

DESIGN WITH FIRE IN MIND

Three Steps to a Safer New Home



Resilient homes and communities built with Firewise principles can be beautiful, affordable, environmentally friendly—and life-saving.



Communities in beautiful natural areas can also be fire-prone. Applying Firewise principles in new developments can reduce wildfire risk.

WILDFIRE THREATENS HUNDREDS of homes each year and causes millions of dollars in damage to property. It doesn't have to be this way. With some forethought, communities and homes can be sited, designed, and built to mitigate losses caused by fire.

The nonprofit National Fire Protection Association, a fire and life safety organization, created the Firewise Communities Program with support from the USDA Forest

Service and state foresters, and provides developers/builders with simple and easy steps to help reduce a home's wildfire risk by preparing ahead of a wildfire.

These steps are rooted in principles based on solid fire science research into how homes ignite. The research comes from the world's leading fire experts whose experiments, models, and data collection are based on some of the country's worst wildland fire disasters.

Who's At Risk? *Everyone*

First, it is important to keep in mind that when it comes to wildfire risk, it is not a geographical location, but a set of conditions that determine the home's ignition potential in any community.

Wildfire behavior is influenced by three main factors: topography (lie of the land), weather (wind speed, relative humidity and ambient temperature) and fuel (vegetation and manmade structures). In the event of extreme wildfire behavior, extreme weather conditions are normally present, like extended drought, high winds, low humidity and high temperatures, coupled with excess fuel build up including the accumulation of live and dead vegetation material.

Region is no longer an indicator of whether you will be impacted by fire, notes Lorraine Carli, Vice President, Outreach and Advocacy, for the National Fire Protection Association: "While there are more communities in the West and South impacted than other areas of the country, increasingly everyone is susceptible. Because of climate change, fires are occurring in places they never have before."

It can be hard to get people to focus on the problem because many simply don't think it will happen to them.



If it's attached to the house, it's part of the house. Use nonflammable materials for attachments such as fences.

"As we see more fires happening—and the media is focusing on longer fire seasons—we are breaking through people's perceptions that it won't happen in their neighborhoods," Carli says. "People are more aware, and that's a good thing because awareness means action for their home and community."

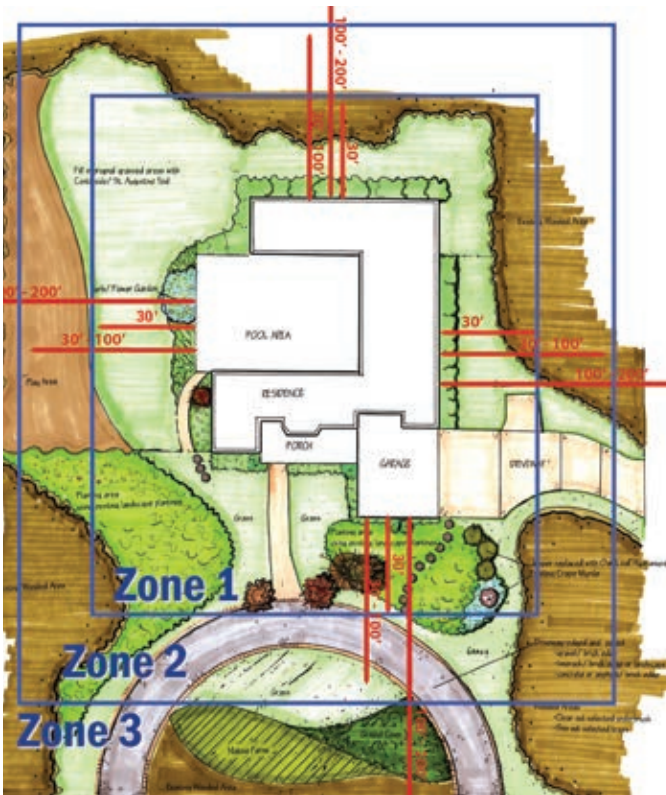
The Firewise Communities Program is a national program, with concepts and best practices that can help any community. The basic premise of a Firewise home is that to be wildfire resilient, a home must be ignition-resistant. It's a package deal: Home design and construction materials are one piece; the immediate surroundings of the home are the other.

Here are three important steps you can take to make the homes and communities safer for your home buyers:

Step 1: Plan a Firewise Landscape

Images of wildfires in action often show a house engulfed in flames, rarely showing how in some cases the surrounding landscape was on fire first, and, depending on its composition, hastening or slowing down the wall of flames. In short: Landscaping is *pivotal* to protecting homes from fire.

When considering surroundings, the primary goal is fuel reduction — limiting the amount of flammable vegetation and materials surrounding the home and increasing the moisture content of remaining vegetation.



The primary goal for Firewise landscaping is fuel reduction—limiting the amount of flammable vegetation and materials surrounding the home and increasing the moisture content of remaining vegetation. The home itself and everything around it up to 100–200 feet is known as the ‘home ignition zone.’

Non-flammable materials, such as hardscaping and brick, help stop the spread of flames.



Firewise Program In Short

FIREWISE IS A KEY COMPONENT of Fire Adapted Communities—a collaborative approach that connects all those who play a role in wildfire education, planning and action with comprehensive resources to help reduce risk. NFPA’s Firewise program is co-sponsored by the USDA Forest Service, the U.S Department of the Interior, and the National Association of State Foresters.

Firewise principles address site design, construction and landscaping, as well as property maintenance and education of residents. These principles can be integrated seamlessly into development design as well as a community’s master deed, covenants, conditions and restrictions (CC&Rs), subdivision rules, and architectural review guidelines.

The program addresses:

- How we build, design and maintain our homes can make them much less vulnerable to ignition in a wildfire.
- The condition of the home itself and its immediate surroundings are what will affect potential home ignition.
- Firewise principles can be “green” and beautiful.
- It’s easier to be Firewise when we design with fire in mind from the beginning.
- For one home to be truly Firewise, neighboring homes must be as well.

For more tips, programs and resources on wildfire preparedness and safety, visit NFPA’s Wildland Fire Operations Division webpage.

The home itself and everything around it up to 100–200 feet is known as the home ignition zone. In areas across the country where the risk of wildfire is high, the home ignition zone extends up to 200 feet beyond the actual home structure. Within this 200-foot area, there are three zones:

ZONE 1 encircles the structure and all its attachments (wooden decks, fences, and boardwalks) for at least 30 feet on all sides. In this area:

- Space plants carefully, and use those that are low-growing and free of resins, oils and waxes that burn easily.
- Mow the lawn regularly. Prune trees up six to ten feet from the ground.
- Space conifer trees 30 feet between crowns. Trim back trees that overhang the house.
- Create a “fire-free” area within five feet of the home, using non-flammable landscaping materials and/or high-moisture-content annuals and perennials.
- Remove dead vegetation from under deck and within 10 feet of house.
- Consider fire-resistant material for patio furniture, swing sets, etc.
- Remove firewood stacks and propane tanks.
- Water plants, trees and mulch regularly.
- Consider xeriscaping.

ZONE 2 is 30–100 feet from the home, and plants in this zone should be low-growing, well irrigated and less flammable. In this area:

- Leave 30 feet between clusters of two to three trees, or 20 feet between individual trees.
- Encourage a mixture of deciduous and coniferous trees.
- Create “fuel breaks”, like driveways, gravel walkways and lawns.
- Prune trees up six to ten feet from the ground.

ZONE 3 is 100–200 feet from the home and this area should be thinned, although less space is required than in Zone 2. In this area:



An example of a Firewise landscape using “islands” of vegetation, a well-watered lawn, and a driveway that serves as a fuel break.

- Remove smaller conifers that are growing between taller trees.
- Remove heavy accumulation of woody debris.
- Reduce the density of tall trees so canopies are not touching.

For more details on zones, check out the Firewise Landscaping and Construction Guide.

NFPA also highlights an array of regional Firewise plant lists here.

Step 2: Consider Fire When Building Homes

Embers can travel a mile or two before landing—a sobering thought that illustrates the invaluable practice of constructing houses using fire-resistant building products.

In fact, according to NFPA, all the research around home destruction and home survival in wildfires points to embers and small flames as the main way that the majority of homes ignite in wildfires. “How we build, design and maintain homes can make them less vulnerable to a fire,” says Carli. “A lot of fires start with embers on a roof.”

To help homes resist ignition, you should:

- Spec non-flammable roof and ignition-resistant construction elements including siding, decking, and windows.
- Consider openings in the home—vents, doggie doors—as potential ember entry points and protect accordingly.



Heavily vegetated steep slopes behind these homes present a challenge for property owners seeking to keep grass and shrubs in check.

- Consider roof/gutter/vent design carefully. For example, complex roofs pose more hazards; edges are vulnerable, including skylight edges; gutters can collect debris; gable end vents are most vulnerable to ember entry from wind. The best solutions include simple roofs, no gutters (if practical), and ventless (if practical) or under-eave vents.

For Developers: Design for Mitigation

Here are some special considerations for developers on how to site developments and homes.

Knowing that terrain and weather are two of the main factors in wildfire risk, consider any major topographical features when designing the subdivision lay-out. These include steep slopes, ridges, bluffs, canyons, “draws”, “chimneys” and “saddles.” Consider that south-facing slopes will have drier vegetation from solar heating and that winds will carry fire up into chimneys and down through canyons. In addition, heavy rains after a fire may cause mudflows or soil erosion.

When considering location of home sites, think of potential fire exposure and elements related to site maintenance and fire response:

- Setbacks
- Home-to-home proximity
- Access/Egress
- Road/driveway width and grade

Homes sited at the top of a ridge will need to have adequate setback away from potential flames. Residents or community managers will need to have access to vegetated

areas in order to maintain them in a Firewise condition.

Think about site design from the point of view of fire approaching, and of the maintenance that will be needed on the landscape to keep fire-prone vegetation from accumulating. Homes with rooflines closer than 30 feet apart can become ignition sources for one another.

Depending on the size of the development, certain infrastructure for fire protection may be required. In the absence of such requirements, you may want to include these features in your plan to enhance community values. For example, since steep, narrow, winding roads make it more difficult for fire engines to respond to fire and medical emergencies, you may want to consider minimizing road gradient where possible both for emergency egress by residents as well as access by fire trucks.

A grade of ten percent or greater will significantly impact the speed and ability of emergency vehicles to arrive and maneuver safely. For a very large community with homes that are widely spread out, a community fire station (or land set aside for one) may be an important addition.

According to Carli, the most overlooked area by builders are porches and decks. "Think of porches, decks, and fences as an extension of the home. Builders must use flame resistant materials in these areas as well so they won't carry the fire to the home."

These points are explained in more detail in the Firewise Landscape and Construction Guide.

In addition, watch this short video from the Insurance Institute for Business & Home Safety showing the results of ember experiments that details what happens when embers ignite mulch.

www.youtube.com/watch?v=lvbNOPSYyss



Step 3: Keep Maintenance in Mind

Proper landscaping and fire-smart house construction must be maintained by the homeowner to be effective in the long term. Make it easy to maintain a Firewise condition:

Think about siting in terms of how the homeowner will deal with surrounding vegetation. As can be seen in the photo on the previous page, the site makes it very challenging for property owners to mow or thin out the vegetation, which could ultimately become fuel in a wildfire.

Provide privacy in design. If you don't create privacy via architectural elements or house siting, owners will add privacy fences, hedges and other features that can increase ignition potential on an otherwise Firewise home.

Build a simple storage area away from the house for firewood to be stacked so it won't become a major wildfire fuel source.

Providing your homeowners with a checklist of maintenance items is as important as fulfilling the punch list when you turn over the keys. Some examples of maintenance include keeping gutters clear of leaves and needles, sweeping debris off flat surfaces, and keeping fuel sources away from the house.

NFPA provides a complete homeowner checklist here.



In a fire, roofing material with a Class A, B, or C rating is fire resistant and will help keep the flames from spreading. Good examples of resistant roofing include composition shingle (top), metal (middle), clay (bottom) and cement tile.



This is an example of overlapping home ignition zones. Special care is needed by all neighbors to minimize fire hazards, since homes this close together can ignite one another in a wildfire.

Be Part of the Community

The above are arguably simple steps you can use to be proactive against fire damage. Once you've committed to doing them, don't hesitate to point out the fire safety features of your homes to potential buyers. As the Firewise Communities Program grows in popularity, these will become selling points that buyers will demand.



Complex roofs need special attention to avoid debris buildup where embers can ignite.



Shrubs against the wood deck go against Firewise principles of keeping "fuel" away from anything that is attached to the house.

Your efforts in addressing siting and fire-smart products for the home will be strengthened by the hands-on efforts of the communities who have elected to join the Firewise Communities Program. The program currently has about 1,200 registered communities and plans to add more communities as official Firewise recognized sites.

"We look at fire protection like a bull's eye," says Carli. "In the center is how the house is built, and then what surrounds it, and then what is further out in the community. You have to consider, though, that if one builder or homeowner employs the principles and installs



The Firewise program is about communities taking responsibility for their own surroundings. Here, a "chipper day" results in reduced "fuel" from brush and dead limbs.



Signs remind people that their community is taking important precautions against fire.

How Fires Start

Here are the three ways homes ignite:

It's the little things. Embers are estimated to be the culprit in more than half of home ignitions leading to destruction. They land in debris on your gutter or under your deck, and fly into vents and other unscreened openings. They wreak havoc on an untreated wood shake roof.

Small flames cause big problems. Embers can start spot fires in your yard that carry to the house. A dry, grassy lawn or a house draped in pine needles provide a continuous path of fuel that small flames consume until they get to the big fuel – your house.

The furnace effect—radiant heat. Large flames within 30 feet of your house can ignite wood surfaces. Large, heavy stands of trees or bushes close to the house mean flames don't even need to touch the house to ignite it. Woodpiles next to the house are a bad idea.

[Check out NFPA's "Dynamics of Wildfire" slideshare for more on how wildfires behave.](#)

the right types of plants and paving, but the houses surrounding it don't, what does that mean in a fire? So the issue becomes how to get neighbors to take safety steps also."

Ultimately, the program is about communities taking responsibility for their own surroundings and requiring fire-smart practices. "It's neighbors helping neighbors so their homes and communities can withstand a wildfire," Carli says. "We visit them on an annual basis and can see how beautiful the communities look and how beautiful homes look with the Firewise landscaping practices they've employed."