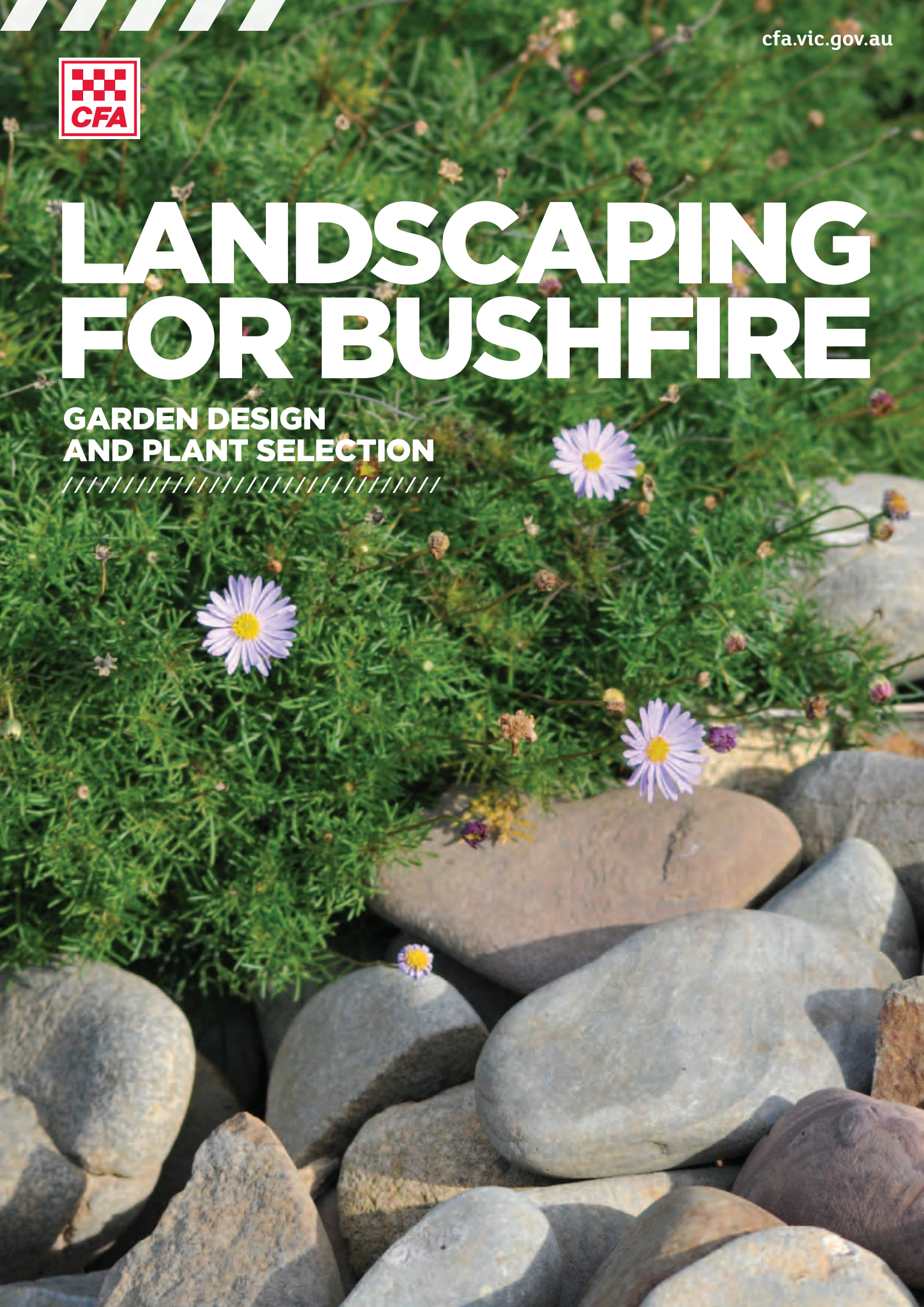




LANDSCAPING FOR BUSHFIRE

**GARDEN DESIGN
AND PLANT SELECTION**



FOREWORD

The type, quantity and condition of fuel has a very important effect on bushfire behaviour. The survivability of buildings, and of those who occupy and shelter in them, can be significantly enhanced or endangered by the type of plants around the building.

Landscaping for Bushfire has been developed by CFA in response to Recommendation 44 from the Victorian Bushfires Royal Commission. It forms just one part of our approach to help Victorian communities prepare for the fire season.

Residents in high bushfire risk areas need to be aware of their environment and the risks they face during the fire season. Planning ahead is essential for surviving the coming fire season. The most effective way to reduce risk in the garden is to focus on the location and arrangement of fuel on your property.

Even though all plants burn, measures can be taken to reduce fire intensity from garden plants. This guide identifies what you can do within defensible space to minimise the risk of losing your house or threatening the lives of occupants in a bushfire.

Landscaping for Bushfire is a valuable resource for home gardeners, landscape architects and nursery staff as well as CFA Fire Safety Officers, Vegetation Management Officers and Home Bushfire Advice Service consultants.

Landscaping for Bushfire bridges the gap between vegetation management and the Bushfire Management Overlay (BMO), providing advice on how to plan and maintain a garden while meeting planning permit conditions within the BMO.



Euan Ferguson AFSM
Chief Officer

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CFA makes this information available on the understanding that you take reasonable care when using it. If you have any uncertainty about the application of the information to your particular circumstance, you should obtain further professional advice.

CFA does not accept responsibility for how you apply or rely on the information in this publication.

Cover image

Brachyscome, photo courtesy of Owen Gooding.

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ABOUT THIS PUBLICATION

CFA has developed *Landscaping for Bushfire: Garden Design and Plant Selection* for new and established homes in high-risk areas. This includes properties in the Bushfire Management Overlay (see below). The focus is on residential gardens, but the design principles can be applied to larger developments and subdivisions.

WHAT INFORMATION IS COVERED?

This publication provides information on landscaping to minimise the effects of direct flame contact and radiant heat on a house during a bushfire.

Sections 2-5 are a guide to the planning and design process. There are four example gardens with landscape plans, design notes and suitable plant options. These gardens illustrate the design principles of landscaping for bushfire for gardens in coastal, hilly, rural and suburban environments.

Section 6 draws attention to the importance of garden maintenance.

Section 7 includes a Plant Selection Key. This tool can be used to help choose suitable plants with low flammability. The key is also available as an online tool at cfa.vic.gov.au/plants

Section 8 provides information on further resources and references.

WHAT IS LANDSCAPING FOR BUSHFIRE?

Landscaping for bushfire involves planning, designing, planting and managing the area around a house.

The aim is to keep the area around a house and other structures (such as carports and sheds) free of plants that can easily catch fire and then ignite the buildings.

Landscaping for bushfire can be used to create new – or modify existing – gardens. It takes into account a number of factors that include:

- understanding how fire behaves
- creating defensible space
- the location of plants within the garden
- the flammability of individual plants
- the need for ongoing maintenance.

BUSHFIRE MANAGEMENT OVERLAY

The Bushfire Management Overlay is a planning control that applies to high bushfire risk areas in Victoria. It identifies areas where the bushfire hazard requires specified bushfire protection measures to be implemented.

The Bushfire Management Overlay is identified by planning schemes and can be found at Clause 44.06. It sets out:

- the types of development that require a planning permit
- the information that must be submitted with a planning permit application
- the objectives, standards, mandatory standards and decision guidelines that must be considered in a planning permit application.

Visit dpcd.vic.gov.au for further details.

WHY IS LANDSCAPING FOR BUSHFIRE IMPORTANT?

Victoria is one of the most bushfire-prone areas in the world. The combination of vegetation, climate and topography creates ideal conditions for bushfire. Population growth in high-risk locations means that these communities need to be well prepared for bushfires.

Landscaping using appropriate design principles and plant selection can increase the likelihood of a house surviving a bushfire – even if the plan is to leave early.

Poorly located vegetation that burns readily may expose a house to increased levels of radiant heat and flame contact.

Well-placed vegetation with low flammability may actually help protect houses by:

- reducing the amount of radiant heat received by a house
- reducing the chance of direct flame contact on a house
- reducing wind speed around a house
- deflecting and filtering embers
- reducing flammable landscaping materials within the defensible space.

A holistic approach is the best way to ensure proper preparation. It involves a combination of bushfire protection measures. These include:

- house construction and maintenance
- preparing a Bushfire Survival Plan (see the *Fire Ready Kit* – available at cfa.vic.gov.au)
- having an adequate water supply and road access
- garden design and plant selection.

FIRE RESISTANT, FIRE RETARDANT OR FIREWISE?

These terms are often used when talking about flammability characteristics of a plant. They have very specific and quite different meanings and should not be confused.

Fire resistant is a term that describes plant species that survive being burnt and will regrow after a bushfire. They are resistant to being killed by a bushfire, but not to being burnt. Therefore, they may be highly flammable and inappropriate for a garden in a high bushfire risk area.

Fire retardant can also be misleading when referring to plants. It implies that a plant will not burn readily or may slow the passage of a fire. It cannot be emphasised enough that all plants will burn under the right conditions.

Firewise, in this document, refers to the flammability ranking system applied to a plant by the Plant Selection Key (see Section 7). The term is linked with advice about maintenance and where that plant should be located within a garden.



IMPORTANT



While a well-planned garden is important, it is only one aspect of preparing for bushfire. It should not be relied upon in isolation. In high-risk areas on **Severe, Extreme** and **Code Red** days, leaving early is always the safest option.

BUSHFIRE BEHAVIOUR

Understanding how bushfire behaves and destroys houses is important when planning, designing and selecting suitable plants for a garden. There are three major factors that influence bushfire behaviour: topography, weather conditions and vegetation.

TOPOGRAPHY (OR SLOPE)

Fire burns faster uphill. As the slope increases so does the speed of the fire and its intensity.

Flames and radiant heat preheat the vegetation ahead of the fire. This dries it out, making it easier to burn.

WEATHER

Hot, dry and windy days provide ideal conditions for a bushfire. In summer, these are common weather conditions that increase the flammability of vegetation.

Low humidity and high temperatures, which are fuelled by hot winds, dry out vegetation, allowing it to readily ignite.

VEGETATION (FUEL)

Plants are the primary source of fuel for a bushfire.

The amount of fuel available to a bushfire and where the fuel is located can directly impact on house survival. Understanding how vegetation influences fire behaviour is important when planning a garden.

Within a property, vegetation management and the placement of other flammable objects around the house can determine the amount of fuel available to a bushfire.

The amount, type (flammability) and arrangement of vegetation affects how easily a bushfire will spread throughout a garden.

Fine fuels such as leaf litter readily dry out, ignite and can be carried as embers. Shrubs, vines and other elevated fuel can act as ladder fuels, allowing fire to climb into the canopies of trees, significantly increasing bushfire intensity.

Breaking up the continuity of the vegetation can limit the spread of fire within the garden.

Remember there are no 'fire proof' plants. All plants can burn under the right conditions – typically in extreme fire weather following extended drought.

See Section 4 for more information about how to minimise bushfire risk through garden design.



Leaf litter and dead plant material on and around houses and gardens can be cleared to reduce the risk of them catching fire or becoming burning embers.

HOW BUSHFIRE DESTROYS HOUSES

House survival is influenced by many interacting factors. The four main ways houses are destroyed during a bushfire are:

- ember attack
- radiant heat
- direct flame contact
- wind.

Ember attack is the most common way houses catch fire during a bushfire. Ember attack occurs when small burning twigs, leaves and bark are carried by the wind, landing in and around houses and their gardens.

If they land on or near flammable materials, such as leaf litter and dead plant matter, they can develop into spot fires. Embers can also ignite a house if they land on or near vulnerable parts of the building.

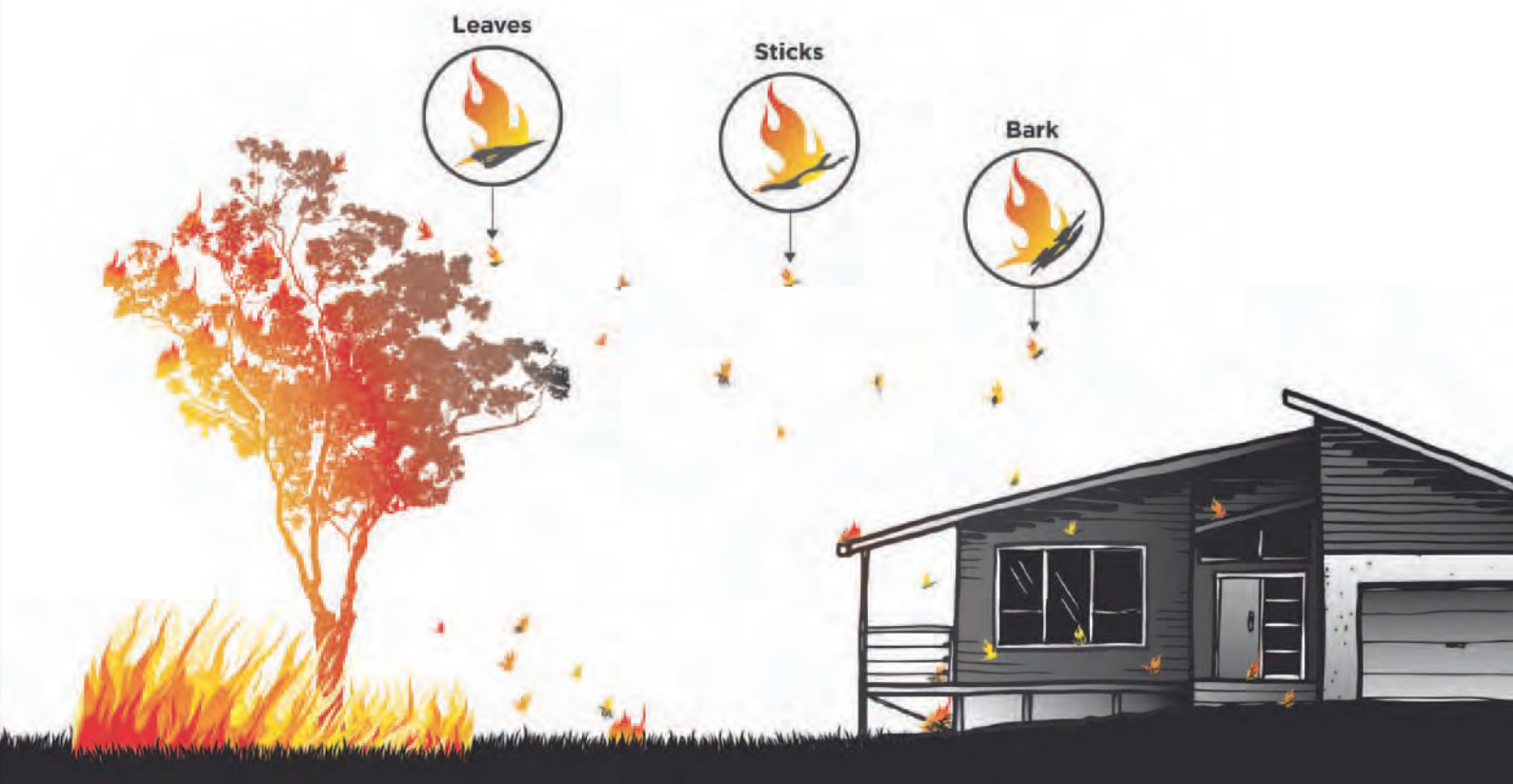
Radiant heat is the heat created from combustion during a bushfire. It can:

- ignite surfaces without direct flame contact or ember attack. This is due to the heat being received from the fire
- dry out vegetation ahead of the bushfire so that it burns more readily
- crack and break windows, allowing embers to enter a building
- distort and melt materials such as plastic.

Flame contact occurs when flames touch a house. Any burning vegetation can directly ignite a house if it is planted too close.

Wind can be very destructive to houses in a bushfire because it:

- carries embers
- can cause trees to fall onto buildings
- can break windows
- can loosen roof tiles
- can blow roofs off houses under severe conditions.



Ember attack

PLANNING A GARDEN

Before designing a garden, there are a number of factors to consider. Reducing bushfire risk to any house is most effective when considered early in the planning process.

NEW HOUSES

Property layout

Think strategically about where the house is located and how the garden around it is designed. That way, it is possible to achieve multiple outcomes – bushfire safety considerations are incorporated but are not the only function of the garden.

Find out what building and planning regulations apply to the property. Visit land.vic.gov.au or talk to the local council. Depending on the bushfire risk, these regulations may influence:

- where the house can be built
- the construction level required
- how to manage the vegetation within the property.

Information in this section is based on the bushfire protection requirements for building in high bushfire risk areas.

The requirements are fully set out in Planning Schemes at Clause 52.47 Bushfire Protection: Planning Requirements (see Further Resources) but are summarised below.

Understanding how these factors influence bushfire can avoid unnecessarily increasing the risk within properties.

Bushfire protection requirements

SITING AND DESIGN

One of the most effective ways to reduce bushfire risk is the appropriate location of a house within a property. Features of the topography can be used to help minimise bushfire spreading into and within the property. Houses should be located away from unmanaged vegetation, steep slopes, saddles or narrow ridge tops. They should ideally be located close to public roads and accessways.

Look at the landscape in and around the property:

- What is the bushfire risk from the surrounding area?
- Is there existing vegetation within or close to the property that will pose a significant bushfire hazard?

Anywhere that embers can lodge or enter a house can start a fire.

There are areas of a house that contribute more to overall bushfire risk than others. These include decks, windows, doors and roof areas. Complex designs that may create nooks and crannies allow dead plant material and embers to drop and accumulate.

DEFENDABLE SPACE

Defendable space is an area of land around a building where vegetation is modified and managed to reduce the effects of flame contact and radiant heat associated with bushfire. It breaks up continuity and reduces the amount of fuel available to a bushfire.

It is one of the most important aspects of preparing properties for bushfire. This is because defendable space separates the bushfire hazard and the house. The greater the separation from the bushfire hazard, the lower the risk.

Defendable space can prevent direct flame contact and minimise the effects of radiant heat on the house. This reduces the risk of house loss during a bushfire, regardless of active defence.

Defendable space:

- comprises an inner and outer zone with different vegetation management requirements
- needs careful garden design that considers the location of all flammable objects
- requires regular maintenance that should be included as part of every Bushfire Survival Plan.

Requirements for defendable space will vary depending on the type of development and the level of bushfire risk to a property. Section 4 provides further detail about defendable space requirements.



Complex house designs allow dead plant material and embers to accumulate.

CONSTRUCTION

The way a building is constructed can help reduce the risk of house loss via radiant heat and ember attack.

Construction standards are linked to defendable space. The greater the area of defendable space, the lower the construction requirement under Australian Standard AS3959-2009: Construction of Buildings in Bushfire-prone Areas.

A bushfire site assessment is required to determine the construction standard that will apply to any house. Details for undertaking a bushfire site assessment in the Bushfire Management Overlay can be found in Department of Planning and Community Development (DPCD) *Practice Note 65: Bushfire Management Overlay and Bushfire Protection: Planning Requirements* (see Further Resources).

PROVISION OF SERVICES

Water is essential for firefighting.

The amount and reliability of water is critical for all properties and must be considered in relation to the bushfire risk.

In all areas the water supply must have appropriate pressure, access and fittings. In the Bushfire Management Overlay, a water supply must be provided.

Access is just as important as it provides a way for residents to get out and the fire services to get in. Roads must be capable of accommodating fire trucks and will require specific construction standards, as well as width and clearance, depending on the property.

For minimum water supply and access requirements that apply to a property in the Bushfire Management Overlay, refer to *CFA Fire Service Guideline: Land Use Planning 0002: Requirements for Water Supply and access in a Bushfire Management Overlay* (see Further Resources).

HOME BUSHFIRE ADVICE SERVICE

Book a free Home Bushfire Advice visit for help assessing bushfire risk at a particular property.

To book an appointment, complete the online form on the CFA website. One of CFA's trained Fire Safety Officers will provide tailored advice, delivered on the property.

Self assessment of bushfire risk can be undertaken by using the Online Household Bushfire Self-Assessment Tool at cfa.vic.gov.au



Paths provide separation between garden beds.



Water feature



Non-flammable outdoor furniture



Water feature

LANDSCAPING

Once the layout of the property is decided there are some decisions to make about what type of garden will be planted.

Gardening is a personal activity and when planning any garden there are many considerations apart from bushfire.

While this publication focuses on gardening to reduce bushfire risk, any garden must meet the needs of those that are using and maintaining it. If a garden suits the needs of residents it is more likely to be maintained from year to year.

There are many different styles of gardening. Some focus on native vegetation, productive or water-sensitive design.

Whatever style is chosen the garden must be appropriate to the local area. Seek advice from the local council (see Further Resources) about species that are suited to a particular location. This will help to avoid planting environmental weeds or invasive plants.

Consider bushfire risk early in the garden planning process. By incorporating the design principles in Section 4, costs can be minimised and bushfire mitigation will complement other functions of the garden.

When planning a garden some things to consider include:

- budget
- the local growing conditions that may affect plant selection
- ongoing maintenance requirements
- function and style of the garden.

Think about how the features below are incorporated into the overall garden design as they may reduce the spread of fire by providing separation between the house and bushfire hazards. For example:

- paths
- pools or water features
- tennis courts
- vegetable gardens.

EXISTING HOUSES

The information outlined on page 6 about defensible space and landscaping is relevant to planning a garden for existing houses.

However, there are also some specific points that need consideration.

CONSTRUCTION

The resilience of existing houses can be improved by retrofitting some building elements.

More advice can be obtained from *A guide to retrofit your home for better protection from a bushfire* (see Further Resources).

PROVISION OF SERVICES

In high bushfire risk areas, it is recommended that a dedicated water supply is installed for firefighting purposes. Where possible, access should meet the requirements as outlined for new houses.

RULES FOR VEGETATION CLEARANCE AROUND EXISTING HOUSES

Throughout Victoria there are restrictions for vegetation clearance on private property. These are contained in the planning scheme of each municipality. In many cases, a planning permit is required to remove vegetation.

In areas where bushfire is a risk, there are particular circumstances where a permit is not required for vegetation removal around existing houses.

For example, the Victoria Planning Provisions Clause 52.17 Native Vegetation outline exemptions that apply for removing, destroying or lopping native vegetation for fire protection. Clause 52.48 Bushfire Protection: Exemptions refers to the 10/30 and 10/50 rules.

To find out if these exemptions apply to a particular council, refer to the relevant planning scheme (see Further Resources).

The 10/30 rule

The 10/30 rule applies to a building used for accommodation that was:

- constructed before 10 September 2009 or approved by a planning or building permit issued before 10 September 2009.

It allows landowners to:

- Remove, destroy or lop any vegetation within 10 metres of an existing building used for accommodation.
- Remove, destroy or lop any vegetation, except for trees within 30 metres of an existing building used for accommodation.
- Remove, destroy or lop any vegetation for a combined maximum width of 4 metres either side of an existing fence on a boundary. The fence must be between properties of different ownership and have been constructed before 10 September 2009.

The 10/50 rule

The 10/50 rule applies only to land in the Bushfire Management Overlay. It applies to a building used for accommodation that was:

- constructed before 10 September 2009 or lawfully erected before 18 November 2011 without the need for a planning permit
- approved by a planning or building permit before 10 September 2009 and erected before 18 November 2011
- approved by a building permit before 10 September 2009 and erected before 18 November 2011.

The 10/50 rule allows landowners to:

- Remove, destroy or lop any vegetation within 10 metres of an existing building used for accommodation.
- Remove, destroy or lop any vegetation, except trees, within 50 metres of an existing building used for accommodation.
- Remove, destroy or lop any vegetation for a combined maximum width of 4 metres either side of an existing fence on a boundary between properties. The fence must be between properties of different ownership and have been constructed before 10 September 2009.

IMPORTANT

In high bushfire risk areas properties may need a greater amount of defensible space. Clearance over the distances stipulated in the 10/30 and 10/50 rules require a planning permit.

DESIGNING A GARDEN

Effective defensible space, house construction, water and access in new and existing gardens can all be compromised by inappropriate landscaping.

The location, type and ongoing maintenance of vegetation within a property have a significant impact on the bushfire risk to any house. These factors can prevent the accumulation of debris and prevent the spread of fire towards a building.

When designing a new or modifying an existing garden, carefully consider the placement of garden beds, trees and other vegetation to reduce the bushfire risk to the house.

When selected and located correctly, plants can filter embers, absorb radiant heat and break up fuel in the path of a bushfire.

However, plants can also contribute to house loss by:

- providing a continual fuel path to the house, allowing direct flame contact
- dropping leaf litter on the ground, which readily ignites and can become embers
- dropping limbs or tree branches onto the house
- adding to fuel loads on or near the house, such as creepers over pergolas, fences or verandahs
- if located too close, producing radiant heat that may ignite the house or cause windows to break, allowing embers into the house
- acting as ladder fuel from the ground into tree canopies, increasing the intensity of the fire.

Vegetation should always be kept clear of access to and from the house and property.



Vines and creepers act as ladder fuels.



Vegetation located too close to a house poses a threat during bushfire.



Garden bed framed by non-flammable landscape materials.
Australian Garden, Royal Botanic Gardens Cranbourne.

The following design principles outline how defensible space can be used to reduce radiant heat, prevent flame contact and minimise ember attack on the building.

These design principles are based on the bushfire protection requirements within the Bushfire Management Overlay.

These principles should be followed in all types of gardens.

**DESIGN PRINCIPLE 1
CREATE DEFENDABLE SPACE**

**DESIGN PRINCIPLE 2
REMOVE FLAMMABLE OBJECTS
FROM AROUND THE HOUSE**

**DESIGN PRINCIPLE 3
BREAK UP FUEL CONTINUITY**

**DESIGN PRINCIPLE 4
CAREFULLY SELECT,
LOCATE AND MAINTAIN TREES**

DESIGN PRINCIPLE 1

CREATE DEFENDABLE SPACE

What is it?

Defendable space is an area of land around a building where vegetation is modified and managed to reduce the effects of direct flame contact and radiant heat associated with bushfire. It breaks up continuity and reduces the amount of fuel available to a bushfire.



Managing vegetation within the defendable space does not mean clearing all plants and trees. There may be opportunities to retain existing vegetation depending on its flammability, location and management.

Whether starting from scratch or making changes to an existing garden, there are ways to design an effective defendable space.

Defendable space needs careful garden design and regular maintenance. It consists of an inner and an outer zone:

- The **inner zone** is the area immediately around the house. It provides separation from fuel sources, reduces radiant heat, eliminates direct flame contact and reduces ember attack. Vegetation needs significant and intensive management. Fuel is managed to a minimum level in this zone.
- The **outer zone** sits between the inner zone and unmanaged vegetation (beyond the defendable space). Vegetation is managed to a more moderate level to substantially decrease the ground fuel and restrict the fuels available to an approaching bushfire.

How to calculate it

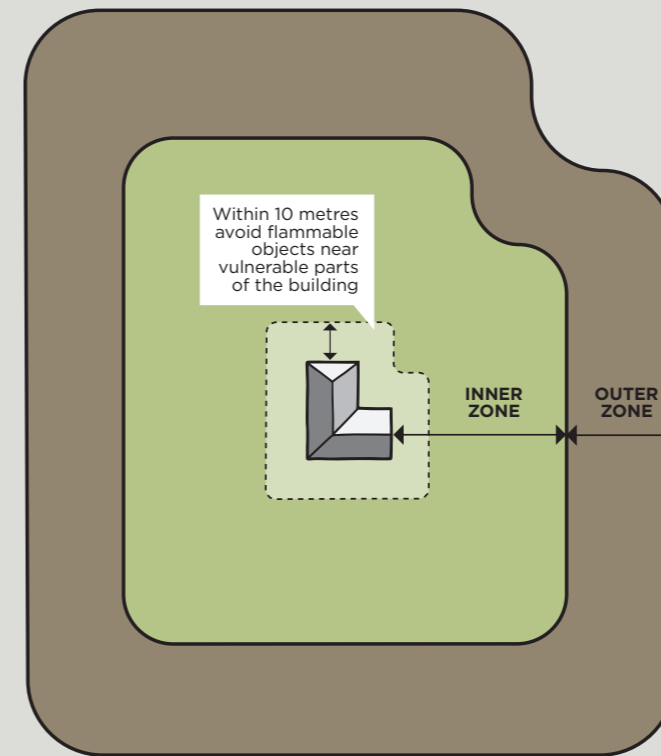
Requirements for defendable space will vary. They depend on the type of development and the level of bushfire risk to the property.

New houses in a Bushfire Management Overlay

As part of the planning permit process, defendable space requirements are determined by a bushfire site assessment. Permit conditions will prescribe the inner and outer zone distances for vegetation management. The site assessment process is outlined in DPCD *Practice Note: 65: Bushfire Management Overlay and Bushfire Protection: Planning Requirements* (see Further Resources).

In the **inner zone** fuel should be managed to the following condition:

- Within 10 metres of a building, flammable objects such as plants, mulches and fences must not be located close to vulnerable parts of the building such as windows, decks and eaves.
- Trees must not overhang the roofline of the building, touch walls or other elements of a building.
- Grass should be no more than 5 centimetres in height. All leaves and vegetation debris are to be removed at regular intervals.
- Shrubs should not be planted under trees.
- Plants greater than 10 centimetres in height at maturity must not be placed directly in front of a window or other glass feature.
- Tree canopy separation of 2 metres and overall canopy cover no more than 15 per cent at maturity.



The **outer zone** fuel should be managed in the following condition:

- Grass must be no more than 10 centimetres in height and leaf and other debris mowed, slashed or mulched.
- Shrubs and trees should not form a continuous canopy.
- Tree branches below 2 metres from ground level should be removed.
- Trees may touch each other with an overall canopy cover of no more than 30 per cent at maturity, with few shrubs in the understorey.
- Shrubs should be in clumps no greater than 10 square metres, which are separated from each other by at least 10 metres.

For both the **inner zone** and **outer zone**:

- Non-flammable features such as tennis courts, swimming pools, dams, patios, driveways or paths should be incorporated into the proposal, especially on the northern and western sides of the proposed building.
- Features with high flammability, such as doormats and firewood stacks, should not be located near the structure.

Existing houses and houses outside the Bushfire Management Overlay

Defendable space can be calculated using CFA's online Household Bushfire Self Assessment Tool available at cfa.vic.gov.au. Ideal defendable space requirements can be worked out using this tool.

What to include

Plants and other flammable objects provide fuel for bushfires and defendable space requires ongoing maintenance.

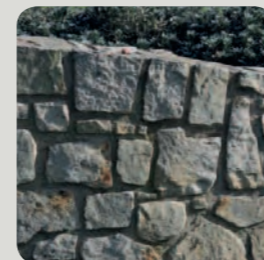
When modifying an established garden, it is critical to consider existing vegetation and other flammable objects within the defendable space.

If planting new vegetation, ensure that it is not compromising the effectiveness of the defendable space by significantly increasing the amount of fuel or adding to its continuity.

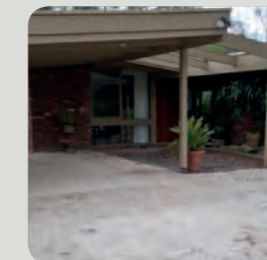
Landscaping for bushfire should:



- Locate areas of low fuel between the house and the bushfire hazard (for example, maintained lawn, ponds, pools and tennis courts).
- Locate farm machinery, sheds and poison well away from the house (as they too may become fuel in a bushfire).



- Use landscaping features to provide barriers to wind, radiant heat and embers (such as stone walls and non-combustible fences).
- Use materials such as brick, earth, stone, concrete and galvanised iron. These can act as radiant heat barriers.



- Use driveways and paths to create separation between vegetation and the house. Suitable materials include clay, concrete, gravel and pebbles.
- Locate non-combustible water tanks to act as radiant heat barriers.

DESIGN PRINCIPLE 2

REMOVE FLAMMABLE OBJECTS FROM AROUND THE HOUSE

The area immediately surrounding a house should be clear of flammable objects that can catch fire during a bushfire.

Within 10 metres of a building, flammable garden materials (such as plants, mulches and fences) must not be located close to vulnerable parts of the building (such as windows, doors, decks, pergolas and eaves). The intention is to prevent flame contact on the house.

There are a number of things that can be done to support this design principle:

- Locate non-flammable surfaces (such as paths, driveways and paved areas) against the house.



- Ensure trees are planted away from the house so they do not cause damage if they fall. They must not overhang the house and should be located 1.5 times their mature height from the house.

For example, if a mature tree height is 8 metres, it should be planted at a minimum of 8 metres x 1.5 = 12 metres away.

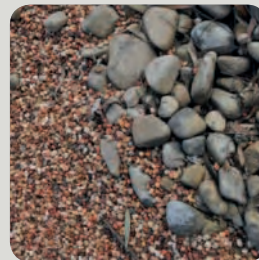
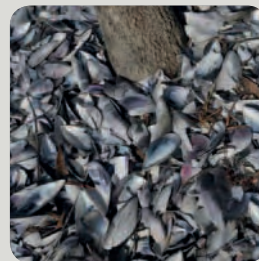
- Maintain grass to no more than 5 centimetres in height in the inner zone and 10 centimetres in the outer zone.



- Use non-combustible, moveable containers and pots that can be relocated in the summer.

- Avoid flammable mulches within the defensible space. Mulch is used to improve the quality of soil, improve water efficiency and keep plants cool and moist in the summer. Most mulch used in gardens can also be a bushfire hazard as it will dry out and burn.

Alternatives include gravel, scoria, pebbles, shells or recycled crushed bricks. These materials provide the same role and come in a variety of shapes and colours.



- Remove other flammable objects from around the house. These include sheds, caravans, outdoor furniture, barbeques, gas bottles, wood piles and organic mulch.

These should not be placed within 10 metres of the house and must have adequate separation from other flammable objects, including plants.

DESIGN PRINCIPLE 3

BREAK UP FUEL CONTINUITY

One of the most effective ways to reduce the spread of fire within a garden is to create separation between plants, garden beds and tree canopies.

Fire spreads easily when plants are located close together.

When a plant catches fire it can preheat and ignite the vegetation around it through radiant heat or direct flame contact.

If there is continuous vegetation leading up to and surrounding a house, fire is likely to spread throughout the garden to the house. Grouping plants and garden beds with areas of low fuel between them can help avoid this by breaking up fuel continuity.

Ways to reduce fuel continuity include:

- Locating shrubs or other flammable objects away from trees. If planted under trees, vegetation can act as a ladder fuel and carry fire into canopies.
- Clumping shrubs and trees so they do not form a continuous canopy and are separated by areas of low fuel.
- Using gravel paths, non-flammable mulch and mown grass to provide separation and areas of low fuel between plant groupings and garden beds.
- Pruning branches to a minimum of 2 metres above the ground. This increases the vertical separation between fuel at ground level and the canopy.



Paths can be used to break up fuel continuity.
Australian Garden, Royal Botanic Gardens Cranbourne.



Mown grass provides separation between garden beds.
Australian Garden, Royal Botanic Gardens Cranbourne.

DESIGN PRINCIPLE 4

CAREFULLY SELECT, LOCATE AND MAINTAIN TREES

Trees can be useful during a bushfire, provided they are:

- selected carefully
- properly maintained
- located at a safe distance from the house.

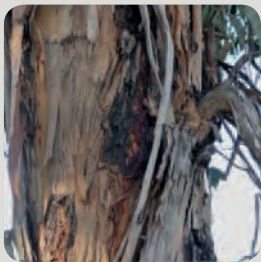
Bushfires are often accompanied by strong winds, which may cause branches to break or whole trees to blow over. Trees can also catch fire, burn through and fall over.

Correctly selected and located trees can:

- reduce wind speed
- absorb radiant heat
- filter embers.

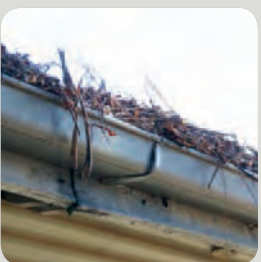
Fire is rarely sustained in the tree canopy, unless there is a fire burning in the plants or leaf litter under the tree.

When implementing this design principle:



- Avoid trees with loose, stringy or ribbon bark.
- Separate tree canopies by at least 2 metres.
- Canopies should cover less than 15 per cent of the inner zone and 30 per cent of the outer zone.

- Prune branches to a minimum of 2 metres above the ground increasing the vertical separation between fuel at ground level and the canopy.
- Locate trees at a safe distance from all other buildings, driveways, water supplies and powerlines. They should be at least 1.5 times their mature height away.
- Do not plant trees near shrubs, as shrubs can carry fire into tree canopies.



- Periodically remove dead leaves, bark and branches as well as leaf litter from underneath trees around the house.

Windbreaks

Trees can also be planted for windbreaks but are most effective in a fire of low to moderate intensity.

However, windbreaks are only one of many factors that affect the speed and progression of a bushfire.

Windbreaks are not a stand alone solution because:

- it takes time for trees to grow and they may not provide protection for some years
- wind direction can change and spot fires occur, allowing bushfires to approach from any direction.

Other things to remember are that:

- there needs to be adequate separation between a building and the windbreak
- a windbreak should not be planted within the defensible space
- trees should be carefully selected and will require ongoing maintenance
- highly flammable trees will become a fire hazard
- the windbreak should be planted at right angles to prevailing winds
- the windbreak should allow some wind to pass through
- the windbreak should have a continuous length of at least 100 metres if possible
- slashed, well-watered grass should be planted underneath the windbreak
- routine maintenance must be carried out to remove leaf litter and other dead plant material from underneath the windbreak.

TYPES OF GARDENS

The following four gardens provide practical examples of landscaping for bushfire, using the design principles outlined earlier in this section.

Plants have been selected for each location for their characteristics of low flammability (see the Plant Selection Key in Section 7).

The example gardens also highlight the importance of proper maintenance.

LEAVING EARLY

In high-risk areas, bushfire behaviour will be driven by the heavily vegetated landscape. While garden design and maintenance can improve the chances of a house surviving a bushfire, do not rely on these in isolation. A garden will not provide protection in a bushfire.

A holistic approach to bushfire preparation is critical. Appropriate water supply, access, house construction and general property maintenance are all important.

On **Severe, Extreme** and **Code Red** days leaving early will always be the safest option.

MODEL 1 COASTAL GARDEN

Establishing and maintaining a garden in a coastal location can be particularly challenging. Strong, seasonal winds, sometimes coupled with high levels of airborne salt, provide difficult growing conditions. These can reduce the height and modify the shape of many garden plants and limit overall growth potential.

Coastal landscapes are also typically exposed to high light conditions and elevated temperatures. These factors, often coupled with sandy, shallow soils with poor water retention, mean that horticultural practices to retain soil moisture, such as addition of organic matter and mulches, become critical for garden success.

Creating microclimates through shelter and screening can minimise these problems and enable a larger range of plants to be grown successfully.

When planning a coastal garden, consider the local site's topography, aspect and neighbouring vegetation.

Gardens located on slopes are more likely to experience the effects of strong winds than those in protected locations.

North-facing gardens are more likely to rapidly dry out during hot summer days. Those in a southerly aspect are more protected.

Natural vegetation growing near the coast is often highly flammable and in some places will be in close proximity to a home garden.

In any of these situations the application of the design principles, such as incorporation of a defensible space and location and arrangement of plants, is particularly important.

EXAMPLE: COASTAL MODEL GARDEN

The numbers here refer to the illustration below and those on pages 20-21.

The paved sitting area **1**, lawn **2** and low-sitting wall **3** provide separation between the house and the direction of the most likely fire hazard.

A small tree **4** is located well away from the house. It provides shade and may also catch embers during a fire. Planting beneath the tree has been kept very low and short. The lower branches of the tree are pruned up to 2 metres from ground level to prevent a fire from moving into the canopy. Behind the tree, a fleshy-leaved hedge **5** is managed as a long, barrier planting. This will also help catch embers.

The area within the property that is most likely to be impacted first by fire has been planted out as a vegetable garden **6** and orchard **7**. Good separation is provided between all trees and garden beds to help slow fire spread. The entire area is irrigated to keep plants lush over hot summer days. The service area **8**, with a shed and washing line, is kept well away from the house in the garden's south-west corner.

Large steel pots with upright succulent plants **9** soften the paved area and can be moved away from the house during summer. The low stone wall acts as a radiant heat barrier and forms an attractive garden feature.

The area north of the house **10** includes smaller growing succulents that minimise the amount of flammable material near the carport **11**. Both the carport and the pergola against the house **12** are constructed of steel. Using this material avoids adding fuel close to the house. The driveway and carport **13** have 4 metres vertical and horizontal clearance for vehicle access.

Small deciduous trees **14** have been planted well away from the house and carport. This ensures there are no overhanging branches and they do not obstruct the driveway. Good separation between the canopies has been provided. Other characteristics such as smooth bark and an open habit contribute to the low flammability rating of these trees.

The gravel driveway **15** and portions of the front garden include bands of decorative stone as a design feature. The front garden also includes strips of lawn **16** between the beds of low shrubs and groundcovers. This provides good separation between plantings and reduces potential fire movement across the garden.

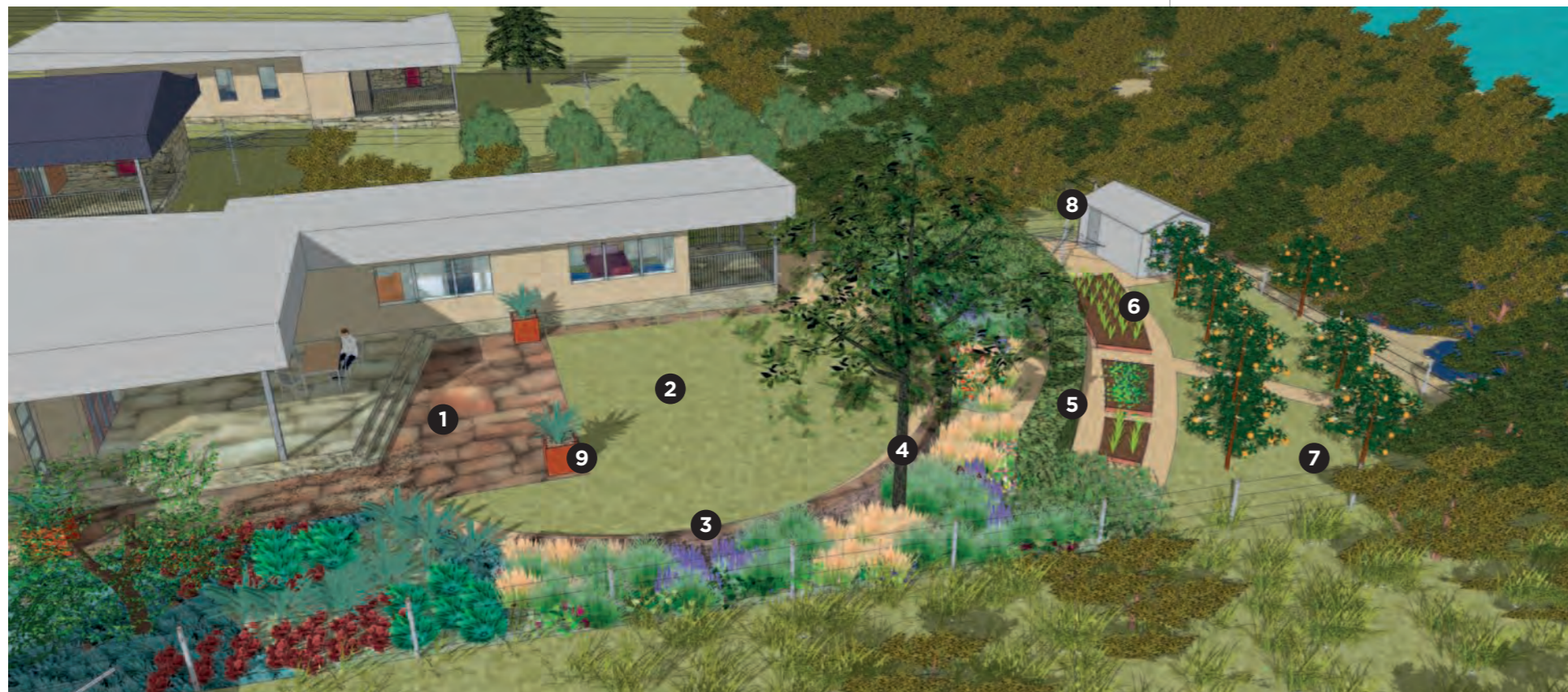
Plants chosen for the model garden have been selected for their firewise properties.

SMALL ORCHARD AND VEGETABLE GARDEN

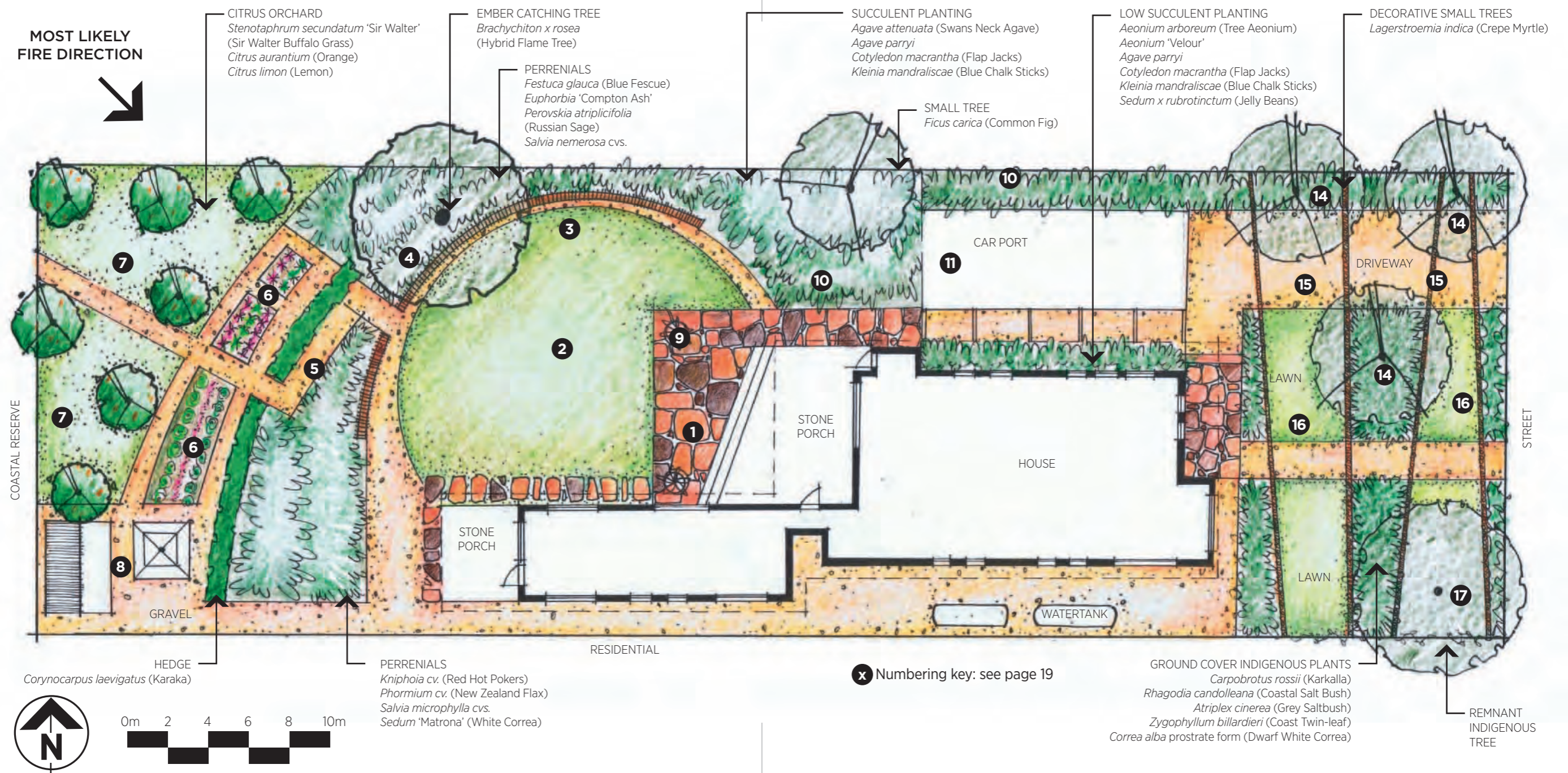
Located on the coastal side of the property, this area adjoins the remnant indigenous vegetation. The orchard includes widely spaced *Citrus* trees (Lemon, Orange) and a lawn of *Stenotaphrum secundatum* 'Sir Walter' (Sir Walter Buffalo Grass). The vegetable garden includes small soil-raised beds edged by rock and is drip irrigated from tank water on site.

HEDGE

The plant used for the medium-sized hedge (2m x 1m) is *Corynocarpus laevigatus* (Karaka). It is a fleshy, evergreen shrub from New Zealand. While maintenance of the hedge is important to reduce plant litter build-up, it is a good example of a firewise plant. This species retains very little dead foliage and has low levels of oils, waxes and resins in the plant tissues.



See also next page.



PERENNIALS

A decorative mix of evergreen and herbaceous perennials and short grasses are planned for this part of the garden to provide colour and textural qualities for most of the year. Where located near the tree, they will be maintained to a low height to ensure good separation.

Plants selected include *Festuca glauca* (Blue Fescue), *Euphorbia* (Compton Ash), *Kniphofia* cv. (Red Hot Pokers), *Perovskia atriplicifolia* (Russian Sage), *Phormium* cv. (New Zealand Flax), *Salvia nemerosa* (Woodland Sage), *Salvia microphylla* (Baby Sage) and *Sedum* (Matrona).

SMALL TREES

The trees are planted across the garden with low, herbaceous vegetation planted beneath them. This planting arrangement will maximise separation between the vegetation and their canopies. The canopies will also be maintained 2 metres apart to reduce fire spread.

Brachychiton x rosea (Hybrid Flame Tree) has been placed more than 10 metres from the house. It has an open, branching habit, fleshy stems and plays a role in ember catching.

Ficus carica (Common Fig) is a small, deciduous, productive tree with an open habit, smooth bark, large leaves stems and plays a role in ember catching.

Lagerstroemia indica (Crepe Myrtle) is also a deciduous tree with smooth bark and open habit. In this garden it will be managed as a pollarded tree (a tree whose

top branches have been cut back to the trunk so that it produces a dense growth of new shoots). This treatment reduces its overall height, as well as keeping lower branches and canopy clear from the ground.

LOW SUCCULENT PLANTINGS

A small linear bed planting of succulents is planted near the house and carport. In the example above, the succulent plants are low in height, have very low flammability and are set well below the house windows. This provides good separation between succulent plantings and vulnerable areas of the house.

Species used here include: *Agave attenuate* (Swans Neck Agave), *Agave parryi*, *Aeonium arboreum* (Tree Aeonium), *Cotyledon macrantha* (Flap Jacks), *Klenia madraliscae* (Blue Chalk Sticks), *Aeonium* 'Velour' and *Sedum x rubrotinctum* (Jelly Beans).

GROUND COVER INDIGENOUS PLANTS

These consist of low-growing, indigenous ground cover plants. They have low flammability features, such as leaf and stem succulence and low litter carrying.

They include *Carpobrotus rossi* (Karkalla), *Rhagodia candolleana* (Coastal Salt Bush), *Atriplex cinerea* (Grey Saltbush), *Zygophyllum billardieri* (Coast Twin-leaf) and *Correa alba* prostrate form (Dwarf White Correa).

TURF AREAS

The turf species used here is *Stenotaphrum secundatum* 'Sir Walter' (Sir Walter Buffalo Grass), a soft, low-growing and drought-tolerant grass.

MODEL 2 HILLS GARDEN

The foothills and mountains of Victoria generally provide exceptional conditions for growing gardens. They typically have higher rainfall, cooler temperatures, deeper soils and well-drained sites. This environment enables a wide range of plants to be grown successfully.

As a result, hills gardens often display great diversity and layers of vegetation, from large trees and shrubs through to ground covers and herbaceous perennials.

The design of a hills garden should carefully consider the local site and context. Many gardens will be located in areas adjoining native forests or tall trees that are highly flammable. In these high-risk sites bushfire can move readily across the landscape (see page 17). Leaving early is the safest option.

Dual-access driveways and multiple entry points should be considered in the design of a garden. This will improve access into and from the site. Using stone or masonry retaining walls is preferable to timber structures. Terracing should be considered on very steep sites to support level areas.

Good garden maintenance is essential in a hills garden. These gardens can produce large amounts of plant growth, including litter, bark and dead leaves.

To reduce fuel load build-up, removal of litter through tree and shrub canopies, such as dry bark hanging from trees and on the ground, is an important garden maintenance task. Pruning trees to raise the canopy 2 metres from the ground and placing trees to ensure canopies are at least 2 metres apart reduces potential fire spread into and between the canopies.

The most suitable vegetation to plant around the house is irrigated, green lawns. Any trees should be placed at least 1.5 times their mature height from the house. Choose low flammable and lush vegetation, particularly in high-risk areas. Locate plants in clumps, away from the house and other flammable structures.

Remember fire can spread from any direction, regardless of slope and aspect.

EXAMPLE: HILLS MODEL GARDEN

The numbers here refer to the illustration below and those on pages 24 and 25.

This hills garden is located within steeply sloping, dense *Eucalyptus regnans* (Mountain Ash) forest. It is typical of many areas including the Dandenongs and the Macedon and Kinglake Ranges.

Some indigenous eucalypts have been retained within the property ① but only those that are located more than 10 metres from the house. They have been retained in clumps and do not overhang the house. Any hanging bark and litter from these trees will be removed from surrounding garden plants during the summer months to help prevent fire ladders into the high canopies ②.

The vegetation chosen beneath these trees ③ includes herbaceous ground covers. They ensure maximum separation between vegetation and the canopy. These have been carefully chosen for their low flammability and dense, lush summer growth.

The orchard trees ⑦ are planted with 2 metres between the mature canopies to reduce potential fire spread. The extensive lawn areas slope downwards to the house ⑤ and those at the property's southern end ⑫ provide areas of low fuel within the defendable space. They will be irrigated and mown low over summer.

Stone terracing ④ reduces the steepness of the slope and makes necessary maintenance easier. The house has been located along the eastern side of the property to provide maximum separation between the house and the main fire hazard to the west.

A vegetable garden ⑧ and orchard ⑦ sit in a series of terraces between the unmanaged vegetation and the house. They have been included in the defendable space because of their low flammability. They will be kept well-watered over summer using the adjacent steel water tanks ⑨.

The retaining walls on the slope ⑥ are all constructed of stone. Stone paving ⑩ and a lawn area ⑪ located between the house and potential fire hazard maximise separation opportunities. The eastern side of the house ⑭ is maintained with gravel as a vehicle storage area and includes steel retaining walls ⑮.

The caravan in this space would be moved off the property during summer and the clothes line and wood shed ⑬ have both been located well away from the house.

Plants chosen for the model garden have been selected for their firewise properties.

FEATURE TREE

The small feature tree in the main lawn, *Parrotia persica* (Persian Ironwood), has been chosen for its attractive autumn foliage and summer shade. It also has a deciduous lifecycle, smooth bark, open, diffuse habit and low leaf-litter production over summer – all low flammability characteristics.

GROUND COVERS

Herbaceous plants are used in the front garden to provide ground cover throughout the year and seasonal colour over winter, spring and summer. All are shade-tolerant perennials with a low-growing habit (to 30 centimetres in height) and have leaves that maintain a high moisture content.

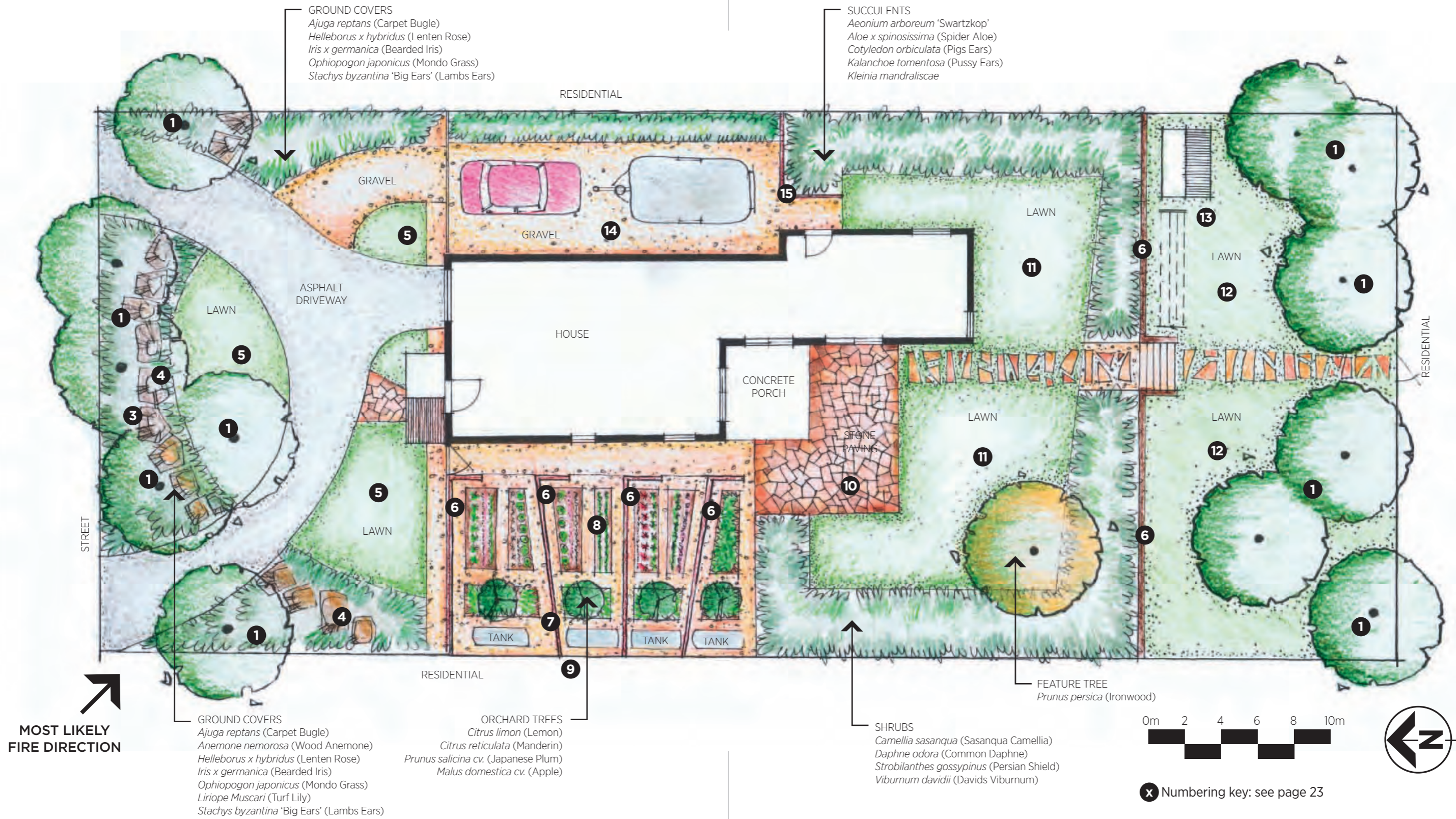
They include: *Ajuga reptans* (Carpet Bugle), *Anemone nemorosa* (Wood Anemone), *Helleborus x hybridus* (Lenten Rose), *Iris x germanica* (Bearded Iris), *Liriope muscari* (Turf Lily), *Ophiopogon japonicus* (Mondo Grass) and *Stachys byzantina* 'Big Ears' (Lambs Ears).

TURF

The lawn areas are planted with *Stenotaphrum secundatum* 'Sir Walter' (Sir Walter Buffalo Grass), a soft-leaf, hard-wearing turf species. It can be managed to a low height and will be irrigated over summer. This maintenance helps create a defendable space.



See also next page.



ORCHARD AND VEGETABLE GARDEN

This includes raised beds of vegetables and a collection of small productive fruit trees. They include a *Citrus limon* (Lemon), *Citrus reticulata* (Mandarin), two *Prunus salicina* (Japanese Plum cultivars) and two *Malus domestica* (Apple cultivars). The vegetables and trees are all irrigated using water supplied from the adjacent steel water tanks.

SHRUBS

Groupings of shade-tolerant evergreen shrubs are planted on the boundary of the garden's middle terrace. They include *Camellia sasanqua* (Sasanqua Camellia), *Daphne odora* (Common Daphne), *Strobilanthes gossypinus* (Persian Shield) and *Viburnum davidii* (Davids Viburnum).

Their broad and fleshy leaves, open habit and coarse texture are low flammability characteristics. All shrubs will be pruned regularly to maintain their height to below 2 metres.

SUCCULENTS

Close to the eastern side of the house are garden beds containing low-growing succulent plants. They include *Aeonium arboresum* (Swartzkop), *Aloe x spinosissima* (Spider Aloe), *Cotyledon orbiculata* (Pigs Ears), *Kalanchoe tomentosa* (Pussy Ears), and *Kleinia mandraliscae* (Blue Chalk Sticks).

MODEL 3 RURAL GARDEN

When planning a rural garden, consider house and garden location, the placement of other structures, elements and services, and good planting design strategies.

Many rural gardens are on larger farming properties surrounded by pasture paddocks and grasses. These can dry rapidly over summer, causing fire to spread from the paddock to the garden.

Other rural gardens are located just outside cities and larger towns. They generally form part of a small 'farmlet', with larger productive and/or ornamental gardens.

One of the most effective ways to reduce fire risk in rural sites is to have defensible space around the house.

Placing farm dams in the direction of the most likely path of a fire provides a fuel-free area and further separation between the bushfire hazard and the house. Dams also form a useful irrigation source for the garden. Keeping plants well hydrated will help reduce heat stress over summer when they often become more flammable.

Sheds and outbuildings should always be located well away from the house, particularly those used for storage of chemicals, fertilisers or hay.

Planting design solutions in the rural garden include the use of lawns, gravel surfaces and kitchen gardens.

These features ensure there are areas of low fuel directly around the house.

Careful placement of all vegetation in the garden is important. In particular, break up the continuity of fuel available to any fire and provide adequate separation between vegetation and the house. This includes locating trees at least 1.5 times their mature height from the house and locating other plants away from vulnerable areas (such as windows, decks and eaves).

The strategic placement of windbreak trees or hedges outside the defensible space of the house block can reduce wind speed and catch embers produced by the fire. Tree selection should consider low flammability characteristics and good maintenance practices need to be applied.

Effective ways to minimise the spread of fire within the garden is by using irrigated, well-spaced orchard trees and good separation of plantings throughout the garden. This can also be achieved with vertical and horizontal separation of garden plantings. In particular, separation between shrubs and trees will remove ladder fuels and break up direct fuel corridors to the house.

EXAMPLE: RURAL MODEL GARDEN

The numbers here refer to the illustration below and those on pages 28 and 29.

The garden and home paddock design aims to reduce spread of a grassfire to the house from surrounding paddocks and properties. It also aims to limit the spread of fire within the garden to the house.

In this garden example, the most likely direction of fire is from the north-west. However, fire can spread from any of the paddocks surrounding the house. Therefore, landscaping for bushfire design principles should be applied throughout.

The farm dam ① is placed in the most likely direction of the fire. The front lawn ④, tennis court ⑨, front driveway ⑤, turning circle ⑥, and kitchen garden ⑧ all provide further separation and areas of low fuel between the fire hazard and the house.

A mass planting of irrigated ornamental orchard trees ② acts as a windbreak and helps provide protection from ember attack in the home paddock. Shrub masses ③ between the house and these trees are ornamental and are kept away from the tree canopies to prevent them acting as ladder fuels. There is also good separation provided between the shrub beds to break up the spread of fire.

Planting has been kept away from the house with lawn and gravel paths. Planting near the driveway ⑦ softens the view from the house with low succulent plants. These are also planted away from vulnerable areas of the house. Decks around the house are replaced with non-flammable materials, such as concrete and steel.

Densely planted windbreaks are provided on the southern and western boundaries ⑭ outside the defensible space. While these are common features on rural properties, choosing low flammable species in this example reduces the fire risk.

The shed with chemical stores ⑪, clothes line ⑩ and fire wood ⑮ are all located well away from the house. Non-combustible water tanks (concrete or corrugated iron) are fed off the roof of the shed ⑫ and may provide an additional water source during a fire. Grapes and berry plants ⑬ are located at the rear of the property near the shed and are kept well-watered over the summer months to reduce their flammability.

Plants chosen for the model garden have been selected for their firewise properties.

TREES

In the orchard, a mixed collection of small fruiting trees have irrigated lawn beneath.

They include *Prunus avium* (Sweet Cherry), *Prunus salicina* (Japanese Plums) and *Prunus domestica* (European Plums). All are trained to an open form and maintained with their lower branches pruned to provide separation.

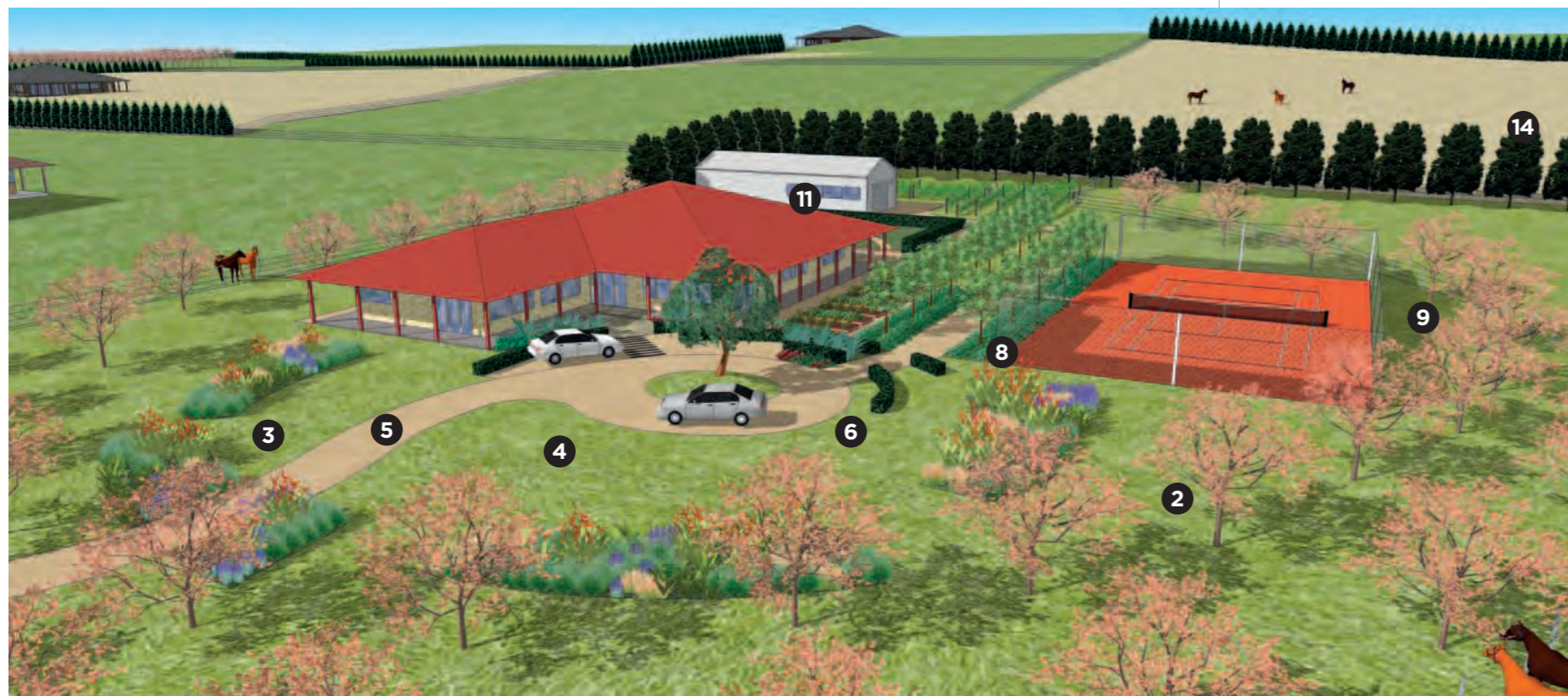
A small, decorative tree *Arbutus x andrachnoides* (Hybrid Strawberry Tree) is located in the lawn turning circle. With smooth bark, an open habit, attractive flowers and form, this display specimen is easily viewed from the house.

BOUNDARY WINDBREAKS

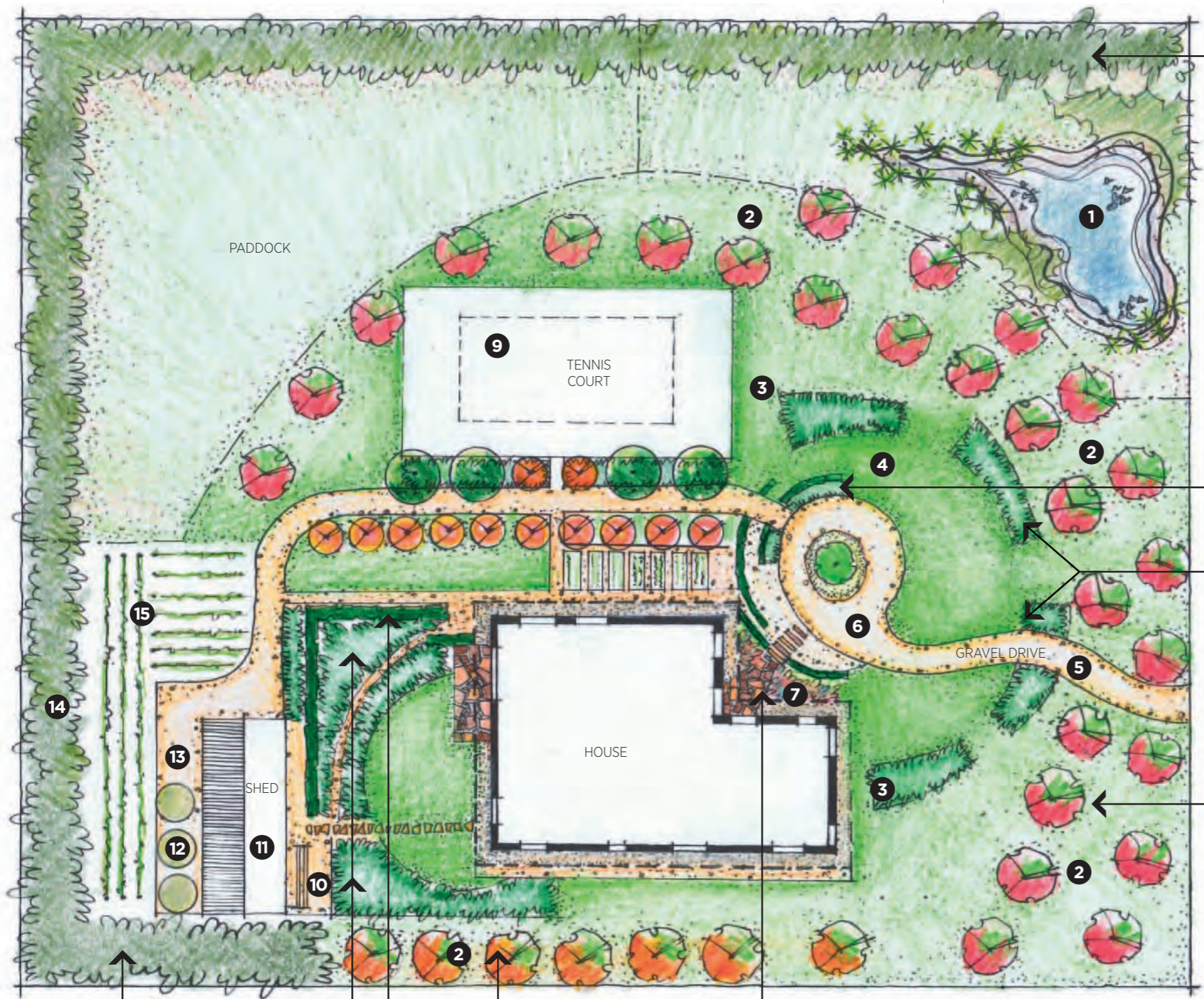
At the outer perimeter of the home paddock on two sides are windbreak plantings.

The species selected includes *Acmena smithii* (Lily Pilly) on the southern boundary and *Casuarina cunninghamiana* (River Oak) on the western boundary of the home paddock.

These trees have a moderately dense habit and retain little dead leaves or twigs. The grass beneath these trees is mowed low and is well-watered during summer.



See also next page.



WINDBREAK
Casuarina cunninghamiana
(River Oak)

**MOST LIKELY
FIRE DIRECTION**



HEDGE
Buxus sempervirens 'Suffruticosa'
(Dutch Box)

HERBACEOUS PLANTINGS
Festuca glauca (Blue Fescue)
Dianella caerulea (Paroo Lily)
Lomandra longifolia
(Spiny-headed Mat Rush)
Phormium 'Apple Green'
(New Zealand Flax)
Strelitzia reginae (Bird of Paradise)

ORCHARD
Prunus avium (Sweet Cherry)

WINDBREAK
Acmena smithii
(Lily Pilly)

PERENNIAL DISPLAY
Achillea millefolium cv. (Yarrow)
Anthemis montana
Beschorneria yuccoides (Mexican Lily)
Festuca glauca (Blue Fescue)
Dahlia 'Le Coco'
Euphorbia 'Compton Ash'
Salvia nemorosa
Tulbaghia violacea (Society Garlic)

HEDGE
Escallonia
'Pink Pixie'

ORCHARD
Prunus salicina
(Japanese Plum)

SUCCULENTS
Aeonium arboresum (Tree Aeonium)
Agave attenuata (Swans Neck Agave)
Cotyledon orbiculata (Pigs Ears)
Echeveria cvs. (Hen and Chickens)
Tradescantia pallida (Purple Heart)
Kleinia mandralascae (Blue Chalk Sticks)
Sedum pachyphyllum (Jelly Beans)
Sedum 'Matrona'



x Numbering key: see page 27

PLANTING AT FRONT DOOR

Closer to the house, flanking the front door are beds of drought-tolerant succulent plants. These have been chosen for their colourful foliage, low-growing habit, fleshy leaves and ease of cultivation.

They include *Aeonium arboresum* (Tree Aeonium), *Agave attenuata* (Swans Neck Agave), *Cotyledon orbiculata* (Pigs Ears), *Echeveria* cvs. (Hens and Chickens), *Tradescantia pallida* (Purple Heart), *Kleinia mandralascae* (Blue Chalk Sticks), *Sedum pachyphyllum* (Jelly Beans) and *Sedum* (Matrona).

HEDGES

Two hedges are used in the garden. These were selected for their low flammability characteristics. In particular, the absence of oils, waxes and resins in the leaves and stems, and their low retention of dead foliage after pruning.

At the front of the house a low hedge (to 50 centimetres in height) of *Buxus sempervirens* 'Suffruticosa' (Dutch Box) is planted either side of the pathway. This is a low-growing form of the Common Box with a medium texture and a moderately dense habit.

At the rear of the house a low hedge to 1 metre high is planted to frame the house garden. This hedge uses *Escallonia* (Pink Pixie). This is a low-growing hybrid form of this compact species that has fleshy leaves year-round. Like all hedging plants both these species require regular maintenance.

PERENNIAL DISPLAY PLANTING AT REAR OF HOUSE

Within the house garden towards the rear are mixed plantings. These contain drought-tolerant, flowering herbaceous perennials, which range from 30 centimetres to 1 metre in height. Plants include *Achillea* cultivars, *Anthemis montana*, *Beschorneria yuccoides* (Mexican Lily), *Festuca glauca* (Blue Fescue) 'Purple Emperor', *Dahlia* 'Licoco', *Euphorbia* (Compton Ash), *Penstemon* cultivars, *Salvia nemorosa*, *Sedum* cultivars, and *Tulbaghia violacea* (Society garlic). These will be irrigated to ensure a lush habit over summer, and mulched with pea gravel – a type of non-flammable mulch.

LAWN

The lawn species is *Pennisetum clandestinum* (Kikuyu Grass). It is tough, hard wearing and able to be managed at a low height. These lawns will be irrigated over summer to assist in maintaining a green, defensible space.

HERBACEOUS PLANTINGS

Around the perimeter of the lawn area are four rectangular clumps of herbaceous plants growing up to 1 metre in height.

These include *Festuca glauca* (Blue Fescue), *Dianella caerulea* (Paroo Lily), *Lomandra longifolia* (Spiny-headed Mat Rush), *Phormium* 'Apple Green' (New Zealand Flax), *Salvia nemorosa* (Woodland Sage) and *Strelitzia reginae* (Bird of Paradise).

All are drought-tolerant plants with strappy or vertical foliage and interesting flowers. They readily maintain a green and lush habit over summer.

MODEL 4 SUBURBAN GARDEN

In recent years, severe fires have moved beyond the rural fringe and into metropolitan suburbs of Canberra and Melbourne.

Planning a garden using the principles in Section 4 can help reduce the bushfire risk in suburban areas. However, a garden only forms one component of preparing for bushfire. There are many other things to consider (see Section 1).

The hard landscaping in a garden involves making changes to material selection. Use brick, stone, steel or concrete materials for retaining walls and garden edging. Gravel products are suitable for pathways and mulches. These design selections can reduce fire risk from within the garden.

In most areas timber should be avoided as this can provide a way of directly moving a fire further into the property. In a garden in a high bushfire risk area, timber fences should be replaced with non-combustible options.

Swimming pools or ponds can help when creating a defensible space if placed between the most likely direction of a fire and the house.

Removing other potential fuel sources from directly around the house is important. This includes sheds, garden tools and machinery areas, woodpiles, outdoor furniture, clothes lines and shade screens. These should all be positioned at least 10 metres away from the house.

Planting design should focus on plants that have low flammable characteristics that are placed away from the house. Plants in containers can be an effective way to create seasonal interest and bring productivity into the suburban garden. They can also be readily moved away from the house.



EXAMPLE: SUBURBAN MODEL GARDEN

The numbers here refer to the illustration below and those on pages 32 and 33.

Existing indigenous trees of *Eucalyptus polyanthemos* (Red Box) have been retained in the suburban garden (1) but those within 10 metres of the house have been removed. Vegetation beneath the trees is confined to shortly-mown lawn, very low shrub and fleshy ground cover plantings. These plantings avoid ladder fuels that can carry fire into the canopy. Any low hanging branches have also been removed up to 2 metres as part of the regular garden maintenance.

A dual access driveway (2) at the front of the property has been provided. The pool (11) has been placed between the house and a possible fire front. It includes a small area of adjoining timber decking (10) that is well separated from the house. Stone paving (9) and gravel pathways (4) are used in the area directly surrounding the house. The pathways have been designed to provide separation between garden beds and areas of low fuel around the house.

The slope of the site has been partially terraced using large rocks (3). Both the rear portion of the garden (12) and the lawn area to the east of the house (5) are maintained as open lawns. This design element reduces fuel loads within the defensible space.

Garden beds are separated by areas of maintained lawn that break up fuel continuity. The lawn also allows easy access for maintenance throughout the garden.

The clothes line and shed (6), which includes swimming pool chemicals and fire wood, are located in this area well away from the house. The eastern boundary of the garden has three large non-combustible water tanks (7) adjoining the fence. These help shelter the house from radiant heat and provide water for the adjacent vegetable garden (8). The vegetation is low around the tanks so that they can be accessed if there is a fire.

Plants chosen for the model garden have been selected for their firewise properties.

POOL AREA

At the back of the pool area is a mixed display planting of short grasses and ornamental shrubs. These include *Festuca glauca* (Blue Fescue), *Cotinus 'Grace'* (Smoke bush); *Echium candicans* (Pride of Madeira), *Euphorbia characias* subsp. *wulfenii* (Wulfen Spurge) and *Senecio vira-vira*.

Adjoining the paving area (between the house and the pool) are low-growing (to 30 centimetres in height), drought-tolerant herbaceous plants. These include *Aloe x spinosissimum* (Spider aloe), *Chrysocephalum apiculatum* (Common Everlasting), *Coreopsis 'Moonbeam'*, *Dianthus caryophyllus* (Pinks) and *Nepeta fassenii* (Catmint).

SIDE PLANTING IN THE FRONT YARD

A mix of grouped shrub plantings (0.5-2 metres in height) is located away from the house. These shrubs are pruned after flowering to maintain an open form, reduce plant litter and encourage repeat flowering.

These Australian native plants include *Alyogyne huegii* (Native Hibiscus), *Banksia blechnifolia* (Creeping Banksia), *Correa pulchella* (Salmon Correa), *Crocea exalata*, *Eremophila maculata* (Emu Bush) and *Philotheca* (Bounda Beauty).

See also next page.



PLANTINGS UNDER THE LARGE EUCALYPTUS

To the front of the property and under the medium-sized *Eucalyptus polyanthemos* (Red Box) are small clipped hedges. These are maintained to a maximum height of 1 metre. They include *Acacia acinaea* (Golddust Wattle), *Syzygium fancissii* 'Little Gem' (Dwarf Lilly Pilly) and *Westringia fruticosa* (Native Rosemary).

Adequate separation between these low shrubs and the mature trees is ensured by under-pruning any low branches and regular maintenance of the hedges.

Low-growing, drought-tolerant Australian herbaceous perennials (to 30 centimetres in height) are planted to the front of the hedges. They include *Brachyscome mulifida* (Cut-leaf Daisy), *Chrysocephalum apiculatum* (Common Everalsting), *Dampiera linearis* (Common Dampiera) and *Scaevola albida* 'Maue Clusters' (Fan Flower).

VEGETABLE GARDENS

Close to the house are raised, steel-edged vegetable gardens. These contain a mix of annual vegetables.

TURF

Pennisetum clandestinum (Kikuyu Grass) – a tough, hard-wearing turf grass – is planted in the lawn areas. It is managed at a low height and is irrigated over summer. This helps to maintain a defendable space.

CHOOSING SUITABLE PLANTS

After planning and designing, the next task is to choose suitable plants for the garden. Some plants have intrinsic characteristics that reduce the likelihood of ignition. Choosing these plants and locating them correctly will help reduce bushfire risk within a garden.

There are a number of characteristics that influence how flammable a plant is. It is important to know which factors contribute to plant flammability. This will assist in making informed decisions when selecting plants for a garden.

A consistent approach for determining the flammability rating of a plant is provided by the Plant Selection Key (see Section 7).

The key takes the user through a series of questions about the characteristics of the plant and provides:

- an overall flammability rating
- firewise rating
- maintenance requirements
- advice on where to locate that plant within a garden.

Before working through the key, there are elements of plant flammability that should be further explained.

PLANT FLAMMABILITY

Determining the flammability of plants is not straightforward. Although it can be tested under controlled circumstances in a laboratory, the flammability of a plant may vary in a bushfire, where the conditions are often unpredictable. Some plants are more flammable than others but all plants in a garden – living and dead – can provide fuel for a bushfire.

Plant flammability is described as a combination of:

- the time taken for a plant to ignite
- how readily it burns when the ignition source is removed
- how much material there is to burn
- how long it takes for all available fuel to be consumed.

Flammability will vary depending on:

- a plant's age, health, physical structure and chemical content

- the daily and seasonal climatic variations
- location of the plant in relation to other vegetation and flammable objects
- the specific part of a plant – some parts of plants are also more flammable than others.

PLANT MOISTURE CONTENT

Foliage moisture content is the most critical factor that determines plant flammability. It influences how readily a plant will ignite.

Plants with high foliage moisture content will not burn until sufficient moisture in its foliage has been removed.

Plants with low moisture content will ignite more rapidly and continue to burn when the ignition source is removed.

Plants in the path of an oncoming bushfire will dry out as a result of the radiant heat and wind generated by the fire. Even fully hydrated plants will eventually dry out and burn if they are exposed to bushfire heat for long enough.



This succulent ground cover has a high moisture content.

REMEMBER

The arrangement of vegetation within a garden, rather than the flammability of individual plants, has a greater impact on how a bushfire will spread.



Thick, succulent leaves



Soft, fleshy leaves

Moisture content depends on a number of interacting factors:

The time of day

- Before sunrise, plants will typically have their maximum moisture content (influenced by the moisture content of the soil and humidity).
- As they transpire during the day their foliage moisture content decreases until the plant stops transpiring after sunset.
- Generally plants are most flammable in the mid- to late-afternoon when their foliage moisture content is at its lowest.

The season

- During summer as the soil dries out, the moisture content of the plant will decrease and the flammability of the plant will increase.

The part of the plant

- The leaves and new growth on a plant will generally have a higher moisture content than the stems or branches.
- Dead leaves and twigs have a very low moisture content that is driven by the relative humidity. On hot, dry days they become highly flammable as fine fuels.

Where it is planted

- The amount of sun or shade, the availability of water, drainage and soil type will affect plant moisture content.

Environmental conditions

- High temperatures, low humidity and periods of drought will increase the flammability of plants.

The age of the plant and its growth stage

- Many plants start as moisture-rich shoots but become woody as they age. As plants approach the end of their life they tend to dry out.
 - New growth on a plant will usually be soft and fleshy and become woody after the growing season.
-

ENVIRONMENTAL WEEDS

In most high bushfire risk areas, houses are located in close proximity to unmanaged vegetation. Some popular garden plants have become environmental weeds by escaping to the bush and displacing native species. Environmental weeds often contribute to high fuel loads, which increases bushfire risk. Priority should be given to removing environmental weeds within the property.

Avoid planting environmental weeds. Contact local council to find out which weed species are a problem in the area. The Department of Primary Industries also has information about weed species at dpi.vic.gov.au

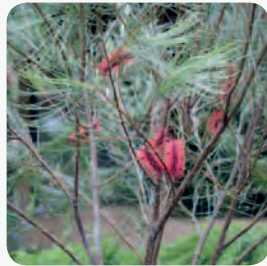
When selecting plants, consider using local native species with low flammability. These are well suited to local conditions and will add to the habitat value of the bushland.

CHARACTERISTICS

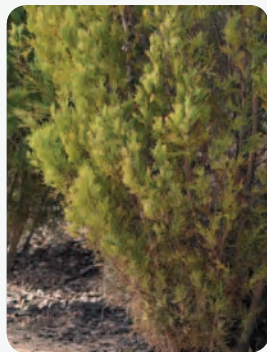
The following plant characteristics are used throughout the Plant Selection Key. They all contribute to plant flammability to varying degrees and should not be considered in isolation.

BRANCHING PATTERN

This influences the distribution and density of foliage within the plant.



- Choose plants with open and loose branching as well as leaves that are thinly spread.



- Plants with closely packed leaves and branches have more fuel available within the plant and are usually more flammable.



- Plants with branches at least 2 metres above the ground are better than those with continuous foliage from the ground to the canopy. Under-pruning increases separation.



- Separation between ground fuel and foliage on the rest of the plant prevents lower branches acting as ladder fuels.

TEXTURE

This describes the overall appearance of the plant.

In coarse textured plants, it is easy to distinguish each branch or leaf from a distance of 3 metres.

Plants with a coarse texture have a lower surface-area-to-volume ratio making them less flammable than plants with a fine texture.



➤ Coarse textured plants



➤ Medium textured plants



➤ Fine textured plants

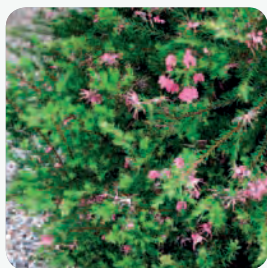


DENSITY

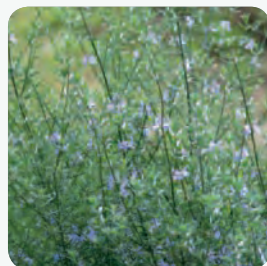
This describes the amount and arrangement of fuel within the plant.

A dense plant is difficult to place a hand into and is not easy to see through.

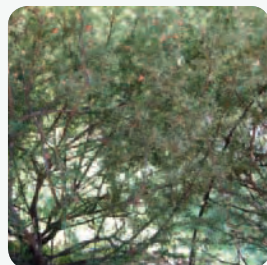
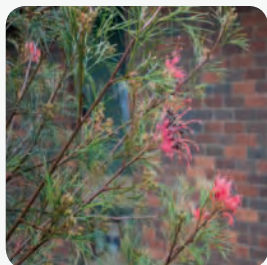
Plants that are very dense are often more flammable as there is a higher fuel load readily available to burn.



➤ Very dense



➤ Moderately dense



➤ Sparsely dense

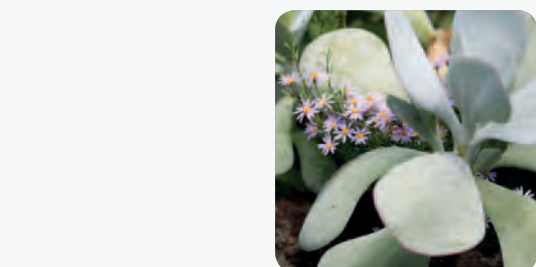
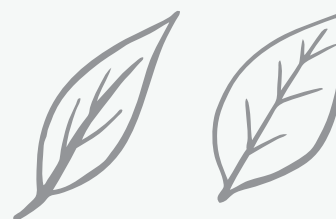
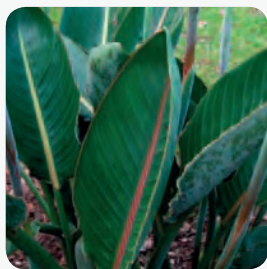


LEAVES

The fineness, size and shape of leaves affect their flammability.



- Wide, flat and thicker leaves (such as those on maples, camellias and oaks) and those that are soft and fleshy have more plant tissue in their leaves. This usually means a higher moisture content relative to their surface area.



- Leaves with a high moisture content take longer to dry out and therefore longer to catch fire.



- Small, thin and narrow leaves have a high surface-area-to-volume ratio, which tends to make them more susceptible to drying out.

- Generally, the higher the surface-area-to-volume ratio, the more flammable a leaf will be. Some plants with high surface-area-to-volume have leaves with high levels of oils (such as paperbark, tea trees, eucalypts) or resins (conifers such as pine trees). These combined properties increase flammability.



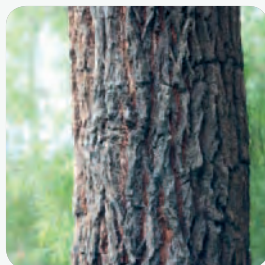
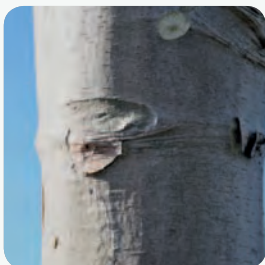
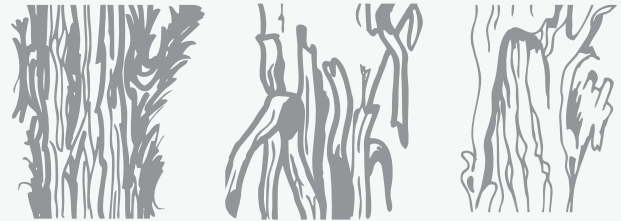
- The shape of leaves influences how easily they are caught in vegetation when they fall off the plant. If leaves are caught within plants it will increase that plant's flammability as leaf litter dries out and ignites readily. Dead pine needles are a good example of leaves that readily catch in other plants.

BARK TYPE

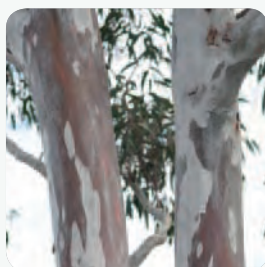
Some bark types ignite more readily than others.



- Bark that is loose, stringy or fibrous will ignite easily and can break off to create burning embers that are carried ahead of a bushfire.
- These types of bark can also act as ladder fuels that carry fire into the canopy of a tree, increasing the intensity of the fire. Examples of such plants include stringybark eucalypts and some paperbarks.



- Bark that is attached tightly to the trunk or is smooth is usually less flammable because it is more difficult to ignite and will not be easily carried as an ember, for example Box Barks.

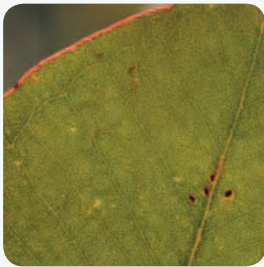


- However, some smooth-barked trees shed their bark annually and trap large ribbons of bark in their branches or on the ground below. These ribbons of bark are highly flammable, can be carried as embers and can also act as a ladder fuel, for example Manna Gums.

OILS, WAXES AND RESINS

Some chemicals that are found naturally in plants will increase their flammability.

The leaves of plants containing significant amounts of oils, waxes and resins will often have a strong scent when crushed. For example rosemary, lavender and eucalyptus have oil in their foliage and pines can have high resin content.



- Waxes and resins have a similar effect of increasing flammability of plants although there are a number of characteristics that contribute to the overall flammability of a plant.
- Plants with high amounts of resins or oils should be limited and placed carefully within a garden.



RETENTION OF DEAD MATERIAL



- Dead leaves, twigs, bark and branches that are retained on the plant or accumulate on the ground or in shrubs can increase the flammability of an otherwise firewise plant.
- Regular pruning and maintenance of all trees and shrubs to remove these fine fuels is necessary.

MAINTAINING THE GARDEN

Remember that establishing a garden takes time. Buildings may not change but the plants in a garden will. To ensure a garden is effective over many years it will require ongoing maintenance of the defendable space around the house.

Replacement planting will need to be considered, as well as the periodic assessment of the suitability of the plants within the garden. Use the Plant Selection Key in Section 7 to assess plant flammability.

Diseased, stressed or dead plants are more flammable and moisture content will be lower in summer when bushfires are most prevalent.

Regular maintenance of the garden must be carried out and should be included as part of overall preparation for bushfire.

Incorporate maintenance into a Bushfire Survival Plan to ensure the garden is ready for the upcoming bushfire season.



Branches should be pruned up to 2 metres above ground level to increase separation from ground fuels.

Regular maintenance actions:

- Clear ground fuel from underneath plants, on and around the house.
- Prune plants with low-hanging branches, providing separation of at least 2 metres above the ground.
- Replace plants that die or become diseased.
- Keep plants well hydrated through watering and mulch. Watering less frequently but for longer encourages the plants to develop deep roots reducing moisture loss during dry periods.
- Replace or cover organic mulch such as woodchips, straw or dead plant matter with non-flammable mulches.
- Remove other flammable objects from your defendable space.
- Remove any fine, dead material that might accumulate in plants.
- Remove weeds from defendable space as these often contribute to high fuel loads.



Use non-flammable mulch.



Remove fine, dead material.

PLANT SELECTION KEY

About the key

The Plant Selection Key is a practical tool developed to guide you in choosing plants suitable for use in a garden in a high bushfire risk area.

The key comprises 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.

An interactive version of this key is available online at cfa.vic.gov.au/plants

This Plant Selection Key is based on Behm AL, Long AJ, Monroe MC, Randall CK, Zipperer WC, Hermansen-Baez LA (2004) *Fire in the Wildland-Urban Interface: Preparing a Firewise Plant List for WUI Residents*. Circular 1453, School of Forest Resources and Conservation, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida.

Address: Southern Center for Wildland-Urban Interface Research and Information,
408 W. University Ave., Suite 306, USDA Forest Service, Gainesville, FL 32601.
Email (ahermansen@fs.fed.us) or fax (1-352-376-4536).

The Plant Selection Key has been customised to better suit Australian conditions and 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 there is uncertainty about the results this key produces, seek professional advice from a plant specialist.

PLANT SELECTION KEY

USING THE KEY: A THREE STEP PROCESS

1. 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 council about legislative 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 5.
- Identify the plant species, including both the common name and the 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.

2. Work through the key

- Begin at 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 62 at the end of the key.
- Collate the results in the record sheet.

3. Rate each plant for its suitability in the garden

The table on page 45 outlines four firewise ratings – Not Firewise, At-Risk Firewise, Moderately Firewise and Firewise – and a corresponding flammability rating. The flammability rating of individual plants depends on the number of 'Less' 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 a garden, where it should be planted (presuming it is suitable) as well as maintenance requirements.

FIREWISE AND FLAMMABILITY RATINGS

NOT FIREWISE

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

- **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 defensible 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 after finishing the key you had 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 known to be particularly flammable.

**BEGIN
PLANT
SELECTION KEY**



PLANT SELECTION KEY

1. What type of plant is it?



Tree

- Has single or multiple woody trunks and grows from 5-30 metres or over at maturity.
- Single-stem trees typically branch well above the ground, while multiple-stemmed trees typically branch close to the ground.
- Foliage is concentrated in the canopy allowing other vegetation to grow underneath.
- Has highly variable leaf and bark types.

Go to 2



Palm or palm-like

- Vary greatly in height.
- 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, screw-palms, cycads and grass-trees. They can grow several metres tall and also 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

- Are shorter and generally more compact than trees, typically 3-4 metres in height with branching close to the ground.
- Have dense, bushy foliage and woody stems.
- Because of this structure, shrubs can carry fire from the ground to the tree canopy.

Go to 13



Vines and climbers

- Have soft or woody stems and are climbing or scrambling plants. Are often grown over fences, pergolas or trellises and can grow over other plants.
- Can be deciduous or evergreen. Some accumulate large amounts of dead leaves.
- Can act as ladder fuel and carry flames up into shrubs, trees or supporting structures.
- Examples include grapes, Virginia Creeper, Coral pea, Running Postman or Happy Wanderer.

Go to 17



Herbaceous plants

- Have soft and fleshy leaves with non-woody stems.
- Are low-growing, often less than 50 centimetres tall.
- Include most smaller flowering plants grown in gardens. Can look 'shrubby', form clumps or grow as groundcovers.
- Moisture content is usually higher than most woody shrubs. Often droop when dry.
- Examples include violets and pansies.

Groundcovers

- Are woody or herbaceous. Woody groundcovers spread without climbing.
- Are generally less than 50 centimetres tall.

Grasses or grass-like

- Leaves are usually long, fine or strappy.
- Vary from a few centimetres to over 2 metres tall. Clump size can be up to 1 metre in diameter.
- Most grasses grown in gardens are perennial rather than annual. Many of these form clumps called tussocks. Examples include Wallaby Grass and Canary Grass.
- Perennial tussock grasses accumulate dead material mixed with the living leaves and are quite flammable, although they usually only burn for a short time.
- Other grasses grow as a continuous mat, such as lawn grasses.
- Leaves of grass-like plants are often coarse and thick and may accumulate dead leaves in the living clump. Examples include Mat rush, New Zealand Flax, Iris and Gladioli.

Go to 18



2. What type of tree is it?



Eucalypts

- Can have woolly fibrous bark (stringy bark), deeply corrugated and dense bark (iron bark), 'chippy' or platy bark (box bark) or smooth (gum bark).
- All flower and have leaves that hang vertically.
- Their bark can be extremely flammable.
- Examples include trees from the genera *Eucalyptus*, *Corymbia* (includes Flowering Gums) and *Angophora* (includes Smooth Barked Apple and Dwarf Apple that are similar in appearance to smooth barked gums).

Go to 3



Conifer or conifer-like

- Develop woody cones and have needle-like or scale-like leaves.
- Examples include pines, hemlocks, spruces, junipers, cedars and cypress.
- Native Australian examples include Cypress Pine, Cherry Ballart and she-oaks.

Go to 7



Other tree types

- This category contains all trees that are not eucalypts, conifers or conifer-like.
- Leaf type can vary greatly. For example:
 - the small leaves and phyllodes (lea-like structures) of wattles such as Blackwood and Silver Wattle
 - the medium-sized leaves of Lilly Pilly and Southern Sassafras
 - the deeply lobed leaves of Silky Oak
 - the wider, broad leaves of Kurrajong and non-native species such as maples, oaks and elms.

Go to 11

3. What type of bark does the tree have?



Stringybark eucalypt with coarse, loose fibrous bark

- Examples include Messmate and Red Stringybark.

Go to 4



Sheds large ribbons or sheets of bark annually

- Strips or ribbons of bark are caught and held in the tree.
- Examples include many smooth or gum-barked eucalypts such as Manna Gum and Mountain Grey Gum.

Go to 8



Does not have stringy bark or ribbons of bark

- Examples include iron bark, some gum-bark species, box bark and peppermint bark eucalypts.

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 3: Rules for vegetation clearance around existing houses* or *Section 5: Choosing suitable plants*.

Go to 29 (END)

5. What is the height of the lowest branch?



Low Branches are less than 2 metres above the ground.

Go to 6



Good separation At least 2 metres between ground and branches.

Go to 20

6. LESS FIREWISE



- Trees must be under-pruned up to 2 metres if possible and dead branches and fronds removed to ensure a more firewise characteristic.

Go to 11

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



Yes The conifer sheds large amounts of leaves or needles. For example, Monterey Pine.

Go to 8



No The conifer or conifer-like tree does not shed large quantities of leaves or needles. Examples may include native Cypress Pine, she-oak and Cherry Ballart.

Go to 9

8. LESS FIREWISE



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

Go to 9

9. What is the height of the lowest branch or frond?



Low Branches or fronds are less than 2 metres above the ground.

Go to 10



Good separation At least 2 metres between ground and branches.

Go to 11

10. LESS FIREWISE



- Trees must be under-pruned to a height of 2 metres if possible and dead branches and fronds removed to ensure a more firewise characteristic.

Go to 11

11. Does it have papery or loose bark?



Yes Trunk has papery bark or loose fibrous bark.
For example tea-trees and most paper barks.

Go to 12



No Trunk does not have papery bark or loose fibrous bark.

Go to 20

12. LESS FIREWISE



- Papery bark and fibres may act as ladder fuels.
- Requires 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.
- From a distance of about 3 metres it is not easy to distinguish individual leaves or branches on plants with a fine texture.
- Examples include diosma and some paper barks 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

- This category includes many azalea and holly species as well as the natives Sarsaparilla and Hairpin Banksia.

Go to 15



Coarse texture

- It is easy to distinguish each individual leaf or branch from a distance of about 3 metres.
- Examples include hydrangea, cotoneaster, hazel pomaderris and blanket leaf.

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 medium- and coarse-textured plants. This makes them generally more flammable.
- Require appropriate placement and routine pruning.

Go to 15

15. How dense is the plant?



Very dense

- 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 shrubby grevilleas and junipers.

Go to 16



Moderately dense

- Sufficiently dense to not be able to see through the plant, but reasonably easy to place a hand into the plant and touch the main stem.
- Examples include some lavenders, rosemary and some correas.

Go to 20



Sparsely dense

- May have open branching patterns, making it easy to see through the plant.
- Examples include many wattles, rhododendrons and some hydrangeas.

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.
- Require appropriate placement and routine pruning.

Go to 20

17. NOT FIREWISE

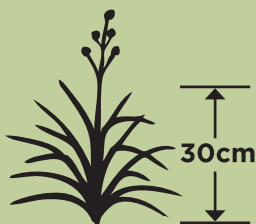


- Vines are extremely flammable as they typically add fuel directly to a structure. As such, they act as ladder fuels bridging gaps between surface fuels and canopy fuels.

For more information, see *Section 3: Rules for vegetation clearance around existing houses* or *Section 5: Choosing suitable plants*.

Go to 29 (END)

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



Yes Grass is greater than 30 centimetres tall (for example grass in the Family Poaceae or Gramineae).

Go to 19

No Short grasses and all other herbaceous plants or grass-like plants.

Go to 20



19. NOT FIREWISE



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

For more information, see *Section 3: Rules for vegetation clearance around existing houses* or *Section 5: Choosing suitable plants*.

Go to 29 (END)

20. Does the plant retain dead leaves or twigs?



Yes Plant retains dead leaves or twigs mixed with the living leaves.

- 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 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 3: Rules for vegetation clearance around existing houses* or *Section 5: Choosing suitable plants*.

Go to 29 (END)

22. Are the leaves waxy or oily?



Yes Leaves have a waxy coating or numerous oil glands dotted on the leaves.

- 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. For example, Wax Myrtle and gallberry.
- Plants in the families Myrtaceae, Rutaceae, Lamiaceae and Pinaceae are examples of plants with numerous oil glands. [Go to 23](#)



No 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.
- Require appropriate placement and routine pruning.

[Go to 24](#)

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



Yes 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, elm trees.

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 Plants drop all 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 Plant 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 cactus, agave, some myoporums such as Creeping Myoporum, many Lilies, some saltbush species and geraniums.

Go to 29



No Plant leaves are not obviously succulent; they may have various shapes and vary in thickness.

Go to 28




28. LESS FIREWISE



- Require 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	<ul style="list-style-type: none"> ➤ Flammability = Low ➤ Where to plant: These plants can be used in a garden as they are not known to be particularly flammable.
 or 	MODERATELY FIREWISE	<ul style="list-style-type: none"> ➤ 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.
 or more	AT-RISK FIREWISE	<ul style="list-style-type: none"> ➤ 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 defensible space.
Was your plant NOT FIREWISE?	NOT FIREWISE	<ul style="list-style-type: none"> ➤ Flammability = Extreme ➤ Where to plant: These plants should not be planted in a garden or used when landscaping for bushfire.

WHAT TO DO NEXT

- It is important to consider the role that plant selection plays in enhancing defensible space.
- If the plant is 'Firewise' or 'Moderately Firewise', locate it according to the design principles as outlined in Section 4. Remember, the location and arrangement of plants has a significant effect on reducing the bushfire risk within your garden, but during summer as soil dries out, 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 defensible space. For further information, see *Section 3: Rules for vegetation clearance around existing homes* or *Section 5: Choosing suitable plants*.
- You can also book a free Home Bushfire Advice Service visit where a member of CFA will assess your property and provide a range of options to assist you to develop your Bushfire Survival Plan. Go to cfa.vic.gov.au/hbas for information and bookings.

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 results)	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.		
	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.		

FURTHER RESOURCES

CFA

cfa.vic.gov.au

Fire Ready Kit

On the Land: Agricultural Fire Management Guidelines

A guide to retrofit your home for better protection from a bushfire

Fire Service Guidelines:

- *Land Use Planning 0002: Requirements for Water Supply and Access in a Bushfire Management Overlay*
- *Land Use Planning 0003: Assessing Vegetation in a Bushfire Management Overlay*

OTHER

dpcd.vic.gov.au/planning/bushfire

Fact Sheet: Planning and Building for Bushfire Protection

Advisory Note 39: Amendment VC83 Bushfire Protection Vegetation Exemptions

Advisory Note 40: Amendment VC83 Bushfire Protection Bushfire Planning Provisions

Practice Note 64: Local Planning for Bushfire Protection

Practice Note 65: Bushfire Management Overlay and Bushfire Protection: Planning Requirements

planningschemes.dpcd.vic.gov.au

Clause 13.05 Bushfire

Clause 44.06 Bushfire Management Overlay

Clause 52.17 Native vegetation

Clause 52.43 Interim Measures for Bushfire Protection

Clause 52.47 Bushfire Protection: Planning Requirements

Clause 52.48 Bushfire Protection: Exemptions

Planning for Bushfire in Victoria (CFA and DPCD, forthcoming)

Department of Sustainability and Environment

dse.vic.gov.au

land.vic.gov.au

Department of Primary Industries

dpi.vic.gov.au

Municipal Association of Victoria

Council details can be found at mav.asn.au/about-local-government/council-details

Ramsay, C and Rudolph, L, 2003 *Landscape and Building Design for Bushfire Areas*, CSIRO, Melbourne.

Standards Australia AS 3959-2009: Construction of Buildings in Bushfire-prone Areas

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