Shelterbelt Design for Climate Change

About this Brochure

Studies have found that shelterbelts have resulted in improved farm productivity and further biodiversity benefits through a range of ecosystem services such as shade and shelter and encouraging beneficial insects and birdlife.

On 1 March 2019 lightning strikes ignited fires in Tynong Nth and Tonimbuk near the Bunyip State Park. These fires eventually joined to form the Bunyip Fire Complex impacting over 300 properties.

Bunyip Landcare members observed that the fire behaviour differed across the district and considered whether shelterbelt design was a factor initiating a review of existing shelterbelts.

As part of the post fire natural environment recovery process, Cardinia Shire Council engaged Eco Logical Australia during 2020 to conduct research into shelterbelt design, with the objective of developing a set of guidelines to assist landholders in designing shelterbelts to be better suited to the future effects of climate change. This brochure is based upon this research and the final guidelines.

Note – the information provided in this brochure is intended as a general guide in the design of shelterbelts. Local conditions must be considered before shelterbelts are implemented.

For further assistance in planting shelterbelts, search for your Landcare group by visiting www.landcarevic.org.au

A full list of local indigenous plants and nurseries available in Cardinia Shire can be found by visiting cardinia.vic.gov.au/parksandenvironment

Download the full Shelterbelt Design Guidelines for Climate Change report at cardinia.vic.gov.au/bushfirerecovery

What are shelterbelts?

Shelterbelts are strips of vegetation planted to provide a wind buffer and shade for livestock, crop protection or to create habitat for wildlife. Well-designed shelterbelts provide a multitude of benefits to farm production and wildlife conservation but can also increase bushfire risk to homes and buildings if not well planned.

Benefits of Shelterbelts:

- Decrease wind speed reducing plant damage
- Provide protection from extreme weather events such as frost
- Reduce erosion by decreasing wind speeds and water flows, holding soil together, and increasing infiltration
- Provision of shelter reduces stress on livestock
- Permanent strips of vegetation within a field such as a shelterbelt may attract beneficial fauna year-round, especially insects, birds and bats
- Productivity on average can be higher per unit land area, with the largest effect occurring in winter
- Reduce wind speed and decrease the forward rate of fire spread in open grassland areas.
- Reduce the rate of fire spread and number of embers generated
- Pasture productivity in areas protected by trees is significantly higher than adjacent open sites.

How can shelterbelts reduce the impacts of climate change?

Climate change will increase temperatures and reduce average annual rainfall across south-eastern Australia. Climate extremes including more frequent drought and more regular and intense bushfires are predicted.
Shelterbelts designed with climate change in mind can act to reduce the impacts of climate change by:

Slowing surface water run off and increasing water infiltration, promoting the natural retention of water, and reducing the impact of drought.

Reducing soil erosion from floods as vegetation in shelterbelts intercepts and slows surface water run-off before it builds into damaging flow.

Acting as barrier against destructive windstorms and high winds, reducing soil erosion, mitigating crop damage, and reducing impacts on livestock.

Reducing the intensity and spread of bushfires by slowing windspeed and reducing ember attack.

Providing shade and shelter for livestock and native wildlife from the increasing severity and duration of heatwaves.

Designing shelterbelts in a changing climate

Increased periods of drought, higher temperatures, reduced rainfall, increased fire risk and more intense storms necessitate a change in how shelterbelts are selected and designed.

- Midstorey plantings to be kept sparse in order to maintain separation between shrubs/ groundcovers and tree canopy to reduce likelihood of fire entering tree canopy.
- Plant shelterbelts wider than 10 m to maximise shelter, wildlife habitat and bushfire protection benefits.
- Place shelterbelts perpendicular to prevailing winds. Several shelterbelts of different orientation may be required in a paddock.
- Provide breaks between remnant vegetation, shelterbelts and built assets to reduce bushfire intensity and likelihood of spreading across a property.
- Plant at a medium density of 40-60% in each shelterbelt to effectively reduce windspeed.
- Seek advice from a local indigenous nursery on the most appropriate species to plant.
- Source plants from a broader climatic range to ensure plantings survive under future climate changes such as higher temperatures and lower rainfall.
- Maximise connectivity across a property through shelterbelts whilst maintaining fire protection measures (e.g. firebreaks and access).
- Fence off shelterbelts to prevent stock access.
- Plant shelterbelts 400 – 700 metres apart. Shelterbelts with high wind exposure should be planted closer.
- Lanes or other openings through a windbreak should be avoided, where possible. However, to ensure safe access and egress across a property there will be a need for angled gated entries through shelterbelts.
- Site preparation and ongoing management are essential.

Types of Shelterbelts

Shelterbelt design and maintenance can vary according to the landholder's needs and priorities. Shelterbelts should be considered in the context of a Whole Farm Plan.
(see pages 6 - 7).

PADDOCK SHELTERBELTS

Paddock shelterbelts protect crops and soil from climate change impacts (e.g. wind erosion, flooding and bushfire), improving the micro-climate for crop production and protecting livestock from adverse weather.

SHELTERBELTS AROUND BUILT ASSETS

The placement of shelterbelts outside the bushfire site assessment area of the house block can reduce wind speed and catch embers produced by a fire.

Wholistic climate change preparation for your land should include:

- House and building design, siting, construction and maintenance
- Whole of farm plan
- Shelterbelt design and maintenance
- Erosion management
- Planning for natural disasters

WILDLIFE SHELTERBELTS

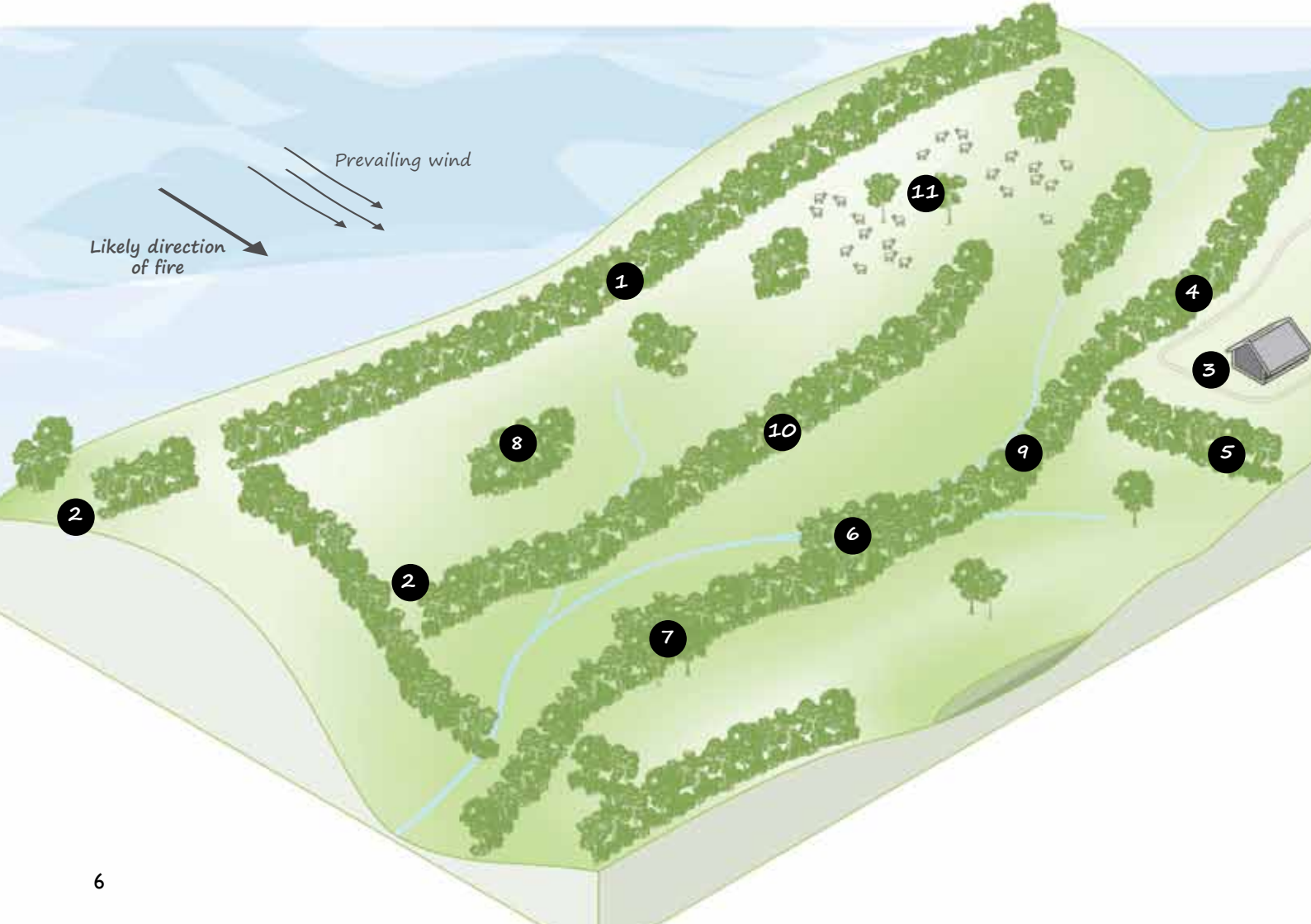
Wildlife shelterbelts provide areas for nesting, feeding and breeding for many birds and other animals. They also provide shelter from severe weather and protection from predators.

RIPARIAN BUFFER SHELTERBELTS

Riparian buffers are planted around diverse types of water bodies such as rivers, streams, creeks, lakes, or wetlands and should be designed to reduce impacts of land use next to the water body.

SHELTERBELTS ON HILLS / SLOPES

Paddock shelterbelts protect crops and soil from climate change impacts (e.g. wind erosion, flooding and bushfire), improving the micro-climate for crop production and protecting livestock from adverse weather.


Prevailing wind
Likely direction of fire
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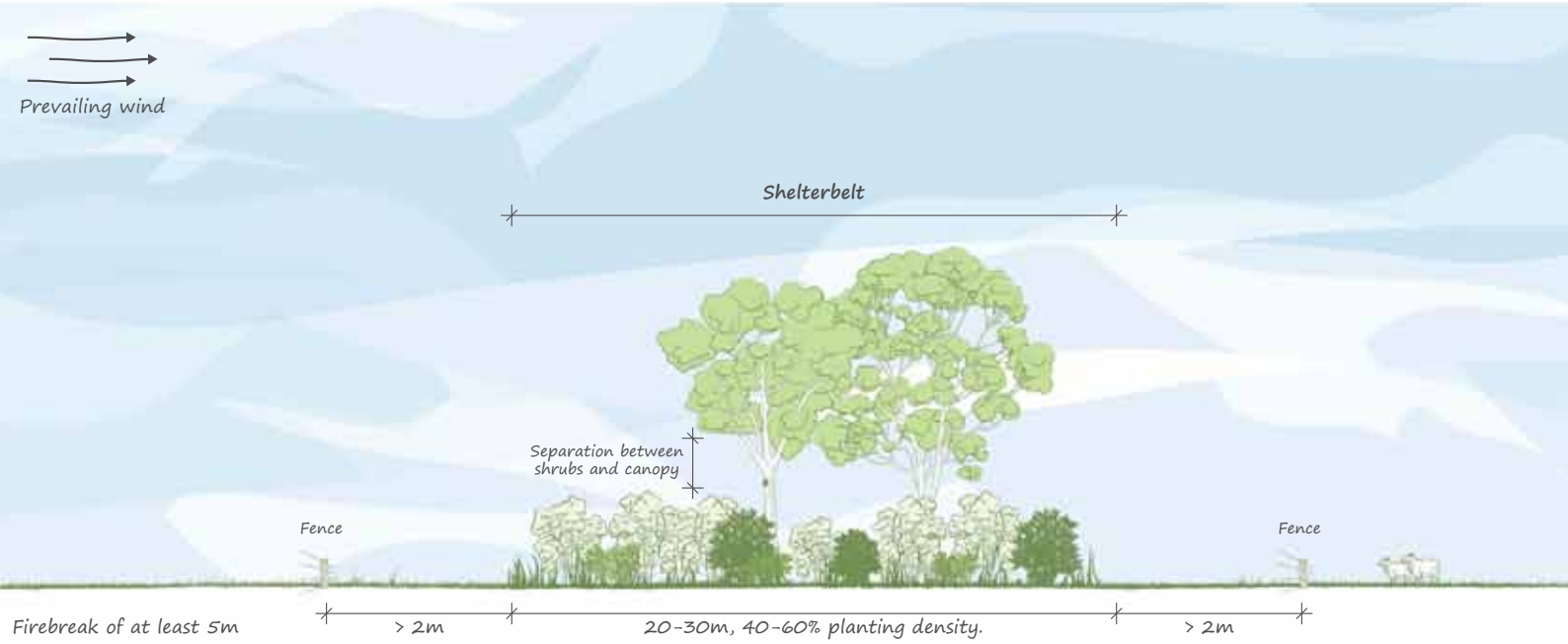
Whole Farm Planning

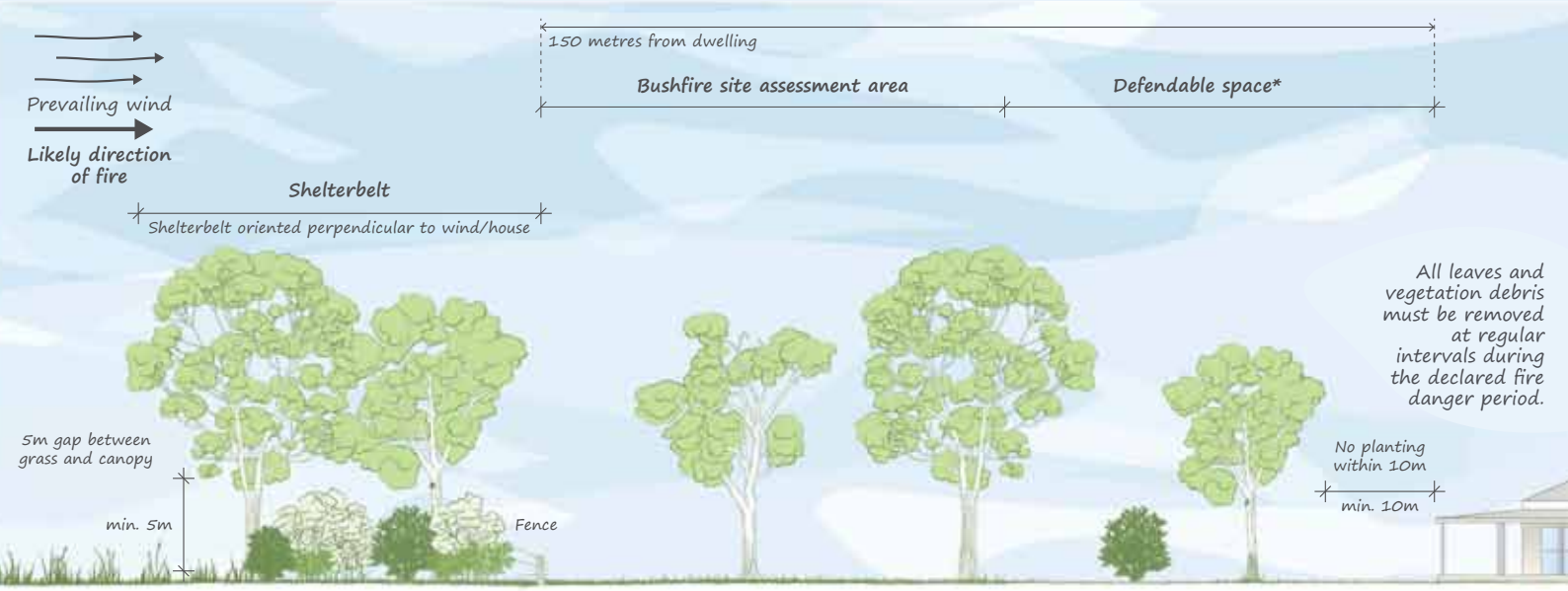
1. Orient shelterbelts towards prevailing winds to protect crops and livestock from extreme weather events, reduce windspeed and catch embers.
2. Break up the continuity of fuel available to reduce bushfire risk by breaking up direct fuel corridors (i.e. direct connection to remnant native vegetation or paddock trees).
3. Shelterbelts should be located outside the bushfire site assessment area.
4. Shelterbelts should be perpendicular to prevailing winds and the asset where possible.
5. Shelterbelts should not 'lead' fire directly towards a built asset.
6. Preserve or restore natural corridors, such as gullies, minor waterways and creeks.
7. Add, restore or build on existing corridors. If possible include scattered remnants in new corridors, as this protects these sites from further decline.
8. Make new plantings or buffers for remnants as wide as practicable (the width chosen is highly dependent on the function of the buffer e.g. bank stability 5m, sediment removal 10-30m, and wildlife habitat 10-300m).
9. Riparian revegetation should ideally be targeted to the northern and western sides of streams (to maximise shading benefits) and in the areas most vulnerable to erosion.
10. Plant shelterbelts along the mid-slope of hills to reduce wind speed, slow the speed and intensity of fire and potentially reduce the distance embers can travel during a fire.
11. Retain isolated paddock trees for shade and shelter for livestock.

Paddock Shelterbelts



Shelterbelts 20-30m wide with 5 rows will provide the most effective wind reduction.
Each shelterbelt should be designed to meet the needs of your specific livestock operation.
Multiple shelterbelts may be required to protect the entire paddock. On most soils, shelterbelt rows can be spaced 400-700m apart.
If access through shelterbelt rows is required, stagger the access points (i.e. not in a straight line) to limit wind funnelling.

Shelterbelts Around built Assets



Indigenous grasses and groundcovers with low flammability to slow fire.

Indigenous trees or shrubs with moderate dense habit that retain little dead leaves or twigs to reduce wind speed and filter embers.

Any planting within the bushfire site assessment area needs to maintain spatial distance and separation between plants as per bushfire management guidelines*.

Defendable space

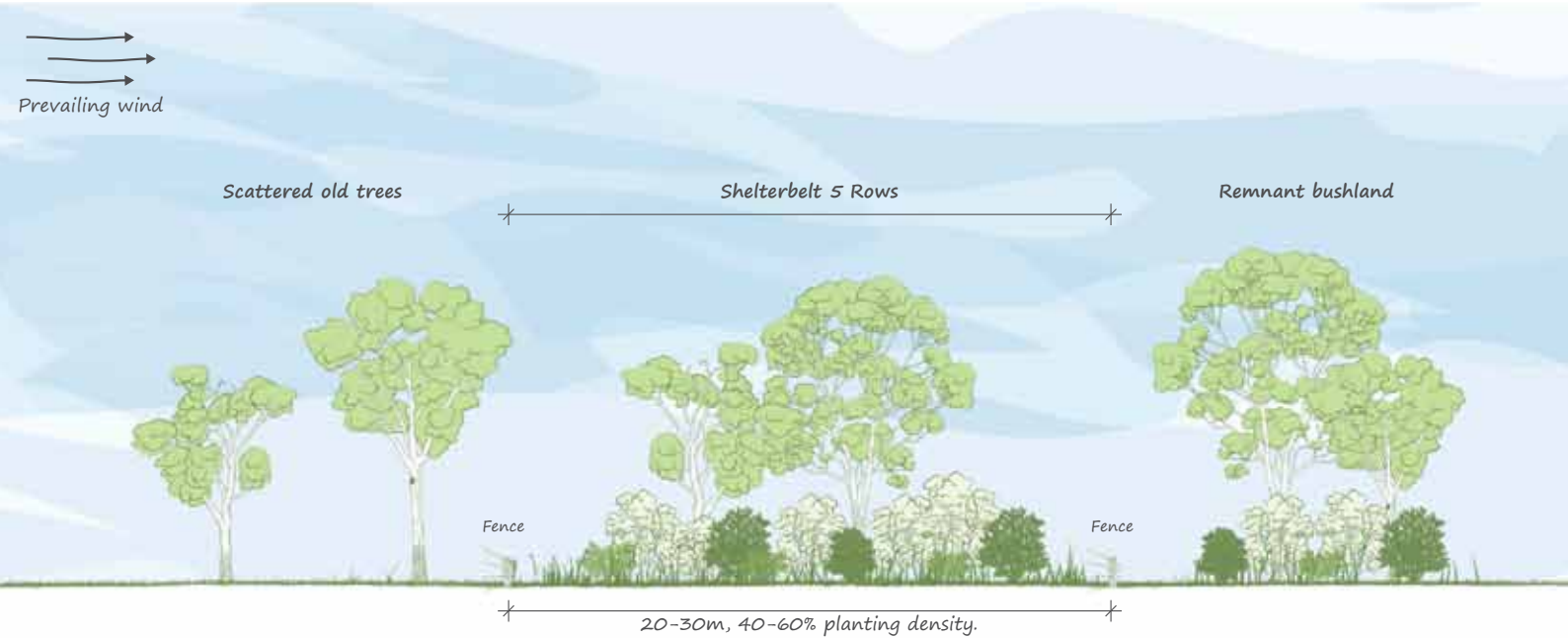
The required dimension and management should be determined from a site based assessment undertaken by a suitably qualified bushfire consultant and as per the bushfire management guidelines*.

***Notes**

For dwellings constructed prior to 2009, *clause 52.12 Bushfire Protection Exemptions* allows a cleared zone of 10m around dwellings, followed by a cleared understory zone to 50m where there is a Bushfire Management Overlay, or cleared understory zone to 30m where there is no Bushfire Management Overlay.

For dwellings constructed after 2009, the defendable space is defined in the Bushfire Management Plan in the permit based on the distances defined in *clause 53.02 Bushfire Planning*.

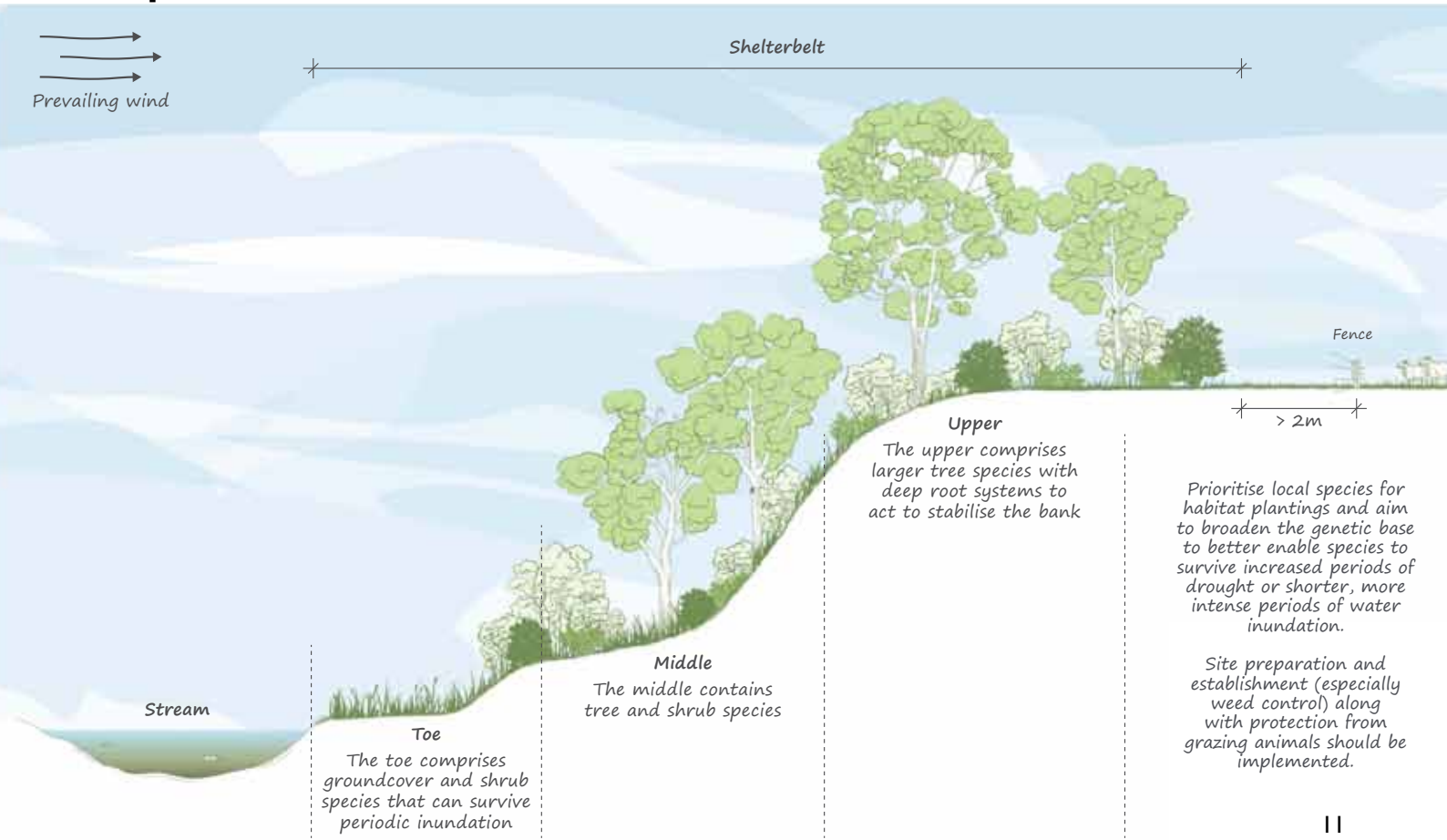
Wildlife Shelterbelts



Five or more rows provide superior wind reduction, allow for a wide mixture of tree and shrub species and create better habitat for wildlife.

Ensure the shelterbelt includes trees as well as shrubs and groundcovers to provide densities that reduce wind speed and catch embers.

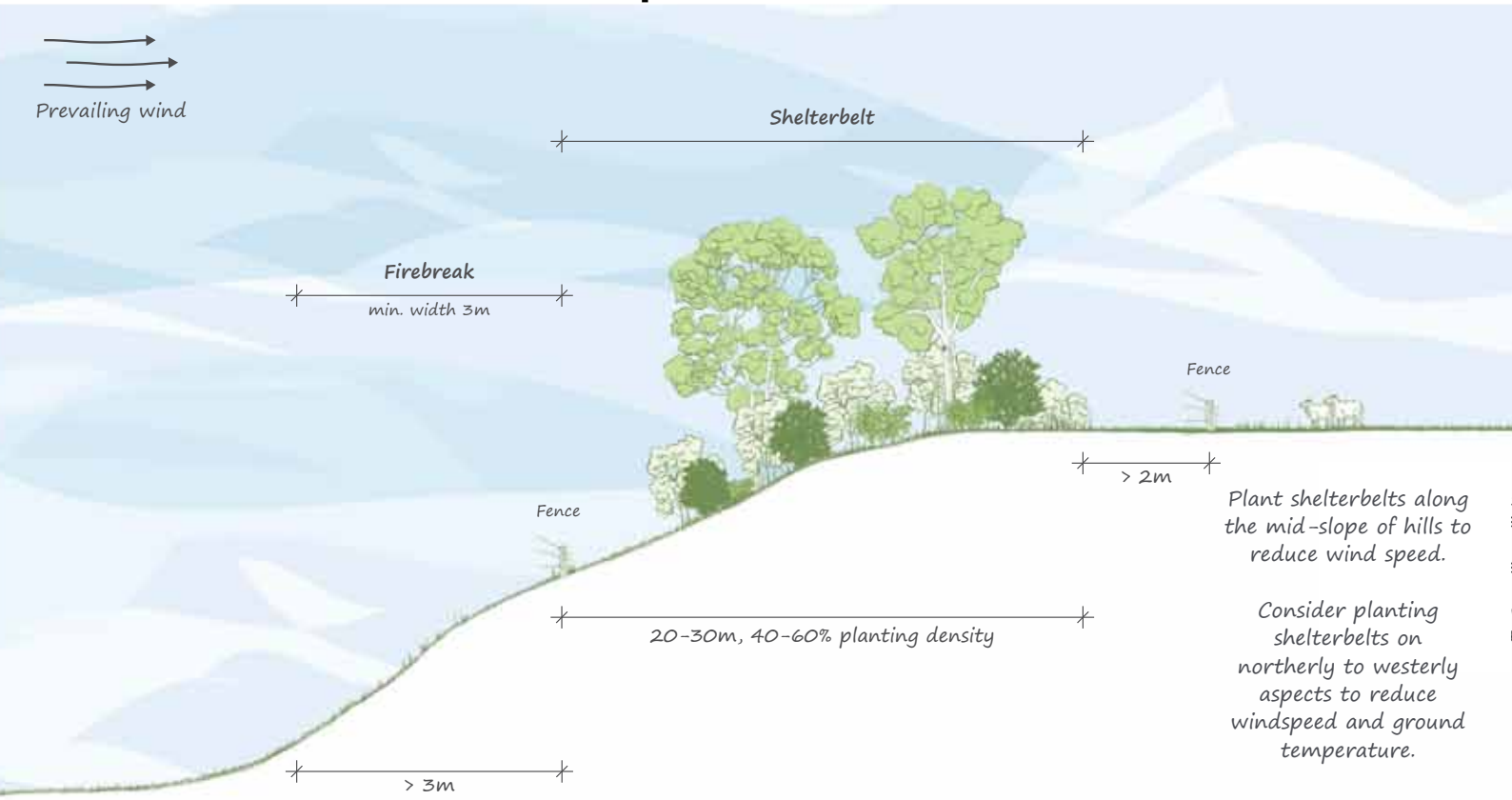
Riparian Buffer Shelterbelt



Prioritise local species for habitat plantings and aim to broaden the genetic base to better enable species to survive increased periods of drought or shorter, more intense periods of water inundation.

Site preparation and establishment (especially weed control) along with protection from grazing animals should be implemented.

Shelterbelts on Hills/Slopes



Plant shelterbelts along the mid-slope of hills to reduce wind speed.

Consider planting shelterbelts on northerly to westerly aspects to reduce windspeed and ground temperature.

Shelterbelts designed with climate change in mind can act to reduce the impacts of climate change. Tonimbuk.

Acacia lined shelterbelt

Caldermeade shelterbelt planting

These guidelines were developed with support from the Victorian Government and Cardinia Shire Council.

Shelterbelt Design Guidelines for Climate Change has been prepared by Eco Logical Australia Pty Ltd with support from Cardinia Shire Council, Port Phillip and Westernport Catchment Management Authority, Western Port Catchment Landcare Network, Bunyip Landcare Group and the landholders of Bunyip North, Garfield North, Tynong North and Tonimbuk. Eco Logical Australia wishes to acknowledge the Bunurong people of the Kulin nation, the Traditional Owners of Bunyip and surrounding areas.

Cardinia

Bunyip Landcare

wpcln
Western Port Catchment Landcare Network