

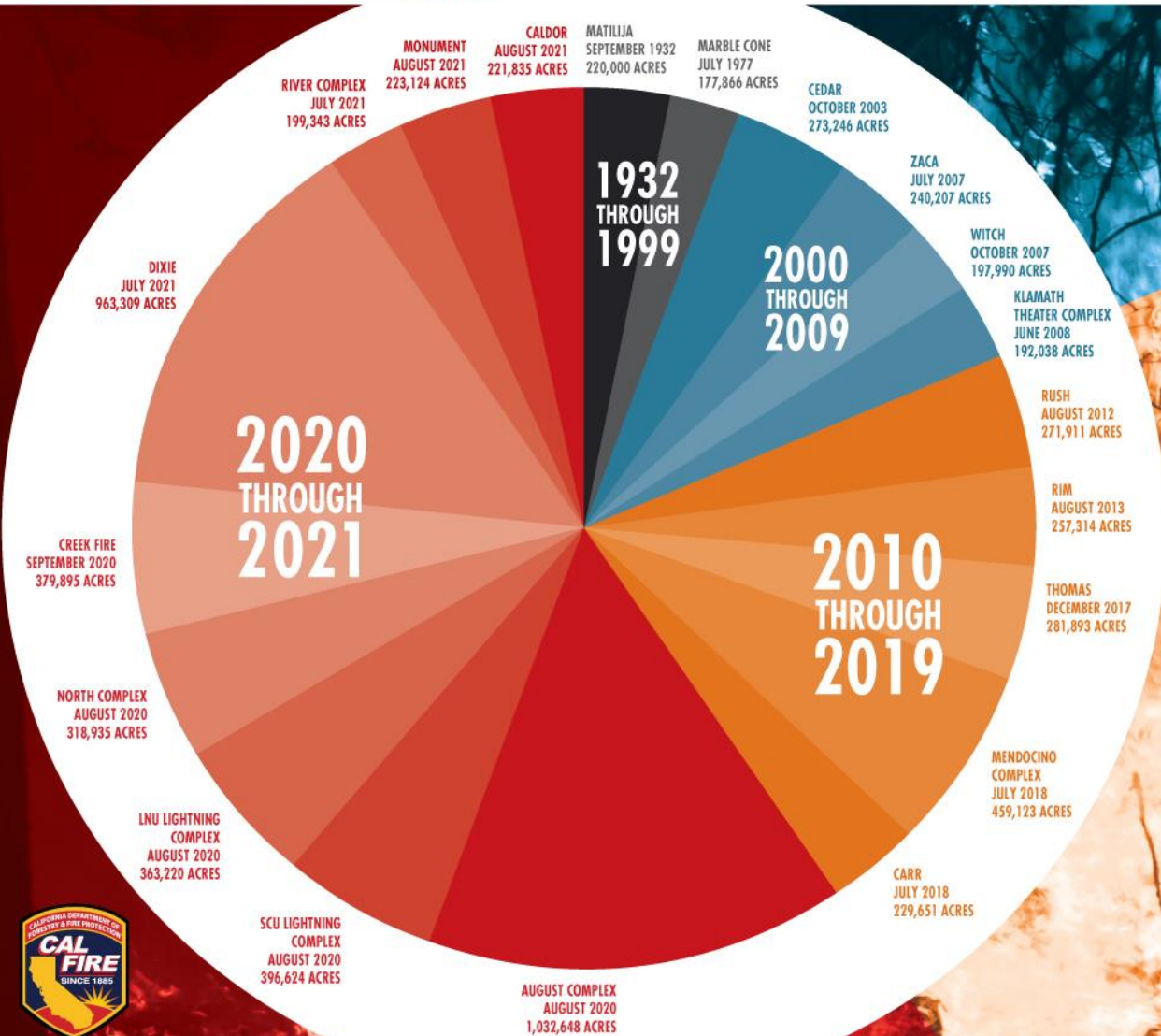
STEPS AND CHALLENGES OF EVOLVING FIREWISE COMMUNITIES

Oakmont Homeowner's Association
June 7, 2022

Presented by:
David Shew, *Wildfire DefenseWorks*
CAL FIRE Staff Chief, Retired

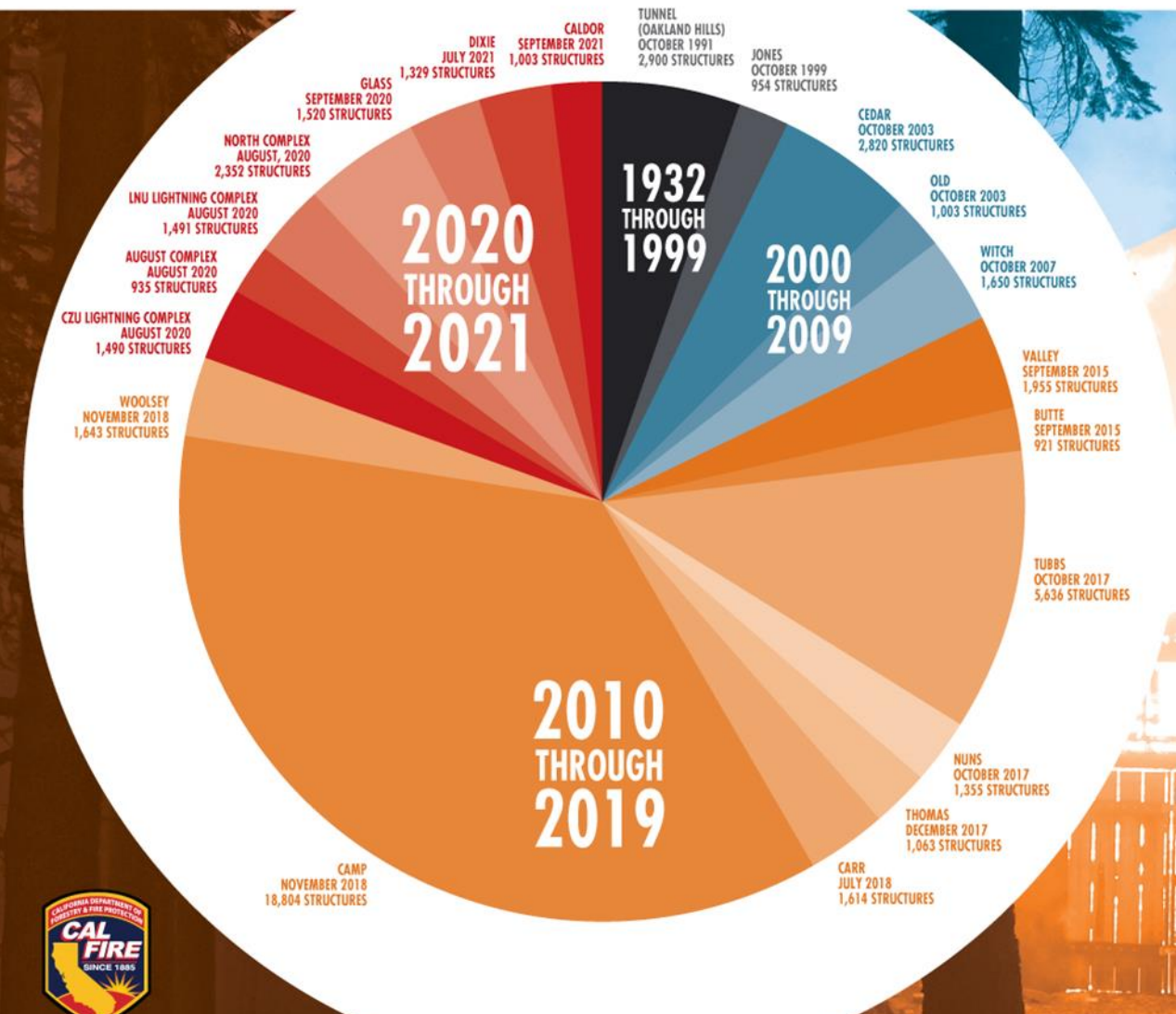
The Risk – Large Destructive Wildfires

TOP 20 LARGEST CALIFORNIA WILDFIRES



NUMBERS CURRENT TO 12/31/2021.

TOP 20 DESTRUCTIVE CALIFORNIA WILDFIRES



NUMBERS CURRENT TO 12/31/2021.

The Hazard – Extreme Weather



The Risk – To Communities

A community that was
burned through by the
Thomas Fire



The Risk – Destructive Wildfires

2014 -2021

| Category of Damage | Structure Type | | | | | | Total | % of Residential Structures Damaged and Destroyed | % of All Structures Damaged and Destroyed |
|--------------------|--------------------------|------------------------|------------------------------|---------------------------|------------------------|----------------|--------------|---|---|
| | Single Family Residences | Multifamily Residences | Mixed Residential Commercial | Nonresidential Commercial | Other Minor Structures | Infrastructure | | | |
| Destroyed | 34642 | 313 | 100 | 1756 | 14630 | 81 | 51522 | 92.21% | 91.93% |
| Major | 194 | 8 | 1 | 31 | 216 | 22 | 472 | 0.53% | 0.84% |
| Minor | 524 | 15 | 4 | 78 | 262 | 15 | 898 | 1.42% | 1.61% |
| Affected | 2140 | 72 | 3 | 210 | 686 | 39 | 3150 | 5.84% | 5.62% |
| TOTAL | 37500 | 408 | 108 | 2075 | 15794 | 157 | 56042 | 100.00% | 100.00% |

- 70% of all structures destroyed are residential structures
All permanent structures greater than 120 sq. ft.

The Risk – Destructive Wildfires

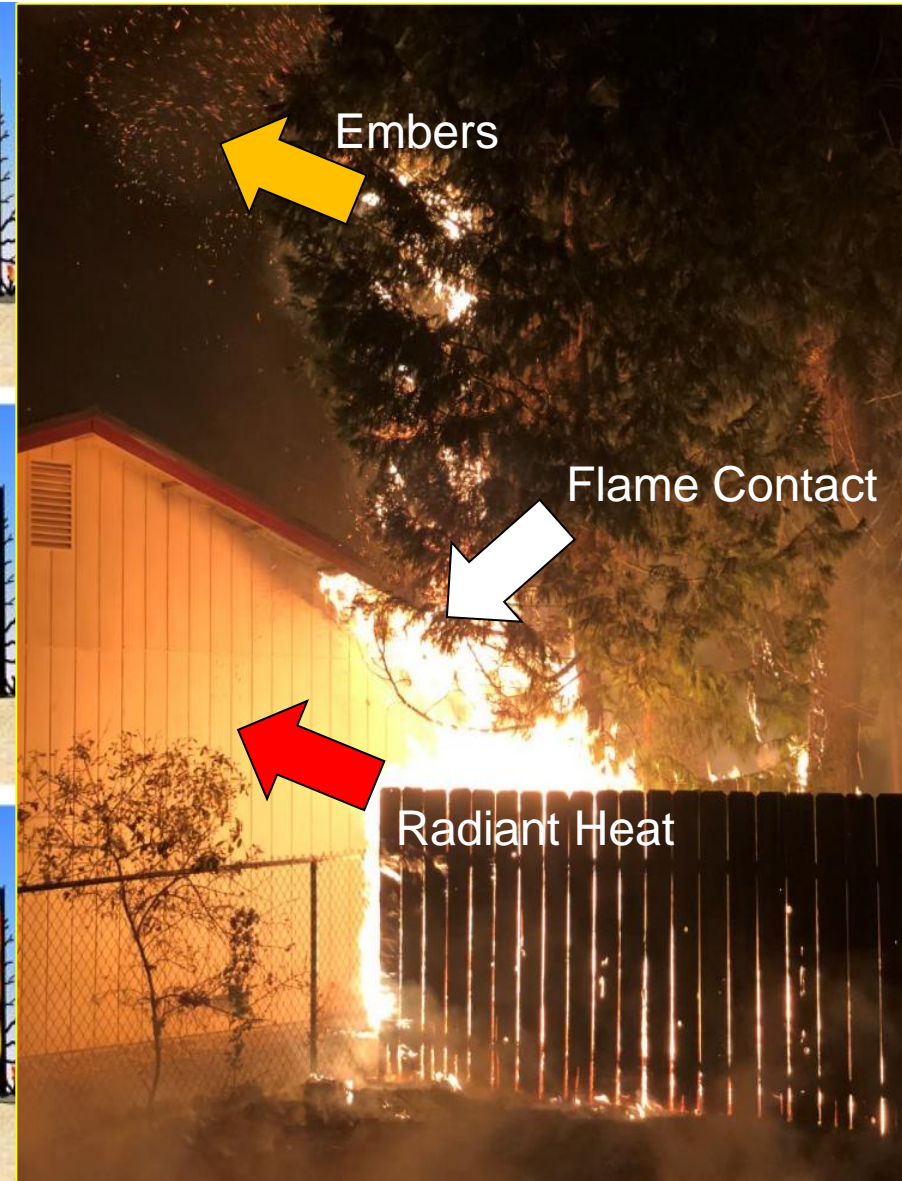
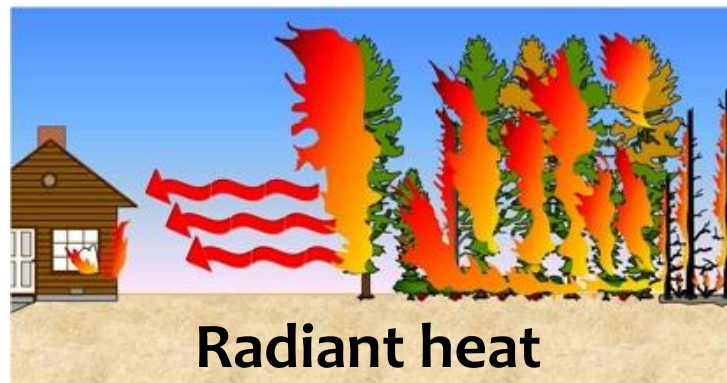
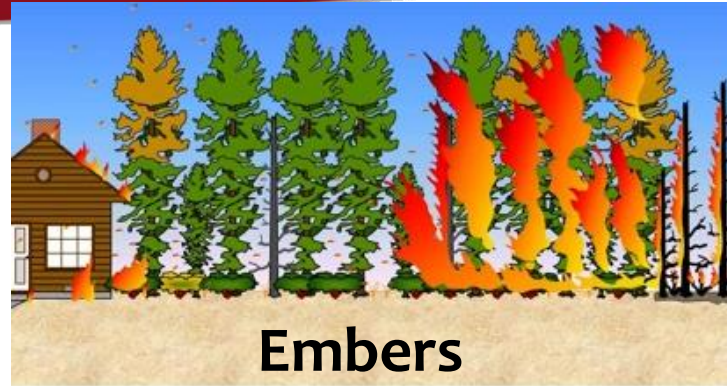
| Total | 2014 | | 2015 | | 2016 | | 2017 | | 2018 | | 2019 | | 2020 | | 2021 | | Since 2014 | |
|----------------------|------|-------|------|-------|------|-------|-------|-------|-------|-------|------|-------|-------|-------|------|-------|------------|-------|
| Structures Destroyed | 240 | 96.7% | 3141 | 96.6% | 1223 | 94.4% | 10922 | 90.6% | 22704 | 93.7% | 555 | 69.2% | 9494 | 89.4% | 3243 | 91.4% | 51522 | 91.9% |
| Structures Damaged | 8 | 3.3% | 112 | 3.4% | 72 | 5.6% | 1139 | 9.4% | 1523 | 6.3% | 247 | 30.8% | 1127 | 10.6% | 292 | 8.3% | 4520 | 8.1% |
| Total | 248 | | 3253 | | 1295 | | 12061 | | 24227 | | 802 | | 10621 | | 3535 | | 56042 | |

- 90 - 95% of all structures that catch fire will be destroyed

All permanent structures greater than 120 sq. ft.

Structure Exposure from Wildfire

- How structures are exposed to wildfire
 - Embers – Responsible for more than 60% of home ignitions and IBHS estimates that can be as high as 90% of home and business ignitions
 - Direct
 - Indirect
 - Direct Flame Contact
 - Radiant Heat



WILDFIRE RESEARCH

|

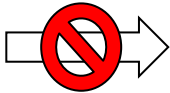
The Risk – To Homes

IBHS



National Institute of Standards and Technology

WUI Fire Exposure

- You can affect your neighbors and your neighbors can affect you*
- Reducing parcel level combustibles reduces the likelihood of structure ignition(s)
- In severe exposures “80% of mitigation”  “80% ignition risk reduction”
- Combinations of combustibles increases the hazard disproportionately

*In medium density construction (like Paradise) and high density (like Coffey Park in Santa Rosa)

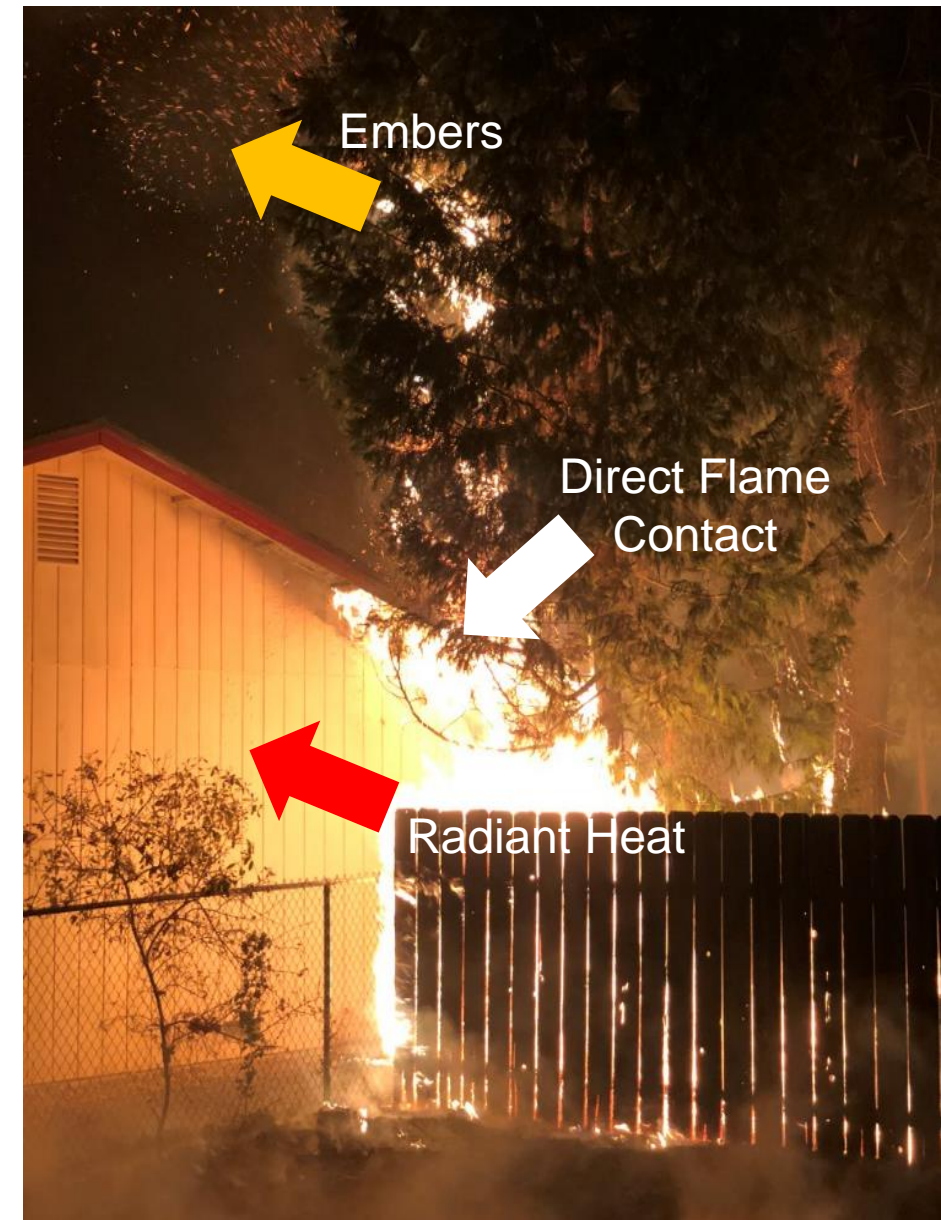


National Institute of Standards and Technology

WUI Fire Exposure

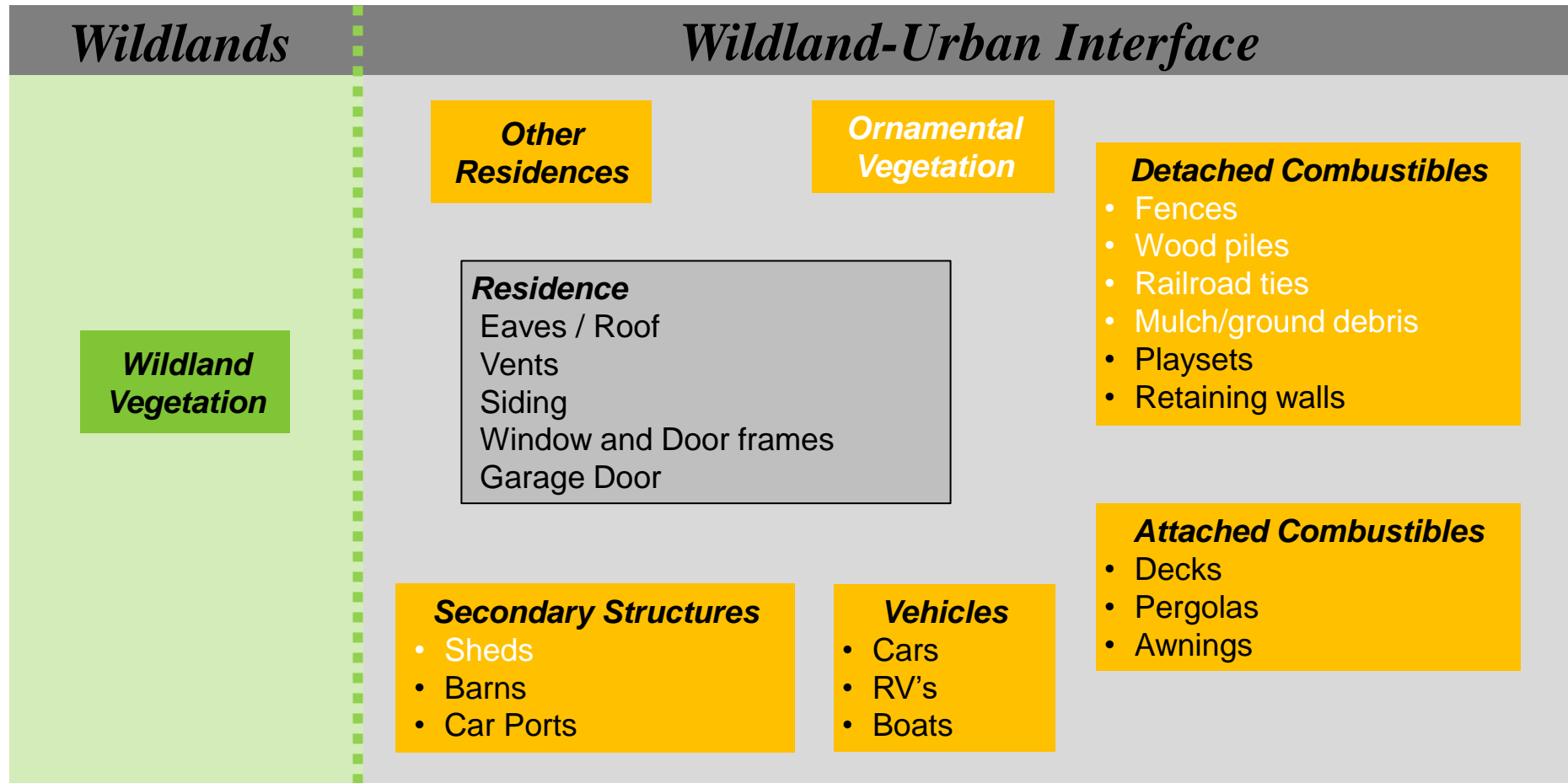
- *Exposure* has two components: *embers and fire*
 - Structure hardening must address both
- NIST data shows 90+% of damaged structures have been defended by emergency resources
- Post WUI fire undamaged
 - Defensive actions
 - Low exposure
 - Hardened construction and defensible space
 - Housing density
- Fire losses are the result of multiple factors

Source: NIST



National Institute of Standards and Technology

Parcel-level combustible features that can contribute to various structure ignition pathways

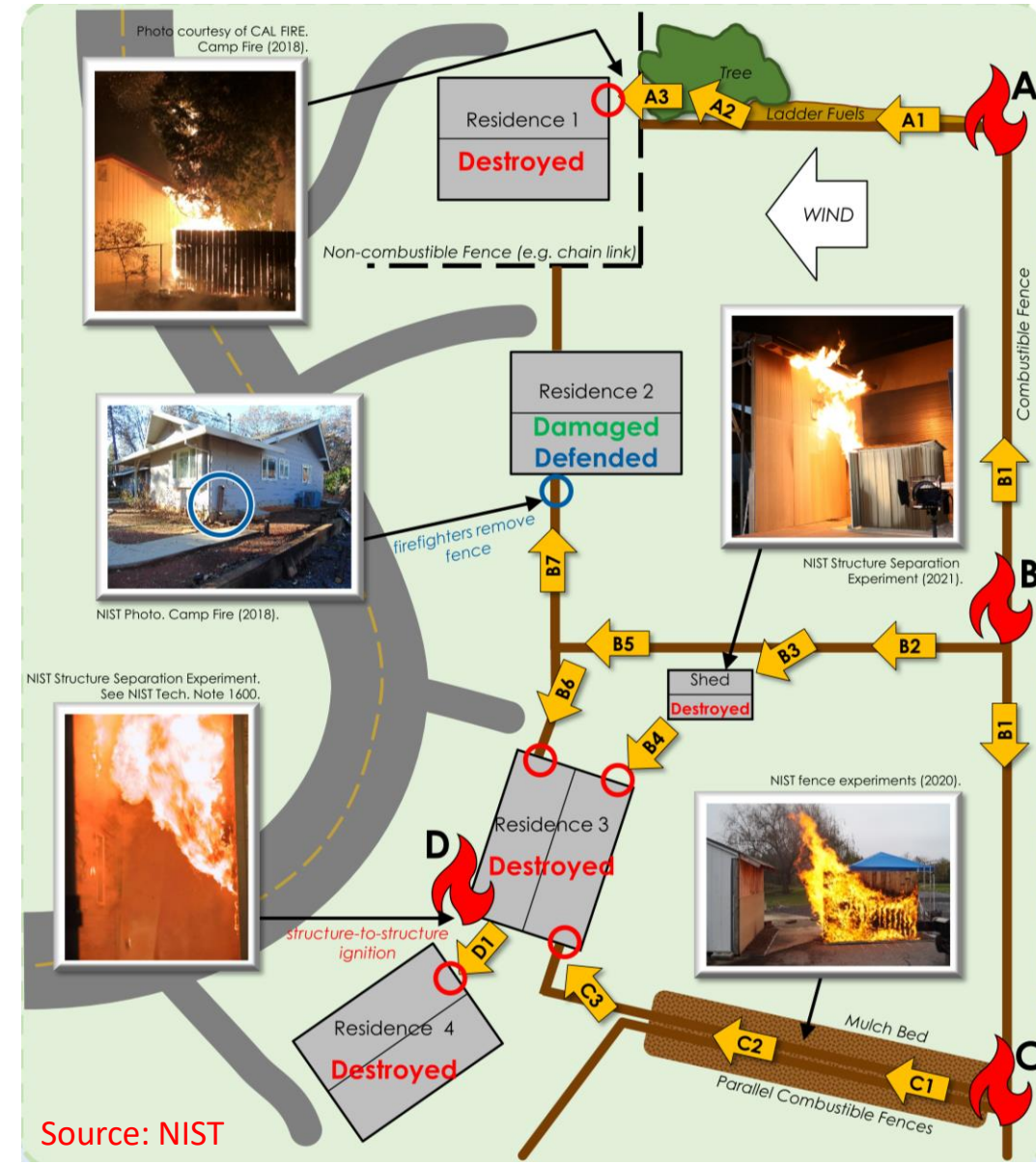


Highlighted in white are hazards NIST and IBHS have performed extensive research on

National Institute of Standards and Technology

Structure Ignition Pathways – Camp Fire

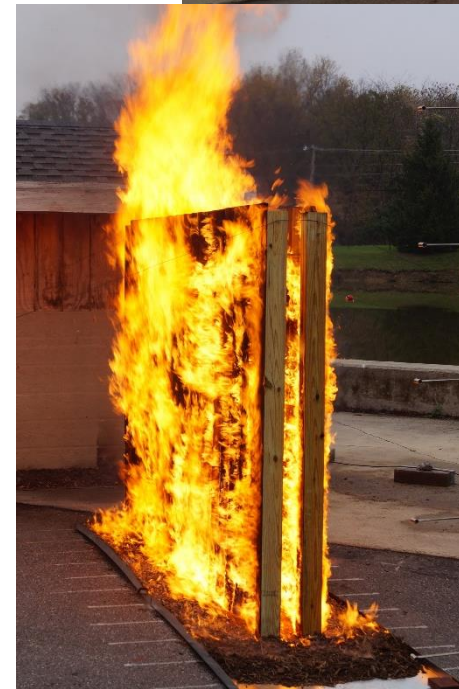
- Ignition Pathway A:
 - Fence -> Tree -> Home – Residence 1
- Ignition Pathway B:
 - Fence -> Home – Residence 2
 - Fence -> Shed -> Home – Residence 3
 - Fence -> Home – Residence 3
- Ignition Pathway C:
 - Fence -> Double Fence -> Home – Residence 3
- Ignition Pathway D:
 - Home -> Home – Residence 4



National Institute of Standards and Technology

Fences only

- Provide a pathway for direct flame spread
 - “House – fence – house – fence – house”
- Act as source of embers and radiant heat
- Use firefighting resources
- Mitigation
 - Replace with noncombustible fences
 - Particularly within the first 5’ of the building
 - No parallel fences
 - Keep fences away from other combustibles such as outbuildings, woodpiles, and mulch



Parallel Fences with
13 mph wind

National Institute of Standards and Technology

Mulch

- Slow/moderate horizontal spread
- Flame spread via ember spotting
- Act as source of embers
- Mitigation
 - Keep yard free of combustible mulch or debris, particularly within the first 5' of the building
 - Keep mulch away from other combustibles such as outbuildings, fences, and woodpiles



National Institute of Standards and Technology

Mulch

- Pine Straw Mulch
 - Burns rapidly and intensely
 - Fine fuel consumed completely
 - No ember spotting
- Rubber Mulch
 - Burn with high initial intensity and toxic smoke
 - Acts as source of embers
- Mitigation
 - Keep yard free of combustible mulch or debris, particularly within the first 5' of the building



Pine Straw Mulch



Rubber Mulch

National Institute of Standards and Technology

Woodpiles

- Spotting occurs over long distances
- Mitigation
 - Remove
 - Relocate far away and away from other combustibles such as fences as shed to limit direct flame contact
 - Cover with a noncombustible or ignition resistant material to limit ignition potential



National Institute of Standards and Technology

Hazard Mitigation Summary for Parcels

- Remove
- Reduce
- Relocate: Away from primary residence AND away from other combustibles
- Reduction in ignition potential: Hardening of combustibles, and building materials and assemblies to reduce the exposure
- Limit ember and fire exposures generated from the combustibles when they ignite



Distance to shed = 6 ft (1.8 m)
Wind speed = 13 mph (6 m/s)

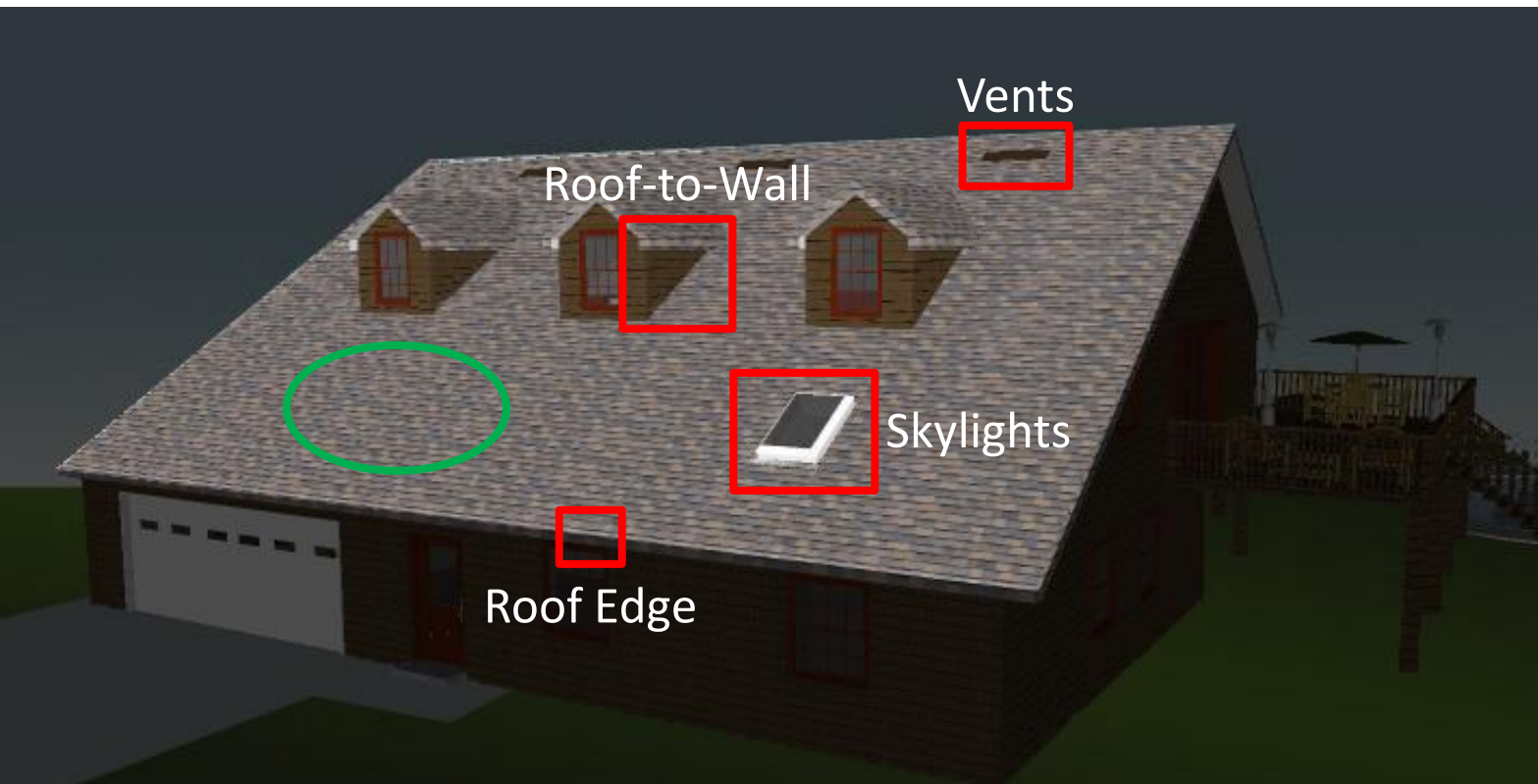


Distance to shed = 0 ft (0 m)
Wind speed = 20 mph (10 m/s)

Insurance Institute for Business and Home Safety

- Roofs

- There are several vulnerable points in a roof



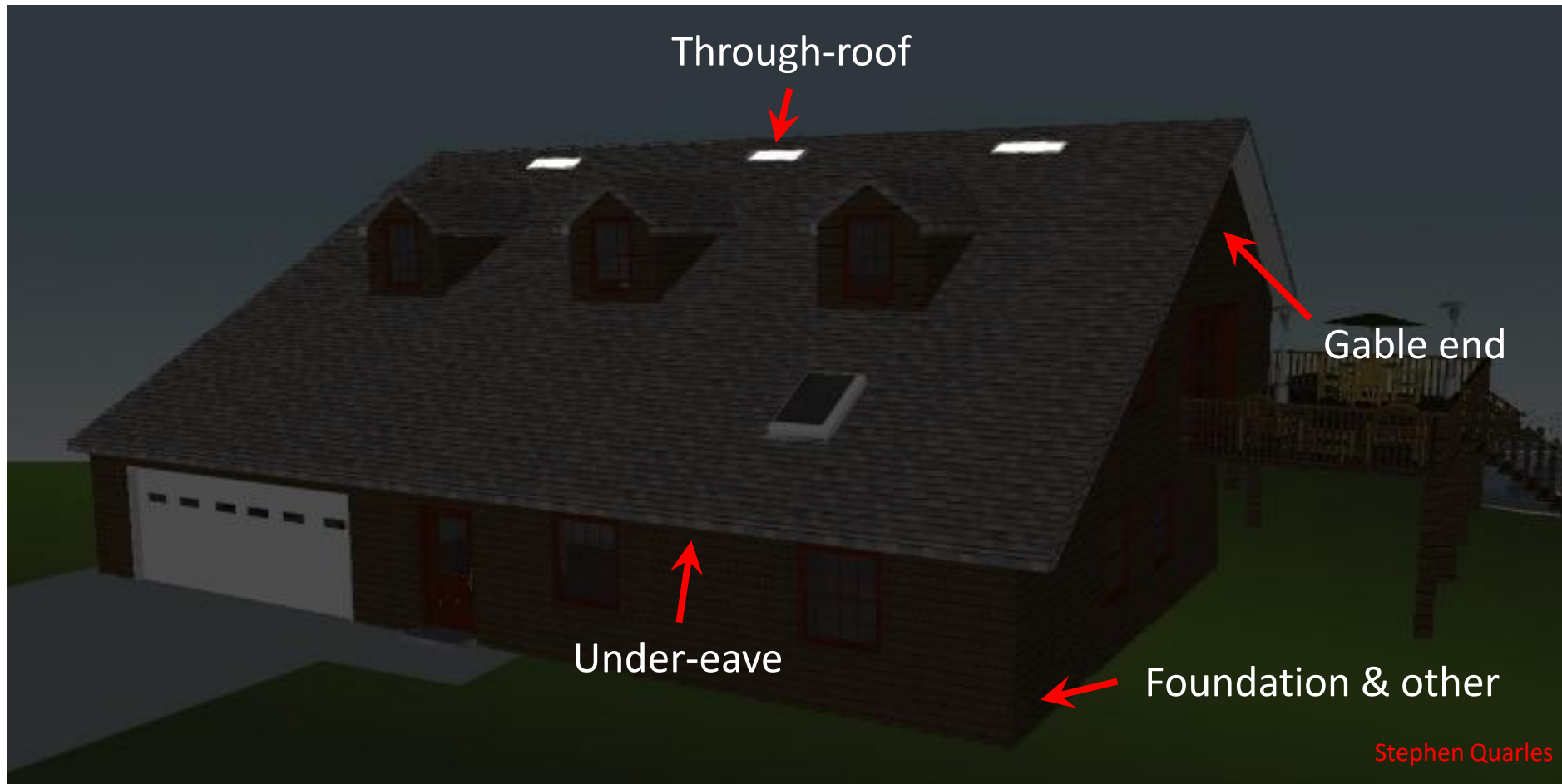
Stephen Quarles



©Insurance Institute for Business & Home Safety

Insurance Institute for Business and Home Safety

- Vents
 - There are several locations of vents



Insurance Institute for Business and Home Safety

Deck Demo



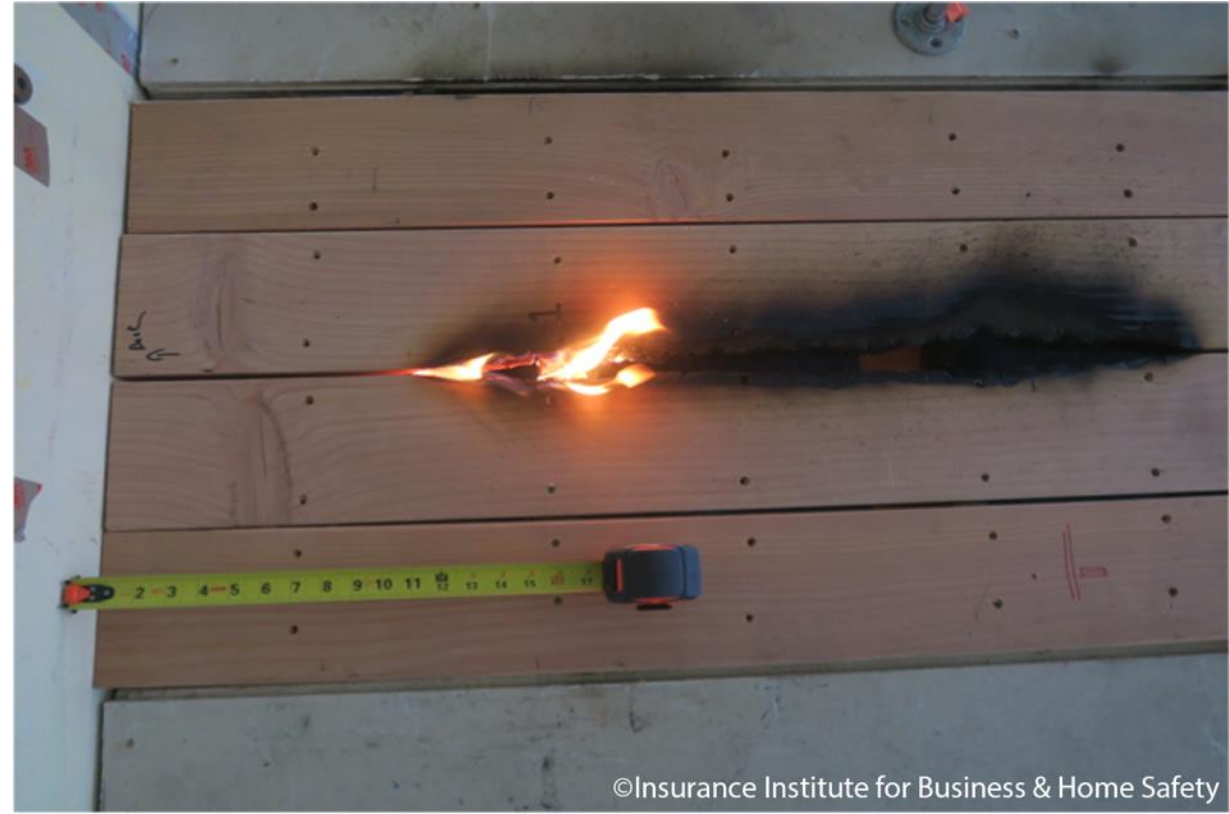
Insurance Institute for Business and Home Safety

- Decks
 - Deck-to-Wall Intersection
 - Deck board spacing
 - Deck joists



Insurance Institute for Business and Home Safety


- Decks
 - Fire develops underneath deck first
 - Fire travels along seams of deck boards to house



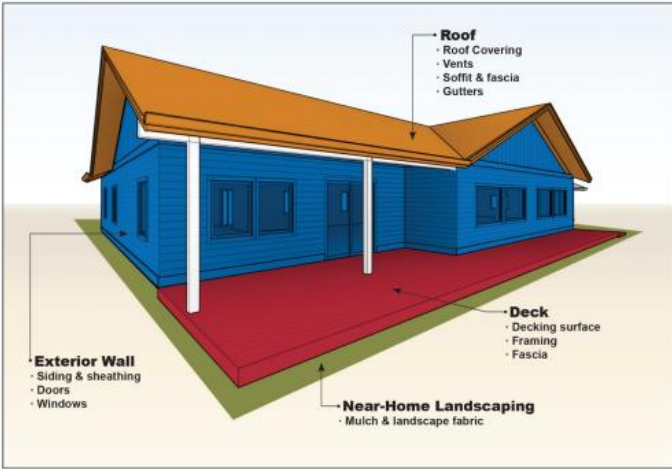
Headwaters Economics and IBHS Study

- Headwaters Economics and IBHS
 - [Building a Wildfire Resistant Home](#)
 - Study conducted in Southwest Montana
- Study being conducted in California

A Research Paper by

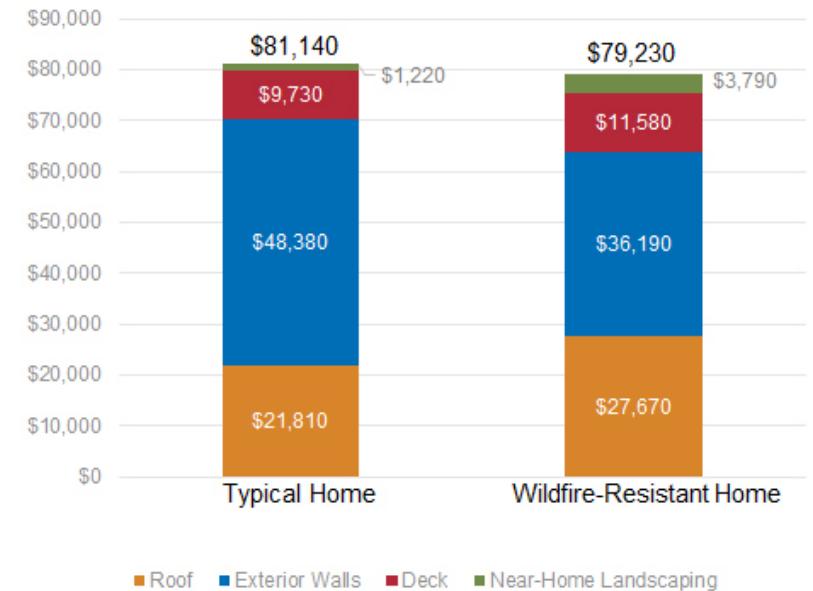


**Building a Wildfire-Resistant Home:
Codes and Costs**



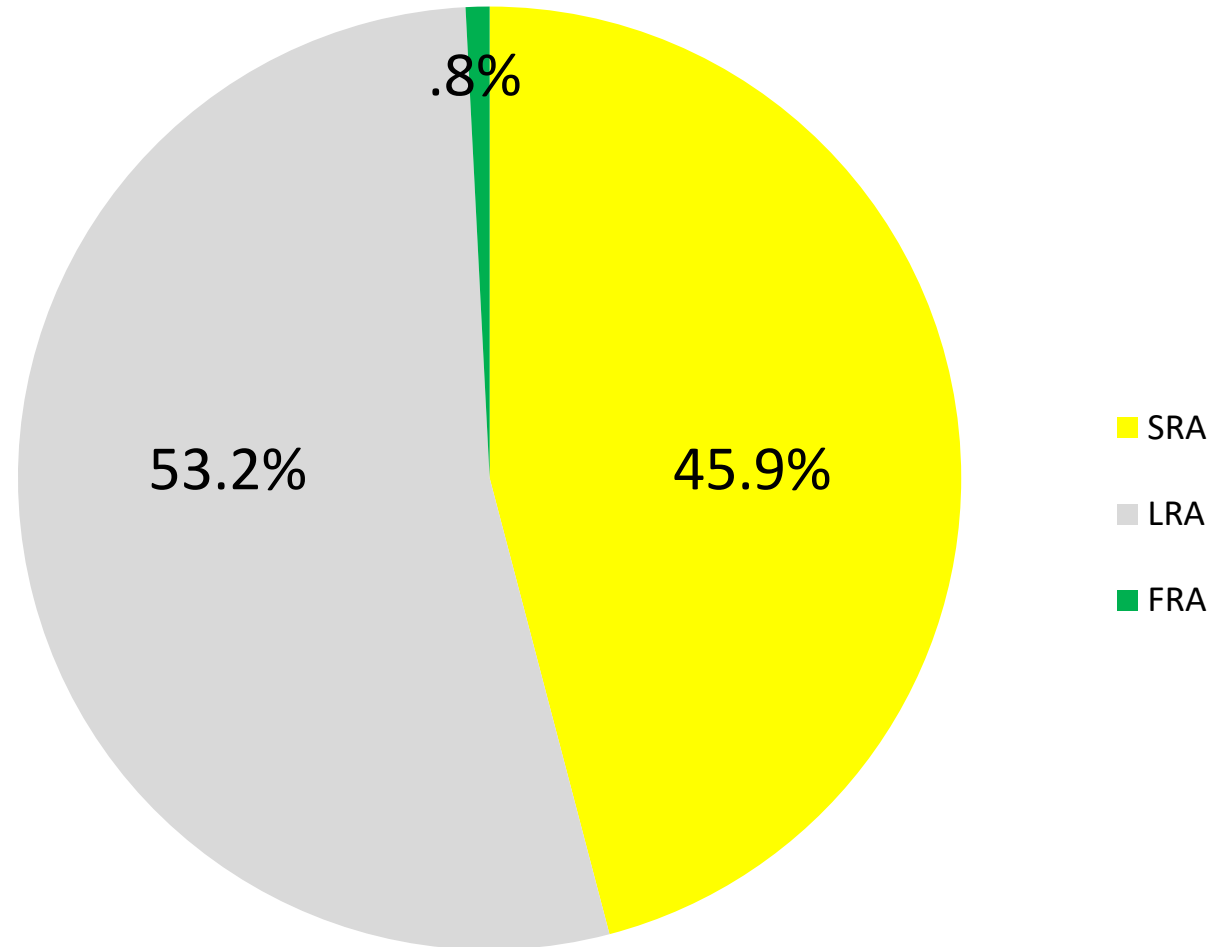
November 2018

New Construction Cost Comparison

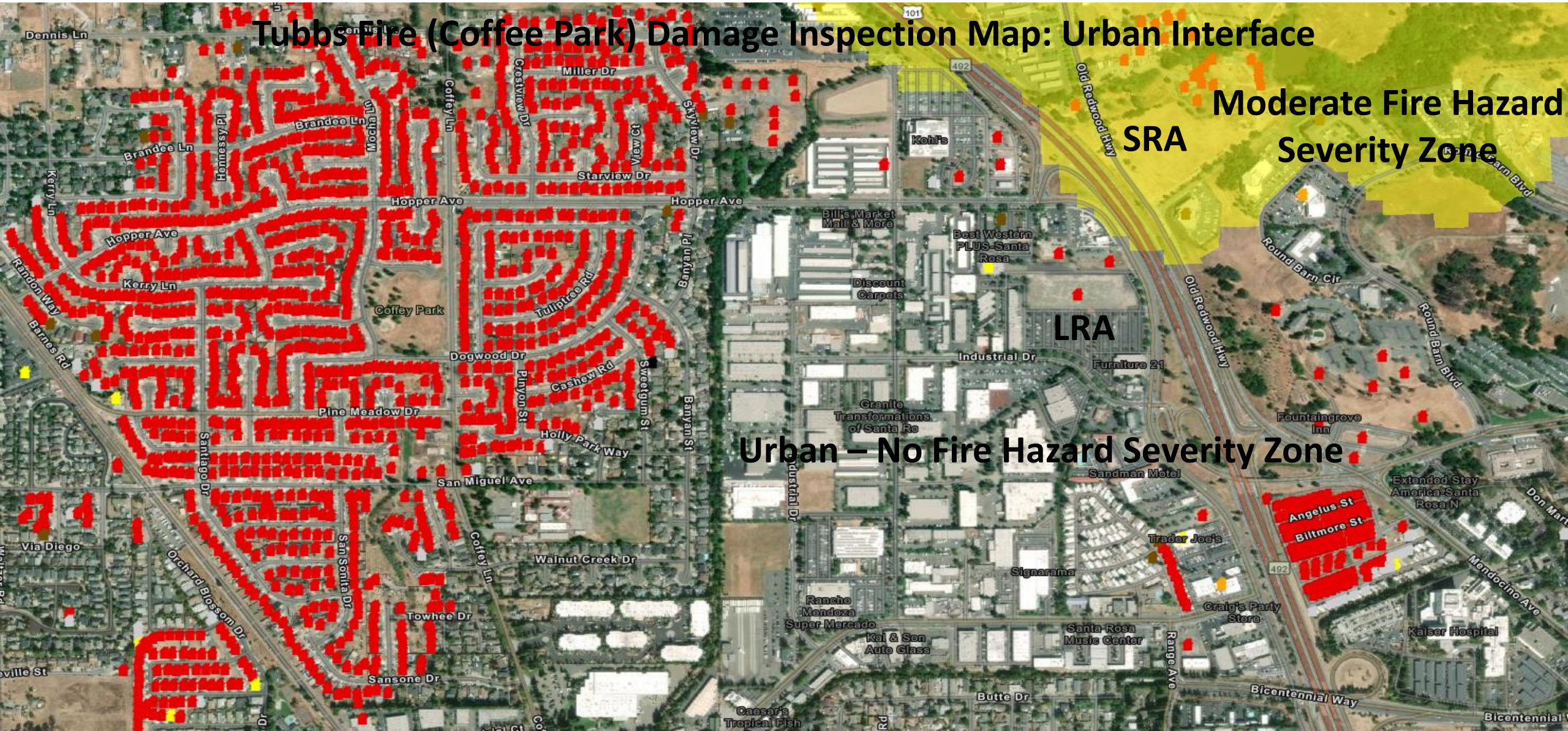


CAL FIRE Statistics and Analysis

Percentage Damaged/Destroyed by Responsibility Area



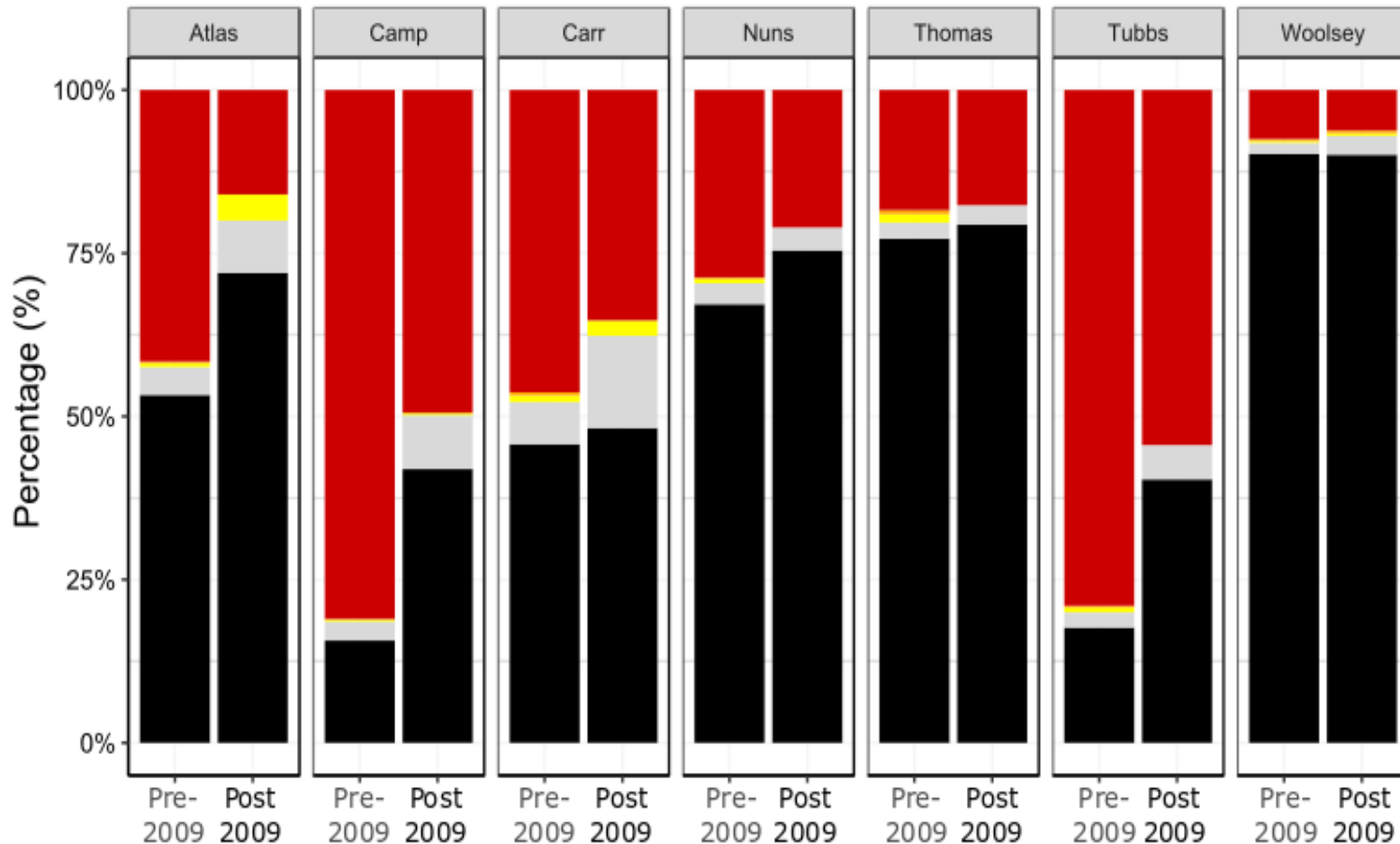
CAL FIRE Statistics and Analysis



Tubbs Fire (Coffey Park) Damage Inspection Map: Urban Interface

CAL FIRE Statistics and Analysis

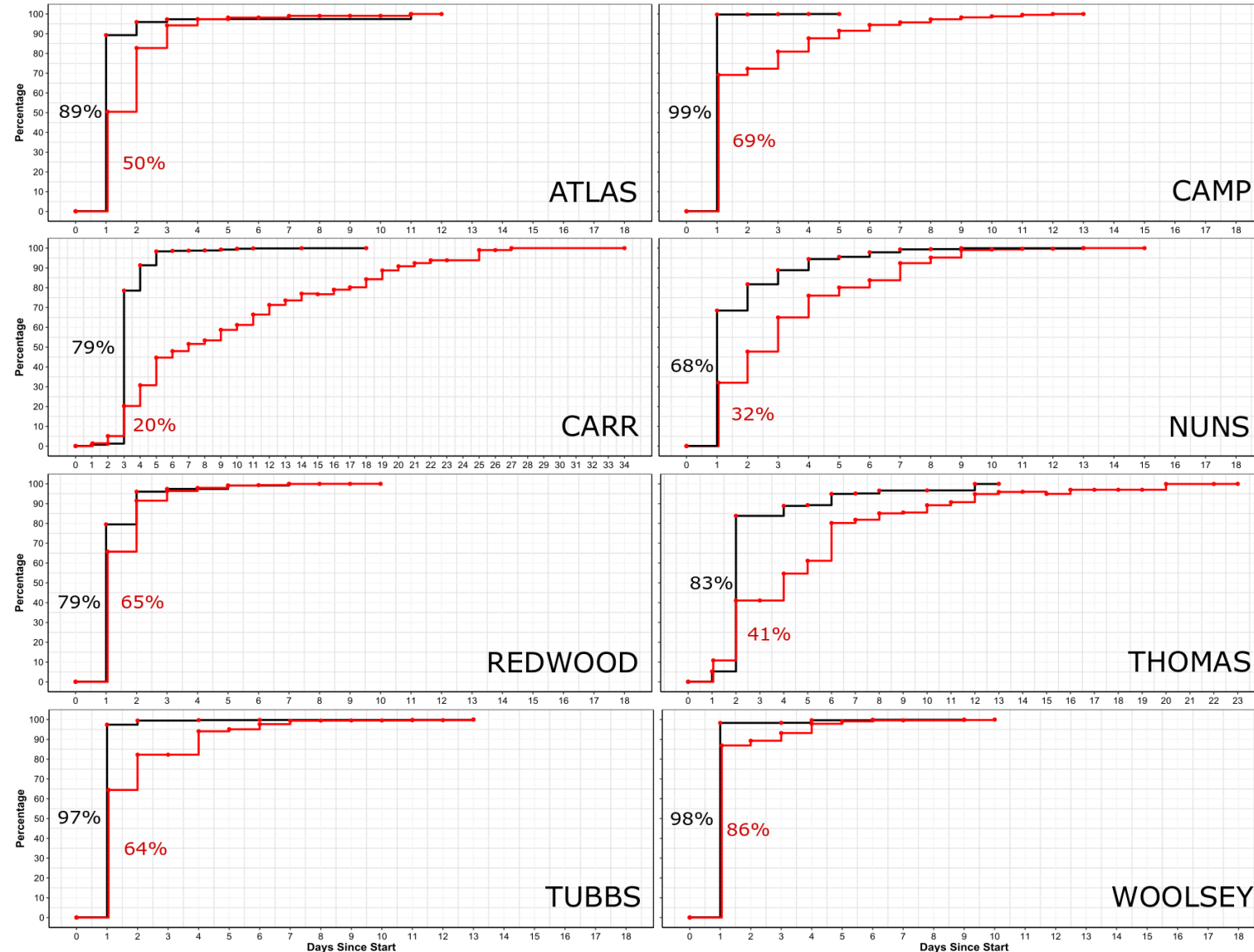
Percentage of structures by damage category inside or within 100 meters of the fire perimeter of the seven largest wildfires in 2017 and 2018



- California Building Code Chapter 7A is making a difference
- Variability between fires
- Many factors influence the survivability of a home

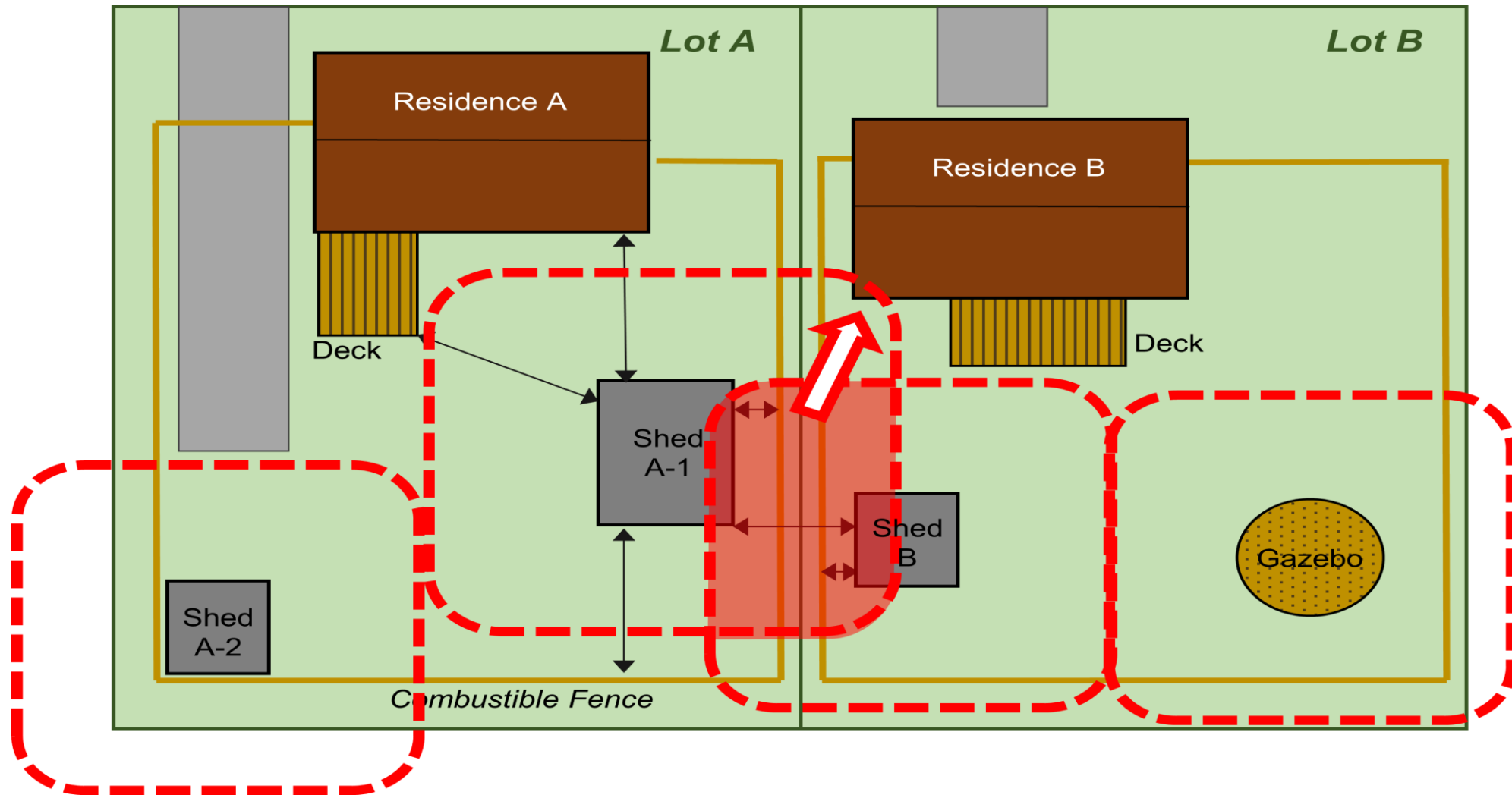
CAL FIRE Statistics and Analysis

Percentage of total structures destroyed (black) and perimeter growth (red) by day since incident start for the top eight largest fires in 2017 and 2018 by incident. The cumulative percentage is labeled for the day with largest growth. Except for the Carr and Thomas fires, all other fires in the analysis suffered 70% or greater damage within the first 24 hours of the fire start. The two most destructive fires (Camp and Tubbs) saw over 95% of structure loss occur in the first 24 hours.



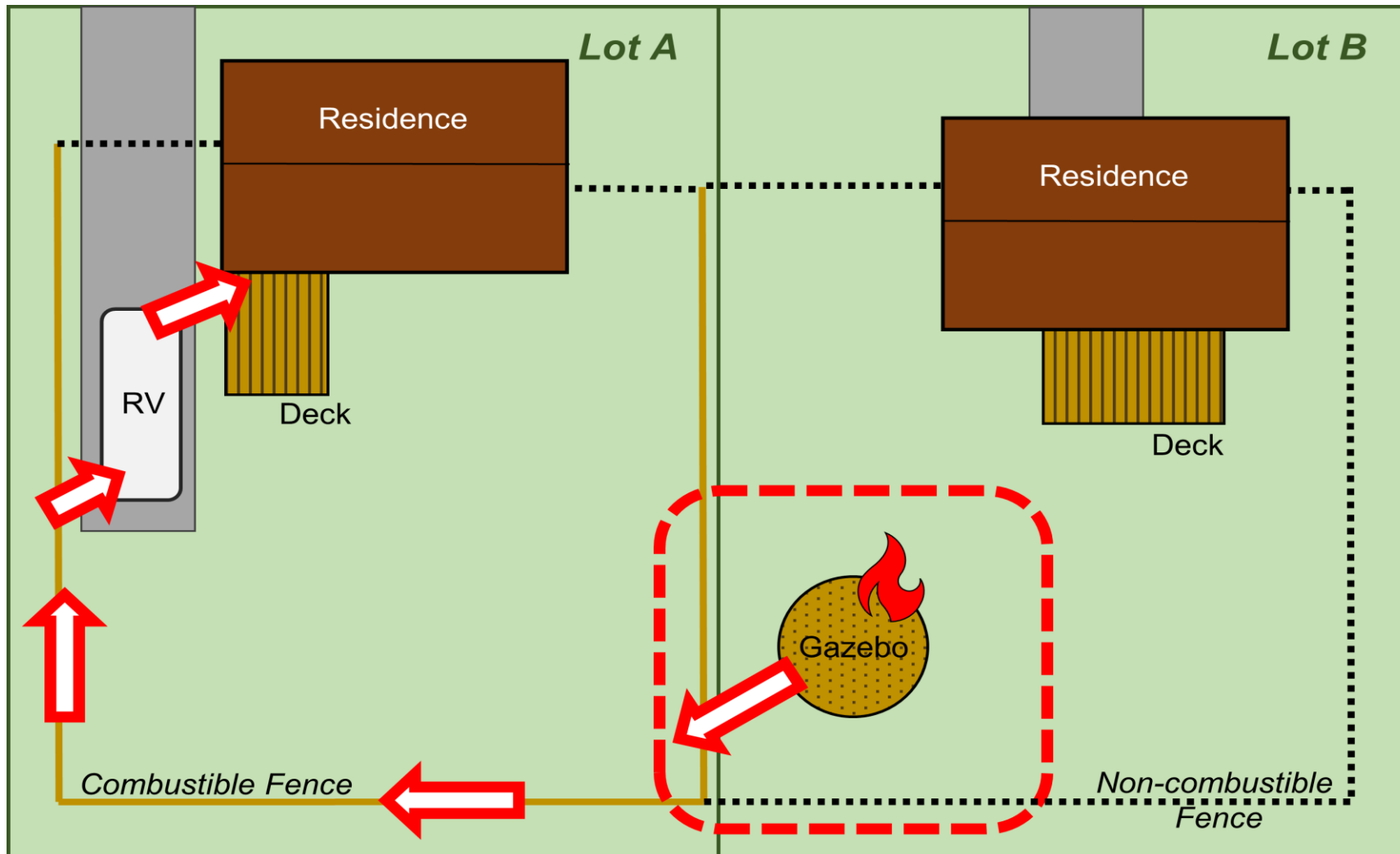
Hazard Mitigation Methodology

Fuel agglomeration has significant impact on energy release and fire spread



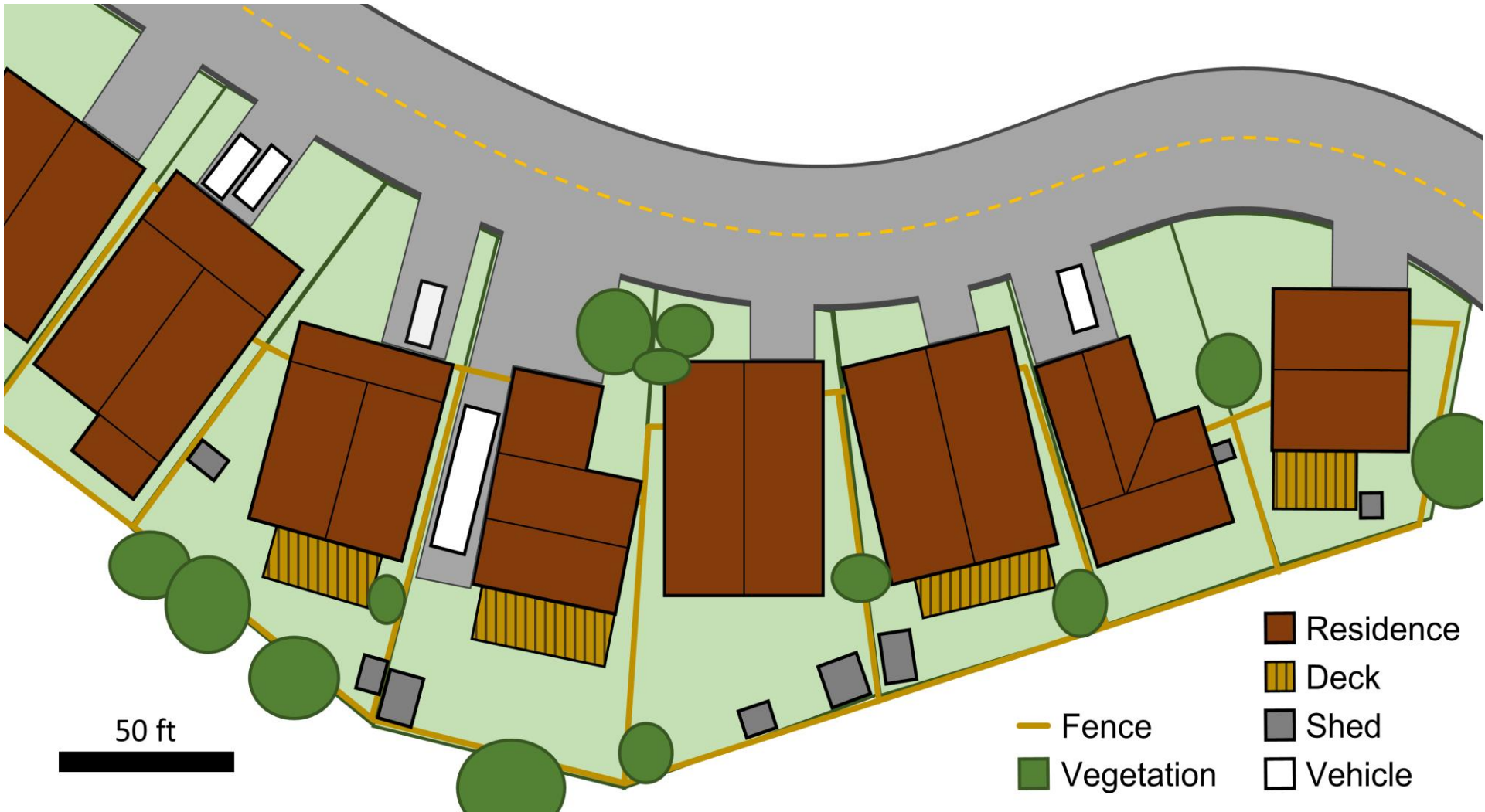
Hazard Mitigation Methodology

Fuel agglomeration has significant impact on energy release and fire spread



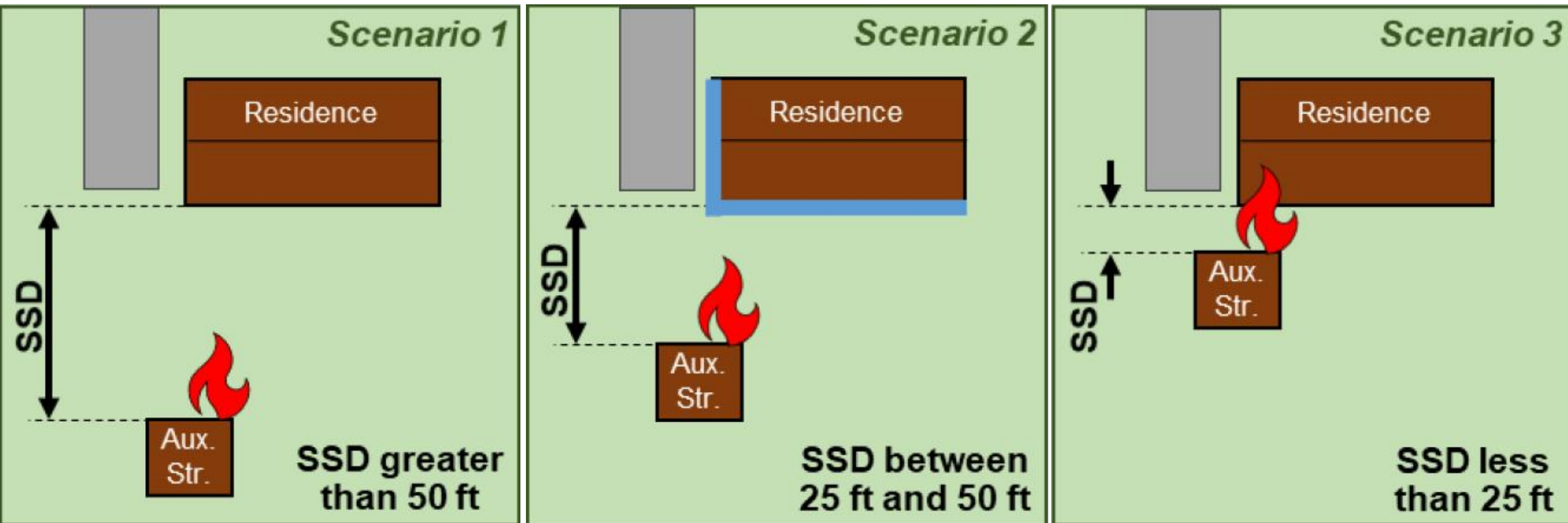
Hazard Mitigation Methodology

Fuel agglomeration has significant impact on energy release and fire spread



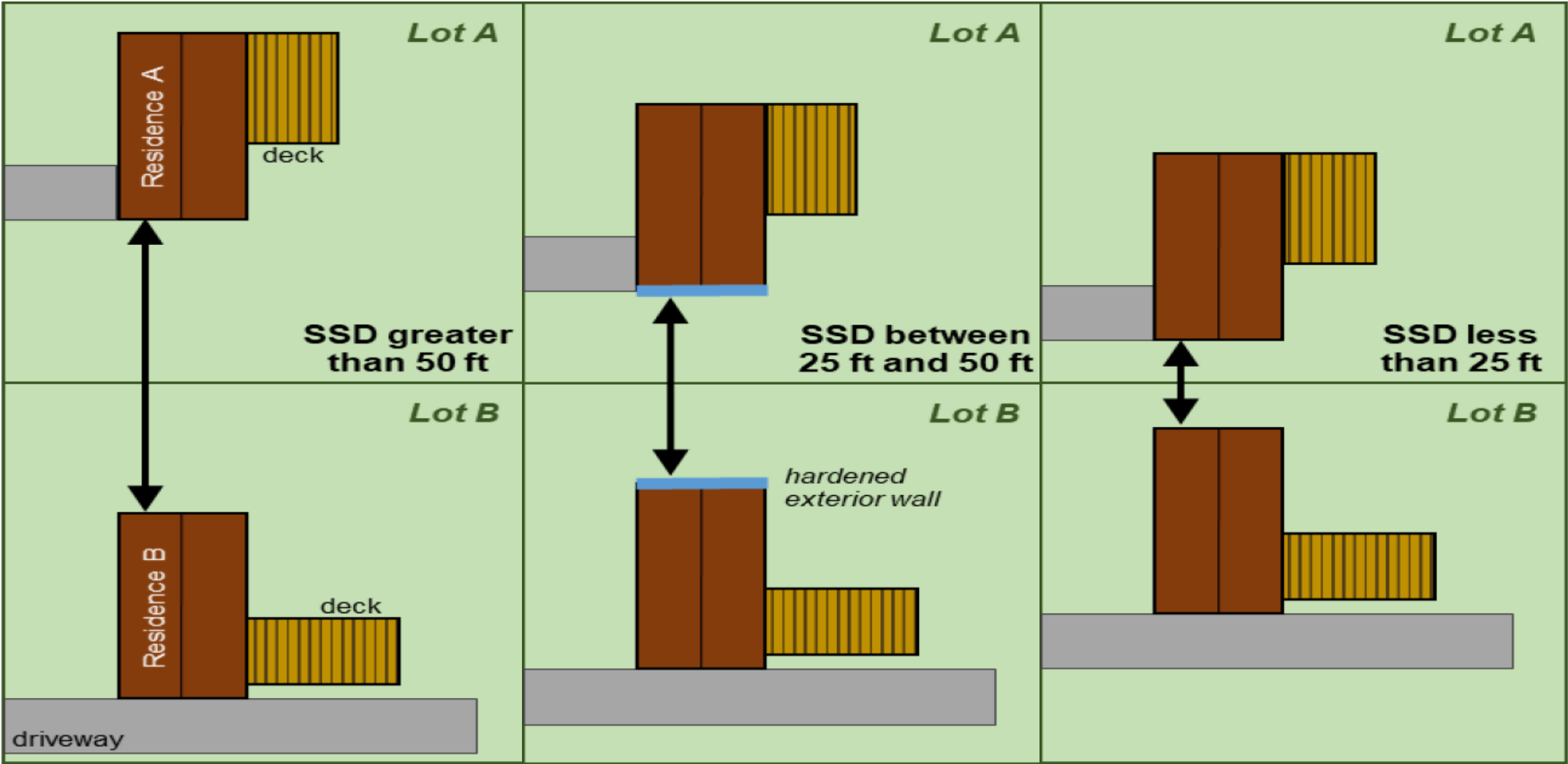
Hazard Mitigation Methodology

Fuel Spacing – Structure Separation Distance (SSD)



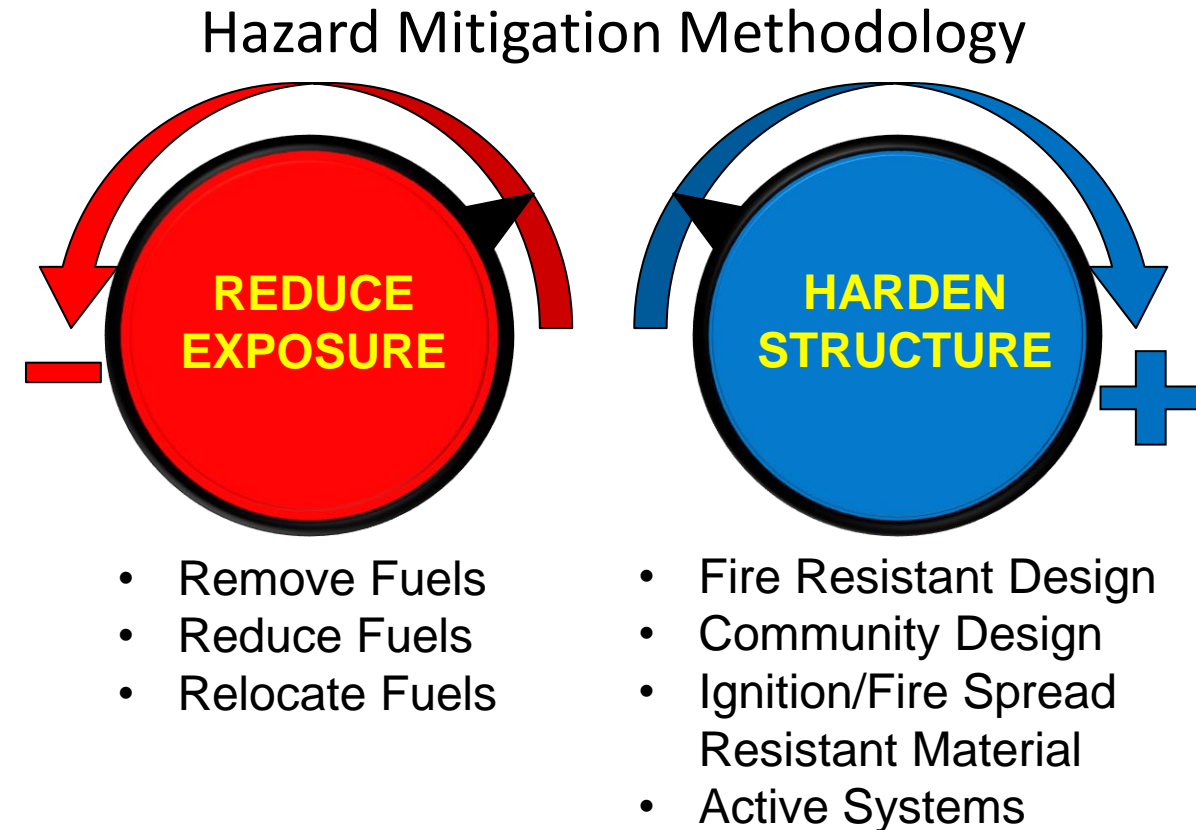
Hazard Mitigation Methodology

Fuel Spacing – Structure Separation Distance (SSD)



Hazard Mitigation Methodology

- Uncoupling the pathways of exposure
 - Land Use Planning
 - New communities
 - Pre-Fire Planning
 - Existing communities
 - Community WUI Fire Hazard Evaluation
 - New Home Construction
 - CBC Chapter 7A
 - Defensible Space
 - PRC 4291, GC 51182, local ordinance
 - Retrofitting Existing Structures
 - California Wildfire Mitigation Program



Defensible Space

Defensible space reduces the exposure to the structure from embers, direct flame contact, and radiant heat from burning vegetation and other nearby combustibles. Defensible space IS NOT 100' to bare soil.

Defensible space by itself DOES NOT guarantee that the structure will not burn during exposure to wildfire.

Home hardening / retrofitting the exterior materials and components of a home to be noncombustible or ignition-resistant is also critical.

It is the “coupled” approach of defensible space and home hardening that give the home the best chance of surviving a wildfire.

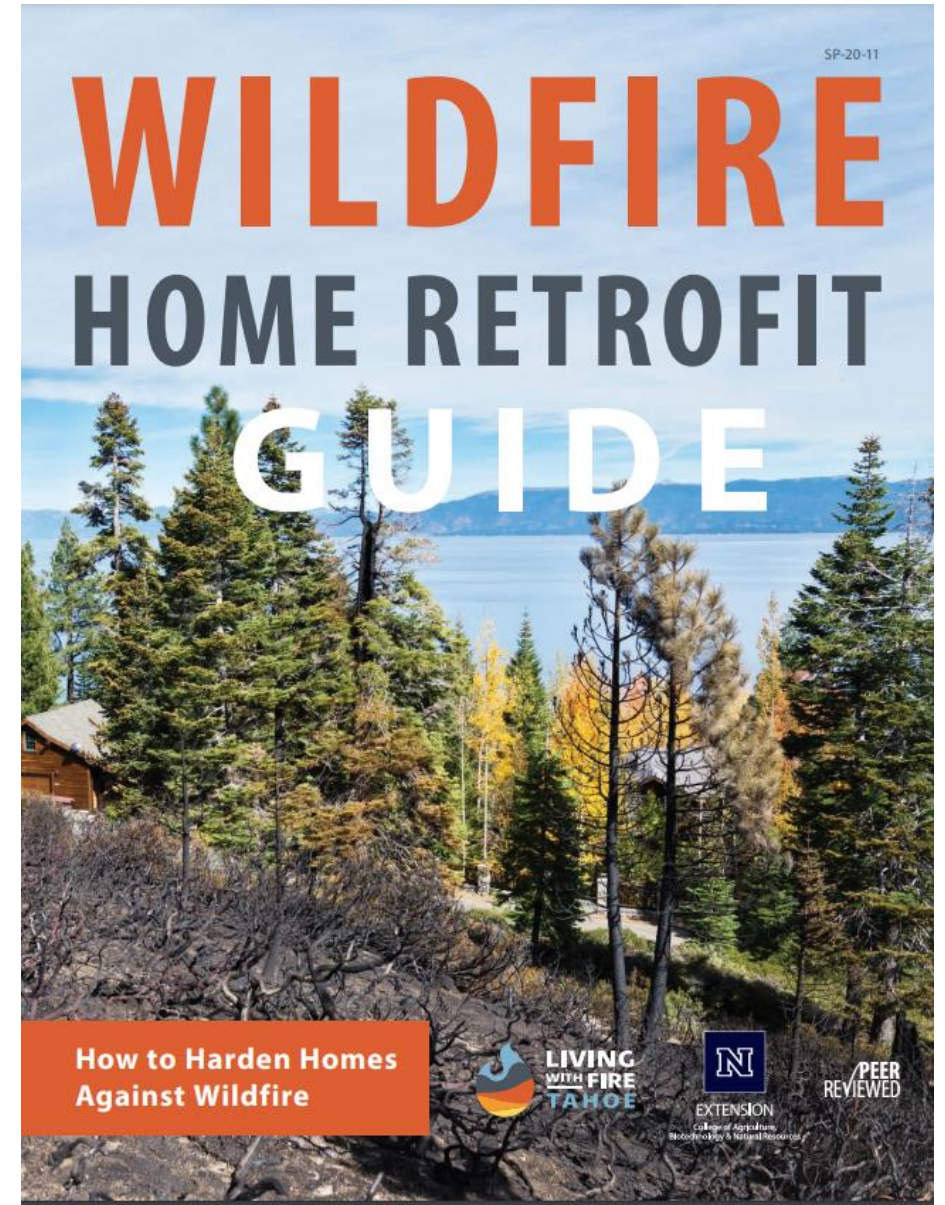
Defensible Space



Why 0-5'?

Retrofitting Existing Structures

- Retrofitting Existing Structures
 - [Wildfire Home Retrofit Guide](#)



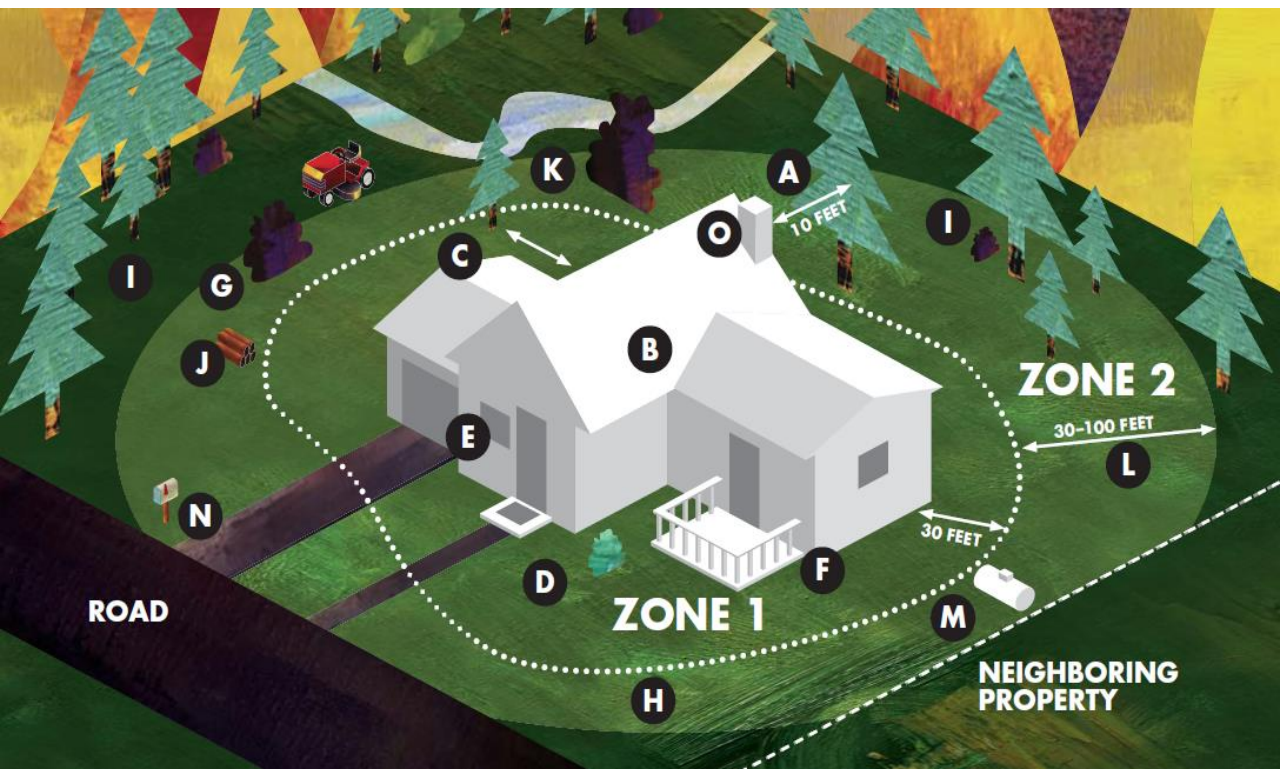
Retrofitting Existing Structures

Hardening a home from wildfire is a coupled approach including defensible space and retrofitting. They **MUST** be done together to give a home the best chance of surviving a wildfire.

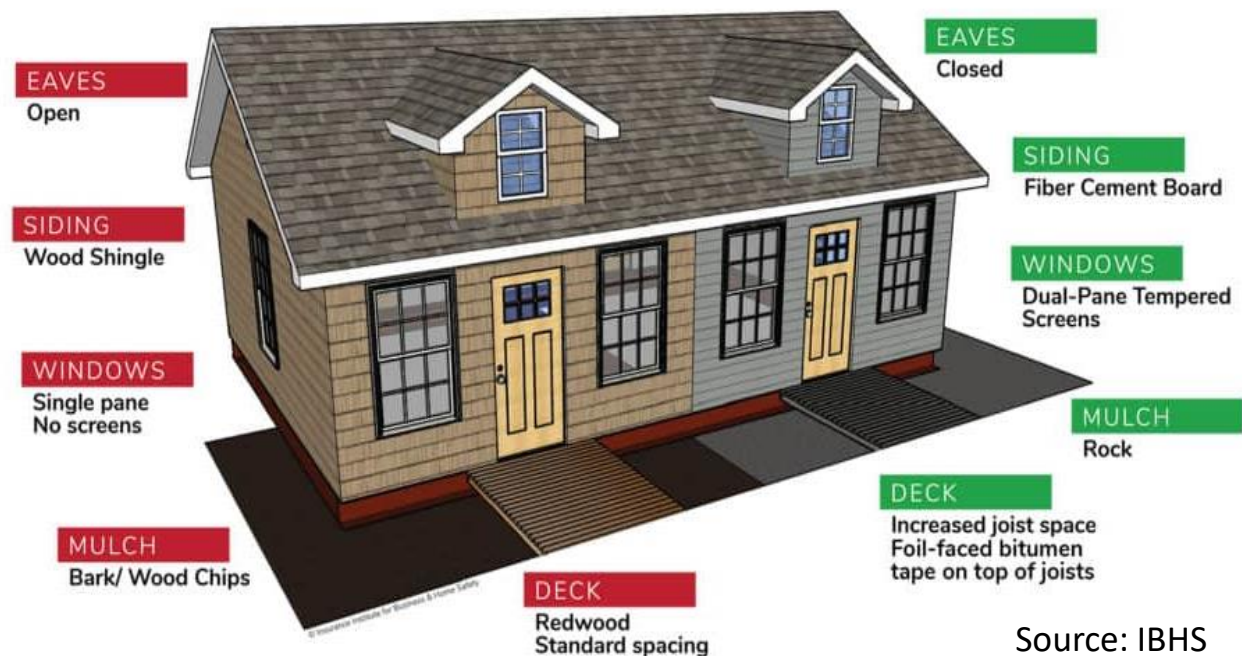
Defensible Space

AND

Home Hardening



Wildfire-Resistance: Make the **“RIGHT”** Choices



Source: IBHS

Insurance Institute for Business and Home Safety IBHS



- Wildfire Prepared Home
- <https://ibhs.org/wildfire-prepared-home/>

The End!

Thank You!!!

Staff Chief David Shew, Retired

CAL FIRE / Office of the State Fire Marshal

WILDFIRE DEFENSEWORKS

707-337-8046

dshew@wildfiredefenseworks.com