GOVERNMENT OF WESTERN AUSTRALIA

DFES Department of Fire & Emergency Services

Bushfire Centre of Excellence
TRAINING / KNOWLEDGE / ENGAGEMENT

Firewise Gardening in Western Australia

Firewise Gardening in Western Australia is the result of a collaborative partnership between the following organisations:

- Department of Fire and Emergency Services
- Department of Biodiversity, Conservation and Attractions
- CSIRO
- Fire Protection Association Australia
- Department of Mines, Industry Regulation and Safety
- Shire of Mundaring
- Shire of Serpentine-Jarrahdale
- Josh Byrne & Associates

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Disclaimer

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The images displayed are solely for illustrative purposes and may not accurately depict a firewise garden in its precise form.

Acknowledgement of Country

The Department of Fire and Emergency Services acknowledges the First Nations Australians throughout the state of Western Australia as the Traditional Custodians of the lands where we live, work and volunteer.

We recognise First Nations Australians' connection to land, waters and community, and pay our respects to Elders both past and present.

This map indicates the general location of larger groupings of Aboriginal people. Boundaries are not exact. For more detailed information about the groups of people in a particular region, contact the relevant Aboriginal Land Council or WA Department of Planning, Lands and Heritage regional offices.

Table of Contents

This guide is divided into sections to help readers navigate through advice on how to plan, design and maintain a firewise garden.

← contents

Chapter 01
Introduction

Firewise Gardening in Western Australia has been developed to help people living in bushfire prone areas of Western Australia (WA) create gardens that reduce the risk of house and garden loss in a bushfire.

Even though all plants may burn under the right conditions, measures can be taken to reduce fire intensity from garden plants. The information in this guide identifies what you can do to minimise this risk in new and established gardens.

Purpose of this guide

This guide is not a formal planning document and does not form part of the State Bushfire Planning framework.

The information in this guide is designed to help owners of new or existing approved properties to plan, design, select plants and maintain a firewise garden.

What is a firewise garden?

A garden is the planned space around your house where plants can be grown. A firewise garden is one that is designed and maintained to reduce the risk of bushfire impact on your life, house and garden.

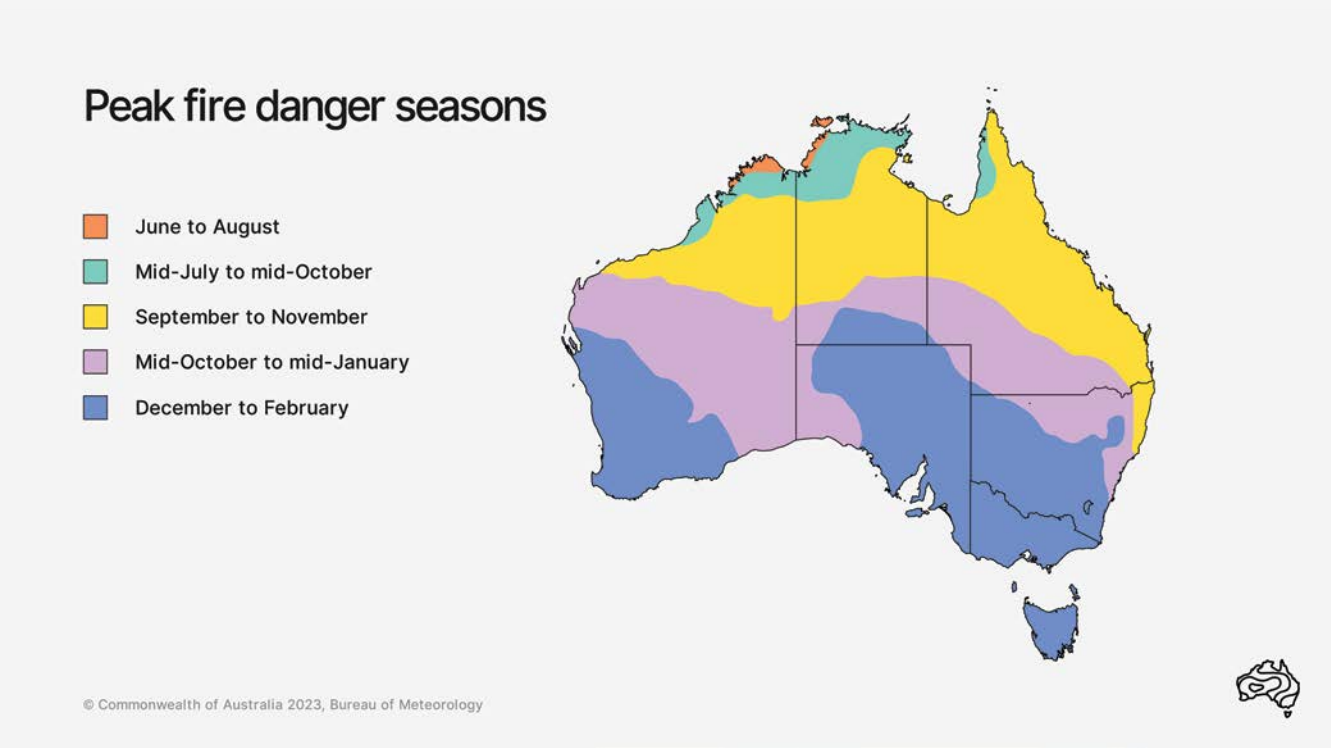
A well-designed firewise garden should provide clear access and defendable space. Areas immediately around the house and other structures, such as carports, should be free of plants and other flammable objects. Removing fuel sources and breaking up fuel continuity should help to minimise ember attack, fire intensity, surface fire, tree strike and exposure from radiant heat released by flames.

When it comes to selecting plants for your firewise garden in areas beyond the house, it is important to consider plant flammability, structure, location within the garden and ongoing maintenance requirements.

Remember that gardens provide more than asset protection and form an important part of a home. They are places for ecological restoration and personal wellbeing. The information in this guide should help you to create a firewise garden that provides enjoyment and value.

WA's varied landscapes

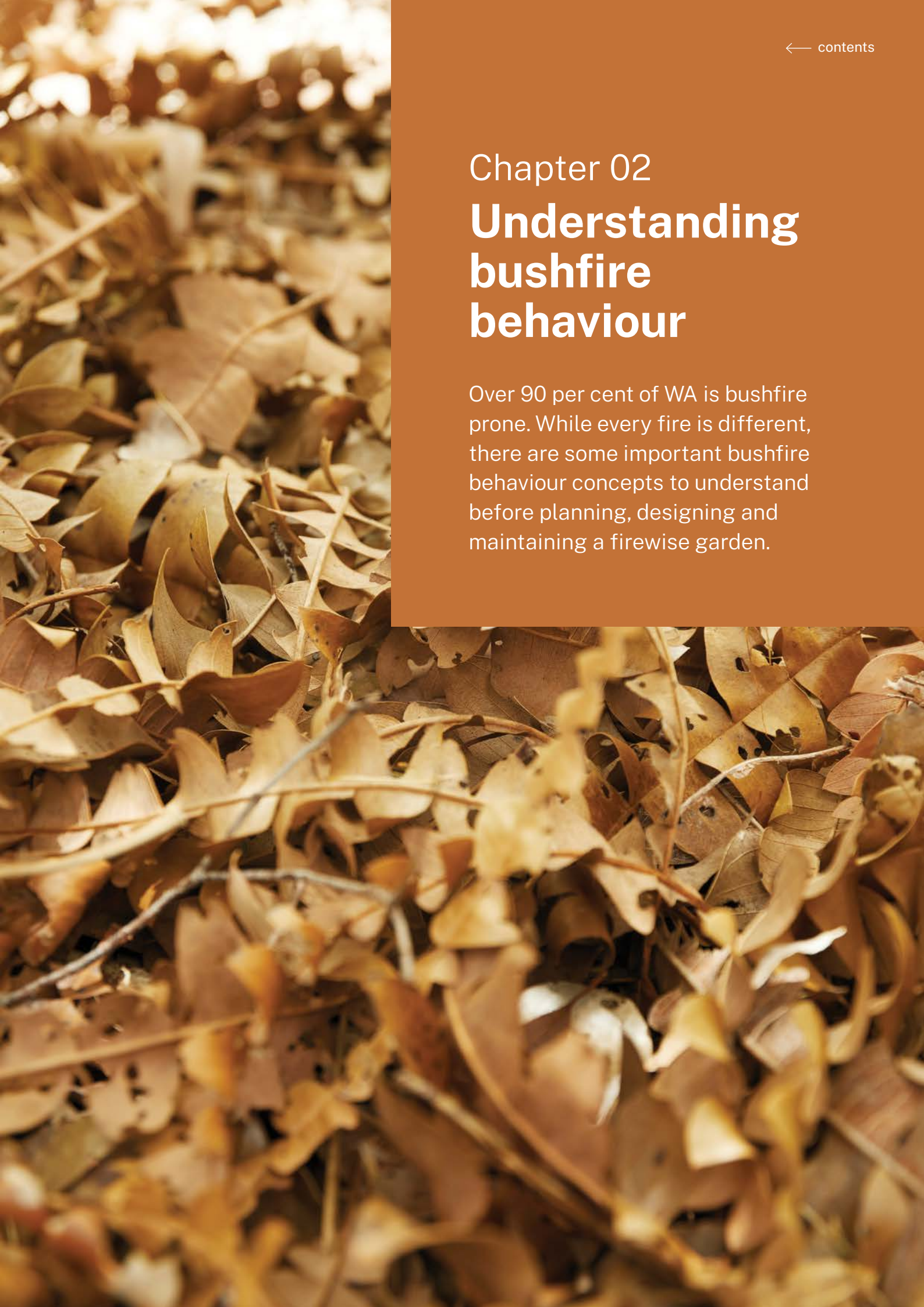
Consider how the information in this guide applies to your climate zone, local vegetation and site-specific requirements. If your garden is located on a challenging site, you may require specific firewise gardening recommendations. In these cases, it is advised that you engage an accredited bushfire planning consultant to help you plan and prepare your house and garden.



Climate change

Climate change is influencing the frequency and severity of dangerous bushfire conditions. Higher temperatures and less reliable rain make droughts and dry gardens more likely. A firewise garden can be planned, designed and maintained to increase your garden's resilience to the impacts of climate change and to reduce bushfire risk to your house, your garden and yourself.

contents



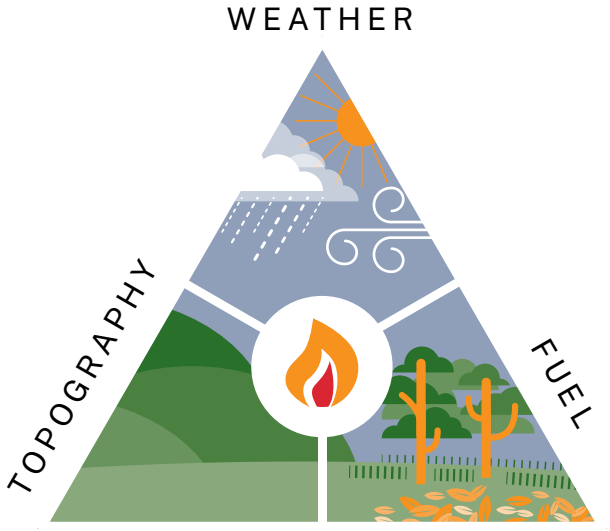
Chapter 02

Understanding bushfire behaviour

Over 90 per cent of WA is bushfire prone. While every fire is different, there are some important bushfire behaviour concepts to understand before planning, designing and maintaining a firewise garden.

Fuel

Fire requires fuel to burn. All plants burn in the right conditions and can be fuel for a fire. Fuel sources can also include fences, sheds and dead plant material such as mulch. You must keep all potential fuel sources away from the house.



The Fire Behaviour Triangle

Fuel characteristics

Fuel load

Fuel load is the quantity of fuel per unit area. It includes fine and coarse fuels.

Fine fuel	Fine fuel includes leaves, twigs and the detached bark of some plant species. It can be dead vegetation (up to 6mm thick) or live vegetation (up to 3mm thick). Fine fuel is quick to ignite and burn, and it can cause fires to escalate quickly.
Coarse fuel	Course fuel includes large dead branches on the ground. These can ignite after a flame front has passed and can burn for hours.

Fuel structure

Fuel structure is how fuels are arranged and how compact the fuel layers are above the ground.

Surface fuels	Surface fuels include bark, leaves and twigs on the ground. These help fire spread under more moderate fire conditions.
Near surface and elevated fuels	Near surface and elevated fuels include small plants and shrubs and can contribute to flame heights, including the ignition of tree canopies.
Bark fuels	Tree bark can add to flammability and the potential for fire to enter the tree canopy. It can also break off and assist fire spread via embers, starting new spot fires ahead of the fire front. The more coarse, loose and fibrous a tree's bark is, the higher the hazard. Smooth-barked trees tend to have a lower hazard rating.

Fuel moisture

Fuel moisture affects how easily fuel will ignite and how much fuel will burn. Fuel with a lower moisture content can lead to a higher likelihood of ignition and (greater) fire intensity. Fine, aerated and dry fuels burn more easily than coarse and moist fuel.

Understanding fire behaviour

Fire behaviour refers to the intensity (heat), speed and spread of a bushfire or planned burn. Fire behaviour is largely influenced by three factors:

- The fuel available to burn
- The topography (or terrain) of the area
- Prevailing weather conditions

Topography

The shape of land surfaces can affect the speed, intensity and spread of a bushfire.

Aspect

Aspect influences the amount of solar radiation land receives. Northern and western facing slopes in WA are exposed to more afternoon sun, making fuel drier and more flammable than on southern and eastern facing slopes.

Slope steepness

Slope steepness, especially relative to the direction of winds, directly influences fire spread and intensity. Each 10-degree increase in slope doubles the rate of fire spread. A fire will burn faster uphill, as flames can more easily reach available fuel in front of the fire. This makes ridgetops and steep slopes dangerous locations for houses.

Depressions

Depressions (low areas of the landscape) can experience increased moisture during wetter times. This can increase plant growth, leading to greater availability of fuel in drier times and the area becoming highly flammable.

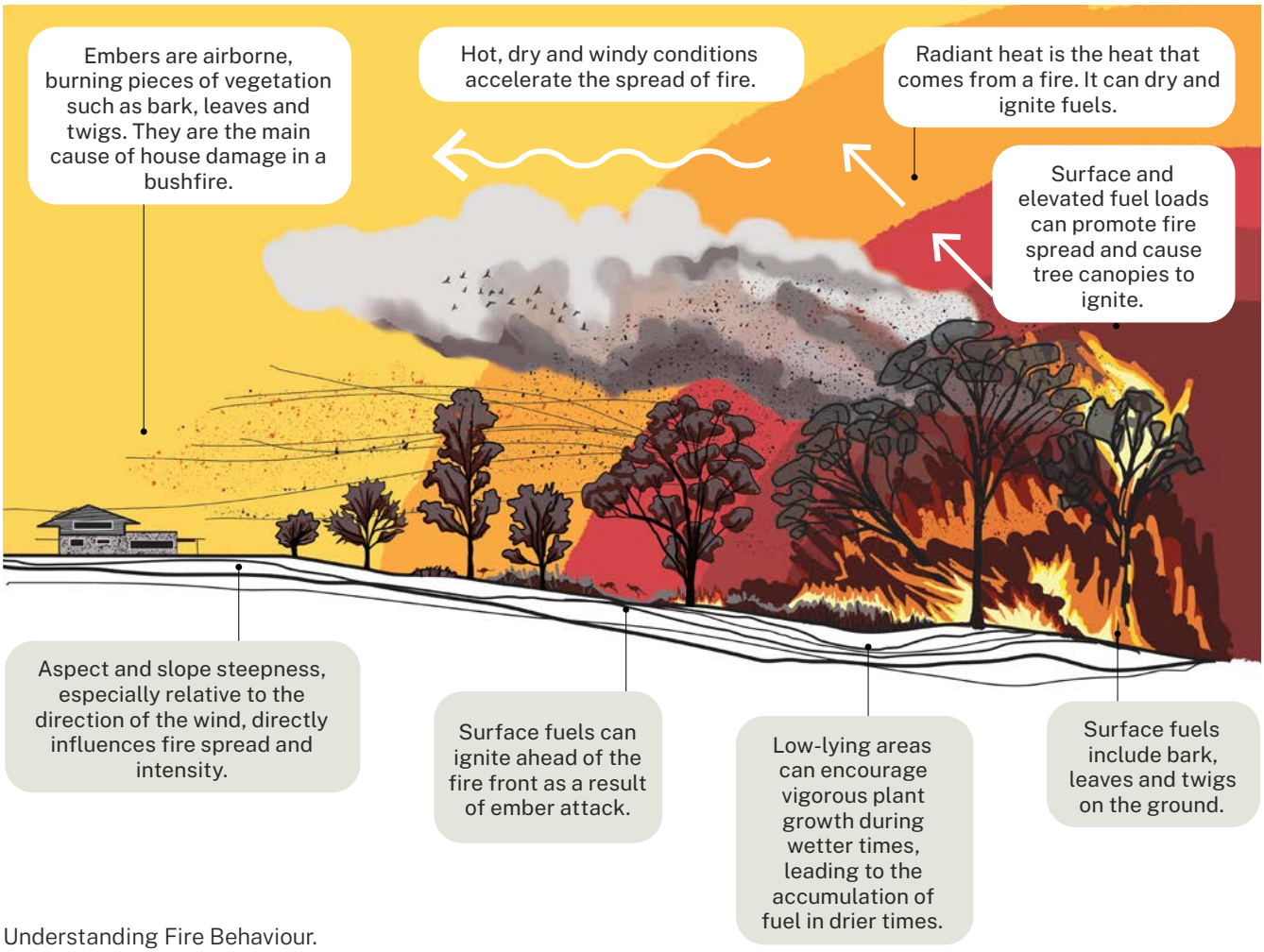
Weather

Temperature, rainfall, humidity, wind speed, prevailing wind direction and seasonality all impact bushfire behaviour. Hot, dry and windy conditions generally reduce the fuel moisture content of plants, allowing for easy ignition and increased spread of fire.

How bushfires spread and impact houses

Houses and other structures can be directly impacted by bushfire flames or indirectly impacted by ember attack, radiant heat, fire-generated winds or tree strike from a damaged tree or branch. Houses become a risk when alight and may no longer protect you.

A firewise garden should be designed and maintained to minimise ember generation, reduce radiant heat and avoid direct flame contact.



Understanding Fire Behaviour.

contents

Chapter 03

Preparation for bushfire

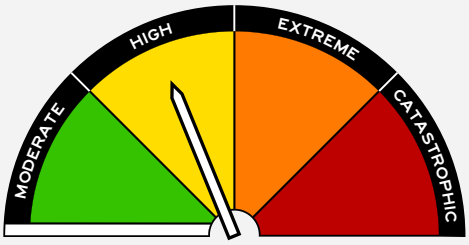
It is important to understand where to go for emergency information and what the bushfire risk is for your location. You can then use this information to prepare accordingly.

Fire danger ratings

Fire danger ratings are broad categories designed to quickly communicate to the public the expected level of fire danger and risk to the community.

Fire danger ratings are used on days when there is a risk of fire and you may need to act. The higher the fire danger, the more dangerous the conditions and consequences if a fire starts.

The Australian Fire Danger Rating System levels are:



Moderate Plan and prepare. Most fires can be controlled. Stay up to date and be alert for fires in your area.

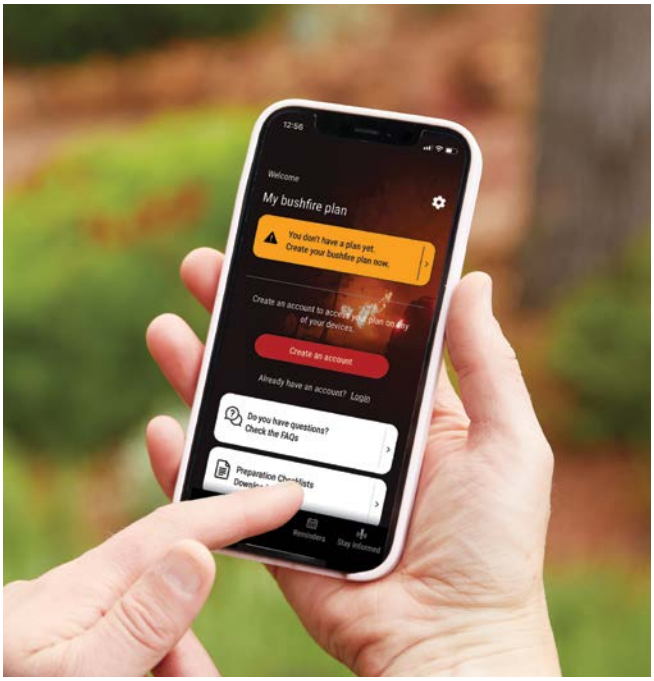
High Be ready to act. Fires can be dangerous. Decide what you will do if a fire starts. Leave bushfire risk areas if necessary.

Extreme Take action now to protect your life and property. Fires will spread quickly and be extremely dangerous. Put your bushfire plan into action. If you and your property are not prepared to the highest level, plan to leave early.

Catastrophic For your survival, leave bushfire risk areas. These are the most dangerous conditions for a fire. Homes cannot withstand fires in these conditions, and if a fire starts and takes hold, lives are likely to be lost. Stay safe by going to a safer location early in the morning or the night before.

My Bushfire Plan

Preparing, discussing and practising a written emergency plan increases your chance of survival. The Department of Fire and Emergency Services (DFES) provides assistance and important information to help you prepare for a bushfire. Visit **emergency.wa.gov.au** to learn more.



Preparing your house, garden and property

This guide provides advice to help you better prepare your garden for bushfire. If you are living in a bushfire prone area, you should undertake further vulnerability assessments and prepare your house, other structures and property accordingly. This includes targeting areas where embers could enter and making sure you have adequate insurance and an up-to-date bushfire plan.

If a bushfire starts in your area, refer to **emergency.wa.gov.au** for official advice, community warnings and other emergency management information.

contents

Chapter 04

Planning a firewise property and garden

Careful planning can help reduce bushfire risk while ensuring that your garden design maintains the features you value and that make your property unique.

Your property may have an existing bushfire management plan that was approved as part of the development process. If so, you must meet the landscaping requirements outlined in the plan. Refer to your local government for more information.

Bushfire Attack Level

A Bushfire Attack Level (BAL) is a measure of the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact. Your garden design and maintenance can also affect your BAL rating.

Determining bushfire attack level

An accredited bushfire planning consultant can help you to determine your BAL rating and understand how it applies to your garden. Visit fpaa.com.au to learn more.

WA State Planning Policies and Guidelines

Since the release of State Planning Policy 3.7 Planning in Bush Fire Prone Areas on 7 December 2015, development within bushfire prone areas of Western Australia should be appropriately sited and designed to reduce the impact of bushfire on property and infrastructure. These developments will also have been subject to a BAL assessment to determine the BAL level and Asset Protection Zone (APZ).

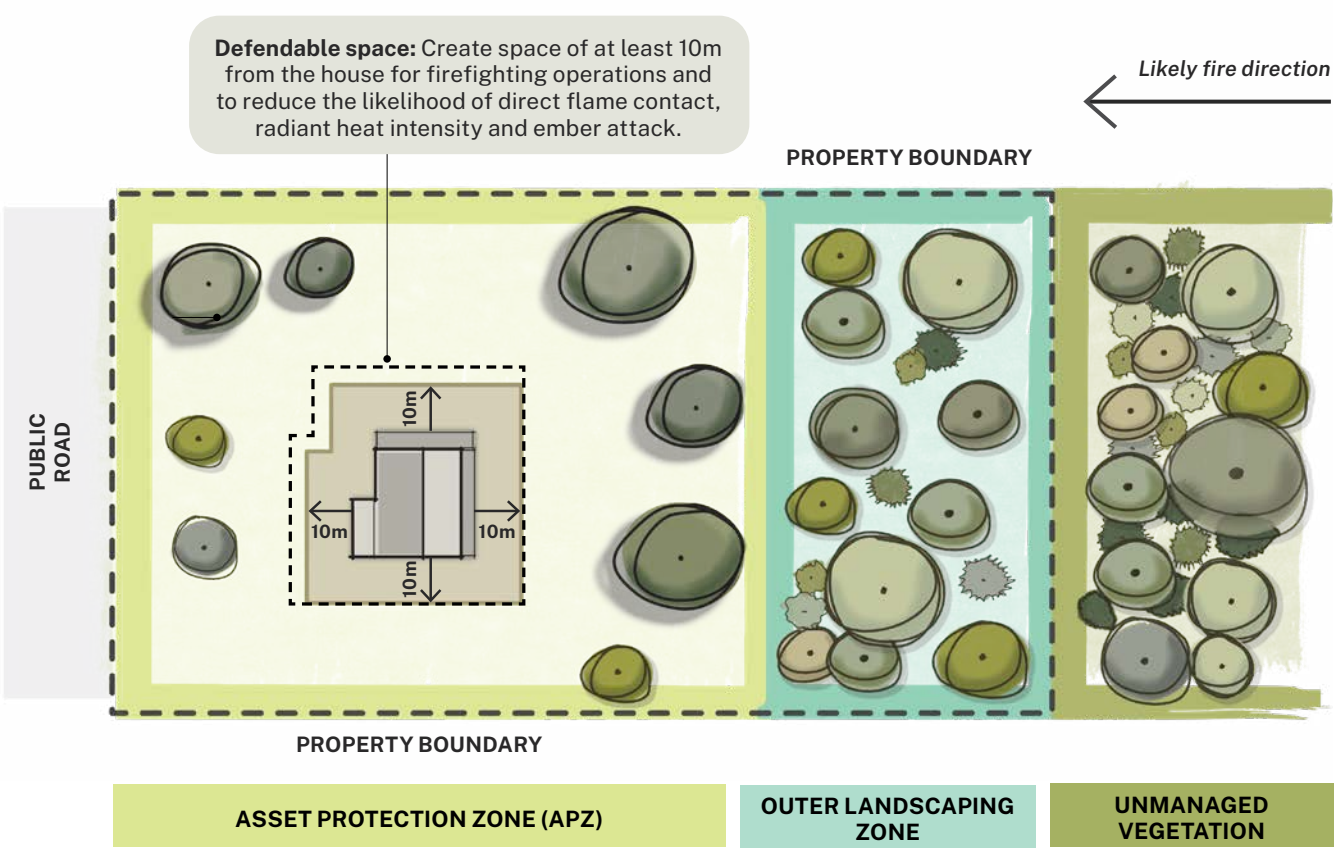
Developments prior to 2015 may have been subject to a Bushfire Management Plan, however as a general rule, all owners should aim for an APZ of 20 metres minimum including a recommended 10m defendable space.

Refer to page 72 for the Department of Planning, Land and Heritage's current WA State Planning Policy documents.

Asset Protection Zone and defendable space

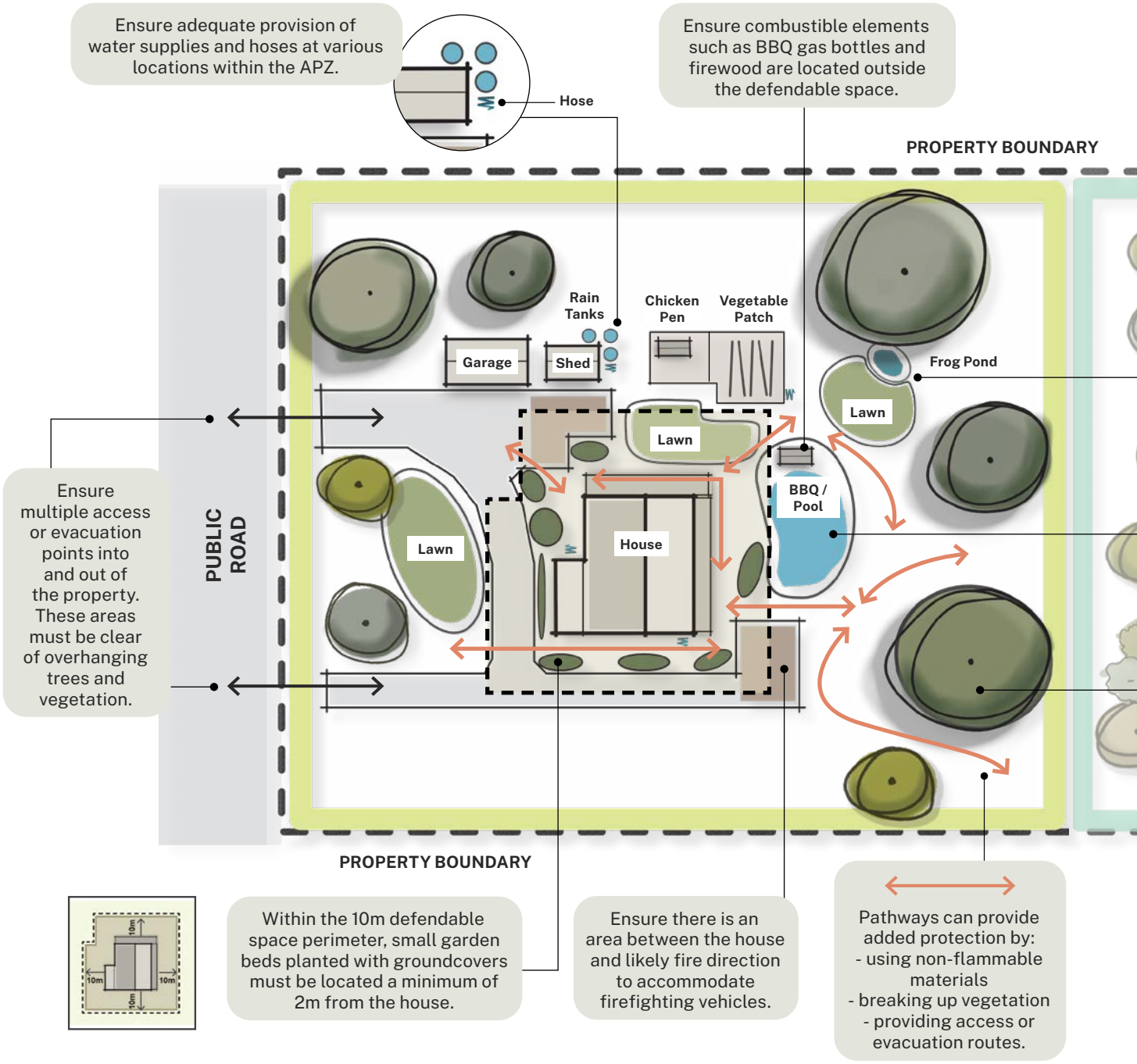
An Asset Protection Zone (APZ) is a very low fuel area immediately surrounding your house or other structures that is managed to reduce bushfire risk. The width of an APZ depends on slope, vegetation and building purpose. At a minimum, it should be large enough to prevent direct flame contact with your house or structures under the worst bushfire conditions.

The APZ must also include a defendable space, which is an accessible area adjoining your house or structure in which firefighting operations can be undertaken. Vegetation within this space should be kept at an absolute minimum, and the space should be free from combustible items and obstructions. It is recommended that this defendable space extend 10m from your house.

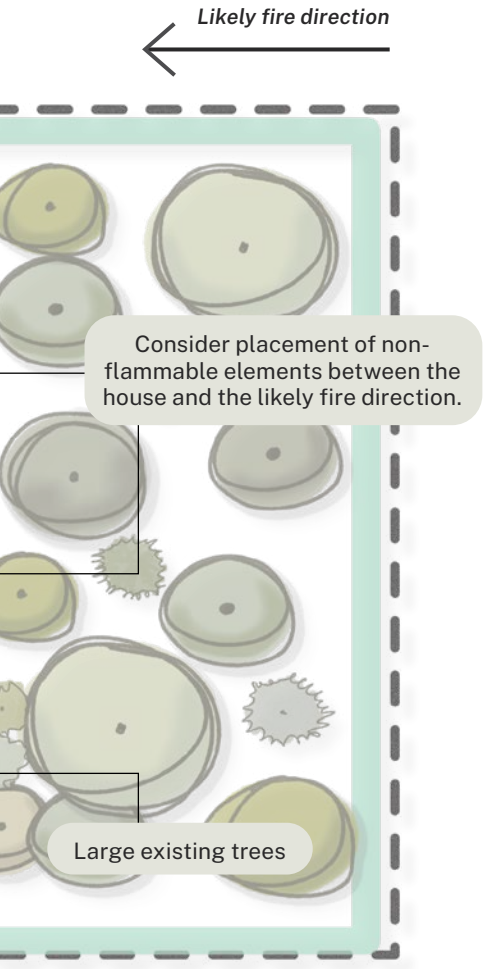


Property layout

The careful positioning of your house (siting) and key property elements or features (site layout) is essential to help reduce the risk of bushfire hazards from surrounding vegetation, adjoining properties and your own property. This may already have been considered if your house and garden is established or under construction. If you are planning a new house and garden, or if you are renovating, consider the following property layout factors.



Planning a Firewise Property



Topography	Consider the land's slope and the likely direction for bushfire attack.
Features	Consider the position of property features such as water tanks, lawn areas, sheds, parking, paths, driveways, swimming pools, tennis courts and gazebos to allow for easy access and safe exit.
Access	Ensure clear access routes from the house, garden and property for safe evacuation and firefighter access.
Defendable space	Create a space of at least 10 metres from the house in which firefighting operations can be undertaken. Maintain the defendable space to reduce the likelihood of direct flame contact, radiant heat intensity and ember attack.
Combustible materials	Consider where you will locate combustible and hazardous objects, such as gas bottles for a BBQ and firewood supply. These must be located away from the house.
Vegetation	Create 'islands' of garden beds by using zoning approaches and creating gaps. If relevant, consider how your garden will safely transition to the natural bush surrounding your property.
Maintenance	Consider what maintenance will be required to reduce fuel in your defendable space and garden areas.
Seasons	Consider how your property may be used year-round and how the layout and design will influence maintenance.

Chapter 05

Firewise garden design principles

No matter where you are located or what your garden type or stage of establishment, having a set of principles can help guide firewise garden design. As well as designing to reduce bushfire risk, it is important to remember that gardens have other important functions. They can help to cool urban areas via shade and transpiration, support and increase biodiversity and provide important links between urban ecosystems. Gardens are also important places to connect with nature and provide relaxation and restoration.

Principle 1: Garden design to reduce bushfire risk

Firewise garden design can reduce attack from embers, heat, flame and wind. It can also improve the ease of defending a house during a bushfire. Out of all the factors that influence fire behaviour, vegetation is the easiest to change.

When designing your garden, you should consider the following.

Availability and volume of fuel

All sources of fuel, including vegetation and combustible materials or objects, need to be located away from your house and structures. Design must consider fuel characteristics, such as fuel load, fuel structure and fuel moisture.

Reduce potential for flame contact

Vegetation should not overhang your house or structures or connect vertically or horizontally.

Reduce ember sources

Seed pods, bark on tree trunks and fine fuels such as leaves can be a major source of embers. Remove fine fuels and select the right plants and trees for your garden. Rake leaves away from the base of trees in the APZ during bushfire season.

Break up fuel continuity

Islands of disconnected trees and shrubs should be separated by a low fuel hazard. These include groundcover (such as mown grass), gravel areas, paths, driveways, ponds, dams and pools. This is also known as a zoning approach to plant selection.

Maintain vegetation moisture

Water plants regularly and choose plants with higher moisture content to reduce the risk of ignition and sustained combustion. Consider grouping plants with similar water requirements to make it easier to maintain your garden. Plants with a high moisture content, such as succulents, require less frequent watering.

Maintenance

During landscape design, it is important to think about what maintenance will be required for your proposed garden. Regular and planned maintenance is essential for achieving a successful firewise garden. If time is an issue, consider designing a low-maintenance garden with open spaces, lawn areas and plants that require less maintenance. Refer to Section 8 for more information on firewise garden maintenance activities.

You can be creative when designing your garden to reduce bushfire risk. Consider aesthetics, privacy, shade and environmental priorities such as tree and vegetation retention, biodiversity and habitat as part of your design. It is also important to design with a sense of space in mind. Think about the way your plants and trees will spread out, so they do not become crowded.

Principle 2: Firewise plant selection

Plant selection should fulfill multiple objectives in a firewise garden. While some plants are more firewise than others, all plants are flammable under severe bushfire conditions. Use the Plant selection key in Appendix 1 to guide you through the plant selection process, keeping in mind the principles and advice listed below.

Purpose of plant	Understand the purpose of each tree and plant in your garden. Select those that support firewise garden design considerations, including APZ planting requirements and firewise plant characteristics.
Type of plant	Consider all types of plants such as trees, shrubs, groundcover, lawn, food producing plants, annual plants and succulents.
Plant characteristics	Consider the size and form of a plant, what it will be like at maturity and how it will react to drought and heatwave conditions. Select plants with high moisture content and low flammability, as well as types that are easy to maintain and do not shed large volumes of leaves and dead material. See Section 6 for further details on firewise plant characteristics.
Locality	Select plants that are suited to local growing conditions. Understand your local government requirements and recommended plant species. It is worth noting that some native plants have lower flammability characteristics and will often be better suited to your location.

Plant selection key

A firewise Plant selection key is available in Appendix 1 »

Principle 3: A balanced approach to gardening

A beautiful and functional garden is the result of design elements working together. Consider garden aesthetics and how to incorporate asset protection and balanced sustainability principles without compromising the intended look, feel and function. Rather than focusing on removing vegetation, a firewise garden can be functional and enjoyable.

The following sustainability principles can guide the design of any type of firewise garden.

Habitat and biodiversity

Select native species with low-flammability characteristics that can also attract insects, birds and animals and provide homes for native bees. Consider creating different habitats for fauna species through landscaping features like gabion walls. Provide water for wildlife in a suitable location with a birdbath or bowl. Avoid environmental weeds. These can include eastern Australian native species that can become an environmental weed when introduced into the WA landscape. Always check with your local nursery if unsure.

Water conservation

Use hydrozoning principles to group plants with similar water needs. Improve soil moisture retention and install efficient irrigation. Use non-combustible wind breaks and shading to create cooler microclimates. Where appropriate, consider collecting rainwater and recycling greywater for an alternative water supply.

Materials selection

Consider the use of locally sourced, repurposed and recycled low-flammability materials in your garden construction. Avoid using timber-lined edging, raised timber or plastic garden beds that can easily burn. Garden beds within the APZ should include non-combustible mulch.

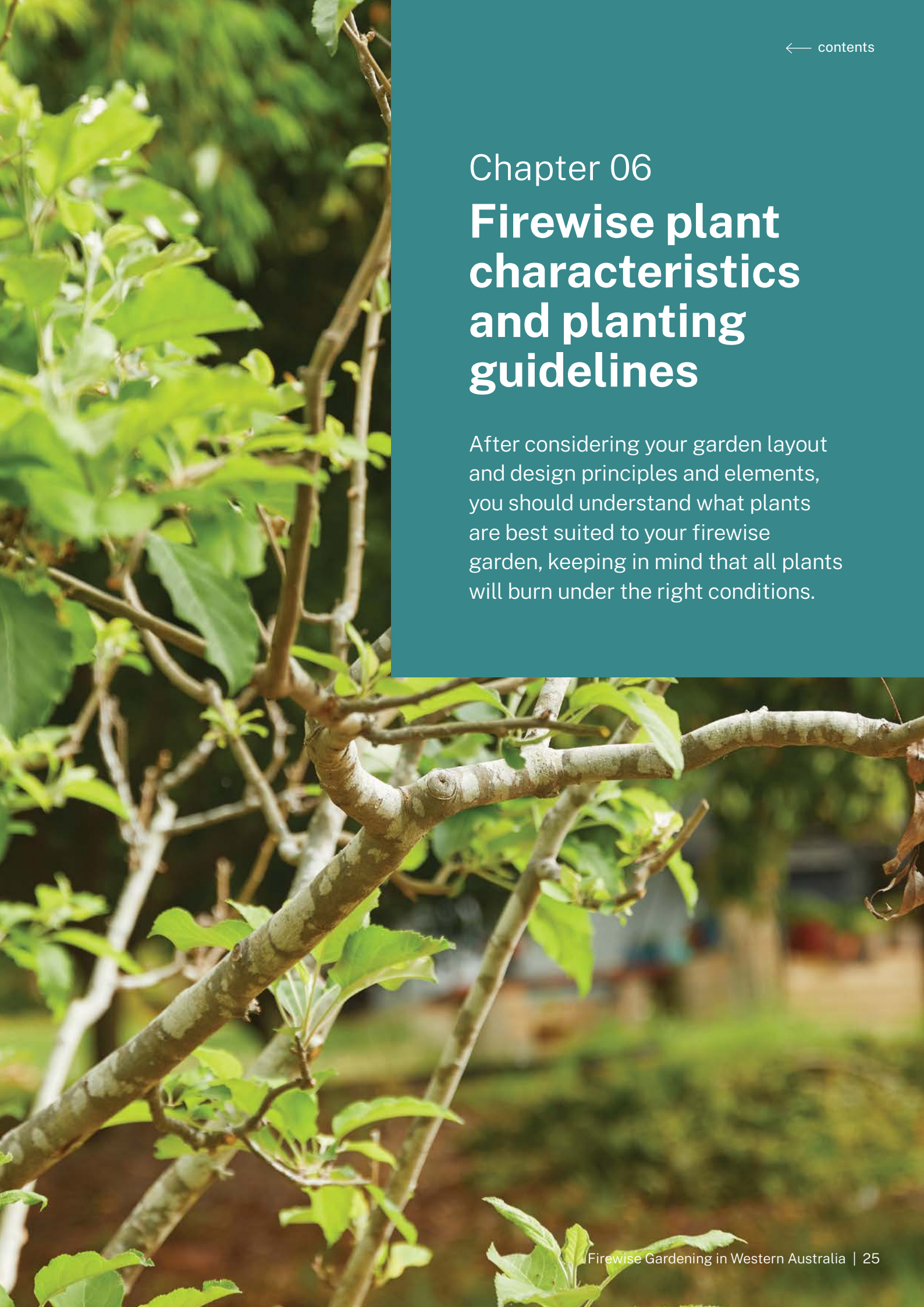
Health and wellbeing

Create a safe and secure place for householders to rest and recreate, grow food and have close contact with nature as part of their daily lives.

Chapter 06

Firewise plant characteristics and planting guidelines

After considering your garden layout and design principles and elements, you should understand what plants are best suited to your firewise garden, keeping in mind that all plants will burn under the right conditions.



Firewise plant characteristics

Consider the following firewise plant characteristics when choosing plants for your garden.

Flammability

Plant flammability depends on plant morphology (shape, size or colour), age, health, structure, chemical content, seasonal climate variations, location in relation to flammable objects and the specific part of the plant. A key factor is the amount of dead material suspended on the live plant. Avoid plants that keep dead branches attached, as this will increase combustible material.

Moisture content

Plants with high moisture content can potentially reduce the risk of ignition. Plants must be kept well watered. Be aware that prolonged summer heat can dry out plants and trees.

Height

Refer to the planting guidelines and heights for the APZ. The lowest branch of a tree or large shrub should be at least two meters from the ground. Lower branches can be pruned to avoid creating a ladder fuel into the tree canopy.

Branching pattern

Consider the distribution and density of plant foliage. Plants should have open and loose branching, thinly spread leaves, no continuous foliage from the ground to the canopy and separation between ground fuel and foliage. Plants with tightly packed leaves and branches are more flammable due to a larger amount of available fuel.

Texture

Consider the overall appearance of a plant, as it can be coarse, medium or fine. Coarse-textured plants are less flammable, as they have a lower surface area to volume ratio.

Bark

Select plants with smooth bark and trunks instead of stringy, coarse, loose and fibrous ones, which can easily ignite and act as ladder fuels that carry fire into the tree canopy. Smooth bark attached tightly to the tree is less flammable, as it is difficult to ignite and not easily carried as an ember. Make sure trees do not shed large ribbons of bark, as these can be highly flammable, get stuck in branches, be carried as embers and act as a ladder fuel.

Density

Consider the amount and arrangement of fuel within a plant, as those with dense branches and foliage provide more fuel to burn. Select plants with fewer fine stems and branches.

Leaf characteristics

The fineness, size and shape of leaves can impact flammability. Small, thin and narrow leaves have a high surface area to volume ratio and are more likely to dry out. Large, broad, thick, fleshy leaves with a high moisture content are best. Avoid leaves that are waxy or oily.

Oils, waxes and resins

Some plants contain high amounts of oils and resins, which can increase flammability. Limit plants and trees like rosemary, Eucalyptus species, and melaleuca, callistemon and other Myrtaceae species. If using these species, place them carefully in the garden, as they can intensify the heat of a fire front. Note that some Eucalyptus species also have characteristics such as coarse leaves, smooth bark and low-density canopies that result in lower ignitability.

Salt content

Species growing in saline conditions have a higher salt content, which can help to slow down burning. Select plants, such as succulents, that have high moisture content.

Dead material

Plants should not retain a lot of dead material or shed large amounts of litter and dead debris, as this contributes significantly to bushfire fuel load. Fuel hazard assessments are heavily dependent on the percentage of dead fuel present. Regular maintenance and pruning can help remove dead material and fine fuels.

Lifespan

Consider how often the plants in your firewise garden will need to be replaced. Some natives species have a relatively short lifespan and, if not removed from the garden, can add to the fuel load once they die. Speak to your local nursery about expected lifespan of plants you are choosing.

Planting guidelines for the Asset Protection Zone

Shrubs

- Shrub foliage cover should not form more than 10% of the total area.
- Shrubs should not be planted in clumps greater than 5m^2, measured from the outer edge of the foliage.
- Clumps and individual shrubs should be separated by at least 5m measured horizontally from the outer edge of their foliage.

Shrubs should not be located within 3m of buildings.

Groundcovers

- A groundcover is any plant with a mature height under 500mm. Strappy plants or small shrubs under 500mm can be used as a groundcover.
- Groundcovers cannot include grasses greater than 100mm in height.
- Groundcovers greater than 500mm in height must be treated as shrubs.

Groundcovers must be kept to a minimum of 3m from windows or doors if greater than 100mm in height.

Groundcovers must be kept to a minimum of 2m from a structure.

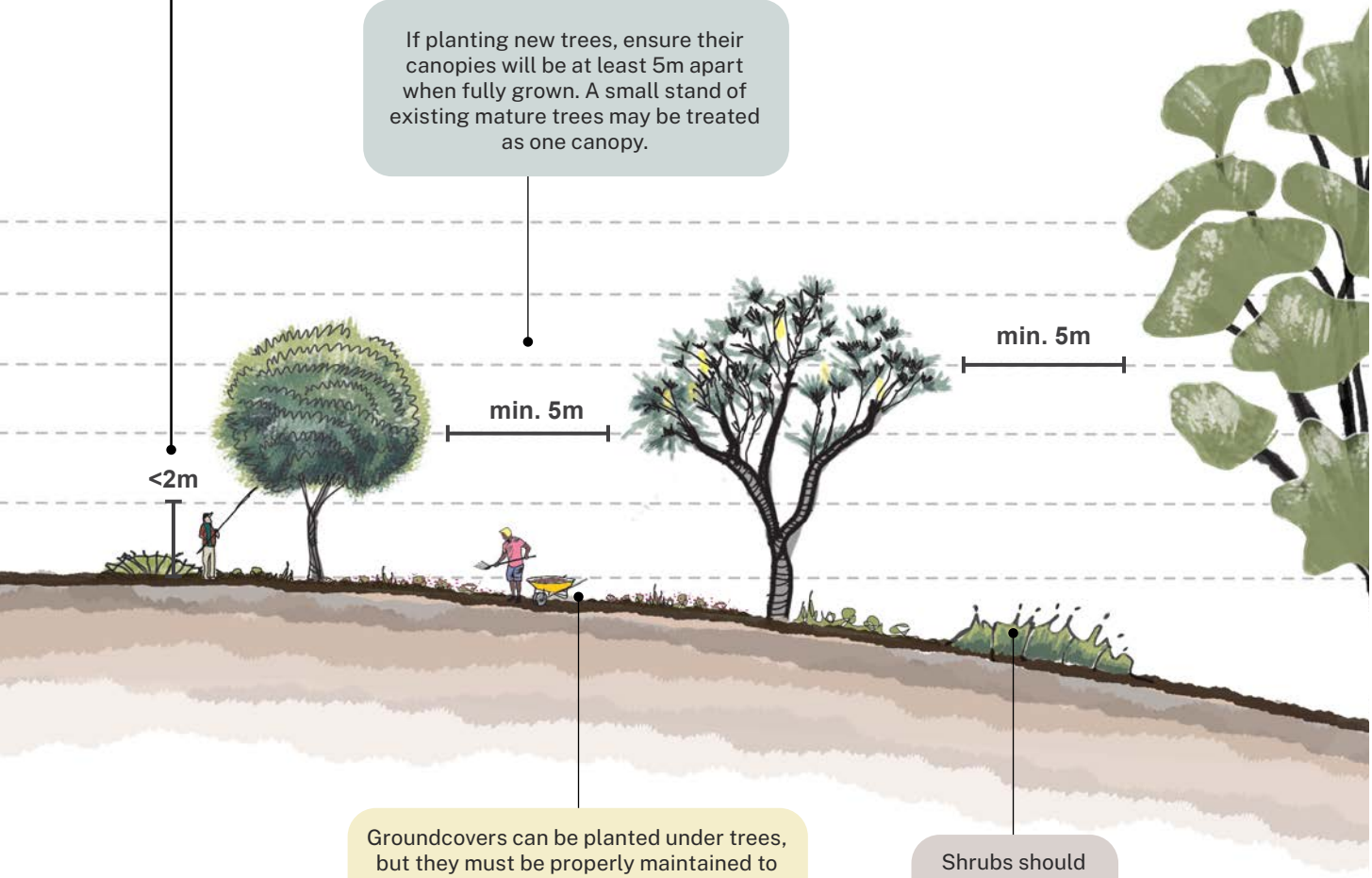
Shrubs should be separated from windows and doors by a distance (**D**) of at least twice their mature height (**H**), measured at the highest point of the shrub.

Trees

- Tree trunks at maturity should be a minimum of 6m from all elevations of the building.
- Branches at maturity should not touch or overhang the building.

The lower branches of trees should be removed to a height of 2m above the ground or surface vegetation.

If planting new trees, ensure their canopies will be at least 5m apart when fully grown. A small stand of existing mature trees may be treated as one canopy.



Groundcovers can be planted under trees, but they must be properly maintained to remove dead plant material.

Shrubs should not be located under trees.

Chapter 07

Designing the landscape elements of a firewise garden

When designing your garden, consider how multiple landscape elements can work together to help you create a firewise garden that you enjoy.

Good landscape design needs to consider materials, plants and garden construction, as well as how to reduce the probability of damage or house loss from bushfire.

Creative landscape solutions should consider the size of the garden, climate zone and intended use. Although still the safest option, the advice to clear all vegetation and replace it with lawn or pavers is now outdated. Gardens that are carefully planned and designed for safety can still receive the benefits of aesthetics, privacy, sound reduction, shade and cooling. Remember to always consider the planting requirements of the APZ.

Water features, irrigation and water-sensitive design

Ensure sufficient water supplies are available for irrigation to maintain plant moisture content. Keeping your garden green and well watered may not be possible during drought, so you may need to target which plants you water to help maintain plant tissue moisture content.

Consider the design and location of water features such as pools, ponds and water tanks, as these add interest to the garden. Water used for gardening can also assist with firefighting during a bushfire. Additional water tanks for firefighting purposes should be constructed from non-combustible materials such as metal, concrete or masonry. Electric-powered irrigation systems should not be relied on as a water supply for firefighting purposes, as electricity is often unavailable during a bushfire. Keep irrigation and firefighting equipment clear of flammable vegetation and groundcovers due to the risk of ignition. Take care when refuelling petrol tanks.

Replace impermeable surfaces with crushed gravel or permeable paving to allow for natural infiltration of stormwater and precipitation. This will also assist in hydrating the landscape. Remember to regularly remove weeds to reduce potential fuel loads in drier times.

Ensure your irrigation system is working properly, with no leaks or gaps, so your garden gets the water it needs. An automatic irrigation system is the most waterwise option, and advice on watering times and amounts is available on the Water Corporation website. If you require expert advice on your garden irrigation, locate a Water Corporation waterwise specialist in your area on the Water Corporation website.

Pathways

Pathways can break up continuity in vegetation and provide important points of access for firefighters, their equipment and evacuation. Ensure there is more than one pathway in and out of the property, and plan and locate access routes away from unmanaged vegetation.

Maintain safe navigation, shield access routes with non-combustible retaining walls, and, where practical, keep pathways artificially lit.

Use non-flammable path options, but remember to keep pathways maintained to reduce weed growth and cleared of overhanging vegetation to reduce bushfire risk.

Pathways can comprise of non-flammable recycled or reused materials, such as pebbles, crushed brick and old pavers. Contact your local recycling centre for suitable products. Logs can define paths, but only if they are located at a safe distance from the house.

Fencing, garden walls and garden edging

Effective firewise fencing and screen walls must be resistant to embers, radiant heat and flame contact and must not provide a potential source for ignition. Suitable non-combustible materials include iron, brick, limestone, concrete, steel and metal posts and wire.

Consider creating gabion walls as a landscape feature that can incorporate recycled materials and provide habitat for local fauna.

Any timber fences should be situated away from the house and other structures. Be aware of the ash from timber treated with copper chromium arsenic (CCA) after a bushfire, as it can contain levels of arsenic, copper and chromium that are dangerous if touched or ingested.

Keep all fences and screens near the house clear of overhanging trees and shrubs, garden waste and combustible mulches.

Reduce the need for garden edging, as it can become a trip hazard, especially in key points of access. If required, use fire-resistant materials such as stone, brick, rocks or weathering steel for landscaped edges, and keep these clear of debris.

Design strategy for garden beds and hydrozoning

It is important to think about 'the right plant in the right place' to achieve a firewise garden. Applying a zoning approach to your firewise garden design can provide necessary gaps in vegetation. When setting up the zones in your garden, it is important to think about the components you have, or want to have, and their function.

Zoning can be based on water, fertiliser, shade, soil type and maintenance requirements. A zoning approach improves plant management, making it easier for you to maintain required nutrient and moisture levels. It also saves time, reduces energy use, improves a plant's chance of survival and can reduce bushfire risk.

Hydrozoning is the process of grouping plants together based on common water requirements. For example, lawn and shrubs should be in separate hydrozones. Irrigation should be based on zones, with sprinklers preferred for lawn areas and drip irrigation for garden beds. To maximise water efficiency, ensure even water distribution and pressure by using consistent sprinkler heads for each hydrozone.

Plant types

Trees

Trees provide shade and cooling during hot summers. If located a safe distance from the house, they can shield against wind, absorb radiant heat and filter embers and flying debris in a bushfire. However, trees can provide a fuel source for ember attack if not selected and managed well. The type of tree you select and its suitability for your chosen location is more important than its size. Choose species with low flammability, remove low-hanging and dead or damaged branches, loose bark and dead leaves, and keep the base of the tree clear of leaf litter. Mature trees should be at least six meters away from your house and structures. Avoid species that shed debris during bushfire season, as well as those with loose, flaky, stringy or ribbon-like bark.

Shrubs

Shrubs can become a ladder fuel that aids the spread of fire. Use them carefully, and choose varieties that are low growing and remain green in summer. Keep shrubs well watered, away from pathways and clear of debris. Large shrubs with high moisture content can provide screening and wind protection when planted away from the house where they are less of a hazard.

Groundcovers

Groundcover species that stay green or can be cut back in summer are best. These should be kept short, well watered and clear of debris. Use groundcovers sparingly, and apply a zoning approach.

Lawn

An irrigated and maintained lawn can provide an effective firebreak or safer area, particularly if located close to the house. Avoid artificial lawn, as it will burn.

Food-producing plants

Food-producing plants or green, irrigated plants with high moisture content are less flammable when compared to other types of vegetation. An irrigated vegetable garden can become a good firebreak if placed strategically, as it has higher moisture levels, is low growing and usually has access paths around it. Keep plants pruned, irrigated and away from the house or other structures to avoid potential direct flame contact.

Annual plants

Annual plants complete their life cycle in one growing season. They can fill spaces between shrubs and provide interest during winter and spring while retaining garden structure and spacing between shrubs and trees during summer. Select plants that are dense in winter and spring but are not present in summer and autumn.

Succulents

Succulents store moisture in their leaves and tend to be drought tolerant and low maintenance. These make a great addition to a firewise garden.

Soil types and improvement

Soil types vary across WA. Understanding the soil type will help you to know what firewise plants are most suitable for your garden's conditions. Healthy soil promotes healthy plants that retain moisture and reduce the risk of ignition and sustained combustion.

Local natives have adapted to grow in existing soil conditions. Productive food crops require soil improvement to ensure soil is pH neutral (7 to slightly acidic 6), is free draining while retaining moisture and contains organic matter and nutrients.

You can purchase a simple soil testing kit from your local nursery, or a soil laboratory can complete a more comprehensive soil test. Knowing your soil allows you to determine what adjustments you may need to make if there are any nutrient deficiencies.

A diverse range of materials are available to improve soil fertility if required, including compost, aged animal manures, green manures, mineral fertilisers and liquid fertilisers. Always follow the manufacturer's instructions, and only apply what your plants need.

Mulching

Mulch can help keep plants green and healthy by reducing evaporation, keeping moisture in the soil and shading roots. The use of organic mulch in the right location can also provide plants with essential nutrients as it breaks down, suppress weeds and protect plants from extreme temperature fluctuations.

It is best to avoid using flammable mulch within the APZ around the house. Instead, consider inorganic pebbles or pea gravel in these areas. If using combustible organic mulch elsewhere, avoid fine materials, separate garden beds, and keep the area small and irrigated where possible.

Biodiversity

A firewise garden can provide a wonderful opportunity to increase local biodiversity and positively contribute to local ecosystems. Firewise ideas to increase biodiversity:

Select a diverse range of firewise plants to achieve a greater range of habitat.

Consider rock walls and gabion structures that provide habitats for lizards.

Add a water feature to provide habitat for frogs, and edge it with rocks and other non-combustible materials and plants.

Include birdbaths and nesting boxes as garden features to attract birds and beneficial insects. Ensure nesting boxes and insect hotels are not located near the house, as they can be highly flammable and a fire hazard.

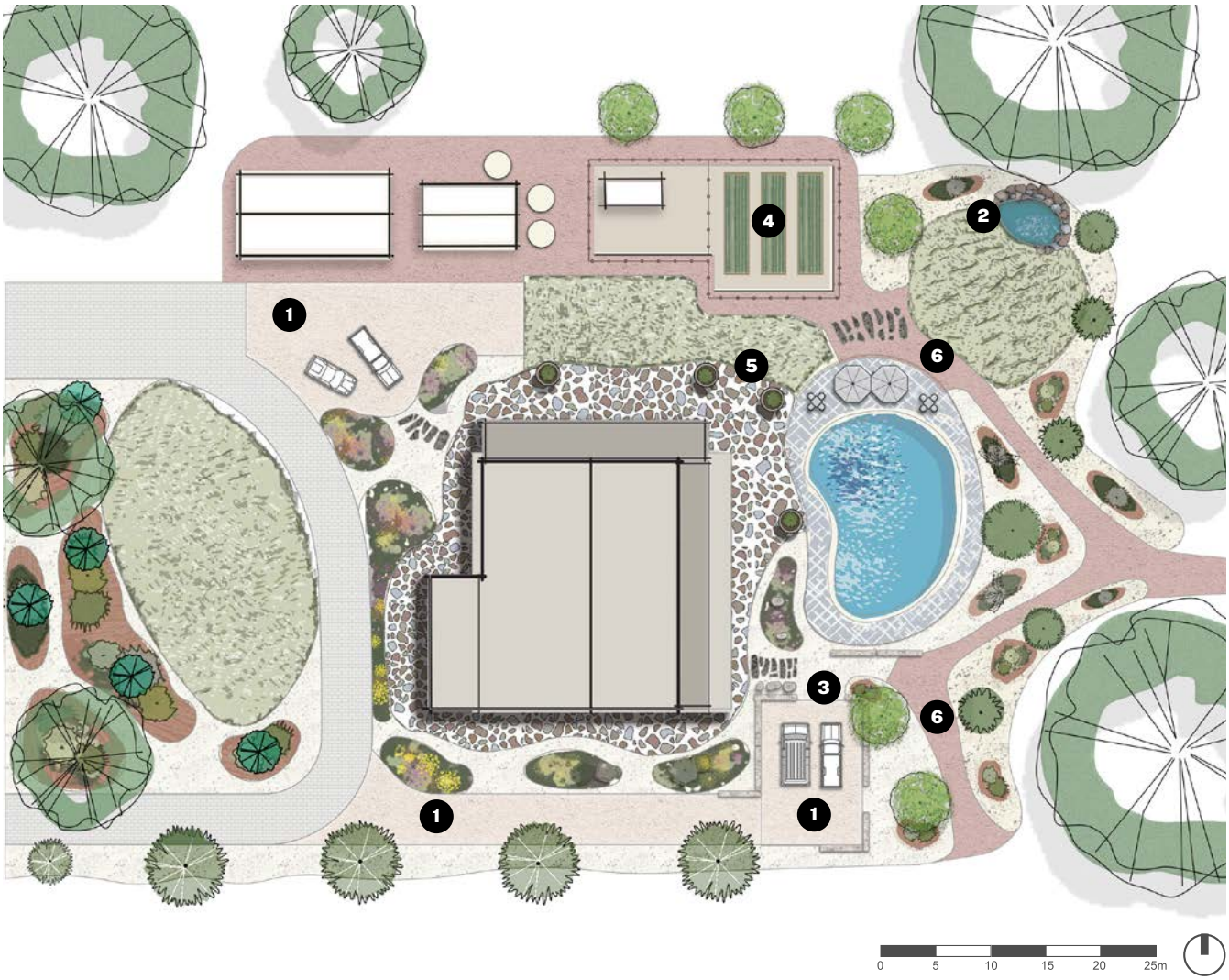
Consider using logs from felled trees to provide habitat for ground-dwelling animals and as a feature to line paths and define garden beds. Logs are not aerated fuels in a bushfire situation and are safe to use in the right location.

Where possible and without jeopardising bushfire safety, protect potential habitat locations when maintaining your garden.

Additional garden features

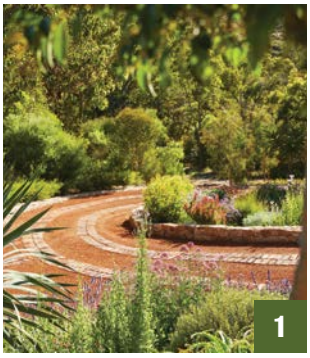
Outdoor pizza ovens and firepits are popular garden features, but you must make sure they comply with local government requirements. Pot plants are a wonderful way to soften paved areas, but they must be moveable, made of non-combustible materials and situated away from the house. Remove hanging pots from around the house and other structures, as these can be a source of fuel.

Elements of a firewise garden

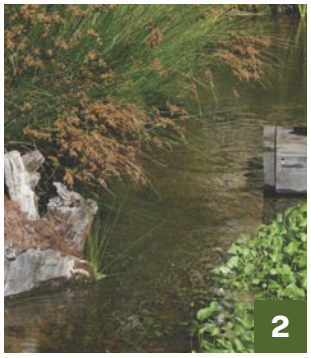


Key

- Large tree
- Small, firewise native tree
- Fruit tree
- High water use area such as turf
- Low-profile garden bed
- Native garden bed
- Low water use area with non-combustible mulch
- Stone paving
- Stone steppers
- Gabion walls



Permeable access routes and pathways allow for natural infiltration of stormwater to hydrate the landscape.



Small water bodies such as garden ponds can provide a non-combustible barrier and encourage a range of biodiversity benefits.

Gabion walls are an example of a non-combustible wall type that provides important habitat for lizards and insects.

Well-maintained, productive garden beds contain moisture-rich soil as part of a firewise garden.

Pot plants can soften paved areas but must be moveable, made of non-combustible materials and situated away from the house.

Non-flammable pathways break up continuity of vegetation and provide important points of access.

Garden beds should contain non-combustible mulches.

Include a variety of firewise plants to increase biodiversity and add interest, while still planting within the APZ guidelines.

Consider the maintenance requirements of your proposed firewise garden design.

Create hydrozones where plants are grouped together based on their common water requirements.

Chapter 08

Maintaining a firewise garden

Regular maintenance keeps your firewise garden looking good. The APZ of a firewise garden requires regular and planned maintenance for adequate preparation for bushfire and to keep a safe defendable space that is free from potential hazards. If possible, schedule important maintenance activities in your calendar, so you do not forget.

Maintenance activities

The following maintenance activities will help you to manage and reduce fuel load, reduce hazards and restrict opportunities for ignition.

Planned burns

Small landholders with properties up to two hectares should undertake planned burning to help remove the build-up of fuel over larger areas of land. Undertaking a planned burn requires carefully planned stages and the right environmental conditions. Burn SMART is a useful planned burning guide for small landholders. Visit **publications.dfes.wa.gov.au** to download.

Reduce fine fuels

Grass clippings, seed pods, leaves, twigs and bark within 20 meters of the house are susceptible to ignition from embers and have the biggest influence on the rate of fire spread. Reduce and maintain live vegetation less than three millimetres thick and dead vegetation less than six millimetres thick.

Move combustible materials

Keep firewood, compost piles and wooden garden furniture away from the house. Remove combustible groundcovers such as dry leaves, bark, twigs and garden mulches, as they can become a hazard and ignite from embers. Consider the material of all garden structures such as fences, stairs, rails and gazebos. Do not use brush fences and screens, as these are highly flammable.

Clear gutters and roof surfaces

Keep all structures, including your house, sheds and tanks clear of fuel sources for protection and to reduce fire spread. Ensure leaves and other dry combustible materials do not accumulate. Regularly maintain garden beds and gutters, rooftops, window ledges and doorways. Install metal gutter guards to help reduce the accumulation of leaf litter.

Manage trees and shrubs

Thin shrubs to reduce excess foliage and prevent them from intersecting with tree canopies. Separate tree canopies, and ensure tree crowns are at least five meters apart. Remove lower branches and those overhanging your house or structures. Remove loose bark from tree trunks for at least the first two meters above the ground.

Manage lawns and grasses

Keep lawn and grasses short to reduce fuel load and minimise the risk of surface fire. Keep lawn green in summer, mowed and clear of debris. It is useful to de-compact lawn in spring with a corer or garden fork to allow water to penetrate deeply and to establish a strong root system.

Manage weeds

Weeds can spread rapidly and significantly add to fuel loads. Remove them regularly, and try to tackle them before they drop seeds.

Hydrate the landscape

Maintain moisture levels around your house, particularly before fire season. Water plants regularly within recommended waterwise guidance, and use a firewise mulch. Apply a soil-wetting agent to increase moisture retention in dry, sandy, water-repellent soils. Ensure your irrigation system is efficient and well maintained.

Fertiliser

You may need to apply additional fertiliser to assist with healthy plant growth. Healthy plants are less flammable, because they have less dead material and a higher moisture content. Apply fertiliser according to the manufacturer's instructions. Correct use can prevent excess nutrients from polluting waterways, as well as avoiding costly and unnecessary waste.

Manage garden waste

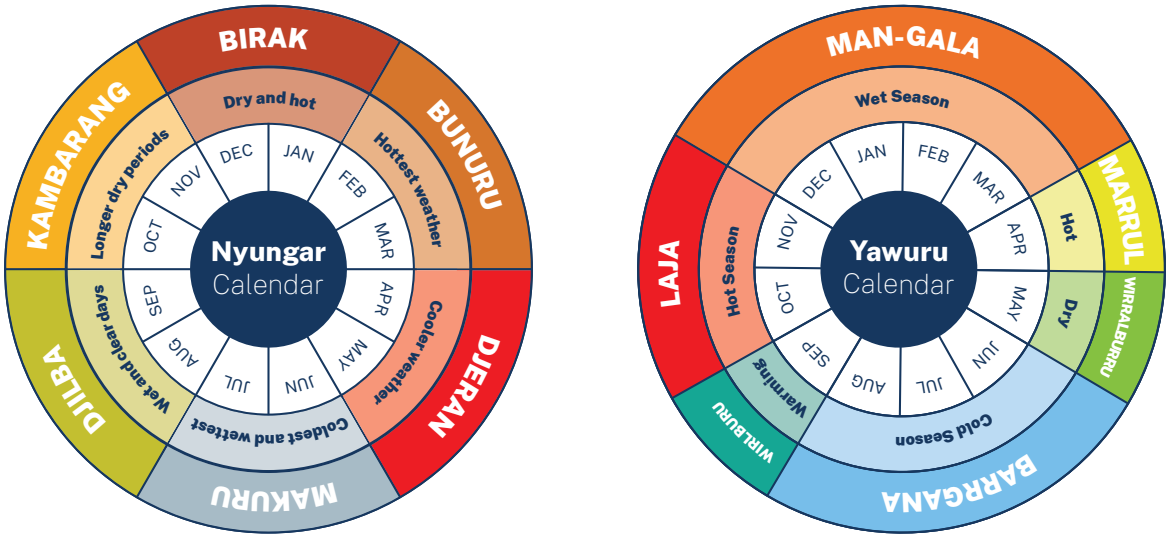
Composting provides a source of nutrients for your garden and is a way to effectively manage garden waste. However, dead plant material, lawn clippings and pruned leaves can be a fire hazard and are easily carried by wind to accumulate in gutters and rooftops. Do not store garden waste and compost piles near your house or other structures. Instead of exposed piles, use tubs or cover compost with a non-flammable material such as fire-retardant hessian. Keep compost moist and regularly turned to reduce risk. You can also dispose of garden waste in the green waste bin, if you live in an area where the local council provides a Food Organics Garden Organics (FOGO) collection service.

Replace with firewise species

Ensure any replacement plants are suitable for a firewise garden.

Maintenance activities according to Indigenous seasonal calendars

Guided by an understanding of Indigenous seasonal calendars, you can perform garden maintenance based on a close relationship with local context and landscape. Maintenance activities take place all year round, but rather than adhering to calendar dates, these can be adjusted to suit what is happening and changing in the environment. Everyone and everything matters. This includes people, the seasons, plants, wind directions, animals and trees that flower at a certain time.



An example of the Nyungar and Yawuru seasonal calendars. Nyungar Country spans from Leeman to beyond Cape Arid in the south-west of WA. Yawuru Country covers Broome, including the subtropical coastal and inland savannah areas in the Kimberley region of WA.

Indigenous knowledge of the seasons is highly localised and unique to each language group across Australia. As such, the number of seasons recognised in an annual cycle, the length of each season, and how they are locally defined and understood differs a lot depending on where the seasonal knowledge of Country has developed.

Tree pruning advice

Prune trees so they do not form a continuous canopy, are separate from underlying vegetation and so branches do not touch or overhang houses or structures. Check with your local government if any trees on your property are protected habitat trees or listed as significant before undertaking any pruning. For personal safety and tree health, it is best to get professional advice from an arborist when undertaking a large amount of pruning. You can prune overhanging branches from adjacent properties back to the boundary, although it is best to consult with the neighbours first, as trees are valuable community assets - as are friendly neighbours - that are best managed collectively.

Tree pruning techniques include crown lifting, crown thinning and selective pruning.

Crown lifting

Crown lifting removes the lowest branches of the tree to two meters above the ground. This can help prevent fire from reaching the canopy via underlying vegetation.

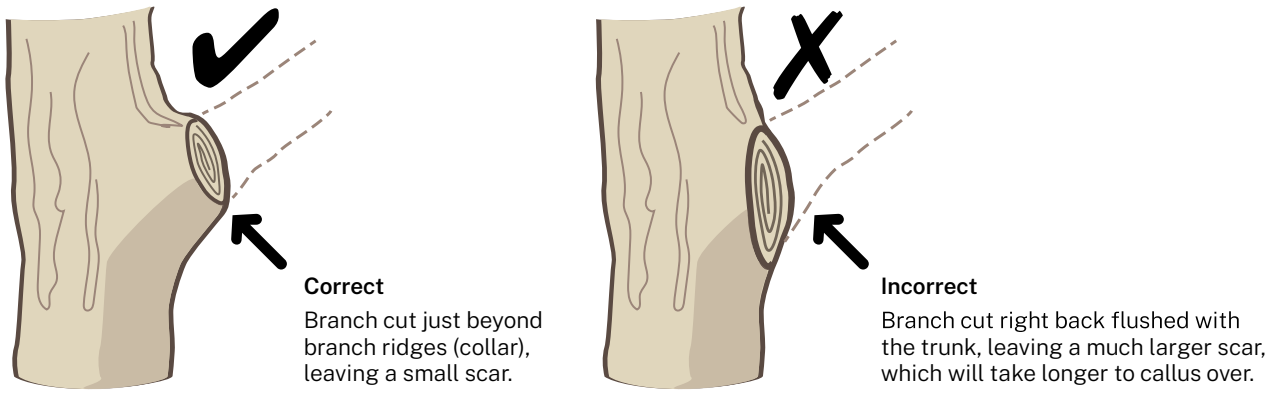
Crown thinning

Crown thinning removes smaller branches while the main structural branches remain. This can reduce the amount of leaf litter from the tree and reduces fire spread in the canopy.

Selective pruning

Selective pruning removes the branches that pose the greatest hazard, such as overhanging branches.

Pruning should aim to minimise the impact on the tree by only removing what is necessary, ensuring balance and cutting with clean, sharp tools just below branch ridges to reduce scar size.



Recommended pruning technique

Appendix 1:
Plant selection key

About the key

The plant selection key was developed as a practical tool to help you choose suitable plants to use in a firewise garden in areas with high bushfire risk.

The key is made up of a series of questions and information about plant characteristics and their relative flammability.

The key provides:

- an overall flammability rating
- a firewise rating
- advice about maintenance
- advice about whether the plant is appropriate for a garden.

The plant selection key has been adapted from Landscaping for Bushfire (Country Fire Authority Victoria, 2022) and customised to better suit Western Australian conditions. It is intended to provide an indication of plant flammability. The flammability of plants is highly variable, and in periods of drought or in the path of an oncoming bushfire, plants will dry out and become highly flammable. If you are uncertain about the results of this key, seek professional advice from a plant specialist.

Thank you to Country Fire Authority Victoria for allowing us to use an adapted version of the plant selection key featured in their publication Landscaping for bushfire (2022).

Plant selection key

Using the key

Make a list of plants to be used in the garden

As a starting point, make an initial list of plants you want to plant in a garden. In doing this, it is important to:

- Choose plants that are suited to the local growing conditions.
- Check with your local government about specific controls that may apply to your property. These may influence what and where you can plant.
- Check for characteristics that influence flammability. These are outlined in Section 6 (Firewise plant characteristics and planting guidelines).
- Identify the plant species, including both the common and scientific name. This is important, as even closely related plants in the same genus can vary greatly in their flammability.
- Take note of the size and form of the plant at maturity. Plant labels often focus on plant size within five to ten years of planting and may not be reliable for this assessment.
- Note how the plant will look in summer and whether it is susceptible to disease, insects or pests. This information can be obtained from plant websites, books, the local nursery or council.

Work through the key

- Begin at Section 1 (What type of plant is it?) and follow the prompts to the next number.
- Record how many **LESS FIREWISE** or **NOT FIREWISE** results the plant receives in the record sheet on page 70.
- Collate the results in the record sheet.

Rate each plant for its suitability in the garden

The table on page 53 outlines four firewise ratings and corresponding flammability ratings. The firewise ratings are: **NOT FIREWISE, AT-RISK FIREWISE, MODERATELY FIREWISE** and **FIREWISE.** The flammability rating of individual plants depends on the number of **LESS FIREWISE** or **NOT FIREWISE** results you record.

Once you have established the firewise and flammability rating for each plant, you can determine the plant's suitability for use within the garden, where it should be planted and its maintenance requirements.

Firewise and flammability ratings

NOT FIREWISE

If you record any **NOT FIREWISE** results, then that plant is **NOT FIREWISE** regardless of any **LESS FIREWISE** results.

Flammability	Extreme
Where to plant	These plants should not be planted in a garden or used when landscaping for bushfire.

AT-RISK FIREWISE

If you recorded three or more **LESS FIREWISE** results, then that plant is **AT-RISK FIREWISE.**

Flammability	High
Where to plant	Avoid using these plants in a garden. If you are on a large property, they may be planted outside the defendable space.

MODERATELY FIREWISE

If you recorded one or two **LESS FIREWISE** results, then that plant is **MODERATELY FIREWISE.**

Flammability	Moderate
Where to plant	These plants can be used in a garden but they need regular maintenance to keep them in a less flammable condition.

FIREWISE

If you record no **LESS FIREWISE** results, then that plant is **FIREWISE.**

Flammability	Low
Where to plant	These plants can be used in a garden, as they are not considered particularly flammable

Begin plant selection key »

1. What type of plant is it?

Trees

- Trees have one or more woody trunks and grow from five metres to 30 metres or more at maturity.
- Single-stem trees typically branch well above the ground, while multiple-stemmed trees typically branch close to the ground.
- Tree foliage is concentrated in the canopy, which allows other vegetation to grow underneath.
- Trees have highly variable leaf and bark types.

GO TO 2 »

Palms or palm-like plants

- Palms vary greatly in height.
- They generally have a single woody trunk topped by fronds.
- Many species retain dead fronds, which can be flammable.
- Australian palm-like plants include tree ferns (*Cyathea spp.*), screw palms (*Pandanus spp.*), cycads (*Macrozamia spp.* and *Cycas spp.*) and grass trees (*Xanthorrhoea spp.*). These plants can grow several metres in height and have a 'skirt' of dead fronds or leaves close to the ground. This is an important flammability characteristic, as it can act as a ladder fuel.

GO TO 9 »

Shrubs

- Shrubs are shorter and generally more compact than trees.
- They are typically three to four metres in height with branching close to the ground.
- Shrubs have dense, bushy foliage and woody stems.
- Because of their structure, shrubs can carry fire from the ground to the tree canopy.

GO TO 13 »

Vines and climbers

- Vines and climbers are climbing or scrambling plants with soft or woody stems.
- They are often grown over fences, pergolas or trellises and can grow over other plants.
- They can be deciduous or evergreen.
- Some accumulate large amounts of dead leaves.
- Vines and climbers can act as ladder fuels and carry flames up into shrubs, trees or supporting structures.
- Examples include exotics such as grapes (*Vitus spp.*), jasmine (*Jasminum spp.* and *Trachelospermum spp.*), wisteria (*Wisteria spp.*) and Australian natives such as Happy Wanderer (*Hardenbergia violacea*) and WA native coral pea (*Kennedia coccinea*).

GO TO 17 »

Herbaceous plants

- Herbaceous plants have soft and fleshy leaves with non-woody stems.
- They are low-growing, often less than 50 centimetres in height.
- Herbaceous plants include most smaller flowering plants grown in gardens.
- They can look 'shrubby', form clumps or grow as groundcovers.
- Herbaceous plants' moisture content is usually higher than most woody shrubs. They often droop when dry.
- Examples include exotics such as violets (*Viola spp.*), pansies (*Viola x wittrockiana*), salvias (*Salvia spp.*) and Marguerite daisies (*Argyranthemum spp.*) and Australian natives such as native daisies (*Brachyscome spp.*) and everlastings (*Bracteantha spp.* and *Chrysocephalum spp.*).

Groundcovers

- Groundcovers can be woody or herbaceous.
- Woody groundcovers spread without climbing.
- Groundcovers are generally less than 50 centimetres in height.

Grasses or grass-like plants

- Grasses have leaves that are usually long, fine or strappy.
- They vary from a few centimetres to over two metres in height.
- Clump size can be up to one metre in diameter.
- Most grasses grown in gardens are perennial rather than annual. Many of these form clumps called tussocks. WA native examples include kangaroo grass (*Themeda triandra*) and native lemon grass (*Cymbogon ambiguus*).
- Perennial tussock grasses accumulate dead material mixed with the living leaves. These are quite flammable, although they usually only burn for a short time.
- Other grasses, such as lawn grasses, grow as a continuous mat.
- Leaves of grass-like plants are often coarse and thick. They may accumulate dead leaves in the living clump. Examples include exotics such as New Zealand flax (*Phormium spp.*) and lily turf (*Liriope spp.*) and Australian natives such as flax lilies (*Dianella spp.*) and mat rush (*Lomandra spp.*).

GO TO 18 »

2. What type of tree is it?

Eucalypts

- Eucalypts can have woolly, fibrous bark (stringy bark); deeply corrugated and dense bark (iron bark); 'chippy' or platy bark (box bark); or smooth bark (gum bark).
- All eucalypts produce flowers and have leaves that hang vertically.
- Their bark can be extremely flammable.
- Gums with rough or stringy bark pose a greater fire risk than smooth-bark gums. However, many smooth-bark gums shed bark, which can become trapped in the tree and pose a fire risk.
- Examples include trees from the genera *Eucalyptus*, *Corymbia* and *Angophora*. Also included, are related genera such as *Lophostemon*, and *Agonis* which includes the Western Australian peppermint *Agonis flexuosa*.

GO TO 3 »

Conifers or conifer-like trees

- Conifers develop woody cones and have needle-like or scale-like leaves.
- Examples include exotics such as pines (*Pinus spp.*), spruces (*Picea spp.*), junipers (*Juniperus spp.*), cedars (*Cedrus spp.*) and cypresses (*Cupressus spp.*).
- Native Australian conifer-like examples include she-oaks (*Allocasuarina spp.*) and native pines (*Callitris spp.*).

GO TO 7 »

Other tree types

- This category contains all trees that are not eucalypts, conifers or conifer-like trees.
- Leaf types can vary greatly.
- Trees with **small leaves** include jacaranda (*Jacaranda mimosifolia*), gleditsia (*Gleditsia spp.*) and poinciana (*Delonix regia*) and most Australian native wattles (*Acacia spp.*).
- Trees with **medium-sized leaves** include exotics such as olives (*Olea spp.*), ornamental pears (*Pyrus spp.*), and lilly pilly (*Syzygium spp.*).
- Trees with **deeply lobed leaves** include WA native bull banksia (*Banksia grandis*).
- Trees with **wide, broad leaves** include Australian native kurrajong (*Brachychiton populneus*) and exotics such as planes (*Platanus spp.*), maples (*Acer spp.*), oaks (*Quercus spp.*) and elms (*Ulmus spp.*).

GO TO 11 »

3. What type of bark does the tree have?

Stringy barks

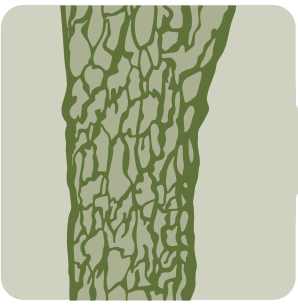
- Found on eucalypts such jarrah *(Eucalyptus marginata)* particularly in its multi-stemmed form, red tingle *(Eucalyptus jacksonii)* and flooded gum (*Eucalyptus rudis*) These are characterised by persistent old dead bark forming deep fissures and a relatively spongy fibrous mass and falling off in wads when very old or as a result of burning. Long-unburnt trees can produce large amounts of embers.

GO TO 4 »

Large ribbons or sheets of bark that shed annually

- Strips or ribbons of bark are caught and held in the tree.
- Examples include many many Western Australian mallees, and smooth-barked and gum-barked eucalypts such as karri *(Eucalyptus diversicolor)* and the river red gum *(Eucalyptus camaldulensis).*

GO TO 8 »



Platy and sub-fibrous barks

- As found on peppermint *(Agonis flexuosa)*, marri *(Corymbia calophylla)* and Swan River blackbutt *(Eucalyptus patens)*. They are characterised by layers of old, dead bark tightly held to the bole and branches, but capable of flaking and losing small chunks as a result of burning or weathering.

GO TO 5 »

Smooth bark with minimal annual shedding

- This bark sheds in flakes.
- Examples include Australian native gums such as spotted gum (*Eucalyptus maculata*), and WA natives such as wandoo (*Eucalyptus wandoo*), western coolibah (*Eucalyptus victrix*) and salmon gum (*Eucalyptus salmonophoia*).

GO TO 5 »

4. NOT FIREWISE

- Trees with this type of bark are extremely flammable.
- This type of bark acts as a ladder carrying fire into the canopy of the tree and produces masses of embers.

For more information, see Section 6 (Firewise plant characteristics and planting guidelines).

GO TO 29 (END) »

5. What is the height of the lowest branch?

Low

The lowest branch is less than two metres above the ground.

GO TO 6 »

Good separation

There is at least two metres between the ground and the lowest branch.

GO TO 20 »

6. LESS FIREWISE

- If possible, trees must be under-pruned up to two metres. Dead branches and fronds must be removed to ensure a more firewise characteristic.

GO TO 11 »

7. Does it shed large amounts of leaves or needles?

Yes

The conifer or conifer-like tree sheds large amounts of leaves or needles. For example, the conifer-like WA native Western she-oak (*Allocasuarina fraseriana*) or exotic Monterey pine (*Pinus radiata*).

GO TO 8 »

No

The conifer or conifer-like tree does not shed large quantities of leaves or needles. For example, the WA native Rottnest Island pine (*Callitris preissii*) or exotic pencil pine (*Cupressis*).

GO TO 9 »

8. LESS FIREWISE

- Pine needles must be periodically removed from roofs, other plants and the ground near structures.
- Eucalypt bark and foliage should be routinely removed from the tree and the ground.

GO TO 9 »

9. What is the height of the lowest branch?

Low

The lowest branches or fronds are less than two metres above the ground.

GO TO 10 »

Good separation

There is at least two metres between the ground and the lowest branches or fronds.

GO TO 11 »

10. LESS FIREWISE

- If possible, trees must be under-pruned up to two metres. Dead branches and fronds must be removed to ensure a more firewise characteristic.

GO TO 11 »

11. Does it have papery or loose bark?

Yes

The trunk has papery or loose fibrous bark.
For example, most Australian native paper barks (*Melaleuca spp.*).

GO TO 12 »

No

The trunk does not have papery or loose fibrous bark.

GO TO 20 »

12. LESS FIREWISE

- Papery bark and fibres may act as ladder fuels.
- These plants require appropriate placement in your garden.

GO TO 20 »

13. What is the plant's texture?

Fine texture

- Texture is used to describe the overall appearance of the plant from a distance.
- On plants with a fine texture, it is not easy to distinguish individual leaves or branches from about three metres away.
- Examples include exotic species such as diosma (*Coleonema spp.*), Australian natives such as WA native wax flowers (*Chamelaucium spp.*) and some of the Australian native paper barks (*Melaleuca spp.*) with thin, narrow leaves.
- The fineness of foliage (the surface-area-to-volume ratio) is a very important determinant of flammability.

GO TO 14 »

Medium texture

- Examples include exotic species such as azaleas (*Rhododendron spp.*), gardenias (*Gardenia spp.*) and coprosma (*Coprosma spp.*), as well as the Australian native bottlebrush (*Callistemon spp.*) and many grevilleas (*Grevillea spp.*).

GO TO 15 »

Coarse texture

- It is easy to distinguish each individual leaf or branch from about three metres away.
- Examples include exotic species such as hydrangeas (*Hydrangea spp.*), hibiscus (*Hibiscus spp.*), many viburnums (*Viburnum spp.*) and magnolia (*Magnolia spp.*).

GO TO 15 »

14. LESS FIREWISE

- Plants with a fine texture have a higher surface-area-to-volume ratio and tend to dry out more readily than plants with medium and coarse textures. This makes them generally more flammable.

GO TO 15 »

15. How dense is the plant?

Very dense

- The plant is so dense that it is very difficult to place a hand in the plant and touch the main stem. These plants have dense branches.
- Examples include exotic species such as junipers (*Juniperus spp.*) and shrubby Australian native grevilleas (*Grevillea spp.*).

GO TO 16 »

Moderately dense

- This plant is sufficiently dense to prevent you from seeing through the plant, but you can reasonably easily place a hand into the plant and touch the main stem.
- Examples include exotic species such as lavender(*Lavandula spp.*), rosemary (*Rosmarinus spp.*) and Indian hawthorn (*Rhapheolepis spp.*), and Australian natives westringia (*Westringea spp.*), and correa (*Correa spp.*).
- Note that some lavenders have the potential to become environmental weeds.

GO TO 20 »

Sparsely dense

- The plant may have open branching patterns, making it easy to see through.
- Examples include many Australian native wattles (Acacia spp.), banksias (*Banksia spp.*) and hakeas (*Hakea spp.*).

GO TO 20 »

16. LESS FIREWISE

- Dense plants have a larger amount of fuel packed closely together, which encourages the spread of flames within the plant.
- These plants require appropriate placement and routine pruning.

GO TO 20 »

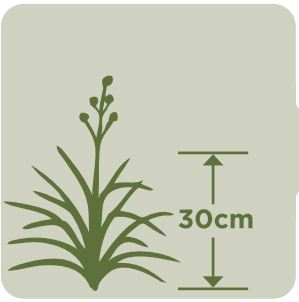
17. NOT FIREWISE

- Vines are extremely flammable, as they typically add fuel directly to a structure. They act as ladder fuels, bridging gaps between surface fuels and canopy fuels.

For more information, see Section 6 (Firewise plant characteristics and planting guidelines).

GO TO 29 (END) »

18. Is it a grass greater than 30 centimetres tall?



Yes

It is a grass greater than 30 centimetres tall (for example grass in the family Poaceae or Gramineae).

GO TO 19 »

No

It is a short grass or any other herbaceous plant or grass-like plant.

GO TO 20 »

19. NOT FIREWISE

- Regardless of how many **LESS FIREWISE** results you may get, tall grasses are extremely flammable, as they readily dry out and rapidly carry fire.

For more information, see Section 6 (Firewise plant characteristics and planting guidelines).

GO TO 29 (END) »

20. Does the plant retain dead leaves or twigs?

Yes

- The plant retains dead leaves or twigs mixed with the living leaves.
- The retention of dead leaves or twigs increases the flammability of a plant. Fine fuels readily dry out and increase the fuel available within the plant for fire.

GO TO 21 »

No

The plant does not usually retain dead leaves or twigs, except when shedding leaves.

GO TO 22 »

21. NOT FIREWISE

- Regardless of how many **LESS FIREWISE** results you receive for this plant, plants that retain dead foliage throughout the year are extremely flammable.
- Dead foliage has very low leaf moisture content and is therefore highly susceptible to ignition.

For more information, see Section 6 (Firewise plant characteristics and planting guidelines).

GO TO 29 (END) »

22. Are the leaves waxy or oily?

Yes

- The leaves have a waxy coating or numerous oil glands dotted on them.
- The leaves of plants containing significant amounts of oils and waxes will often have a strong scent when crushed. The presence of these chemicals often contributes to plant flammability.
- Plants with waxy leaves are often grey, silver or whitish, and the waxy 'bloom' can be scraped off the leaf with a fingernail. An example is the exotic bay laurel (*Laurus nobilis*).
- Plants in the families Myrtaceae, Rutaceae, Lamiaceae and Pinaceae are examples of plants with numerous oil glands.

GO TO 23 »

No

The leaves do not have a waxy coating or numerous oil glands.

GO TO 24 »

23. LESS FIREWISE

- Plants with large amounts of oils and waxes are more flammable than those without these chemicals.
- These plants require appropriate placement and routine pruning.

GO TO 24 »

24. Is the species seriously susceptible to disease, insects or pests?

Yes

- The species is known to be seriously susceptible to disease or insect pests.
- Plants seriously susceptible to disease are likely to become stressed and have less vigorous growth.
- When this happens, there is a lower foliage moisture content, and a greater number of dead leaves are retained. This, in turn, makes the plant more flammable. For example, Phytophthora-dieback-prone plants like jarrah (*Eucalyptus marginata*), and Polyphagous plants prone to shot-hole borers, which include maple (*Acer spp.*), oak (*Quercus spp.*), plane (*Platanus spp.*), Coral tree (*Erythrina spp.*), avocado (*Persea spp.*) and willows (*Salix spp.*).
- It is worth noting that moisture stress due to declining rainfall in south-west Western Australia is leading to a greater risk of decline and vulnerability to pest and disease attack.

GO TO 25 »

No

Species is not known to be particularly susceptible to disease or insect pests.

GO TO 26 »

25. LESS FIREWISE

- ☐ Routine monitoring and appropriate treatment for the disease or pest is recommended.

GO TO 26 »

26. Is the plant deciduous or evergreen?

Deciduous

The plant drops all its leaves once a year, and the new leaves usually have higher moisture content than evergreen plants.

GO TO 29 »

Evergreen

Plants retain leaves for several years.

GO TO 27 »

27. Are the leaves soft, thick or fleshy?

Yes

- The plant's leaves are soft, thick, succulent or fleshy.
- These types of leaves often have a higher moisture content than hard, thin and needle-like leaves, making them less flammable.
- Moisture can often be seen on the exposed edge of torn leaves. Examples include exotic species such as cactus (various genera/spp.), agave (*Agave spp.*), geraniums (*Pelargonium spp.*), and many lilies such as agapanthus (*Agapanthus spp.*) and New Zealand rock lily (*Arthropodium cirratum*). Native Australian examples include some myoporums, such as creeping boobialla (*Myopurum parvifolium*) and some saltbush (*Atriplex spp.*).

GO TO 29 »

No

The plant's leaves are not obviously succulent. They may have various shapes and vary in thickness.

GO TO 28 »

28. LESS FIREWISE

- The plant requires appropriate placement and routine pruning.

GO TO 29 »

29. End

How many LESS FIREWISE ratings did your plant score?	Then your plant is:	What does this mean?
None	**FIREWISE**	**Low flammability** **Where to plant:** These plants can be used in the garden, as they are not known to be particularly flammable
☒ or ☒☒	**MODERATELY FIREWISE**	**Moderate flammability** **Where to plant:** These plants can be used in the garden, but they need regular maintenance to keep them in a less flammable condition.
☒☒☒ or more	**AT-RISK FIREWISE**	**High Flammability** **Where to plant:** Avoid using these plants in the garden. If you are on a large property, they may be planted outside the defendable space.
The plant was **NOT FIREWISE?**	**NOT FIREWISE**	**Extreme flammability** **Where to plant:** These plants should not be planted in a garden or used when landscaping for bushfire.

What to do next

1. Consider the role that plant selection plays in enhancing defendable space.

   If the plant is **FIREWISE** or **MODERATELY FIREWISE**, locate it according to the design principles outlined in Section 4 and Section 5. Remember, the location and arrangement of plants has a significant effect on reducing the bushfire risk within your garden, but as soil dries out during summer, the moisture content of plants will decrease, and their flammability will increase.

   If the plant is **AT-RISK** or **NOT FIREWISE**, it should not be planted within the defendable space. For further information, see Section 6 (Firewise plant characteristics and planting guidelines).

2. Prepare a Bushfire Survival Plan. Visit mybushfireplan.wa.gov.au to find out how to get started.

Record Sheet

Use this sheet to record the plant name and how many **LESS FIREWISE** or **NOT FIREWISE** results the plant receives as you work through the plant selection key.

Plant name	**NOT FIREWISE** Circle the questions that had a **NOT FIREWISE** outcome	**LESS FIREWISE** Circle the questions that had a **LESS FIREWISE** outcome	Firewise Rating	Flammability
			NOT FIREWISE any NOT FIREWISE results	Extreme
			AT-RISK FIREWISE 3 or more LESS FIREWISE result	High
			MODERATELY FIREWISE 1 or 2 LESS FIREWISE results	Moderate
			FIREWISE No LESS FIREWISE results	Low
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		
	4. 17. 19. 21.	6. 8. 10. 12. 14. 16. 23. 25. 28.		

Disclaimer: DFES makes this information available on the understanding that you take reasonable care when using it. If you are uncertain about applying this information, you should obtain further professional advice.

Appendix 2:
Glossary

Access: Any movement onto or out of the property by owners, occupants or emergency responders.

Aspect: The direction a piece of land is facing.

Asset Protection Zone (APZ): An area surrounding a building that is managed to reduce bushfire risk. Included in the APZ is a defendable space, in which firefighting operations can be undertaken to defend the structure.

Bushfire: An unplanned and uncontrolled vegetation fire burning in a forest, woodland, scrub or grassland.

Bushfire attack: An attack by wind, burning embers, radiant heat or flame generated by a bushfire.

Bushfire prone area: An area that is subject to, or likely to be subject to, bushfire attack.

Bushfire attack level (BAL): A means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact. BAL is measured using increments of radiant heat expressed in kilowatts per meter squared and is the basis for establishing the requirements for construction to improve protection of building elements from attack by bushfire.

Coarse fuel: Fallen branches and logs.

Combustion (combustibility): How well a material burns.

Defendable space: An area of land around a building within which firefighting operations can be undertaken to defend the structure. In defendable spaces, trees and underlying vegetation should be kept at an absolute minimum to reduce the effects of flame contact and radiant heat associated with bushfire. It should also be free from combustible items and obstructions.

Ember attack: An attack by smouldering or flaming windborne debris that can enter or accumulate around a building and that may ignite the building or other combustible materials and debris.

Fire intensity: A measure of the energy release of a fire through the combustion process. Fire intensity is calculated by multiplying the amount of fuel consumed (in kilograms per square meter), the heat yield of the burning material (in kilojoules per kilogram) and the fire's rate of spread (in meters per second).

Firewise plant: A plant that has been given a flammability ranking, which helps determine if a plant is appropriate for a garden.

Flammability: A general term for the ability to burn. In a landscape context, it refers to a set of plant characteristics that influences fire probability and behaviour.

Fine fuel: The most available fuel for fire. Fine fuel typically includes leaves, twigs and bark and is split into dead vegetation less than six millimetres thick and live vegetation less than three millimetres thick.

Ignitability: The ability to start a fire. Ignitability can be measured as the time needed to start ignition once material is exposed to a heat source.

Low flammability: The flammability attribute of plants that are slow to ignite, combust with low intensity and sustain burning for a short period of time, relative to other plants.

Additional reading and resources

DFES website

Visit the DFES website **dfes.wa.gov.au/hazard-information/bushfire** for information on bushfire preparation.

The DFES publications page **publications.dfes.wa.gov.au** is regularly updated with useful resources such as:

- Burn SMART: A planned burning guide for small landholders
- Guide for Applying the Bush Fire Risk Treatment Standards

Local government

Check with your local government for advice on plants, garden maintenance, tree pruning procedures, local environmental protection and tree retention information.

Local nurseries specialising in firewise plants

Seek advice from local native plant nurseries or qualified consultants for a variety of low-flammability species that are suitable for your location.

WA State Planning Policy

Check the Department of Planning, Land and Heritage website for the most up-to-date versions of:

- Map of Bush Fire Prone Areas
- *State Planning Policy 3.7: Planning in Bushfire Prone Areas*
- *Guidelines for Planning in Bushfire Prone Areas* (landscaping section in Appendix 4)
- Position Statements and Fact Sheets for bushfire prone areas

Sketch page

Use this page to start planning and designing your firewise garden.