Photo: Institute for Business and Home Safety

Zone 0

For enhanced defensible space as directed by AB 3074 (2020) and SB 504 (2024)

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Fire Network- ***Community Resiliency and Built Environment***

What does AB 3074 (2020) require?

- Create an **ember-resistant zone within 5 feet of the structure**, based on regulations promulgated by the State Board of Forestry and Fire Protection
- On or before **January 1, 2023**, the State Board of Forestry and Fire Protection, in consultation with the Department of Forestry and Fire Protection, shall update the **guidance document** to include suggestions for creating an ember-resistant zone within five feet of a structure based on regulations promulgated by the State Board of Forestry and Fire Protection, in consultation with the Department of Forestry and Fire Protection, to **consider the elimination of materials in the ember-resistant zone that would likely be ignited by embers**.
- For purposes of this section, **a structure for the purpose of an ember-resistant zone shall include any attached deck.** This section does not limit the authority of the State Board of Forestry and Fire Protection or the Department of Forestry and Fire Protection to require the removal of fuel or vegetation on top of or underneath a deck pursuant to this section.
- (2) (A) The requirement for an ember-resistant zone pursuant to Section 51182 **shall not take effect for new structures until the State Board of Forestry and Fire Protection updates the regulations**, pursuant to paragraph (1) of subdivision (a) of Section 51182, and the guidance document, pursuant to paragraph (2) of subdivision (c) of Section 51182.
- (B) The requirements for an ember-resistant zone pursuant to Section 51182 **shall take effect for existing structures one year after the effective date for the new structures**.

SB 504 (2024)

- **51182.**
- (a) A person who owns, leases, controls, operates, or maintains an occupied dwelling or occupied structure within a very high fire hazard severity zone designated by the local agency pursuant to Section 51179, shall at all times do all of the following:
- (1) (A) Maintain defensible space of 100 feet from each side and from the front and rear of the structure, but not beyond the property line except as provided in subparagraph (B). The amount of fuel modification necessary shall consider the flammability of the structure as affected by building material, building standards, location, and type of vegetation. **Fuels shall be maintained and spaced in a condition so that a wildfire would be unlikely to ignite the structure.** This subparagraph does not apply to single specimens of trees or other vegetation that are well-pruned and maintained so as to effectively manage fuels and not form a means of rapidly transmitting fire from other nearby vegetation to a structure or from a structure to other nearby vegetation or to interrupt the advance of embers toward a structure. The intensity of fuels management may vary within the 100-foot perimeter of the structure, with more intense fuel reductions being used between 5 and 30 feet around the structure, and an ember-resistant zone being required within 5 feet of the structure, based on regulations promulgated by the State Board of Forestry and Fire Protection, in consultation with the Office of the State Fire Marshal, to consider the elimination of materials in the ember-resistant zone that would likely be ignited by embers. **The regulations may also alter the fuel reduction required between 5 and 30 feet to integrate the ember-resistant zone into the requirements of this section.** Consistent with fuels management objectives, steps should be taken to minimize erosion, soil disturbance, and the spread of flammable nonnative grasses and weeds.

SB 504 continued

- (2) On or before January 1, 2023, the State Board of Forestry and Fire Protection, in consultation with the Office of the State Fire Marshal, shall update the guidance document to include suggestions for creating an ember-resistant zone within five feet of a structure based on regulations promulgated by the State Board of Forestry and Fire Protection, in consultation with the Office of the State Fire Marshal, to consider the elimination of materials in the ember-resistant zone that would likely be ignited by embers. Existing and new structures shall meet the same standard for the ember-resistant zone, but regulations shall allow the staging of work for existing structures to support implementation of the ember-resistant zone and address the costs of compliance.

AB 3074 and SB 504 Takeaways

- Gives authority to address defensible space standards in both the SRA and LRA
- The Board should work in consultation with OFM to develop the Zone 0 regulations
- Defensible space applies to all fire weather conditions
- Zone 0 is intended to address embers
- New and existing structures shall meet the same standards
- Existing structures have 3 years to meet the standards and there is support for phasing in the work

Status and timeline update

- Board of Forestry and Fire Protection has a **committee** focused on Zone 0 (three members that include the Board's chair)
  - Monthly meetings since March 2025
  - Thousands of public comments
- Paused in December for work on the economic analysis and the guidance document, expect an update in **March and public meetings in April and May**.
- We anticipate a **final version** this spring that will support trees in Zone 0 (with ladder fuels managed), remove wooden combustibles (gates and mulch), and address vegetative fuels.

Zone 0 Experiments:

What's a hedge got to do with it?

Michael Gollner, Wuquan Cui, Mitchell Huffman (UC Berkeley)
Dave Winnacker (Berkeley Fire Department)
Yana Valachovic, Jessie Godfrey, Bruno Pitton (UC ANR)

With support from:

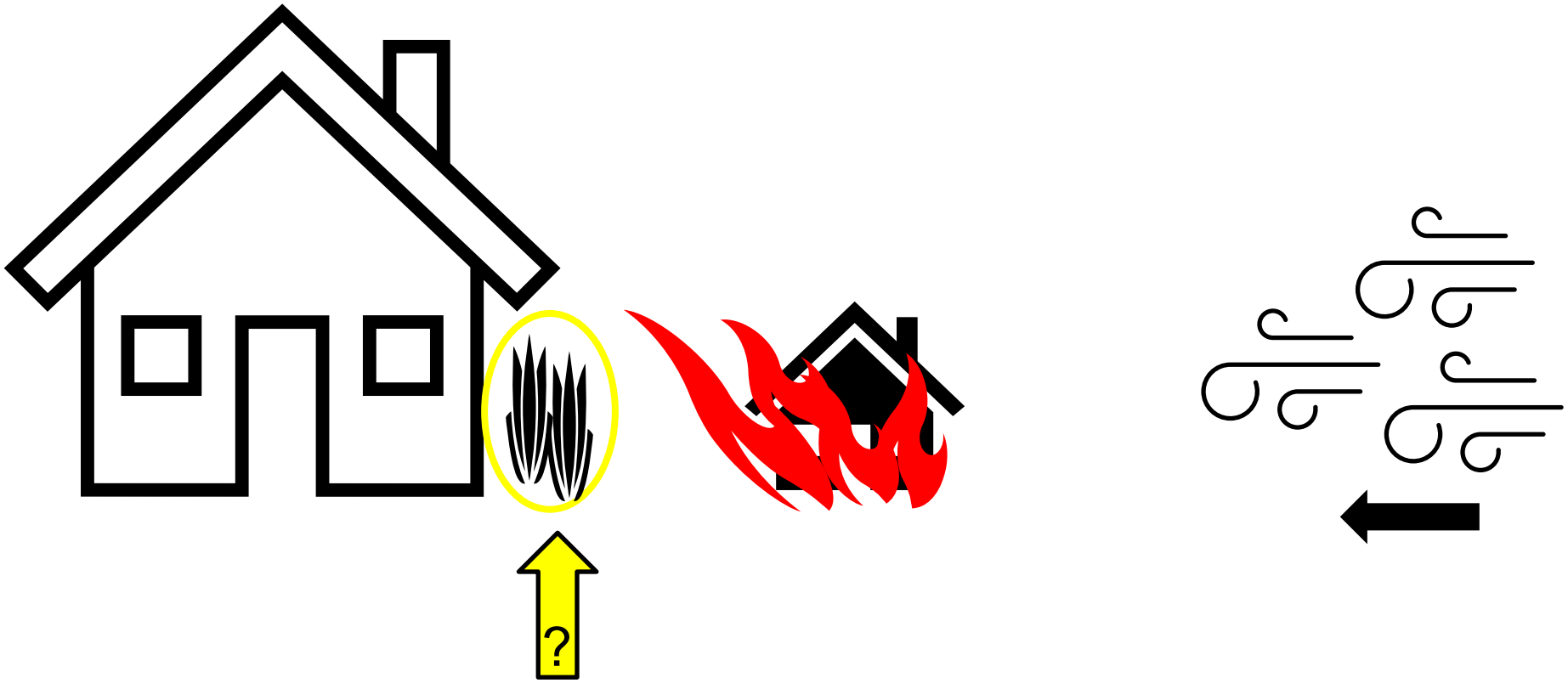
GORDON AND BETTY MOORE FOUNDATION

UC ANR

Berkeley Fire Research Lab
MECHANICAL ENGINEERING

Recent plant flammability test in California with a broadleaf hedge

- Do foundation plantings buffer the structure from the radiant heat of a small burning shed exposed to a 15-mph wind?



Experiment Design and Key Points

- **Three treatments, four replicates:**
  - No plants
  - Hydrated, healthy or “wet” plants placed in front of the wall
  - Stressed “dry” plants placed in front of the wall (still visibly green and pliable)

- **Fuel** was dried wooden pallets (4’ tall x 8’ wide, 4’ deep), with 15 mph winds, 10 feet apart from a 16-foot-wide instrumented, fireproof target wall with 18” eaves.

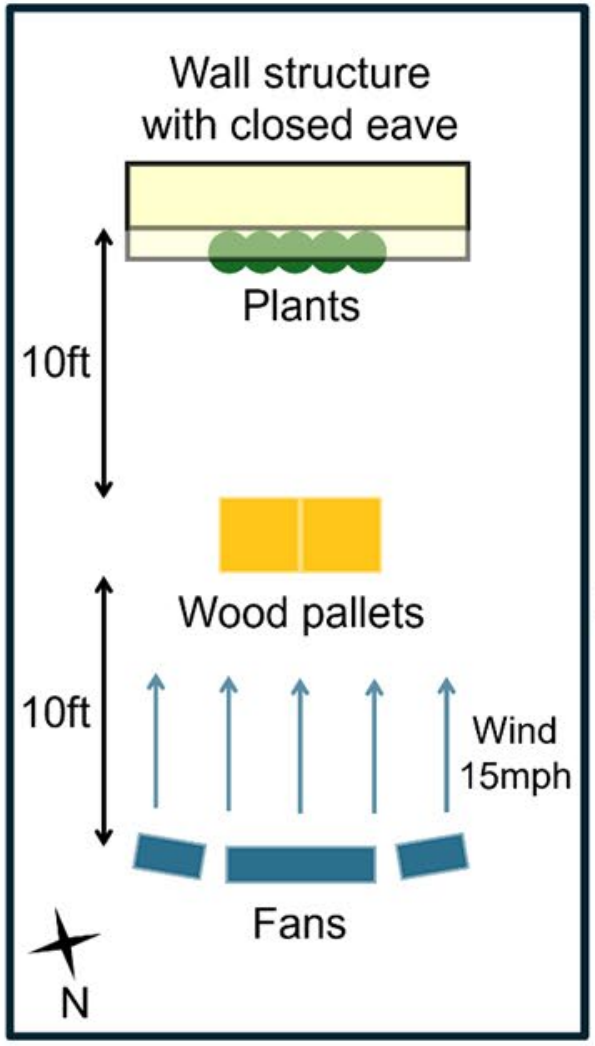
- Flame lengths approached but did not sustain contact with vegetation or the wall.

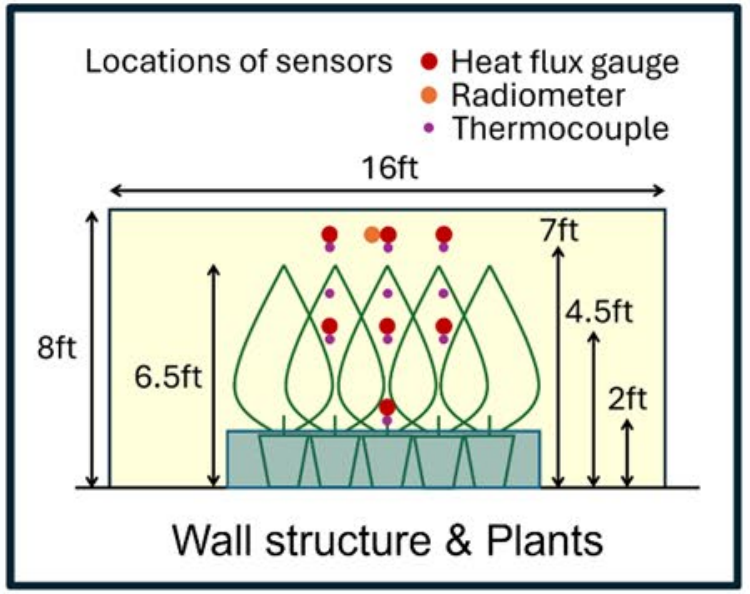
- **Average sustained heat fluxes** to the wall ranged from 20 - 40 kW/m2 for 3-4 minutes.
  - These heat fluxes are within the range of those observed from a fully involved structure about 10’ apart without wind. [Gorham et al. 2025]

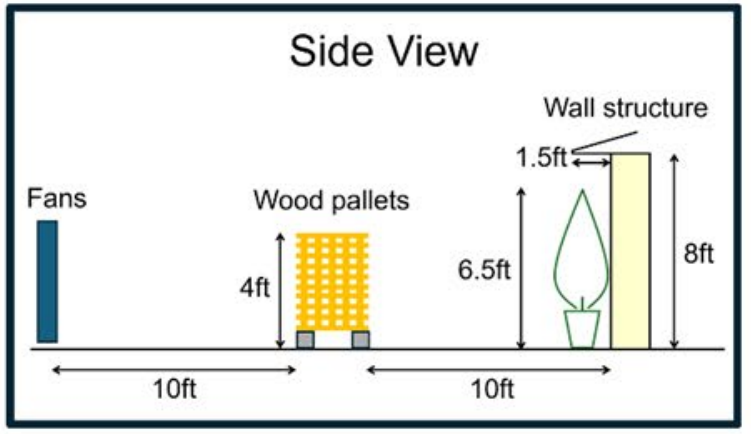
Gorham, Daniel J., Joseph M. Willi, and Gavin P. Horn. "Residential Exterior Wall Reaction to Post-Flashover Compartment Fires." *Fire and Materials* (2025).

Experimental Design

We used a non-flammable structure to observe heat flux at the wall to avoid rebuilding the structure for each replicate and to have a quantitative measure of heat exposure.







Take home points, comparison to other work

- In our study, we found that any potential **buffering by a healthy, well-hydrated** woody shrub 5 feet tall and adjacent to structures was 1) **temporary** and 2) **overcome** by accumulated heat exposure and ignition of the adjacent plant.

- Plants in either a healthy, well-hydrated, or a stressed condition were observed to ignite at 15 mph wind speeds with fire exposures mimicking an adjacent burning structure in **less than 2 minutes**

Take home points- Plant conditions, age factor

- The healthy plant tested in this experiment was in the best condition possible
- Plants were young, vigorous, and thin.
- No surface fuels or dead materials
- An older maintained plant would still have vulnerable places for embers or flame contact

Photos Jessie Godfrey

Take home points- Plant flamability in relation to a building

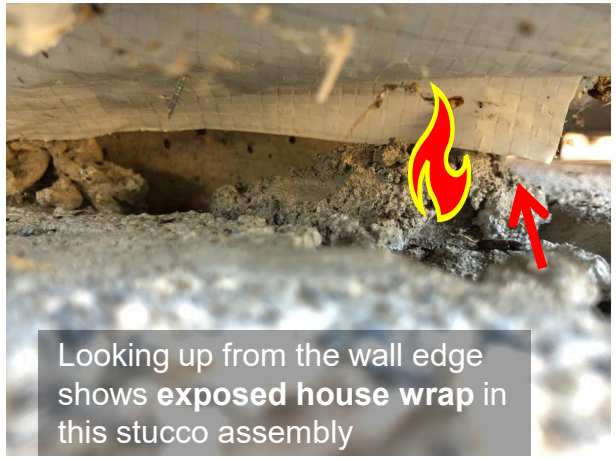
- We need a standard testing protocol for plants in Zone 0.
- What exposure scenarios should be tested?
  - Under what **weather** conditions (humidity, temperature, wind velocity)?
  - For what **types of buildings** (siding type, location of and type of window, age of building, level of maintenance, etc.)?
  - What **fire exposure** scenarios (radiant heat, direct flame contact, embers)?
- California does not have a testing facility to evaluate plants, building materials, and fire exposures


Embers can be blown in, forming a vortex.
Embers can also be generated from the near-building combustibles.
Ignition of combustibles at the base of the wall is a significant vulnerability
A firefighter works to put out spot fires from embers
Source: LA Times

Base of wall vulnerabilities

Best scenario: a 6-inch elevated perimeter foundation, with metal base flashing, and noncombustible cladding.

Common vulnerabilities



Looking up from the wall edge shows **exposed house wrap** in this stucco assembly

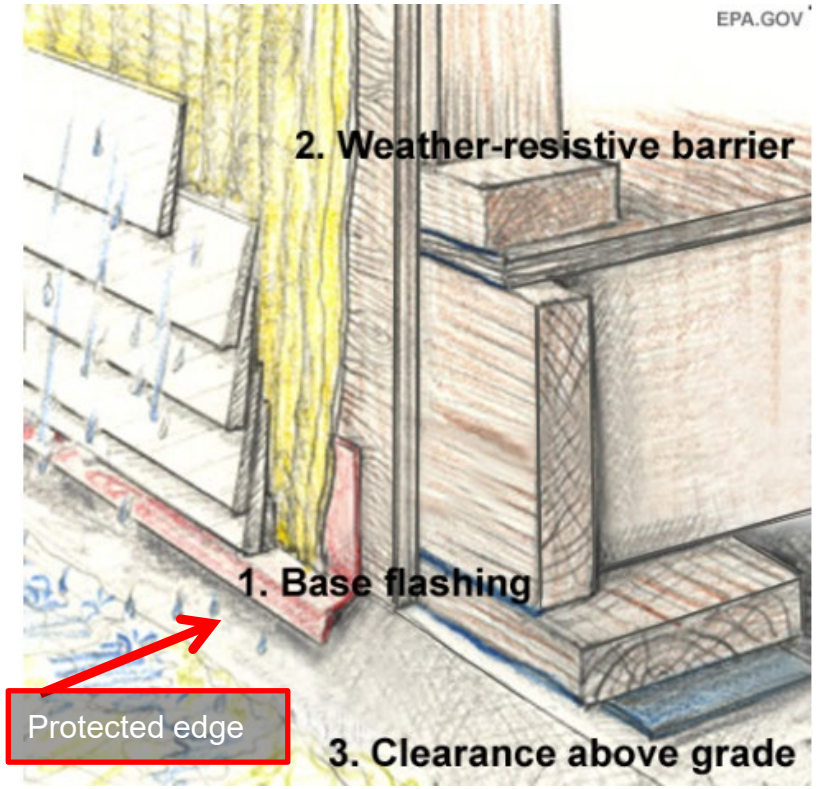
Stucco assembly concerns:

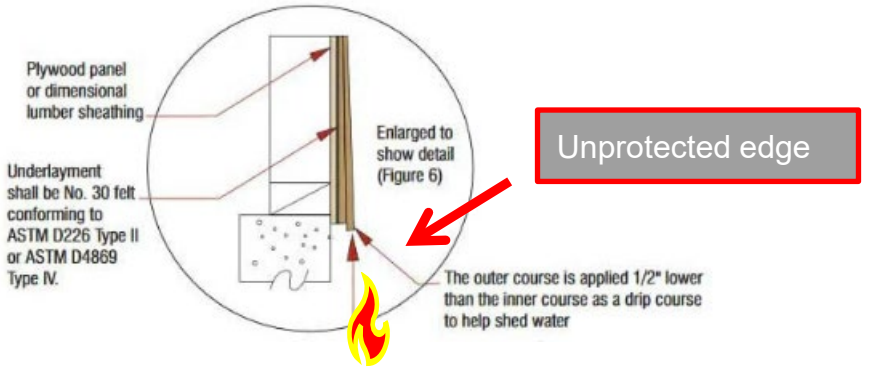
- No base flashing present = unprotected edge
- Combustible house wrap is exposed at the base of the wall,
- Fire may get behind the stucco

Wood cladding concerns:

- The baseplate is wood
- Unprotected wood shingle edge
- Ignition of the wood siding and wood baseplate may occur

Wall assembly details





Under eave-vulnerabilities

Issues:

- Heat and flames can become trapped under the eave.
- Embers can be caught.
- Exposed rafters and open eave construction commonly have gaps and openings where embers or flames can penetrate.

Solutions:

- Use ignition-resistant or noncombustible construction materials to “box-in” the eave.
- Upgrade vents to resist flames and embers
- Reduce near-to-building combustibles to prevent flames in this area.

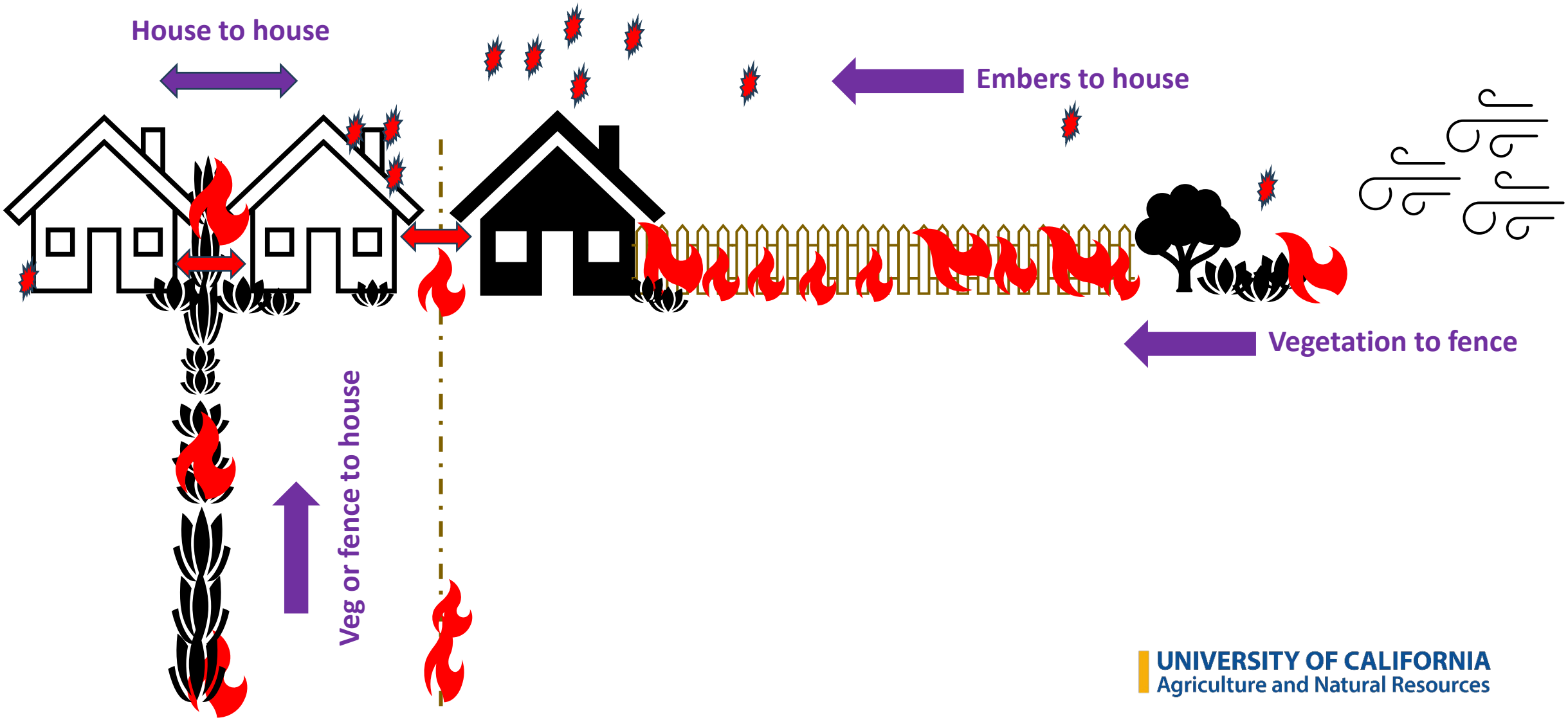
Open eave, freeze block vents

Soffited-eave, strip vents

Photos: Steve Quarles

Comparison of ladder fuels

Fire pathways and transitions



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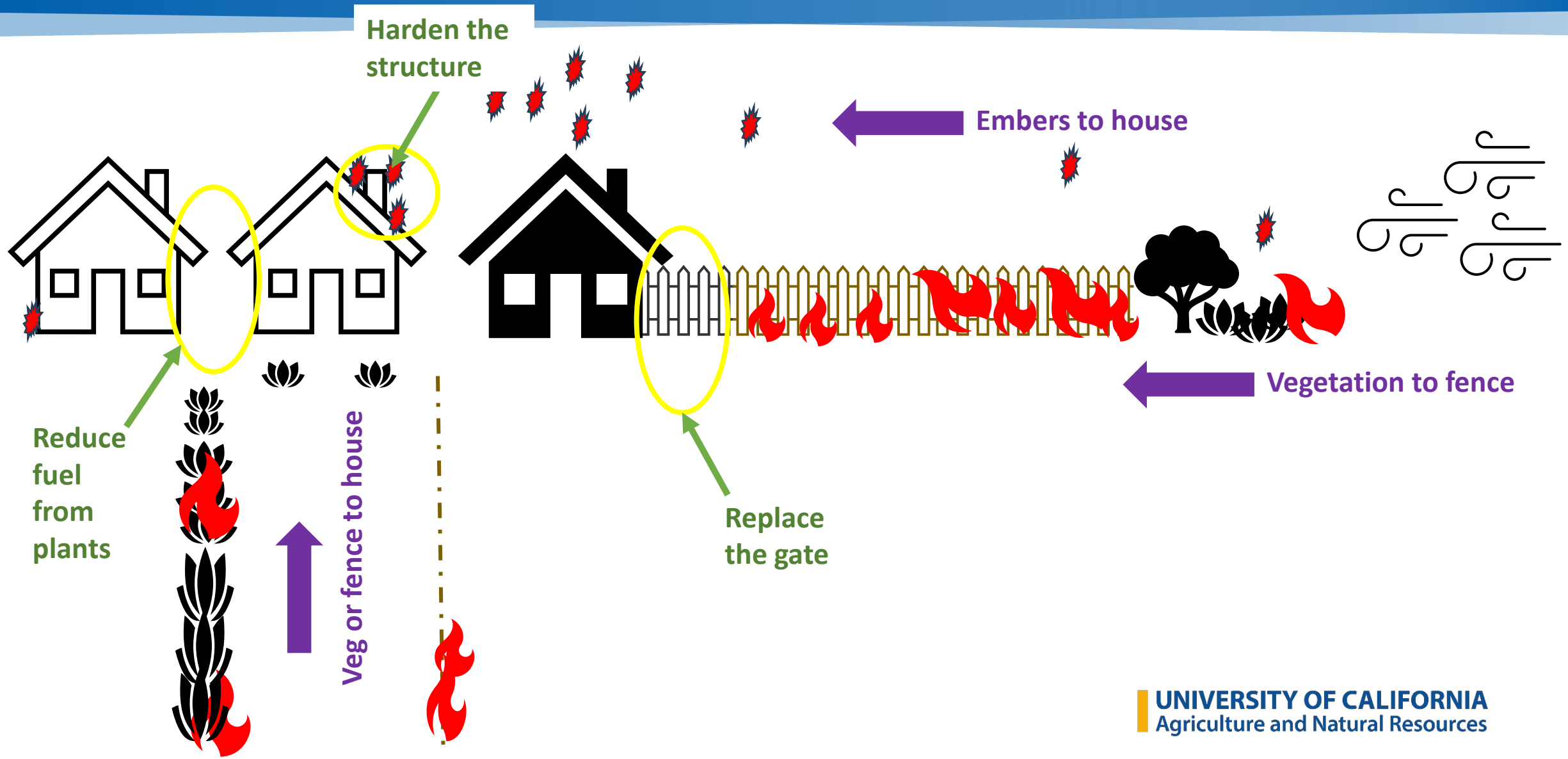
Fire pathways and transitions- how to break the wick



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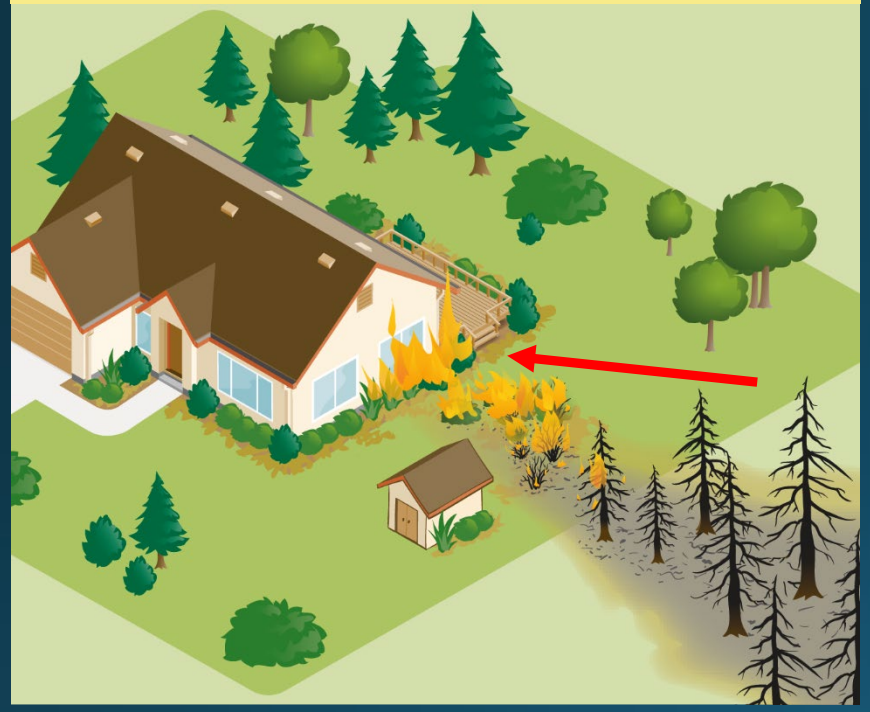
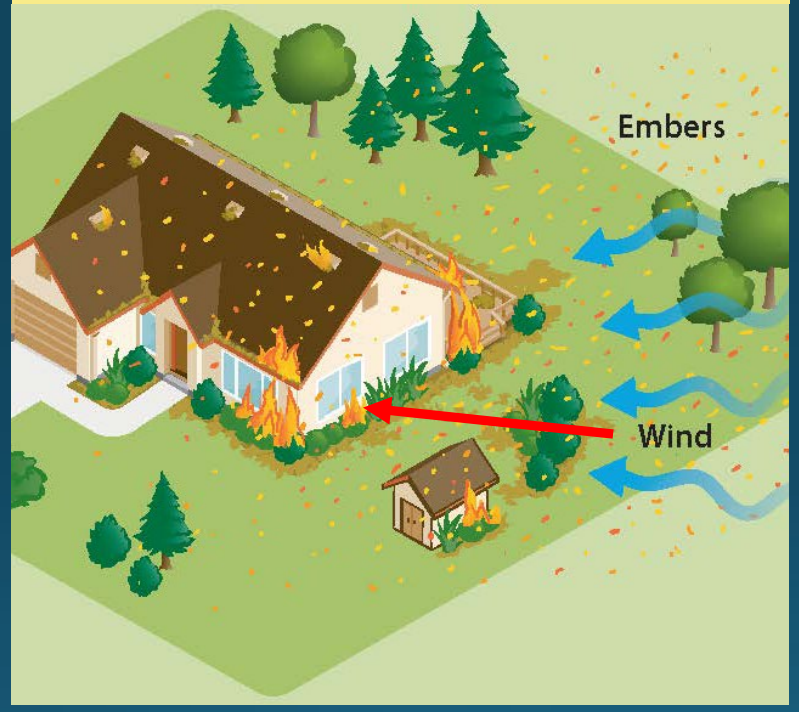
Three types of fire exposures

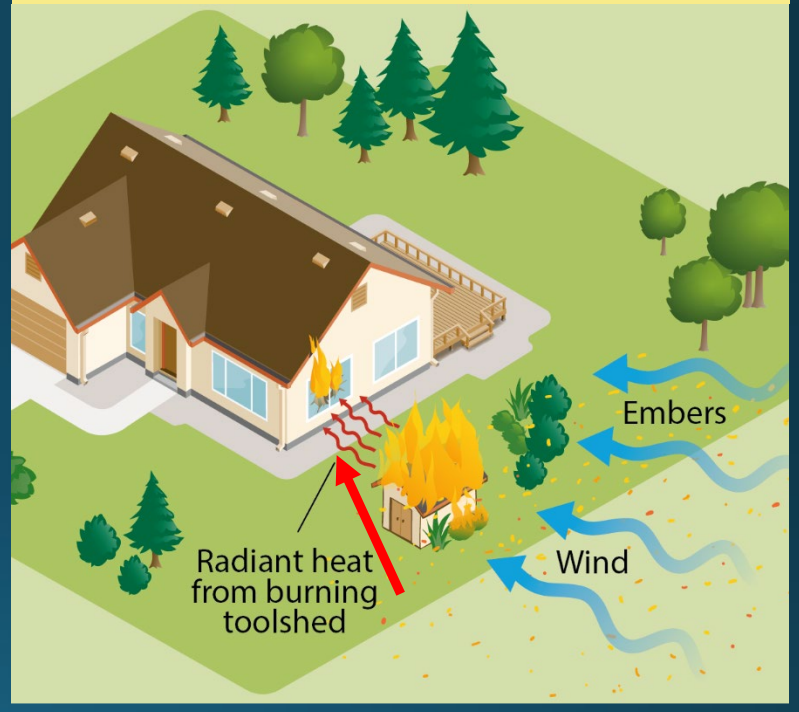
Direct flame contact



Embers



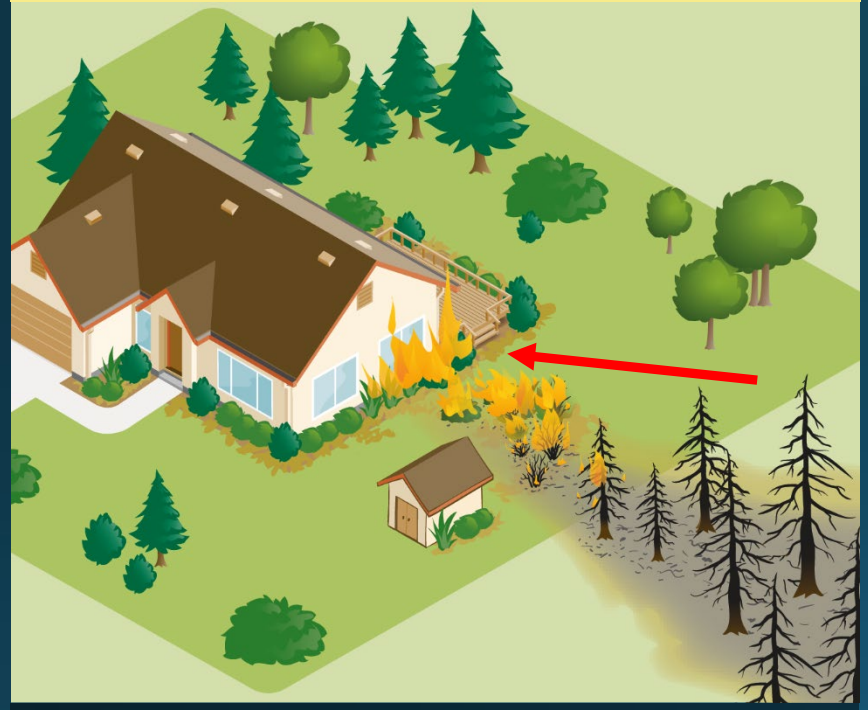
Radiant heat



- Defensible space strategies have focused on how to reduce <u>direct flame contact.</u>
- **Preparing for embers and radiant heat exposures takes a different approach**.

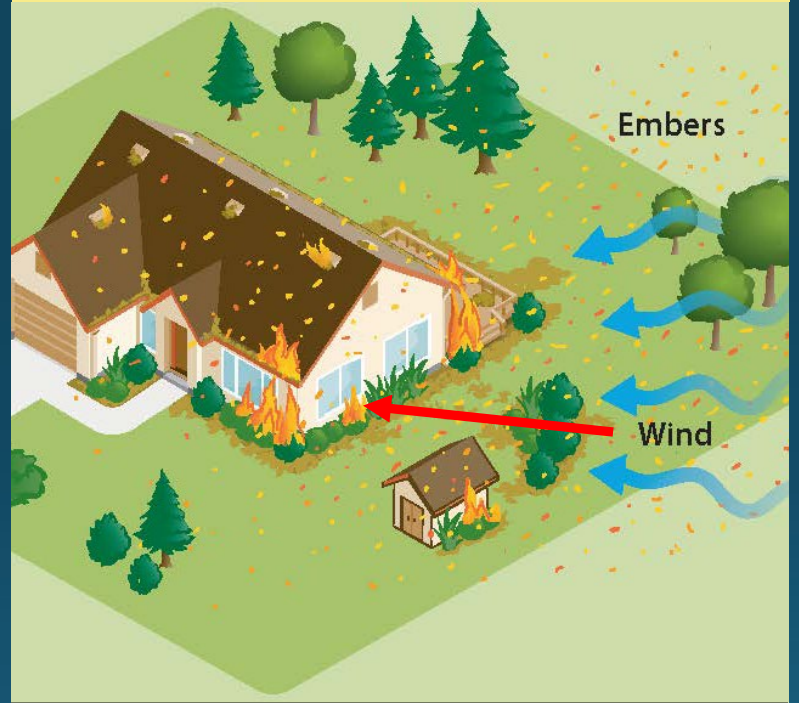
Techniques to reduce pathways

Direct flame contact



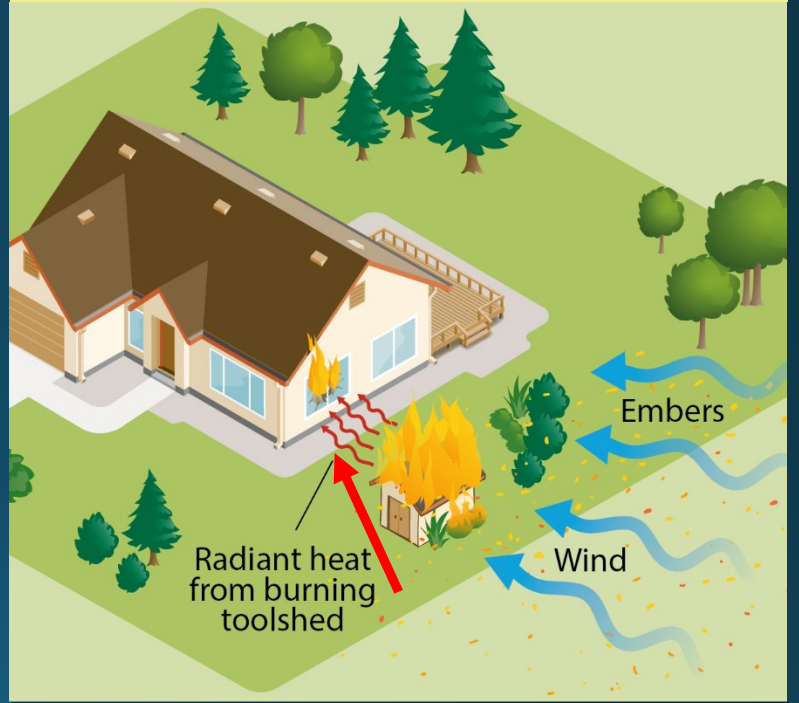
Defensible space implementation interrupts fire pathways and reduces the potential for direct flame contact

Embers



Home hardening with defensible space can help mitigate ember exposure

Radiant heat



Home hardening and fuel reduction can address potential radiant heat exposure

Purpose- Zone o

Zone o is the o-5’ perimeter of the building and attached decks

Zone 0 reduces the likelihood of structure ignition by reducing the potential for **direct ignition of the structure from flame contact**, by **embers that accumulate at the base of a wall**, and/or indirect ignitions when **embers ignite vegetation, vegetative debris or other combustible materials located close to the structure that result in either a radiant heat and/or a direct flame contact** exposure to the structure.

Zone 0 is the **horizontal area within the first five feet around the structure and any outbuildings and attached decks, and stairs**. The zone also includes the **area under attached decks and stair landings**. To be most effective, the zone should incorporate a **6-inch vertical area** between the ground and the start of the building’s exterior siding.

Zone 0 is a critical component of structure defense and, when coupled with Zones 1 and Zone 2, is essential to defensible space.

Purpose- Zone 1

Zone 1 is the 5-30’ perimeter of the building and attached decks

Zone 1 reduces the likelihood of fire burning directly to the structure.

This is accomplished by modifying fuels and creating a discontinuity between planting groups that limits the pathways for fire to burn to the structure and reduces the potential for near-to-building ember generation and radiant heat exposures.

An additional purpose of this zone is to provide a **defendable zone** for fire personnel to stage and take direct action

Purpose- Zone 2

Zone 2 is the 30-100' perimeter of the building and attached decks, or to the edge of the property line

Zone 2 actions are designed to reduce the potential behavior of an oncoming fire in such a way as to drop an approaching fire from the crown to the ground.

Fuel modification includes removing dead vegetation and reducing living vegetation to **eliminate fuel ladders and create vegetation separation** between individual or islands of trees or shrubs.

These vegetation modification requirements are more significant for those properties with **steeper terrain, larger and denser fuels, highly volatile fuels, and areas subject to frequent fires**.

Additional **benefits** of the Zone 2 include facilitating direct defense actions, improving the function of Zones 0 and 1 by reducing the flame heights, and the potential for ember generation and radiant heat exposure to structures.