Wildfire Risk Assessment Guide *for* Homeowners

in the Southern United States

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Wildfires are an important and necessary occurrence in many natural areas of the southern United States, but they also present a risk to homes constructed in, or next to, such areas. All homes are not equally at risk for a variety of reasons.

For homeowners, risk is based on nearby land use, vegetation near homes and building design and materials. If you live in a subdivision surrounded by other homes or developments with abundant green lawns and open space, or in the middle of an urban area, then your wildfire risk is likely low and this document may not apply to you. However, if your home is located adjacent to or near undeveloped, shrubby or wooded land, then you could be at risk if a wildfire occurs — read on!

Risk assessment allows homeowners to evaluate their particular exposure to fire as well as the critical factors that increase their risk. This guide will help you determine your risk and how to reduce it.

Factors That Influence a Home's Vulnerability *to* **WILDFIRE**

For fire to occur, three things must be present: heat, oxygen and fuel (some words are defined in the glossary). During wildfires, oxygen is not a limiting factor due to its abundance in the atmosphere. When a house is subjected to an approaching wildfire, whether or not it ignites depends on the length of time it is exposed to high heat or embers — and the home's properties as a fuel. The primary fuels during wildfires are plants (both living and dead), although flammable materials on or near a house can also function as fuel. There are three primary ways in which a wildfire can ignite a home:

- **Firebrands,** or floating embers, can lead to home ignitions up to a mile away if they land on flammable objects such as wood shingles, wood decks or pine needles (Figure 1).
- **Direct flame contact** with the structure or attached features such as fences or decks can cause ignition.
- **Radiant heat** can ignite, melt or damage certain materials (e.g., soffit vents, siding, windows) which expose other flammable materials in a house to possible ignition.

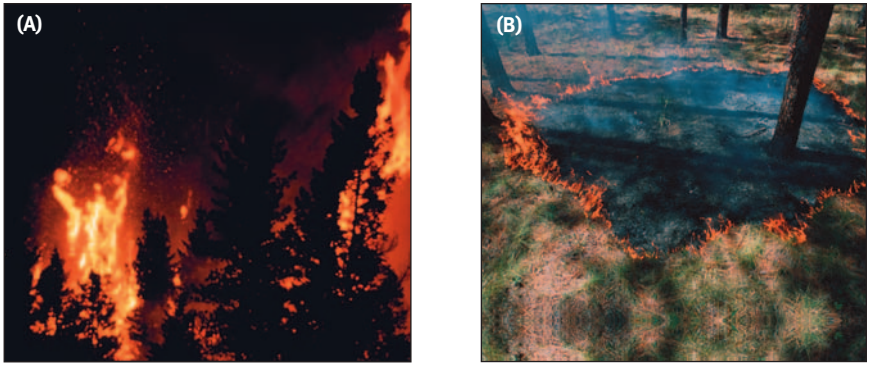

Figure 1. Burning pieces of vegetation (firebrands above the flame in A) may be carried hundreds of feet by winds and convection. When the embers land in grass or pine needles (B), or other flammable material, fires can spread quickly to nearby structures.

Characteristics of a home and its surrounding landscape can directly influence these ignition pathways, and therefore, a home's level of wildfire risk. The most important hazard rating factors for individual homes are 1) the natural or planted vegetation around a home and 2) building materials and structural design. The steepness or slope of the land around a home is also important (Figure 2), and it is included in the rating system for the building materials and design.

Other factors may contribute to the wildfire risk of a community such as the availability of fire hydrants and other sources of water, the proximity of fire control organizations or the access roads in and out of a community. The focus of this guide is risk assessment on individual lots and homes, not for the community as a whole. For more information on community risk, contact your local fire control organization.

Figure 2. The house in this figure is situated on a hill with 30% slope, or steepness. Wildfires may spread faster and with more intensity as slopes get steeper.

VEGETATION Around *a* HOME

When assessing wildfire hazard, the vegetation around a home can be considered in two zones: the wildland zone or natural plant community in which homes and lots are situated, and the landscaped zone of modified vegetation. This includes trees, planted shrubs or mown grass between structures and the wildland zone. Both zones are important in determining wildfire hazard.

The type of plants and their arrangement in the wildland zone significantly influence whether a wildfire will spread through your community. If a wildfire does occur, they will also influence the fire's intensity, its destructive potential (hazard) and the generation of embers. The most common wildland plant communities in the southern United States are ranked by their relative wildfire hazard in the "Risk Assessment" section of this document (page 6).

To identify the natural plant community you live in, walk around the outside of your home and observe the types and arrangement of plants beyond your landscaped zone, including their size and density. Plant community descriptions (with photos) on pages 11 through 15 may be useful in this identification. If the natural vegetation around your home has characteristics of more than one plant community, focus on the vegetation that is near ground level (e.g., shrubs, grasses and dead leaves). The arrangement of this material, called surface fuel, generally has the greatest effect on fire intensity and fire movement.

Both living and dead plants will burn — and they function as the primary fuel during wildfires. The intensity with which they burn also depends on seasonal weather patterns, which vary across the South. For example, the wildfire season in Florida often peaks in May when the state typically experiences dry weather and high temperatures. In the southern Appalachian Mountains region, however, most wildfires occur in winter or early spring — while the trees are dormant and dead leaves cover the ground. Some of these seasonal differences in fire behavior are included in the plant community descriptions at the end of the guidelines.

Investigations of why homes burn during wildfires consistently find that the distance from the edge of the wildland plant community to the house is a key factor influencing a home's survival. Most experts recommend maintaining a landscaped zone cleared of highly flammable vegetation that extends a minimum of 30 feet out from a home; but the recommended area may be extended up to at least 100 feet in high hazard areas or mountainous terrain. This area of modified vegetation is referred to as defensible space, because it improves the likelihood that the home will survive on its own if firefighters cannot reach it or it gives firefighters space to maneuver their firefighting equipment.

To create defensible space around your home, it is not necessary to remove all plants (Figures 3 and 4).

- Create islands or clumps of plants that are separated by areas that won't burn readily: lawn, dirt and gravel/stone walkways.
- Prune plants so that the lowest tree branches are separated vertically from the tallest shrubs or grass by at least 10 feet.
- Isolate or remove plants that are known to be highly flammable.
- Maintain a space of 2 to 5 feet immediately adjacent to the house that is cleared of all shrubs and dead plant materials.

For the risk assessment in this guide, the categories of defensible space represent the distance away from your house (in all directions) where vegetation has been maintained or modified. To determine which defensible space point rating to use for your home, locate and measure the minimum distance from your house to the edge of the unmodified, wildland zone.

Figure 3. Vegetation around this house was modified to demonstrate major principles for creating defensible space. Notice the tall, dense shrubs (palmettos) in the before treatment picture (A). The homeowner removed the tall, flammable shrubs — like palmetto — and replaced them with an assortment of groundcovers and low growing shrubs (B) to reduce fire risk.

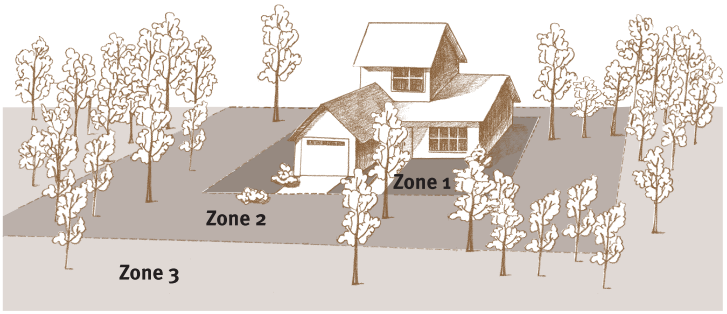

Figure 4. Diagram of defensible space. Zone 1 represents the area within 2 to 5 feet of the house cleared of all vegetation. Zone 2 extends at least 30 feet out from the house as the primary zone of defensible space, and Zone 3 represents the area between 30 and 150 feet away from the house where the reduction in shrub and tree density is less severe.

Building Design *and* Construction Materials

Many parts of a home are vulnerable to wildfire. In general, exterior construction materials that degrade or ignite when exposed to heat or flames (vinyl, wood or glass) create the most risk.

- Wood shingles on a roof will ignite when exposed to firebrands, as will debris in gutters or roof valleys.

- Airborne embers can enter attics through open eaves or soffits.
- Vinyl soffits will melt when exposed to heat from a wildfire and fall away from the roof trusses or wall sheathing, creating a pathway for embers to enter the attic. (Figure 5)
- Fire can be carried underneath a structure by sparks or nearby burning plants if a home has an open foundation or a deck without skirting.
- Wooden decks and fences that are connected to a house can lead to home damage if they ignite during wildfires.
- Windows can transmit radiant heat and break under heat stress. Tempered or double-paned glass performs better than single-paned glass during wildfires. Windows with a low-emittance (low-E) coating also perform well during wildfires, because the coating reduces the transmission of heat through the glass. Should a window break, it serves as an easy pathway for embers to enter a home.
- The distance between homes in a neighborhood can also be important, because a burning home produces significantly more heat than most vegetation and emits large pieces of burning material that can ignite other nearby houses or structures.

FIGURE 5. A row of foundation shrubs ignited in front of this house during a wildfire. Notice how the vinyl siding around the windows and the vinyl soffit vents were damaged, but the brick was not.

The structure component of the risk assessment lists building construction materials and related factors that contribute to a home's wildfire risk rating. All of the factors listed are important, but it only takes one weak point on a house for ignition to occur during a wildfire. Therefore, related factors were grouped, and you should select the highest rated factor from each group to assess the structure component. Factors in the first group (e.g., wood deck or roof) are susceptible to firebrand ignitions. A home with a high hazard rating for these factors can be damaged or destroyed even when the fire is hundreds of feet away. The second group includes local factors that either increase the wildfire intensity or provide ignition sources from adjacent structures. The third group includes factors (windows, vinyl soffits, etc.) that are resistant to firebrands, but sensitive to nearby burning objects. These factors are vulnerable to radiant heat or direct flame contact. Therefore, homeowners with 100 feet or more of defensible space, and at least 3 to 5 feet of cleared space immediately adjacent to the structure, should not include any factors from the third group to rate their home.

Wildfire Risk Assessment *for* Southern Homeowners

This risk assessment is organized into two major components: **A.** The *Fuel Component* and **B.** The *Structure Component*. The fuel component assesses the vegetation around a home. The structure component identifies hazardous characteristics of a home's design and building materials. During a wildfire, the fuel and structure components work together to affect the home's survivability. That's why both components must be assessed to determine the wildfire risk of a particular home.

A. Fuel Component

Select the most appropriate point rating for each of the two fuel factors (natural plant community and defensible space) and multiply the points together to determine the fuel component score. Refer to plant community descriptions in Appendix A if you need clarification on which surrounds your home.

1. Ratings for the major plant communities of the southern United States:	**Points**
Very Low Fire Hazard Cultivated agricultural lands	**0**
Low Fire Hazard Hardwood forest (e.g., oaks, hickories, maples, poplars) Mature pine plantations that are open underneath trees (few shrubs) Seasonally flooded swamps (e.g., cypress or bay swamps)	**1**
Moderate Fire Hazard Pine savannas (low density pines with grasses underneath) Grasslands Seasonal marshes	**3**
High Fire Hazard Pine forests with shrubs < 6 feet tall Young hardwood forests with dense shrubs Recently logged forests with downed woody debris Other plant communities dominated by shrubs < 6 feet tall	**4**
Very High Fire Hazard Dense shrubs > 6 feet tall; may or may not have trees above the shrubs	**5**
Total points for natural plant community around your house	____

2. Defensible Space	**Points**
> 100 feet of defensible space	**1**
60-100 feet of defensible space	**1.5**
30-60 feet of defensible space	**2**
< 30 feet of defensible space	**4**
Total points for defensible space	____

A. Fuel Component Total; multiply points from **1** and **2**: ___ x ___ = _____
(1) (2)

B. Structure Component

Check only the highest rated factor in each list that describes a structural characteristic of your house or surrounding area. Then record the points from the highest rated factor that you checked as the subtotal for that group of factors (only one factor per group). If none of the listed factors are represented on your property, then your rating for that group will be zero.

1. Firebrand Ignition Factors (Check only the highest rated factor):	**Points**
Wood shingles or shakes on roof (Class C or not rated)	**5**
Wood deck	**3**
Open or combustible soffits	**3**
Open space under house without skirting	**3**
None of the above	**0**
Total points for Firebrand Ignition Factors (maximum 5 points)	____

2. Other Indirect Ignition Factors (Check only the highest rated factor):	**Points**
Slopes > 30%	**2**
Wood fence (connected to house)	**2**
Adjacent house or outbuilding < 50 ft. from house	**1**
Stacked firewood and/or propane tanks < 30 ft. from house	**1**
None of the above	**0**
Total points for Indirect Ignition Factors (maximum 2 points)	____

3. Heat-Related or Direct Ignition Factors (Check only the highest rated factor): *Include these factors ONLY if you have < 100 feet of defensible space*	**Points**
Wood siding	**3**
Vinyl siding or soffits	**2**
Single paned, non-tempered glass	**2**
None of the above	**0**
Total points for Heat-related Ignition Factors (maximum 3 points)	____

B. Structure Component Total; add points from 1-3: ___+___+____=____
(1) (2) (3)

Combine the Fuel and Structure Components to determine your overall wildfire risk rating

Overall Wildfire Risk Rating:

A. Fuel Component Total _____ + **B.** Structure Component Total ____ = _____

Interpreting your overall risk rating:

< 5 = Low Risk , 5-8 = Moderate Risk, 9-13 = High Risk , > 13 = Very High Risk

What do your scores tell you?

The total risk rating is related to four levels of fire risk (low to very high). If your rating falls in the high or very high-risk category, you should take an active role in reducing the risk of wildfire on your property. Your actions could significantly increase the survivability of your home in the event that a wildfire occurs. You can reduce your total risk rating by modifying the particular factors that increase your risk rating the most, using the hazard reduction rules as a guide. For example, if you recorded high hazard points for the "firebrand" factors, then you should consider modifying that factor to score fewer hazard points (e.g., close soffits or crawl space). However, with the factors that are associated with radiant heat or direct flame contact, you can reduce the hazard simply by maintaining a sufficient area of defensible space. If you are unable to increase your defensible space due to small lot size, you can concentrate on building materials and/or work with your neighborhood association to address wildfire safety concerns. For example, a firebreak could be created around your neighborhood. For more information on possible neighborhood or community-level risk reduction actions, contact your local fire control or forestry organization and visit the following website for examples of what other communities have done: **http://www.firewise.org/usa/**

Conclusion

As a homeowner, you need to understand that in critical fire situations there may not be enough firefighting resources to protect all homes. By taking personal responsibility for reducing hazards around your home, you may substantially increase the likelihood that your home will survive a serious fire. It is important to make those changes before a fire starts! Equally important will be regular maintenance to maintain your firewise home and landscape.

WILDFIRE HAZARD REDUCTION ACTIONS

For each of the following factors that may be contributing to your wildfire hazard, actions are listed that will reduce that hazard. The house in Figure 3 presents examples of many of these actions. Both the landscaping around the house and its building materials were "retrofit" to be more fire resistant. For more information on the retrofit house (and additional pictures), visit the following website: **www.interfacesouth.org/fire/firewisehome/**

If house has wood shingles or deck,

- replace wood shingles with Class A shingles (asphalt, fiberglass), tiles or metal
- install nonflammable skirting (metal screen, stucco or masonry) around wood deck if not already present
- install a sprinkler system to cover roof and/or deck
- convert deck to screened porch with metal screen

If house has wood siding,

- clear flammable vegetation and mulch from a 3-5 foot zone around structure
- create defensible space that extends at least 30 to 100 feet from home

If house has open foundation and crawl spaces,

- clear debris and other flammable materials from under house
- install nonflammable skirting (metal screen, stucco or masonry) around house
- clear flammable vegetation and mulch from a 3-5 foot zone immediately around house

If shrubs dominate adjacent wildlands

- use prescribed burning, hand-held tools or herbicide applications to remove most natural-growing shrubs up to a distance of at least 60 feet from the house; islands of plants can be left in accordance with defensible space guidelines; shrub treatments may have to be repeated periodically
- if on a hill, remove most shrubs within 100 feet of the house on the downhill side
- in the area between 60 and 150 feet from the house, the density and continuity of shrubs and trees should also be reduced

If significant woody debris (downed trees and branches) is present in adjacent wildlands and defensible space is less than 60 feet,

- use prescribed burning or chipping equipment to reduce the amount of large woody debris in wildlands
- pile and burn following local outdoor burning ordinances

If grasses dominate adjacent wildlands and defensible space is less than 30 feet,

- mow regularly to keep grass short in your defensible space
- use goats, sheep or cattle to keep grass short in adjacent wildlands
- install sprinkler system in area from 0 to 30 feet from house

In all situations, maintenance is a must:

- remove pine needles and other flammables that collect on roof, deck and around foundation
- prune shrubs and trees periodically to remove dead materials

Glossary

Coastal Plain A region in the southern USA of relatively flat terrain that includes the coastal areas of the Atlantic Ocean and the Gulf of Mexico and extends inland to the Piedmont.

Deciduous Plants that lose all of their leaves seasonally, usually in the fall.

Defensible Space The area around a structure where modified vegetation patterns and landscaping allow the structure to better survive on its own and, when resources are available, provide sufficient space for firefighters to maneuver their equipment.

Evergreen Plants that have green leaves throughout the year; they do not lose all of their leaves or needles at one time.

Firebrands Air-borne embers that are capable of igniting plants or homes at great distances from a wildfire.

Fire Intensity Refers to the amount of heat produced by a fire in a given area. Fire intensity is dependent on fuel and weather conditions.

Fuel Any material that can burn; the primary fuels in wildfires are plant materials.

Hardwood Trees Trees that generally have flat, broad leaves (not needles), such as oaks, maples, hickories, magnolias; many are deciduous (lose leaves in the fall), but some are evergreen.

Plant Community A natural group of plants that live together in a particular environment.

Pocosin An evergreen shrub-dominated bog or wetland found on the Atlantic Coastal Plain.

Radiant Heat Heat coming off of a burning object that you can feel without actually touching the flame.

Surface Fuels Trees up to 6 feet, shrubs, grasses and other herbaceous plants, litter (fallen leaves or needles) and downed woody material.

APPENDIX A

Descriptions of Common Plant Communities in the South

Cultivated agricultural lands

- Land under a variety of agricultural uses, including pastures, orchards and croplands
- May be similar in appearance to grasslands but frequent irrigation and tillage decreases the fire hazard
- Abandoned fields that have been fallow for several years should not be considered in this fuel type (see Grasslands)
- This fuel type supports fires of low intensity and spread rate

Hardwood forest/mature pine plantation

- Closed forests of large deciduous trees with overlapping branches
- Common trees include oaks, hickories, maples and scattered pine or cedar
- Few shrubs exist underneath the trees, but the ground is often covered with dead leaves and needles, which carry the fire
- Older pine plantations with few shrubs are also included
- Fires in this fuel type are rare during the summer and burn slowly, with low flames
- Fires in this fuel type burn faster and with higher flames during the winter and they may reach the tops of small trees in areas with significant dead wood on the ground

Seasonally flooded swamps

- Density of trees ranges from sparse to dense
- Common trees include baldcypress, pondcypress and bays
- Shrubs, grass and aquatic plants may be present underneath the trees
- Fires occur when the swamps are dry
- If shrubs or grasses are present, they carry the fire, but flames rarely reach the tree tops
- The thick layers of muck or duff on top of the soil of swamps can burn and/or smolder for long periods of time if ignited, producing much smoke

Pine savannas

- Open pine forest with low density of trees
- Ground covered with perennial grasses, some pine needles and dead branches
- The lowest branches on the trees are often at least 20 feet above the grass
- Historically, the grasses burned frequently (every 2 to 5 years) with low intensity, fast-moving fires

Grasslands

- Open grasslands, savannas and old agricultural fields
- Few or no shrubs and trees
- Common grasses include ryegrass, broomsedge, bahia grass and fescues
- When ignited, fast-moving surface fires are common
- Windy conditions can result in extreme fire behavior

Marshes

- Dense reeds and grasses that grow in marshy or wet areas
- Includes the sawgrass prairies of south Florida and cogongrass in nonwet areas
- Grasses are at least 3 feet tall
- At least $^{1}/_{3}$ of the above-ground plant tissue is dead
- Fast moving, intense fires are common
- Not a common fuel type near residential developments

Pine forests with shrubs less than 6 feet tall

- Moderate to high density of shrubs that are 2 to 6 feet tall
- Forest of tall pine trees of varying densities whose lower branches are separated vertically from shrubs
- Common shrubs include gallberry, palmetto, fetterbush, wax myrtle and various bays
- Includes young to middle-age pine plantations with shrubs underneath
- Fire intensities and spread rates vary significantly, but long flame lengths and moderate spread rates can occur

Young hardwood forests/Piedmont or Highlands shrub communities

- This fuel category groups various shrub and small tree communities
- Shrubs are less dense and/or shorter than in pocosins
- Distribution of shrubs is often patchy
- Lands dominated by young, deciduous shrubs and trees that developed after a major disturbance (e.g., logging) are also included
- Under windy conditions, fire travels through shrubs — but it will drop down to ground in open patches

Recently logged or cleared forests with downed woody debris

- Areas where trees were recently logged (includes partial cuts and clearcuts)
- Branches and trunks of trees (called slash) were left on the ground
- Fires in this fuel type can spread fast and burn intensely, producing abundant firebrands
- Slash that is at least 3 years old will burn slower and be less intense because of decomposition of the dead woody material

Dense shrubs over 6 feet tall

- High density of shrubs that are 6 feet or taller
- Trees may or may not be present above shrubs
- In the coastal regions of the Carolinas this fuel type includes pocosins
- Also includes areas of southern rough that have high densities of tall shrubs (> 6 feet)
- Fires in this fuel type often burn with high intensity and rates of spread
- Leaves of living shrubs carry fires in this fuel type

Using These Guidelines

The Guidelines are designed for application to individual properties by homeowners, fire management agencies, Cooperative Extension Service offices and homeowner associations. Excellent guidelines for use in neighborhoods, subdivisions and communities are available through a number of organizations listed on the next page. Such community-based guidelines generally contain a number of factors for risk assessment that are out of the control of individual homeowners. Our goal was to create a set of guidelines focused on individual properties, applicable across the South, and complementary to the community-based guidelines. Copies of the Guidelines were distributed to state forestry agencies in all southern states as well as many county and city fire organizations. Additional copies are available through the Southern Center for Wildland-Urban Interface Research and Information.

The “Fine Print”

There are no guarantees that following all the assessment procedures and recommendations contained in these Guidelines will eliminate all risk in extreme fire conditions, but doing so will greatly increase the likelihood that your home can be protected.

Additional Information Sources

Your first priority for additional information should be your state forestry agency, local county or city fire organizations, and county extension service office. Consult your phone book for their contact information.

In addition, the following websites are excellent sources of information on risk assessment and hazard mitigation.

Firewise Communities
http://www.firewise.org/

Southern Center for Wildland-Urban Interface Research and Information
http://www.interfacesouth.org/

Federal Alliance for Safe Homes (FLASH)
http://www.flash.org/welcome.cfm

Florida Forest Protection Bureau
http://flame.fl-dof.com/

Federal Emergency Management Agency-U.S. Fire Administration
http://www.usfa.fema.gov/

The National Association of State Foresters
http://www.stateforesters.org/

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