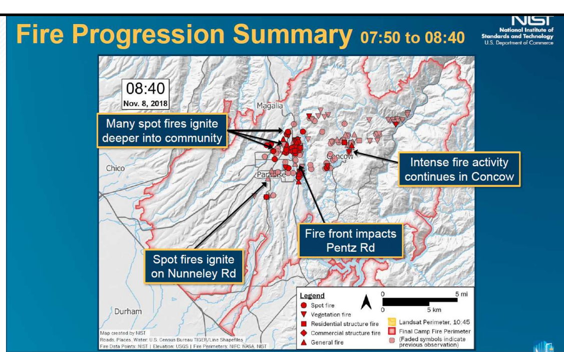
- What does a wildfire look like? The Paradise Fire timeline
- Anatomy of a wildfire. What are the key elements?
- Components of a wildfire risk model
- Model validation challenges

39

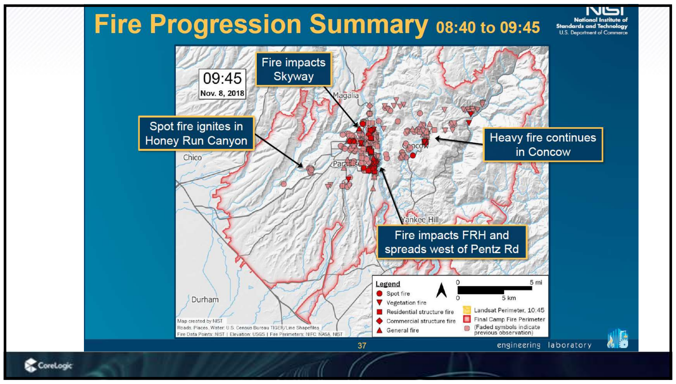


From: https://www.nist.gov/publications/case-study-camp-fire-fire-progression-timeline

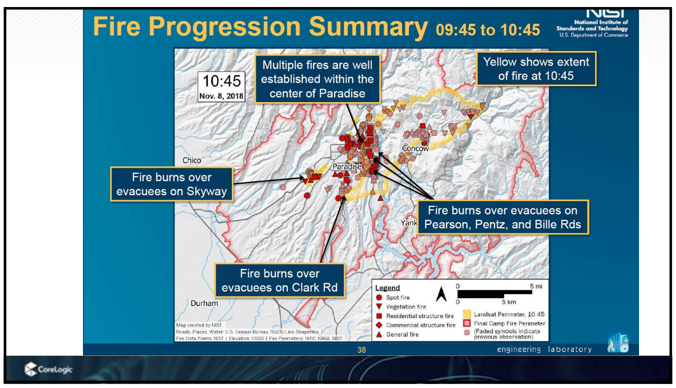
40



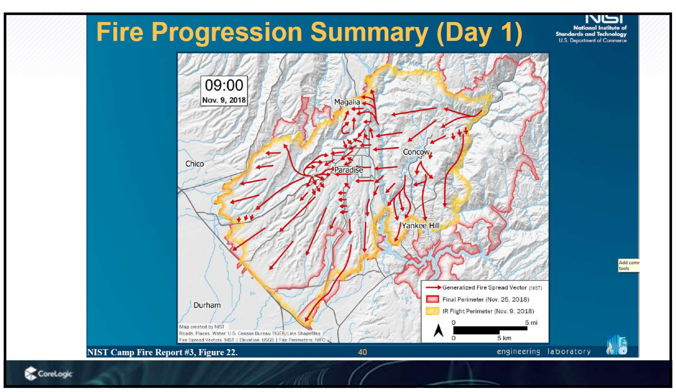
41


Fire Progression Summary 08:40 to 09:45
09:45
Nov. 8, 2018
Fire impacts Skyway
Spot fire ignites in Honey Run Canyon
Heavy fire continues in Concow
Fire impacts FRH and spreads west of Pentz Rd
Magalia
Chico
Yankee Hill
Durham
Legend
Spot fire
Vegetation fire
Residential structure fire
Commercial structure fire
General fire
Landsat Perimeter, 10:45
Final Camp Fire Perimeter
(Faded symbols indicate previous observation)
5 mi
5 km
37
engineering laboratory
CoreLogic

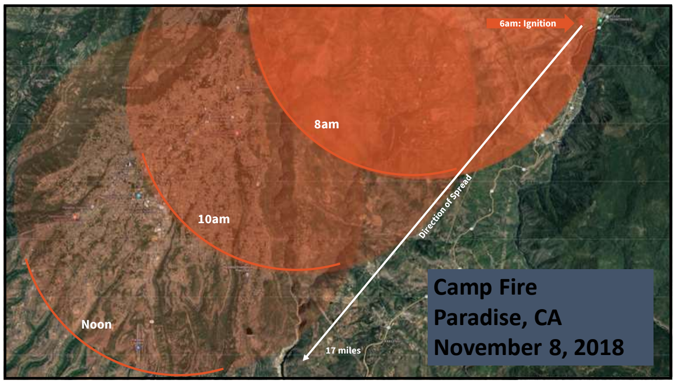
42


Fire Progression Summary 09:45 to 10:45
10:45
Nov. 8, 2018
Multiple fires are well established within the center of Paradise
Yellow shows extent of fire at 10:45
Fire burns over evacuees on Skyway
Fire burns over evacuees on Pearson, Pentz, and Bille Rds
Fire burns over evacuees on Clark Rd
Chico
Paradise
Concow
Durham
Legend
Spot fire
Vegetation fire
Residential structure fire
Commercial structure fire
General fire
Landsat Perimeter, 10:45
Final Camp Fire Perimeter
(Faded symbols indicate previous observation)
5 mi
5 km
38
engineering laboratory
CoreLogic

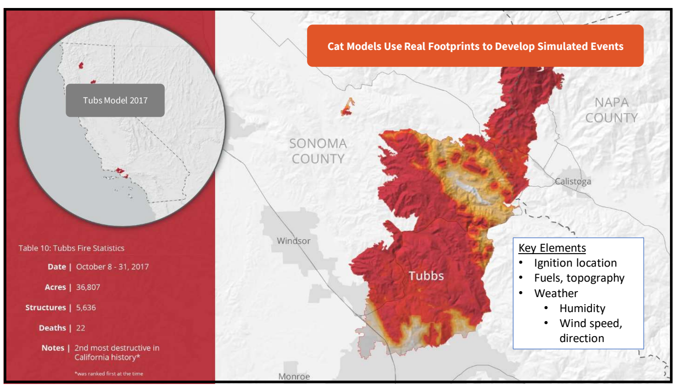
43


Fire Progression Summary (Day 1)
09:00
Nov. 9, 2018
Magalia
Chico
Paradise
Concow
Yankee Hill
Durham
Generalized Fire Spread Vector
Final Perimeter (Nov. 25, 2018)
IR Flight Perimeter (Nov. 9, 2018)
5 mi
5 km
NIST Camp Fire Report #3, Figure 22.
40
engineering laboratory
CoreLogic

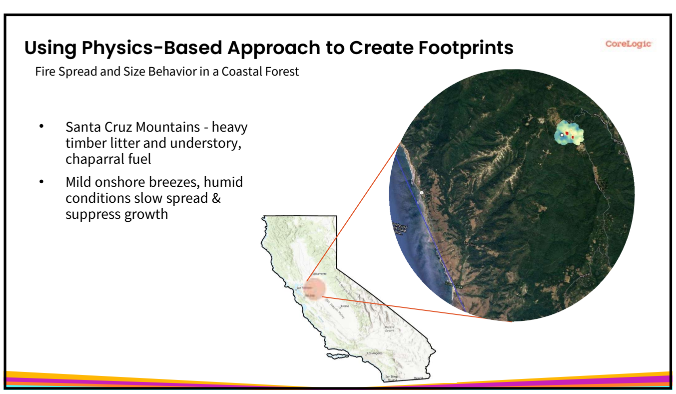
44


6am: Ignition
8am
10am
Noon
Direction of Spread
17 miles
Camp Fire
Paradise, CA
November 8, 2018

45


Cat Models Use Real Footprints to Develop Simulated Events
Tubs Model 2017
SONOMA COUNTY
NAPA COUNTY
Calistoga
Windsor
Tubbs
Monroe
Key Elements
Ignition location
Fuels, topography
Weather
Humidity
Wind speed, direction
Table 10: Tubbs Fire Statistics
Date | October 8 - 31, 2017
Acres | 36,807
Structures | 5,636
Deaths | 22
Notes | 2nd most destructive in California history*
*was ranked first at the time

46


Using Physics-Based Approach to Create Footprints
CoreLogic
Fire Spread and Size Behavior in a Coastal Forest
Santa Cruz Mountains - heavy timber litter and understory, chaparral fuel
Mild onshore breezes, humid conditions slow spread & suppress growth

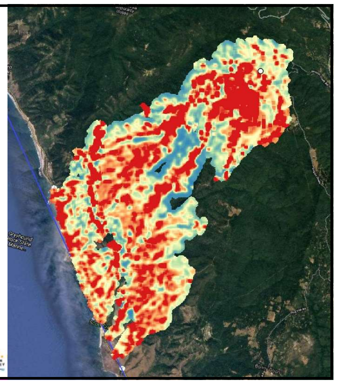
47

Fire Spread is Not Uniform

Millions of Simulated Events Representative of Real Fires

Rapid spread during offshore dry-wind events in late summer-fall season

- Heavy Timber Litter and Understory chaparral fuels creates larger fires



48

Notable recent wildfires

Common elements – short duration for damage

Fire	Wind	Structures	Duration 80%+
Tubbs 2017	60 mph	5,643	8 hrs
Camp 2018	35 mph	18,804	8 hrs
Marshall 2021	115 mph	1,084	6 hrs

The physical fire lasted much longer. Most damage to property occurred in the initial period

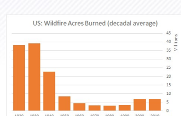
Most property losses occur while fire services are focused on protecting lives, or as they transition to defending property

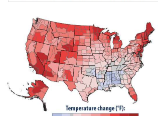
CoreLogic

49

CA Wildfire Risk: The future does not look like the past

- Wildfire fuel (unburnt vegetation) is increasing every year
- Summers are getting longer and hotter (climate change)
- Housing growth in WUI continues unabated
- New forestry management mitigation programs are being introduced
- In total
  - We cannot expect the future risk of wildfires to mimic the past
  - Planning requires something beyond experience rating



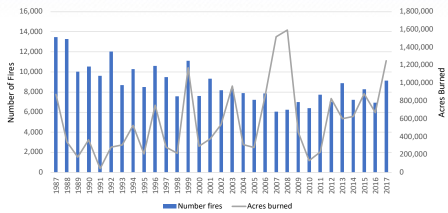


Growth in CA WUI
33% more in 20 years

CoreLogic

50

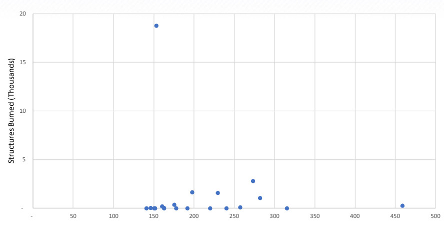
California Fires and Acres



- Source: California Department of Forestry and Fire Protection, 2018

51

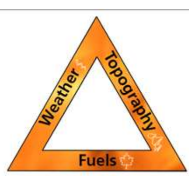
Fire Size vs. Homes Burnt, California Top 20



- Source: California Department of Forestry and Fire Protection, 2018

52

The key elements to a wildland fire



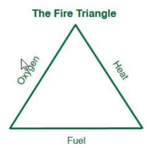
- Weather includes temperature, wind speed and direction, humidity
- Topography is shape of the land, as well as elevation, slope and aspect.
- Fuels - moisture level, chemical makeup, and density - the degree of flammability

53

Characteristics of large fires in California

Understanding the peril of extreme fires

- Late season (**Fuel**)
  - largest fires were between September and November
  - California dry summer weather pattern produces the fuel necessary for a fire
- High winds for multiple days (**Oxygen**)
  - High winds provide the oxygen necessary for a large fire
- Suburban concentrations in and near wildland areas (**Heat/Ignition**)
  - Human activities provide the "heat" in the form of incidental ignitions



CoreLogic 54

54

The fluid dynamics of wildfire

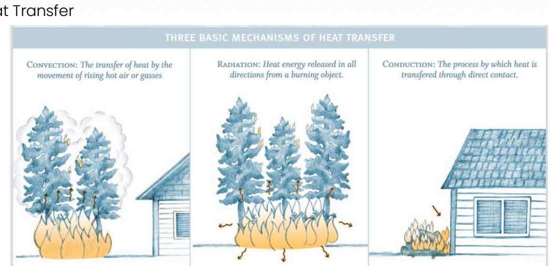
- The influence of the fire–atmosphere coupling is much greater in wildland fires than in building fires.
  - The influence of the fire–atmosphere coupling is much greater in wildland fires than in building fires.
  - wildland fuels are primarily fine, they are also efficiently cooled when the surrounding ambient air is cooler than they are. That means that the indraft of air caused by a fire may actually impede its spread.

CoreLogic

55

Understanding Fire Behavior

Heat Transfer



From: https://www.srs.fs.usda.gov/factsheet/pdf/fire-understanding.pdf

CoreLogic

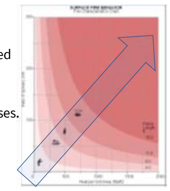
56

Anticipating ultimate fire losses

Modeling the physics of a wildfire

Increasing fireline intensity equates to increasing difficulty to fight fire

- Wildland fires are distinct from smaller fires
  - Driven by winds
  - Influenced by fuel loads and topography
- The shape and eventual extent of the fire are driven by many localized geographic and climate factors
- As fireline intensity increases, the ability to constrain the fire decreases.
  - Hand crews can only fight fires to a certain size
- Slope plays a secondary impact
  - The inability to maneuver heavy equipment can impede fire fighting



Scott, Joe H. 2012. Introduction to Wildfire Behavior Modeling. National Interagency Fuels, Fire, & Vegetation Technology Transfer. Available: www.nifft.gov.

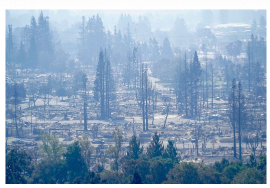
CoreLogic 57

57

Wildland Fire – not like other loss perils

Wildland fire is a full loss peril

- Fires destroy the entire building and stresses the 100% reconstruction cost for the policy
  - Not even hurricanes or earthquakes cause widespread 100% loss severity
  - Under-insurance will be exposed in a wildfire
- California Dept of Insurance (CDI) may be increasing costs for contents and ALE coverage[1] beyond historic claims
- Coverage C loss exposure remains ambiguous
  - Valuation methods not as rigorous as for Coverage A



Larkfield area, Santa Rosa Fires, 2017

1-http://www.insurance.ca.gov/0400-news/0100-press-releases/2018/upload/nr086NoticeExpeditedClaimsProcedures.pdf

CoreLogic 58

58

Roofing Type Classes

(Based on UL 790 (ASTM E 108) Standard Test Method)

- **Class "A":** The highest fire-resistance rating for roofing as per ASTM E-108. Indicates roofing can withstand severe exposure to fire originating from sources outside the building.
- **Class "B":** Fire-resistance rating that indicates roofing materials can withstand moderate exposure to fire originating from sources outside the building
- **Class "C":** Fire-resistance rating that indicates roofing materials can withstand light exposure to fire originating from sources outside the building
- **Class "U":** Unrated e.g. Wood Shingle
- Default Class is set to "U" unless we can smart default on Building Code

CoreLogic 59

59

Additional Secondary Structure Modifiers

- **Fire Resistive Siding**
- **Fire Resistive Windows**
- **Non Combustible Attachments**
  - Fences + Decks
- **Automatic External Fire Extinguishing System**
  - The most effective protection
  - Needs water reservoir, pump and electric supply with battery back-up to be fully effective
- **Structure Fire Vulnerability Mitigated**
  - Ensuring Fire Embers cannot enter the structure by using screening across ventilation, protecting eaves
  - No accumulation of debris on roofs and in gutters

CoreLogic 60

60

Perimeter Clearance

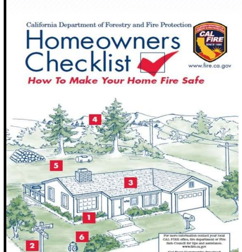
CALFire Defensible Zones endorsed by the Insurance Institute for Business & Home Safety (IBHS)

Description	Clearance Range
Lean, Clean and Green Zone	0' to 30'
Reduced Fuel Zone	30' to 100'
Non combustible Zone	0' to 5'

CoreLogic 61

61

Mitigation Strategies



Attribution: CalFire http://www.calfire.ca.gov

Attribution: IBHS http://disastersafety.org/legal/

CoreLogic 62

62

Mitigation Examples (IBHS Examples)

Underneath decks

Unenclosed

Debris

Unenclosed eaves
Vents

63

Validating a Wildfire model with experience data

Some techniques from hurricanes and earthquakes won't work

- Loss experience model comparisons for HU and EQ work well
  - Hurricane Andrew generated about 2M claims
  - Northridge EQ affected about 3M homes
  - As of 25 October, Hurricane Ian has ~600k claims[1]
- Wildfires and SCS are different
  - Large wildfire is 10,000 homes
  - Large thunderstorm damages 5,000 homes
- How the loss-experience is brought forward for comparison to model results on today's portfolio has a large influence on results

1 - https://www.floir.com/home/ian, 1 Nov 2022

64

One example from wildfire

San Diego, CA

- Observation: (apparent) big model mis-match in re-simulation of San Diego wildfires in 2003 and 2007
  - State-wide housing growth is about 2% per year
  - Within the fire footprints, housing growth was about 4% per year (much higher than state, county averages).
  - Re-analysis of today portfolio showed losses than did not agree
- Earthquakes and Hurricanes affect enormous areas, and small-scale anomalies are averaged out
  - Hurricane Ian claims represent 8% of entire state!
  - Not true for SCS or wildfire

65

Managing and Mitigating wildfire

Proceeding to a manageable level of risk

- Wildfire has 3 critical aspects
  - Ignition — Related to human activities. Can be reduced but not eliminated
  - Fire spread to homes — Regional fuel reduction to slow fire, make it fightable
  - Home destruction — Harden homes. Can reduce but not eliminate risk.

CoreLogic

66

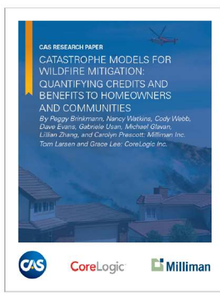
Making models work

CoreLogic

Casualty Actuarial Society Research Paper

2 rate-making studies

- Mitigation credits for as-is regional fuels
- Mitigation credits for mitigated fuels
- Fully mitigated *could* reduce rates ~35%
  - Much of this is already in-place
- De-risking (eliminating ladder-fuels in forested areas)
  - Additional 35% drop
- https://www.casact.org/publications-research/publications/cas-research-papers-and-briefs



67

Ladder-fuel reduction

Only a part of the solution

- The goal is to lower fire intensities and ladder-fuels are an important aspect of fire intensity
  - Ladder fuels are not the only component
  - For achievable risk reduction, fuel reduction must be verifiable
    - Imagery fails
    - LIDAR point clouds need to be very dense to achieve credible results
- More research is needed to identify achievable and verifiable risk reduction

CoreLogic

68

So where do we go from here

The future of wildfire risk

- Ignitions can be reduced
  - But never eliminated
- Fuels can be mitigated
  - New remote surveillance technology can perform audits
- Risk can be modelled
  - Regulatory and market barriers persist

69

70