Restoration for Homeowners

A Guide to Fire Safety and Native Landscaping in Southwestern Ponderosa Pine Forests

NORTHERN ARIZONA UNIVERSITY | Ecological Restoration Institute

College of Engineering, Forestry, and Natural Sciences

Introduction

MANY PEOPLE LIVE IN THE upland forests of the Southwest for its mild weather, beautiful scenery, and recreation opportunities. But, living in this idyllic landscape also means living with fire, which has played a natural role in the forests of the West for millions of years. As people push further into natural areas that historically experience frequent fire, it is critical that residents and communities work together to be fire adapted. Although much is being done by land managers to restore southwestern forests and reduce the risk of catastrophic fire, residents can and should take action, too, to protect their homes and families.

Throughout the West there are homes, subdivisions, and entire communities located in and adjacent to unhealthy and fire-prone forestlands. Evidence shows that restoration treatments, which include the mechanical thinning of excess small trees and the reintroduction of fire through prescribed burns, help reduce the risk of fire in these areas. Forest restoration not only reduces hazardous fuels but it improves wildland health by returning overgrown forests to a more resilient condition, one that can better withstand major disturbances from insects, fire, and changes in climate. Treatments also increase firefighter safety and allow increased tactical fire suppression options that may not be possible in untreated locations.

Yellow coneflower (*Ratibida columnifera*)

Although firefighters play a key role in safeguarding communities, their resources are limited during extreme fire events. They may not be able to protect every home, especially those where homeowners have taken no proactive steps to increase safety. It is important that homeowners chip in to protect their homes and neighborhoods and help create a Fire Adapted Community. In the end, wildfire safety and home protection starts with the homeowner. While it may not be possible to be 100 percent fireproof, what you do around your home and surrounding property can mean the difference between damage, loss, or survival.

This guide is intended to provide homeowners with information to help reduce wildfire risk while also promoting a healthier and more sustainable environment. This guide will help you determine whether your home and property are in danger of ignition, and provide actionable steps and resources to reduce that risk. It will also provide tips on choosing fire-resistant plants and landscape designs that conserve water and provide wildlife habitat.

WHAT IS A FIRE ADAPTED COMMUNITY?

The Fire Adapted Communities Network takes a collaborative approach to wildfire risk reduction. It engages key stakeholders in the community and invites everyone—from wildfire officials, community planners, residents, business owners, emergency responders, insurance representatives, and land managers—to take action in preparing for wildfire. Firewise is an important element of being fire adapted. It provides a framework that includes concepts and tips for homeowners to best prepare for wildfire by reducing their home's risk of ignition.

Fire's Natural Role in the Forest

Fire has played a natural role in forested ecosystems throughout western North America for millions of years. The evolutionary environment of ponderosa pine forests included frequent, low-intensity fire, which managed tree populations, supported plant diversity, and provided wildlife habitat by maintaining healthy understory forest conditions.

Fire scars on pine trees, along with other lines of evidence, tell a history of low-intensity fires burning through the woods every two to 12 years. Before Euro-American settlement in the late 1880s, forests were open and parklike. The fires, mostly ignited by lighting, would burn across the forest surface, regulating over-abundant tree growth by removing saplings and stimulating native grasses, wildflowers, and shrubs. The resulting landscape was one interspersed with clumps of old, large pine trees and grassy meadows—ideal habitat for foraging animals, butterflies, and birds.

With settlement came intense livestock grazing, logging, and fire exclusion, as few of these ecologically beneficial fires were allowed to burn. Forests grew dense with small, highly flammable pines and a thick ground cover of decades of accumulated dead and downed woody debris, which serve as fuel for future wildfires. These forest fuels would have been naturally cleaned up by our once frequent, low-intensity fires. Today's abundance of fuel produces dangerous, destructive, and fast-moving wildfires. They burn so hot that they kill large trees, destroy buildings and homes, and threaten lives.

There are more than 45 million homes near or in the wildland-urban interface (National Fire Prevention Association).

FIRE SCARS HELP PAINT A PICTURE OF THE PAST

Tree rings tell the story of the past—and the future. Small char marks (arrows) reveal that this northern Arizona ponderosa pine tree experienced 34 low-severity fires over 240 years. The fires stopped after 1869, when newly introduced livestock ate away grasses and other fine fuels. Small trees proliferated and fire danger grew. Restoration requires reestablishing the ecological processes that shaped these forests, including low-severity fire.

What is Restoration?

Restoration is a process to restore the natural patterns and arrangements of native forest plants so they can tolerate and bounce back from disturbances like natural fire, insect infestations, and drought.

In places where forests are highly degraded and stocked with an over-abundance of trees, fire alone cannot restore natural structure. In these cases, land managers use mechanical thinning operations to cut down and remove excess small trees. Prescribed fire is often applied after thinning to reduce fuel accumulation on the forest floor and reinvigorate grasses and wildflowers. By reducing competition for water and nutrients, restoration improves the health of the remaining trees. Ecologists in the Southwest have spent decades studying the historical and natural conditions of the forests and use these conditions to guide restoration treatments.

The ecological and social benefits of restoration are numerous. Healthy forests protect water supplies, create wildlife habitat, provide recreational opportunities, strengthen economies, improve surface water quality and recharge groundwater, and protect carbon storage in trees, to name a few. Studies show that the removal of small trees and hazardous fuels, like pine needles and woody debris, greatly reduces the risk of catastrophic fire. Many communities across the West have developed wildfire protection plans that include forest restoration activities in the wildland-urban interface (WUI), defined as the area where forests and urban development intersect. Research has shown that restoration treatments in the WUI have protected communities from wildfire by slowing down or even stopping the spread of the fire and providing areas for safe and effective firefighting efforts.

There were 1,251 large or significant wildfires reported in 2016 (40,000 acres or more) (National Interagency Fire Center).

How to Protect Your Home from Fire

Wind-blown embers from a wildfire can travel well over a mile. So while the flames may not be at your back doorstep, depending on wind and weather conditions, a distant fire can be just as dangerous, igniting smaller fires ahead of the main fire front. Excess fuel accumulations of live and dead vegetation plus a changing climate that includes warmer, drier weather patterns increase the danger of extreme wildfire behavior. Fire intensity and severity are influenced by a variety of factors, like fuel, weather, and terrain. We cannot control the weather or topography, but we can help control the fuel a fire needs to grow and spread.

Fire tends to move from the ground into the crowns of trees through "ladder" fuels like shrubs and low-hanging tree branches and limbs. As it moves into the trees, the flames become longer and larger and create more heat. Flying embers can land and easily ignite on roofs, gutters, and decks if they are strewn with dead leaves and pine needles as well as wooden patio furniture and cushions, firewood piles, underdeck storage items, and other combustibles. Excess pine cones, dead leaves, and needles on lawns can carry the fire to your home's flammable features.

The key is to create a defensible space from fire in and around your home. You can do this by managing the fuels on your property through appropriate treatments in three key zones extending around your home.

LIVING WITH SMOKE

Fire is simply a part of life in southwestern ponderosa pine forests. Seasonal prescribed burns—planned ignitions designed to safely reduce excess hazardous fuels—do produce smoke. But smoke from a prescribed fire is not as heavy, abundant, or long-lasting as smoke produced from a wildfire because land managers plan in advance to mitigate such impacts. For many, tolerating occasional light smoke from controlled fires is more desirable than experiencing heavy smoke from unpredictable and destructive wildfires.

Forest managers typically give the public advance warning of prescribed burns. If you have concerns about smoke, contact your local fire department or the agency conducting burns. Many have plans for notifying and accommodating people sensitive to smoke.

HOME IGNITION ZONES

NFPA, Firewise Communities Program

ZONE 1 0–30 ft

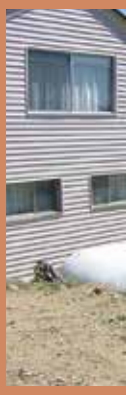
Zone 1 is a well-irrigated area that includes your home, any structures that extend from it, and the area around it for at least 30 feet on all sides. This area includes decks, porches, fences, and other attachments to the home. Consider non-flammable or low flammability construction materials when building, repairing, or remodeling your home, particularly regarding roofs, siding, and windows.

In this area:

- Firewood stacks and propane tanks should be moved far away from the home; they should not be located in this zone.
- Create a "fire-free" area within five feet of the home by avoiding plants and mulch. Use non-flammable landscape materials instead and/or high-moisture content annuals and perennials.
- Rake leaves and pine needles away from the foundation, and remove dead vegetation and stored combustible items from under the deck.
- Remove pine needles and other flammable materials from the roof and gutters.
- Plants in this zone should be widely spaced and low growing. Make sure the plants are free of resins, oils, and waxes that burn easily.
- Mow the lawn regularly. Prune trees up to 10 feet from the ground.
- Space conifer trees 30 feet between crowns. Trim back trees that overhang the house.
- Consider fire-resistant material for patio furniture, swing sets, etc.
- Water plants, trees, and mulch regularly.
- Consider xeriscaping—a style of landscaping that uses little to no water—to conserve water and break up ground fuel continuity.

For more info on xeriscaping, visit https://www.nationalgeographic.org/encyclopedia/xeriscaping/.





Site and Structure Hazards *(facing page, from top to bottom)*
a *Pine needles and pine cones should be cleared from decks.* ***b*** *Woodpiles should be moved away from the house.*
c/d *Propane tanks are highly flammable and should be moved far away from the home.*
e *Pine needles should be cleared from roofs and gutters.*

ZONE 2 30–100 ft

Zone 2 is 30 to 100 feet from the home. 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.
- Maintain open space between tree crowns and prune trees up to 10 feet from the ground.

Trimming trees reduces fire risk.

- Clear and dispose of heavy accumulations of pine needles, fallen leaves, and other flammable materials.
- Keep plants watered and mow dry grasses and weeds.
- Choose deciduous trees.
- Create "fuel breaks," like driveways and gravel walkways.
- Allow good access. Maintain a wide, uncluttered driveway with sufficient vertical and horizontal clearance to allow fire engines to enter and to turn around. Post your house number so it is visible from the street.

ZONE 3 100–200 ft

Zone 3 is 100 to 200 feet from the home. This area should be thinned, although less space is required than in Zone 2. NOTE: Because of other factors such as topography, the recommended distances to mitigate for radiant heat exposure actually extend between 100 to 200 feet from the home — on a site-specific basis.

In this area:

- Reduce the density of tall trees so canopies are not touching and remove ladder fuels — such as smaller conifers growing between taller trees and dead, dangling branches — to lower the danger of crown fire without losing the forest's natural qualities.
- Protect big, old trees. Large pines provide important wildlife habitat, are aesthetically pleasing, and increase property values. Rake pine needles and woody debris at least 2 feet away from their trunks and trim nearby small trees and shrubs that could carry fire into their crowns.
- Remove heavy accumulations of downed logs and branches.
- Think clumps. Some clumps of dense trees and shrubs can be left standing for visual screening or for wildlife habitat, as long as they're separated from the house and from one another by defensible open space—and placed so they can't carry fire into the crowns of large trees.
- Think openings. Openings with grasses and other low vegetation are important for many wildlife species, and can help stop or slow a fire.

Creating a Natural, Firewise Landscape

Landscaping and landscape management play a critical role in minimizing wildfire risk to homes and property. Firewise landscaping can be aesthetically pleasing while reducing potential wildfire fuel. Plant choice, spacing, and maintenance are critical and your landscape, which includes the plants in it, must be maintained to continue being Firewise. There are many native and local species that are appropriate for Firewise plant material.

Designing Your Landscape

Increasing your home and property's fire resistance doesn't mean you have to relinquish aesthetic landscaping methods. In fact, there are many landscaping ideas that add aesthetic value to your home while reducing its risk from fire, increasing wildlife habitat, and conserving water.

Some ideas to incorporate are:

- Use small irregular clusters of plants. For example, if you plant trees or shrubs for privacy make sure they are positioned in "islands" away from buildings or large trees.
- Use decorative rock, gravel, and stepping stones for landscaping and pathways to break up ground fuels and add visual dimension.
- Use rock mulch, cinders, or gravel in and around flower beds to inhibit weed growth and maintain soil moisture without increasing fire danger.
- Make sure tall, woody plants or groupings on slopes are spaced widely, since fire travels more quickly on slopes than flat ground. Well-maintained native perennial ground covers can control erosion without significant fuel increases.
- Create rock piles instead of dead brush piles for wildlife cover.
- Use a variety of plant species. Plant diversity results in fewer harmful insects and diseases and supports a healthy landscape more resistant to wildfire.
- Control invasive species. Nonnative plants like Dalmatian toadflax, cheatgrass, and spotted knapweed threaten natural forest diversity and can readily carry fire.
- Use native plants that tolerate local conditions. Consult your local arboretum, botanic garden, garden club, plant nursery, municipal planning department, or county extension master gardener program.

Choosing Firewise Plants

The following are some tips on choosing Firewise plant species for your home landscape plan:

- Choose deciduous shrubs and trees. Their leaves have higher moisture content and they tend to be more fire resistant. These plants drop their leaves seasonally, which means less fuel to carry fire through their canopies; however, it is critical you rake and remove the leaves every year.
- Choose drought-adapted plants, like succulents or cacti. They tend to have smaller leaves or leaves that store water.
- Avoid plants with high resin content, which makes them flammable even when well-watered. Conifers like pines, firs, spruces, junipers, and Arizona cypress tend to be flammable due to their oil and pitch content, regardless of moisture status.
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Look for the following characteristics when choosing Firewise plants:

- Plants that grow without accumulating large amounts of dead branches, needles, or leaves (e.g., aspen or maple trees).
- Plants that have open, loose branches with a low volume of total vegetation (e.g., currant and elderberry).
- Plants with low resin content (many deciduous species).
- Plants with high-moisture content (succulents, some herbaceous plants).
- Plants that grow slowly and do not need frequent clipping.
- Plants that are short and grow close to the ground (small wildflowers, non-coniferous groundcovers).

Most homes, an estimated 90 percent, are destroyed during wildfire by burning embers landing on, in, or near the house on something that easily ignites (Living with Fire Program).


Western yarrow *(Achillea millefolium)*


Blue flax *(Linum Lewisii)*


Showy goldenflower *(Heliomeris multiflora)*


Blue grama *(Bouteloua gracilis)*

Backyard Wildlife Habitat

Backyards are a part of a home's landscape that have the potential to provide habitat for many wildlife species. Migratory birds and butterflies travel through the Southwest visiting shade trees and flower gardens on their migrations in the spring and fall. They are best adapted to feed and nectar on local, native plants. Check with your local plant nursery for a list of plants best suited for your garden and region.

Water Features

There are many water features on the market today that are designed with water conservation in mind. Birdbaths, small fountains, or ponds attract birds and dragonflies. Water should be changed frequently to avoid algae growth or mosquito larvae.

Plants as Food for Wildlife

Many plants provide food for animals. Leafy trees, shrubs, and wildflowers support populations of small insects that attract birds and other animals. Showy wildflowers produce nectar and pollen for hummingbirds, butterflies, moths, and bees. Shrubs and trees that bear fruit or nuts attract an array of animals through winter. Plant many different types of vegetation to ensure a variety of food sources. To avoid wildlife conflicts, seal crawl spaces, attics, and garages to keep out skunks, squirrels, rodents, and other unwanted wildlife.

On average, U.S. land management agencies spend $2.6 billion on fire suppression-related activities each year (National Fire Prevention Association).

Flowers ~ Pollinator animals like bees, hummingbirds, bats, butterflies, and moths are attracted to yards and garden with a diversity of flowering species. Penstemons are a widely used group of native flowers because they have showy, colorful flowers that attract hummingbirds, bees, and butterflies. Perennial wildflower meadows that incorporate a variety of species ensures that some flowers will bloom every year even with varying moisture conditions. Native wildflowers such as yellow coneflower *(Ratibida columnifera),* showy goldenflower *(Heliomeris multiflora),* and blue flax *(Linum lewisii),* are a few plants to consider.

Berries ~ Currants, gooseberries, serviceberries, chokecherries, and barberries are all native shrubs that produce wild fruits. Their abundant, sweet fruits are sought after by birds and other wildlife. As an added bonus, shrubs, when planted away from the house, can also provide visual screening or wind protection.

Grasses ~ A more economical and environmentally friendly alternative to the classic bluegrass lawn is to use native grasses that are drought tolerant. Blue grama *(Bouteloua gracilis)* is often suggested, but many people mix this grass with western yarrow *(Achillea millefolium),* a flowering plant.

Native Plant Web Resources

Arizona Native Plant Society: http://www.aznps.com/sources.php

National Wildlife Federation's Garden for Wildlife: http://www.nwf.org/Home/Garden-For-Wildlife.aspx

Center for Water Efficient Landscaping (CWEL), Water-Wise and Native Plants: http://cwel.usu.edu/plants

Invasive Weeds of the Southwest: http://www.invasiveweeds.com/canido

Center For Invasive Plant Management: www.weedcenter.org

Southwest Exotic Plant Information Clearinghouse: www.usgs.nau.edu/SWEPIC

A total of 4,312 structures were destroyed by wildfires in 2016, including more than 3,000 homes and more than 70 commercial buildings (National Interagency Fire Center).

THE BUZZ

ON BEES AND OTHER POLLINATORS

Many plants depend on honeybees or other pollinators to reproduce. In recent years, bee populations have dwindled and bee colonies, both wild and managed, across the country are at risk due to a phenomenon called colony collapse disorder (CCD). This occurs when a majority of worker bees abandon the hive causing it to collapse, or die. This is a major concern for the U.S. agricultural industry, which relies on bees to pollinate crops. There are many contributing factors to CCD, but agreement exists that pesticides, loss of habitat, climate change, and disease are at the forefront.

So what can you do?

Create a pesticide-free space for pollinators that will invite native bees and other beneficial insects. Purchase plants that aren't pretreated with pesticides. If it is unclear if the plants were treated, ask questions when shopping for seeds and flowers. Leave the blooming clover, which some see as a weed, for bees to enjoy. Plant high-nectar flowers and provide a "bee bath"—a shallow container of fresh, clean water for thirsty bee visitors.

For more information on specific flowers and plants for your bee garden, go to **thehoneybeeconservancy.org**.

HOW TO CREATE A WILDFIRE ACTION PLAN*

Before a wildfire threatens your home, prepare an action plan and familiarize all members of the family with it. Use the checklist below to help craft your plan:

Create an Evacuation Plan:

- ☐ Designate an emergency meeting location outside the fire or hazard area.
- ☐ Identify several different escape routes from your home and community.
- ☐ Have an evacuation plan for pets and large animals like horses and other livestock.
- ☐ Create a family communication plan with a friend or relative as the primary point-of-contact. This person can help coordinate with family members in case of separation.

Be Prepared:

- ☐ Have fire extinguishers available on site, train your family to use them, and make sure they are up-to-date.
- ☐ Ensure your family knows where your gas, electric, and water main shut-off controls are located. Teach everyone how to shut them down in an emergency.
- ☐ Assemble an emergency supply kit for each person.
- ☐ Maintain a list of emergency contacts in the emergency supply kit.
- ☐ Keep an extra emergency supply kit in your car in case you cannot reach your home because of fire.

* Modified from www.readyforwildfire.org

General Resources

- National Fire Prevention Association, Wildfire Safety: http://www.nfpa.org/public-education/by-topic/wildfire-and-seasonal-fires/wildland-fires
- Firewise Communities Program: http://www.firewise.org/
- Firewise Toolkit: http://www.firewise.org/wildfire-preparedness/firewise-toolkit.aspx
- Fire Adapted Communities Learning Network: https://fireadaptednetwork.org/
- Forests and Rangelands, Community Wildfire Protection Plans: www.forestsandrangelands.gov/communities/cwpp.shtml
- U.S. Fire Prevention and Education: https://www.fs.fed.us/fire/prev_ed/
- The Wildfire Home Assessment and Checklist by the Insurance Institute for Business & Home Safety: http://disastersafety.org/wp-content/uploads/wildfire-checklist_IBHS.pdf. (This link has a cost estimator to help prioritize projects and plan your home improvement budget.)
- The "How to Prepare for a Wildfire" guide by the Federal Emergency Management Agency: https://www.fema.gov/media-library-data/1409003859391-0e8ad1ed42c129f11fbc23d008d1ee85/how_to_prepare_wildfire_033014_508.pdf
- The International Association of Fire Chiefs Ready, Set, Go! program: http://www.wildlandfirersg.org/

Resources by State

- Arizona Department of Forestry and Fire Management, Firewise: https://dffm.az.gov/fire/prevention/firewise
- Colorado Firewise Communities: https://csfs.colostate.edu/wildfire-mitigation/colorado-firewise-communities/
- New Mexico State Forestry Fire Prevention and Outreach: http://www.emnrd.state.nm.us/SFD/FireMgt/FirePreventionandOutreachProgram.html
- Utah Division of Forestry, Fire & State Lands, Wildfire Community Preparedness: http://www.ffsl.utah.gov/index.php/fire/resources-for-homeowners

Cover images, clockwise from top: A Firewise home (courtesy National Fire Protection Association)*; Butterfly visiting a native flower (photo by ERI); Low-water, fire-resistant landscaping* (courtesy Mark Brehl, Arizona State Forestry). *Page 8: "Spring Bath"* by TJ Gehling, 2015.

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The Ecological Restoration Institute

The Ecological Restoration Institute at Northern Arizona University is a pioneer in researching, implementing, and monitoring ecological restoration of dry, frequent-fire forests in the Intermountain West. These forests were significantly altered during the last century, with decreased ecological and recreational values, near-elimination of natural low-intensity fire regimes, and greatly increased risk of large-scale fires.

The ERI is working with public agencies and other partners to restore these forests to a more ecologically healthy condition and trajectory—in the process helping to significantly reduce the threat of catastrophic wildfire and its effects on human, animal, and plant communities.

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