

Selecting Firewise Shrubs to Reduce Wildfire Risk

By Annie Hermansen-Báez, Wayne Zipperer, Alan Long, Anna Behm, Anne Andreu, and Dawn McKinstry

SHRUB FLAMMABILITY



Dwarf yaupon
Ilex vomitoria

High flammability



Pipestem
Agarista populifolia

Moderate flammability



Oakleaf hydrangea
Hydrangea quercifolia

Low flammability

Introduction

Living in the wildland-urban interface (where your home is near or surrounded by natural vegetation) provides a great opportunity for you to enjoy outdoor scenery, such as the natural backdrop of a surrounding forest. Landscaping your yard allows you to enrich the natural scenery and enjoy your favorite flowers and foliage with attractive shrubs and groundcovers. Colorful flowering plants can also attract wildlife, enhancing the outdoor experience. However, in areas with moderate to high risk of wildfire, this same vegetation may provide fuel and make your home vulnerable. Plan your landscape to lower your risk of losing your home to wildfire and maintain a beautiful, wildlife-friendly yard. This illustrated guide can help you select shrubs for your landscape, particularly for homes in the southern United States.

Planting shrubs according to their flammability can help you and other homeowners lower your risks associated with wildfire. Create a “defensible space” (**Figure 1**) by incorporating firewise principles into your landscape design, selecting and placing plant types strategically, and maintaining vegetation properly. Additional fact sheets in the “Fire in the Wildland-Urban Interface” series (listed at the back of this fact sheet), the InterfaceSouth website (www.interfacesouth.org), and the Firewise Communities website (www.firewise.org) provide additional information about how to landscape with fire in mind. The term “firewise” used throughout this publication describes practices or conditions that reduce wildfire risk.



This fact sheet is part of the *Fire in the Wildland-Urban Interface* series and is a joint product of the University of Florida, Institute of Food and Agricultural Sciences (IFAS) and the USDA Forest Service, Southern Research Station, Centers for Urban and Interface Forestry — InterfaceSouth.

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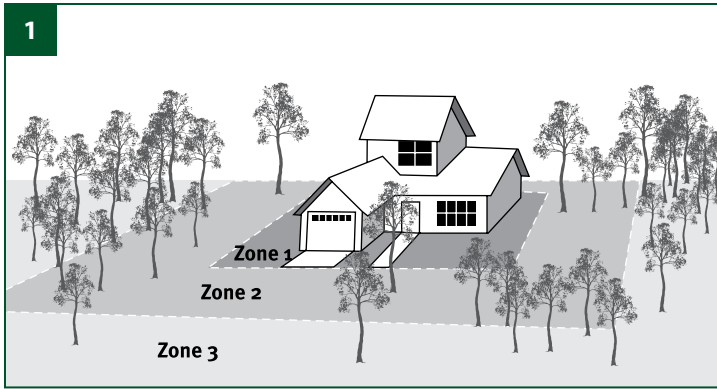


FIGURE 1. Diagram of defensible space. Zone 1 represents the area up to 6 feet from the house, cleared of most vegetation to prevent direct structural ignition. Zone 2 extends at least 30 feet out from the house as the primary zone of defensible space. The defensible space of zones 1 and 2 is designed to minimize the chance of a fire reaching the house through surrounding vegetation. Zone 3 represents the area greater than 30 feet away from the house that may still include landscaping modifications to reduce the threat of fire.

How Do Shrubs Vary in Their Flammability?

Different types of shrubs respond to fire differently. Some shrubs light up faster when exposed to a flame, burn at higher temperatures, and continue burning longer than less flammable species. A shrub's response to fire is described using four flammability components (**Box 1**). Flammability components can be related to visible characteristics of the plant, such as its leaf shape and branching patterns. For example, wide, flat, succulent leaves tend to be less flammable than small needles (**Figure 2A, 2B**). Other characteristics that contribute to a shrub's flammability are not so easy to detect by visually inspecting a shrub. Branches and leaves differ in how much water they hold, and this affects how they burn. Some shrubs contain unique oils, resins, or other chemical traits that affect their flammability. For more information about the characteristics that determine a plant's flammability, see **Table 1**.

BOX 1. Defining Plant Flammability

Flammability among plant species differs based on the following components:

- Ignitability – the length of time it takes a plant to ignite once it is exposed to a flame or heat source
- Sustainability – the length of time that a plant will continue to burn once it has caught fire
- Combustibility – how rapidly or intensely a plant burns; the amount of heat given off during burning
- Consumability – how completely the plant burns, or the quantity of the plant material that is consumed by the fire



Photo credit: Ted Bodner

FIGURE 2A. Adam's needle leaves.



Photo credit: J.S. Peterson

FIGURE 2B. Chinese juniper needles.

TABLE 1. Common Plant Characteristics That Influence Flammability

CHARACTERISTICS OF LOW FLAMMABILITY PLANTS	CHARACTERISTICS OF HIGH FLAMMABILITY PLANTS
<ul style="list-style-type: none"> • Green leaves only on plant • Thick, fleshy leaves or stems • Broad leaved • Produces small amounts of dead and fine materials below plant • Open growth form with low density of leaves and small twigs along branches • Low levels of volatiles, oils, or resins • High moisture content, succulent 	<ul style="list-style-type: none"> • Dead leaves/twigs retained on plant • Dry leathery leaves • Needle-like or very fine leaves • Production of large amounts of dead leaves below the plant • Dense, compact form • Abundant, dense foliage • High oil or resin content including gums and terpenes • Foliage with low moisture content • Shaggy bark

A shrub’s flammability is also affected by surrounding conditions that influence how fire spreads. Dense groups of shrubs, nearby vegetation, and the presence of fallen leaves or other dead material can increase a shrub’s flammability. When the soil around a shrub becomes dry, or if the weather has been clear and dry, fire is more likely. During drought or in extreme weather or fire conditions, even firewise plants may be more flammable than under normal conditions.

NOTE: Sometimes generalizations using one species to predict another species’ flammability are risky. Learn the flammability of each species you plant. Never substitute another species for one listed on firewise plant lists, even if the two plants are in the same genus. The flammability tests described in the next section demonstrated that even though Chinese juniper (*Juniperus chinensis*) and Ashe juniper (*Juniperus asheii*) are in the same genus, Chinese juniper is highly flammable and Ashe juniper is moderately flammable, and both were ranked accordingly. Similarly, hollies (genus *Ilex*) were represented in all three flammability categories: gallberry/inkberry (*Ilex glabra*) is of high flammability, blue holly (*Ilex x meserveae*) is of moderate flammability, and Foster holly (*Ilex x attenuata*) and winterberry (*Ilex verticillata*) are of low flammability.

Determining Shrub Flammability

Researchers at InterfaceSouth of the U.S. Forest Service (SRS 4952: Integrating Human and Natural Systems in Urban and Urbanizing Environments), the School of Forest Resources and Conservation of the University of Florida, and the National Institute of Standards and Technology (NIST) studied how characteristics of several common ornamental shrubs affected the shrubs’ flammability in well-watered, controlled conditions. The 34 shrubs tested were selected based on the responses to a survey by fire professionals across the southern United States. Based on the results of the flammability study, the shrubs were grouped into three categories of flammability: high, moderate, and low. These categories can help you select shrubs and place them in your landscape according to firewise principles.

Four of the 34 shrubs tested were found to be highly flammable and eight were moderately flammable. Highly flammable plants can ignite quickly and release large quantities of heat even when healthy and well-watered. The eight moderately flammable shrubs could become highly flammable during a drought. Plants in both of these categories may be planted cautiously in isolated landscape beds within the defensible space but well away from structures. The remaining 22 species were ranked as having low flammability. These species are acceptable for planting within the defensible space in firewise landscapes, although regular maintenance and removal of dead plant material is still recommended for all shrubs planted near structures. It is probably wise to keep most shrubs out of the 2- to 6-foot ignition zone immediately next to homes.

Guide to Firewise Shrubs

Though this guide can help you to select firewise shrubs, the following should also be kept in mind:

- Select the “right plant for the right place” by choosing plants that are well adapted to the conditions where they are to be planted and by considering their flammability characteristics.
- Prune regularly to maintain vertical and horizontal separation from other plants, especially those close to structures.
- Periodically remove dead or diseased plant material from plants within your home landscape.
- Remember, there are no “fireproof” plants. All plants and organic mulches will burn in extreme weather or fire conditions.

High Flammability

Highly flammable plants ignite quickly and release large quantities of heat even when healthy and well-watered. Keep them at least 30 feet or more from structures or planted in isolated landscape beds, separated vertically and horizontally from other plants and the structures. Note the full-grown height and width of each shrub when selecting its location to ensure that as it grows it will continue to fit the space according to firewise principles.



J. S. Peterson



Wikipedia: Chhe

Chinese juniper (*Juniperus chinensis*)

Native to Southern U.S.: No

Height: 50–60 ft

Spread: 20 ft

Site Requirements: Intolerant of shade, moderately tolerant of drought. Prefers moist, well-drained soils but is very urban tolerant, especially of poor soils, compacted soils, and soils with a wide range of pH values.



Ted Bodner



Ted Bodner

Dwarf yaupon (*Ilex vomitoria*)

Native to Southern U.S.: Yes

Height: 20–25 ft

Spread: 10–20 ft; often maintained as landscaping hedges

Site Requirements: Tolerant of shade to full sun; drought tolerant. Prefers well-drained soil; however, it will survive in wet environments.



Ted Bodner



James H. Miller

Gallberry or inkberry (*Ilex glabra*)

Native to Southern U.S.: Yes

Height: 4–8 ft

Spread: 4–8 ft

Site Requirements: Tolerant of full sun or partial shade; drought tolerant. Prefers acidic soil with adequate moisture.



Ted Bodner



Ted Bodner

Mountain laurel (*Kalmia latifolia*)

Native to Southern U.S.: Yes

Height: 7–15 ft

Spread: 3–5 ft

Site Requirements: Tolerant of shade and drought. Prefers cool, moist, acidic, organic soil.

Moderate Flammability

Moderately flammable shrubs can become highly flammable in certain environmental conditions such as drought, but they may be planted with caution in isolated landscape beds or as isolated plants within the defensible space. Plant them 15 feet or more away from the house. Note the full-grown height and width of each shrub before selecting its location to ensure that as it grows it will continue to fit the space according to firewise principles.



Joseph A. Marcus



University of Texas

Ashe juniper (*Juniperus ashei*)

Native to Southern U.S.: Yes

Height: 35–40 ft

Spread: 15–25 ft

Site Requirements: Tolerant of full sun and drought. Tolerant of most well-drained soils.



domnan.com



Wikimedia commons: A. Barra

Hershey's red azalea (*Rhododendron obtusum*)

Native to Southern U.S.: No

Height: 3–8 ft

Spread: 4–6 ft

Site Requirements: Tolerant of partial shade to partial sun and moderately tolerant of drought. Prefers acidic, clayey, loamy, and sandy soil.

**Blue holly** (*Ilex x meserveae*)

Native to Southern U.S.: No

Height: 8–12 ft

Spread: 8–12 ft

Site Requirements: Tolerant of full sun to partial shade and moderately tolerant of drought. Prefers moist, slightly acidic, well-drained soils, but is relatively soil adaptable.

**Pipestem** (*Agarista populifolia*)

Native to Southern U.S.: Yes

Height: 8–12 ft

Spread: 5–10 ft

Site Requirements: Moderately tolerant to tolerant of drought. Requires full sun to partial shade. Prefers acidic, moist soil. A common shrub in the understory of mixed swamps and along creeks.

**Boxwood** (*Buxus microphylla* var. *koreana*)

Native to Southern U.S.: No

Height: 4–6 ft

Spread: 3–5 ft

Site Requirements: Tolerant of partial shade; moderately tolerant of drought. Prefers moist, cool soil with mulch around roots.

**Rhododendron** (*Rhododendron x chionoides*)

Native to Southern U.S.: No

Height: 6–10 ft

Spread: 8–10 ft

Site Requirements: Tolerant of shade to full sun; moderately tolerant of drought. Prefers moist, cool, acidic, well-drained, organic soil.

**Glossy abelia** (*Abelia x grandiflora*)

Native to Southern U.S.: No

Height: 3–6 ft

Spread: 3–6 ft

Site Requirements: Tolerant of shade, moderately tolerant of drought. Prefers acidic to neutral soil that is well-drained and moist.

**Leyland cypress** (*x Cupressocyparis leylandii*)

Native to Southern U.S.: No

Height: 60–90 ft

Spread: 12–15 ft

Site Requirements: Intolerant of shade, moderately tolerant of drought. Tolerant of most soils except for those that are constantly wet.

**Adam's needle** (*Yucca filamentosa*)

Native to Southern U.S.: Yes

Height: 2.5 ft with an annual woody inflorescence up to 8 ft

Spread: 2.5 ft

Site Requirements: Tolerant of light shade to full sun; tolerant of drought. Prefers moist, well-drained, deep soils, but is extremely tolerant of dry sandy soils, and urban conditions such as poor soils, various soil pHs, and soil compaction.

Low Flammability

Low flammability shrubs are acceptable for planting within the defensible space in firewise landscapes as long as they are planted six feet or more away from the house. Vertical and horizontal separation is not as critical as it is with shrub species of high flammability. All shrubs planted near structures still require regular maintenance and removal of dead plant material. Note the full-grown height and width of each shrub before selecting its location to ensure that as it grows it will continue to fit the space according to firewise principles.

Ted Bodner



Jeff McMillian



Anisetree (*Illicium floridanum*)

Native to Southern U.S.: Yes

Height: 10–15 ft

Spread: 6–10 ft

Site Requirements: Tolerant of partial shade to full sun; moderately tolerant of drought. Tolerant of a variety of soils from acidic to slightly alkaline, from sandy to loamy, to clayey.

Kurt Stauber



Kurt Stauber



Bigleaf hydrangea (*Hydrangea macrophylla*)

Native to Southern U.S.: No

Height: 3–6 ft

Spread: 3–6 ft

Site Requirements: Tolerant of partial sun, thrives in shade; intolerant of drought. Prefers loose, rich, and moist but well-drained soil.

C. and L. Loughmiller



Forest and Kim Starr



Arrowwood (*Viburnum dentatum*)

Native to Southern U.S.: Yes

Height: 6–12 ft

Spread: 6–12 ft

Site Requirements: Tolerant of full sun to partial shade; tolerant of drought once plant is established. Prefers moist, well-drained soils, but is highly adaptable to dry soils, poor soils, and soils of various pH, as well as heat, drought, and pollution (very urban tolerant).

R. and E. Chambers



Wikimedia commons: Lamiot



Butterfly bush (*Buddleia davidii*)

Native to Southern U.S.: No

Height: 5–10 ft

Spread: 6–8 ft

Site Requirements: Intolerant of shade; tolerant of drought. Prefers moist, well-drained soil but tolerates a range of soil types.

Missouri Botanical Garden



USDA Plants Database



Bayberry (*Myrica pensylvanica*)

Native to Southern U.S.: Yes

Height: 5–10 ft

Spread: 5–10 ft

Site Requirements: Intolerant of shade; tolerant of drought. Prefers moist, well-drained soils but is extremely adaptable to clayey soils, sandy soils, poor soils, dry or wet soils, soils of various pH, and winter salt spray.

Gary Cooper



Forest & Kim Starr



Camellia (*Camellia japonica*)

Native to Southern U.S.: No

Height: 8–15 ft

Spread: 5–10 ft

Site Requirements: Tolerant of partial shade; somewhat tolerant of drought. Prefers moist, acidic soil, but is adaptable.

Ted Bodner



Ted Bodner



Beautyberry (*Callicarpa dichotoma*)

Native to Southern U.S.: No

Height: 3–4 ft

Spread: 3–5 ft

Site Requirements: Tolerant of full sun to partial shade; tolerant of drought. Prefers dry to moist soil.

Wikipedia



Forest & Kim Starr



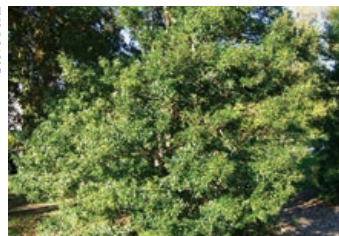
Coontie (*Zamia pumila*)

Native to Southern U.S.: Yes

Height: 3 ft

Spread: 5–6 ft

Site Requirements: Tolerant of full sun to dense shade; tolerant of drought. Prefers well-drained sands or sandy loam soils.

**Foster holly** (*Ilex x attenuata*)

Native to Southern U.S.: Yes

Height: 20–30 ft

Spread: 7–10 ft

Site Requirements: Tolerant of partial shade to full sun; tolerant of drought. Prefers a variety of soils, including clay, loam, and sand; prefers soils that are slightly alkaline or acidic, and well-drained.

**Oleander** (*Nerium oleander*)

Native to Southern U.S.: No

Height: 6–12 ft

Spread: 6–10 ft

Site Requirements: Tolerant of bright sun to partial shade; tolerant of drought. Prefers well-drained soil. This plant is very poisonous and could be dangerous in your home landscape.

**Gardenia/Cape Jasmine** (*Gardenia jasminoides*)

Native to Southern U.S.: No

Height: 4–6 ft

Spread: 4–5 ft

Site Requirements: Tolerant of partial shade to sun; moderately tolerant of drought. Prefers acidic soil, ideally moist and high in organic matter but well-drained.

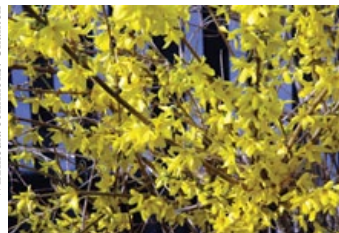
**Pittosporum** (*Pittosporum tobira*)

Native to Southern U.S.: No

Height: 8–12 ft

Spread: 4–8 ft

Site Requirements: Tolerant of shade and sun; moderately tolerant of drought. Prefers slightly acidic, fertile, well-drained soils, but will tolerate a variety of soil pHs.

**Klein's forsythia** (*Forsythia x intermedia*)

Native to Southern U.S.: No

Height: 8–10 ft

Spread: 10–12 ft

Site Requirements: Moderately tolerant of both shade and drought. Prefers loose soil, but will perform well in most soils.

**Rosebay** (*Rhododendron maximum*)

Native to Southern U.S.: Yes

Height: 5–40 ft

Spread: 20–40 ft

Site Requirements: Tolerant of partial to relatively dense shade; intolerant of drought. Prefers cool, moist, acidic, well-drained, organic soil.

**Oakleaf hydrangea** (*Hydrangea quercifolia*)

Native to Southern U.S.: Yes

Height: 6–10 ft

Spread: 6–10 ft

Site Requirements: Tolerant of shade or partial shade; moderately tolerant of drought. Prefers calcareous and slightly acidic soils.

**Scarlet firethorn** (*Pyracantha coccinea* var. *mohave*)

Native to Southern U.S.: No

Height: 6–13 ft

Spread: 6–13 ft

Site Requirements: Tolerant of sun to partial shade; tolerant of drought. Prefers moist, well-drained soil.

W. D. Bransford



Wikimedia commons MPF



Shubby cinquefoil (*Potentilla fruticosa*)

Native to Southern U.S.: No

Height: 1–4 ft

Spread: 2–4 ft

Site Requirements: Intolerant of shade, prefers full sun; tolerant of drought. Prefers moist, well-drained soil but does well in poor, dry sites.

Opiola Jerzy



Opiola Jerzy



Weigela (*Weigela florida*)

Native to Southern U.S.: No

Height: 6–9 ft

Spread: 9–12 ft

Site Requirements: Tolerant of full sun; moderately tolerant of drought. Prefers well-drained soil. Tolerant of air pollution.

Ted Bodner



Ted Bodner



Sweet pepperbush (*Clethra alnifolia*)

Native to Southern U.S.: Yes

Height: 5–8 ft

Spread: 4–6 ft

Site Requirements: Tolerant of full sun to partial shade; low tolerance of drought. Prefers moist, acidic soil with organic matter.

Stefan Bloodworth



Jeff McMillian



Winterberry (*Ilex verticillata*)

Native to Southern U.S.: Yes

Height: 6–15 ft

Spread: 6–10 ft

Site Requirements: Moderately tolerant of shade; intolerant of drought. Prefers moist, organic soil, but will tolerate a range of soil types, including dry to wet.

Chris Evans



davesgarden.com: greatswede



Walter's viburnum (*Viburnum obovatum*)

Native to Southern U.S.: Yes

Height: 8–25 ft

Spread: 6–10 ft

Site Requirements: Moderately tolerant of shade; highly tolerant of drought. Prefers moist to wet soils, often in swamps.

Creating Your Own Firewise Plant List

Though the shrubs shown in this fact sheet have been scientifically tested for their flammability, we have also developed a step-by-step method, which includes a key for estimating the flammability of shrubs and other plant species not found in this fact sheet. This method was developed from the findings of a three-year plant flammability project conducted by the University of Florida and InterfaceSouth, as well as from related research from around the country. The method was tested for repeatability and accuracy through expert review, classroom testing, and the shrub flammability studies described above.

This step-by-step method is found in the fact sheet “Fire in the WUI: Preparing a Firewise Plant List for WUI Residents” (www.interfacesouth.org/products/fact_sheets/Preparing_Firewise_Plant_List.pdf).

An on-line, interactive version of the flammability key can be found at: www.interfacesouth.org/products/decision-support-systems.

Summary

In some areas, a list of firewise plants may not be available. While you can use the flammability key previously mentioned to estimate a plant’s flammability, the plants shown in this fact sheet have been specifically tested for their flammability. While a shrub’s flammability is influenced by surrounding conditions and its level of maintenance, the flammability categories presented here are a useful guide for selecting and placing shrubs according to firewise principles.

The 22 plant species listed with low flammability are appropriate for addition to firewise lists and planting near a home. The eight moderately flammable plants may be planted with caution in the defensible space around a home. All shrubs within the defensible space should be routinely maintained by removing dead or diseased plant material. Homeowners should be aware that even firewise plants may be more flammable during drought or other extreme fire conditions.

Since species within the same genus were found to vary in flammability, it is important for homeowners and landscapers not to substitute plants within the same genus for those on firewise plant lists without first learning the flammability of the substitute species.

Information Resources

- Atstecks.com Nursery and Gardens, www.atstecks.com
- Connecticut Botanical Society, www.ct-botanical-society.org/galleries/rhododendronmaxi.html
- Floridata, www.floridata.com
- Horticulture at Ohio State University, hcs.osu.edu/pocketgardener
- Meadowbrook Nursery, www.we-du.com/mm5/merchant.mvc?Screen=PROD&Store_Code=wedu&Product_Code=rhochiond&Category_Code=Rhododendrons
- Michigan State University, web1.msue.msu.edu/imp/modzz/masterzz.html
- North Carolina State University, www.ces.ncsu.edu/depts/hort/consumer/factsheets
- Oregon State University, oregonstate.edu/dept/ldplants
- Sunny Gardens.com, www.sunnygardens.com/garden_plants/a.php
- University of Connecticut, www.hort.uconn.edu/plants
- University of Florida Cooperative Extension Service, edis.ifas.ufl.edu
- University of Illinois, woodyplants.nres.uiuc.edu
- U.S. National Arboretum, www.usna.usda.gov
- USDA Forest Service, www.fs.fed.us/database/feis/plants/
- USDA Plants Database, plants.usda.gov
- Wikipedia www.wikipedia.org
- Zipcodezoo.com

Other Fact Sheets in the “Fire in the Wildland-Urban Interface” Series

- Fire in the Wildland-Urban Interface: Considering Fire in Florida’s Ecosystems (EDIS Circular 1431, edis.ifas.ufl.edu/fr137)
- Fire in the Wildland-Urban Interface: Understanding Fire Behavior (www.interfacesouth.org/products/fact_sheets/fire-in-the-interface-fact-sheets/understanding-fire-behavior, EDIS Circular 1432, edis.ifas.ufl.edu/fr138)
- Fire in the Wildland-Urban Interface: Selecting and Maintaining Firewise Plants for Landscaping (www.interfacesouth.org/products/fact_sheets/fire-in-the-interface-fact-sheets/selecting-and-maintaining-firewise-plants-for-landscaping, EDIS Circular 1445, edis.ifas.ufl.edu/fr147)
- Fire in the Wildland-Urban Interface: Preparing a Firewise Plant List for WUI Residents (www.interfacesouth.org/products/fact_sheets/fire-in-the-interface-fact-sheets/preparing-a-firewise-plant-list-for-wui-residents/, EDIS Circular 1453 edis.ifas.ufl.edu/fr151)
- Fire in the Wildland-Urban Interface: Reducing Wildfire Risk While Achieving Other Landscaping Goals(www.interfacesouth.org/products/fact_sheets/fire-in-the-interface-fact-sheets/reducing-wildfire-risk-while-achieving-other-landscaping-goals, EDIS Circular 1478, edis.ifas.ufl.edu/fr162)
- Quick Guide to Firewise Shrubs (www.interfacesouth.org/products/fact_sheets/fire-in-the-interface-fact-sheets/illustrated-guide-to-firewise-shrubs/index_html)

Many of these fact sheets are also available in Spanish on the InterfaceSouth website at: www.interfacesouth.org/products/fact_sheets?set_language=es



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