



The Kara Kara Conservation Management Network Inc.



Strategic Plan 2019 - 2023

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Cover images (from left): Swift Parrot (C Tzaros); Silver Banksia (A Hughes); and Yellow Robin's nest (H Yuille).

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Our vision

Healthy, biodiverse and resilient ecosystems in a well-connected landscape.

Our purpose

To protect and enhance habitat critical to the survival of native flora and fauna, in particular threatened and declining species.



Above: View from atop Mt Bolangum, looking east towards Tottington NCR and the St Arnaud Range (D Saxon-Campbell).

Acknowledgement of Country

The Kara Kara CMN acknowledges the Traditional Owners of the land in which the Kara Kara region lies. The Dja Dja Wurrung and Wotjobaluk peoples have been intrinsically linked to this region for millennia, performing age-old ceremonies of celebration, initiation and renewal. We acknowledge their living culture and unique role in sustaining the natural and cultural heritage of this region.

About this Plan

The Kara Kara CMN (or 'Network') is a not-for-profit conservation organisation based at St Arnaud in north-central Victoria.

This *Strategic Plan* provides a focus for the Network's conservation activities for the five years 2019 to 2023. Recognising the important ecological values of the Kara Kara region, it identifies the Network's key conservation targets, the current and ongoing threats to these targets and what strategies we will use to help protect and conserve natural habitats and ecosystems, and the threatened and declining species that rely on them for survival.

Who we are

The Kara Kara CMN was established in 2010 by the Buloke & Northern Grampians Landcare Network to protect biodiversity in the Kara Kara region in north-central Victoria.

Managed by a committee of volunteers drawn from the local community, the Network's membership comprises a mix of individuals, community groups, and public and private land managers, all of whom share a common goal; to conserve the rich biodiversity the Kara Kara region is known for. As such, this Plan is, of necessity, synergistic with the strategies of our regional partner and supporter organisations as we collectively work towards achieving this goal.

At the Kara Kara CMN, we believe that our native species and their habitats are worth protecting, not just as a legacy for future generations of humans to enjoy, but for their own sake. They are our motivation.

The 'Kara Kara region'

Location

Situated predominantly within the Goldfields Bioregion, the Kara Kara CMN's main area of interest – a locality we have called the 'Kara Kara' region for the purposes of this Plan – spans almost 2,000km² or about 195,000 hectares; from St Arnaud in the north to Moonambel in the south, and from Morrl Morrl in the west to the Avoca River in the east (Figure 1 overleaf). At its core is the St Arnaud Range, a prominent north-south orientated ridge of contiguous temperate woodland that takes in the Kara Kara National Park and adjacent nature conservation reserves.

Situated within an agricultural (mixed farming) matrix, additional woodland remnants of varying size lie to the west and east of the St Arnaud Range on both public and private land.

A biodiversity hotspot

The Kara Kara region is known as a 'biodiversity hotspot', not only because of its high proportion of remnant native habitat relative to other areas in Victoria, but also because it is a refuge for a range of species, many of which are threatened or in serious decline.

At a landscape scale, the Kara Kara region has important bio-linkages: to the Grampians in the south-west via the Pyrenees Range and Mt Cole Suite; and to the Box-Ironbark forests of central and north-eastern Victoria through Mt Kooyoora State Park, the Greater Bendigo National Park, Heathcote-Graytown National Park and Chiltern-Mt Pilot National Park.

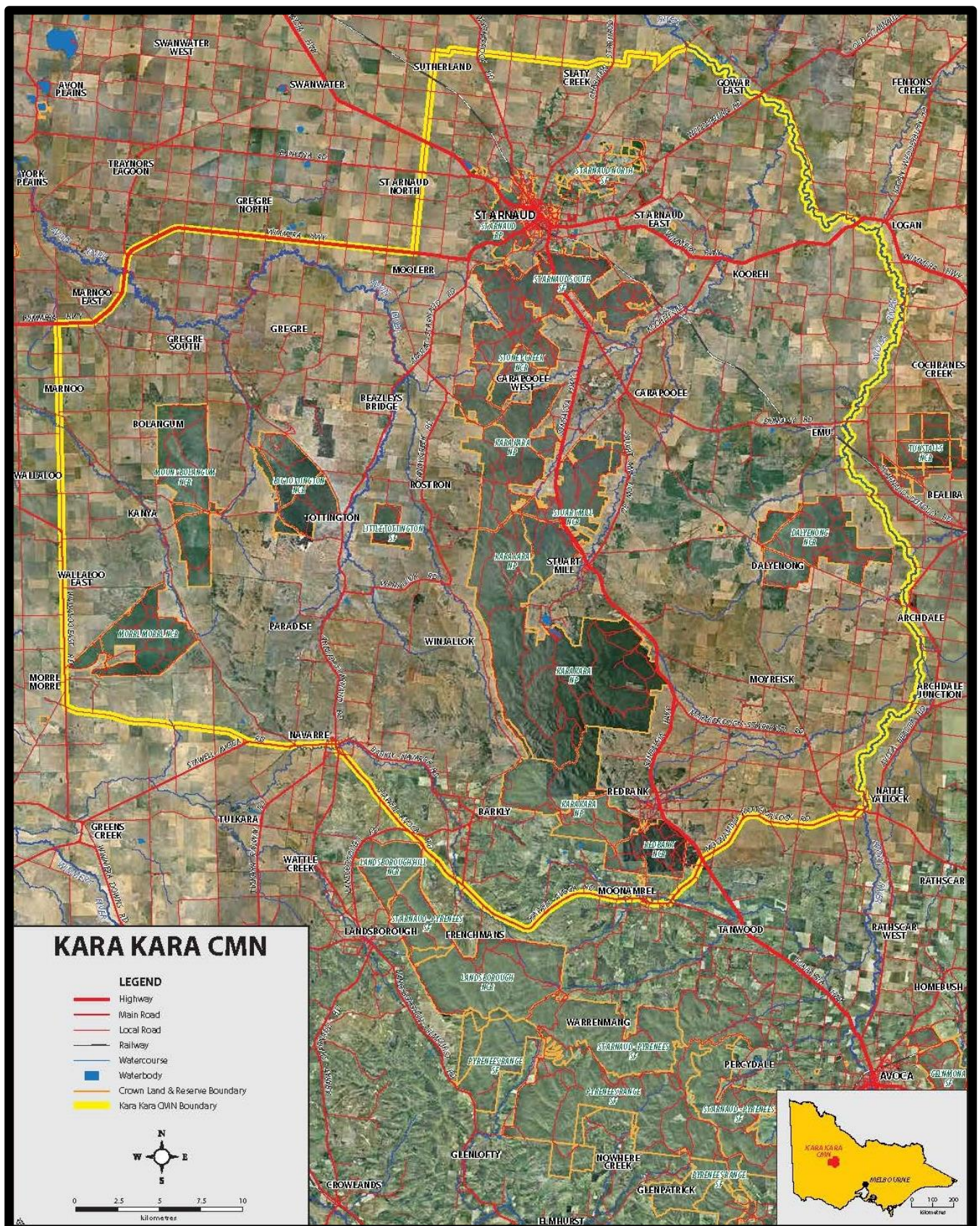


Figure 1: The Kara Kara CMN's main area of interest in north-central Victoria, called 'the Kara Kara region' in this Plan.

Terrestrial habitats

Good-sized remnants of temperate woodland are a feature of the Kara Kara region across several Ecological Vegetation Communities (EVCs) (Appendix 1). These ecologically-important woodland communities occur mainly on public land within the National Reserve System, notably within the Kara Kara National Park and adjacent Nature Conservation Reserves along the St Arnaud Range or as isolated remnants within a cleared agricultural matrix to the east and west of the Range. There are also sizeable remnants on private land. In Victoria, the conservation status of these woodlands ranges from Least Concern to Endangered (Appendix 1).

Another feature of Kara Kara forests is their typically diverse understorey across all structural layers. This structural complexity includes the canopy layer over a mix of small to medium native shrubs (i.e. wattles, rice-flowers, hop-bushes and heaths), as well as herbs, perennial tussock grasses, and both annual and perennial native forbs, including terrestrial orchids.

Riparian habitats

Two river catchments predominate within the Kara Kara region, one on either side of the St Arnaud Range:

- To the west is the land-locked Avon-Richardson river system. Originating in the hills of the northern Pyrenees Ranges to the south-west, the Avon River flows through the western side of the Kara Kara region before joining the Richardson River on the York Plains at Banyena and eventually draining into Lake Buloke in the Mallee region (NCCMA 2013).
- To the east is the Avoca River which delineates the Kara Kara CMN's eastern boundary. It flows northwards through the Kara Kara region before anabranching and terminating at Lake Bael Bael near the Victoria/NSW border.

Both of these river systems provide important habitat for a variety of aquatic flora and fauna.



Above: The Kara Kara National Park is situated on the St Arnaud Range in north-central Victoria (D Saxon-Campbell).

Our conservation targets

The Kara Kara CMN has identified a number of targets for conservation action within our region. Classified within three main categories and identified below, these targets will be the focus of the Network's conservation efforts for the life of this Plan.

1. Threatened and declining vegetation communities	2. Threatened and declining flora and fauna	3. Riparian and aquatic ecosystems
<ul style="list-style-type: none"> ● Box-Ironbark forest ● Grassy woodland ● Heathy woodland ● Plains Woodland 	<ul style="list-style-type: none"> ● Brush-tailed Phascogale ● Woodland birds ● Endemic native orchids ● Buloke (<i>Allocasuarina luehmannii</i>) ● Silver Banksia (<i>Banksia marginata</i>) ● Grey Grass-tree (<i>Xanthorrhoea glauca</i> ssp. <i>angustifolia</i>) ● Spiny Riceflower (<i>Pimelea spinescens</i> ssp. <i>spinescens</i>) 	<ul style="list-style-type: none"> ● Natural creek-lines ● Ephemeral soaks ● Freshwater wetlands



Above: The Box-Ironbark vegetation community (D Saxon-Campbell).

1. Threatened and declining vegetation communities

The temperate woodland communities to be targeted by the Kara Kara CMN for conservation action over the life of this Plan are:

- **Box-Ironbark Forest (EVC 61)** – Occurs on low hills and gently undulating rises on infertile and often stony soils. It features an open canopy and a variety of eucalypts to ~20m, including Grey Box (*Eucalyptus microcarpa*), Red Ironbark (*E. tricarpa*), Yellow Gum (*E. leucoxylon*) and Red Box (*E. polyanthemus*) over a dense to open small tree/shrub layer and a range of herbs and grasses (DSE¹ 2004).

Conservation status:

Victoria – Depleted

Federal – Not listed

Once widespread across central Victoria, Box-Ironbark woodlands have been reduced to about 17 percent of their original extent (ECC 2001) as a result of land clearing, timber harvesting, gold mining and other activities that followed European settlement.

In the Kara Kara region, Box-Ironbark woodland occurs mainly in the Kara Kara National Park and adjacent Nature Conservation Reserves (NCRs) at the northern end of the St Arnaud Range. This area contains one of the largest intact remnants of Box-Ironbark forest remaining in Victoria. Isolated patches also occur on private land and in NCRs to the east and west of the Range.

Box-Ironbark forest is ecologically important as key habitat and an abundant source of nectar and invertebrates (Lollback 2007) for a range of birds and mammals, including threatened and endangered species such as the Swift Parrot (*Lathamus discolor*), Brush-tailed Phascogale (*Phascogale tapoatafa*) and Powerful Owl (*Ninox strenua*).

Active threats: Climate change; Habitat loss and degradation; Loss of genetic diversity; Grazing pressure; Feral and invasive species; Inappropriate fire regimes; Human-nature disconnect. See pages 14 to 19 for more information.

- **Grassy Woodland (EVC 175)** – Occurs on sedimentary soils on the lowest slopes, either on its own or as a mosaic with Alluvial Terraces Herb-rich Woodland (EVC 67). Canopy (to ~15m) species typically include Grey Box and Yellow Gum over sparse but diverse shrub and ground layers (DSE² 2004).

Conservation status:

Victoria – Vulnerable

Federal - Endangered

Cleared mostly for agriculture, Grassy Woodland has been reduced to about 7 percent of its original extent and is one of Victoria's most depleted EVCs (ECC 2001). In the Kara Kara region, it occurs mostly as isolated remnants on both public and private land.

Active threats: Climate change; Habitat loss and degradation; Loss of genetic diversity; Grazing pressure; Feral and invasive species; Inappropriate fire regimes; Erosion; Human-nature disconnect. See pages 14 to 19 for more information.

- **Heathy Woodland (EVC 48)** – Commonly occurring on nutrient-poor soils, Heathy Woodland is dominated by low eucalypts (to ~10m) including Yellow Gum, Grey and Red Box, and Red Ironbark, as well as Bundy (*Eucalyptus gonicalyx* s.l.) and Buloke. It typically lacks a secondary tree layer, but features a diverse low shrub layer and sparse but diverse ground layer (DSE³ 2004).

Conservation status:

Victoria – Depleted

Federal – Not listed

In the Kara Kara region, the largest remnants of Heathy Woodland occur in the Moolerr (I45) Bushland Reserve, Dalyenong NCR, Dalyenong (I59) Bushland Reserve and on private land, all east of the St Arnaud Range.

Heathy Woodland is key habitat for rare native orchids and other geophytes. Some of these, such as the Stuart Mill Spider Orchid (*Caladenia cretacea*) and Red-Cross Spider Orchid (*C. cruciformis*), are endemic to the north-central region of Victoria.

Active threats: Climate change; Habitat loss and degradation; Loss of genetic diversity; Grazing pressure; Feral and invasive species; Inappropriate fire regimes; Human-nature disconnect. See pages 14 to 19 for more information.

- **Plains Woodland (EVC 803)** – Occurring on fertile, poorly drained soils on flat or gently undulating plains, this EVC is an open eucalypt woodland to ~10m, with a sparse shrub layer over a species-rich grassy and herbaceous ground layer (DSE⁴ 2004).

Conservation status:

Victoria – Endangered

Federal – Not listed

The majority of Plains Woodland has been cleared for agriculture and now occurs only as small, isolated patches on the plains to the west and north-west of St Arnaud. Endangered Buloke typically features prominently in this EVC, along with Grey and Yellow Box, and River Red Gum (*E. camaldulensis*). It is also potential habitat for the endangered Buloke Mistletoe (*Amyema linophylla* ssp. *orientale*) and a suite of threatened herbaceous species.

Active threats: Climate change; Habitat loss and degradation; Loss of genetic diversity; Grazing pressure; Feral and invasive species; Human-nature disconnect. See pages 14 to 19 for more information.



Above: Grey Grass-tree flower with butterfly pollinator (D Saxon-Campbell).

2. Threatened and declining fauna and flora

Collectively, the temperate woodlands of the Kara Kara region provide habitat for a rich diversity of native flora and fauna. Over time, however, a range of threatening processes (see page 14) – most of which are ongoing – have impacted on regional biodiversity to the extent that many species are in serious decline. Some are listed as threatened under Federal and/or State legislation (Fauna - Appendix 2; Flora – Appendix 3); however, there are many more declining species within the Kara Kara region that are not afforded official protection from Federal and State threatened species legislation.

Threatened and declining fauna to be specifically targeted for conservation action by the Kara Kara CMN are discussed in this section.

- **Brush-tailed Phascogale**

The Brush-tailed Phascogale, or Tuan, is a nocturnal arboreal marsupial with a distinctive brush-like tail. It inhabits a variety of dry sclerophyll woodland habitats where it forages almost exclusively in the canopy on spiders, insects, small birds and mammals, and eucalypt nectar.

Phascogales shelter and breed in nests in tree hollows, either in stumps on the ground or in trees up to 11m above ground level.

Mating typically occurs in May and June, after which the males die. Females produce litters of 7-9 young from mid-June to early August after a gestation period of about 30 days.

The ongoing degradation and fragmentation of woodland habitats, a lack of suitable tree hollows and predation by foxes and feral cats and a range of other threats (see below) have contributed to the decline of Brush-tailed Phascogale populations in Victoria, including within the Kara Kara region.

The Kara Kara CMN has been working to improve and extend habitat for this species through its nest-box and revegetation programs.

Conservation status:

Victoria – Endangered

Federal – Not listed

Active threats: Climate change; Habitat loss and degradation; Loss of genetic diversity; Feral and invasive species; Inappropriate fire regimes; Human-nature disconnect. See pages 14 to 19 for more information.

- **Woodland birds**

Woodland birds have been a primary conservation target for the Kara Kara CMN since our inception in 2010, in particular, species that are threatened or endangered and listed for protection under Victorian or Federal legislation (Appendix 2). These species include Barking Owl (*Ninox connivens*), Bush Stone-Curlew (*Burhinus grallarius*), Chestnut-rumped Heathwren (*Calamanthus pyrrhopygius* ssp. *pyrrhopygius*), Crested Bellbird (*Oreoica gutturalis*), Diamond Dove (*Geopelia cuneata*), Diamond Firetail (*Stagonopleura guttata*), Hooded Robin (*Melanodryas cucullata*), Painted Honeyeater (*Grantiella picta*), Powerful Owl (*Ninox strenua*), Red-tailed Black-Cockatoo (*Calyptorhynchus banksii* ssp.

Conservation status:

Victoria –

- Temperate woodland bird community - Threatened
- Individual species – Varies, from not listed to Critically endangered;

Federal – From not listed to Critically Endangered

graptogyne), Speckled Warbler (*Chthonicola sagittata*), Square-tailed Kite (*Lophoictinia isura*) and Swift Parrot (*Lathamus discolor*).

However, there is a growing suite of woodland bird species that, while not listed on Victorian or Federal threatened species' lists, are also in serious decline. This includes, but is not limited to, familiar and iconic species such as the Laughing Kookaburra (*Dacelo novaeguineae*), Southern Boobook (*Ninox boobook*) and Willie Wagtail (*Rhipidura leucophrys*) (BLA 2015; Milman & Evershed 2015).

The Kara Kara CMN acts to conserve woodland birds through a range of habitat restoration programs. Since 2015 the Network has also actively surveyed bird assemblages on a quarterly basis across up to 20 woodland sites, submitting results to key research databases such as BirdLife Australia's 'Birdata' and the Victorian Biodiversity Atlas.

Active threats: Climate change; Habitat loss and degradation; Loss of genetic diversity; Grazing pressure; Feral and invasive species; Inappropriate fire regimes; Human-nature disconnect. See pages 14 to 19 for more information.

- **Endemic native orchids**

The native woodlands of the Kara Kara region are habitat for a suite of rare and delicate native orchids, some of which are found nowhere else. Over time, however, habitat loss and degradation and the drying climate has dramatically reduced native orchid populations within the region to the extent that those remaining have become isolated, both geographically and genetically.

Conservation status:

Victoria - Rare to endangered

Federal – From not listed to Endangered

Species of particular conservation concern include the Stuart Mill Spider Orchid, Red Cross Spider Orchid, Candy Spider Orchid (*Caladenia versicolor*), Brilliant Sun-orchid (*Thelymitra mackibbinii*), Lowly Greenhood (*Pterostylis despectans*), Woodland Leek Orchid (*Prasophyllum* sp. aff. *validum*) (DELWP³ 2016) and Bristly Greenhood (*Pterostylis setifera*) (DEPI 2014).

Active threats: Climate change; Habitat loss and degradation; Loss of genetic diversity; Grazing pressure; Inappropriate fire regimes; Human-nature disconnect. See pages 14 to 19 for more information.

- **Buloke (*Allocasuarina luehmannii*)**

Endemic to south-eastern Australia, Sheoak-like Buloke is a character species of several vegetation communities, including Heathy Woodland (EVC 48), Alluvial Terraces Herb-rich Woodland (EVC 67), Plains Grassy Woodland (EVC 55) and Plains Woodland (EVC 803), all of which occur on the plains or at low elevations (DSE^{3,4,5,6} 2004).

Conservation status:

Victoria – Endangered

Federal – Not listed

Within the Kara Kara region, Buloke occurs as mosaic patches on public and private land mainly on and to the east of the St Arnaud Range. On the plains to the north and north-west of St Arnaud, however, Buloke has been extensively cleared for agriculture and is limited to isolated remnants which face ongoing threats from a range of processes (DEHA 2008). As a result, remaining stands of Buloke are small, isolated and often in a degraded condition.

A threatened species in itself, Buloke is also key habitat for the endangered south-eastern subspecies of the Red-tailed Black Cockatoo, which is occasionally still recorded in the Kara Kara region.

Active threats: Climate change; Habitat loss and degradation; Loss of genetic diversity; Grazing pressure; Human-nature disconnect. See pages 14 to 19 for more information.

- **Silver Banksia (*Banksia marginata*)**

Shown as 'Honeysuckle' on colonial survey maps, Silver Banksia (*B. marginata*) was once common across south-eastern Australia. Widespread land clearing over time has seen the range of this species decline to the point that it now occurs only in small isolated patches or as single aging trees. Despite this, Silver Banksia is not listed for protection under either Victorian or Federal legislation.

Conservation status:

Victoria – Not listed

Federal – Not listed

To help save this beautiful and iconic species, in 2015 the Kara Kara CMN joined with other conservation groups across southern, central and northern Victoria in a collaborative partnership known as The North-Central Silver Banksia Group. So far, this group has been successful in identifying and collecting leaf samples from remnant populations throughout much of regional Victoria. Subsequent genetic testing of these samples revealed, as expected, that these populations are at serious risk of inbreeding (Miller 2018). If inbreeding was to occur, the remaining stands of Silver Banksia would suffer a further loss of vigour, even poorer germination rates and substantially reduced resilience in the face of environmental 'shocks' such as disease and climate change.

Seed gathered from the healthiest of these remnant populations is now being used to establish several *B. marginata* seed orchards around the State and help secure the species' future. Seedlings produced by these orchards will be reintroduced into the remnant Banksia populations to improve gene flow and also used in future revegetation works on both public and private land.

Within the Kara Kara region, the Network has also been working to save this iconic species by monitoring local Silver Banksia populations and ensuring that the species is included in the mix of native seedlings used in our annual revegetation plantings.

Is it too late for the Silver Banksia? It is too soon to tell; however, there is little doubt that the current and rapid drying and warming trend in our climate poses a significant challenge to the ongoing survival of this species, particularly in central and northern Victoria.

Active threats: Climate change; Habitat loss and degradation; Loss of genetic diversity; Grazing pressure; Human-nature disconnect. See pages 14 to 19 for more information.

- **Grey Grass-tree (*Xanthorrhoea glauca* ssp. *angustifolia*)**

The Kara Kara region contains at least four, possibly more, known relict populations of the Grey Grass-tree: two on public land, one on private land and one in a privately-owned conservation reserve.

Conservation status:

Victoria – Endangered

Federal – n/a

This rare Grass-tree subspecies is found only in Victoria where it occurs in woodland, or in heathland without a consistent eucalypt canopy, and on impoverished soils on inland hills and foothills of the Great Dividing Range. Another subspecies, *X. glauca* ssp. *glauca* occurs in New South Wales. Taxonomically, the features that separate the two subspecies are leaf shape, leaf width and leaf colour (Bellette 2014).

Thought to have once been reasonably widespread in Victoria, populations of *X. g. angustifolia* have been fragmented over time by a range of historical land management practices to the point where they are now small and geographically isolated. *X. g. angustifolia* is known to suffer high mortality after fire and, like all *Xanthorrhoea* species, is highly susceptible to grazing and the introduced soil pathogen, *Phytophthora cinnamomi* (Bellette 2014).

Within the Kara Kara region, the largest of the three known relict populations, at View Point near St Arnaud, contains just under 1,000 plants and has been fenced to exclude grazing macropods and foster natural recruitment. The two smaller populations are more open to grazing pressure, while all three are at risk from fire.

Active threats: Climate change; Habitat loss and degradation; Loss of genetic diversity; Grazing pressure; Inappropriate fire regimes; Human-nature disconnect. See pages 14 to 19 for more information.

- **Spiny Riceflower (*Pimelea spinescens* ssp. *spinescens*)**

Endemic to western Victoria, the Spiny Riceflower is a small shrub (<50cm), so named because of the small spine-tipped, partly-herbaceous stems on mature plants. It typically occurs in grassland or open shrubland on basalt-derived soils across the central Victorian volcanic plains, and on alluvial soils across the plains of north-west Victoria, often in association with Spear-grasses (*Austrostipa* spp.), Wallaby-grasses (*Austrodanthonia* spp.) and Kangaroo Grass (*Themeda triandra*) (DSE⁷ 2008) and a variety of other grassland species.

P. s. spinescens is slow-growing and long-lived, with separate male and female plants that are visually different when in flower. Plants are insect-pollinated, with flowering occurring from April to August. The species is known to respond well to fire (DSE⁷ 2008; Reynolds 2013).

With the majority of plains grassland having been cleared for agriculture, remnant populations of *P. s. spinescens* are typically small and isolated, and restricted mainly to conservation and flora reserves, road and rail reserves, rural cemeteries and airports (DSE⁷ 2008). Accordingly, current and ongoing threats to this species include weed invasion, road works and grazing (DSE⁷ 2008).

Active threats: Climate change; Habitat loss and degradation; Loss of genetic diversity; Grazing pressure; Feral and invasive species; Human-nature disconnect. See pages 14 to 19 for more information.

Conservation status:

Victoria – Endangered

Federal – Critically
Endangered

3. Riparian and aquatic ecosystems

Waterways in the Kara Kara region are home to a rich variety of flora and fauna, as well as providing a source of fresh water to sustain many terrestrial species. They are also refuges in times of drought, and during and after bushfire in woodland areas. Maintaining the health of these habitats and ecosystems is therefore crucial for sustaining biodiversity, both regionally and downstream.

- **Natural creek-lines**

Natural creek-lines provide important bio-linkages between remnant patches of habitat, facilitating the dispersal of native wildlife and plants, and the movement of water and nutrients during episodic flooding events.

Conservation status:

Victoria – Not listed

Federal – Not listed

The Kara Kara region encompasses part of the upper catchments of the Avoca and Avon Rivers, with first and second order streams including the Sandy, Wallaloo and Andersons Creeks in the west and the Campbells, Middle, Strathfillan, Western and Cherry Tree Creeks in the east. Flows in both river systems are highly variable according to rainfall, and stream condition varies from moderate to poor (NCCMA 2007; NCCMA 2014).

Flowing through a variety of land uses on both public and private land, these natural creek-lines are subject to a range of environmental and human-induced impacts, many of which have the potential to degrade water quality with ensuing negative effects on biodiversity.

Active threats: Climate change; Habitat loss and degradation; Loss of genetic diversity (of species); Grazing pressure; Feral and invasive species; Inappropriate fire regimes; Erosion; Human-nature disconnect. See pages 14 to 19 for more information.

- **Ephemeral soaks**

The term 'ephemeral soaks' refers to persistent wet or boggy areas that occur around the base of steep plutons of igneous rock, such as granite outcrops, following periods of prolonged and/or intense rainfall. Caused by lateral seepage, these soaks typically occur when hydrological features such as ground water, wetlands, swamps and rivers have been 'recharged', as occurred in 2010/11 (WCMN 2018).

Conservation status:

Victoria – Not listed

Federal – Not listed

In north-central Victoria, ephemeral soaks can be found around the base of landmark geological features such as Mt Kooyoorra, Mt Korong, Mt Buckrabanyule and the Yawong Hills (WCMN 2018), as well as around the granite outcrops at Emu, near St Arnaud.

Ephemeral soaks are home to unique floristic communities comprising mostly herbaceous species, many of which are now at risk from a range of threats.

Active threats: Climate change; Habitat loss and degradation; Loss of genetic diversity; Grazing pressure; Feral and invasive species; Human-nature disconnect. See pages 14 to 19 for more information.

- **Freshwater wetlands**

Victoria's north-central region contains over 1,600 wetlands of significant size (NCCMA 2015) as well as small, temporary freshwater wetlands that may become inundated on a seasonal basis.

All of these wetlands are unique ecosystems that support a diverse array of fauna and flora. The majority of these wetlands are outside of the Kara Kara region, however, their environmental integrity is very much dependent on the health of feeder creek-lines and rivers in the upper catchment, including in the Avoca and Avon-Richardson systems.

Conservation status:

Victoria – Not listed

Federal – Critically Endangered (specifically small seasonal herbaceous wetlands)

Active threats: Climate change; Habitat loss and degradation; Loss of genetic diversity (of species); Grazing pressure; Feral and invasive species; Erosion; Human-nature disconnect. See pages 14 to 19 for more information.



Above: Campbells Creek, a tributary of the Avoca River (D Saxon-Campbell).

Active threats to our conservation targets

Some of the key threats that are actively impacting on our conservation targets have been identified below and are rated in Table 1 on page 20. Strategies and actions that the Network will utilise to help address these threats within the Kara Kara region are outlined on pages 21 to 31.

Climate change

Historically, the climate of the Kara Kara region has been characterised by hot, dry summers and cool winters. Annual rainfall for St Arnaud averaged about 500mm, with most occurring between late autumn and spring (ABOM 2019). In recent decades, however, the climate of south-eastern Australia has experienced a distinct warming and drying trend, manifest through –

- *Warmer temperatures*, which have increased by $\sim 1^{\circ}\text{C}$ on average since 1910. This warming trend has also seen an increase in the frequency of extreme heat events and dangerous bushfire weather, as well as in the length of the annual fire season and in the frequency and severity of drought conditions.
- *Significantly reduced autumn to spring rainfall*, resulting in decreased stream-flows for most of the year. Further, in recent decades a higher proportion of total annual rainfall has come from 'heavy rain events', resulting in flash flooding. Droughts have also become more prevalent. (ABOM/CSIRO 2018)

All of these impacts are predicted to become more pronounced and prevalent into the future (ABOM/CSIRO 2018). They will also interact with, and compound, the effects of the other threatening processes identified elsewhere in this section.

Regional species' impacts

Alongside habitat loss, anthropogenic climate change has emerged as a significant threat to biodiversity (Lindenmayer *et al.* 2010), creating survival challenges for species across a number of scales; from individuals and populations to communities and ecosystems. Impacts range from subtle to dramatic (Hoffmann *et al.* 2019). Species with low genetic variability, those that are dependent on a particular disturbance regime – for example, fire – and/or those that are reliant on a particular habitat or moisture regime (Lee *et al.* 2015, Hoffmann *et al.* 2019) are particularly vulnerable.

Examples of climate change impacts are emerging across Australia. Many of these same impacts are also being observed in and around the Kara Kara region. They include:

- Broad-scale canopy dieback within eucalypt woodland remnants and corridors due to severe drought-stress. As well as altering forest structure, dieback increases fine fuel loads and by extension, fire risk and spread rates (Hoffmann *et al.* 2019).
- Increasing woodland vulnerability to repeated and severe infestations of sap-sucking psyllids (*Cardiaspina* sp.) and boring insects, an impact that is being driven by drought-stress and dieback. The repeated defoliation associated with these outbreaks further contributes to tree dieback and has negative consequences for woodland biodiversity and function (Hoffmann *et al.* 2019). Psyllid outbreaks are expected to increase with the altered rainfall patterns and increased frequency of heat waves associated with climate change (Hoffmann *et al.* 2019).
- Changes in the composition of woodland vegetation to favour shrubs, driven by warmer temperatures and 'too-frequent' fires (Hoffmann *et al.* 2019), with cascading effects for woodland fauna and flora (Butt *et al.* 2013).
- Phenological changes arising from warming temperatures and drying conditions leading to disruptions in species/eco-community interactions. For example, changes in the timing,

length and intensity of flowering (Rawal *et al.* 2015), fruiting, and seed development in plants is likely to drive range shifts or mortality in species such as birds, bats and insects that rely on these resources (Butt *et al.* 2013). Threatened orchids that are reliant on a particular pollinator (Hoffmann *et al.* 2019), including some species endemic to the Kara Kara region, will be particularly vulnerable to these changes.

Modelled climate change responses for three key eucalypt species commonly found in the Kara Kara region – Grey Box, Red Ironbark and Red Box – showed that decreases in the intensity and duration of flowering for all three species are likely (Rawal *et al.* 2015).

Changes to flowering times of native trees and shrubs, or the complete lack of flowering events altogether, is already having an impact on the Kara Kara CMN's activities. Wholesale nurseries who propagate native tube-stock are having difficulty in sourcing seed, leading to an inability to supply or short-supply in some species. This shortage is beginning to impact on the mix of species available for the Network's revegetation projects.

- The increasing potential for heat stress impacts on native wildlife, particularly in the arid zone, with birds and some mammals (i.e. bat species) likely to be the worst affected. Increasing mortalities will be the most obvious of these impacts, but more subtle and longer-term effects potentially include changes in body condition leading to decreased survival, reduced reproduction and greater susceptibility to disease. These potential effects are of particular concern for threatened species (McKechnie *et al.* 2013).
- Declines and extinctions in insect populations, which have been observed not only in the Kara Kara region but elsewhere in Australia and around the globe. Habitat loss, the rise of agricultural monocultures and intense insecticide use are also contributing to these declines. 'Beneficial taxa' such as butterflies, bees and ants – insect orders that perform essential ecological services – are among those affected, with flow-on impacts for other species in the food chain such as the frogs, lizards and birds that feed on them (Sánchez-Bayo & Wyckhuys 2019).

Habitat loss and degradation

The loss, fragmentation and degradation/simplification of natural habitats as a result of land use changes since European settlement continues to be a key driver of species declines in the Kara Kara region.

The majority of remnant woodland in the region – with the exception of some isolated patches containing old-growth eucalypts – is secondary forest, containing multi-stemmed coppice regrowth which lacks the natural tree hollows needed by a variety of hollow-dependent species for shelter, breeding and protection from predators.

The loss of large, old-growth eucalypts, both from within remnant native woodland and, increasingly, mature paddock trees on the fertile plains is also of concern. These trees are succumbing to old age, disease and/or dieback as a result of a drying climate.

Further, large areas of woodland, particularly on public land that takes in the Kara Kara National Park and adjoining conservation reserves, are severely lacking in understorey which increases the vulnerability of ground-dwelling/nesting bird and mammal species to predation by feral predators. While understorey loss is mostly attributable to the considerably reduced rainfall and a booming kangaroo population, illegal firewood removal is also a contributing factor.

Loss of genetic diversity

As native habitats become more and more fragmented, flora populations and those of less mobile faunal species can become smaller and geographically isolated. Opportunities for gene flow between these small isolated populations is dramatically reduced with the result that, over time, genetic diversity is lost. This loss of diversity makes such populations increasingly

vulnerable to environmental shocks and the impacts of a range of threatening processes, which ultimately threaten their long-term survival (Hoffmann *et al.* 2019).

Grazing pressure

Intense grazing pressure has had a massive adverse impact on the condition and function of temperate woodland ecosystems within the region. Factors such as easy access to permanent water (i.e. farm dams) and improved (both quality and quantity) pastures, a lack of natural predators and habitat fragmentation have combined to generate a boom in native macropod populations, notably of Eastern Grey Kangaroos (*Macropus giganteus*) (Howland 2016) but also Western Grey Kangaroos (*M. fuliginosus*) and Black Wallabies (*Wallabia bicolor*). European Hares (*Lepus europaeus*) and European Rabbits (*Oryctolagus cuniculus*) also contribute to grazing pressure and habitat loss.

Grazing and the trampling of native understorey by Eastern Grey Kangaroos in particular, has been linked to the decline of multiple taxa across south-eastern Australia, including various species of ground-foraging/nesting birds and threatened species such as the Striped Legless Lizard (*D. impar*) (Howland 2016) which was once widespread in the Kara Kara region.

Feral and invasive species

The Australian biota has been shaped by human activities for millennia; however, in the past few centuries and particularly since European settlement, these activities have been the key driver of the extinction or near extinction (i.e. extinct in the wild) of over 30 native species across Australia and New Zealand – a rate that is substantially above the 'natural' background extinction level contained in the fossil record (Bellard *et al.* 2016).

Many of these losses have occurred as a result of alien or exotic species that have been deliberately or accidentally introduced or transported by humans (Bellard *et al.* 2016).

Introduced predators

Introduced opportunistic predators such as the European Red Fox (*Vulpes vulpes*) and Feral Cat (*Felis catus*) continue to pose a direct threat to native wildlife in the Kara Kara region. This is despite ongoing strategic fox baiting programs undertaken by State Government agencies on public land, and the co-ordinated baiting and shooting programs of local landholders assisted by incentives such as the Fox and Wild Dog Bounty (AV 2017¹). Currently there is still no effective broad-scale control method for feral cats (Legge *et al.* 2017).

Foxes are distributed across mainland Australia except for the tropical north (AV 2017²) and are typically concentrated in areas of highest food availability. This is consistent with observations of fox behaviour in the Kara Kara region, which suggests that foxes live on forest edges and feed mostly on private land.

In contrast, feral cats are known to occur across continental Australia in almost all environments, with regional densities varying according to climatic conditions, prey abundance (of both native and feral species such as rabbits) and the availability of food from alternate sources (i.e. rubbish dumps, grain silos etc) (AV 2018¹). Cats are cryptic, mostly nocturnal and trap-shy, making them difficult to capture. Unlike foxes, they are rarely seen. Despite this, cat densities in natural environments, including within the native woodlands in the Kara Kara region, are conservatively estimated to be in the range of 0.2-0.7 cats/km² (Legge *et al.* 2017).

Foxes and cats are both declared pest animals under the Victorian Catchment and Land Protection Act 1994 (CaLP Act) (AV 2018²), although the latter was declared only from 26 July 2018 and only on public land managed by Parks Victoria and the Department of Environment, Land, Water & Planning (DELWP¹ 2018). This includes the Kara Kara National Park and Nature Conservation Reserves throughout the Kara Kara region. Fox and cat predation are also listed as key threatening processes under the EPBC Act 1999 (DEE¹ 2019).

Introduced herbivores

Two herbivorous pests introduced to Australia – the European Hare and European Rabbit – are widespread in the Kara Kara region on both public and private land.

Both species are environmental and agricultural pests, grazing on native understorey plant communities including threatened native orchids, pastures and crops. They also compete with native fauna for food and habitat. Hares and rabbits are a significant threat to revegetation project sites, nipping off seedlings and gnawing on the bark of young trees and shrubs. Rabbits, with their often-large colonial warrens, also contribute to soil erosion and associated waterway sedimentation (AV 2017²).

Where Hares were once only rarely seen in the Kara Kara region, there has been a noticeable increase in sightings in recent years. In contrast, Rabbit populations have been well established in the region for decades, although the size of populations can vary significantly from year to year according to the incidence of biological controls such as *Myxoma* virus and *Calicivirus*.

While they add to the pressure by native grazers, on the upside, hares (adults and leverets) and rabbits are both common prey species for foxes and feral cats – thereby easing the pressure on native species to a degree – and also for larger raptors such as the Wedge-tailed Eagle (*Aquila audax*) (AV 2017²).

Like foxes and cats, the European Hare and European Rabbit are also listed as established pest animals under the CaLP Act 1994 (AV 2018²).

Introduced birds

Other well-established feral species in the Kara Kara region include the House Sparrow (*Passer domesticus*), Common Starling (*Sturnus vulgaris*), Common Blackbird (*Turdus merula*) and the European Honey Bee (*Apis mellifera*). Another species, the aggressive Common (or Indian) Myna (*Sturnus tristis*), is a relatively new invader into the region.

All of these species contribute to the decline of native species by passively or aggressively out-competing them for a range of resources – from food to structural resources such as natural tree hollows.

Environmental weeds

Environmental weeds pose a significant threat to biodiversity because of their tendency to become invasive, in the process outcompeting native species and eroding the quality of habitats. Most environmental weeds are exotic species introduced into Australia through the agriculture or horticulture industries; however, native plant species can also become 'weedy' when introduced outside their known biogeographic range (Gallagher & Leishman 2014).

Agriculture is the primary land use within the Kara Kara region and most environmental weeds are spread during grain cultivation/transportation and/or by grazing domestic livestock. Native herbivores also graze on agricultural land and disperse weed seeds into woodland habitat. Weeds species can also be spread along creek lines, or anywhere regularly disturbed by natural processes (e.g. floods) or human activities such as cultivation, grazing and machinery operation and movement.

Environmental weeds commonly found in the Kara Kara region and their classifications under Victorian and Federal legislation are listed in Appendix 4.

Introduced pathogens

The introduced pathogen, Myrtle Rust (*Puccinia psidii*), was first detected in Australia in 2010 and soon became established in natural ecosystems along the east coast in an area stretching from southern New South Wales to Far North Queensland (Carnegie *et al.* 2016) where it has caused significant damage and tree mortality (Pegg *et al.* 2018). It has also become

established, albeit with limited distributions, in Tasmania, the Northern Territory and in Victoria (AV 2017³) although reports of Myrtle Rust to the west of the Great Dividing Range have so far been few (Pegg *et al.* 2018).

This invasive pathogen infects and kills newly expanding leaves, stems, fruits and flowers of plants in the Myrtle (Myrtaceae) family; a taxa that dominates Australia's native flora, with Eucalypts, Callistemons, Melaleucas, and Tea Trees (*Leptospermum*) among its most iconic genera.

Based on experiences elsewhere, Agriculture Victoria has stated that eradication of Myrtle Rust is not possible and, as such, the focus is now on management to minimise spread and impact (AV 2017³). It is therefore reasonable to assume that this pathogen represents a significant potential threat to native woodlands in the Kara Kara region, and especially to already threatened and declining species such as Blakely's Red Gum (*E. blakelyi*).

Inappropriate fire regimes

At the time of development of the Kara Kara CMN's last Strategic Plan (i.e. *Strategic Plan 2013-2018*), the Victorian Government was committed to a long-term prescribed burning program with an annual rolling hectare-based target of five percent minimum of public land. This target was one of the recommendations adopted by the Government following the Victorian Bushfires Royal Commission into the devastating Black Saturday bushfires of February 2009 (VBRC 2009).

While the intention of this recommendation was the protection of assets and human life, the implementation of this ambitious target was, in practice, having a number of unintended, negative consequences for biodiversity. For example:

- 'Too-frequent' burns in some areas meant that a variety of native plant species had insufficient time to set seed and regenerate. Over time, this had the potential to substantially change the native vegetation matrix (Gell 2012) of Victoria's forests;
- A higher incidence of 'hot' fuel reduction burns often resulted in 100% canopy scorch, the destruction of logs/stump hollows and other coarse woody debris that provide important habitat for woodland fauna; and
- In order to meet the target, fire agencies were increasingly burning large tracts of public land away from areas of asset concentration (Gell 2012) due to the pressure of an ever-shrinking window of opportunity for conducting weather-dependent fuel reduction burns.

After considerable public debate on the issue, the State Government initiated an investigation into the impacts of the five percent target by the Inspector General of Emergency Management (IGEM), who recommended that the hectare-based fuel reduction target be dropped in favour of a risk-reduction approach which prioritised the most at-risk areas for fuel reduction operations (VIGEM 2015). The Government subsequently accepted and adopted the IGEM's recommendation which was implemented from July 2016 (VIGEM 2017).

Since then, the threat posed to native habitats from what was effectively an inappropriate, government-imposed fire regime has eased considerably. Nonetheless, the bushfire threat to native biodiversity and human communities remains significant, particularly in the context of climate change. The warmer temperatures, lower annual rainfall, and more intense and frequent heat events and droughts predicted for the future will take us into new and uncharted territory.

Erosion

Soil erosion and the associated siltation of waterways is a natural weathering process, however, historic land uses and other practices have contributed to higher-than-normal rates of erosion in some areas of the Kara Kara region. This is manifest through severe scouring and gully erosion at the headwaters of some first-order streams; impacts that are likely to worsen during the infrequent but heavy rain events predicted under climate change.

The management of soil erosion in riparian zones within the region is the primary responsibility of the North Central Catchment Management Authority (NCCMA), and as such, erosion control is not a key component of this *Strategic Plan*. Nonetheless, the Kara Kara CMN can use its local knowledge to assist, and partner with, the NCCMA in the execution of its responsibilities within the region.

The 'human-nature disconnect'

Like all species on Earth, humans are born out of, and part of, the natural environment; a physiological connection that is essential to the physical and mental health of our species. And yet, over time, people the world over have become increasingly disconnected from nature (Soga & Gaston 2016), a shift that was observed in popular culture as far back as the 1950s (Kesebir & Kesebir 2017).

The reasons are complex and varied. Some key factors underpinning this cultural shift have been significant changes in global population demographics – notably, the trend towards urbanisation in human populations – and changes in societal recreational choices associated with rapid advances in digital technologies including the trend towards 'virtual experiences' (Pergams & Zaradic 2006; Soga & Gaston 2016).

This 'human-nature disconnect' is observed in the general failure by humans to appreciate the potential and real consequences of our behaviours and activities on the environment, together with a lack of understanding that the future of our own species is ultimately dependent on the health and integrity of the planet's ecosystems (Soga & Gaston 2016; Chivian & Bernstein 2004).

Directly reflecting this social and cultural trend, there has been a general failure across all levels of government to develop meaningful and effective public policy for, and allocate sufficient resources to, environmental conservation, whether on 'big ticket' issues such as climate change or to mitigate localised threats to species, populations, communities, ecosystems and biomes (Chivian & Bernstein 2004).

At the Kara Kara CMN, it is our view that the human-nature disconnect underpins all of the active threats to our conservation targets, and more broadly, is fundamental to the current global environmental and extinction crisis.

Rating the threats to our conservation targets

The active threats to species and natural habitats in the Kara Kara region identified in the previous section have been rated according to severity, potential scope and permanence/reversibility potential (See Appendix 5 for methodology).

Table 1: Threats to conservation targets

Active threats across the Kara Kara region	Threatened and declining vegetation communities				Threatened and declining fauna and flora							Riparian and aquatic ecosystems		
	Box-Ironbark Forest	Grassy Woodland	Heathy Woodland	Plains Woodland	Brush-tailed Phascogale	Woodland birds	Endemic native orchids	Buloke	Silver Banksia	Grey Grass-tree	Spiny Riceflower	Natural creek-lines	Ephemeral soaks	Freshwater wetlands
Climate change	M	VH	VH	VH	M	H	VH	M	VH	M	M	H	VH	VH
Habitat loss and degradation	H	H	H	VH	H	H	H	H	H	M	VH	H	VH	VH
Loss of genetic diversity	H	H	H	VH	VH	M	VH	H	VH	VH	VH	VH*	VH*	VH*
Grazing pressure	M	VH	H	M	L	H	VH	VH	H	VH	M	H	H	M
Feral and invasive species	M	H	H	H	VH	H	L	L	L	M	M	VH	M	M
Inappropriate fire regimes	M	M	M	L	H	M	VH	L	L	H	L	H	L	L
Erosion	L	H	L	L	L	L	na	L	L	L	L	VH	L	M
The 'human-nature disconnect'	H	H	H	H	H	H	H	H	H	H	H	H	H	H

Legend:

VH= Very High

H = High

M = Medium

L = Low

* Note: These threat ratings refer specifically to the potential loss of genetic diversity in faunal and floral species within creek-line, ephemeral soak and wetland ecosystems.

Our strategies

The Kara Kara CMN will implement a range of strategies and actions to help mitigate the impacts of the active threats to our conservation targets identified in this Plan.

The Network's performance and progress towards achieving our stated objectives will be outlined in the Kara Kara CMN's *Year in Review*, a report published each year to coincide with the Network's Annual General Meeting. Past Reports are available on the *Events & Resources* page of the Network's website at www.karakaracmn.org.au.

Key strategies

- 1) Conserve, protect and enhance natural habitats and species**
- 2) Be an advocate for biodiversity**
- 3) Engage with the community**
- 4) Build strong and enduring partnerships**
- 5) Contribute to scientific knowledge**
- 6) Secure the Network's future**



Above: A Brown Treecreeper, one of a suite of threatened and/or declining woodland bird species (H Yuille).

1. Conserve, protect and enhance natural habitats and species

Objectives

- Protect and enhance habitat critical to the survival of woodland flora and fauna, particularly threatened and declining species.
- Increase the area and quality of native habitat within the Kara Kara region.
- Improve landscape connectivity to facilitate species movement and dispersal.
- Protect threatened species.
- Reduce the impacts of feral and invasive species.
- Manage existing, and be alert to emerging, threats to regional biodiversity.
- In managing all Kara Kara CMN on-ground projects on private land, aim to achieve a 'win-win' for biodiversity and landholders/managers.

As the threats impacting species and ecosystems within the Kara Kara region increase in both number and extent, on-ground projects that are designed to protect and enhance the quality of native habitats have never been more important.

For the life of this Plan, the Network's efforts to conserve, protect and enhance natural habitats will focus specifically on three landscape zones within the Kara Kara region (Figure 2):

- 1) From Morrl Morrl Conservation Reserve in the west to the Avoca River in the east;
- 2) From St Arnaud in the north to Moonambel in the south; and
- 3) On the Avon plains to the north-west of St Arnaud.

The areas identified in Zones 1 and 2 above will be the focus of the Network's revegetation and habitat improvement works.

On-ground works in Zone 3 will primarily focus on threatened species protection, particularly conservation target species such as Buloke and Spiny Rice-Flower.



Above: Spiny Rice-flower, a threatened grassland species (D Saxon-Campbell).

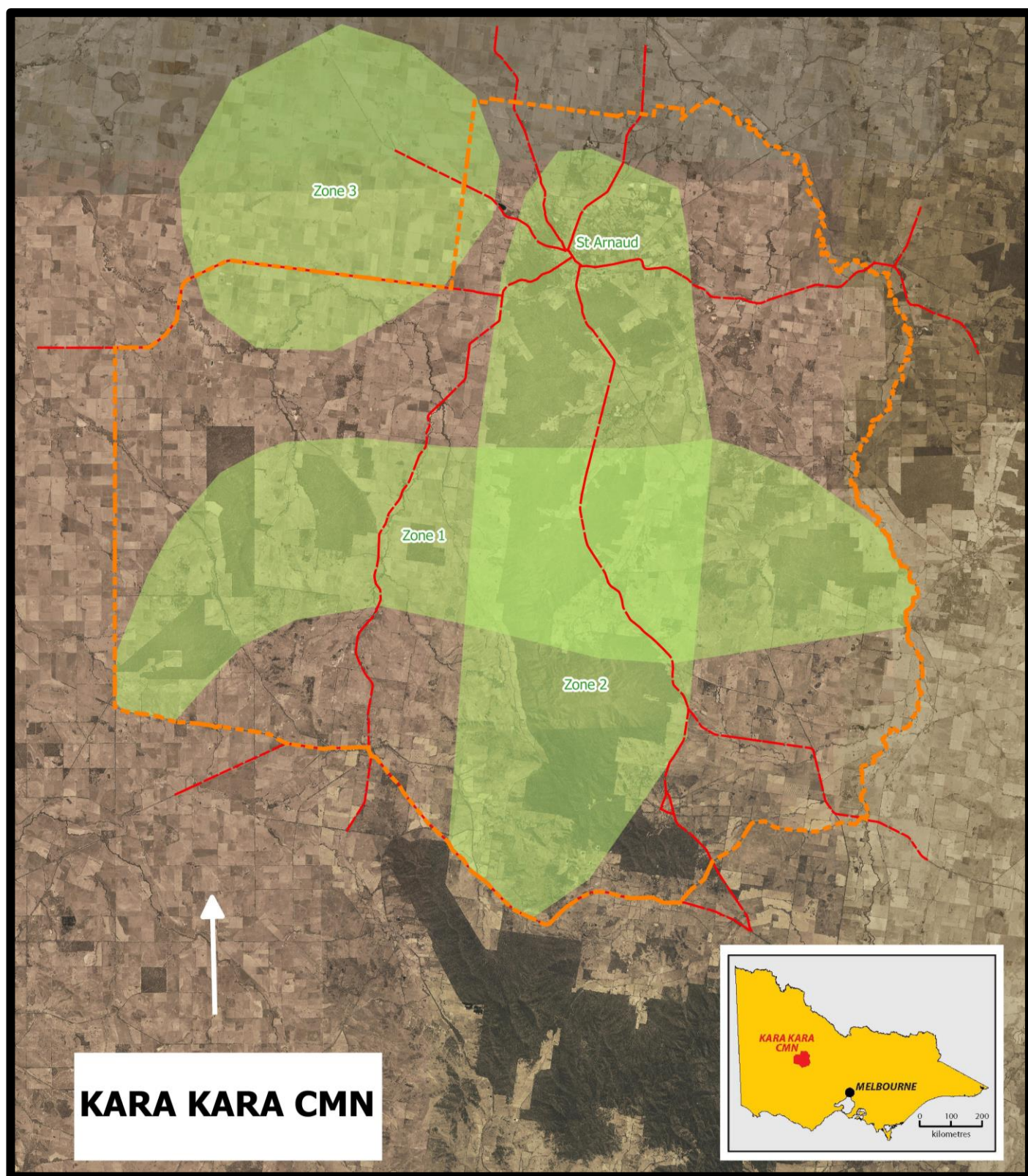


Figure 2: The landscape zones that will be the focus of Network conservation efforts for the life of this *Strategic Plan*.

Key actions to be undertaken to achieve these objectives are outlined in the highlight box below.

Actions

1) *On-ground programs...*

...for threatened/declining vegetation communities, flora and fauna

- Identify landscape connectivity gaps (particularly in Zones 1 and 2) and actively engage with landholders to encourage participation in bio-link creation and enhancement projects.
- Undertake revegetation programs (using both direct seeding and/or native tube-stock as appropriate to the site) on private land.
- Construct and install structural elements to improve native habitat for wildlife (e.g. species-specific nest-boxes, habitat logs and water retention barriers etc).
- Identify, and initiate actions/projects to protect populations of threatened and declining flora (e.g. grazing exclusion fencing).
- Assist and support specialist conservation agencies with native orchid monitoring and recovery programs.
- Support/co-ordinate programs for the control of feral and invasive species (e.g. weeds and feral foxes, cats, birds and herbivores), where appropriate.
- Manage weed infestations as appropriate to site and land tenure.

...for riparian and aquatic ecosystems

- Initiate projects to restore and rehabilitate native vegetation along natural watercourses.
- Partner with, and support, the NCCMA on projects that protect natural riparian and aquatic ecosystems.

2) *Monitoring*

- Measure/evaluate the effectiveness/success of selected habitat protection/enhancement programs on an ongoing basis, fine-tuning Network processes and procedures as required. Specific monitoring actions should include:
 - Establishing photo points at the completion of all revegetation projects;
 - Regular visits to selected revegetation projects to monitor growth and condition; and
 - Nest-box monitoring.
- Immediately report the emergence of new environmental weeds or pathogens (e.g. Myrtle Rust) that may pose a risk to biodiversity within the Kara Kara region.

2) Be an advocate for biodiversity

Objectives

- Influence public policy across all levels of government on issues relating to biodiversity conservation, natural resource management, and the emergence and management of threatening processes.
- Facilitate the protection of remnant native habitats on private land into perpetuity.
- Influence strategic bushfire management planning within the Kara Kara region.
- Influence state and local government policy on the appropriate locations for community firewood collection.
- Remain apolitical at all times.

In the biodiversity conservation space, the ability to initiate and successfully complete on-ground projects is just part of the story. Active and apolitical public advocacy can be just as important to improving the lot of native flora and fauna within the complex and bureaucratic regulatory environment in which we operate.

While the Kara Kara CMN is but one voice among many, our local knowledge of regional biodiversity and the current 'state of play' as to its condition and potential threats makes it incumbent upon us to speak out.

Actions

- Represent the interests of biodiversity in the Kara Kara region by participating in government consultation processes relating to environmental policy and legislation.
- Be alert to opportunities to protect natural habitats on private land into perpetuity, in particular by facilitating strategic land acquisitions and private covenants by our conservation partners.
- Advocate for greater protection of native habitats, flora and fauna through status upgrades to Bushland Reserves, Nature Conservation Reserves and State/Regional Parks.
- Provide input into DELWP's Bushfire Strategic Management Planning relating to the location, frequency and intensity of prescribed fuel reduction burns on public land.

3) Engage with the community

Objectives

- Educate the community about regional biodiversity and why conserving it is important.
- Raise awareness of the Kara Kara CMN among its various target audiences.
- Strengthen community participation in, and understanding of, Network programs.
- Engage with Traditional Owners.
- Maintain and strengthen the Kara Kara CMN's reputation as a 'good environmental citizen'.
- Establish the Kara Kara CMN as a 'go to' organisation for on-ground assistance and conservation advice in our region.
- Nurture future generations of conservationists.
- Remain apolitical at all times.

Effective achievement of the Kara Kara CMN's projects and programs requires the Network to engage with a wide variety of audiences, including:

- Broad-acre and absentee landholders;
- Urban and peri-urban landholders;
- Existing and potential volunteers (individuals and organisations);
- Kara Kara CMN members;
- Kara Kara CMN eNews mailing list;
- Kara Kara CMN Facebook 'friends';
- The Dja Dja Wurrung and Wotjobaluk peoples (as Traditional Owners of Country in the Kara Kara region);
- Primary and secondary schools, both teaching staff and students (as future generations of conservationists);
- Partner and other organisations working in the environmental conservation space;
- Community groups and the broader community of the Kara Kara region;
- Government (Federal, State and Local) and semi-government agencies (as conservation partners, Network members and administrators/regulators); and
- The general public.

Communicating with each of these audiences requires slightly different key messages and engagement strategies.

Actions

- Host and/or sponsor community events (i.e. seminars, field trips and activities) that promote and encourage the conservation of regional biodiversity and threatened communities/species.
- Identify and engage with broad-acre and absentee landholders to encourage their involvement in the Network's on-ground programs.
- Involve the Kara Kara region's Traditional Owners in Network programs, as appropriate.
- Seek out opportunities to engage with individuals and organisations/agencies to expand the Kara Kara CMN's volunteer network.
- Regularly communicate with the Kara Kara CMN's various audiences to raise awareness about the Network, its objectives and programs (i.e. via the website, eNews, Facebook posts and general media), and disseminate other conservation-related news and information.
- Expand/strengthen the Kara Kara CMN's schools' program (i.e. participation in Kara Kara CMN on-ground projects, education and habitat improvement programs).
- Seek out opportunities to engage with existing and potential conservation partners, including participating in and presenting at regional events and activities.



Above: Volunteers planting native tube-stock to help create a bio-link for wildlife (D Saxon-Campbell).

4) Build strong and enduring partnerships

Objective

- Build and maintain active and enduring partnerships that protect and enhance biodiversity in the Kara Kara region and more broadly.

As a small, largely volunteer-run organisation, the Kara Kara CMN can achieve much more for regional biodiversity by partnering with like-minded conservation organisations than by going it alone. This is true both within the Kara Kara region and elsewhere in Victoria.

We share local knowledge and ideas, benefit from each other's strengths, and provide each other with on-ground support when and where it is needed.

Working collaboratively also potentially improves our ability to attract funding for the Network's projects and programs, particularly given the recent shift in the project selection criteria for Federal and State government grants towards collaborative, landscape-scale conservation initiatives over smaller, localised ones.

Actions

- Regularly engage with neighbouring CMNs, conservation groups, government agencies and NGOs that are active in the Kara Kara region.
- Where possible, develop partnerships that create and improve habitat quality and linkages at both regional and landscape scales.
- Support and maintain a close working relationship with the Dja Dja Wurrung and Wotjobaluk peoples as the Traditional Owners of land within the Kara Kara region, particularly in relation to programs on public land.



Above: View from the St Arnaud Range towards Mt Bolangum in the west, showing how revegetation works create important landscape linkages for native wildlife (D Saxon-Campbell).

5) Contribute to scientific knowledge

Objective

- Contribute to scientific knowledge by monitoring and sharing data on selected woodland fauna and flora in the Kara Kara region.

Ongoing field research is essential to human understanding of the natural environment, including how it works, the rich diversity of flora and fauna that inhabits it, and the current and potential impacts of a range of processes that threaten their survival, whether natural or anthropogenic.

The Kara Kara CMN contributes to scientific knowledge in a number of ways; firstly, by monitoring selected threatened and declining species within our region and sharing our data with the scientific community, and secondly, through our regular participation in a range of externally-run Citizen Science programs.

Actions

- Conduct quarterly bird surveys at established woodland sites within the Kara Kara region.
- Initiate a regular nest-box monitoring program.
- Share Network data with specialist government and biodiversity databases in a timely manner [e.g. BirdLife Australia's 'Birddata' and the Victorian Biodiversity Atlas (VBA)].



Above: Striated Thornbill (H Yuille).

6) Secure the Network's future

Objectives

- Secure the ongoing financial and operational viability of the Kara Kara CMN.
- Secure funding for Network projects and programs.
- Maintain good governance.
- Increase Kara Kara CMN membership and volunteer participation.
- Provide a safe workplace for the Network's employees and volunteers.

Like most volunteer-run community groups, the Kara Kara CMN must overcome significant challenges to ensure that the organisation remains relevant, and financially and operationally viable. The rural population is shrinking and ageing, the pool of community volunteers is limited and government funding – particularly for environmental programs – is in short supply.

Funding Kara Kara CMN programs

As a not-for-profit entity, the Kara Kara CMN relies on financial assistance from a range of government and non-government sources to fund its projects and programs. This includes grants from State and Federal governments, privately-owned philanthropic organisations and public donations.

At a State level, Landcare and Biodiversity grants funded by the Victorian government and administered by DELWP and the NCCMA are key sources of funding for Network programs.

Since 2012 the Network has also been a recipient of funding under the Victorian Government's Landcare Facilitator Program (VLFP), which enables the employment of a part-time Landcare Facilitator. For the Kara Kara CMN and similar recipient organisations, having a paid Facilitator is an invaluable resource. In addition to supporting our Committee of volunteers, the role provides the Network with stability and cohesion, and a focal point to drive planning and reporting, program delivery, and our community engagement, partnership building and monitoring activities.

Looking ahead, there are opportunities for the Network to access additional funding streams, notably from philanthropic sources and public donations. The Kara Kara CMN has Deductible Gift Recipient (DGR) Status which affords potential donor organisations and individuals the opportunity to claim a tax deduction on donations in excess of \$2. With so many worthy causes, competition for philanthropic funds in particular is understandably high; however, accessing this funding stream will continue to be a key objective of the Network for the life of this *Strategic Plan*.

A sound operational base

Securing Kara Kara CMN's long-term future is about more than funding; it's also about building a sound operational base for the Network. Succession planning, capacity building through ongoing training and skills development, good governance and the provision of a safe workplace are all essential elements.

In this context, the Kara Kara CMN Committee remains alert to opportunities to strengthen the Network's operational viability. In recent years, Network governance has been reviewed and significantly improved, and safe workplace policies and procedures adopted. Committee capacity has also been strengthened with the addition of new members to broaden our skills base and ensure that the profile of the Kara Kara CMN Executive is representative of a broad section of the community.

Actions

Financial viability

- Secure ongoing Landcare Facilitator funding.
- Actively seek out funding for Network projects from both government and philanthropic sources.
- Increase public donations to the Kara Kara CMN.

Operational viability

- Plan for Committee succession, including identifying and recruiting appropriately-skilled Committee members.
- Build Committee and Facilitator capacity by actively seeking out opportunities for training and skills development.
- Reconnect with 'member agencies/organisations' and encourage active participation in, and support of, Network projects and programs.
- Be alert to opportunities to expand, and engage with, Kara Kara CMN's membership and volunteer base.
- Monitor/evaluate selected projects for the purpose of internal process improvement.
- Maintain good governance by staying abreast of changes to the law relating to incorporated associations, and registered charities and environmental organisations, and implementing changes to Kara Kara CMN policies and procedures as necessary.
- Maintain safe work practices at all times in accordance with the Kara Kara CMN's current *Operating Policies & Procedures*.



Above: Buloke Mistletoe in bloom (D Saxon-Campbell).

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APPENDIX 1

Key Ecological Vegetation Communities (EVCs) of the Kara Kara region and their conservation status

Vegetation community	EVC No.	Conservation status	
		Victoria*	Federal**
Grassy Woodland/Alluvial Terraces Herb-rich Woodland Mosaic	175/67	Endangered	-
Plains Woodland	803	Endangered	-
Grassy Woodland	175	Vulnerable	Endangered
Valley Grassy Forest	47	Vulnerable	-
Box-Ironbark Forest	61	Depleted	-
Heathy Woodland	48	Depleted	-
Grassy Dry Forest	22	Depleted	-
Hillcrest Herb-rich Woodland	70	Depleted	-
Sandstone Ridge Shrubland	93	Least Concern	-
Heathy Dry Forest	20	Least Concern	-

*Source: DELWP² (2019).

**Source DEE² (2019)

APPENDIX 2

Some threatened and declining fauna of the Kara Kara region

Species	Recorded in region since 2010*	FFG-listed (Vic)**	EPBC-listed (Cwth)**
Mammals			
Brush-tailed Phascogale, <i>Phascogale tapoatafa</i>	✓	●	-
Fat-tailed Dunnart, <i>Sminthopsis crassicaudata</i>	✓	-	-
Spot-tailed (Tiger) Quoll, <i>Dasyurus maculatus</i>	✗	●	E
Squirrel Glider, <i>Petaurus norfolcensis</i>	✗	●	-
Birds			
Barking Owl, <i>Ninox connivens</i>	✗	●	-
Bush Stone-Curlew, <i>Burhinus grallarius</i>	✓	●	-
Chestnut-rumped Heathwren, <i>Calamanthus pyrrhopygius pyrrhopygius</i>	✗	●	-
Crested Bellbird, <i>Oreoica gutturalis</i>	✓	●	-
Diamond Dove, <i>Geopelia cuneata</i>	✓	●	-
Diamond Firetail, <i>Stagonopleura guttata</i>	✓	●	-
Hooded Robin, <i>Melanodryas cucullata</i>	✓	●	-
Painted Honeyeater, <i>Grantiella picta</i>	✓	●	V
Powerful Owl, <i>Ninox strenua</i>	✓	●	-
Red-tailed Black-Cockatoo, <i>Calyptorhynchus banksii graptogyne</i>	✓	●	E
Speckled Warbler, <i>Chthonicola sagittata</i>	✓	●	-
Square-tailed Kite, <i>Lophoictinia isura</i>	✓	●	-
Swift Parrot, <i>Lathamus discolor</i>	✓	●	CE
Reptiles			
Olive Legless Lizard, <i>Delma inornata</i>	✗	●	-
Striped Legless Lizard, <i>Delma impar</i>	✗	●	V
Amphibians			
Bibron's Toadlet, <i>Pseudophryne bibronii</i>	✗	●	-
Southern Bell Frog, <i>Litoria raniformis</i>	✗	●	V

* As recorded in Australia-wide and State wildlife databases, including BirdLife Australia's Birddata, the Atlas of Living Australia (ALA) and the Victorian Biodiversity Atlas (VBA).

** Conservation Status Key:

- FFG [Flora and Fauna Guarantee Act 1988 (Vic)].
- EPBC [Environment Protection and Biodiversity Conservation Act 1999 (Cwth)]:
CE = Critically endangered; E = Endangered; V = Vulnerable.

APPENDIX 3

Some threatened and declining flora of the Kara Kara region

Species	DELWP*	FFG-listed (Vic)*	EPBC-listed (Cwth)*
Blakelyi's Red Gum, <i>Eucalyptus blakelyi</i>	-	-	-
Brilliant Sun-Orchid, <i>Thelymitra mackibbinii</i>	e	●	V
Bristly Greenhood, <i>Pterostylis setifera</i>	r	-	-
Buloke, <i>Allocasuarina luehmannii</i>	e	●	-
Buloke Mistletoe, <i>Amyema linophylla</i> ssp. <i>orientale</i>	e	-	-
Candy Spider Orchid, <i>Caladenia versicolor</i>	e	●	V
Cane Speargrass, <i>Austrostipa breviglumis</i>	r	-	-
Deane's Wattle, <i>Acacia deaneii</i> ssp. <i>paucijuga</i>	r	-	-
Grey Grass-tree, <i>Xanthorrhoea glauca</i> ssp. <i>angustifolia</i>	e	●	n/a
Hairy Hopbush, <i>Dodonaea boroniifolia</i>	r	-	-
Large Rustyhood, <i>Pterostylis maxima</i>	v	-	-
Lowly Greenhood, <i>Pterostylis despectans</i>	e	●	E
McIvor Spider Orchid, <i>Caladenia audasii</i>	e	●	E
Narrow-leafed Waxflower, <i>Philothea angustifolia</i> ssp. <i>montana</i>	v	-	-
Red Cross Spider Orchid, <i>Caladenia cruciformis</i>	e	●	-
Silver Banksia, <i>Banksia marginata</i>	-	-	-
Small Milkwort, <i>Comesperma polygaloides</i>	v	●	-
Spiny Rice-Flower, <i>Pimelea spinescens</i> ssp. <i>spinescens</i>	e	●	CE
Stuart Mill Spider Orchid, <i>Caladenia cretacea</i>	e	●	-
Swamp Diuris, <i>Diuris palustris</i>	e	●	-
Woodland Leek Orchid, <i>Prasophyllum</i> sp. aff. <i>validum</i>	e	-	-

* Conservation Status Key:

- DELWP (formerly DEPI and DSE) – Species status on the Advisory List maintained by the Department of Environment, Land, Water & Planning, Victoria. Key: e = endangered; r = rare, v = vulnerable.
- FFG [Flora and Fauna Guarantee Act 1988 (Vic)];
- EPBC [Environment Protection and Biodiversity Conservation Act 1999 (Cwth)].
Key: CE = Critically endangered; E = Endangered; V = Vulnerable.

Source: DEPI (2014); (A Hughes, pers.comm., 2019).

APPENDIX 4

Some common environmental weeds of the Kara Kara region

Common name	Botanical name	State (Vic) classification			Federal classification
		Mallee	North Central	Wimmera	
Blackberry	<i>Rubus fruticosus aggregate</i>	R	RC	RC	WNS
Boxthorn	<i>Lycium ferocissimum</i>	RC	RC	RC	WNS
Bridal Creeper	<i>Asparagus asparagoides</i>	R	R	R	WNS
Boneseed	<i>Chrysanthemoides monilifera</i>	RC	RP	RC	WNS
Cape Tulip (2 leaf)	<i>Moraea miniata</i>	RP	RC	RP	-
Deadly Nightshade	<i>Atropa belladonna</i>	-	-	-	-
Gazania	<i>Gazania rigens</i>	-	-	-	-
Gorse/Furze	<i>Ulex europaeus</i>	R	RC	RC	WNS
Heliotrope	<i>Heliotropium europaeum</i>	-	-	-	-
Horehound	<i>Marrubium vulgare</i>	R	RC	RC	-
Prickly Pear	<i>Opuntia stricta</i>	RC	RC	RC	WNS
St John's Wort	<i>Hypericum perforatum</i>	R	RC	RC	-
Serrated Tussock	<i>Nassella trichotoma</i>	RP	RP	RP	WNS
Soursob	<i>Oxalis pes-caprae</i>	R	R	R	-
Spear Thistle	<i>Cirsium vulgare</i>	R	R	R	-
Spiny Rush	<i>Juncus acutus</i>	R	RC	RC	-
Sweet Briar	<i>Rosa rubiginosa</i>	R	RC	RC	-
Wheel Cactus	<i>Opuntia robusta</i>	RC	RC	RC	-
Willows	<i>Salix</i> sp.	R	R	R	WNS

Key to weed classifications (State and Federal):

- **Under Victorian legislation** [Catchment and Land Protection (CaLP) Act 1994 (Vic)] -

RC = Regionally Controlled - Usually widespread, with ongoing control measures required to prevent spread. Land owners must take all reasonable steps to prevent growth/spread on their land.

RP = Regionally Prohibited - Not widely distributed but capable of spread. Capable of eradication but must be managed. Land owners/managers (public and private) must take all reasonable steps to eradicate.

R = Restricted - Poses an unacceptable risk of spread within Victoria and to other States/Territories. Trade in these weeds and their propagules, either as plants, seeds or contaminants in other materials is prohibited.

- **Under Federal legislation** [Environment Protection and Biodiversity Conservation (EPBC) Act 1999 (Cwth)] -

WNS = Weed of National Significance.

Sources: AG (2019); (AV 2018²); (AV 2017⁴); (NCCMA 2012).

The threat rating system

Note: The threat rating system outlined below was used to identify and rate the key threats to our conservation targets on page 20. The rating system was kindly provided by Bush Heritage Australia.

1. Rate the scope of the threat

Very High	The threat is likely to be pervasive in its scope, affecting the target across all or most (71-100%) of its occurrence/population.
High	The threat is likely to be widespread in its scope, affecting the target across much (31-70%) of its occurrence/population.
Medium	The threat is likely to be restricted in its scope, affecting the target across some (11- 30%) of its occurrence/population.
Low	The threat is likely to be very narrow in its scope, affecting the target across a small proportion (1-10%) of its occurrence/population.

2. Rate the severity of the threat

Very High	Within the scope, the threat is likely to destroy or eliminate the target, or reduce its population by 71-100% within 10 years or 3 generations.
High	Within the scope, the threat is likely to seriously degrade/reduce the target or reduce its population by 31-70% within 10 years or 3 generations.
Medium	Within the scope, the threat is likely to moderately degrade/reduce the target or reduce its population by 11-30% within 10 years or 3 generations.
Low	Within the scope, the threat is likely to only slightly degrade/reduce the target or reduce its population by 1-10% within 10 years or 3 generations.

3. Rate the irreversibility (permanence) of the threat

Very High	The effects of the threat cannot be reversed and it is very unlikely the target can be restored, and/or it would take more than 100 years to achieve this (e.g., wetlands converted to a shopping centre).
High	The effects of the threat can technically be reversed and the target restored, but it is not practically affordable and/or it would take 21-100 years to achieve this (e.g., wetland converted to agriculture).
Medium	The effects of the threat can be reversed and the target restored with a reasonable commitment of resources and/or within 6-20 years (e.g., ditching and draining of wetland).
Low	The effects of the threat are easily reversible and the target can be easily restored at a relatively low cost and/or within 0-5 years (e.g., off-road vehicles trespassing in wetland).

Explanation of Key Terms

Scope - Most commonly defined spatially as the proportion of the target that can reasonably be expected to be affected by the threat within ten years, given the continuation of current circumstances and trends. For ecosystems and ecological communities, scope is measured as the proportion of the target's occurrence. For species, scope is measured as the proportion of the target's population.

- The *target* refers to the focal conservation target at the scale being assessed - in technical terms, the target occurrence within the defined project area (e.g., small site, landscape, or even global scale).
- *Affected* means subject to one or more stresses from the threat.
- The *ten-year* time frame can be extended for some longer-term threats like global warming that need to be addressed today.
- *Current circumstances and trends* include both existing as well as potential new threats.
- *Occurrence* for ecosystems is typically by area.
- Species includes both single species targets as well as multiple species guilds. If a species is evenly distributed, then the proportion of the target's population is the same as the proportion of the area occupied, but if it is patchily distributed, then it is not. In these cases, it is important to specify the unit of assessment for the target (e.g., breeding pairs vs. nests vs. individuals).
- For both ecosystems and species, the proportion is estimated as the percentage of the target's occurrence at the scale being assessed (e.g. a water pollution threat affecting an aquatic ecosystem target is measured as the percentage of that aquatic ecosystem target affected, not the percentage of the entire assessment area).

Severity - Within the scope, this is the level of damage to the Target from the Threat that can reasonably be expected given the continuation of current circumstances and trends. For ecosystems and ecological communities, this is typically measured as the degree of destruction or degradation of the target within the scope. For species, this is usually measured as the degree of reduction of the target population within the scope.

- *Within the scope* refers to both the spatial and temporal scope defined above. It is important to note that the severity rating is not made for the entire assessment area, but only within the scope the threat affects. Thus, if the scope of a hunting threat only affects a sub-population of the overall species target, the severity assessment is only made in relation to that sub-population.
- For ecosystem targets, *destruction or degradation* is defined in reference to one or more key attributes of the target. Likewise, damage to species targets is most often defined in terms of the *degree of reduction* of the key attribute "population size." In some cases it may be appropriate to consider other key attributes for species targets, such as reduction of breeding pairs.

Irreversibility (Permanence) - The degree to which the effects of a threat can be reversed, and the target affected by the threat restored.

Explanation of Key Terms

- Permanence applies to the *effects of the threat* on the target, not the threat itself. In other words, it is not a measure of how difficult it is to stop the threat, but rather to undo the stress caused by the threat on the target. It is important to note that the use of the permanence rating as specified is largely in respect to prioritizing potential threats.
- If a threat is looming that will cause irreversible damage, then it makes sense to try to address that threat. However, if the threat has already occurred and the irreversible

damage has already taken place, then it may not make sense to prioritize that threat for action.

Explanation of How Target-Threat Ratings Are Calculated

The first table shows the rule-based procedure for combining the rankings for the **Scope** and **Severity** variables to get a ranking of **Threat Magnitude**.

		Scope			
		Very High	High	Medium	Low
Severity	Very High	Very High	High	Medium	Low
	High	High	High	Medium	Low
	Medium	Medium	Medium	Medium	Low
	Low	Low	Low	Low	Low

The **Threat Magnitude** is then combined with **Irreversibility** ratings using the second table to get the Target-Threat Rating.

		Irreversibility			
		Very High	High	Medium	Low
Magnitude	Very High	Very High	Very High	High	Medium
	High	High	High	Medium	Low
	Medium	Medium	Medium	Low	Low
	Low	Low	Low	Low	Low

For example, if the Scope is rated as "Very High" and the Severity is rated as "High", the Threat Magnitude is "High" (see first table). If the Irreversibility is rated as "medium", then the overall rating becomes "Medium" (see second table)

Explanation of How Threat Rating Summaries Are Calculated

This methodology uses a combination of rules for rolling up ratings across targets and threats, and for the project as a whole. As shown in the grid below, the bottom row contains the overall ratings for each target, and the far right-hand column contains the ratings for each threat. The cell in the lower right-hand corner contains the overall rating for the project. Normally the overall project rating is based on rolling up the threat ratings in the right-most column, using the 3-5-7 and 2-Prime rules.

3-5-7 Rule

Multiple threats to individual targets and multiple target threat scores are first summed together using the 3-5-7 rule:

- 3 High rated threats are equivalent to 1 Very High-rated threat;
- 5 Medium rated threats are equivalent to 1 High-rated threat; and
- 7 Low rated threats are equivalent to 1 Medium-rated threat.

Refer Row 2 – there are 3 High ratings (which equals 1 Very High) and 1 Very High rating, so it is treated as if it had two Very High ratings. In the *Ione Chaparral* Column, there are 5 Medium ratings (equals one High), plus one High, for a total equivalent of 2 High ratings.

<i>Active Threats Across Systems</i>	Vernal pool grasslands	Lower Floodplain	Upper Floodplain: Chinook Salmon	Upper Watershed	Ione Chaparral	Blue Oak Woodland	Overall Threat Rank
Farms	High	High	High	High	-	Very High	Very High
Housing	High	High	-	High	Medium	Very High	Very High
Groundwater withdrawal	-	High	Very High	-	-	-	High
Levee and dike construction	-	High	Very High	-	-	-	High
Industrial development	-	-	-	-	High	High	High
Fire suppression	Medium	-	-	High	Medium	High	High
Invasive/alien species: Plants	High	Medium	-	-	Medium	Medium	Medium
Invasive/alien species: Animals	-	Medium	Medium	High	-	-	Medium
Forestry practices	-	-	-	High	-	-	Medium
Operation of drainage systems	-	-	-	High	-	-	Medium
Grazing	Medium	-	-	-	-	Medium	Medium
Recreational vehicles	-	-	-	Low	Medium	-	Low
Agricultural runoff	-	Medium	-	-	-	-	Low
Overfishing or overhunting	-	-	Low	-	-	-	Low
Threat Status for Targets	High	High	Very High	Very High	High	Very High	VERY HIGH

Overall
Project Rank

Prime Rule

After the 3-5-7 rule has been applied, the 2-prime rule is used to determine the rolled up rating for a target, a threat, or for the whole project. This rule requires the equivalent of two ratings at a certain level for the end result to be that level. For example, there would have to be the equivalent of at least two Very High ratings to produce a Very High result, or two ratings of Medium or above to produce a Medium result. In the example, the Housing threat has the equivalent of two Very High ratings (due to the 3-5-7 rule), so the result is Very High. The Recreational Vehicles row has one Medium rating and one Low. Since it does not have two or more Mediums, the result is Low.

Majority Override

The Majority Override rule ensures that the overall project rating is not reduced too much by the other rules. Normally, the overall project rating is a rollup of the threat ratings, using the rules above. However, if a majority of the targets have a rating higher than that computed rollup, then that majority rating is used instead. For example, if the result of using the 3-5-7 and 2-prime rules gave a project rating of Medium, but 4 out of the 6 targets had at least one rating of at High (or Very High), then the Majority Override rule would take effect and the overall project rating would be High.