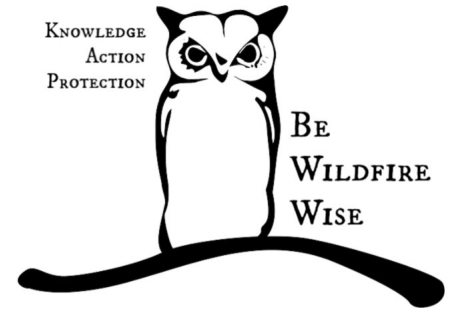


# FIRE-RESILIENCY: Hardening Your Home and Creating Defensible Space

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GEORGETOWN DIVIDE  
FIRE SAFE COUNCIL





# Wildland Urban Interface (WUI)

- WUI = zone of transition between wilderness and land more heavily developed for human activity
  - built environment meets / intermingles with the natural environment
- Are wildland urban interface disasters inevitable?
- Greater risk from wildfires from two sources
  - wildfire flames
  - embers

# Becoming Fire-resilient

- A home must be **ember-ignition resistant** to withstand the exposure to blown-in embers.
- The landscape around the home needs to protect from embers, not be a source of them.
- For maximum wildfire protection for your home, a combination of:
  - Utilizing appropriate building materials (**home hardening**), and
  - Near-home vegetation management, aka **defensible space**

# Becoming Fire- resilient

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Ember exposure during a wildfire means you cannot ignore building material and design considerations.

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If you ignore your defensible space, the wildfire will produce maximum ember, flame, and radiant heat exposure to your home.

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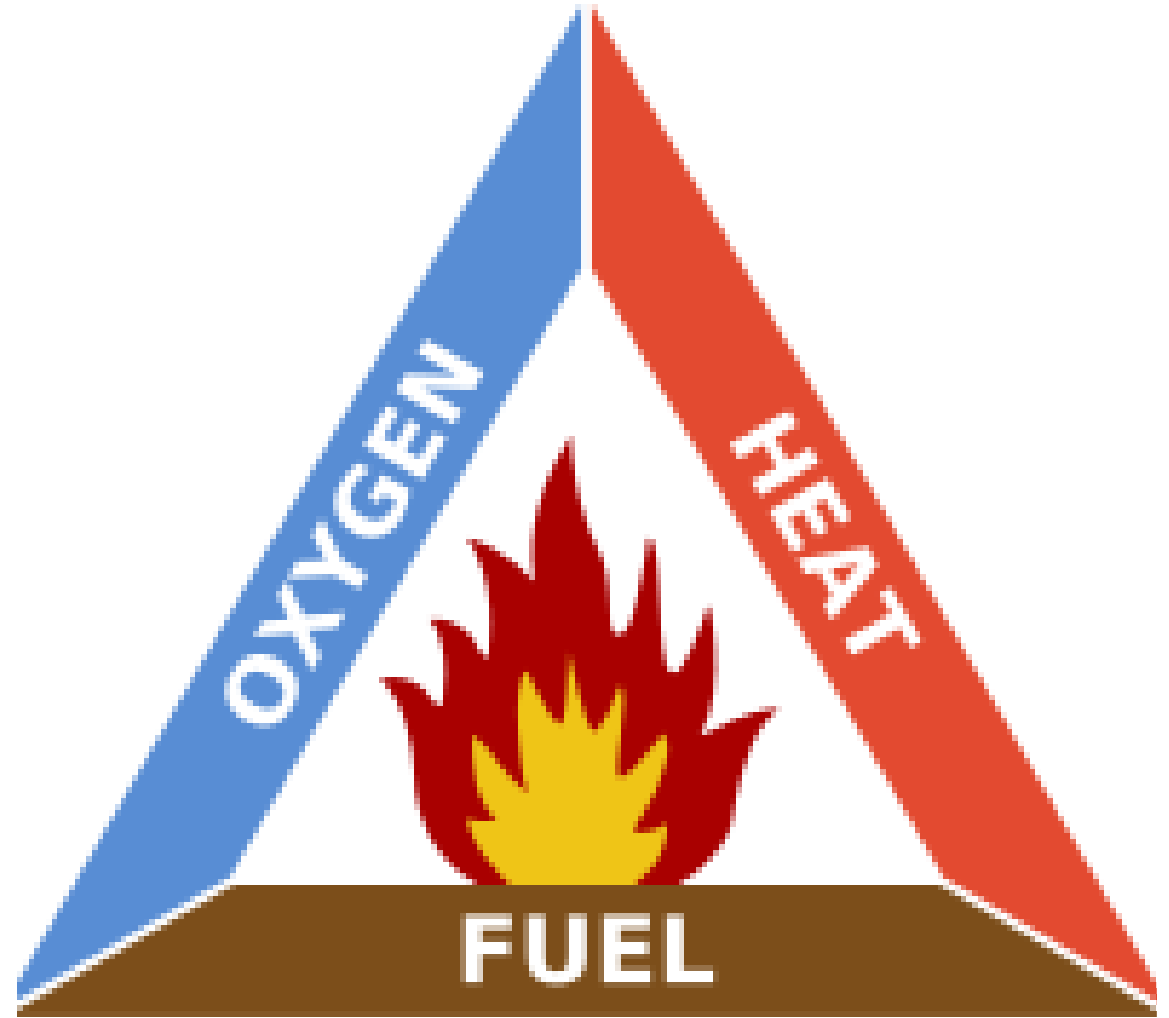
Even hardened buildings are unlikely survive such exposure, as a weak link will likely exist somewhere in the building enclosure.



# 3 Essential Ingredients

Fire requires oxygen, fuel, and heat

- Oxygen is abundant from the atmosphere
- Plants are primary fuels -- their arrangement greatly influences the transfer of heat
- Three basic mechanisms of heat transfer are ***convection, radiation, and conduction.***



# Convection

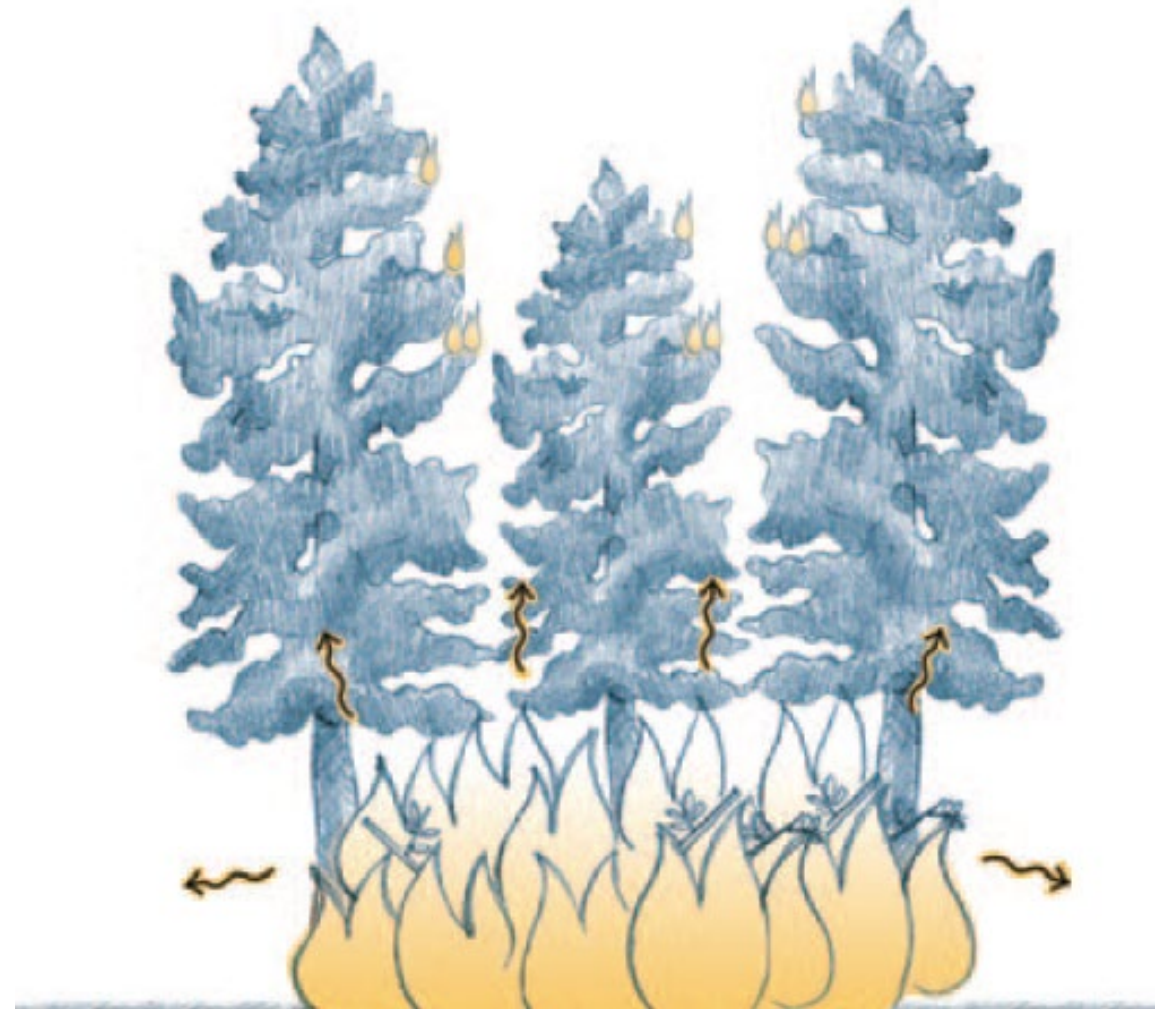
- The transfer of heat by the physical movement of hot masses of air upward.
- Burning vegetation creates convection currents that preheat the leaves and branches of shrubs and trees above the fire.
- Vertical air currents lift burning materials in the form of embers.

CONVECTION: *The transfer of heat by the movement of rising hot air or gasses*



# Radiation

- The heat you feel from burning objects is radiated heat.
  - Radiant heat is what you feel when you stand near burning campfire.
- Size and mass of the burning objects determines the amount of radiant heat released.
- In most cases, radiant heat from a wildfire will not ignite materials on homes 30 feet away.



# Conduction

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- Heat transfer from direct contact.
  - the heat that you feel when you touch a cup of hot water.
- Carries heat through fuels, such as logs or house walls, raising the temperature of fuels to the point that they ignite.

CONDUCTION: *The process by which heat is transferred through direct contact.*



# Cumulative Effects

The configuration of vegetation affects how these mechanisms come into play.

- Abundant and continuous flammable vegetation may cause a fire to rapidly advance.
  - Plants near the fire are dried, preheated, and even ignited through the effects of *convection* and *radiation*.
  - *Conduction* preheats and dries larger fuels that are touching each other intensifying the heat and the fire.





# Embers

- Burning pieces of airborne wood and/or vegetation
- Can be carried up to a mile by the wind
- ***Ember storms the greatest danger to homes in the WUI***

(Insurance Institute for Business & Home Safety)

# Embers

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- Blow onto buildings ahead of approaching flames and even after the flames have passed.
  - land on combustibles — such as dead vegetation, firewood or deck furniture — starting spot fires.
  - can enter buildings through vents and windows causing structures to burn from the inside out.





- **Homes do not spontaneously ignite— they are lost as a result of the growth of initially small fires, either in or around the home or building**



**Angora Fire – South Lake Tahoe**





1. Wood Roof
2. Roof Openings
3. Roof Debris
4. Skylights
5. Spark Arrester
6. Windows
7. Vents
8. Rain Gutters

9. Siding
10. Woodpiles
11. Patio Furniture
12. Deck Boards
13. Deck Debris
14. Deck Accessories

15. Under Deck
16. Flowerboxes
17. Eaves
18. Flowerbeds
19. Vehicles
20. Garage Door
21. Garbage Cans
22. Wooden fences

# Embers

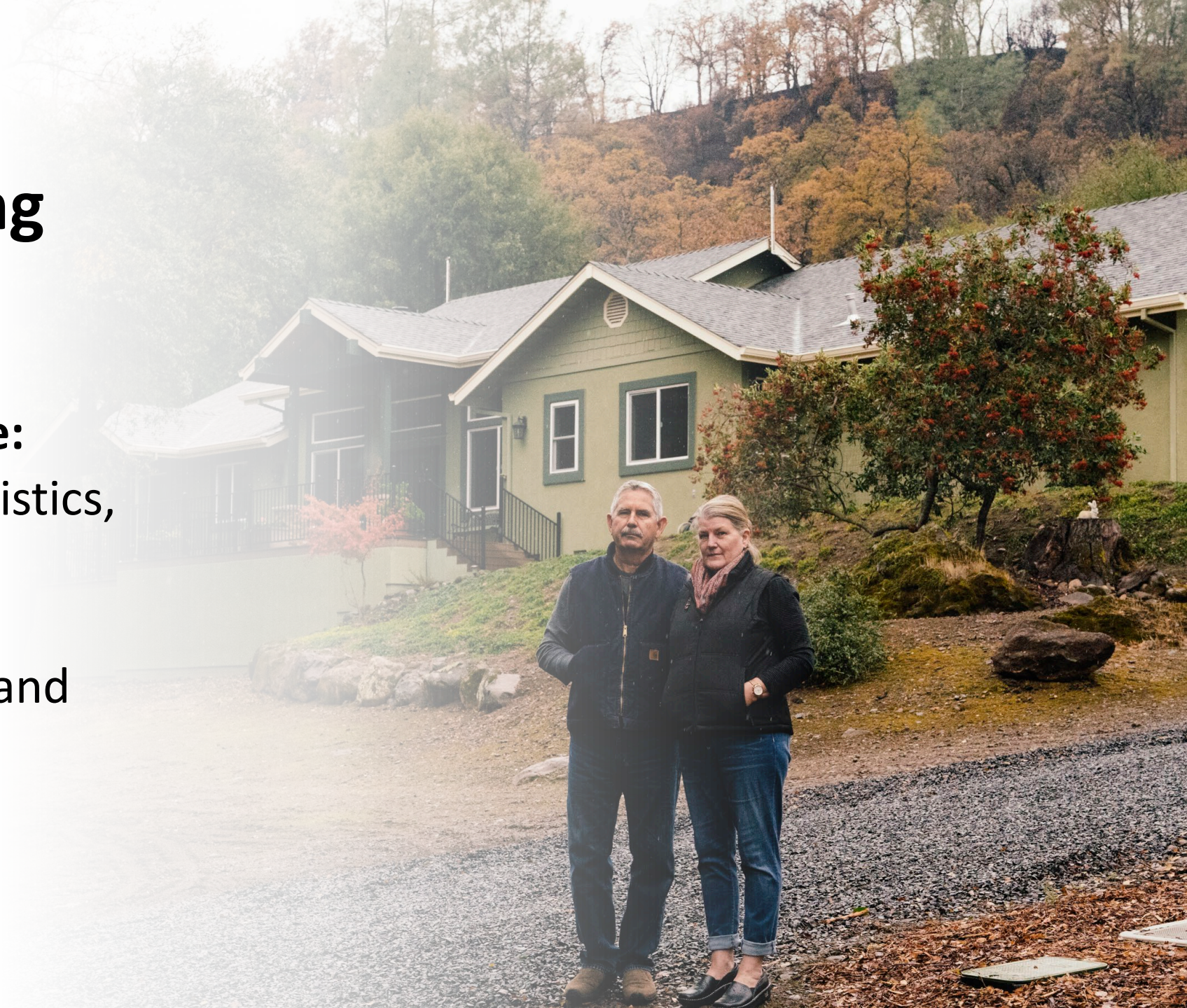


- A common misconception is that the most loss occurs as the main body of the fire passes as a wall of flame
- The main flame front moves through an area in a very short time: anywhere from quickly -- 5 to 10 minutes



# Factors Influencing Building Survival

- The most important are:
  - vegetation characteristics,
  - fire intensity,
  - building materials (especially roofing), and
  - maintenance







# Surviving Wildfire

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Not a matter of controlling the wildfire but changing conditions of your house and immediate surroundings to prevent ignition.

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It's about what **you** do to keep your home from burning down!

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***If your house doesn't ignite, it doesn't burn!***



# Doing an Ignition Assessment

- **It's a matter of separating or house from the wildfire.**
  - High intensity flames 30 away from home cannot ignite a home.
  - A handful of burning embers can ignite house directly or material around the house that then spreads the fire.
  - Must prevent surface fire from advancing across your property and connecting with your home.



# Home Construction

- Almost every aspect of how your home is built and the materials used will affect the potential for ignition



# Roof Coverings

- Most vulnerable due to its large, relatively horizontal surface.
- Fire ratings for roofs offer a measure of protection.
  - Class A provides greatest protection and class C the least.
  - Regardless of type, keep it in good condition and free of combustible debris.
  - Intersections of more complex roofs collect more debris.



# Skylights

- Potential entry point for embers.
- Flat skylights contain tempered glass
- Domed skylights have a plastic outer shell and interior screen.
  - close during a wildfire in order to avoid the entry of embers
- Look for accumulated debris that could combust at edges





# Roof Edges

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- Vulnerable to wildfire exposure in 3 ways when:
  - Debris in the rain gutter adjacent to the roof edge,
  - large gaps between the roof covering and roof sheathing (barrel clay tiles), and
  - and lack of a metal drip edge.
- Gaps at the roof edge allow for the entry of windblown debris and embers.
  - Bird stops available for barrel tiles must be properly installed.
  - Keep moss from lifting shingles.



# Rain Gutters

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- Burning debris in gutters provides exposure to the edge of the roof.
- Roof edging protects against ignition of exposed roof sheathing or exposed fascia board.



# Rain Gutters

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- **Keep gutters clear of debris!**
- Vulnerability of roof edge will depend on the materials used and how well flashing protects the edge.
  - Metal gutters will stay in place while debris burns.
  - Vinyl gutters melt quickly, detach, and fall to the ground causing siding to combust, especially if there are foundation plants present.
- Remove debris before fire season and continue through the summer and fall.



# Gutter Covers

- Gutter cover devices limit the build-up of debris in the gutter and allow for the free flow of water into and out.
  - These devices either cover the gutter with a solid material or screen



# Vents (Crawl Space, Attic and Eaves)

- Vents function to remove excess moisture from those spaces.
- Embers can enter vent screens!
- Building codes require non-combustible, 1/8" metal wire-mesh screen to prevent small rodents from and embers from entering.
  - Don't go smaller than 1/8" mesh-- may affect the air circulation in the spaces where they are used.
  - New vents designed specifically to resist intrusion of embers in flames or commercially available.



# Crawl Space Vents

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- In a pinch, install temporary covers prior to evacuation.
  - ¼" plywood, sheet metal, metal tape, etc.
  - remove upon returning home

# Attic and Eave Vents

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- A system of vents are used to ventilate attic spaces:
  - inlet vents in the eaves and soffit areas, and
  - outlet vents placed at or near the ridge line of the roof.
- Embers entering attic vents can ignite fine debris and other combustible materials.
  - Ignition of structural support members can occur after exposure to the flames





# Gable-end Vents

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- Vulnerable to ember entry.
- **Closure devices** for gable end and open-eave vents are commercially available.
  - Manually-operated (i.e., closed) by turning or pulling a wall- or ceiling-mounted handle.
  - Manually reopen after the wildfire threat has passed.





# Open-framing with Frieze-block Vents

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- Inlet vents used with open-eave framing.
  - Outlet vents are on top of the roof.
- Can be vulnerable even if vents are absent.
  - Improperly-installed or warped blocking can develop gaps where the blocking and rafter tails intersect.
  - Wind-blown embers can become lodged there and ignite debris, potentially spreading to structural support members.



# Open-framing with Frieze-block Vents

- If you can see exposed rafters in the eave, seal gaps with caulking for exterior applications, or
- Consider enclosing the underside of the roof eave/overhang
  - Highly recommended given the benefit from both an ember entry and flame contact exposure.

# Soffited Eaves

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- A 'strip vent,' which is commonly found in soffited eaves
- Vents in a soffited (boxed-in) eave are not as vulnerable to ember entry.





## Eye-brow (through-roof) Vents

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- Dormer-type through-roof vents are vulnerable to ember entry.

# Ridge Vents

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- Found along the entire ridge of the roof.
  - Provide a negative pressure region that pulls air out of the attic.
  - Baffles at front edges keep rain and embers from entering.
  - Removal of debris from the inlet to any ridge vent is critical.



# Exterior Siding

- Provides weather protection, and contributes to the aesthetics of the building
- With proper selection and maintenance of nearby vegetation, most siding will be able to resist wildfire exposure.
- Non-combustible or ignition-resistant materials reduce potential fire exposure at windows and the eave area of a building.

# Exterior Siding

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- Common ***combustible*** siding products include:
  - Solid wood
  - composite wood products (plywood, oriented strand board, and other compressed wood fiber products), and
  - vinyl or other plastics.
- Common ***non-combustible*** materials include three-coat stucco, metal siding, and fiber-cement siding.
- ***Ignition-resistant*** wood products (treated with an exterior fire-retardant chemicals and pass a standard flame-spread test after undergoing a specified weathering procedure).

# Siding

- Combustible siding products can withstand flames and protect against penetration for the duration of a main flame front (5 to 10 minutes).
- Prolonged radiant or flame contact exposure from abundant close-by vegetation, or other building, may result in failure.





# Exterior Siding - Trim

- Combustible trim is vulnerable to embers and potential flame contact exposure, especially at internal corners.
    - Use non-combustible or ignition-resistant material.
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# Windows

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- Open windows are most vulnerable to flames from embers.
- Closed windows will fail if the glass breaks or if the frame material ignites and burns through into the home.
- Larger windows are more vulnerable than small ones.



# Windows

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- The type of glass and framing materials affect vulnerability to flame.
  - Upgrade to dual- or triple-pane windows.
  - Tempered glass is four times stronger than normal annealed glass.
  - Reflective film on the exterior surface of exterior glass provides effective protection against radiant exposures.
    - These coatings also help reduce energy costs of a building and provide UV-protection for flooring and furniture.
  - Low-E coatings on the inner surfaces of dual pane windows also improve the performance of a window exposed to a wildfire.



# Window Screens

- Improve performance of glass exposed to radiant heat.
    - Bronze, fiberglass with a polyvinyl chloride coating, and aluminum screens improve glass performance by increasing the time needed for edge cracks to develop.
    - Bronze screens are most effective and aluminum screens the least effective.
    - Do not provide any added protection from flame-contact exposure, such as that from burning vegetation located under the window.
-

# Window Screens

- Windblown embers can pass through screens if glass in the window has failed.
  - Wind blowing against the screen will result in the ember being reduced in size until it can pass through.
  - Embers passing through fine mesh not likely to ignite internal furnishings.
- If glass and screening have both failed, embers entering will be able to ignite combustible materials in the home.

# Windowsills and Curtains

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- Windowsills and entry door sills are also vulnerable.
  - Embers can ignite debris or ignite decayed trim.
  - Decayed wood ignites at a lower temperature than sound wood.
- Ignition of window curtains from a radiant exposure prior to glass breakage is unlikely if annealed or tempered glass is used.





# Decks

- **Vulnerability of decks to wildfire will depend on:**
  - Deck-board material,
  - topography,
  - the amount, type, and condition of vegetation leading up to the deck, and
  - combustible material stored under the deck or kept on the deck.

# Decking

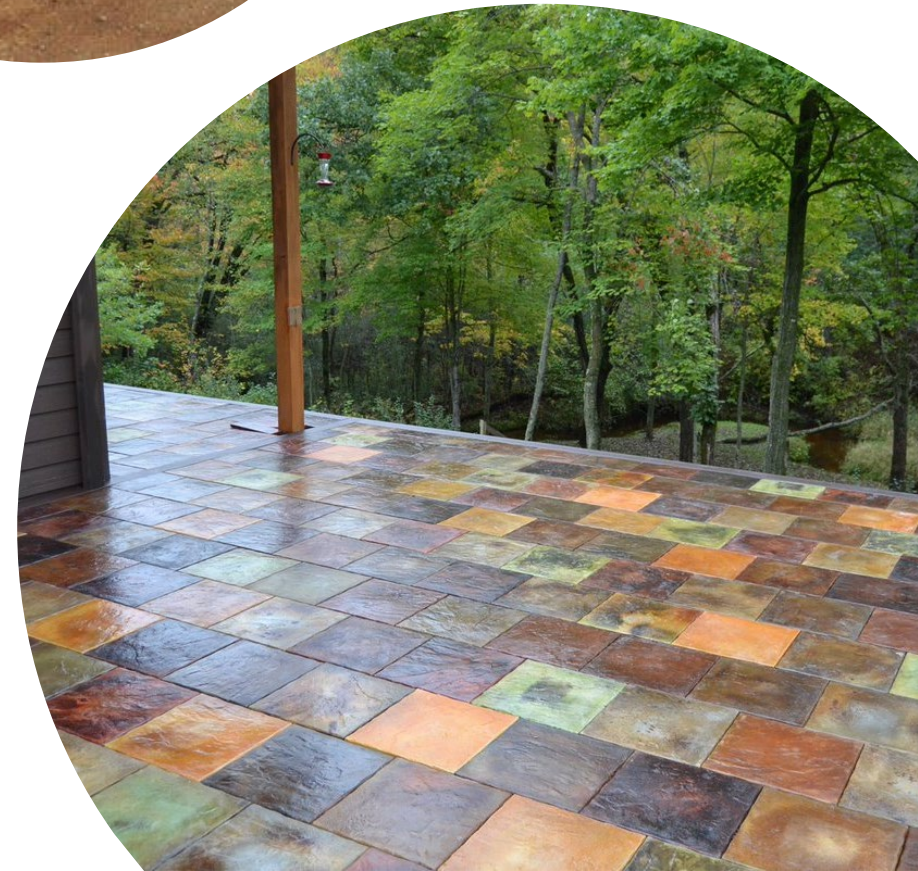
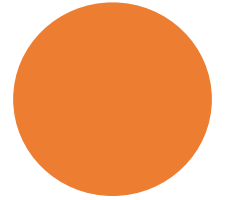
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- Lower-density wood (i.e., redwood), is more vulnerable to ignition by embers compared to a higher-density, wood-plastic composite decking.
- Higher-density wood, such as the tropical hardwood ipe, and exterior fire-retardant-treated deck boards, are also less vulnerable than a lower-density wood decking products.



# Decking

- Untreated and fire- retardant treated wood, and wood-plastic composite products are all combustible.
  - Untreated-wood decking is not highly combustible by itself.
- Light-weight concrete is non-combustible.



# Decks

- Remove easily ignited materials that accumulate in gaps between deck boards and at interface between decking and siding of the home.
- Replace rotted decking or fascia boards.
- On wood decks, replace the first two or three boards with a fire-resistant, non-wood product more resistant to combustion.





# Decks

- Other fuel sources contribute to deck fires.
  - Combustible vegetation next to under the deck
  - Combustible materials on or under decks (e. g., brooms, umbrellas, patio furniture, door mats, wood piles, etc.)
    - Move as far from the building as possible
    - Space to avoid clustering items.





# Decks

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- Closing in the underside of the deck will reduce risk of ignition.
- The closer the deck is to the ground, the harder it is to use as a storage area, but it becomes more difficult to clean out debris that may accumulate.





# Deck Skirting

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- Apply non-combustible sheathing or siding around the perimeter (a vertical enclosure)
- ½" galvanized hardware cloth back with 1/8" non-corrosive, metal mesh screen
- With existing wood lattice:
  - Apply fire-resistant coating
  - Install 1/8" metal mesh screen on backside



# Fences and Shade Structures

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- Wood fences become freeways for fires.
  - Those lined with plants that get dense and twiggy catch embers and spread fire.
- Wood arbors, gazebos, and pergolas
- Flammable lath or shade cloth coverings
- Vines or other woody vegetation



# Fences and Shade Structures

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Replace with structures constructed of 1-hour fire-rated wood or metal and disconnect from the main house.

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Paint or stain existing wood structures with fire- or heat-resistant products.

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Replace shade cloth or lath with non-flammable materials such as tin, fire-rated plastic sheets, or aluminum louvered systems.

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Only fire-retardant plants should be used adjacent to structures.

# Fire- retardant Treated Wood

- **Exterior-rated, fire retardant-treated wood products** are:
  - Pressure-impregnated with chemicals that improve the fire performance characteristics, and resist flame-spread and smoke development caused by fire.
- Weathering reduces the efficacy of retardants.
- Periodic re-application required.



# Fire- retardant Treatments and Coatings

- ***Fire-resistant paints*** create a barrier against flames.
  - When met with flames, forms a char layer on the substrate increasing the time it takes for flames to penetrate.
  - Can be applied to steel, timber, and plasters to avoid burning and destruction.
  - Good for 30 minutes to hours before failing.
- ***Fire-retardant paints*** make combustible materials much more difficult to ignite slowing ignition.



# Fire- retardant Treatments and Coatings

- **Gel coatings** are a new fire protection alternative are available to homeowners.
  - Effective, if applied correctly to points of fire entry.
  - Can be applied by homeowners.
  - Coatings lose effectiveness within hours due to water evaporation.
- **These paints and gels are NO replacement for managing vegetation or improving building materials or design.**

# Defensible -space Zones

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Coupled with **home hardening**, defensible space is essential to improve your home's chance of surviving a wildfire.

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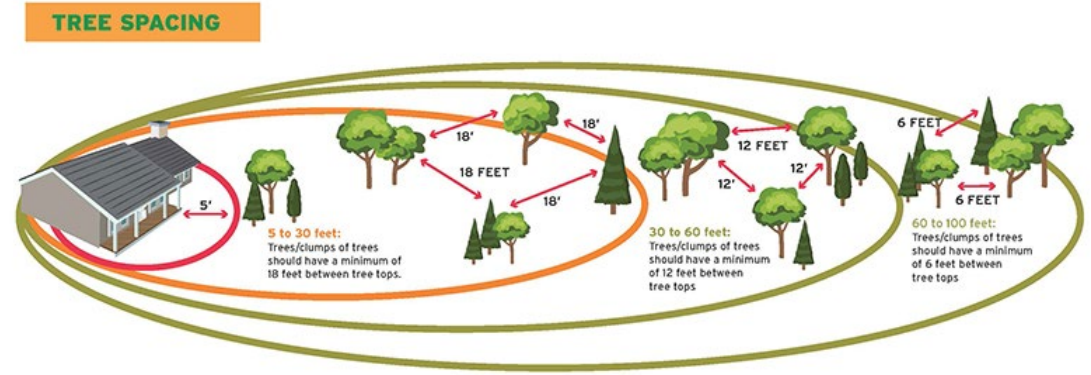
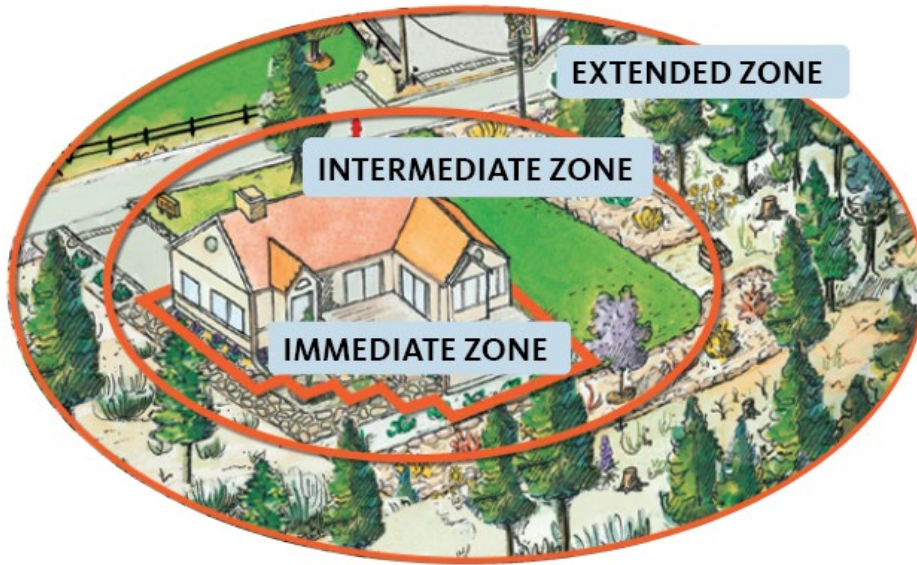
The buffer you create between a building on your property and the landscape vegetation, or wildland area that surrounds it.

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The space needed to slow or stop the spread of wildfire particularly from direct flame contact or radiant heat.

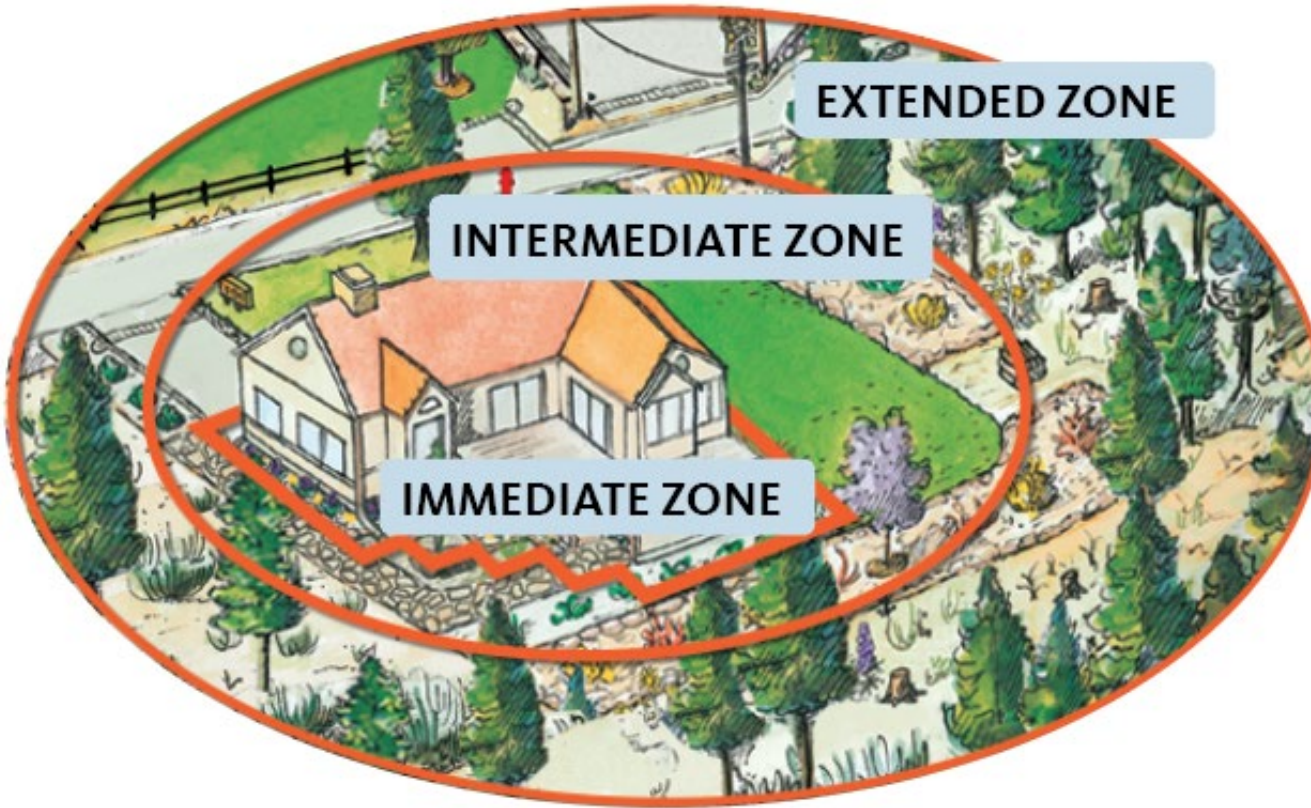
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Provides firefighters a safe area to work in to defend your home.



# Defensible Space Zones

## Old standard



## Defensible Space Zones Zones 1-3

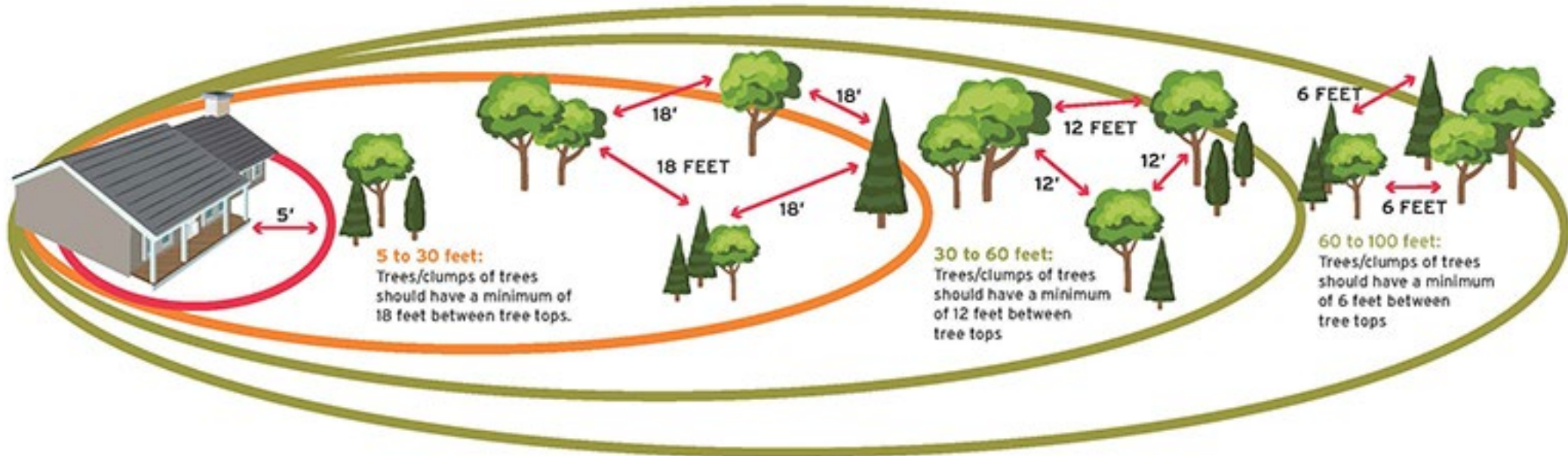


# Defensible Space Zones

- Zones 0 - 3

## TREE SPACING

New standard





Cut and remove  
branches that  
hang over roof.

**Zone 0**  
0' - 5'

**Zone 1**  
5' - 30'

**Zone 2 & 3**  
≥ 30'

**Property  
Protection  
Zone**

≥ 15'  
(or 1/3 tree height)

# Zone 0 - Home Ignition Zone

- Zone 0, sometimes referred to as the *immediate zone*.
- The areas closest to your house, 0 -5', including:
  - Surfaces of the structure itself (outside walls, roof)
  - Decks
  - This area is ***most vulnerable*** and should be more aggressively maintained for fire-resistance.
  - **There should be zero combustibles in this zone!**

# Zone 0

- Remove combustible outdoor furniture.
- Remove or relocate all combustible materials, including garbage and recycling containers, firewood, and patio accessories, etc.
- Replace jute or natural fiber doormats with heavy rubber or metal grates.

# Zone 0

- Do not store firewood, lumber, or combustibles here, or on or under decks or overhangs.
- Replace combustible fencing, gates, and arbors attached to the home with non-combustible alternatives.
- Remove tree limbs that extend into this zone.
- Remove all fallen leaves and needles.

# Zone 0

- **No vegetation** is recommended within 5 feet of any structure, including decks.
- Use only inorganic, non-combustible mulches such as stone or gravel.
- Hardscaping is strongly recommended around the base of the home.
- Avoid flames running across the ground and connecting with your home.





# Zone 1 - Lean, Clean & Green Zone

- The perimeter area surrounding your home to the distance of 30 feet.
  - Lean - minimization of flammable materials.
  - Clean – low-height and low-density of vegetation.
  - Green - the least flammable types of vegetation best suited to this zone.

# Zone 1

- Everyone should be able to move unimpeded through the zone.
- The zone in which firefighters will generally battle a blaze.
- Used for recreation and functional activities.
- Aesthetics and privacy play a role in making plant selections.
- Fences, hedges, sheds, compost areas, and any combustible items are fuel.

# Zone 1

- Remove all dead grasses, weeds, plants, stems and branches, cones and foliage.
- Remove fire-hazardous plants.
- Remove flammable mulches.
- Choose only ***fire-resistant plants*** and keep them healthy and irrigated.
- Use only compost or small bark mulch.
- Relocate boats, RVs, and other vehicles outside this zone.
- No firewood and lumber.



# Zone 1

- Space shrubs at least two times the width of the mature plant.
- Trim trees to remove limbs 8 to 10 feet from the ground.
- Separate the canopies of trees by at least 10'.
- Clear vegetation around fences, sheds, outdoor furniture, play structures, etc.
- Create 10' of clearance around outbuildings and LPG storage tanks.
- **Maintain regularly**, focusing on the areas closest to structures.



## Zone 2 - Extended Zone

- Area 31-100' from structures
- Cut or mow annual grass down to a maximum height of 4 inches.
- Create horizontal spacing (6-8') between shrubs and trees.
- **Separate the canopies of trees in this zone from Zone 1 by at least 10-15'.**
- Remove excess dead vegetation.
- Remove all piles of dead vegetation.

# **Zone 3 – Access Zone**

- Clear routes are key to safe and unimpeded evacuation and allowing fire equipment and crews to fight wildfires.
- Treat as a mini-shaded fuel break.



# Zone 3

- Clear vegetation 14' overhead and 10' from the sides of roads and driveways in the same manner as defensible space Zone 1 and 2
  - Create vertical spacing between shrubs, and lower tree limbs
- Maintain 22 feet of unobstructed roadway for emergency responders.

# Private Roads & Driveways

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- **What the fire crew sees**
  - Narrow drive or road (<22'?)
  - Overhanging, dense vegetation
  - Is there a turnaround?
  - Is there a way out?
  - Will this become a death trap?





# Private Roads & Driveways

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- Same road after clearing



# Zone 3

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- **Address numbers must be clearly visible from the road**
  - 4-inch reflective numbers on a contrasting background
  - Place numbers at driveway
  - Don't mount on flammable posts





# All Zones

- Thin and remove vegetation to reduce ladder fuels and prevent flames from moving closer to the home.

## MINIMUM VERTICAL CLEARANCE







# Firescaping

- Well-thought-out landscapes can help defend the home against the threat of fire.
    - One of the biggest factors affecting fire-avoidance is the choice of plant materials in the Defensible-space Zones.
-

# Firescaping

- Not necessary to create a moonscape by removing vegetation or paving over the entire space.
  - Common misconception: no vegetation is safer than any vegetation.
  - Makes for a clear path for blowing embers.



# Zone and Island Approach

- This approach to fire-resiliency accommodates personal priorities + reduces wildfire vulnerability + respects water, soil, vegetation and habitat needs.
- **The Goal:** resist ignition from flying embers while accommodating most intensive uses in the transition from your house to the outdoor space.

# Zone and Island Approach

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Green vegetation can burn in a wildfire situation -- include small firebreaks to slow down a fire.

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Design walkways, dry stream beds, short walls, small patio area, and lawns function as small firebreaks.

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Islands of vegetation are aesthetically pleasing and reduce the potential vulnerability of your yard.



# Zone and Island Approach

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# Fuel Breaks

- Dry stream beds can break up larger areas
  - Slow, spread, sink water
- Paths can create islands and define hydrozones, saving water.



# Firescaping

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- **Thin rather than clear** to reduce plant fuels.
  - Excess and/or dead plants surrounding your home act as fuels when fire strikes.
  - Remove flammable varieties; replace with more with fire-resistant ones.
- Avoid plants that create lots of litter.
  - Select plants that shed minimal amounts of needles, leaves, and seed pods/cones.

# Firescaping

- Use native plants in your defensible space.
  - Easy to maintain
  - Have strong root systems that will reduce property damage from erosion after the fire has passed.
  - Commonly have roots that will regenerate the plant after a fire.





## Firescaping

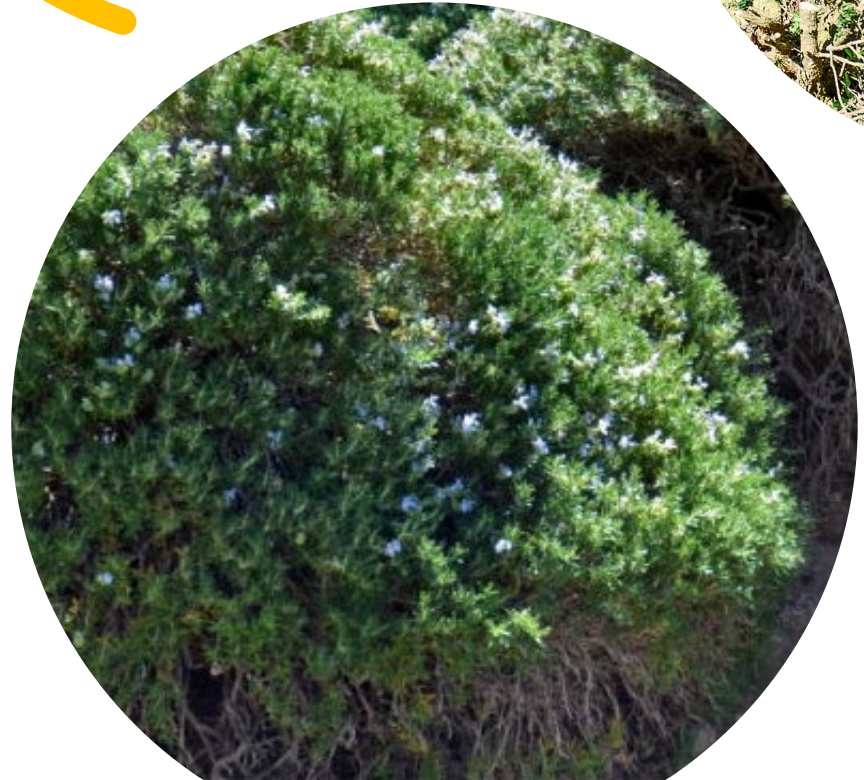
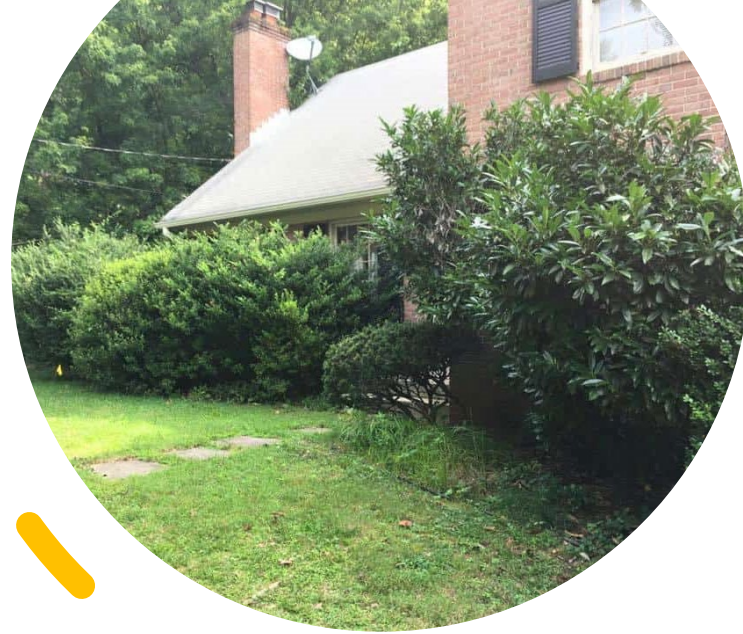
- A well-maintained yard is not necessarily synonymous with a fire-resistant landscape.
  - Vegetation will either lead a fire to a structure, slow it or stop it.
  - Plants near a structure are one of the most important factors in its chance of it becoming involved.





# Everything Has A Life Span

- As a landscape ages, the risk of fire dramatically rises.
- A landscape that was planted 50 years ago may require the removal of some, if not most of the plants.





# Expected Life Span

## Plant Group

## Expected Life

Large Trees

40–120 years

Medium Trees

18–60 years

Large Shrubs

8–25 years

Small Shrubs

5–15 years

Vines

6–15

Perennials

2–6 years

Biennial

2 years

Annuals

Every Year

# Plant Selections

- Plant selection can be a challenge because at one point or another, **every plant may burst into flames.**
  - Some selections that are less likely to do that than others.
  - Consult online fire-wise plant guidelines, UCCE recommendations.
  - Don't be surprised! Plant lists conflict with one another.



# Plant Selections

- The ability of any plant to retard or resist fire depends on its condition.
  - Old, woody, water-starved, pest-infested, or disease-ridden plants are more flammable.

# Characteristics of Less Flammable Plants

- Determine likelihood that a plant will catch fire, feed a fire, or repel a fire.
- Knowing traits of less flammable plants is more important than remembering lists of plants.
- **Landscape maintenance, not plant selection, is the key for fire resilience!**

# Characteristics of Less Flammable Plants

- A less flammable plant will have:
  - Deciduous rather than evergreen leaves.
  - Large and broad rather than needle- and blade-like leaves.
  - Moist and easily bent leaves instead of stiff and leather-like.
  - Thick instead of fine or thin leaves.
  - A low amount of litter.
  - Watery sap as opposed to thick, gummy or resinous sap.
  - Leaves and stems without a heavy scent, as opposed to strong aromatic qualities.
  - Leaves that are silver or gray.
  - Leaves that are not hairy.

(Douglas Kent, Firescaping)



# Fire-retardant and Fire-resistant Plants

- Plants to be used in Zone 1 should be **fire-retardant**.
  - Sizzle and wilt when exposed to fire but reluctant to produce a flame.
  - Properly maintained, they can catch and extinguish fire brands.
  - The trade-off for this protection is irrigation.
    - Most need supplemental water to maintain adequate moisture.
    - Succulents are a notable exception.
- **Fire-resistant plants** repel fire.
  - Leaves and twiggy growth may produce a flame when exposed to fire, but the flame quickly dies.
  - Thick bark and dense wood protect the plant from fully igniting.
  - Many will resprout after a wildfire reducing risk of erosion following a fire.
  - Drought-tolerant, but most would benefit from an occasional deep watering.

# Plants for Zone 0

- **Plants within the first 5 feet of all structures are totally discouraged.**
- Should fall in the category of **fire-retardant** species,
  - High-moisture plants that will grow close to the ground and have a low sap or resin content.
  - Include:
    - succulents,
    - low, non-woody ground cover,
    - herbaceous perennials, and
    - lawn alternatives.





# Plants for Zone 1

- **Fire-retardant plants** should dominate the plant palette in this area.
- Food crops are very fire-retardant and fire-resistant (Edible gardens)
  - Usually have high moisture and large, supple leaves.
  - Annuals, perennials, subshrubs, shrubs, vines, or trees
  - Offer fire protection, personal health and even some environmental benefits.
    - Vegetable gardens, fruit trees and berry vines fall in this category.





# Plants for Zone 1

- **Lawns**

- Fire resistant and exceptionally difficult to ignite.
- A safe surface from which to fight a fire.
- Consume large quantities of water with little return.
- Future water restrictions may require letting them go brown.





# Plants for Zone 1

**Lawn alternatives**, primarily spreading perennials that root along their stems, use far less water, can tolerate limited foot traffic, and if properly cared for, will not be ignited by burning embers.

- Alum root/coral bells
- Birdsfoot trefoil
- Geranium/ Crane's bill
- Creeping red fescue
- Woodland strawberry
- Lippia
- Native clovers
- Coyote mint
- Fleabane

# Zone 1 Flowering Perennials

- A perennial is any non-woody plant that lives longer than two years.
- Most sport flowers for weeks at a time from spring through fall, supporting pollinators, including bees and butterflies.
- Be selective as many will become woody with age.
  - Alum root
  - Black eyed Susan
  - Columbine
  - Coreopsis
  - Flax
  - Hooker's evening primrose
  - Indian paintbrush
  - Lupine
  - Mallow
  - Helianthus
  - Milk weeds
  - Coneflowers
  - Poppies





# Zone 1 Hedges

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- The wrong type of hedge may lead a wildfire to a structure – a properly planned and maintained hedge will do just the opposite.
  - All hedges will have to be replaced at some point.
  - Avoid those species that have a dense, twiggy interior.
  - Hedges reluctant to ignite, have large leaves, are somewhat slow growing, and do not create excessive litter.
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- Coffeeberry
  - Spicebush
  - Currents and gooseberry
  - Cherry laurel
  - Mock orange





# Zone 1 Trees

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- The placement of trees needs to be carefully considered to avoid canopies that may eventually get big enough to be too close to structures.
  - Desert willow
  - Native dogwood
  - Buckeye
  - Deciduous oaks
  - Western redbud

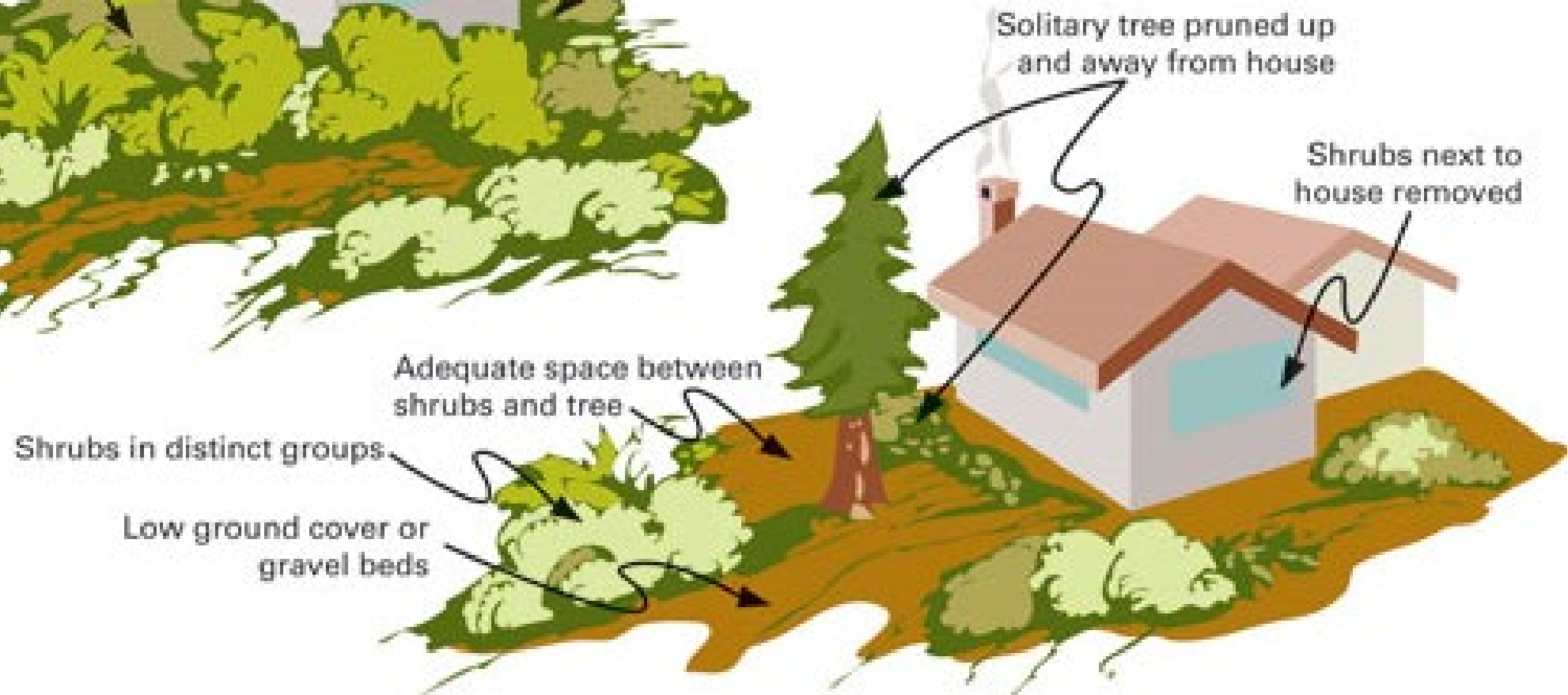


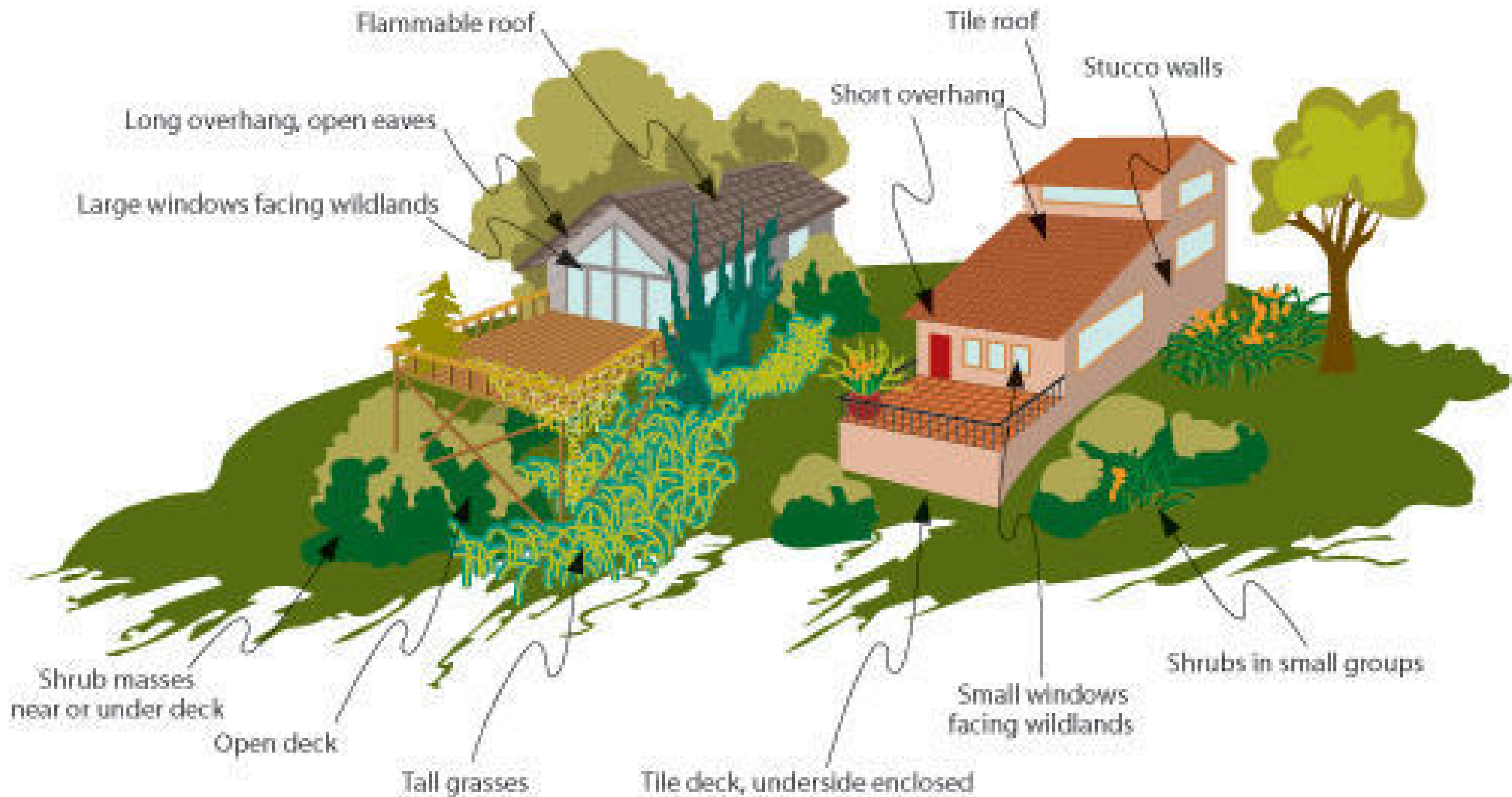


## POORLY MAINTAINED LANDSCAPE



## WELL MAINTAINED LANDSCAPE





# Plants for Zone 2: Extended Zone

- **Objective** -- stop a groundfire utilizing plants with a level of fire-resistance despite drought and some neglect.
- The transition from domesticated landscape to a more natural one.
  - maintenance is more important than plant selection
- With irrigation, you will have far more selection of plants to use.
- Without irrigation, plants selections should be made carefully with respect to the structure and characteristics discussed previously and spaced further apart.

# Zone 2 Plants

- Properly landscaped and maintained, this area can dramatically slow an approaching fire.
- Native species encouraged, with adequate spacing between shrubs and trees.
- Eradicating invasive plants and controlling erosion should be primary management goals.



# Zone 2 Plants

- Break up continuity of growth and eliminate ladder fuels.
- Depending on the slope of your land, trees and plant clusters should be vertically and horizontally clear of one another.
  - groupings of short and tall plants create an opportunity for easy flame transfer.
- Make sure trees are trimmed clear 8 to 10 feet off the ground.



# Size, Placement and Spacing of Plants

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- Determine the slope of your property before planning your design or plan for thinning and removal.
- Spacing between plants on slopes must be greater than it would on level ground:
  - 0 to 20% slope requires at least 10 feet between tree crowns
  - 20 to 40% slope requires a 20' between the tree crowns
- Clear tree branches 20 to 40 feet from the ground on steeper slopes.
- Any Zone 1 trees should be clear of the home
  - No branches making no contact with roofing or siding.

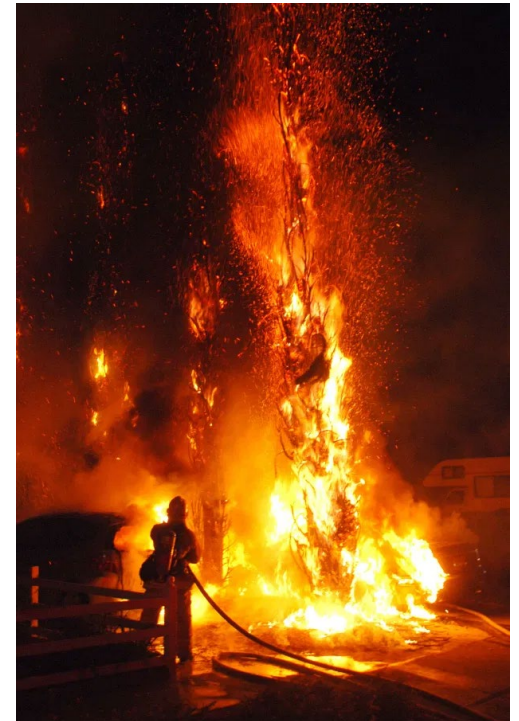
# Zone 3 Plants

- Same as Zone 1 & 2
  - Use more deer-resistant native species



# Highly-flammable Trees

- The plants listed below create highly ignitable and highly combustible conditions—some will ignite without flame contact.
  - These plants should be removed from Zones 1 and 2
    - Fir
    - Acacia
    - Incense cedar
    - Cedar
    - Leyland and Italian cypress
    - Eucalyptus
    - Sweet bay
    - Spruce
    - Pine
    - Coast redwood
    - Yew
    - Arborvitae
    - Hemlock
    - California bay







# Highly-flammable Shrubs/Perennials

- Chemise, greasewood
  - Sage brush
  - Coyote bush
  - Field and black mustard
  - Broom
  - Hopseed bush
  - Buckwheat
  - Juniper
  - Larch
  - Creosote
  - Tea tree
  - Rosemary
  - Blackberries
  - White, Cleveland, purple, black sages
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# Highly-flammable Grasses

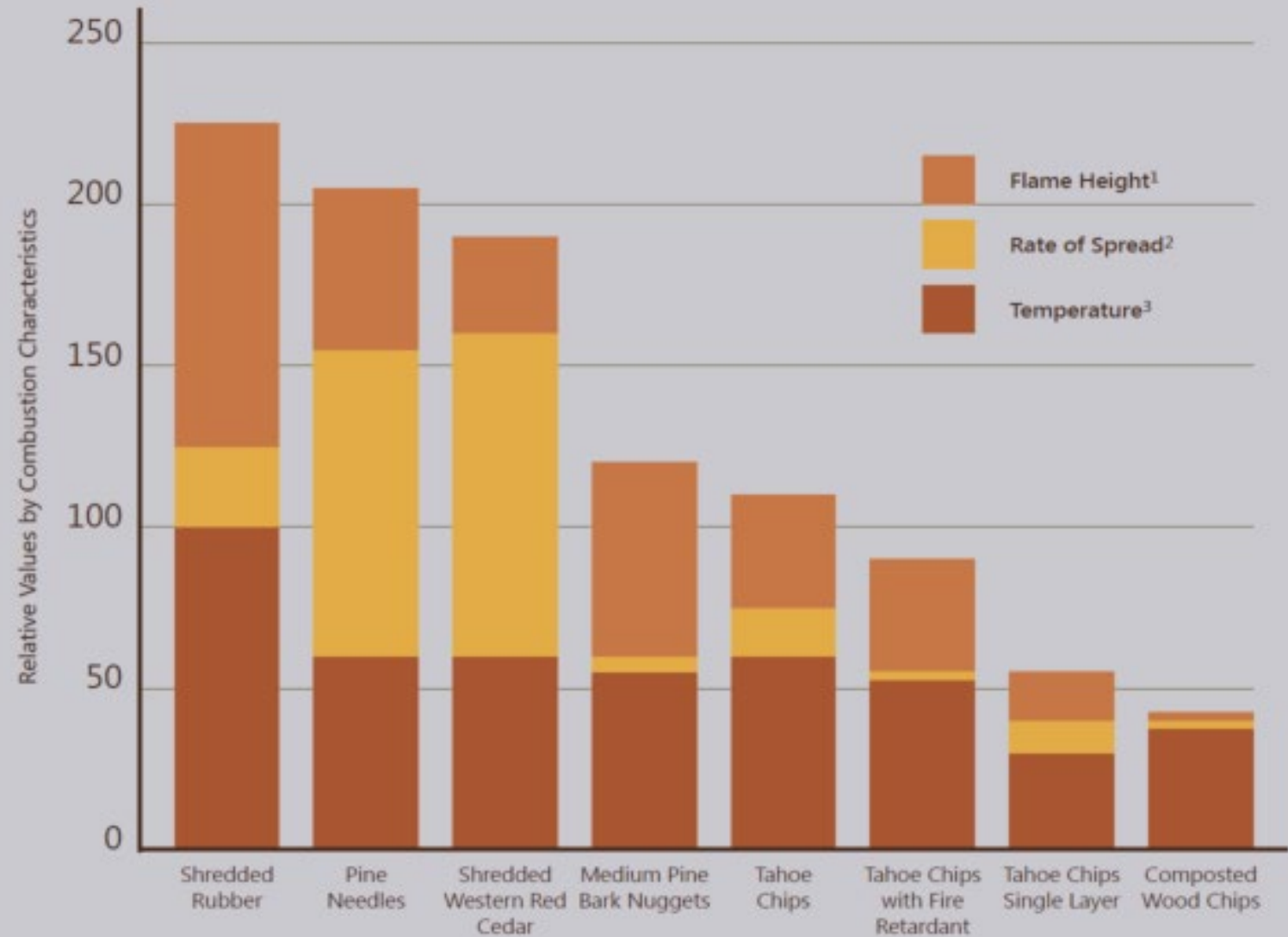
- Annual grasses: barley, oats, and rye
- Pampas grass
- Miscanthus
- Fountain grass
- Feather grass
- Quack grass



# Mulches

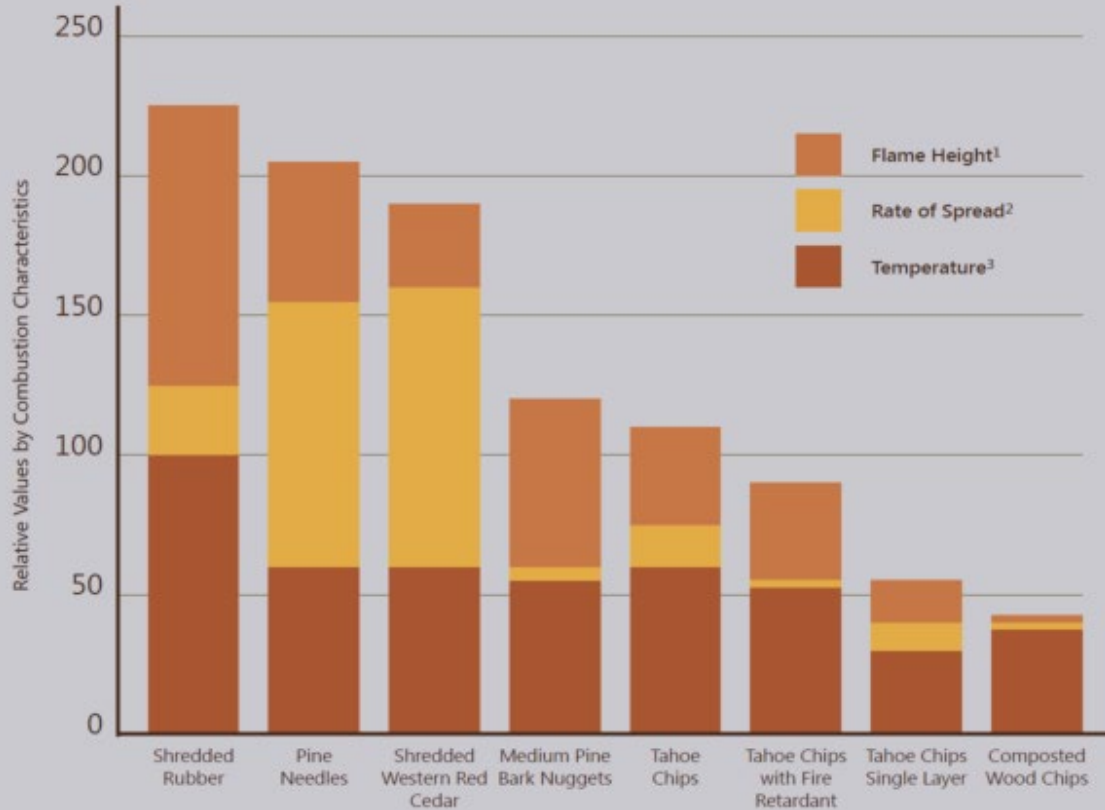
- Help retain soil moisture,
- Control weeds,
- Feeds the soil, and
- Moderate soil temperatures.

# Mulch Flammability Comparison





# Mulches



- Shredded rubber, pine needles and shredded cedar bark have the highest hazardous combustion characteristics
  - recommended for use only in areas more than 30 feet from the house

The Combustibility of Landscape Mulches, University of Nevada Cooperative Extension study

# Mulches

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- Use maximum of a 2" layer of mulch in planting beds
  - Compost and small particle-sized woody mulches don't tend to ignite.
  - Only inorganic material should be used in Zone 0 adjacent to structures, including decks.



# Organic Mulches

- **Composted Wood Chips** under 1 inch in size.
  - Low burn-characteristics but may smolder.
- **Irrigating wood and bark mulches**, should not be relied upon to lessen fire hazard.
  - Irrigation reduces the ignitability of mulches, but water supply and pressure may be limited or unavailable during a wildfire.
  - Dry, hot, windy weather will dry out the mulch well in advance of the flaming front.

# Weed Fabric

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- Weed fabrics are made out of synthetic materials and will burn easily if exposed.
  - Really bad for the soil.
  - Best not to use at all.





# Emergency Watering Systems

- Can increase the ignition tolerance of a structure and landscape:
  - Help extinguish incoming embers and the small fires they create, and
  - Requires more time and heat to cause ignition.
- Must be able to operate during power outages and dramatic drops in water pressure.
- System needs to be easy to use.
- Use only the high-quality materials:
  - Galvanized steel pipe instead of PVC
  - Galvanized or brass fittings should be used instead of plastic.

# Emergency Watering Systems

- Create an environment that extinguishes embers by:
  - 1) **hydrating potential fuels**, thus making them less susceptible to ignition,
  - 2) **increasing humidity**, and
  - 3) **creating a cooler microclimate** around the home.





# Emergency Watering Systems

- Small amounts of water or wet surfaces can extinguish embers.
  - High-wind conditions cause the majority of wildland fire structure losses.
  - Most exterior sprinkler systems are NOT designed for high winds.
-

# Emergency Watering Systems

- Water storage devices recommended to be at least 2500 gallons to make a difference.
- Cisterns, ponds, pools, and water tanks require a slightly different approaches to make water accessible.
- Bring to the attention of fire departments so that they are aware of them.





# Emergency Watering Systems

- An emergency water source should never be farther than 200 feet from the structure it is serving.
- A fire truck should be able to drive to within 10 feet of a water source.
- Provide a clear pathway between the water source and structures for fire fighters.

# Emergency Watering Systems

- Drainpipes of pools and water tanks need to be readily accessible and modified to make the fittings compatible with the fire fighter's hose.
- Firefighters need a 2-1/2" threaded male fitting.
  - A removable reducing bushing can be screwed onto this larger fitting to accommodate a garden hose.
  - Check with local officials for their recommendations.

# Emergency Watering Systems

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- With a loss of electricity and/or a big drop in water pressure, a good water pump can be critical in defending a structure.
  - Two types of pumps: gasoline- or electric- powered with a generator.
  - Should deliver a minimum of 100 gallons of water per minute at 50 pounds per square inch of pressure and has a standard 1-1/2" threaded outlet.
  - Any water pump should include an 8-foot suction hose, 100 feet of fire hose, and an adjustable fire nozzle.
    - A fire hose is distinguished from other hoses by its fire-resistant jacket.
    - Pumps drawing out of a pond should have a fine mesh screen over the water intake and a minimum 8'-long suction hose.



# Emergency Water Systems

- Rooftop Sprinkler Systems
  - While rooftop sprinkler systems may seem like a good idea, they are generally ineffective once domestic water systems lose pressure.
  - The steeper a roof, the less effective this irrigation system is.





# Wind-Enabled Ember Dousing (WEED) System

- Sprays into the wind
- Use the wind to blow spray onto the structure maximizing windward protection.
- Low flow rate
  - <30 gpm provides >3 hours protection with a 5000-gallon supply.
- ***Supplements*** defensible space
- 100' clearance to protect from radiant heat



# WEED System

- **CONCEPT**: Achieve wind-resilient ember protection by directing coarse water spray outward from the structure.
- The wind blows it back onto the structure.
- Spray accumulates where embers do (shown by computer simulation)
- Low spray densities needed to protect from embers (as opposed to radiant heat)

(Published in the International Fire Safety Journal,  
September 2006)

# Emergency Watering Systems

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- Test the system annually before the start of fire season and perform any maintenance needed on a regular basis.
- Oil and start generators: always run an engine dry before storing, which helps prevent gas from coming up inside the carburetor and cylinders.
- Replace old gasoline with fresh.
  - Aged gasoline has a tendency to turn dark and sour; please volatility; and gum up filters, lines, and carburetors.
- Test in oil water pumps. Turn all valves on and off several times to ensure proper function.

# Maintenance and Cleanup

- **A garden designed for fire resilience is not static – it requires maintenance over its lifetime.**
  - Get rid of dead and dying trees and plant debris promptly.
  - Water plants in the ember resistance zone regularly.
  - Mow, prune, and trim all zones regularly to maintain defensible spacing between trees and plant clusters.
  - Check and clean gutters regularly.
  - Place piles outside of Zone 2.
  - Beside your own property, trim vegetation on your property that impinges on a neighbor's Zone 1 and 2.



# Prepare for Evacuation

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- **Inside the House**

- Know your community's emergency response plan and have a plan on where to go when it is time to evacuate, and best routes for leaving your location.
- Shut all windows and doors; leave them unlocked.
- Remove flammable window shades, curtains and close metal shutters.
- Remove lightweight curtains.
- Move flammable furniture to the center of the room, away from windows and doors.
- Turn off pilot lights.
- Leave your lights on so firefighters can see your house under smoky conditions.
- Shut off the air conditioning.

# Prepare for Evacuation

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- **Outside**

- Gather up flammable items from the exterior of the house and bring them inside (patio furniture, children's toys, door mats, trash cans, etc.) or place them in your pool.
- Turn off propane tanks.
- Move propane BBQ appliances or tanks away from structures.
- Connect garden hoses to outside water valves or spigots for use by firefighters.
- Fill water buckets and place them around the house.
- Don't leave sprinklers on or water running, they can affect critical water pressure.

# Prepare for Evacuation

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- **Outside (cont.)**

- Leave exterior lights on so your home is visible to firefighters in the smoke or darkness of night.
- Have a ladder available and place it at the corner of the house for firefighters to quickly access your roof.
- Seal attic and ground vents with pre-cut plywood, metal tape, or commercial seals.
- Patrol your property and monitor the fire situation. Don't wait for an evacuation order if you feel threatened.
- Check on neighbors and make sure they are preparing to leave.

# No such thing as fire-proof!

- **You cannot have a fire-proof building!**
- These concepts are borrowed from other reliable sources.
- Not a substitute for professional assessments or hiring professionals to harden your home.
- Just listening to this won't do anything to reduce your risk.
- **Get out there and make some improvements!**



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- <https://ucanr.edu/sites/fire/Prepare/Landscaping/Mulch/>

**Thank you for joining us!**

**Q & A**

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