ReBird
the Ranges

Action Plan for reversing the decline of Mount Lofty Ranges woodland birds.

2025—2100

Partners

Design: rodeo.com.co

Cover caption: Spotted Pardalote.
Photo: Martin Stokes

From ReBird the Ranges

This Action Plan was created by an alliance of partner organisations with a shared passion and commitment to reversing the decline of woodland birds in the Mount Lofty Ranges. The alliance has named its recovery program ReBird the Ranges. This plan incorporates the collective wisdom and data from over 20 organisations.

ReBird the Ranges' membership continues to grow, and we invite all levels of the community to join the effort to achieve critical bird recovery and nature restoration at scale.

Want to stay connected and help?

Join our mailing list by emailing info@rebirdtheranges.org

Share information about the actions needed to support bird recovery in the Mount Lofty Ranges

Join one of our partner organisations and help with a planting day or other bird recovery events

Visit rebirdtheranges.org for more ways to get involved

SA Western Whistler.
Photo: Neale Dyster

Contents

About the Plan

This plan outlines the actions required to halt and reverse the decline of woodland bird species in the Mount Lofty Ranges (MLR). It is designed for everyone interested in bird and biodiversity recovery in the MLR, including government policymakers, public and private landholders, local and international supporters, and organisations involved in on-ground restoration and research.

The 75 year timeframe on this plan acknowledges the long-term nature of reconstructing and stewarding the MLR's landscapes. It offers high-level guidance on the actions needed to recover and sustain woodland bird species. It is hoped that groups and individuals will adopt the goals and action areas and implement them through their projects.

ReBird the Ranges will take the following steps to ensure the successful implementation of this plan:

- Collaborate with stakeholders to define and design high-impact projects, identify the project leads, partnerships and funding required.
- Develop nature financing partnerships and support landholders to engage in emerging biodiversity markets.
- Engage landholders and community in opportunities for involvement, raising awareness and showcasing the work being done.
- Monitor trends in bird populations, and review and refine the plan to ensure it remains effective in guiding bird recovery.

Citation: ReBird the Ranges (2025) Action Plan for reversing the decline of Mount Lofty Ranges woodland birds, 2025 - 2100.

Left: Black-chinned Honeyeater. Photo: Martin Stokes

Vision and mission

Our vision

Mount Lofty Ranges birds are thriving within resilient, healthy landscapes.

Our mission

Reverse the declines and prevent further extinctions of woodland bird species in the Mount Lofty Ranges through conservation, restoration and community involvement.

Mount Lofty.
Photo: Louis Hoang

First Nations' custodianship of Mount Lofty Ranges birds

"Since the dawn of time our people have had a spiritual, environmental and cultural connection to all birds and their habitats. Whether it be through our Ngartji system which defines our roles and responsibilities of caring for Country and all in it, our storylines and songlines, as a food source, as a material source or as a transmitter of messages – birds have always been a part of our daily rituals and wellbeing."
— Mark Koolmatrie, Ngarrindjeri Elder[1]

Kaurna conducting a Cultural Burn at Tuthannga in the Adelaide Parklands in 2021. The Kaurna Fire Team is healing and restoring Country by reintroducing Cultural Fire to the landscape.
Photo: Matt Turner

[1] Clarke 2023

Kaurna, Ngarrindjeri, Peramangk, Ngadjuri, and First Peoples of the River Murray have long been custodians of the landscapes and birds of the Mount Lofty Ranges. For Aboriginal people, birds were more than just creatures of the sky and the bush; they were essential partners in their lives.

People closely observed birds, using their behaviour as indicators of the weather. For example, when swifts moved into an area, it signalled the arrival of rain or a storm. The sight or sound of "diamond birds"—such as zebra finches, diamond firetails, and pardalotes—was a sign that fresh water could be found nearby[1].

Birds also served as a natural alarm system. Their calls would often warn of dangers, like approaching snakes. Fantails, butcher birds, and cockatoos could signal the presence of visitors or help guide people if they became lost[1].

Birds also played a key role in finding food. Their presence would tell people when seeds or fruits were ready for harvest. In some cases, Aboriginal hunters worked with eagles, flushing out small animals like wallabies and kangaroos into the open, where the eagles would catch them. The hunt was then shared between the hunters and the eagles, a demonstration of the deep connection between people and birds[1].

Aboriginal people cared for Country and used seasonal, cool burns to revitalise habitats. These managed fires exposed the earth, making insects and small reptiles accessible, attracting birds, and creating a rich food source for various species. Raptors and wood-swallows, drawn to the smoke, hunted the prey revealed by the flames, while granivores gathered in the scorched soil to find seeds. Cultural burning maintained open and grassy woodlands, preventing shrub overgrowth and allowing native grasses to flourish in southeastern Australia's forests and woodlands[2]. Many bird species came to depend upon these open grassy habitats[1].

Today, First Nations continue to hold strong connection to the landscapes and birds of the MLR. Knowledge and stories about them are being passed down to younger generations. Caring for Country practices, such as cultural burning, are again being used to revitalise habitats and restore nature.

[1] Clarke 2023
[2] Mariani, et al. 2022

We are committed to finding opportunities to involve First Nations in caring for Country, enabling their custodianship of the landscapes and bird species of the MLR. See pages 41 - 49 for key areas of collaboration.

Photo: Martin Stokes

Executive summary

The Mount Lofty Ranges has some of the highest bird extinction rates and concentrations of threatened bird species in Australia. 78 species have been shown to be declining since 2012.

Photo: Heiko Otto

Our goals

1.

Create a groundswell of community support for bird recovery

Recovering bird populations will only be possible through the deliberate action of people. It will require commitment and collaboration of landholders, community, investors and partner organisations. We'll know we're succeeding when there's increased awareness and community action, and greater investment each year.

2.

Protect existing habitats and manage threats

Remnant native vegetation provides critical habitat that take centuries to develop. In the MLR, we need to stop the loss and protect remnant habitats. Equally important is improving the condition of all remnant vegetation and managing threats such as pest plants and animals, grazing pressure and fire regimes. Success will mean less trees and hectares of native vegetation cleared each year, and more landholders, First Nations and volunteers actively managing habitats.

3.

Reconstruct habitat at scale

The current extent of habitat in the MLR cannot sustain healthy populations of many woodland bird species. This goal sets ambitious targets to reconstruct 120,000 ha of grassy woodland and 14,000 ha of heathland habitats disproportionately cleared in the region. These efforts align with global and national targets to restore 30% of each habitat type for biodiversity. It is also a priority to reconnect fragmented habitats to increase resilience to climate change.

4.

Research, monitor and adapt

This goal focuses on continuous learning and improvement of our restoration programs. Monitoring bird populations helps track their status and trends. To maximise impact, regular evaluation of programs is essential, and targeted research is needed to fill critical knowledge gaps.

The need for urgent action

‘Around 90% of the original woodland habitats of the Mt Lofty region were cleared by 1980. The birds that survive in the remaining habitat have continued to decline over the last 40 years. This includes honeyeaters, finches, robins, flycatchers, thornbills, and cuckoos to name a few. The prognosis for woodland birds is bleak. Many will disappear from the region unless substantial and appropriate action is taken.’

Assoc Prof. David Paton AM

Chestnut-rumped Thornbill.
Photo: Dan Easton

Mount Lofty Ranges: a biodiversity hotspot

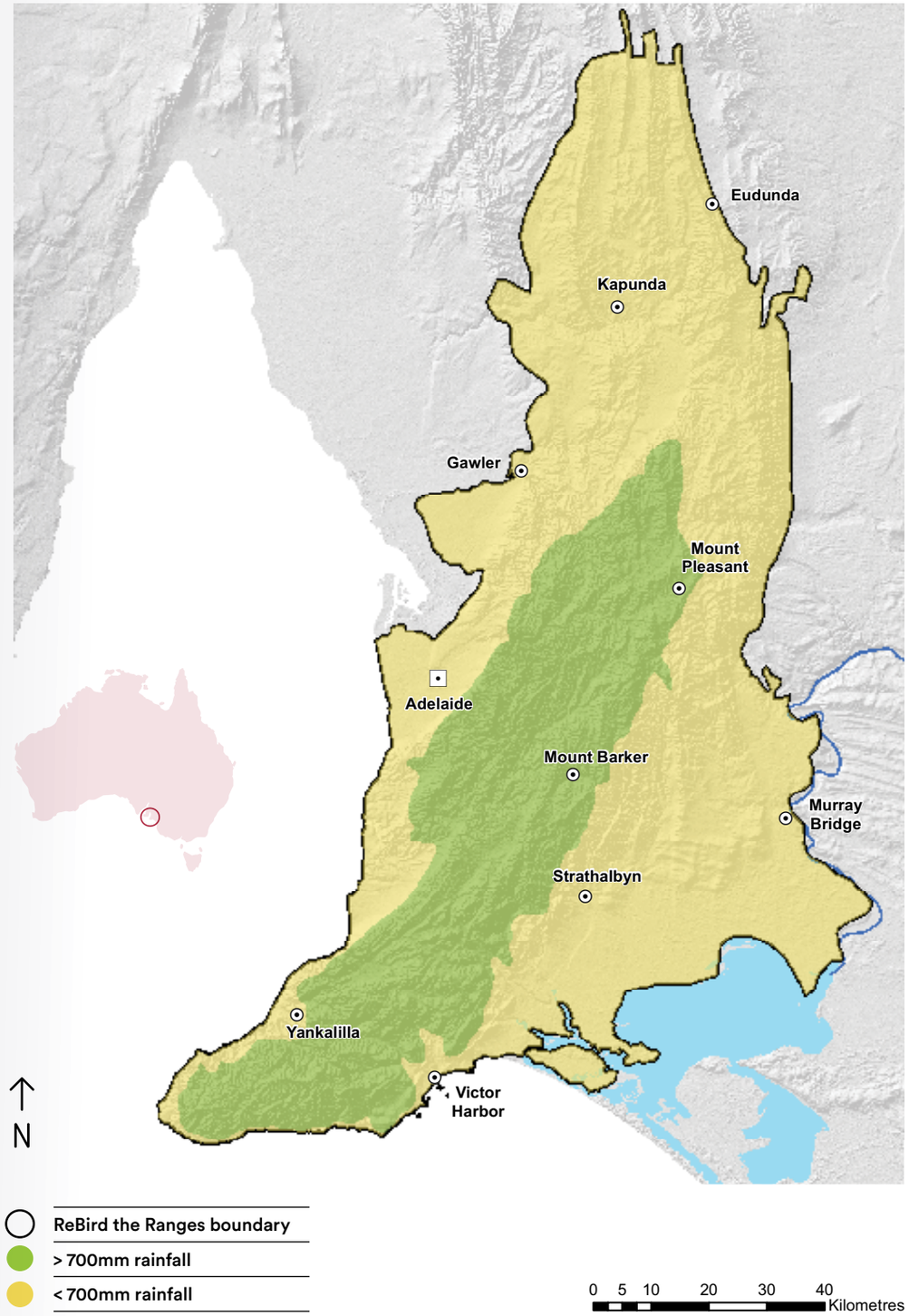
The Mount Lofty Ranges region is outstanding for its rich biodiversity. While only representing 1% of South Australia, it is home to over half the state's bird species.

The Mount Lofty Ranges (MLR) is a unique and beautiful part of the world. The region, as defined in this plan, stretches from the Barossa Valley in the north, along the eastern edge of the ranges, southward to Lake Alexandrina and the Murray River, encompassing the Fleurieu Peninsula, and extending across the Adelaide Plains to the west (Figure 1). This area covers just over 1 million ha.

Framed by low-lying semi-arid woodlands and mallee to the north and east, and by ocean to the south and west, the MLR is effectively an island of relatively mesic habitats. These wetter ecosystems, especially forests, woodlands and swamps, are more characteristic of eastern Australia than the drier ecosystems typical of much of South Australia.

The MLR region has a high diversity of landscapes and ecosystems within its small area, due largely to the variable topography of the ranges (rising from sea level to over 700 m), soils and rainfall patterns. As a result, many of the birds naturally found in the MLR are isolated and genetically distinct from their counterparts in eastern Australia.

Figure 1:
The MLR region as defined in this plan.



Mount Lofty Ranges: a bird extinction hotspot

For decades, ecologists have reported that many bird species in the Mount Lofty Ranges are declining (Ford and Howe 1980; Paton, et al. 2004). The MLR has some of the highest rates of bird extinctions (Figure 2) and concentrations of threatened bird taxa on the Australian mainland (Garnett and Baker 2021).

Long-term monitoring has provided insights into these declines, with some monitoring studies suggesting that the overall number of woodland birds in the MLR has dropped by 45% since 2001 (Prowse, et al. 2021).

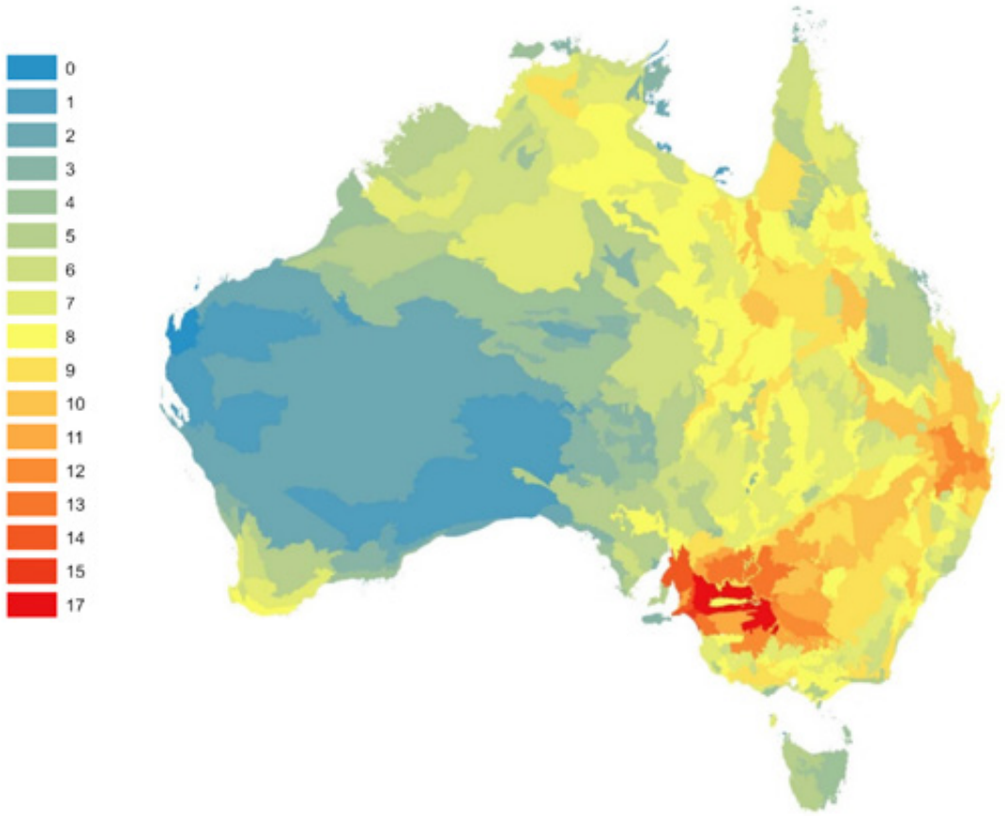
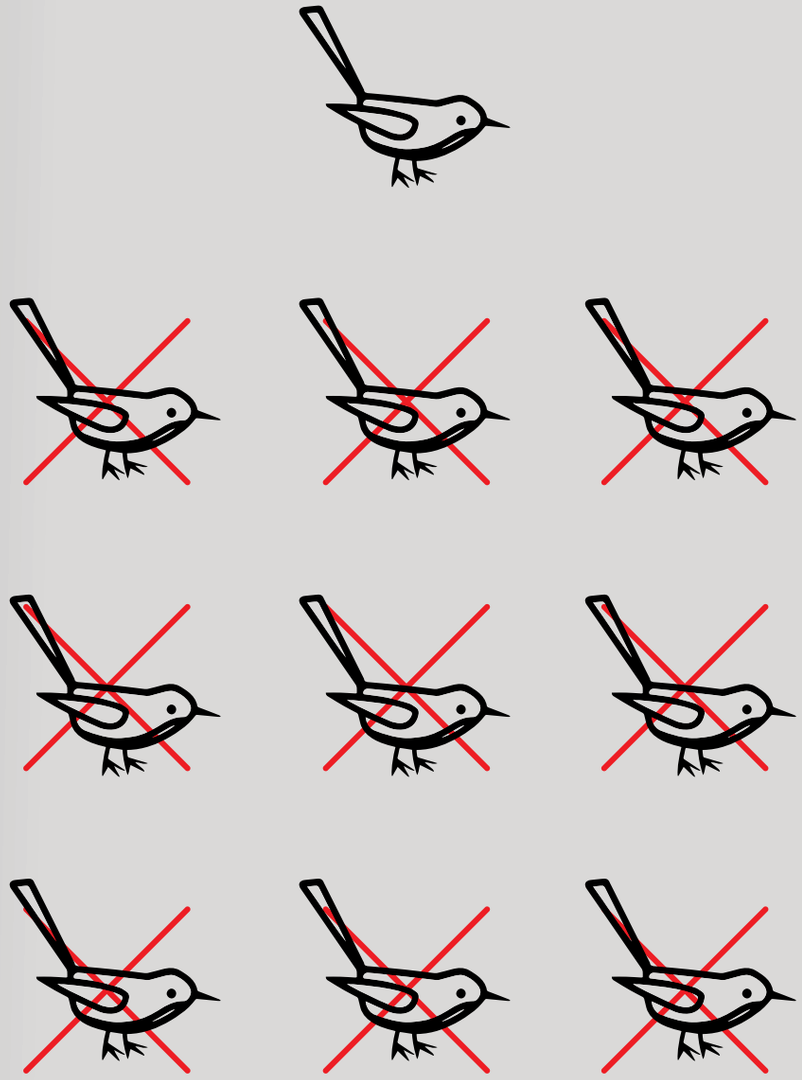
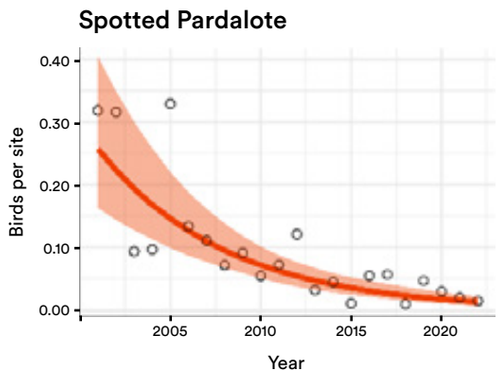


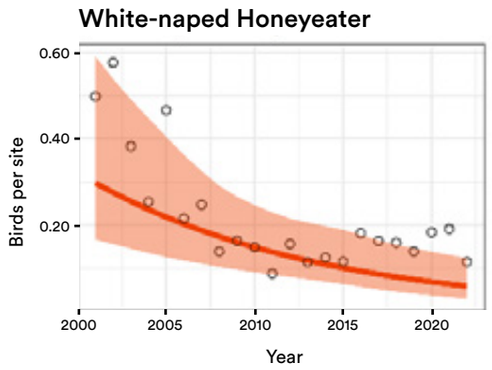
Figure 2: Number of birds extinct within subregions across Australia, showing high extinction rates of birds in the Mount Lofty Ranges (adapted from Ward, et al. 2022).

It is hard to show people what has been lost, as the birds that are no longer here are now invisible and silent. For every bird that remains we can assume there are at least nine others that no longer have a place to live in the Mount Lofty Ranges.





Spotted Pardalote.
Photo: Ann Houghton



White-naped Honeyeater.
Photo: Neale Dyster

Figure 3: Trends in detection of Spotted Pardalote and White-naped Honeyeater across 159 monitoring sites in the central eucalypt forests of the MLR over the past 20 years (Prowse, et al. 2021).

Examples of the decline include the Spotted Pardalote (*Pardalotus punctatus punctatus*) and White-naped Honeyeater (*Melithreptus lunatus*), two bird species that are moderately common and widespread across southern and eastern Australia (Birdlife Australia 2023). Over the past 20 years, both species have seen significant declines across 159 monitoring sites in the central eucalypt forests of the MLR (Prowse, et al. 2021). This shows that, despite native vegetation in South Australia being protected from most clearance since 1991, many bird species are still declining. It appears that the remaining habitat is insufficient in both quality and quantity to maintain these species.

Mount Lofty Ranges woodland bird conservation status

Of the 266 bird species recorded as occupying or visiting the MLR, 121 are native species that inhabit the terrestrial habitats and are collectively referred to as ‘woodland birds’.

The conservation significance of the woodland bird species varies greatly – from endemic subspecies that exist nowhere else in the world to species that visit rarely as vagrants. Thirteen species are considered abundant and not of conservation concern, leaving 108 woodland terrestrial bird species that should be actively monitored. Alarmingly, 78 of these species have shown population declines in the region since 2012 (Allan 2023).

This plan includes actions to support regionally declining species, including those with a listed conservation rating and those with no listing.

“Species currently declining, but not yet listed as threatened, also deserve consideration to reduce their risk of sliding towards extinction and to maintain their functional roles in both natural and modified ecosystems... While conservation of threatened species is critical... there are complementary challenges (for) species not officially listed as threatened. The greatest reduction in ecological processes is likely to occur when relatively common species decline in abundance.”

(Bennett, et al. 2024, p.2-3).

Dependence of woodland birds on the Mount Lofty Ranges.

Of 121 woodland bird species,
78 have declined since 2012.
12 species are regionally extinct.

Dependence on the region

Group A – Threatened with extinction (IUCN criteria) (8)

Bassian Thrush, Western Beautiful Firetail, Black-chinned Honeyeater, Chestnut-rumped Heathwren, Diamond Firetail, Hooded Robin, Southern Emu-wren, Southern Whiteface

Group B – Isolated populations (17)

Brown Thornbill, Buff-rumped Thornbill, Crescent Honeyeater, Eastern Shrike-tit, Eastern Spinebill, Little Wattlebird, Painted Button-quail, Purple-crowned Lorikeet, Red-browed Finch, Scarlet Robin, Shining Bronze-Cuckoo, White-browed Scrubwren, White-naped Honeyeater, White-throated Treecreeper, Yellow Thornbill, Yellow-faced Honeyeater, Yellow-tailed Black-Cockatoo

Group C – Regular breeders (34)

Australian Owlet-nightjar, Brown Goshawk, Brown Treecreeper, Brown-headed Honeyeater, Brush Bronzewing, Chestnut-rumped Thornbill, Collared Sparrowhawk, Common Bronzewing, Dusky Woodswallow, Elegant Parrot, Fan-tailed Cuckoo, SA Western Whistler, Grey Currawong, Horsfield's Bronze Cuckoo, Jacky Winter (*SE ssp.*), New Holland Honeyeater, Rainbow Bee-eater, Red Wattlebird, Red-rumped Parrot, Restless Flycatcher, Rufous Whistler, Sacred Kingfisher, Silvereye, Southern Boobook, Spotted Pardalote (*south-eastern ssp.*), Spotted Pardalote (*yellow-rumped ssp.*), Striated Thornbill, Superb Fairy-wren, Tawny Frogmouth, Varied Sittella, Weebill, White-browed Babbler, White-winged Chough, Yellow-rumped Thornbill

Group D – Widespread or occasional visitors (49)

Australian Hobby, Black Falcon, Black Kite, Black-faced Cuckoo-shrike, Black-shouldered Kite, Blue-winged Parrot, Brown Falcon, Brown Quail, Brown Songlark, Bush Stonecurlew, Eastern Barn Owl, Emu, Fairy Martin, Flame Robin, Glossy Black-Cockatoo (*KI ssp.*), Grey Butcherbird, Grey Fantail, Grey Shrike-thrush, Laughing Kookaburra, Little Eagle, Little Lorikeet, Masked Woodswallow, Mistletoebird, Nankeen Kestrel, Olive-backed Oriole, Pallid Cuckoo, Peaceful Dove, Peregrine Falcon, Red-capped Robin, Rufous Songlark, Singing Honeyeater, Spiny-cheeked Honeyeater, Spotted Nightjar, Square-tailed Kite, Striated Pardalote, Swamp Harrier, Swift Parrot, Tawny-crowned Honeyeater, Tree Martin, Wedge-tailed Eagle, Welcome Swallow, Whistling Kite, White-browed Woodswallow, White-fronted Chat, White-plumed Honeyeater, White-throated Needletail, White-winged Triller, Willie Wagtail, Zebra Finch

Group E – Abundant generalists – not of conservation concern (13)

Australian Magpie, Crested Pigeon, Crimson Rosella, Eastern Rosella, Galah, Little Corella, Little Raven, Long-billed Corella, Magpie-lark, Musk Lorikeet, Noisy Miner, Rainbow Lorikeet, Sulphur-crested Cockatoo

See Appendix 1 for more detail on bird groupings.

Drivers of woodland bird decline

The loss of habitat in the Mount Lofty Ranges has been driving bird declines for 50 years. Ford and Howe (1980) predicted that at the current level of native vegetation, 35-50 species of birds would eventually become extinct in the region, even if no further vegetation was cleared.

Hooded Robins.
Shutterstock image.

Habitat loss, fragmentation and degradation

The birds of the Adelaide and MLR regions have faced devastating changes in the past 200 years. Since European settlement, an estimated 87% of the region was cleared for agriculture, industry and housing (DEH 2010). The loss of habitat in the MLR has been driving bird declines for 50 years (Ford and Howe 1980).

Alongside this widespread habitat loss, there have been profound changes to the ecology of the region, including:

- the end of regular burning of native grassy woodlands by First Nations peoples.
- logging, cropping, fertilising and grazing of flatter, more fertile soils.
- harvesting of trees for construction and industry, with some areas replaced with forestry plantations.
- establishment of pest plants and animals, which displaced many native species through selective grazing and competition.
- increased pasture and permanent water supplies leading to a rise in western grey kangaroo numbers, causing over-grazing of native vegetation.
- alteration of environmental water flows due to diversion, use and storage in dams.
- development of settlements, roads, houses and industrial infrastructure.

These combined changes have fragmented, degraded and reduced bird habitats across the region.

Habitat fragmentation has significant impacts on bird populations, especially:

- reduced available habitat leading to smaller overall populations.
- isolation of sub-populations, making it harder for individuals to traverse landscapes, reducing breeding success and increasing genetic bottlenecks.
- difficulty for individuals locating critical resources for feeding, survival and reproduction.
- increased vulnerability of isolated vegetation patches to edge effects and lower resilience.

While many bird species have survived the historic habitat clearance, the dramatically altered landscapes and ongoing habitat degradation mean that population declines continue. Without significant intervention local extinction will likely follow – this is referred to as an ‘extinction debt’ (Tilman, et al. 1994).

The current amount and quality of habitat across the Mount Lofty Ranges is insufficient to support and sustain healthy populations of many bird species.

Scarlett Robin.
Photo: Martin Stokes

Disproportionate clearance of ecosystems

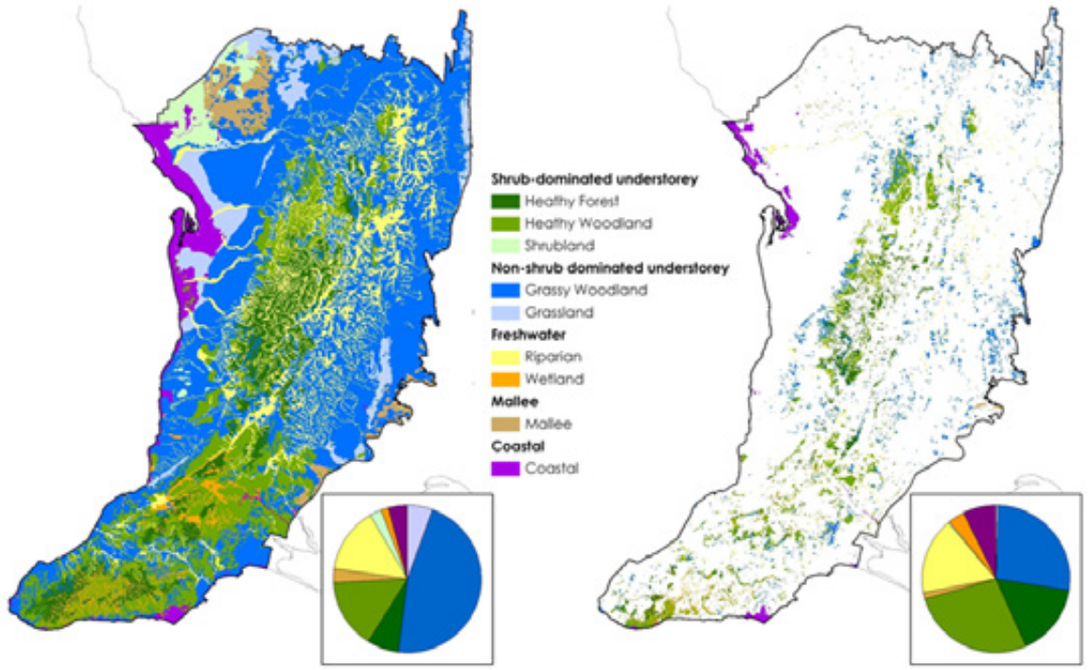


Figure 4: First Nations managed landscapes (4a) and post-European settlement vegetation (4b) (Source: DEH 2009).

Vegetation clearance across the region was extensive, but as shown in Figure 4, some habitats were cleared more than others. Most of the remaining vegetation in the MLR is concentrated in a band of forest and woodland habitat along the elevated central spine of the ranges. The forests in the higher, steeper areas with less fertile soils were logged but not heavily farmed. Today, nearly half of this habitat remains, though it has been significantly modified and varies widely in condition.

In contrast, the more gently sloping grasslands and grassy woodlands of the Adelaide Plains to the west and the eastern slopes of the ranges – which once covered 80% of the region were almost entirely cleared for agriculture and settlements. This extensive loss of grasslands and grassy woodlands had a profound impact on bird species that depended on these habitats, including the majestic Australian Bustard (*Ardeotis australis*).

Once a common sight in the region, the Australian Bustard is now regionally extinct. Its decline was primarily driven by the widespread clearance and modification of native grasslands, which eliminated essential food sources and shelter. This was further exacerbated by hunting and predation by foxes (Boehm 1947).

Australian Bustard, once a common sight in the grassy woodlands of the MLR.
Photo: David Ongley

Current drivers of decline and threats

The drivers and threats causing woodland bird declines are multifaceted and complex. Three primary drivers and five key threats are summarised below (see Appendix 3 for a detailed conceptual model of drivers, pressures and impacts).

Primary drivers of bird decline in the Mount Lofty Ranges

Urban infrastructure and development

Clearance of vegetation for residential and industrial development continues in the MLR. These impacts occur at both at the property scale with urban infill and tree clearance, and on a broader landscape scale, particularly in high-growth areas like Mount Barker. Urbanisation brings with it pest plants and animals, habitat loss and removal, and changes to water and fire regimes.

Agriculture and land use development

Land has historically been cleared for agriculture, and food production and agriculture continue to be a key land use across the MLR today. In addition to native vegetation clearance, such land use change can alter natural water systems, introduce pest plants and animals, and impact birds through the application of insecticides and herbicides. However, agricultural practices continue to evolve, with revegetation increasingly embraced as a key part of regenerative agriculture. This shift enhances biodiversity and also boosts on-farm natural capital, contributing to sustainable land management.

Climate change

Climate change influences habitat condition and resource availability for birds. Under a medium emissions scenario, the MLR climate is projected to be about 2˚C hotter by 2099, accompanied by more variable and reduced spring rainfall, more catastrophic fire days, more frequent heatwaves, and a rise in extreme weather events such as floods and storms (DEW 2022). These changes will exacerbate stresses on already vulnerable bird populations. Impacts may include disrupted seasonal patterns, mismatches between flowering times of nectar-producing plants and their pollinators, and heightened pressures from disease and pest species.

Photo: Louis Hoang

Key threats to Mount Lofty Ranges birds and their habitats

Grazing by livestock, pest animal species and overabundant native animals

The high total grazing pressure from livestock, overabundant kangaroos and introduced pest animal species (such as deer, goats and rabbits) in the MLR can reduce the diversity and health of native habitats. This pressure particularly degrades understorey of remnant vegetation, with some of the most palatable plant species, such as Allocasuarina species, disappearing from parts of the landscape. There are also indirect effects from hard-hooved animals, including soil compaction and/or erosion, particularly in riparian areas. Bird species that are specialist ground foragers or rely on shrubby understorey are most at risk from these grazing pressures.

Inappropriate fire regimes

Fire is a natural element in our landscapes, and burning patterns have changed significantly in the last 200 years. Large, hot bushfires can have severe impacts on remnant habitat patches and can directly kill birds. Fire regimes can have longer term consequences for vegetation and habitat. For example, Koch (2003) identified that seed and nectar production in stringybark trees can be reduced for an average of 10 years following crown scorching. While some birds benefit from long-unburnt habitat (Prowse 2017), other species in ecosystems such as heathland, may benefit from more frequent fires. These managed fires can promote vegetation recruitment, enhance habitat quality and optimise habitat for some birds.

Insecticides and loss of insects

Loss and degradation of habitat, along with light pollution and pesticide use, have had debilitating effects on regional insect populations. The majority of MLR birds eat insects, which means that loss of insects is a critical issue. Insect abundance and the populations of birds that depend upon them can be used as a biodiversity health indicator.

Weeds, disease and predation

The condition and function of habitats in many areas have been significantly altered by weed incursions that displace native plants that provide essential food and structural components. Some weeds now provide habitat and need to be replaced gradually. Diseases also pose substantial threats to wild bird populations. For example, psittacine beak and feather disease is a threat to parrot species, while the impending arrival of avian influenza in Australia may have serious consequences for wild and domestic birds. Additionally, root rot fungus (*Phytophthora cinnamomi*) seriously threatens habitat condition in some parts of the MLR.

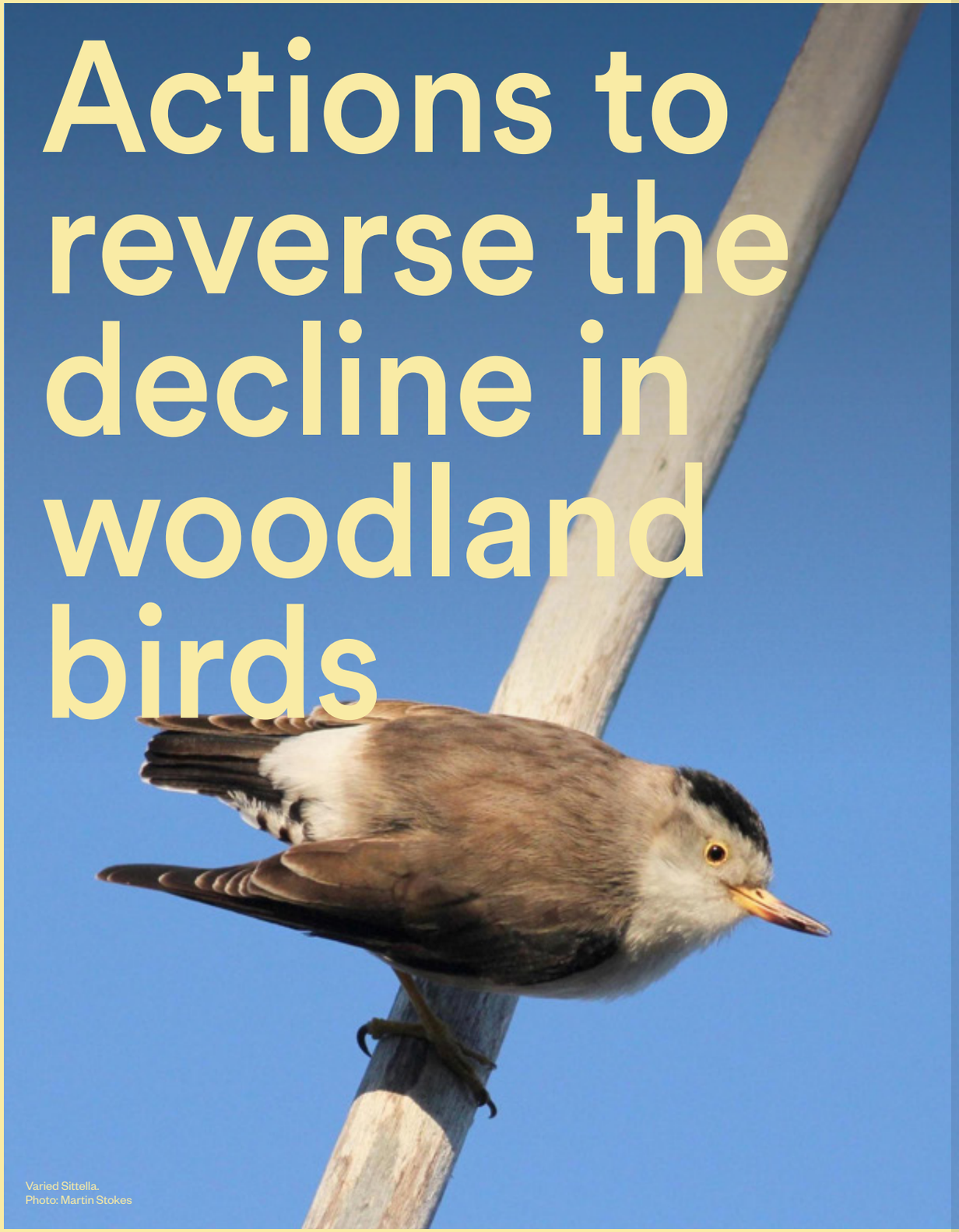
Predation of birds, nests and eggs by native and introduced animals (such as cats, foxes, dogs and rats) has been found to be significant in similar temperate woodlands in south-eastern Australia.

Effective management of these threats requires species-specific and site-specific approaches. For example, rapid removal of blackberry can inadvertently displace thicket-dependent birds, while fox baiting can lead to an increase in cat populations.

Native and invasive bird competition

Some woodland bird species are adversely affected by aggressive, abundant native and introduced species. For example, the native Noisy Miner and Magpie can be aggressive to more vulnerable bird species and can also raid nests of eggs and chicks. The non-native Common Blackbird can compete with the threatened Bassian Thrush for habitat.

Actions to reverse the decline in woodland birds



Varied Sittella.
Photo: Martin Stokes

“What we need to do right now is start an honest conversation between community groups, farmers, policy makers and key industry players about what is valued in the Mount Lofty landscape. The science is settled; too many woodland bird species are in serious decline and now is the time to take action before these birds and their systems are further imperilled. It isn’t too late, but it will be soon.”

Professor Patrick O’Connor

Our goals and success measures

ReBird the Ranges partners are committed to restoring and reconstructing 30% of each habitat type across the MLR. The target aligns with the Australian Government's Threatened Species Strategy Action Plan 2022-2032 and other international commitments. It has been demonstrated by science to be the optimal balance between conservation effort and ecological reward.

'...managing 30% of optimally located land area for conservation may be sufficient to meet conservation targets for 81.3% of the terrestrial plant and vertebrate species...'

(Jung, et al. 2021, p.1)

To achieve this target, we would need at least 300,000 ha of the approximately 1,000,000 ha MLR region to be covered with functional bird habitat. This requires existing habitat to be maintained or restored to a functional quality, and missing habitat to be reconstructed. This needs to occur in the right proportions, to ensure there is enough of each habitat type. The restoration targets presented in our goals use the latest DEW vegetation mapping to calculate the area required to achieve 30% of each habitat type.

The goals in this plan are unashamedly ambitious but achievable within our proposed 75 year timeframe. As outlined in Appendix 4 we already have many groups and individuals restoring and reconstructing bird habitat. To achieve the 30% target required to secure bird populations, the current rate of reconstruction projects across the MLR would need to be upscaled by six-fold.

1.

Create a groundswell of community support for bird recovery

- Increase in community awareness and active volunteering each year
- Increase in investment and nature financing each year

2.

Protect existing habitats and manage threats

- Reduction in number of trees and hectares of native vegetation cleared each year
- Increase in number of landholders, First Nations people and volunteers actively managing habitats for birds
- 60,000 ha of closed woodland and heathland, and 127,000 ha of grassy woodland and grassland, being actively managed to provide functional habitat for priority bird species

3.

Reconstruct habitat at scale

- 120,000 ha of grassy woodland and grassland reconstructed in priority locations
- 14,000 ha of heathland reconstructed in priority locations

4.

Research, monitor and adapt

- Learnings are shared and bird recovery initiatives are adapted and improved
- Monitoring detects trends in bird abundance and distribution, and supports understanding of bird species status
- Knowledge gaps are filled with research and evaluation of restoration actions

Goal 1.
Create a groundswell of community support for bird recovery

The bird declines will only be reversed by the deliberate action of people. We can fix this if we work together, to increase understanding and grow community support for bird recovery. We need everyone's help – from those that own land and run commercial properties to those who can get involved, volunteer, donate or promote the stories of bird recovery programs.

Community at Mark Oliphant Conservation Park revegetation; Landscapes Hills and Fleurieu.

Table 1.
Action areas for Goal 1 – Create a groundswell of community support for bird recovery.

Action areas	Description
1.1 Raise community awareness	Share narratives, communicate stories and celebrate the joy of birds. Explain the challenges and emphasise the ways that individuals can help. Work with partner organisations and high-profile advocates to reach wider audiences.
1.2 Involve First Nations peoples in bird recovery	Collaborate with First Nations peoples to embed Aboriginal knowledge into restoration practices and caring for Country, including cultural burning. Create opportunities for Aboriginal businesses and communities to actively participate and benefit from restoration initiatives.
1.3 Inspire community action	Motivate community involvement in bird recovery activities, including volunteering and participating in restoration projects, birdwatching, citizen science and other events. Encourage bird-friendly revegetation and gardens.
1.4 Engage all landholders in bird recovery	Inspire and provide support for landholders to improve the condition of remnant vegetation and to reconstruct habitats, and potentially to dedicate, manage or rotate a percentage of their land for birds and biodiversity.
1.5 Support landholders in priority reconstruction areas	Engage landholders in high priority areas for reconstruction of grassy woodland or heathland, where target bird species still exist and where remnant habitats can be connected. Encourage practices that benefit both biodiversity and production.
1.6 Attract significant funding and capital investment	Explore and attract funding, investment and partnership opportunities (local, national and global) to support bird recovery actions – particularly for the expensive and large-scale habitat reconstruction required. Link landholders with available income streams and grant opportunities, including emerging biodiversity markets.

Goal 2.
Protect existing habitats and manage threats

Retaining existing habitats and restoring their habitat condition is far more cost effective than trying to reconstruct them once lost. Ecosystem loss is irreversible and even the best recovery efforts come a poor second to a fully functioning natural system. Although the South Australian Native Vegetation Act 1991 regulates native vegetation clearance, the cumulative impact of minor clearance is not trivial. The Native Vegetation Council 2022–23 Annual Report lists 94 ha and 965 remnant trees as being officially cleared that year across the Hills and Fleurieu section of the MLR.

There are concerns about the health of remnant habitats due to the threats mentioned earlier. That is why we have included restoration targets in this goal, along with reconstruction targets in Goal 3. Restoration involves removing threats such as weeds or over-grazing and adding enhancements such as native grasses and shrubs or missing habitat elements including logs and hollows.

‘Overall, the protection of remnant habitat is critical to prevent further declines. Revegetation and infill plantings, while an important piece of the puzzle, take years to provide benefits to birds (e.g. saplings can provide an understorey habitat) and 100s of years to provide mature habitat features such as nesting hollows.’

(Jung, et al. 2021, p.1)

Photo credit: Bush For Life volunteers, Trees For Life.

Table 2.
Action areas for Goal 2 – Protect existing habitats and manage threats.

Action areas	Description
2.1 Improve the condition of remnant habitats through managing threats and adding missing elements	Ensure all remnant native vegetation is restored and maintained to provide functional habitat for bird species. Support landholders to enhance habitat structure and diversity by planting endemic plant species that provide food or shelter, retaining fallen and standing dead trees, installing nest boxes to replace missing hollows, promoting mulch layers and dense or sparse understorey depending on the site. Support landholders to manage problematic weeds, and to manage cats, dogs, rabbits, foxes, rats, overabundant native birds, and honeybees.
2.2 Manage total grazing pressure to optimise habitat structure and support regeneration	Implement regional programs to eradicate feral goats and deer and to manage over abundant kangaroos. Ensure quotas for commercial harvest of kangaroos adequately reflect accurate kangaroo density data. Support landholders with information and fencing programs for regeneration and/or revegetation. Explore rotational and pulse grazing and other grassland optimisation techniques.
2.3 Enhance legal protection of existing bird habitat	Advocate for policies, regulatory compliance and social attitudes that protect existing native vegetation, including expanding clearance criteria to cover gradual habitat loss (e.g. ringbarking by livestock). Advocate for legal protection of revegetated habitats and standing dead trees.
2.4 Improve awareness among landholders, developers and real estate agents	Establish systems to ensure buyers and owners are aware of existing vegetation protection laws, land management obligations and recommended best practice. Target buyers and owners of land with priority habitat areas.
2.5 Support and expand a well-managed private, public and First Nations representative reserve system	Work with relevant authorities (and conservation organisations) towards a representative and effective reserve system that provides strong protection and effective management for bird habitats. Investigate options for First Nations land acquisition and management. Pursue covenants and other protection for specific and essential bird habitats on private land.
2.6 Retain native vegetation in the face of bushfire threats	Work with councils, fire authorities and landholders to communicate 'living with fire' strategies that allow for bird habitat to be maintained alongside bushfire safety and prevention activities. Consider using cool cultural burns to lower bushfire risk.
2.7 Manage fire and use cultural burning to maintain health of ecosystems	Work with Department for Environment and Water, Landscape Boards, Country Fire Service, First Nations and other land managers to protect threatened bird populations from bushfire and maximise habitat structure and fire age to meet the needs of priority bird species. Engage First Nations Fire Teams to conduct cool mosaic burning whenever possible.
2.8 Return water and improve the condition of riparian habitat	Encourage landholders to enhance riparian ecosystems, including through fencing livestock out of watercourses, revegetation, removal of unnecessary dams, installing low-flow devices to dams and other measures to increase environmental flows.
2.9 Increase insect populations and reduce poisons	Raise awareness and promote actions to increase insect populations. For example, encourage insect-promoting plantings, minimise pesticide use and reduce light pollution. Promote alternatives to rodenticides that can kill raptors.

Goal 3. Reconstruct habitat at scale

Fragmented, degraded or insufficient habitat is the primary threat to MLR woodland birds. Reconstructing habitat at scale in the MLR is a key priority to boost the resilience and recovery of bird populations. Both global and Australian targets focus on “restoring 30% of degraded landscapes” (DCCEEW 2022).

The most urgent need is for reconstruction of the extensively cleared plant communities – grassy woodlands, grasslands, and heathlands. This requires large-scale revegetation to reconstruct fully functional, self-sustaining ecosystems that can support a range of bird species, as well as targeted revegetation for the species most at risk of extinction. The aim of reconstruction is not to return land to its pre-European condition, but to restore habitats that are more functional for birds, self-generating, and resilient to climate change impacts. See Appendix 4 for the range of reconstruction projects already underway.

Left: Planting at Watchalunga Nature Reserve, Nature Foundation.
Right: Volunteers planting at Frahns Farm. Bio·R

Table 3.
Action areas for Goal 3 – Reconstruct habitat at scale.

Action areas	Description
3.1 Reconstruct heathland / closed shrubland at scale for species of concern	Reconstruct an additional 14,000 ha of heathland / closed shrubland to reach the total of 26,000 ha needed to support viable populations of heathland-dependent species (Allan, et al. 2020). Focus revegetation efforts near known populations of the threatened MLR Southern Emu-wren, Western Beautiful Firetail and MLR Chestnut-rumped Heathwren. Prioritise plantings of more than 100 ha. Expanding this habitat will also benefit a wide range of other at-risk species. Reconstruction can take place on both private and public land and should ideally be protected through Heritage Agreements or covenants.
3.2 Reconstruct grassy woodlands and grasslands at scale for species of concern	Reconstruct an additional 120,000 ha of grassy woodlands and grasslands to reach a total of 240,000 ha, ensuring 30% representation of the habitat's former extent. This revegetation aims to maintain an open woodland or grassland structure that supports bird species foraging on the ground. Focus plantings near existing populations of priority bird species, with a preference for areas over 100 ha. The revegetation approach can be tailored to different land uses, ranging from full ecosystem restoration in rested paddocks through to replacing paddock trees and creating block plantings in grazing areas.
3.3 Reconstruct eucalypt forests and woodlands for species of concern	Given the larger extent of eucalypt forest and woodland, the restoration focus for this vegetation community is on improving habitat condition and managing threats (Goal 2). While it is a lower priority, targeted reconstruction to connect remnants or expand patch sizes to over 100 ha will benefit many bird species that rely on these habitats.
3.4 Protect and maintain reconstructed habitats	Once new habitat is established, assist land managers in maintaining it as high-quality bird habitat for the long term. This includes ongoing threat management (see Goal 2) and, where feasible, securing formal protection (e.g. through Heritage Agreements).
3.5 Plan for a different climate – drier, warmer, with more extreme weather	Plan for a future climate that is drier, warmer and experiences more extreme weather events by incorporating broader, climate-ready provenance into revegetation tube and seed stock. This means using locally sourced seeds mixed with seeds from warmer climates to increase resilience in plantings (Trees for Life 2021). Additionally, protect existing drought refuges and create new climate refuges where birds can shelter during extreme weather (Howling and Fullagar 2020).
3.6 Increase revegetation capacity: seed collection, seed production and propagation	Establish seed orchards and seed propagation areas to boost seed production. Encourage greater community involvement in collecting, propagating and planting seed. Strengthen the human resources, infrastructure and equipment needed to scale up seed production for MLR revegetation efforts.
3.7 Support Indigenous 'Caring for Country' activities by engaging First Nations work teams	When carrying out land reconstruction and restoration activities across the region, as outlined in 3.1 to 3.4, plan to involve First Nations work teams and cultural advisors. Their role will include identifying and protecting cultural heritage sites and supporting a broad range of healing Country activities.

Goal 4. Research, monitor and adapt

We are fortunate to have long-term longitudinal bird datasets and millions of bird records across the MLR. Yet there are still gaps in our knowledge of the status of bird species, the drivers of their decline, and how to best motivate communities to restore habitats.

Robust research, monitoring and evaluation is required to ensure we are efficient and that we learn from and adapt our restoration work. Embracing innovative techniques and novel approaches will be part of the solution to help address this massive challenge, especially in the face of a changing climate.

Below: Undertaking bird survey monitoring. Photo: Ben Westmoreland

Right: Chestnut-rumped Heathwren. Photo: Martin Stokes

"Monitoring and research provide the essential feedback loop that lets us adjust conservation efforts to changing conditions."

Thomas E. Lovejoy

Table 4.
Action areas for Goal 4 – Research, monitor and adapt.

Action areas	Description
4.1 Establish a coordinated MLR bird monitoring program	Develop a region wide monitoring framework tailored to track trends in woodland bird species, including their abundance, distribution and use of existing and reconstructed habitat. This framework should integrate existing monitoring programs (as outlined in Appendix 5) and define monitoring methods and frequencies. The monitoring will support adaptive management of restoration and reconstruction programs. Secure sustainable funding for implementing and maintaining the monitoring program over the long term.
4.2 Track habitat condition and extent	Monitor trends in native vegetation, including restoration and reconstruction progress to understand effectiveness of interventions. Develop habitat monitoring using up-to-date methods and technology (e.g. remote sensing, drone and satellite) to map the extent and quality of habitat and track changes over time.
4.3 Prioritise high research that will directly improve bird recovery program methodology	Engage universities and research institutions to undertake research projects that will inform and guide restoration practices, including: • Landscape-scale habitat restoration • Socio-economic research • Ecological research • Climate Resilience (see Appendix 6 for more details)
4.4 Prepare best-practice guidelines for MLR bird recovery actions	Once new habitat is established, assist land managers in maintaining it as high-quality bird habitat for the long term. This includes ongoing threat management (see Goal 2) and, where feasible, securing formal protection (e.g. through Heritage Agreements).
4.5 Develop new citizen science opportunities	Activate citizen scientist and volunteer participation in data collection, data entry and ecological monitoring. Promote the use of citizen science apps for recording bird sightings (e.g. eBird, Birdata and iNaturalist).
4.6 Research courageous and innovative options to safeguard the most threatened bird species	Consider options available to protect the last populations of threatened species, including translocations and reintroductions, if viable. This may include novel approaches and researching options for captive insurance populations for species with small and isolated populations that could be wiped out by a single stochastic event.

Habitat needs of woodland birds

“In the Mount Lofty Ranges, every tree and every shrub matters – only with healthy habitats can we expect our birds to recover and thrive in the face of environmental challenges.”

Dr Rebecca Boulton

Eastern Spinebill on Yakka spike.
Photo: Martin Stokes

Heathland habitat

The recovery of bird populations in the MLR is closely tied to expanding the amount of functional bird habitat. This chapter details the essential habitat reconstruction and restoration needs and targets for woodland birds in three broad habitat groupings:

- Heathlands – wet and dry closed shrublands and coastal heath
- Open woodlands and grasslands – with a shrubby or grassy understorey
- Closed forests and woodlands – with dense or open sclerophyll shrub understorey.

Heathland habitat Cox Scrub Conservation Park.
Photo: Ben Westmoreland

Heathland is an essential habitat for some of the region's endemic and most threatened bird species. It is a priority to retain, restore and reconstruct this habitat around remaining bird populations.

Heathlands are characterised by a closed dense shrubby understorey, usually <2 m in height, and include heath, heathy woodland, coastal heath, and shrubby swamps. They occur on a variety of soils, some bird species prefer heathy understorey without a tree canopy and others are also found in closed forests and woodlands with a dense shrubby understorey. The MLR Southern Emu-wren (*Stipiturus malachurus intermedius*) is restricted to dense vegetation without a canopy, which includes swamp habitats within samphire, low shrubland and sedgeland/grassland-dominated waterways. Heathlands have been significantly cleared and modified by altered grazing, water and fire regimes.

Currently, only 12,000 ha of heathlands remain in the region (see Figure 5). Of this existing heath habitat, only about 5,000 ha is presently in a fire age class that is suitable for the species of conservation concern. Targeted ecological burns are an important method of increasing habitat for these species.

There are four bird species that specifically depend upon heathlands and many more that use some features of this habitat (Table 5). Among these, three threatened endemic subspecies the Western Beautiful Firetail (*Stagonopleura bella samueli*), MLR Southern Emu-wren and MLR Chestnut-rumped Heathwren (*Hylacola pyrrhopygia parkeri*) have experienced significant declines in recent years. To ensure their survival, it is critical to maintain and extend heathland habitats around their remaining populations (see Appendix 2).

Figure 5 shows the extent of heathland habitat and some of the current project sites. As heathland birds' dispersal ability is typically poor, restoration and reconstruction activities have begun at sites with known populations. Figure 6 shows the current areas occupied by the three endemic heathland species. Projects restoring heathland habitats beyond these areas will ultimately be essential to connect bird populations across their former range. Appendix 4 details habitat reconstruction efforts projects underway by ReBird the Ranges partners.

Note: Conservation ratings used in the document: Critically endangered (CR), endangered (EN), vulnerable (VU), rare (RA) and near threatened (NT) (see Appendix 1 for further details).

Over 100 ha of heathland reconstruction at Deep Creek National Park.
Photo: Landscape Hills and Fleurieu

Table 5.
Heathland dependent bird species (4).

Common name	Scientific name	Highest rating	Habitat grouping	Feeding guild	Niche / notable feature	Primary risk / need
Brush Bronzewing	*Phaps elegans*	Regional - RA	Heath & Forest	Granivore	Closed shrubland	Ground feeder
Chestnut-rumped Heathwren (MLR ssp.)	*Hylacola pyrrhopygia parkeri*	EPBC - EN	Heath & Forest	Insects & seed	Endemic	Ground nester
Southern Emu-wren (MLR ssp.)	*Stipiturus malachurus intermedius*	EPBC - EN	Heath	Insectivore	Endemic	Specific dense structure
Western Beautiful Firetail	*Stagonopleura bella samueli*	EPBC - EN	Heath	Granivore	Endemic	Specific food / seed plants

Southern Emu-wren.
Photo: Dion Thomson

Western Beautiful Firetail.
Photo: Heather Connolly

Chestnut-rumped Heathwren.
Photo: Martin Stokes

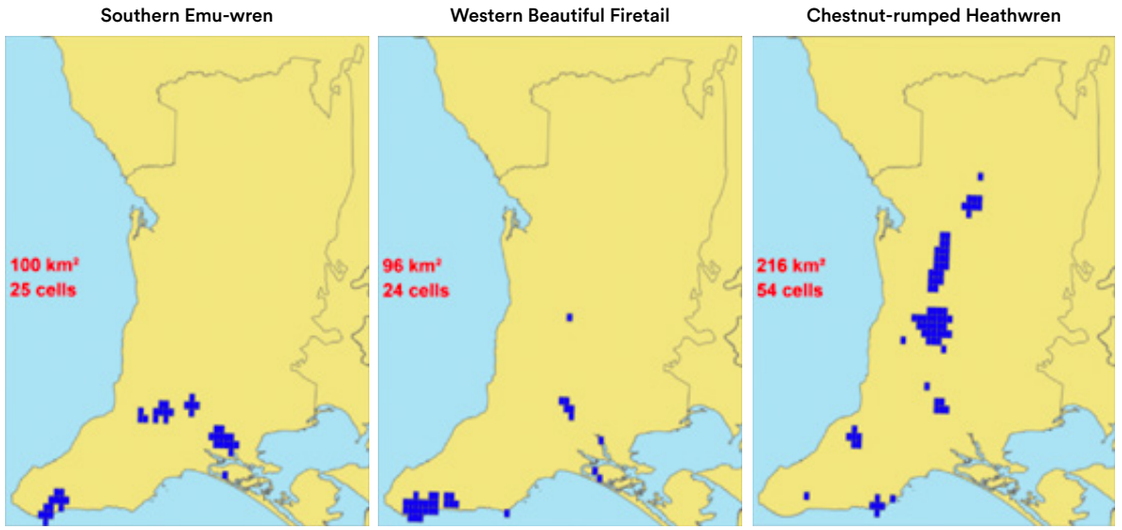


Figure 6: Area of Occupancy maps using records since 2012, for three heathland dependent bird species. Each blue square represents a 4 km cell that the species has been recorded in (Allan 2023).

Heathland reconstruction at Deep Creek. Photo: David Pearce

Figure 5:
Heathland vegetation with current project sites (further described in Table 6).

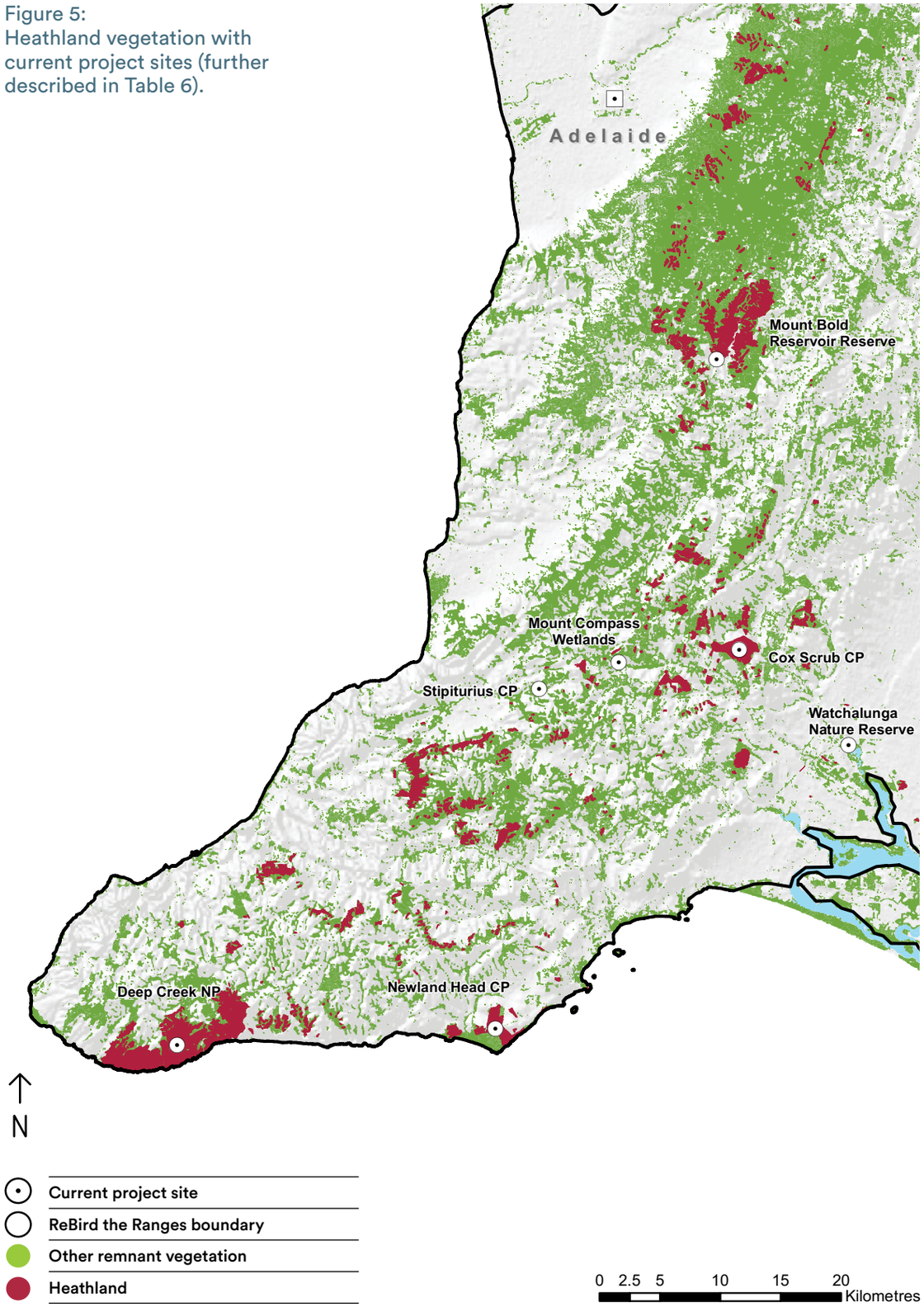


Table 6.
Heathland focus areas for reconstruction and restoration.

Region	Habitat / location significance	Dependent bird species
Deep Creek National Park and surrounds	The tip of the Fleurieu Peninsula supports significant areas of heathland vegetation and has a climate tempered by the surrounding ocean. It is an essential climate refuge that needs to be maintained and extended into the future.	A stronghold for Western Beautiful Firetail, Southern Emu-wren and other heathland dependant species.
Newland Head Conservation Park and surrounds	This isolated habitat patch is an important refuge for many heathland species.	Chestnut-rumped Heathwren is still persisting in this habitat.
Fleurieu swamps and parks cluster (Stipiturus CP, Mt Compass Wetlands, Cox Scrub CP & Watchalunga Nature Reserve)	This cluster of properties includes some of the most significant areas of wet heathland habitat in the MLR. Water flows, levels and management are critical for maintaining this habitat.	Especially important for the Southern Emu-wren with a majority of the remaining population found within these sites.
Mt Bold Reservoir Reserve and surrounds	This reserve supports one of the largest areas of heathland and closed woodland habitat in the central MLR. It is valuable habitat for both heathland and woodland dependent birds.	A stronghold for the Chestnut-rumped Heathwren.

Grassy woodland and grassland habitat

Before European settlement, grassy woodlands and grasslands covered over 80% of the region, forming a wide arc on either side of the central ranges and extending into valleys and fertile soils within the ranges (DEH 2009). Historically dominant in the region, these ecosystems were heavily targeted for agriculture, and disproportionately cleared, leaving only 7% of grassy woodlands and a mere 1% of grasslands.

Grassy woodlands are characterised by a ground layer that is dominated by native tussock-forming grasses and sedges with small shrubs and herbs. Grasslands can be naturally treeless but have a similar ground layer composition to grassy woodlands. The rainfall suitable for this habitat type ranges from approximately 300 to 600 mm per year.

Grassy woodlands have a very open canopy of widely spaced trees, usually eucalypts – including Pink Gum (*Eucalyptus fasciculosa*), River Red Gum (*E. camaldulensis*), SA Blue Gum (*E. leucoxylon*), Manna Gum (*E. viminalis*), Peppermint Box (*E. odorata*), Grey Box (*E. microcarpa*) and Mallee Box (*E. porosa*) – as well as Drooping Sheoak (*Allocasuarina verticillata*) and native pines (*Callitris spp.*).

There are 14 bird species in the region that are highly dependent upon this habitat (Table 7) and many other species that rely upon some features of this habitat for at least part of their needs.

The ecological significance of grassy woodlands is recognized through national listings under the EPBC Act, including the following threatened ecological communities:

- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- Peppermint Box (*Eucalyptus odorata*) Grassy Woodland of South Australia
- Iron-grass Natural Temperate Grassland of South Australia.

South Australia's Provisional List of Threatened Ecosystems also highlights additional at-risk grassland communities: *Allocasuarina verticillata* Grassy Low Woodland on clay loams of low hills; *Banksia marginata* Grassy Low Woodland on sandy loam plains in higher rainfall areas; *Callitris gracilis +/- E. leucoxylon* Grassy Low Woodland on quartzite gravels on western footslopes of Adelaide Hills; and *Themeda triandra +/- Danthonia spp.* Tussock Grassland on heavy, fertile soils of plains and hill slopes.

Grassy woodlands and grasslands are the most depleted habitats in the Mount Lofty Ranges and support the highest number of dependent bird species. Of all the Mount Lofty Ranges habitats, grassy woodlands and grasslands need to be reconstructed at the greatest scale.

Grassy Woodland. Photo: Bryan Haywood

Grassy Woodland.
Photo: Catherine Austin

Table 7.
Grassy woodland and grassland dependent species (14).

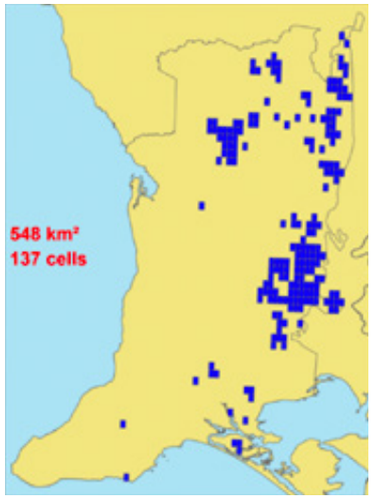
Common name	Scientific name	Highest rating	Feeding guild	Niche / notable feature	Primary risk / need
Black-chinned Honeyeater	*Melithreptus gularis gularis*	IUCN Criteria B - VU	Nectarivore	Rarely recorded	Functionally extinct?
Brown Treecreeper	*Climacteris picumnus*	Regional - EN	Insectivore	Dead wood	Nesting hollows
Chestnut-rumped Thornbill	*Acanthiza uropygialis*	Regional - VU	Insectivore	Dead wood	Nesting hollows
Diamond Firetail	*Stagonopleura guttata*	EPBC - VU	Granivore	Nearby water	Ground feeder
Hooded Robin (SE ssp.)	*Melanodryas cucullata cucullata*	EPBC - EN	Insectivore	Open ground	Needs large patches
Jacky Winter (SE ssp.)	*Microeca fascinans fascinans*	NP&W - RA	Insectivore	Ecotones	Ground feeder
Painted Button-quail	*Turnix varius*	NP&W - RA	Grain, Insects	Leaf litter	Ground nester
Rainbow Bee-eater	*Merops ornatus*	Regional - VU	Insectivore	Aerial feeder	Mud nest tunnels
Red-rumped Parrot	*Psephotus haematonotus*	Regional - NT	Granivore	Ground feeder	Nesting hollows
Restless Flycatcher	*Myiagra inquieta*	NP&W - RA	Insectivore	Aerial feeder	Insects
Southern Whiteface	*Aphelocephala leucopsis*	EPBC - VU	Insectivore	Open ground	Ground feeder
Tawny Frogmouth	*Podargus strigoides*	Regional - NT	Insectivore	Nocturnal	Young fall from nests
White-browed Babbler	*Pomatostomus superciliosus*	Regional - EN	Omnivore	Leaf litter	Ground feeder
White-winged Chough	*Corcorax melanorhamphos*	NP&W - RA	Insects, seed	Leaf litter	Ground feeder

Diamond Firetail.
Photo: Dan Easton

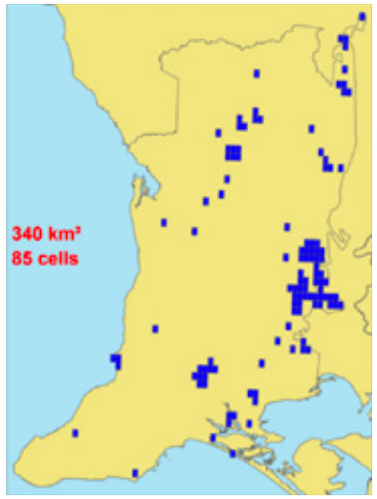
Hooded Robin.
Photo: Dan Easton

Brown Treecreeper
Photo: Neale Dyster

Diamond Firetail



Hooded Robin



Brown Treecreeper

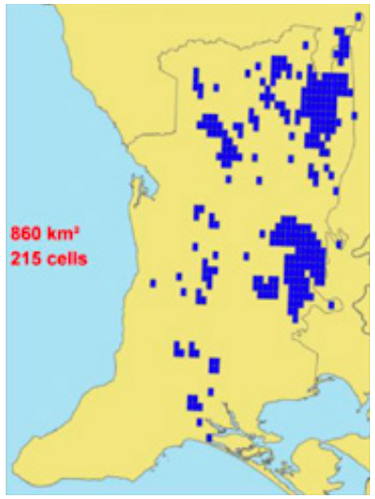


Figure 8: Area of Occupancy maps using records since 2012 of three declining grassy woodland and grassland dependent bird species. Each blue square represents a 4 km cell that the species has been recorded in (Allan 2023).

Kangaroo grass (*Themeda triandra*) understory provides essential food and shelter for birds and insects.

Insufficient habitat is the primary threat to the species listed in Table 7, but each also requires specific habitat features. Structural and floristic diversity is important, including open ground in the spaces between native plant tussocks – a key characteristic of grassy woodlands. These inter-tussock spaces allow species like the Diamond Firetail (*Stagonopleura guttata*) and Painted Buttonquail (*Turnix varius*) to forage and enable insectivores such as the Hooded Robin (*Melanodryas cucullata*) to spot and catch prey. However, introduced annual pasture grasses form dense mats of dead grass, removing this crucial habitat feature.

The Diamond Firetail, like most granivores listed, depends on woodlands with low tree and shrub density and a high cover of native grasses for foraging, roosting and breeding. Efforts to restore grassy woodlands should prioritise these habitat characteristics.

To assist bird species with limited dispersal ability, habitat reconstruction should ideally extend out from remnant population strongholds, enlarging and connecting fragmented habitats. For example, the Victorian subspecies of the Brown Treecreeper (*Climacteris picumnus*) has demonstrated poor ability to cross habitat gaps, leading to its loss from many isolated fragments (Cooper and Waters 2002).

Focus areas for reconstruction and restoration of grassy woodland and grassland are discussed in table 8. Many of these sites are in areas known to support populations of dependent bird species (Figure 8). As these bird species occur elsewhere across the MLR, restoration works beyond these focus areas are also important to secure and extend current populations. Appendix 4 details habitat reconstruction projects underway by ReBird the Ranges partners.

Rainbow Bee-eater.
Photo: David Pearce

‘Honeyeaters regularly move distances of 10– 100 km in search of food within the Mount Lofty region. The habitats that provide floral nectar during late summer and autumn, the gum and box woodlands, however, have been disproportionately cleared and honeyeater populations decline during these times.’

Paton, et al. 2004

Figure 7.
Grassy woodland and grassland vegetation with current project sites (further described in Table 8).

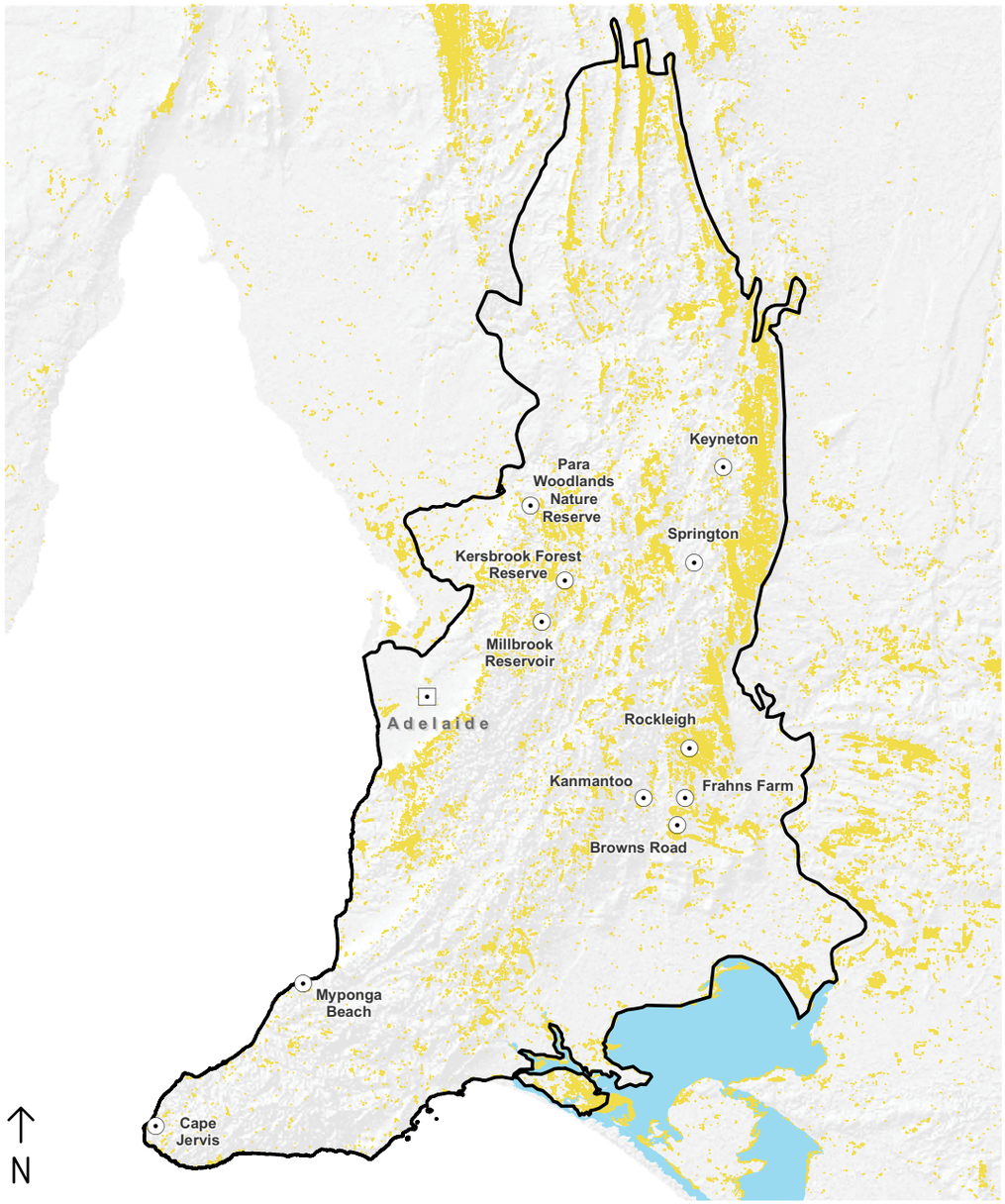


Table 8.
Grassy woodland and grassland focus areas for reconstruction and restoration.

Region	Habitat / location significance	Dependent bird species
Northwest reserve cluster	This cluster includes remnant and restored grassy woodland / closed woodland habitats, with several properties already managed by ReBird the Ranges partners. Includes Para Woodlands Nature Reserve, Para Wirra CP, Kersbrook Forest and Millbrook Reservoir.	Painted Button-quail, Restless Flycatcher and Diamond Firetail.
Eastern MLR grassy woodland	This area transitions from MLR Grassy Woodlands to Murray Mallee and provides habitat for most of the grassy woodland bird species. It includes historic Monarto plantings and revegetation programs at Keyneton, Springton, Kanmantoo, Rockleigh, Frahns Farm and Browns Rd reserve.	Hooded Robin, Southern Whiteface, Chestnut-rumped Thornbill, Brown Treecreeper, Restless Flycatcher, Rainbow Bee-eater, White-browed Babbler.
Southwest Drooping Sheoak cluster	Includes projects near Myponga Beach and Cape Jervis. The habitat was significantly cleared and the reconstruction of threatened Drooping Sheoak Grassy woodland will provide essential habitat adjacent to the closed woodlands of Myponga reservoir and Deep Creek NP.	Black-chinned Honeyeater, Red-rumped Parrot and Hooded Robin have been recorded nearby.

Closed forest and woodland habitat

Closed eucalypt forests and woodlands grow on the thinner, less fertile soils of the steeper, higher-altitude central spine of the ranges. Ridge tops feature low-nutrient skeletal soils, while riparian gullies have deeper, fertile soils that support some of the region's largest trees. These trees provide essential habitat for hollow-dependent birds such as the Yellow-tailed Black Cockatoo (*Zanda funerea*).

Current mapping indicates 43% of this vegetation community remains. However, it is well documented that much of it is in poor condition, with limited true old-growth forest and intact understory. Much of the area has regrown after clearing or logging, and remnants are degraded due to fragmentation, pest plants and animals, and altered grazing, water and fire regimes (Bradshaw 2019).

Many remnants are small patches which face increased edge effects, reduced resilience, and diminished capacity to recover and re-seed after events such as bushfires and prescribed burns (Prowse, et al. 2017). The shrub layers of woodlands are highly vulnerable to alteration or elimination from fire, weed invasion, and grazing pressures (Paton, Carpenter, and Sinclair 1994).

This habitat type includes forests and woodlands with a closed or open sclerophyll shrub understorey as well as tall gully forests with a closed understorey. The canopy eucalypt species are typically Stringybark (*E. obliqua*), Pink Gum (*E. fasciculosa*), Manna Gum (*E. viminalis*), SA Blue Gum (*E. leucoxylon*), River Red Gum (*E. camaldulensis*), Cup Gum (*E. cosmophylla*) or Candlebark (*E. dalrympleana*). The central spine of the MLR has higher rainfall (600 to >900 mm) than the flanking country. The midstorey and understorey of these habitat types vary significantly, from highly dense and impenetrable, to open and dominated by herbs and grasses.

Fifteen woodland bird species are considered closed forest and woodland specialists (Table 9) and many other species depend upon some features of this habitat for at least part of their needs.

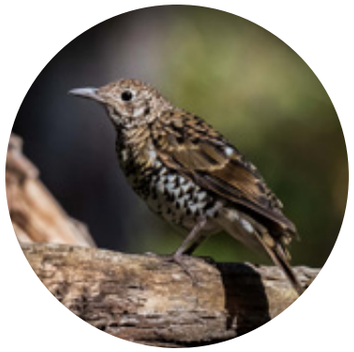
The remaining eucalypt forests and woodlands were less extensively cleared and are precious. They include large old growth trees and the priority is to retain and restore the remnants to maintain and increase their functionality.

Closed forrest with fallen timber providing important habitat for insects and birds. Photo: David Pearce

Table 9.
Closed forest and woodland dependent species (15).

Common name	Scientific name	Highest rating	Feeding guild	Niche / notable feature	Primary risk / need
Bassian Thrush (SA ssp.)	*Zoothera lunulata halmaturina*	EPBC - EN	Insectivore	Endemic/ dense moist understory	Ground feeder
Brown Thornbill	*Acanthiza pusilla*	Regional - VU	Insectivore	Closed Shrubs	Ground feeder
Buff-rumped Thornbill	*Acanthiza reguloides*	Regional - NT	Insects, seed	Sparce understory	Ground feeder
Crescent Honeyeater	*Phylidonyris pyrrhopterus*	Regional - NT	Nectar, insects	Dense vegetation	Nectar supply
Eastern Spinebill	*Acanthorhynchus tenuirostris*		Nectar, insects	Follow flowering plants	Nectar supply
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	Regional - NT	Insectivore	Brood parasite	Host abundance
Grey Currawong	*Strepera versicolor*		Omnivore	Terrestrial and arboreal	Insects and vertebrates
Scarlet Robin	*Petroica boodang boodang*	NP&W - RA	Insectivore	Open ground	Ground feeder
Shining Bronze-Cuckoo	*Chalcites lucidus plagosus*	Regional - RA	Insectivore	Brood parasite	Host abundance
Striated Thornbill	*Acanthiza lineata clelandi*		Insectivore	Old growth	Shrub layer
White-browed Scrubwren	*Sericornis frontalis*		Insectivore	Leaf litter	Ground feeder
White-naped Honeyeater	*Melithreptus lunatus*	Regional - VU	Nectar, insects	Follow flowering plants	Nectar supply
White-throated Treecreeper	*Cormobates leucophaea*	Regional - NT	Insectivore	Dead Wood	Nesting hollows
Yellow-faced Honeyeater	*Caligavis chrysops*		Nectarivore	Mainly arboreal	Nectar supply
Yellow-tailed Black-Cockatoo	*Zanda funerea*	NP&W - VU	Seeds, insects	Hollows	Nesting hollows

Stringybark Woodland.



Bassian Thrush.
Photo: Neale Dyster

Scarlet Robin.
Photo: Neale Dyster

Brown Thornbill.
Photo: Tom Hunt

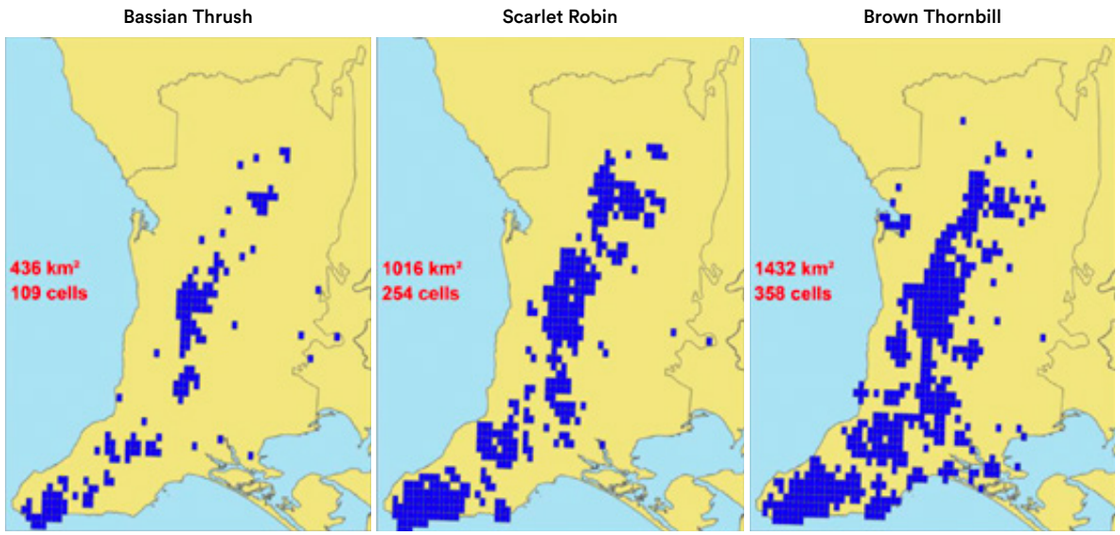


Figure 10: Area of Occupancy maps using records since 2012 of three species that depend upon remnant closed forest and woodland habitats. Each blue square represents a 4 km cell that the species has been recorded in (Allan 2023).

Stringybark woodland.

The species in Table 9 are primarily insectivores and nectarivores, feeding on the tree and shrub flowers or insects that occur in this habitat. The focus for restoration of this habitat is to increase its functionality to meet the diverse and sometimes contrasting needs of these bird species.

Many species, such as canopy-foraging or hollow-nesting birds, depend directly on trees for food and shelter. Others, like the Western Bassian Thrush *(Zoothera lunulata halmaturina*), require dense understorey vegetation (sometimes including weeds) and rich mulch layers. This species is particularly reliant on moist riparian habitat and is highly sensitive to frequent fires, grazing and trampling by livestock and other herbivores (Boulton and Whittaker 2021).

In contrast, the Brown Thornbill also requires dense shrubby vegetation but responds favourably to disturbances that promote regrowth. Meanwhile, the Scarlet Robin requires access to open ground, which is more available with more frequent fires, grazing and other clearing events.

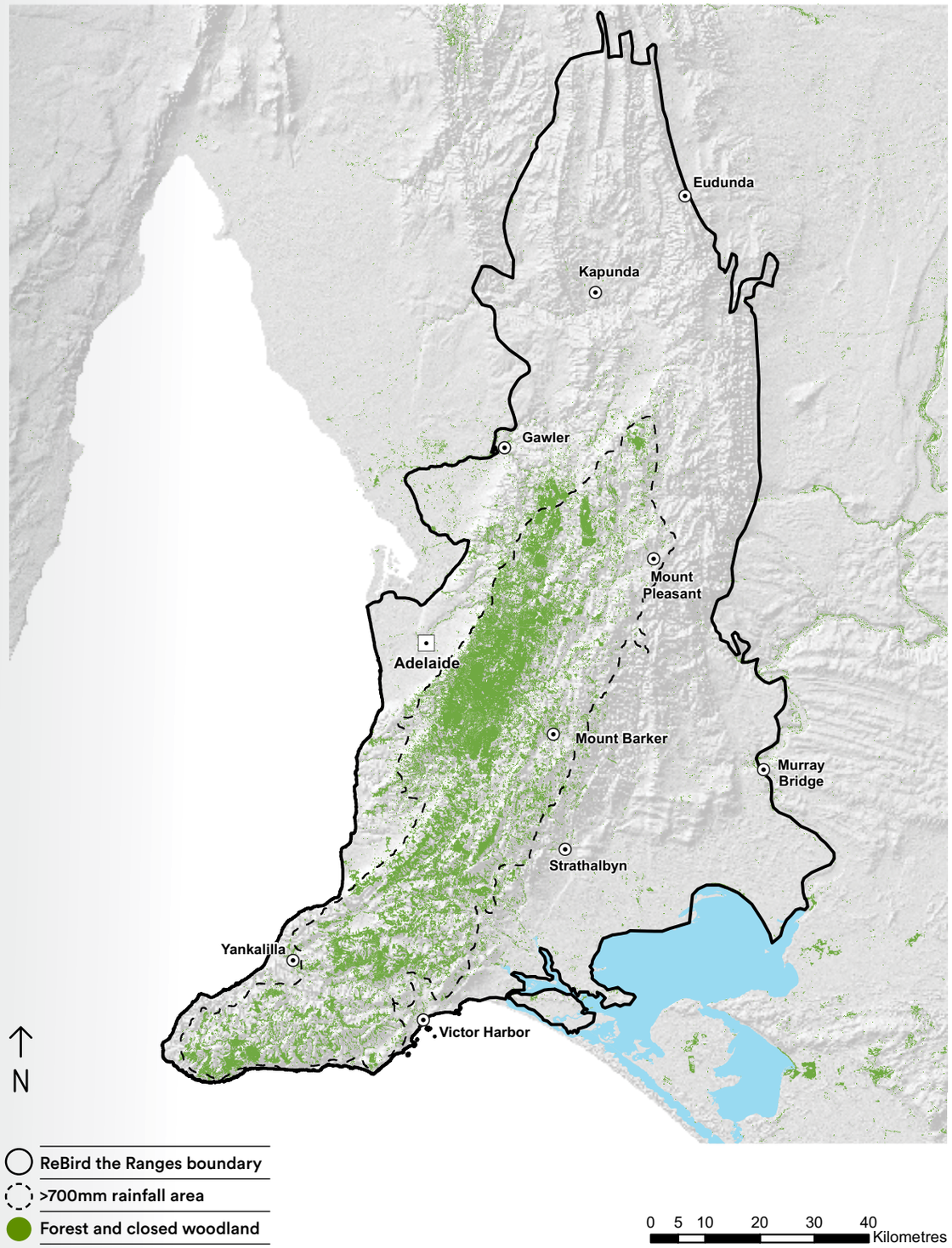
This diversity of habitat preferences illustrates the importance of large patch sizes that include a variety of different habitat types and components. Structural and temporal diversity is essential, with habitats progressing through various stages from new-growth to old-growth, open to closed, recently burnt to long unburnt.

Figure 9 shows existing forest and closed woodland habitat and uses the > 700mm isohyet to indicate the likely historic extent of this habitat type. Figure 10 shows the areas occupied by three of the dependent bird species.

Maintaining and restoring the functionality of all existing closed forest and woodland habitat is the priority and ideally projects should extend out from 100 ha or greater clusters known to be occupied by dependant bird species. While this is a significant task, it is likely to be less costly than the habitat reconstruction required for grassy woodlands and heathlands. Restoration efforts will focus on maintaining the ground, grass, and shrub layers to support dependent bird species. This includes addressing threats outlined in Chapter 2 and incorporating missing habitat elements discussed later in this chapter.

Restoration work is underway in many parts of the region. Initiatives include the Trees for Life Tree Scheme, which assists landholders in growing and planting seedlings of key missing plant species, support and grants provided by Landscape Boards, and work by individuals, Bushcare, Friends of Parks and other volunteer groups that are active in restoration work from weed removal to installing nesting boxes.

Figure 9.
Forest and closed woodland vegetation shown with >700 mm (average, annual) rainfall zone to indicate the likely historic extent of this habitat type.

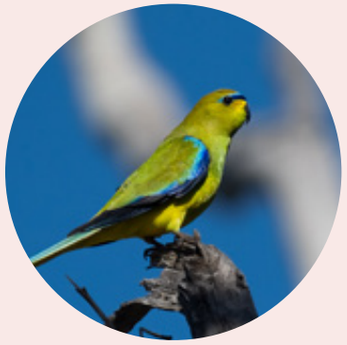


Species found across the region – in a variety of habitat types

There are 26 regionally dependent bird species that do not specialise in one of the three primary habitat types detailed in this chapter (Table 10). Instead, they seek out suitable habitats across the region. Some species move great distances each season seeking flowering and fruiting plants or specific habitat features. For instance, the Eastern (Crested) Shrike-tit (*Falcunculus frontatus*) forages by peeling bark from upper eucalypt branches in woodlands, while the Elegant Parrot (*Neophema elegans*) roams widely across the region in search of seed-bearing plants.

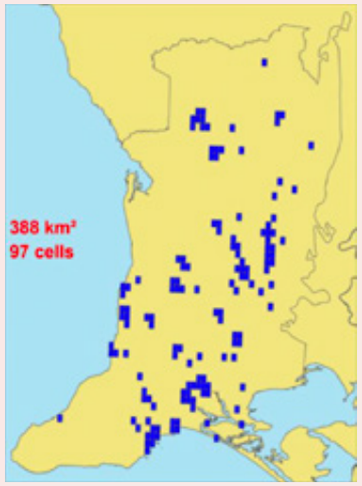
There are also some bird species that visit the MLR temporarily to fulfil specific needs. For example, some mallee bird species will use the region as a refuge during drought or extreme conditions or follow irruptive food sources. Other species appear sporadically in small numbers and their actual population movements are still not fully understood.

Eastern (Crested) Shrike-tit.
Photo: Martin Stokes



Elegant Parrot.
Photo: Neale Dyster

Eastern Shrike-tit



Elegant Parrot

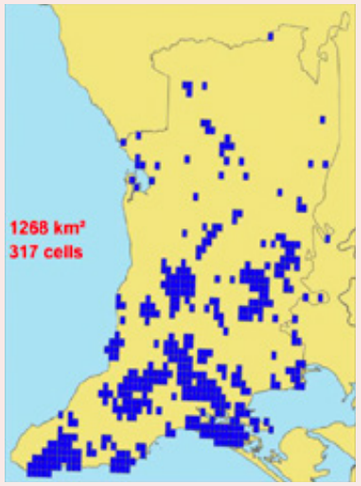


Figure 11: Area of Occupancy maps using 4km squares to demonstrate how two species move across most of the region to meet their habitat needs (Allan 2023).

Table 10.
Species dependent upon habitat found across the region (26).

Common name	Scientific name	Highest rating	Feeding guild	Niche / notable feature	Primary risk / need
Australian Owlet-nightjar	*Zoothera lunulata halmaturina*	Regional - RA	Carnivore	Nocturnal	Nesting hollows
Brown Goshawk	*Accipiter fasciatus*		Carnivore	Ambush hunter	Prey birds
Brown-headed Honeyeater	*Melithreptus brevirostris*	Regional - NT	Insects, nectar	Arboreal	Insects and nectar
Collared Sparrowhawk	*Accipiter cirrocephalus*		Carnivore	Ambush hunter	Small birds
Common Bronzewing	*Phaps chalcoptera*		Granivore	Shrubs	Ground feeder
Dusky Woodswallow	*Artamus cyanopterus*	Regional - RA	Insectivore	Aerial feeder	Nesting hollows
Eastern Shrike-tit	*Falcunculus frontatus*	NP&W - RA	Insectivore	Old growth Eucalyptus	Insects
Elegant Parrot	*Neophema elegans*	NP&W - RA	Granivore	Ground feeder	Nesting hollows
Horsfield's Bronze Cuckoo	*Chalcites basalis*	Regional - NT	Insectivore	Brood parasite	Host abundance
Little Wattlebird	*Anthochaera chrysoptera*		Nectarivore	Scrubby habitats	Nectar supply
New Holland Honeyeater	*Phylidonyris novaehollandiae*		Nectarivore	Defend nectar sources	Nectar supply
Purple-crowned Lorikeet	*Parvipsitta porphyrocephala*	Regional - NT	Nectarivore	Follow flowering plants	Nectar supply
Red Wattlebird	*Anthochaera carunculata*		Nectarivore	Defend nectar sources	Nectar supply
Red-browed Finch	*Neochmia temporalis*	Regional - NT	Granivore	Nearby water	Seed supply
Rufous Whistler	*Pachycephala rufiventris*	Regional - NT	Insectivore	High arboreal forager	Insects
Sacred Kingfisher	*Todiramphus sanctus*	Regional - NT	Carnivore	Migrates n. in winter	Nesting hollows
SA Western Whistler	*Pachycephala pectoralis*		Insectivore	Arboreal	Insects
Silvereye	*Zosterops lateralis*	Regional - VU	Insects, fruit	Disperse seeds	Pest in orchards
Southern Boobook	*Ninox boobook*	Regional - NT	Carnivore	Nocturnal	Nesting hollows
Spotted Pardalote (south-eastern ssp.)	*Pardalotus punctatus punctatus*		Insectivore	High arboreal gleaner	Nesting hollows
Spotted Pardalote (yellow-rumped ssp.)	*Pardalotus punctatus xanthopyge*		Insectivore	High arboreal gleaner	Nesting hollows
Superb Fairy-wren	*Malurus cyaneus leggei*		Insectivore	Ground & shrub feeder	Insects
Varied Sittella	*Daphoenositta chrysoptera*	Regional - VU	Insectivore	Arboreal	Rough bark & dead trees
Weebill	*Smicrornis brevirostris*		Insectivore	Arboreal	Insects
Yellow Thornbill	*Acanthiza nana*	Regional - NT	Insectivore	Glean foliage	Insects
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	Regional - NT	Insectivore	Low/ ground feeder	Avoids dense forest

General habitat enhancements for birds across the region

Bird species use habitats in new and unexpected ways, and we will never fully understand how birds interact with their habitats. Within habitats there are subtle ecotones and micro-habitats, which are essential for some species. For example, certain species depend on deep, moist litter layers for hunting worms and insects, structural niches like hollows and rotting wood for nesting and shelter, and diverse food resources. The specific feeding and nesting preferences of each species define their habitat requirements and can guide conservation efforts. In the absence of a specific target habitat, the following general habitat attributes are beneficial for bird conservation.

White-browed Scrubwren.
Photo: David Pearce

Insects

Insects and other invertebrates are the primary food for most woodland birds. While some birds directly feed on seeds, flowers and fruits, insectivorous species rely on ecological processes that produce insects. Aerial insectivores, in particular, depend on habitats that generate insect swarms. Restoring habitats will support insect populations by maintaining ecological components like surface water and fallen timber, which are essential for insect lifecycles. Reducing direct threats such as pesticide use will also benefit insects.

Ground feeders and ground nesters

Approximately a quarter of the bird species of conservation concern are ground feeders and/or ground nesters. This group includes insectivores like robins that pounce on ground prey, leaf-litter foragers such as babblers and thrushes, and grass-seed eaters like finches, pigeons and parrots. Being at ground level, especially while nesting, exposes these bird species to predation from cats, foxes and rats. Additionally, their survival is highly dependent on the quality of grass, litter and ground cover, which can be impacted by activities such as fire regimes, clearing, herbivory and agricultural practices.

Old-growth trees with nesting hollows

Around 21% of the bird species of concern require old-growth trees with nesting hollows for breeding and roosting. Parrots, cockatoos, pardalotes, tree martins, owls, cuckoos and thornbills are among the species that rely on hollows of varying sizes. Since many trees take hundreds of years to develop suitable hollows (Howling and Fullagar 2020), this habitat feature often becomes a limiting factor for these birds. In areas lacking natural hollows, installing substitute nesting boxes or artificial hollows can be beneficial, provided they are specifically designed for the declining species.

Riparian habitat and climate refuges

Some of the region's most threatened birds are remaining only in the coolest and wettest southern parts of their range. Riparian zones and valleys that extend throughout the region offer critical climate refuges during extreme heat. These habitats, characterized by shady vegetation along creek lines and water bodies, provide essential cooling and protection. Conservation action to maintain these areas involves fencing to exclude livestock, managing invasive weeds and planting shade-producing vegetation.

Other important habitat features

Striated Thornbill and nest.
Photo: Martin Stokes

Dead wood

Fallen and standing dead wood plays a crucial role in supporting insects and reptiles, which in turn serve as food for many insectivorous birds, such as treecreepers. Standing dead trees should be protected, and large logs and fallen timber retained or added if absent.

Edges and transitional zones

Many bird species are typically found along transitions between vegetation types, in clearings where ground has been disturbed, or where trees or shrubs open to grasslands. These ecotones provide a variety of resources and shelter.

Plant clusters

Planting in natural groupings and clusters can assist in creating a heterogeneous landscape for birds. Reference ecosystem can be used for guidance and consideration for topography, aspect and soil type. Groupings of flowering plants become prized focal areas for nectarivores and insectivores, as well as improving pollination and seed set (McCallum, et al. 2018).

Plant diversity for year-round food

Many layers of plants, from grasses to trees and, climate-resilient seed stock is needed. Birds need species flowering in every season, to provide a continual supply of nectar, seeds, fruit and insects.

A temporal and spatial mosaic

Different bird species have varying habitat preferences, with some favouring clear ground layers and others seeking dense shrub cover. Birds benefit from mosaics of habitat types, with patches being large enough or linked so there can be a mosaic of different ecological progressions, including closed and open habitat, old and new growth, grazed and ungrazed, recently burnt and long-unburnt.

Proximity to surface water

Some birds, like finches, drink several times a day and most need daily access to water.

Disturbance and new growth

Many birds benefit from habitat disturbances that promote new growth, higher densities of plants and young leaves to attract insects.

Future directions

“Recovering the birds and habitats of the Mount Lofty Ranges is an urgent and massive task – but we can achieve it with a groundswell of community action and partner support.”

Dr Wendy Telfer

Over 100 ha of heathland reconstruction at Deep Creek National Park.
Photo: Landscape Hills and Fleurieu

This plan sets a vision and actions to guide the recovery of woodland birds of the Mount Lofty Ranges. By enhancing the functionality of ecosystems, reconstructing disproportionately cleared vegetation communities, and improving plant diversity, we aim to create the abundant food and shelter resources these birds desperately need.

The benefits of these efforts will extend far beyond birds – they will support biodiversity and strengthen ecosystem resilience in the face of a changing climate.

The historical clearing of vegetation in the MLR led to dramatic declines in woodland bird populations. Today, habitat loss and degradation continues to drive these declines. To reverse this trend, we need swift, science-backed action supported by an engaged community.

The challenge before us is to rapidly expand the functional bird habitats across the MLR. This means taking immediate steps to protect species on the brink of extinction, as well as the long-term enhancement of remnant vegetation and the reconstruction of significant areas of new habitat. By using the best techniques and innovations and employing them across the diverse landscapes and land tenures of the MLR, we can achieve our goals.

This plan proposes a bold and hopeful vision. We have committed landholders and restoration organisations, and we have knowledge about what habitat is needed and where. Our challenge lies in reaching out and finding a new wave of supporters that will amplify our bird recovery actions by orders of magnitude. We need to inspire champions to share our passion and help make ReBird the Ranges a global success story of bird recovery.

Together, we can turn this vision into reality and ensure the songs of woodland birds fill the Mount Lofty Ranges for generations to come.

Community helping establish seed orchard at Riverdale farm.
Photo: Simon Harris.

References

Allan, J, R Johnson, A West, and K. Abley. 2020. Mount Lofty Ranges Closed Shrubland Bird Monitoring Baseline Surveys 2019/20 Report. Adelaide: Department for Environment and Water.

Allan, J. 2023. Species Occupancy Assessments Mount Lofty Ranges Birds, (unpublished report). Adelaide: Department for Environment and Water.

Bennett, A., A. Haslem, S.T. Garnett, R.H. Loyn, J.C.Z. Woinarski, and G. Ehmke. (2024). "Declining but not (yet) threatened: a challenge for avian conservation." Australia, Emu 124 (1): 123-145.

BirdLife Australia. 2023. HANZAB, [text before updates sourced from: Marcharnt, S. et al (eds) 1990-2006 Handbook of Australian, New Zealand and Antarctic Birds. Volume 1 to 7. Birdlife Australia.

Boehm, E.F. 1947. "The Australian Bustard: with special reference to its past and present status in South Australia." South Australian Ornithologist 18: 37-40.

Boulton, RL., and D. Whittaker. 2021. Monitoring Program for the Vulnerable Bassian Thrush, Mount Lofty Ranges, South Australia. Adelaide: Draft prepared by the University of Adelaide.

Bradshaw, C.J.A. 2019. "Opportunities to improve the future of South Australia's terrestrial biodiversity." Rethinking Ecology 4: 45-77.

Clarke, PA. 2023. Aboriginal Peoples and Birds in Australia: Historical and Cultural Relationships. Melbourne: CSIRO Publishing.

Cooper, C.B, and J.R Waters. 2002. "Independent effects of woodland loss and fragmentation on Brown Treecreeper distribution." Biological conservation 105: 1-10.

Department for Environment and Water 2022. Guide to Climate Projections for Risk Assessment and Planning in South Australia 2022, Government of South Australia, through the Department for Environment and Water, Adelaide.

Department of Environment and Heritage. 2009. Informing Biodiversity Conservation for the Adelaide and Mount Lofty Ranges Region, South Australia. Priorities, Strategies and Targets. Adelaide: Department for Environment and Heritage.

Department of Climate Change, Energy, the Environment and Water 2022, Threatened Species Strategy Action Plan 2022 - 2032, Department of Climate Change, Energy, the Environment and Water, Canberra, September. CC BY 4.0.

Department of Climate Change, Energy, the Environment and Water. 2023. Conservation Advice for *Stagonopleura guttata* (diamond firetail). Canberra: Department of Climate Change, Energy, the Environment and Water.

Ford, H, and R Howe. 1980. "The Future of Birds in the Mount Lofty Ranges." South Australian Ornithologist 28: 85-89.

Garnett, S, and G. B. Baker. 2021. The Action Plan for Australian Birds 2020. 1st edition. CSIRO Publishing.

Gillam, S, and R. Urban. 2014. Regional Species Conservation Assessment Project, Phase 1 Report: Regional Species Status Assessments, Adelaide and Mount Lofty Ranges NRM Region. South Australia: Department of Environment, Water and Natural Resources.

Howling, G, and A Fullagar. 2020. Temperate Woodland Birds Conservation Action Plan, first edition 2020-2024. BirdLife Australia.

Jung, M Arnell, A de Lamo, X García-Rangel, S. Lewis, M Mark, J. 2021. Areas of global importance for conserving terrestrial biodiversity, carbon and water, Nature Ecology & Evolution 5 (11): 1–11.

Koch, P. 2003. Factors influencing food availability for the endangered south-eastern Red-tailed Black-Cockatoo Calyptorhynchus banksii graptogyne in remnant stringybark woodland, and implications for management. PhD thesis, University of Adelaide, Adelaide.

Mariani, M, S. E Connor, M Theuerkauf, A, Kuneš, P Herbert, D Bowman, M. S Fletcher, L Head, et al. 2022. "Disruption of cultural burning promotes shrub encroachment and unprecedented wildfires." Frontiers in Ecology and the Environment 20 (5): 292-300.

McCallum, K, M. F Breed, D. C Paton, and A. J. Lowe. 2018. "Clumped planting arrangements improve seed production in a revegetated eucalypt woodland." Restoration Ecology 27 (3): 638-646.

Noss, R. F, AP Dobson, R Baldwin, P Beier, CR Davis, DA Dellasala, J Francis, and H Locke. 2012. "Bolder thinking for conservation." Conservation Biology 26: 1-4.

Paton, D.C, G Carpenter, and R.G Sinclair. 1994. "A second bird atlas of the Adelaide region. Part 1: changes in the distribution of birds: 1974-75 vs 1984-85." Australian Ornithologist 31: 151-193.

Paton, D.C, D.J Rogers, and W. Harris. 2004. "Birdscaping the environment: restoring the woodland systems of the Mt Lofty region, South Australia." In Conservation of Australia's Forest Fauna (second edition), by Daniel Lunney (ed), 331-358. Mosman, NSW: Royal Zoological Society of New South Wales.

Prowse, T.A.A, S.J Collard, A Blackwood, P. J O'Connor, S Delean, M Barnes, P Cassey, and H. Possingham. 2017. "Prescribed burning impacts avian diversity and disadvantages woodland-specialist birds unless long-unburnt habitat is retained." Biological Conservation 215: 268-276.

Prowse, T.A.A, P.J O'Connor, S. J Collard, K. J Peters, and H. P. Possingham. 2021. "Data from: Optimising monitoring for trend detection after 16 years of woodland-bird surveys." Dryad Digital Repository.

SERA, Standards Reference Group. 2021. National Standards for the Practice of Ecological Restoration in Australia. Edition 2.2. Society for Ecological Restoration Australasia.

Tilman, D, R. May, C. Lehman, and M. Nowak. 1994. "Habitat destruction and extinction debt." Nature 371: 65-66.

Trees For Life. 2021. Climate Change Resilience Strategy. Brooklyn Park, South Australia: Trees For Life.

Ward, M, J. E. M Watson, H. P Possingham, S. T Garnett, M Maron, J. R Rhodes, MacColl C, et al. 2022. "Creating past habitat maps to quantify local extirpation of Australian threatened birds." Environmental Research Letters 17.

Wilson, J, and A Bignall. 2009. Regional Recovery Plan for Threatened Species and Ecological Communities of Adelaide and the Mount Lofty Ranges, South Australia. South Australia: Department for Environment and Heritage.

Glossary

Community	In this document, 'community' refers to the people who live in the MLR and to supporters in South Australia, around the country and across the world.
Conservation[1]	All the processes and actions of looking after a place so as to retain its natural significance; always includes protection, maintenance and monitoring. Note: Conservation may, according to circumstance, also include regeneration, restoration, enhancement, reinstatement, preservation or modification, or a combination of more than one of these. Conservation includes conserving natural processes of change, as opposed to artificially accelerated changes.
Maintenance[1]	The continuous protective care of the biodiversity and geodiversity of a place.
Monitoring[1]	Ongoing review, evaluation and assessment to detect changes in the natural integrity of a place, with reference to a baseline condition.
Protection[1]	Taking care of a place by managing impacts to ensure that natural significance is retained.
Reconstruction	The specific actions to return cleared land to a more biodiverse, functional native habitat. Usually involving weed treatments and extensive replanting. 'A restoration approach used when the appropriate biota need to be entirely or almost entirely reintroduced as they cannot regenerate or recolonise within feasible timeframes, even after expert facilitated regeneration interventions. Site earthworks may or may not be needed. An example of reconstruction is the mass revegetation of trees, shrubs and groundcovers on previously cropped agricultural lands (including mature successional phase species) ...' Standards Reference Group SERA (2021).
Regeneration[1]	The natural recovery of natural integrity following disturbance or degradation. Note: Regeneration applies to both the geodiversity and biodiversity of a place and includes the process of natural succession.
Restoration[1]	Formally, 'returning existing habitats to a known past state or to an approximation of the natural condition by repairing degradation, by removing introduced species or by reinstatement' (Australian Natural Heritage Charter). However, in this plan it is also used to refer to the process of moving towards a past state and/or a more functional state. The process of both ecological and habitat restorative activities occurring along a continuum. When restoration is being done with the intent of fully recovering an ecosystem, we use the term 'reconstruct'. Restoration of existing habitat refers to a wide range of activities, from adding specific or novel habitat elements (e.g. food or structure plants such as paddock trees), to the removal of threats (such as weeds and predators) or implementing changes to the grazing regime or fire regime; these are all done with the intent of moving in a positive direction along the restoration continuum.
Retain	Conservation and retention of existing habitat. Action to prevent further clearing, damage or degradation of remaining or restored native habitat. See also definitions of 'conservation' and 'protection'.

[1] Definitions adapted from the Australian Natural Heritage Charter https://vgls.sdp.sirsidynix.net.au/client/search/asset/1292682

Appendix 1.
Mount Lofty Ranges woodland birds and their groupings.

Of the 121 MLR woodland birds identified in this plan, at present 13 are considered abundant and 49 are widespread or occasional visitors with a low dependence upon the region. This leaves 59 bird species of priority regional conservation concern due to their high dependence upon the habitat of the MLR.

Table 10.
Grouping the birds of the Mount Lofty Ranges.

Groupings	No. species
Woodland birds of the MLR	**121**
The highly dependent species:	**59**
A. Threatened with extinction Meet EPBC or IUCN Red List criteria and have a significant part or all of their population within the MLR.	8
B. Isolated populations breeding resident populations in the MLR that are likely isolated from other populations.	17
C. Regular breeders Breeding residents for which the MLR comprises a substantial portion of their range.	34
The species with a lower dependence upon the region or of low conservation concern:	**62**
D. Widespread or occasional visitors Species that are found across most of Australia and the MLR only provides a small fraction of their habitat needs.	49
E. Abundant species Have large and widespread populations. They are adaptive to modified landscapes and sometimes over-abundant. Not of conservation concern.	13
Bird species that are not the focus of this plan:	**144**
Regionally extinct species No longer recorded in the MLR and not considered viable to target.	12
Edge of range species Only occasionally recorded in the region, unlikely to be impacted by regional recovery actions.	44
Seabirds, shorebirds, wetland birds and other waterbirds Not the focus for terrestrial recovery actions.	82
Introduced species Excluded as not of conservation concern.	7
TOTAL birds recorded in the MLR	**266**

Grouping the Mount Lofty Ranges woodland birds

The MLR Woodland Birds have been defined in five groupings (A to E) using the Handbook of Australian, New Zealand and Antarctic Birds (HANZAB) (BirdLife-Australia 2023) maps and notes (especially distribution, population, movements and breeding sections).

These groupings will continue to change – as knowledge improves of species dependence on habitat across the region, population trends and risk levels, and as species' movements change, including in response to climate change. For example, the Kangaroo Island Glossy Black Cockatoo (*Calyptorhynchus lathami halmaturinus*) was previously listed as regionally extinct but has been added to the MLR woodland birds list due to its occasional visits around Cape Jervis and its potential to benefit from continued grassy woodland reconstructions. Other birds are also likely to become more dependent upon the region as climate change warms and dries the surrounding country, with the Weebill (*Smicrornis brevirostris*) and the White-winged Chough (*Corcorax melanorhamphos*) two examples of species already on the move into the region.

Conservation status

Both the World Conservation Union (IUCN Red List) guidelines and Australia's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) classify threatened species into three categories in the following order from the highest to lower extinction risk categories – critically endangered (CR), endangered (EN) and vulnerable (VU). The conservation status of Group A species are clearly defined as nationally threatened. Many of the Group B species are listed either at a state level under the *National Parks and Wildlife Act 1972* (NPW Act) or regional assessment (Gillam and Urban 2014) as endangered (EN), vulnerable (VU) and rare (RA). The regional assessment also includes a near threatened (NT) category that sits below rare.

See rebirdtheranges.org for full MLR bird species list with notes and conservation ratings.

Group A.
Threatened with extinction (IUCN criteria)

Group A species have been assessed as threatened with extinction using the regional guidelines from the World Conservation Union (IUCN Red List) or the National EPBC Act criteria. This group of bird species are considered most at risk of extinction and are the focus of state and federal agencies and usually have conservation advice and recovery plans. The most recent assessment at the regional level was conducted in 2023 (discussed in Appendix 2). The list in Table 10 only includes the species with a strong relationship to the MLR. In the full list of woodland birds there are an additional 4 EPBC listed species that occasionally visit the region: the Swift Parrot (*Lathamus discolor*), KI Glossy Black-Cockatoo, Blue-winged Parrot (*Neophema chrysostoma*) and White-throated Needletail (*Hirundapus caudacutus*). These will all be included in our monitoring programs and given greater priority if they establish populations in the region.

Table 11.
Group A. Threatened with extinction (IUCN criteria) (8 species).

Common name	Scientific name	Highest rating	Habitat grouping	Feeding guild	Niche / notable feature	Primary risk / need
Bassian Thrush (SA ssp.)	*Zoothera lunulata halmaturina*	EPBC - EN	Forest	Insectivore	Endemic/ dense moist understory	Ground feeder
Black-chinned Honeyeater	*Melithreptus gularis gularis*	Criteria B - VU	Region wide	Nectarivore	Rarely recorded	Functionally extinct
Chestnut-rumped Heathwren (MLR ssp.)	*Hylacola pyrrhopygia parkeri*	EPBC - EN	Heath, forest	Insects, seed	Endemic	Ground nester
Diamond Firetail	*Stagonopleura guttata*	EPBC - VU	Grassy WL	Granivore	Nearby water	Ground feeder
Hooded Robin (SE ssp.)	*Melanodryas cucullata cucullata*	EPBC - EN	Grassy WL	Insectivore	Open ground	Needs large patches
Southern Emu-wren (MLR ssp.)	*Stipiturus malachurus intermedius*	EPBC - EN	Heath	Insectivore	Endemic	Specific dense structure
Southern Whiteface	*Aphelocephala leucopsis*	EPBC - VU	Grassy WL	Insectivore	Open ground	Ground feeder
Western Beautiful Firetail (Western ssp.)	*Stagonopleura bella samueli*	EPBC - EN	Heath	Granivore	Endemic	Specific food / seeds plants

Group B.
Isolated populations

Group B are species that have a breeding population in the MLR and are likely isolated from other breeding populations that occur across the country (often in the south east region of Australia). This group of birds have an obvious strong dependence upon the MLR and will directly benefit from targeted habitat reconstruction that meets their needs.

Table 12.
Group B. Isolated populations (17 species).

Common name	Scientific name	Highest rating	Habitat grouping	Feeding guild	Niche / notable feature	Primary risk / need
Brown Thornbill	*Acanthiza pusilla*	Regional - VU	Forest	Insectivore	Closed Shrubs	Ground feeder
Buff-rumped Thornbill	*Acanthiza reguloides*	Regional - NT	Forest	Insects, seed	Sparce understory	Ground feeder
Crescent Honeyeater	*Phylidonyris pyrrhopterus*	Regional - NT	Forest	Nectar, insects	Dense vegetation	Nectar supply
Eastern Shrike-tit	*Falcunculus frontatus*	NP&W - RA	Region wide	Insectivore	Old growth Eucalyptus	Insects
Eastern Spinebill	*Acanthorhynchus tenuirostris*		Forest	Nectar, insects	Follow flowering plants	Nectar supply
Little Wattlebird	*Anthochaera chrysoptera*		Region wide	Nectarivore	Scrubby habitats	Nectar supply
Painted Button-quail	*Turnix varius*	NP&W - RA	Grassy WL	Grain, Insects	Leaf litter	Ground nester
Purple-crowned Lorikeet	*Parvipsitta porphyrocephala*	Regional - NT	Region wide	Nectarivore	Follow flowering plants	Nectar supply
Red-browed Finch	*Neochmia temporalis*	Regional - NT	Region wide	Granivore	Nearby water	Seed supply
Scarlet Robin	*Petroica boodang boodang*	NP&W - RA	Forest	Insectivore	Open ground	Ground feeder
Shining Bronze-Cuckoo	*Chalcites lucidus plagosus*	Regional - RA	Forest	Insectivore	Brood parasite	Host abundance
White-browed Scrubwren	*Sericornis frontalis*		Region wide	Insectivore	Leaf litter	Ground feeder
White-naped Honeyeater	*Melithreptus lunatus*	Regional - VU	Forest	Nectar, insects	Follow flowering plants	Nectar supply
White-throated Treecreeper	*Cormobates leucophaea*	Regional - NT	Forest	Insectivore	Dead Wood	Nesting hollows
Yellow Thornbill	*Acanthiza nana*	Regional - NT	Region wide	Insectivore	Glean foliage	Insects
Yellow-faced Honeyeater	*Caligavis chrysops*		Region wide	Nectarivore	Mainly arboreal	Nectar supply
Yellow-tailed Black-Cockatoo	*Zanda funerea*	NP&W - VU	Forest	Seeds, insects	Hollows	Nesting hollows

Group C.
Regular breeders

Group C include species that live and breed in the MLR, or regularly migrate to breed in the region. They have continuous populations that extend beyond the MLR. However, they are occupy selected habitats in limited parts of the country and are dependent upon MLR habitats for a substantial part of their populations. Improvements to their habitat niches across the MLR will likely benefit these species.

Table 13.
Group C. Regular breeders (34 species).

Common name	Scientific name	Highest rating	Habitat grouping	Feeding guild	Niche / notable feature	Primary risk / need
Australian Owlet-nightjar	*Aegotheles cristatus*	Regional - RA	Region wide	Carnivore	Nocturnal	Nesting hollows
Brown Goshawk	*Accipiter fasciatus*		Region wide	Carnivore	Ambush hunter	Prey birds
Brown Treecreeper	*Climacteris picumnus*	Regional - EN	Grassy WL	Insectivore	Dead wood	Nesting hollows
Brown-headed Honeyeater	*Melithreptus brevirostris*	Regional - NT	Forest	Insects, nectar	Arboreal	Insects and nectar
Brush Bronzewing	*Phaps elegans*	Regional - RA	Heath. Forest	Granivore	Closed shrubland	Ground feeder
Chestnut-rumped Thornbill	*Acanthiza uropygialis*	Regional - VU	Grassy WL	Insectivore	Dead wood	Nesting hollows
Collared Sparrowhawk	*Accipiter cirrocephalus*		Region wide	Carnivore	Ambush hunter	Small birds
Common Bronzewing	*Phaps chalcoptera*		Region wide	Granivore	Shrubs	Ground feeder
Dusky Woodswallow	*Artamus cyanopterus*	Regional - RA	Region wide	Insectivore	Aerial feeder	Nesting hollows
Elegant Parrot	*Neophema elegans*	NP&W - RA	Region wide	Granivore	Ground feeder	Nesting hollows
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	Regional - NT	Forest	Insectivore	Brood parasite	Host abundance
Grey Currawong	*Strepera versicolor*		Region wide	Omnivore	Terrestrial and arboreal	Insects and vertebrates
Horsfield's Bronze Cuckoo	*Chalcites basalis*	Regional - NT	Region wide	Insectivore	Brood parasite	Host abundance
Jacky Winter (SE ssp.)	*Microeca fascinans fascinans*	NP&W - RA	Grassy WL	Insectivore	Ecotones	Ground feeder
New Holland Honeyeater	*Phylidonyris novaehollandiae*		Region wide	Nectarivore	Defend nectar sources	Nectar supply
Rainbow Bee-eater	*Merops ornatus*	Regional - VU	Grassy WL	Insectivore	Aerial feeder	Mud nest tunnels
Red Wattlebird	*Anthochaera carunculata*		Region wide	Nectarivore	Defend nectar sources	Nectar supply
Red-rumped Parrot	*Psephotus haematonotus*	Regional - NT	Grassy WL	Granivore	Ground feeder	Nesting hollows
Restless Flycatcher	*Myiagra inquieta*	NP&W - RA	Grassy WL	Insectivore	Aerial feeder	Insects
Rufous Whistler	*Pachycephala rufiventris*	Regional - NT	Region wide	Insectivore	High arboreal forager	Insects
Sacred Kingfisher	*Todiramphus sanctus*	Regional - NT	Region wide	Carnivore	Migrates n. in winter	Nesting hollows
SA Western Whistler	*Pachycephala pectoralis*		Region wide	Insectivore	Arboreal	Insects
Silvereye	*Zosterops lateralis*	Regional - VU	Region wide	Insects, fruit	Disperse seeds	Pest in orchards
Southern Boobook	*Ninox boobook*	Regional - NT	Region wide	Carnivore	Nocturnal	Nesting hollows
Spotted Pardalote (south-eastern ssp.)	*Pardalotus punctatus punctatus*		Region wide	Insectivore	High arboreal gleaner	Nesting hollows
Spotted Pardalote (yellow-rumped ssp.)	*Pardalotus punctatus xanthopyge*		Region wide	Insectivore	High arboreal gleaner	Nesting hollows
Striated Thornbill	*Acanthiza lineata clelandi*		Forest	Insectivore	Old growth	Shrub layer
Superb Fairy-wren	*Malurus cyaneus leggei*		Region wide	Insectivore	Ground & shrub feeder	Insects
Tawny Frogmouth	*Podargus strigoides*	Regional - NT	Region wide	Carnivore	Nocturnal	Young fall from nests
Varied Sittella	*Daphoenositta chrysoptera*	Regional - VU	Region wide	Insectivore	Arboreal	Rough bark & dead trees
Weebill	*Smicrornis brevirostris*		Region wide	Insectivore	Arboreal	Insects
White-browed Babbler	*Pomatostomus superciliosus*	Regional - EN	Grassy WL	Omnivore	Leaf litter	Ground feeder
White-winged Chough	*Corcorax melanorhamphos*	NP&W - RA	Grassy WL	Insects, seed	Leaf litter	Ground feeder
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	Regional - NT	Region wide	Insectivore	Low/ ground feeder	Avoids dense forest

Group D.
Widespread or occasional visitors

Group D includes species that are either regular residents with widespread populations across the country, or occasional visitors. In both cases the populations of these species have a substantial part of their habitat needs met beyond the MLR. While they may benefit from habitat improvements in the region, the impact will be far less significant than for the species in groups A, B and C. This group is important to monitor and assess at a population wide level to ensure it remains secure across its full range.

Table 14.
Group D. Widespread or occasional visitors (49 species).

Common name	Scientific name	Highest rating	Habitat grouping	Feeding guild	Niche / notable feature	Primary risk / need
Australian Hobby	*Falco longipennis*		Grassy WL	Carnivore	Widespread across Aust.	
Black Falcon	*Falco subniger*	NP&W - RA	Grassy WL	Carnivore	Widespread across Aust.	
Black Kite	*Milvus migrans*	Regional - RA	Region wide	Carnivore		
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*		Region wide	Insectivore	Widespread across Aust.	
Black-shouldered Kite	*Elanus axillaris*		Grassy WL	Carnivore		
Blue-winged Parrot	*Neophema chrysostoma*	EPBC - VU	Grassy WL	Granivore	Previously more regular - now rare.	Nesting hollows
Brown Falcon	*Falco berigora*	NP&W - RA	Grassy WL	Carnivore		
Brown Quail	*Synoicus ypsilophora*	NP&W - VU	Region wide	Granivore	Ground cover	Ground feeder
Brown Songlark	*Cincloramphus cruralis*	Regional - Rare	Grassy WL	Insectivore	Nomadic	Ground nester
Bush Stone-curlew	*Burhinus grallarius*	NP&W - RA	Grassy WL	Omnivore	Rarely recorded	Ground nester
Eastern Barn Owl	*Tyto alba*	Regional - RA	Region wide	Carnivore	Widespread, all continents.	Nesting hollows
Emu	*Dromaius novaehollandiae*	Regional - VU	Grassy WL	Seeds, insects	Widespread across Aust.	Ground nester
Fairy Martin	*Petrochelidon ariel*	Regional - RA	Grassy WL	Insectivore	Aerial feeder	
Flame Robin	*Petroica phoenicea*	NP&W - VU	Grassy WL	Insectivore	Open ground	Ground feeder
Glossy Black-Cockatoo (KI ssp.)	*Calyptorhynchus lathami halmaturinus*	EPBC - EN	Forest & WL	Granivore	Needs allocasuarina	Nesting hollows
Grey Butcherbird	*Cracticus torquatus*	Regional - VU	Grassy WL	Omnivore	Widespread across Aust.	
Grey Fantail	*Rhipidura albiscapa*		Region wide	Insectivore	Widespread across Aust.	
Grey Shrike-thrush	*Colluricincla harmonica*		Region wide	Omnivore	Widespread across Aust.	Ground feeder
Laughing Kookaburra	*Dacelo novaeguineae*		Region wide	Carnivore	Widespread across Aust.	Nesting hollows
Little Eagle	*Hieraaetus morphnoides*	NP&W - VU	Region wide	Carnivore	Widespread, Aust & New Guinea	
Little Lorikeet	*Parvipsitta pusilla*	NP&W - EN	Forest	Nectarivore	Rarely recorded	Nesting hollows
Masked Woodswallow	*Artamus personatus*	Regional - RA	Grassy WL	Insects, nectar	Aerial feeder	
Mistletoebird	*Dicaeum hirundinaceum*		Region wide	Frugivore	Mistletoe	
Nankeen Kestrel	*Falco cenchroides*		Region wide	Carnivore		
Olive-backed Oriole	*Oriolus sagittatus*	NP&W - RA	Grassy WL	Insects, fruit	Occasional visitor	
Pallid Cuckoo	*Cacomantis pallidus*	Regional - RA	Grassy WL	Insectivore	Brood parasite	
Peaceful Dove	*Geopelia placida*	Regional - VU	Grassy WL	Grain, Insects	Nearby water	Ground feeder
Peregrine Falcon	*Falco peregrinus*	NP&W - RA	Grassy WL	Carnivore	Prey birds	
Red-capped Robin	*Petroica goodenovii*	Regional - RA	Grassy WL	Insectivore	Open ground	Ground feeder
Rufous Songlark	*Cinclorhamphus mathewsi*	Regional - VU	Grassy WL	Insects, seeds	Widespread across Aust.	Ground nester
Singing Honeyeater	*Gavicalis virescens*		Grassy WL	Insects, nectar	Widespread across Aust.	Ground feeder
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*	Regional - NT	Grassy WL	Omnivore		
Spotted Nightjar	*Eurostopodus argus*	Regional - RA	Grassy WL	Insectivore	Nocturnal	Ground nester
Square-tailed Kite	*Lophoictinia isura*	NP&W - EN	Grassy WL	Carnivore	Rarely recorded	

Table 14.
Group D. Widespread or occasional visitors (49 species) continued.

Common name	Scientific name	Highest rating	Habitat grouping	Feeding guild	Niche / notable feature	Primary risk / need
Striated Pardalote	*Pardalotus striatus*		Region wide	Insectivore		Nesting hollows
Swamp Harrier	*Circus approximans*	Regional - VU	Region wide	Carnivore	Widespread AU & NZ	Swamps
Swift Parrot	*Lathamus discolor*	EPBC - CR	Region wide	Nectarivore	Previously more regular - now rare.	
Tawny-crowned Honeyeater	*Gliciphila melanops*	Regional - EN	Heath	Insects & nectar	Closed shrubland	All year flowering
Tree Martin	*Petrochelidon nigricans*	Regional - NT	Region wide	Insectivore	Aerial feeder, hollows	Nesting hollows
Wedge-tailed Eagle	*Aquila audax*		Region wide	Carnivore		
Welcome Swallow	*Hirundo neoxena*		Grassy WL & HL	Insectivore		
Whistling Kite	*Haliastur sphenurus*	Regional - VU	Grassy WL	Carnivore	Widespread AU, New Guinea	
White-browed Woodswallow	*Artamus superciliosus*	Regional - Rare	Grassy WL	Insectivore	Aerial feeder	Nesting hollows
White-fronted Chat	*Epthianura albifrons*	Regional - VU	Grassy WL	Insectivore		Ground feeder
White-plumed Honeyeater	*Ptilotula penicillata*		Grassy WL	Nectar, Insects		
White-throated Needletail	*Hirundapus caudacutus*	EPBC - VU	Region wide	Insectivore	Previously more regular - now rare.	Aerial feeder
White-winged Triller	*Lalage tricolor*	Regional - RA	Grassy WL	Insectivore	Widespread AU & Asia	
Willie Wagtail	*Rhipidura leucophrys*	Regional - NT	Region wide	Insectivore	Widespread AU, New Guinea	
Zebra Finch	*Taeniopygia castanotis*	Regional - VU	Grassy WL	Granivore	Nearby water	Ground feeder

Group E.
Abundant species

Some bird species have adapted well to the modified landscape in the MLR and have maintained healthy and widely distributed populations across the region and the country. In some cases they are 'over-abundant' or 'impact-causing' due to becoming disruptive to other native species, or impacting on agriculture and townships. These species are not of conservation concern and not the focus for the recovery actions within this plan.

Table 15.
Group E. Abundant species (13 species).

Common name	Scientific name	Highest rating	Habitat grouping	Feeding guild
Australian Magpie	*Gymnorhina tibicen*	Least Concern	Region wide	Omnivore
Crested Pigeon	*Ocyphaps lophotes*	Least Concern	Region wide	Granivore
Crimson Rosella (Lofty - Flinders Ranges form)	*Platycercus elegans*	Least Concern	Region wide	Seeds, fruit, grubs
Eastern Rosella	*Platycercus exemius*	Least Concern	Region wide	Seeds, fruit, grubs
Galah	*Eolophus rosiecapilla*	Least Concern	Region wide	Seeds, fruit, grubs
Little Corella	*Cacatua sanguinea*	Least Concern	Region wide	Granivore
Little Raven	*Corvus mellori*	Least Concern	Region wide	Omnivore
Long-billed Corella	*Cacatua tenuirostris*	Least Concern	Region wide	Granivore
Magpie-lark	*Grallina cyanoleuca*	Least Concern	Region wide	Insects & seed
Musk Lorikeet	*Glossopsitta concinna*	Least Concern	Region wide	Nectarivore
Noisy Miner	*Manorina melanocephala*	Least Concern	Grassy WL	Omnivore
Rainbow Lorikeet	*Trichoglossus haematodus*	Least Concern	Region wide	Nectarivore
Sulphur-crested Cockatoo	*Cacatua galerita*	Least Concern	Region wide	Seeds, fruit, grubs

Extinct species

Species that are considered regionally extinct are those that were once found in the region and have not been recorded in recent times. These species are not specifically targeted for restoration work as recovery of extinct species is difficult, expensive and often unsuccessful. Yet it is hoped that the additional habitat created for the birds in groups A, B and C will improve the chances of some of these species returning or being re-introduced in future. This list includes one endemic subspecies – the Spotted Quail-thrush (MLR subspecies) that is now considered extinct in the wild.

Table 16.
Extinct species (12 species).

Common name	Scientific name
Australian Bustard	*Ardeotis australis*
Australian Masked Owl	*Tyto novaehollandiae*
Azure Kingfisher	*Ceyx azureus*
Barking Owl	*Ninox connivens*
Crested Bellbird	*Oreoica gutturalis*
Eastern Ground Parrot	*Pezoporus wallicus*
King Quail	*Excalfactoria chinensis*
Magpie Goose	*Anseranas semipalmata*
Plains-wanderer	*Pedionomus torquatus*
Regent Honeyeater	*Anthochaera Phrygia*
Rufous Fieldwren	*Calamanthus campestris*
Spotted Quail-thrush (MLR)	*Cinclosoma punctatum anachoreta*

Appendix 2.
The region's most threatened species.

The Department for Environment and Water (DEW) has produced Species Occupancy Assessments for the birds of the Mount Lofty Ranges using over a million records (Allan 2023). This assessment used the International Union for the Conservation of Nature (IUCN) Criterion B, regional assessment, and determined that five species met the IUCN Criterion B standard as threatened. The Western Beautiful Firetail and MLR Southern Emu-wren met the Endangered criteria and the Tawny-crowned Honeyeater, MLR Chestnut-rumped Heathwren and Black-chinned Honeyeater met the Vulnerable criteria. Upon review the Tawny-crowned Honeyeater was downlisted to Near Threatened due to their interaction with neighbouring populations in the mallee, owing to their large mobility and nomadism.

The IUCN regional guidelines also have other criteria (A, C & D) that relate to population level risk assessments. This assessment using recent data will be run in future and will complement the results of the criteria B assessment.

The graph in Figure 12 shows all the species analysed in order of area of occupancy (AoO), which is the area within the MLR in which each species has been recorded. The purple tinted bars indicate a decline since 2012, white bars indicate no change and the few red tinted bars show increases. This data shows that most birds in the MLR are trending downward. Note that this graph is indicative but not conclusive for all species, as generally the birds at the top of the chart are widespread and plentiful and those at the bottom have limited distribution and low abundance. Others have a very low AoO in the MLR but are widespread across the majority of Australia. For example, the Black Falcon has its stronghold in arid and semi-arid zones with a limited dependence upon MLR habitat.

Figure 13 shows the AoO maps for nine of the more common and widespread species and can be contrasted with Figure 18, which shows the AoO of nine of the least widespread species. The AoO maps for the region have been very useful in illustrating the key locations used by priority species.

Figure 12.
The area of occupancy (AoO) post-2012 for each woodland bird species (horizontal bars) and percent of change compared with pre-2012 (red-blue shading) (Allan 2023).

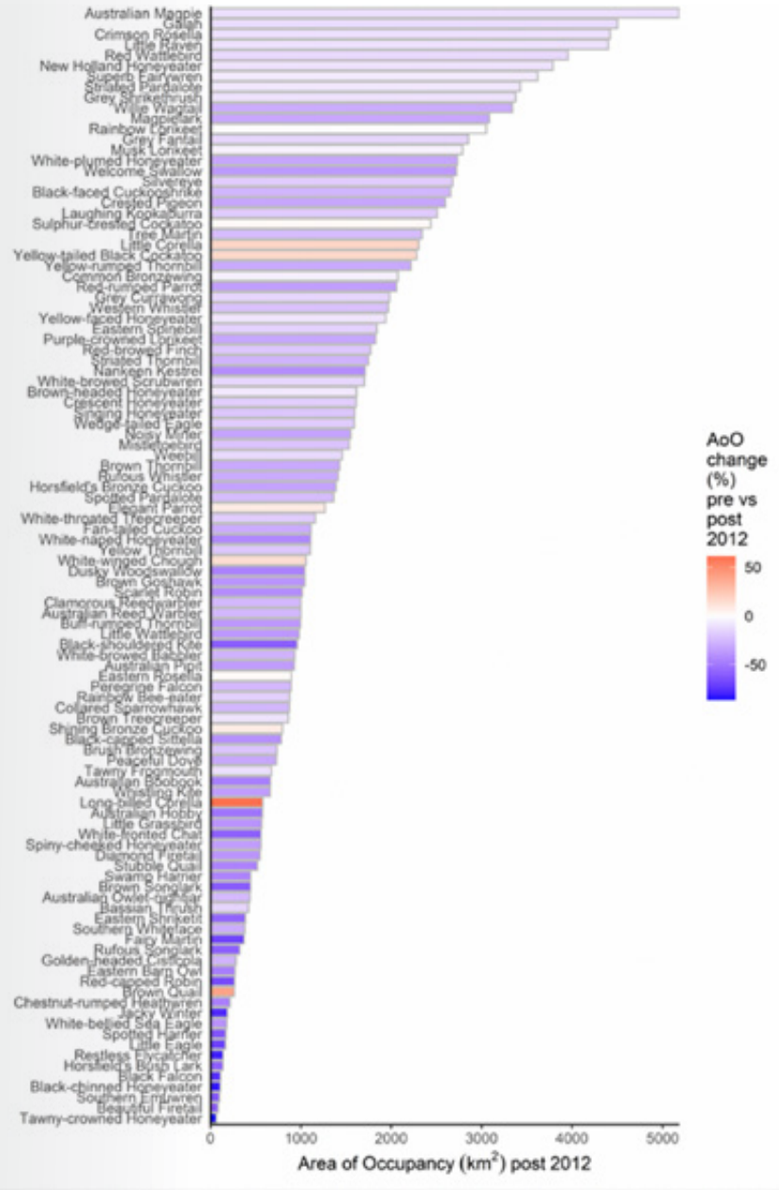


Figure 13.
MLR area of occupancy (AoO) maps for nine of the more widespread bird species (since 2012). Each blue square represents a 4km cell that the species has been recorded in.

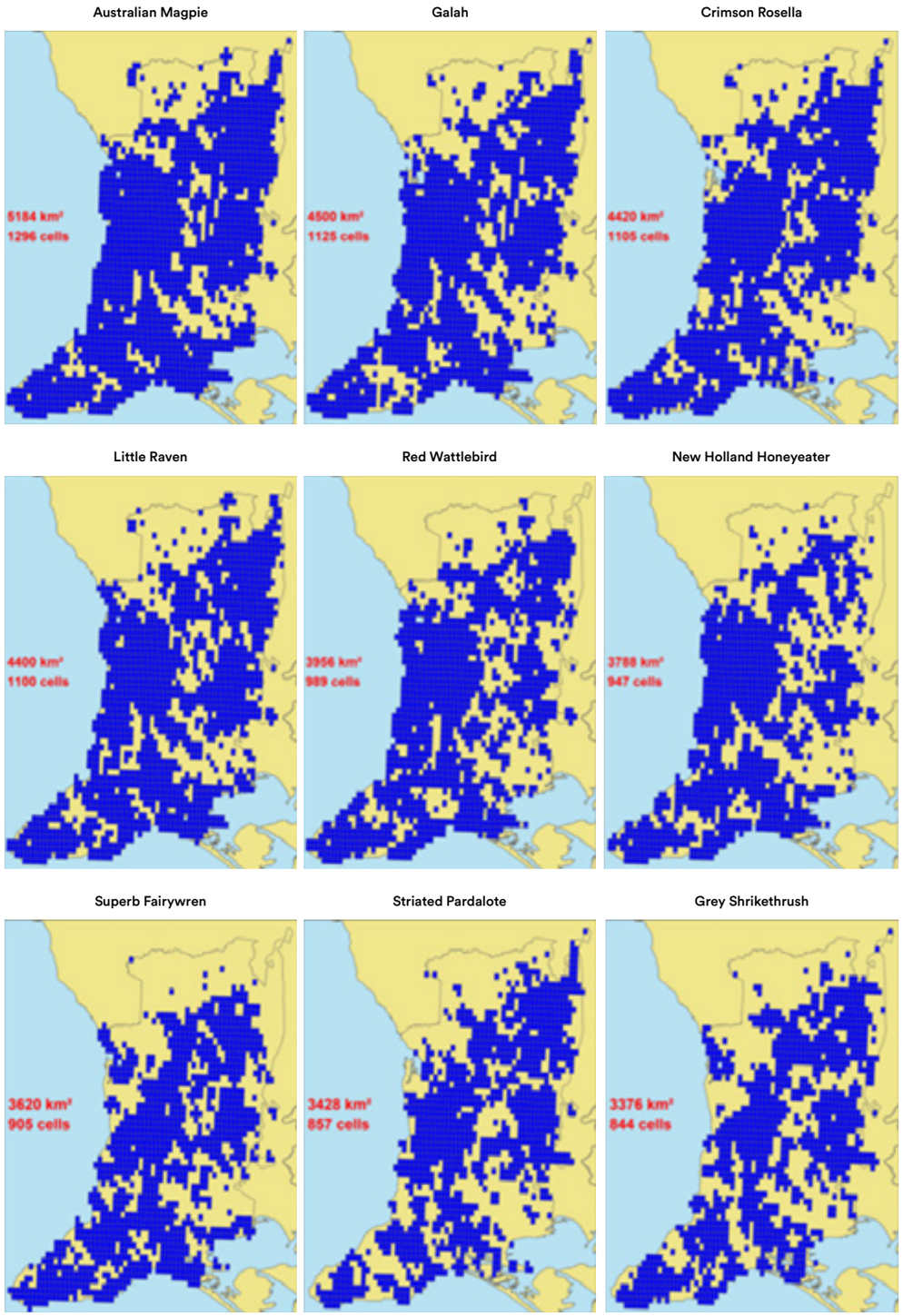
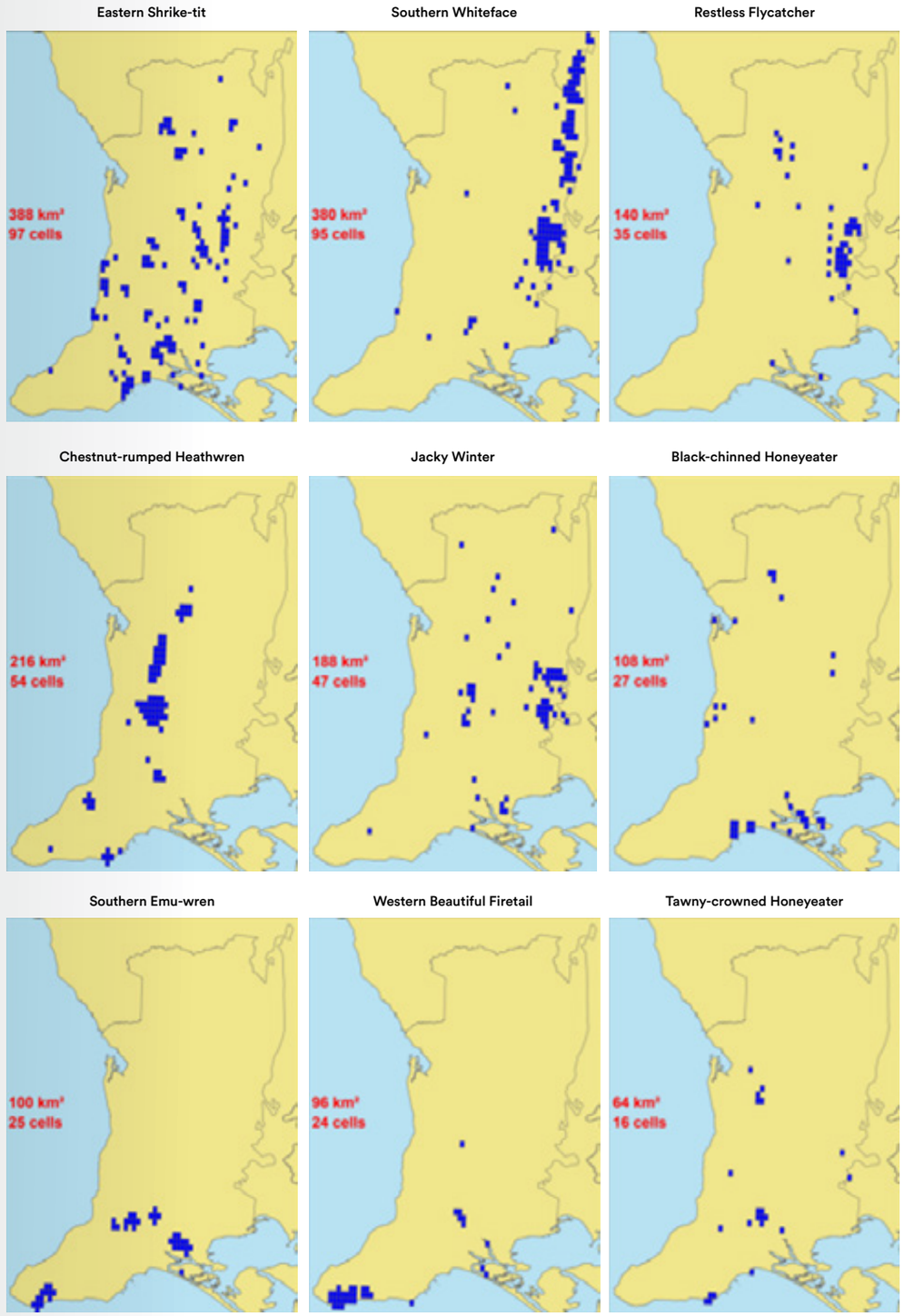


Figure 14.
MLR area of occupancy (AoO) maps for nine of the least widespread species (since 2012). Each blue square represents a 4km cell that the species has been recorded in.



Joel Allan has also provided background information on various threatened species in other publications, the changes in range of three species illustrated in Figure 19 and explained below.

The Western Beautiful Firetail has suffered a considerable decline in range, persisting now only at the Deep Creek / Balquhidder complex and Cox Scrub CP; extensive surveys recently undertaken were unable to find individuals in Mount Bold, Myponga or Newland Head where they were once commonly found (Allan et al. 2020).

The MLR Chestnut-rumped Heathwren has also undergone extensive declines and is known to be persisting mainly in the Mount Bold / Scott Creek complex, with small numbers at Myponga, Newland Head CP, Black Hill CP and Morialta CP; it may have disappeared from much of the Deep Creek / Balquhidder landscape and the Hindmarsh Tiers and Stirling areas. The MLR Chestnut-rumped Heathwren and the Brush Bronzewing are found in the dense, heathy understorey of the closed forest habitat along the central spine.

The most significant populations of the MLR Southern Emu-wren are at Deep Creek NP, the lower Finniss River / Tookayerta Creek, and swamps around Mount Compass (Stipiturus CP, Hesperilla CP and the Mount Compass School swamp); new locations have recently been found along the Finniss River in Nature Foundation's Watchalunga nature reserve.

The Tawny-crowned Honeyeater (*Gliciphila melanops*) was once widespread across the region, as far north as Para Wirra. Now only small numbers breed around Newland Head CP. It is an occasional visitor to other sites across the MLR with major populations in the west and east of Australia – it is less dependent upon the region than the endemic species.

Habitat reconstruction would ideally extend out from existing remnant strongholds where birds are holding on, as many of the species that use this habitat have a limited ability to disperse.

As well as creating new habitat, the remnant habitat requires ongoing maintenance, especially managing fire regimes. Research has shown for Western Beautiful Firetails that '… the subspecies may return to burnt areas within 2 years, though a fire interval of 15 to 35 years is preferred. This correlates to the time sheoak trees take to recover and produce seeds. Inappropriate fire regimes for the subspecies include: vegetation that is >40 years unburnt and high-severity fire recurring at intervals of 15 years or less - as this removes habitat and leaves insufficient time for recovery of habitat' (Western Beautiful Firetail Conservation Advice EPBC 2022). This also reinforces the need to extend the habitat, so that there is adequate area to support a mosaic of different fire aged habitat.

Figure 15.
Historical records and 2018–2020 records for three threatened bird species (Allan et al. 2020).

Appendix 3.
Conceptual model of drivers and pressures of bird decline.

Figure 16 shows a Drivers-Pressures-States-Impacts-Responses (DPSIR) conceptual model of the societal drivers of decline in woodland birds in the MLR and the responses that could slow or reverse this trend. This model, prepared by Assoc. Prof. Patrick O'Connor, University of Adelaide, identifies anthropogenic changes that are primary drivers, which create pressures on the system as a result of human activities. The impacts of these drivers and pressures vary across bird species, necessitating tailored responses to maintain functional bird populations.

Importantly, while many pressures negatively affect bird populations, some species may derive benefits from specific pressures—for example, weeds providing habitat and food resources, or grazing pressures helping maintain grassy ecosystems that support certain bird communities. The model focuses on bird species as the asset of interest. However, the ecosystems and ecosystem services, other native species, and human-nature connections within the region are also important assets which are impacted by the drivers and pressures listed and can benefit from appropriate consideration in the design of responses.

Drivers: The social and economic impetus for changes in the landscape that directly and indirectly trigger the pressures on woodland birds. Climate change acts on the system as a driver of change but is primarily outside the influence of the MLR socio-economic system. The critical drivers of change to bird populations are land use and land use change from agriculture, urbanisation and infrastructure development.

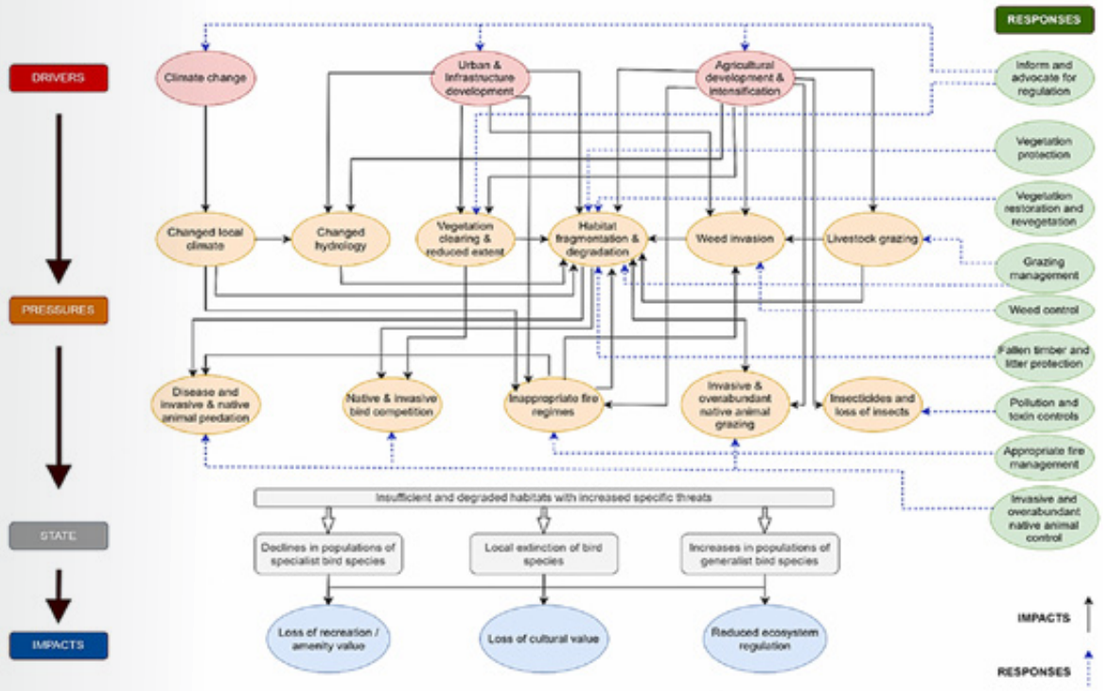
Pressures: The factors which 'impact' on bird populations. The pressures are primarily from loss of extent of bird habitat (largely but not only historical) through clearance of native vegetation, and habitat modification as a consequence of current and legacy effects of land use and land use change. The woodland bird populations are impacted by pressure from inappropriate fire regimes (bushfire and controlled burning), weed and feral animal invasion, total grazing pressure, disease, changes in competition between native bird species, climate change on ecosystems and interactions between pressures.

State: The state of the woodland birds of the MLR and their habitats is such that a large number of bird species (predominantly species which have some habitat requirements for high-quality woodland vegetation) have declined in total number (total abundance halved in the 20 years to 2020), even since wholesale clearing of native vegetation ceased in the 1980s. At the most extreme end of the decline, several species have become extinct or are at high risk of local extinction. Changes in the system have also resulted in increases in the abundance of some native bird species (primarily large bodied and carnivorous species) and the introduction of a number of non-native bird species. Degraded habitats may not be able to be recovered in some situations where there has been a transition due to drivers and pressures which cannot be controlled at local scales (e.g. climate modification).

Impacts: The impacts of changes in the woodland bird populations are the consequences of this change for the social, economic and environmental wellbeing of the people and systems of the MLR. The changes in bird populations have consequences for the regulation of natural and agri-ecosystems as services from ecosystems are disrupted (e.g. declines in bird populations can reduce pollination, insect control and seed dispersal). The landscape of the MLR also provides a large amount of recreational, cultural and amenity benefit to local residents and visitors to the region. Changes in bird populations and subsequent changes in the vegetation and functioning of natural ecosystems can have significant impacts on the social and economic benefits from a stable and functional ecosystem.

Responses: Responding to changes in the system that supports bird species and populations requires actions on both the drivers and the pressures. Responses need to target land use and land use change as well as the current and legacy pressures on woodland birds and the ecosystems they rely on. An efficient response relies on the right choice, sequencing and combination of actions to be taken for individual or suites of bird species, at a scale where the benefits outweigh the costs (including public benefits). Responses also need to use the right mixture of suasion, incentivisation, regulation and public provision to be successful.

Figure 16.
The Drivers–Pressures–States–Impacts–Responses (DPSIR) conceptual model for woodland bird decline and recovery in the Mount Lofty Ranges.



Appendix 4.
Current partners and bird recovery projects.

Groups, individuals and ReBird the Ranges partners are already experienced and actively improving bird habitat. Some achievements to date:

- The Watchalunga Nature Reserve, purchased in 2015 by the Nature Foundation, planted with over 12,000 seedlings to create denser vegetation for what is now the largest population of the Southern Emu-wren in the world.
- The Hills and Fleurieu has worked together with Department for Environment and Water to fence and revegetate over 110 ha of cleared land at Deep Creek National Park and created habitat now used by 34 bird species, including the largest mainland population of the Western Beautiful Firetails.
- Para Woodlands Nature Reserve, a partnership between Nature Foundation and the Department for Environment and Water, has seen 500 ha of former farming land restored into a functional grassy woodland habitat where the bird species increased from 24 in 2006 to 117 in 2023.
- BioR is conducting one of the most comprehensive grassy woodland reconstruction projects in the MLR on 550 ha at Frahns Farm. Weed and fertilizer contaminated soil is removed, herbivore exclusion fencing erected and tens of thousands of grasses, herbs, climbers, shrubs and trees are planted each year with the help of volunteers to create structurally and floristically diverse habitat for woodland birds.
- Bird monitoring is actively conducted across the region by many of our partners, including the University of Adelaide and Nature Conservation Society SA who have been conducting woodland bird monitoring for > 20 years across 164 sites (see Appendix 5).
- Thousands of committed individuals and Friends of Parks, Landcare and Bushcare groups volunteer their time to restore and reconstruct habitat, across the MLR. Much of this work has a bird recovery and biodiversity enhancement focus.

Table 17.
Summary of ReBird the Ranges partners' bird recovery skills and current projects.

Partner	Capabilities relevant to bird recovery	Relevant projects and skills
Bio-R	**Specialise in reconstructing structurally and floristically diverse habitats for biodiversity which are self-sustaining and resilient.** Planting programs consist of direct seeding and tube-stock with a diverse mix of native grasses, herbs, climbers, shrubs and trees at varying densities for habitat heterogeneity. Plantings are protected with herbivore-exclusion fencing. Pre-spraying and topsoil scraping is used to remove weed seed banks. Growth, survival, and reproductive outputs of plantings are documented, and vertebrate and invertebrate fauna monitored prior to, during and after restoration. Seed collection is complemented by seed production areas for direct seeding and propagation in BioR's plant nursery.	• Reconstruction at Frahns Farm (550 ha Grassy woodland) Monarto • Reconstruction of Myponga Beach (45 ha Sheoak Grassy Woodland) • Site preparation & weed control • Herbivore exclusion fencing • Seed production areas • Plant nursery / propagation • Planting and watering techniques • Community engagement • Flora and fauna monitoring
Birdlife Australia	**Australia's peak body for bird conservation.** Leads and advises on threatened species recovery programs across Australia with campaigns including woodland birds and beach-nesting bird programs in SA. Leads citizen science projects, conducts research and monitoring, community education, engagement and marketing programs. Develops the Bird Conservation Strategy for Australian Birds. Works with businesses and government to change the laws to better protect birds.	• Leader of the Temperate Woodland Bird Conservation Action Planning process (across SE Australia and into MLR) • Compiles the Handbook of Australian, New Zealand and Antarctic Birds (HANZAB) • Conducts the Aussie Bird Count and administers the Birdata app • Fundraising, research, community engagement and campaigning
Birds SA	**South Australia's peak body for birds and birdwatchers.** Hold regular birdwatching field trips and supports citizen science programs and lobby government. Partner with Kanmantoo-Callington LandCare Group and Second Nature Conservancy to manage the Browns Road / Monarto woodland. Manage a seed orchard and re-vegetation program. Operate a small research-grants conservation fund. Currently running a campaign to protect beach nesting birds in SA.	• Support the Browns Road / Monarto woodland and Minko Scrub near Mount Compass • Some of the best ornithologists in the state actively recording bird observations and educating others • Aim to connect Browns Road property to Frahns Farm to make a combined 850 ha reserve
Conservation Volunteers Australia (CVA)	**Coordinate volunteers to restore Australian nature with the support of (mostly corporate) partners.** Organise volunteers to participate in on-ground projects, with a strong community engagement and education focus. CVA invest in sites and activities that will have a real positive environmental impact.	• Restoration at Billy Goat Hill, Lobethal (1700 seedlings planted in 2023) • Linking community members with environmental volunteering • Conduct three major volunteer events per year • Administer Apps and education resources
Department of Environment and Water (DEW), including National Parks and Wildlife Service	**Leads environment and water policy in SA, including managing National & Conservation Parks in the Mount Lofty Ranges.** The Native Vegetation branch administers native vegetation clearance, distribute clearance offset fees and administer private heritage agreements, including re-vegetation and environmental management. The DEW fire crew manage prescribed burning planning and program. Threatened species assessment and science. The National Parks and Wildlife Service maintains conservation areas, protecting vegetation and wildlife, and addressing climate change.	• Management of National Parks • Native vegetation clearance management • Science to underpin conservation prioritisation • Threatened species assessment and monitoring • Fire management planning and prescribed burning program • Leading policy for wildlife and overabundant native animals • Volunteers and Friends of Parks programs
First Nations	**Kaurna, Ngarrindjeri, Peramangk, Ngadjuri and First Peoples of the River Murray** have many active healing country and some cultural burning programs underway to revitalise habitat and restore nature	• Kaurna fire crew have conducted several cultural burns across the MLR • Ongoing weed control and revegetation • Cultural education tours and heritage site identification
Forestry SA	**Manages forestry reserves in MLR.** Oversees 6000 hectares of native vegetation, across 3 main forests. Collects bird survey data and an active supporter of numerous research projects. Conducts fire prevention, fire fighting and prescribed burns. Works with community groups and visitors.	• Manage and restore Cudlee Creek, Kalamunda, Kersbrook, Little Mount Crawford and Mt Panorama native forest reserves • Prescribed burning • Site rehabilitation and biodiversity management • Visitor management
Green Adelaide	**Manage the environment of the metropolitan Adelaide region.** Facilitate partnerships, invest in aligned initiatives, nature education, and delivering iconic on-ground environmental projects such as: Urban greening, Birds of prey habitat, Butterfly friendly Adelaide, Bringing platypus to the Torrens, and others. Support the Kaurna cultural burning program.	• Lead the rewilding Adelaide's bird of prey project including Square-tailed Kite monitoring • Deliver numerous urban environmental and ecological programs • Facilitate cultural burning

Table 17.
Summary of ReBird the Ranges partners' bird recovery skills and current projects continued.

Partner	Capabilities relevant to bird recovery	Relevant projects and skills
Greening Australia	**Large-scale landscape restoration and targeted biodiversity projects** achieved via environmental markets and corporate/ philanthropic funding and working with private, public and corporate property owners. Capabilities include revegetation work, research, GIS, native seed supply, annual carbon aggregations with private landholders, working with Traditional Owners to plan and deliver projects. Incorporate practical climate-ready aspects to their restoration work.	• WOMADelaide Forest plantings, at Langhorne Creek, Hartley, Newland Head and southern Fleurieu Peninsula (109 ha) • WWF Drooping Sheoak woodland sites at Cape Jervis, Myponga and Mt Observation • Site preparation & weed control • Seed collection and sale • Numerous habitat reconstruction techniques
Hills and Fleurieu Landscape Board	**Support community to manage land, water, pest plants and animals and biodiversity within the Hills and Fleurieu region.** Conduct training and events for conservation and land management. Provide free practical advice from stewardship officers. Connect and link like-minded groups and people. Provide grants and funding for environmental and agricultural projects. Host the coordinators of the ReBird the Ranges program and administer the Landscape Priority Fund bird recovery projects.	• Host ReBird the Ranges coordinators • Back from the Brink – heathland reconstruction at Deep Creek National Park • Agricultural and environmental flora, fauna and ecosystem management services • Community engagement and support around environmental issues
Local Governments. Including Adelaide Hills, Alexandrina, Barossa, Mt Barker, Murray Bridge, Onkaparinga, Victor Harbor and Yankalilla	**Councils are responsible for managing all council land including parks and nature reserves.** They support and encourage property owners and land care groups to care for bushland. They contribute to development planning decisions and set environmental management policy.	• Revegetation and restoration of parks and reserves. • Community engagement and relationships with landholders • Policy on vegetation management and fire prevention activities. • Cat control and management
Murraylands and Riverland Landscape Board	**Support community to manage land, water, pest plants and animals and biodiversity within the Murraylands and Riverland region,** including numerous regional projects in partnership with the community, First Nations, not-for-profit groups, industry and local government. Manage wetlands, floodplains, threatened species and pest plants as well as support sustainable farming practices.	• Conserving Iron-grass Natural temperate grasslands of SA (especially eastern MLR) • Agricultural and environmental flora, fauna and ecosystem management services • Community engagement and support around environmental issues
Nature Conservation Society SA (NCSSA)	**Speaking and acting for nature in SA** through advocacy, research and engagement. A long history of active conservation and protection to ensure that native species and their habitats are conserved throughout South Australia. Use scientific knowledge and research to speak up and act for nature and conservation projects and campaigns based on the best available evidence. A significant driving partner in the MLR woodland bird monitoring program, initiated by Professor Hugh Possingham, Drew Tyre, and Dr Scott Field in 1999.	• 20 years of MLR Woodland Bird Monitoring Program • Active campaigns to protect threatened bird species in SA • Advocacy and lobbying of decision makers • Support environmental projects and research • Community engagement
Nature Foundation	**The engagement of people, development of resources and good science to conserve the precious habitat of South Australia.** Purchases and manages critical habitat through the Forever Nature Fund and environmental offset solutions. Run community engagement programs, wildlife monitoring programs, tree planting days and host Conservation Conversations.	• Watchalunga Nature Reserve (92 ha swamp habitat optimized for birds) • Para Woodlands Nature Reserve (500 ha being restored to a functioning grassy woodland) • Community engagement and education • Land and biodiversity management
Northern and Yorke Landscape Board	**Support community to manage land, water, pest plants and animals and biodiversity within the Northern and Yorke region,** including numerous regional projects in partnership with the community, First Nations, not-for-profit groups, industry and local government. Manage threatened species and pest plants as well as supporting sustainable farming practices.	• Carbon Farming Outreach Program • Regenerating catchments for environmental and cultural water flows in the Barossa catchment • Agricultural and environmental flora, fauna and ecosystem management services • Community engagement and support around environmental issues
SA Water	**Manages around 20,000 ha within the Mount Lofty Ranges in reservoir reserves.** Implements numerous revegetation and habitat reconstruction projects using various methodologies, and conducts trials, monitoring and fire management. Supports research projects on managed properties.	• Management of all SA Water properties • Millbrook Reservoir grassy woodland reconstruction • Catchment care and restoration innovation
Second Nature Conservancy	**Regional habitat restoration and reconstruction, weed management, nursery operation and community programs.** Work with private, public and corporate property owners. Run citizen science and community education programs. Plan, develop and deliver large-scale, community-focused biodiversity conservation programs and projects across the eastern MLR and Lower Lakes.	• Re-vegetation across numerous properties in the SE section of the MLR • Bush care and weed control • Site preparation, planting and guarding • Seed collection, propagation and sale • Numerous habitat reconstruction techniques
Society for Ecological Restoration Australasia (SERA)	**Promote ecological restoration to sustain the diversity of life and re-establish an ecologically healthy relationship between nature and culture.** Developed the National Standards for Ecological Restoration, organise SERA conferences, write reports and discussion papers. Restoration projects Engage volunteers in restoration projects. Linked to SER international.	• Numerous forest restoration and reconstruction projects across Australia • Conferences and guidelines for ecological restoration projects
Trees for Life (TFL)	**Delivers conservation, revegetation, community engagement, training programs and services.** Projects include MLR Paddock Tree program and community bushfire recovery plantings. Have 7000 active supporters and 800 volunteer growers. Have a seed collection program across 42 provenance zones, a seed bank and nursery. Years of experience in numerous revegetation methodologies.	• Grassy woodland revegetation in the Eastern Mount Lofty Ranges • Manage Bushcare sites across the MLR • Supply 75,000 trees – seeds, soil and advice to landholders per year • Direct seeding programs, Deep Creek and private land • Carbon plantings & Trees for Habitat
University of Adelaide	**Contemporary education and research to meet the local and global community's evolving needs and challenges.** There is current and/ or planned bird recovery related research into, Landscape-scale habitat restoration (strategy and design), Socio-economic research (drivers and incentives), Ecological research (birds and habitat) and Climate resilience (projections and mitigations).	• Support for 20 years of MLR Woodland Bird Monitoring Program with data analysis • Potential to add value to all recovery projects with applied research • Host the Environment Institute which is funding research into Bird Recovery projects across the MLR

Appendix 5. Monitoring.

The action areas under goal 4 on page 52 specify two monitoring actions:

- 4.1 Establish a coordinated MLR wide bird monitoring program
- 4.2 Track habitat condition and extent.

We are fortunate in having long-term monitoring programs that provide woodland birds presence records (summarised in Table 17). Some bird surveys and revegetation programs report on habitat health and bird interactions, but this is an area that would benefit from greater monitoring. A fit-for-purpose monitoring program will be developed to guide monitoring of:

- trends in populations and diversity of priority bird species across habitats of the MLR
- how priority bird species are using habitat elements
- which restoration actions are producing the most functional habitat for priority species.

Table 18.
Known bird and habitat monitoring programs in the MLR.

Monitoring program	Description and purpose, including target species and habitats	Method	Longevity and frequency
Woodland Bird Monitoring program (University of Adelaide, Nature Conservation Society of SA, and NRM/landscape boards)	Understand population numbers and bird species trends at 164 sites surveyed (primarily in the central ranges).	Skilled volunteers survey sites using 2 ha / 20-minute bird survey method (Lyon 1986), recording all birds seen and heard. Surveys performed in the early morning, between 30 minutes and 4 hours after sunrise.	Since 1999; annual
Low rainfall grassy woodland threatened bird monitoring (Joel Allan, DEW)	To monitor declining woodland birds in low rainfall grassy woodlands of the MLR. Full details: Allan JR, et al (2018) 'Putting the power in monitoring: Optimising survey design to determine the effectiveness of restoration on woodland birds in the northern and eastern Mount Lofty Ranges', DEWNR, Adelaide.	Priority was given to the threatened species: Brown Treecreeper, Chestnut-rumped Thornbill, Diamond Firetail, Hooded Robin, Jacky Winter, Restless Flycatcher and Southern Whiteface. The survey built upon Biological database for SA (BDBSA) and Birdlife Australia data from 1996-2017. Experts surveyed 165 sites on the northern and eastern MLR. Four surveys of each site using the 2 ha, 20-minute method (Lyon 1986), were conducted between August to February 2017/18.	Using data from 1996 onward. Survey conducted 2017/18.
Heathland threatened bird monitoring (Joel Allan, DEW)	Baseline closed shrubland / heathland for Western Beautiful Firetails, MLR Chestnut-rumped Heathwren and MLR Southern Emu-wren. Full details: Allan JR, et al (2020) "Mount Lofty Ranges Closed Shrubland Bird Monitoring Baseline Surveys 2019/20 Report, DEW, Adelaide.	Experts surveyed 245 closed shrubland sites (predominantly southern Fleurieu) 2-3 times in the breeding season (Aug to Feb) 2019/2020 to establish a baseline. Sites comprised of a 500m long by 100m wide transect, with call playback for target species used at five points along the transect. Presence of birds seen or heard was recorded. This survey is currently being repeated in 2024/2025.	Baseline in 2019/20 and follow-up in 2024-25.
MLR Western Bassian Thrush monitoring program (Rebecca Boulton)	A Western Bassian Thrush monitoring program throughout the MLR. Full details: Boulton R,L., & Whittaker D. (2021) Monitoring Program for the Vulnerable Bassian Thrush, MLR, SA. Draft report prepared by the University of Adelaide, Adelaide.	Experts surveyed 60 sites across the northern, central, and southern sections of the Mount Lofty Ranges. Sites of suitable habitat with both previous records and uncertain Western Bassian Thrush presence. Surveys were conducted by placing Audio Moth, acoustic recorders 400m apart across each site for 14 days. Sites range from 16 to 64 ha in size. The monitoring is planned to continue for at least 8 years.	Since 2020, planned to continue till 2028.
Friends of Scott Creek CP bird banding	Data from a long-term bird banding project is being analysed. Jim Spiker is the current coordinator.	The banding data is being analysed: 1) a comparison of bird species diversity, abundance, survivorship and movements within and between burned and unburned sites prior to a following the Scott Creek Fire in Jan 2020, and (2) long-term changes in abundance, body size and shape relative to climate variables in several species for which there are sufficient data available.	Since 1993
Systematic area searches (David Paton)	1. Mt Bold area (70 ha, SA Water land). 2. Para Woodland (~70 ha, NFSA- and DEW-managed land referred to as the Barossa block). 3. Monarto 1970s woodland plantings (two sites – ca 70 ha & 60 ha, one is part of Monarto Woodlands Park and managed by DEW, the other is managed by Zoos SA as it is inside Monarto Zoo). 4. Frahns Farm (550–750 ha DEW Crown land). The original 550 ha was surveyed 13 times between April 2015 and March 2016. It is now surveyed quarterly every 2 years or thereabouts. 5. Cygnet Park (300 ha, private property). 6. Cromer Conservation Park (ca 42 ha, DEW). 7. Newland Head Conservation Park (72 ha surveyed).	1 to 6. Systematically visiting every part of a designated area and recording: species of bird, number of birds, activity of the bird (foraging, perching, flying, preening, breeding etc), the plant species in which the bird was sighted, the substrate being used (ground, fallen timber, branch, foliage, flowers, dead branch, air) the height of the bird above the ground, and its position recorded with a GPS. Surveys also include pre- and post-fire monitoring, detailed vegetation records, kangaroo grazing impacts upon plant and bird species structures, and impacts of revegetation programs. 7. Fixed width transects and non-systematic area searches – in this case 6 parallel transects that are 200 m apart, 1.2 km long with 100 m fixed width. Birds recorded in each 1 ha area along these transects and the numbers and activity of each bird detected is recorded. For 1, 2, 3 & 7, detailed vegetation assessments are also undertaken near the start of the surveys, and for all sites I also record flowering of the key plants semi-quantitatively. Where the plants are mapped, I also have records of whether the plants died and/or if not, then how long they are taking to recover from fire.	Commenced: 1. Sept 2003 2. June 2007 3. Mid-1990s 4. 2015 5. 2009 6. August 2022 7. March-April 2021

Table 18.
Known bird and habitat monitoring programs in the MLR continued.

Monitoring program	Description and purpose, including target species and habitats	Method	Longevity and frequency
Bird banding (David Paton)	Bird banding continues at Newland Head, Frahns Farm and the Coorong.	Most of the bird banding programs that are run are aimed at determining longevity (survival), population structure (proportions of young to adult birds, males to females, etc.) and residency versus movements of birds in the Coorong (coastal scrubs).	
Forestry SA	Conducts and supports various surveys on Forestry SA lands. Including Square-tailed kite and Bassian Thrush monitoring. Keeps numerous survey data, including bird banding and pre and post fire studies.	Forestry SA has historic woodland bird records, using various survey methods from Mt Crawford by Tom Hands 2009, Penny Paton 2009-2020 and Graham Carpenter 2011. From Kuitpo Forest Reserve by J Edington 1981, D Weisner 1984 and R Hill 1996.	1980 onward
SA Water	Conducts and supports various surveys on SA Water lands with University academics and restoration scientists.	Actively monitors revegetation projects for new species using trail cameras and observations. At the Milbrook Reservoir Reserve revegetation site they recorded the re-emergence of the Buff-rumped Thornbill and Dusky Woodswallow.	

Appendix 6.
Research needs.

Action areas for Goal 4 on page 52 and 53 lists two actions that relate to research:

- 4.3 Prioritise high impact research that will directly improve bird recovery program methodology
- 4.6 Research courageous and innovative options to safeguard the most threatened bird species

ReBird the Ranges partners have identified knowledge gaps for future research, including applied research that can assist in improving the design of new and ongoing habitat restoration programs. This list is not exhaustive and we encourage researchers to connect with ReBird the Ranges partners to co-design research programs that can assist in the recovery of MLR woodland bird species and habitats.

Research needs are grouped into four themes:

A) Landscape-scale habitat restoration: The strategy and design involved in reconstructing heathlands, grasslands, and grassy woodlands and the restoration of all remnant habitat.

B) Socio-economic research: Understand and address landowner engagement, policy needs, and investment strategies to enable sustainable, long-term habitat restoration.

C) Ecological research: Address knowledge gaps in bird population dynamics, habitat requirements, and restoration techniques to guide effective interventions.

D) Climate resilience: (In addition to adaptations mentioned in A and C) Prepare for extreme events (e.g., heatwaves, fires) and ensure restored landscapes will function in the face of a dramatically different climate.

Table 19.
Knowledge gaps and research topics.

Research topic	Research questions	Notes / context
A. Landscape-scale habitat restoration		
Targeting reconstruction efforts within the MLR and reach 30% of each ecosystem type	Where is it ecologically a priority and where do those properties overlap with supportive landowners and other economic and social considerations? What design compromises will find the balance between social and environmental success?	It is accepted that patches larger than 100 ha that are adjacent to existing bird populations should be the first priority. All property tenure and use types should be evaluated.
Refining methods for reconstruction and restoration for priority woodland bird species	It is accepted that restoring land to pre-European condition is no longer possible therefore what are the optimal and essential re-construction design/s elements (across the sub-habitats of the MLR) for returning habitat to the MLR at scale? What novel approaches and techniques are feasible to trial in the MLR?	This research will support Action area 4.4 which proposes the writing of best practice guidelines for bird habitat restoration and reconstruction.
Designing, reconstructing and managing resilient, biodiverse landscapes	Resilience of plantings to climate change – what plants from outside the region should be considered? How should fire be managed and used across the landscape to optimise bird habitat, mitigate wildfires and protect bird populations?	We are assuming >2 degrees warmer by 2100
B. Socio-economic research		
Understanding motivations and barriers to landholder commitment of property to bird habitat.	Which landowners would or could be willing to dedicating part or all of their property to bird habitat? Are further legal mechanisms needed to commit land to conservation indefinitely? What incentives and support are most important?	We currently have heritage agreements to change land titles to dedicate it to biodiversity conservation.
Understanding how landholders can best engage in carbon and biodiversity markets	What nature repair markets are available to landholders? How should people be approached and supported to engage with these initiatives. What financial and social incentives are most successful?	
Understanding how to create a groundswell of community support for bird recovery	What communications and engagement activities will increase awareness and ideological and practical support for woodland bird recovery? Is it best to target specific community segments? Is citizen science worth pursuing for science/ engagement?	There is a risk that community engagement does not translate to on-ground ecological outcomes.

Table 19.
Knowledge gaps and research topics continued.

Research topic	Research questions	Notes / context
C. Ecological research		
Understanding woodland bird species' ecology to enable planning of recovery actions	What patch sizes and how connected dose habitat need to be for priority MLR birds? What are the dispersion capabilities, home ranges, habitat sizes, vegetation structures that are required by priority species? Can general guidelines and models be written?	Much is known about MLR bird ecology but it is not readily available to land managers and restoration practitioners.
Understanding the current status and trends in bird population and distribution	What is the status and trends in woodland bird species populations and distributions? Which species are disappearing the fastest and what habitat elements should we recover first?	DEW (J Allan) has run a regional IUCN Red List criteria B, to determine the species most vulnerable to extinction. Other criteria (A, C, D) have been proposed.
Understanding specific threats and mitigation options for woodland bird species	What are the risk levels and viable mitigations of various threats? • Avian influenza and other bird diseases • Water management • Herbivory by introduced pest animals and over-abundant native animals • Predation by cats and, or foxes. • Bird Strike – cars, wind turbines, reflective structures • Plant dieback diseases including *Phytophthora cinnamomic* • Lack of nesting sites	Interventions in the landscape are costly and can have un-intended consequences. It is important that we know what interventions will have the greatest benefit.
Insuring against the extinction of the most threatened species	Which threatened species are most vulnerable to stochastic events? Would captive insurance populations or translocation and reintroduction be viable?	Western Beautiful Firetails and Southern Emu-wrens both have such isolated populations that a bad fire on southern FP could wipe them out.
Understanding how to support insect populations	Insects – what can and should be done to specifically support insects, or will habitat restoration do enough for insects and birds? Are there novel ways of providing more insect habitat, adding missing lifecycle elements?	Insect decline is widely reported and with a majority of birds depending upon insects this issue is significant. Dead trees, logs and watercourses are known to be important in insect lifecycles.
D. Climate resilience		
Maintain flora and fauna through extreme events	Model the sort of ecosystems that will be needed in 2100 and beyond. What plant species need to be substituted or moved south? What types of interventions, are needed to ensure habitat survives extreme heat events and is resilient to lower rainfall and increased fire frequency. How do you maintain riparian refuges? Do new species of high shade and drought tolerant plants need to be added to shelter and feed birds?	Average temperatures are expected to rise on average by 2-5 degrees by 2100 and extreme heat days are expected to increase in frequency, duration and intensity.
Innovation interventions	What interventions are necessary to save birds and their habitat: • Should watering systems be added to new plantings and remnant bushland? • Should water baths or misting sprays be used on extreme heat days? • Is supplementary feeding needed during droughts? • What sort of fire suppression strategies are needed to save bird populations?	There are reports of significant habitat and bird mortality with regard to extreme heat events. In cases where adaptation is not possible significant human intervention may be the only path forward.

Acknowledgements

Development of this plan was funded through a SA Government Landscape Priorities Fund grant and Hills and Fleurieu Landscape Board landscape levy funding.

This plan was written by David Pearce, ReBird the Ranges Coordinator. ReBird the Ranges members contributed to this plan in workshops, working groups and numerous edits. Notable contributions were made by the Steering Committee (Patrick O'Connor, Ross Oke, Wendy Telfer, Janet Klein, Kirsty Bevan, Jody Gates, Wendy Stubbs, Amelia Hurren and Natasha Davis) and the Learning and Research Working Group (Thomas Prowse, Rebecca Boulton, Lucy Clive, Anthony Abley, Brittany Norris, Shaun Kennedy and Craig Gillespie).

Valuable input was received from the Communications and Partnership Coordinator, Valeria Velez Portes, and the Communications and partnership working group (Jacqui Wilson, Ray Nias, Ben Simon, Sarah Ansell, Janet Klein, Hayley Burns, and Tony (Salty) Freshwater). Content contributions and edits were also provided by David Paton, Patrick O'Connor, Graham Carpenter, Joel Allan, and Jeremy Freeman (mapping). Additional ideas and content provided by Jody Gates, Randall Johnson, Luke Price, Monika Rhodes, Hugh Possingham and Megan Harper. Thanks to Adrian Stokes for his editing work. Thank you to all the photographers who shared their photos and the Birds SA photo gallery (credits in body). Finally, thank you to Wendy Telfer for her contribution and guidance throughout the entire planning and writing process.

Find out how you can be involved

Together, we can explore new ideas, take strategic and meaningful actions, and collaborate toward a better future for birds, for our communities and ourselves.

Join us
rebirdtheranges.org

ReBird
the Ranges