Lessons from the 2025 Los Angeles Wildfires

Home loss during wildfires occurs when part of a building ignites due to one or more of three wildfire exposures: 1) direct flame contact, 2) radiant heat, and 3) embers. Embers can ignite materials on or attached to the building, enter through vents or open windows, or ignite vegetation and combustible materials nearby, resulting in flames touching the building. Radiant heat from nearby burning materials can break windows or directly ignite portions of the building.

Post-fire studies and laboratory experiments offer essential information about how local construction and landscaping practices affect building and property vulnerabilities. Assessments following the 2025 firestorms in Los Angeles provide key information and add to the body of research following other destructive wildfires in California, Colorado, and Hawaii over the last decade.

Figure 1: Not all homes burned in the Eaton Fire footprint. In most cases, fire suppression activities were key to buildings surviving the fire.

Were there unique vulnerabilities in the homes in Altadena and Palisades?

In these communities, stucco or stucco-like products are the most common cladding, and are generally less vulnerable to fire. As a result, windows were the weak link in the Eaton and Palisades Fires. Radiant heat from adjacent burning buildings or landscaping broke windowpanes or deformed the glazing on vinyl windows, allowing the glass panes to fall out. A fire can enter once there are these kinds of openings in the building.

Many surviving homes had **dual-paned, tempered glass windows** and noncombustible siding. Dual-paned windows perform far better with radiant heat exposure than single-pane windows, which are common in buildings built before the 1970s (and in most homes in these fire footprints).

Figure 2: The Palisades Fire burned to the beach, taking many homes along the coast in its path. Some of the surviving buildings illustrated effective home hardening, such as having dual-paned tempered glass windows.

What can we learn from surviving homes?

Post-fire investigations often initially focus on the transition between burned and surviving homes to look for clues about what contributed to the building's survival or to learn details about the direction that the fire was traveling. Were there design elements or materials that were resistant to fire that made the difference in why

Figure 3: These woody shrubs likely contributed to the radiant heat damage that broke the window in this home. Implementing a 5-foot noncombustible perimeter (Zone 0) is best practice.

Figure 4: Fire personnel cut away the gate to keep the fire burning along the fence from reaching the house.

one building succumbed and the other did not? Or was there **someone who helped extinguish a fire** in the surviging building? Once a portion of a building ignites, it generally takes some form of human intervention to prevent further fire spread. In big conflagrations like the Eaton and Palisades Fires, where crews are spread thin, small interventions can be very effective. These may include removing fence panels to prevent the fire from traveling to the house, spraying water on burning vegetation, moving a burning door mat, or using an axe to cut away burning vegetation. **These actions largely contributed to homes surviving the 2025 Los Angeles Fires**. In the days and weeks following damaging fires, scientists and crews from CAL FIRE collect data to answer critical questions about whether there are signs of home hardening actions or defensible space in action. More detailed studies, such as those done by the National Institute of Standards and Technology (NIST), take much longer and involve reconstructing fire progression through in-person interviews, reviewing security camera footage, and extensive fieldwork.

Rebuilding considerations

Like a phoenix rising from the ashes, Los Angeles and other fire-affected areas can use what we've learned about home survival as a rebuilding blueprint for a more fire-resilient future. Fire mitigation and fire adaptation actions include the following:

- **Home hardening** is best incorporated at the beginning of the rebuilding process, considering the lot shape, slope, and size, building materials, the separation between buildings, the shape and complexity of the roof, and other important details that can better set up a structure for withstanding future wildfire exposures. In Los Angeles, where homes and outbuildings are close, consider using tempered glass windows; ignition-resistant materials on all structures, including outbuildings; and vents designed to resist flame and ember exposures. Many of these mitigations can be seen in the California Building Code Chapter 7A. It is best practice to use the guidance provided by Chapter 7A regardless of whether all of the rebuilding will be required to meet the standards. Additional considerations include creating at least 20 feet of separation between buildings; designing homes to have simpler roof designs and minimizing roof and wall intersections; enclosing eaves; and where lots have steeper slopes, placing the house away from the slope edge.
- **Landscaping and vegetation management should incorporate a 3-zone defensible space system**. Fuel for fire comes in many forms and includes trellises, gates, woody vegetation, wood mulch, vines, and wood and petroleum products to create garden beds. These items can act like a wick and allow fire to travel

to the house or be ignited by embers. When rebuilding, designing a 5-foot perimeter around the building and attached decks or stairs is the first defense against fire exposure.

- **Zone 0** is the 0 to 5-foot zone, which reduces the likelihood of structure ignition by reducing the potential for ignition of the structure from flame contact, by embers that accumulate at the base of a wall, and/or ignitions when embers ignite vegetation, vegetative debris or other combustible materials located close to the structure that result in either radiant heat and/or direct flame contact exposure to the structure. Zone 0 is the horizontal area within the first five feet around the structure, any outbuildings, attached decks, and stairs. It also includes the area under attached decks and stair landings. The zone should incorporate a 6-inch vertical area between the ground and the start of the building's exterior siding to be most effective. Zone 0 should be applied to all structures on the property. Where wood fences attach to structures, a noncombustible gate should be incorporated.
- **Zone 1** is the structure's 5- to 30-foot perimeter, where tree branches should be limbed up, planting groups separated into islands, and fire should have difficulty traveling between planting areas.
- **Zone 2 i**s the 30- to 100-foot perimeter, where trees and shrubs should be pruned to help reduce the flame height of an oncoming fire so fire personnel can safely work at the property and take defensive actions. In both the Eaton and Palisades fires, wildland fuels were commonly connected to the landscaping vegetation, allowing fire to travel to the structures easily.

Figure 5: California's 3-zone defensible space system is critical for fire mitigation.

Figure 6: Radiant heat damaged this window. Note the vinyl glazing is deformed. In some cases radiant heat led to window panes breaking or falling from the frame.

What about retrofitting a home?

Homes can be effectively **updated and retrofitted to mitigate future wildfire exposure.** At the top of the priority list are three items: having a well-maintained **Class A roof** (see Chapter 7A), upgrading **vents** to have 1/8 metal mesh or installing Chapter 7A compliant vents that resist both flames and embers, and creating **Zone 0** around all structures. Over time, when buildings are less than 20 feet away from each other, upgrade windows to double-paned tempered glass or incorporate metal shutters.

- **Break the pathways**: Plants, wood fences, and bender boards that define planting areas create beauty, but fire can follow these items to the structure. When a yard includes these elements, ensure they are not linked in a way that fire can follow them like a wick to structures. Replace wood gates that attach to the house with metal. Plants should be placed into groups or islands separated from the house and each other. Trim tree branches to prevent fire from climbing from the ground to the top tree.
- **Prevent radiant heat exposure**: Every building can be a vector or a future radiant heat source. It is essential to take care of all buildings, even if they have little financial value. For example, an ignited garden shed near the house can become a heat source to the home. Create Zone 0 for all structures, especially when they are within 20 feet of each other.

Conclusions

The Eaton and Palisades fires provide further urgency to retrofit existing structures to match the wildfire exposures of the last decade and to rebuild Los Angeles and other fire-impacted areas to a better standard. The good news is that research has demonstrated that by careful attention to 1) the selection, location, and maintenance of vegetation and other combustibles on the property (i.e., the defensible space on the property), 2) implementing retrofits to "harden" the home, and 3) implementing an ongoing maintenance program, it is possible to substantially improve the odds that a home will survive a future wildfire. These actions do not have to be costly, but they require understanding the three types of exposures a home will experience when threatened by a wildfire.

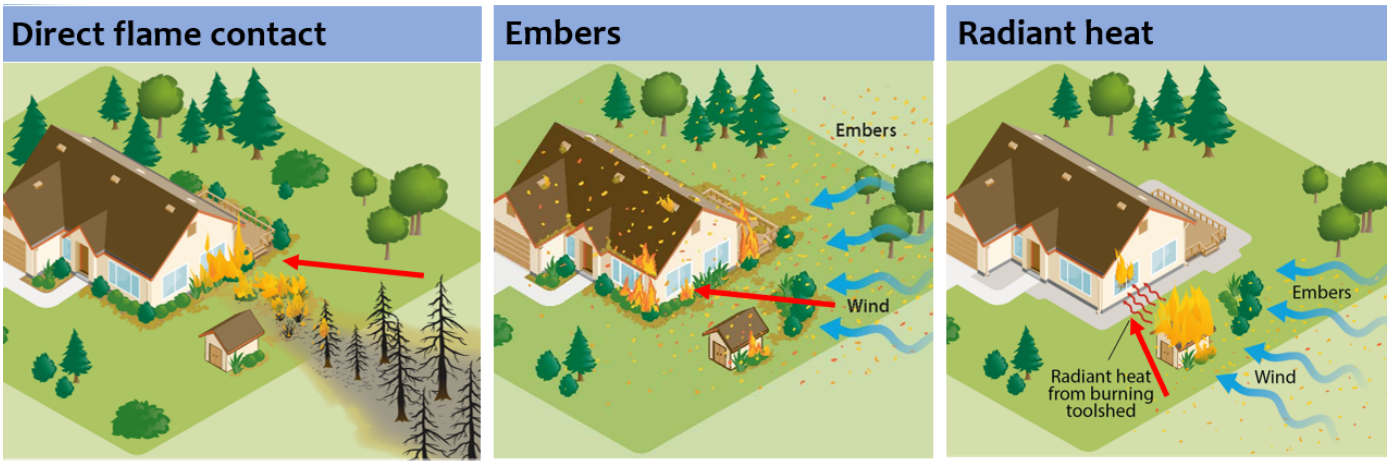

Figure 7: Fire mitigation is most effective when consideration is given to these three types of fire exposure.

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