

DRAFT Conservation Advice¹ for the Eastern Mallee Bird Community

This document combines the approved conservation advice and listing assessment for the threatened ecological community. It provides a foundation for conservation action and further planning.



Malleefowl (*Leipoa ocellata*) [centre]; Gilbert's Whistler (*Pachycephala inornata*) [top left]; Black-eared Miner (*Manorina melanotis*) [right]; White-fronted Honeyeater (*Purnella albifrons*) [bottom left].
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Conservation Status

The Eastern Mallee Bird Community was nominated for listing on the threatened ecological communities list under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

At the time of this advice, the ecological community corresponds in part with the Victorian Mallee Bird Community, listed as threatened in Victoria. Some member species of the ecological community are individually listed as threatened by jurisdictions that overlap with the community's extent.

The ecological community was assessed by the Threatened Species Scientific Committee, with a preliminary recommendation that the ecological community may merit listing as **Endangered** and that a recovery plan is not required for the ecological community at this time. The Committee's preliminary assessment of the eligibility against each of the listing criteria is:

Criteria 1: Eligible as Vulnerable	Criterion 4: Eligible as Vulnerable to Endangered
Criterion 2: Not eligible	Criteria 5: Eligible as Vulnerable;
Criterion 3: Eligible as Vulnerable to Endangered	Criterion 6: Insufficient data.

The Committee's full preliminary assessment and recommendations are at Section 6.

The main factors that make the threatened ecological community eligible for listing in the Endangered category are the severe declines in multiple functionally significant birds and loss of ecological integrity, primarily due to fragmentation of mallee habitats and the impacts of altered fire regimes and pest animals across parts of the Eastern Mallee. These have resulted in reduced abundance, shifts in the composition of prominent birds, and localised extinctions of component bird species.

¹ The Conservation Advice is a statutory document as per section 266B of the *Environment Protection and Biodiversity Conservation Act 1999*.

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1 CONSERVATION OBJECTIVE

The objective of this conservation advice is to:

- mitigate the risk of extinction of the Eastern Mallee Bird Community and help recover its biodiversity and function through protecting it from significant impacts as a Matter of National Environmental Significance under national environmental law; and
- guide implementation of its management and recovery, consistent with the recommended priority conservation and research actions set out in this advice.

This Conservation Advice contains information relevant to the objective by:

- describing the ecological community and where it can be found ([section 2](#));
- identifying the key threats to the ecological community ([section 3](#));
- summarising the existing protections for the ecological community ([section 4](#));
- outlining information to guide its identification and conservation, including the key diagnostic features, condition thresholds and classes, and additional information to identify the ecological community, and the priority conservation and research actions to stop its decline and support its recovery ([section 5](#)); and
- presenting evidence to explain why the ecological community merits listing as nationally threatened under national environment law ([section 6](#)).

2 DESCRIPTION OF THE ECOLOGICAL COMMUNITY AND THE AREA IT INHABITS

2.1 Description

The ecological community described in this conservation advice is a type of faunal community. It is an assemblage of birds associated with mallee vegetation in the semi-arid areas of New South Wales (NSW), South Australia (SA) and Victoria. This section describes the assemblage of bird species that comprise the ecological community, plus their habitats, and noting that many occurrences or observations of this community are now likely to be in a modified state with a depauperate species composition and habitat features. Key diagnostic characteristics and any condition requirements for this community are outlined in Section 5.

2.1.1 Name

The ecological community was originally nominated as the 'Woodland and Heathland Bird Community of the Murray Mallee Bioregion'. The nomination was based on a threatened ecological community listed in Victoria under the name, *Victorian Mallee Bird Community*, with a distribution limited to the Murray Mallee region of north-western Victoria and south-eastern SA. However, an analysis of the bird fauna of the Eastern Mallee by Birdlife Australia (2015a) identified a larger bird assemblage dependent on mallee with a broader range that encompasses the Eyre-Yorke Block bioregion as well as the Murray Mallee. The same eastern assemblage of birds is associated with mallee woodlands across both these regions. It is this assemblage on which the national ecological community is based (see Appendix A).

The name of the ecological community is the **Eastern Mallee Bird Community** (hereafter referred to as the "Eastern Mallee Birds" or "the ecological community"). The name refers to an assemblage of native bird species that has a strong association with mallee woodlands and shrublands in south-eastern Australia. It also aligns with the name applied by Birdlife Australia (2015a) to a woodland bird assemblage in the 'Eastern Mallee' region (see 2.1.2, below). The term 'Mallee' is defined here as:

"a growth habit in which several woody stems arise separately from a lignotuber (usually applied to shrubby eucalypts); a plant having the above growth habit; vegetation dominated by such plants." (McCusker, 1999).

It is applied here solely to species of eucalypts that naturally show this growth habit and are indigenous to the Eastern Mallee region.

2.1.2 Location and climate

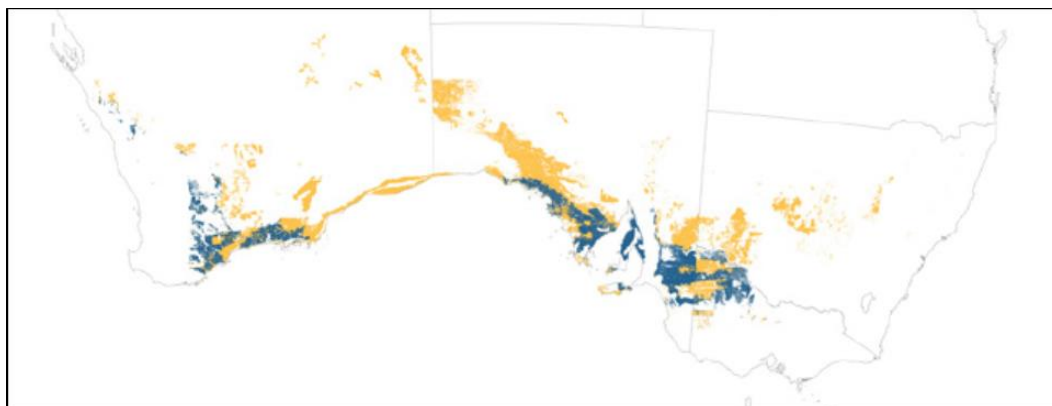
Mallee vegetation occurs in the drier, semi-arid parts of Australia, generally south of the arid zone (Yates et al., 2017) in Western Australia, South Australia, New South Wales and Victoria (Figure 2.1). It is not continuous across this broad range due to variations in landscape and climate. The Nullarbor Plain represents a substantial gap that separates the Western Australian mallee from the eastern mallee. The Flinders Ranges represents another, smaller gap in distribution between formerly extensive areas of mallee on the Eyre and Yorke Peninsulas from those around the lower Murray.

The distribution of the Eastern Mallee Birds focuses on bioregions in temperate south-eastern Australia that have major occurrences of mallee vegetation, and where an assemblage of birds considered to be dependent on, or strongly associated with, mallee habitats is present. The Eyre Yorke Block (EYB) and Murray Darling Depression (MDD) IBRA bioregions² formerly contained extensive areas of mallee vegetation, with the MDD bioregion currently retaining the most extensive remnants of mallee vegetation and fauna in south-eastern Australia (Government of South Australia, 2013). The distribution of the national Eastern Mallee Bird

² IBRA bioregion refers to the Interim Biogeographical Regionalisation of Australia. IBRA bioregions are large geographically distinct areas of similar climate, geology and landform with corresponding similarities in their vegetation and animal communities. The version current at the time of this advice is IBRA v7 (DoE, 2013), which divides Australia into 89 bioregions and 419 subregions, including offshore islands.

Community therefore covers the EYB and MDD bioregions and intervening subregions that provide landscape connections ([Figure 2.2](#)).

Figure 2.1. Distribution of key mallee vegetation across southern Australia, based on the extent of NVIS MVG³ 14 Mallee woodlands and shrublands.

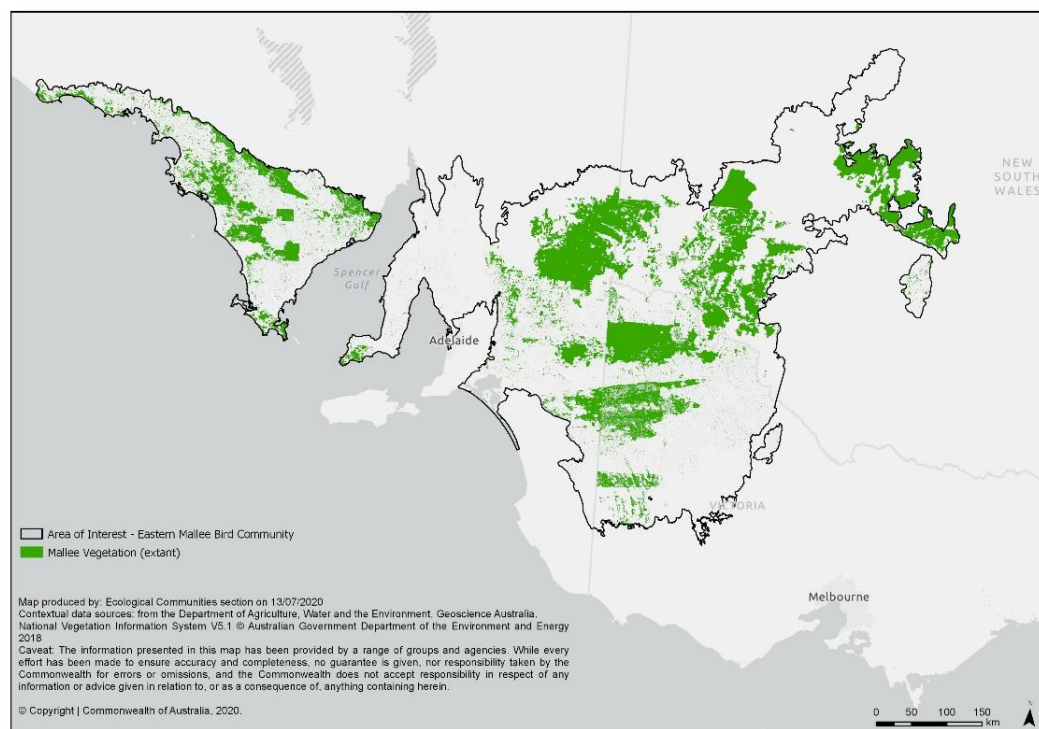


Source: Map reproduced from DoEE (2017a), based on data from NVIS v5.1 (DAWE 2020b).

Orange polygons show the current extent.

Blue polygons show the change in extent, i.e. areas of mallee likely present in 1750 but since removed or heavily modified.

Figure 2.2. The Eastern Mallee region (black outline) and current extent of mallee vegetation within the region (green polygons).



Source: Environmental Resources Information Network (ERIN, DAWE) based on data from NVIS v5.1 (DAWE 2020b). The Eastern Mallee boundary is based on the IBRA bioregions and subregions described below.

³ NVIS refers to the National Vegetation Information System v5.1, a national system for describing Australia's natural vegetation at various scales. A consistent continental-wide vegetation dataset is currently available only at the broadest scale of Major Vegetation Group (MVG).

Birdlife Australia (2015a) identified an Eastern Mallee region for their analysis of woodland bird assemblages. The distribution of the Eastern Mallee Birds described here generally follows their definition of the Eastern Mallee with some differences that simplify the bioregional extent. The component subregions included in the Eastern Mallee for the national ecological community are:

- Eyre Yorke Block bioregion (EYB): entire bioregion excluding offshore islands;
- Murray Darling Depression bioregion (MDD): entire bioregion;
- Flinders Lofty Block (FLB): subregion Broughton (FLB02) that connects EYB and MDD;
- Riverina (RIV): subregions around the Murray River that intrude into the MDD - Murray Fans (RIV03, west of Swan Hill), Robinvale Plains (RIV05), and Murray Scroll Belt (RIV06);
- Darling Riverine Plains (DRP): subregions around the Darling River anabranches that intrude into the MDD - Great Darling Anabranch (DRP08); and Pooncarie-Darling (DRP09).

The climate of the Eastern Mallee region is summarised by the agro-climatic classification system of Hutchinson et al. (2005). This system was adapted from an existing global agro-climatic classification, with an overlay of IBRA bioregions to align climate with broad landscape formations, natural vegetation and common land uses across Australia. The EYB and MDD bioregions fall within the Mediterranean to semi-arid climate category and classes, described as follows by Hutchinson et al (2005).

Category E - Warm, seasonally wet/dry. Long hot summers and mild winters with significant moisture limits on growth. These include the Mediterranean and adjacent inland climates, where the dry season is in summer, and mid-latitude eastern continental climates with wetter summers and drier winters.

- Class E1. Classic “Mediterranean” climate with peaks of growth in winter and spring and moderate growth in winter. The main land uses are forestry, horticulture, winter cropping and improved pastures. This climate class occurs in far south-western WA and southern SA. It covers mallee vegetation in the southern Eyre and Yorke Peninsulas, Kangaroo Island, the Coorong and the Naracoorte Coastal Plain. Eastern Mallee subregions that fall into this class are: EYB01, EYB03 (part), EYB04 and MDD03.
- Class E2. “Mediterranean” climate with drier cooler winters and less growth than for the ‘classic Mediterranean’ Class E1. The main land uses are horticulture, winter cropping and improved pastures. This climate class covers south-west WA, southern SA, north-west Victoria and southern NSW. It includes mallee vegetation in the northern part of the Eyre and Yorke Peninsulas, southern Murray Darling Depression, the southern Flinders-Lofty Block, and the western Riverina and Cobar Peneplain bioregions. Eastern Mallee subregions that fall into this class are: EYB02, EYB03 (part), EYB05 (part), FLB02, MDD02, MDD04 and MDD05.
- Class E6. Semi-arid climate that is too dry to support field crops. Soil moisture tends to be greatest in winter. The main land use is as rangeland. This climate class covers the southern edge of the arid interior in WA, SA, NSW and Queensland. It includes occurrences of mallee vegetation in the far western Eyre Peninsula, adjacent Gawler bioregion, northern parts of the Murray Darling Depression, Flinders Lofty Block and Cobar Peneplain bioregions. Eastern Mallee subregions that fall into this class are: EYB05 (part), MDD01, MDD06 and MDD07.

2.1.3 Eastern Mallee Bird assemblage

The Eastern Mallee Birds is an assemblage of 52 terrestrial native bird species identified as being dependent on, or strongly associated with, mallee habitats in south-eastern Australia ([Table 2.1](#)). The data and sources on which the assemblage is based are outlined in [Appendix A](#).

The Eastern Mallee Birds excludes all aquatic and marine species (e.g. ducks, egrets, seagulls), and all exotic species present in the region. No birds of prey (e.g. falcons, owls) were identified as members of the Eastern Mallee Birds. While species from all these groups certainly occur within the Eastern Mallee, they are not considered to have a particular affinity with mallee vegetation as their primary habitat.

The Eastern Mallee Birds includes representatives from the following groups ([Table 2.1](#); [Appendix A](#)):

- 23 bird families. The most diverse families included are the Meliphagidae (Honeyeaters) with nine bird taxa, followed by the Acanthizidae (Thornbills) with five species. Thirteen of the families are represented by only a single species.
- 12 feeding guilds. The most common guilds present are the Foliage and Branch Gleaners with eleven species and the Small Nectarivores with nine species. Three of the guilds are represented only by a single species. The assemblage of birds collectively provides a range of functions within mallee habitats, including regulation of insect populations, dispersal of fruit and seeds, and nutrient cycling from vegetation canopies to the ground layer.
- 21 taxa listed as threatened by at least one jurisdiction, national, NSW, SA and/or Victoria). Six species are listed as nationally threatened under the EPBC Act at the time of this assessment. These include iconic threatened mallee birds such as the Black-eared Miner, Mallee Emu-wren, Malleefowl, Red-lored Whistler and Western Whipbird. Another three species that are not formally recognised to be threatened, are currently protected as migratory species under the EPBC Act: Black-eared Cuckoo, Spotted Nightjar and Rainbow Bee-eater.
- 18 bird species are mallee-dependent component species of the Victorian Mallee Bird Community listed as threatened in Victoria. All except two bird taxa in the Victorian threatened community are part of the Eastern Mallee Birds, the exceptions being the Redthroat and Slender-billed Thornbill. The latter two bird species were found to have a relatively low correspondence with Eastern Mallee vegetation.

Comparisons with other broad-scale woodland bird communities identified from across southern Australia highlight which Eastern Mallee birds overlap with other woodland bird assemblages, and which species are unique to Eastern Mallee (see [Appendix B](#) for details about the woodland bird communities compared). About 14 (Birdlife Australia 2015) to 18 (Anon 2017) bird species are unique to the Eastern Mallee habitats, depending on how various bird communities and their regional coverage are defined. The Eastern Mallee bird species generally considered unique under both bird community schemes include the: Black-eared Miner; Mallee Emu-wren; Malleefowl; Purple-gaped Honeyeater; Red-lored Whistler; Regent Parrot; Shy Heathwren; Striated Grasswren; and Western Whipbird ([Table 2.1](#)).

Table 2.1. Component bird species of the Eastern Mallee Bird Community and characteristics shown by each species.

Species name	Common name	Family	Feeding guild	Threatened spp.	Unique spp.	Key / Associated spp.
<i>Amytornis striatus</i>	Striated Grasswren	Maluridae	Lower-stratum insectivore	T; M	A; B	Key
<i>Calamanthus cautus</i>	Shy Heathwren	Acanthizidae	Foliage & branch gleaner	T; M	A; B	Key
<i>Cinclosoma castanotum</i>	Chestnut Quail-thrush	Cinclosomatidae	Ground forager	T; M	A	Key
<i>Drymodes brunneopygia</i>	Southern Scrub-robin	Petroicidae	Pouncer	T; M	B	Key
<i>Leipoa ocellata</i>	Malleefowl	Megapodiidae	Decomposer	T; M	A; B	Key
<i>Lichenostomus cratitius</i>	Purple-gaped Honeyeater	Meliphagidae	Small nectarivore	T; M	A; B	Key
<i>Malurus splendens</i>	Splendid Fairy-wren	Maluridae	Lower-stratum insectivore	M		Key
<i>Manorina melanotis</i>	Black-eared Miner	Meliphagidae	Small nectarivore	T; M	A; B	Key
<i>Microeca fascians</i>	Jacky Winter	Petroicidae	Pouncer	M		Key
<i>Neophema splendida</i>	Scarlet-chested Parrot	Psittacidae	Large nectarivore	T	A	Key
<i>Nesoptilotis leucotis</i>	White-eared Honeyeater	Meliphagidae	Small nectarivore	M	B	Key
<i>Oreoica gutturalis</i>	Crested Bellbird	Oreocidae	Ground forager	T		Key
<i>Pachycephala inornata</i>	Gilbert's Whistler	Pachycephalidae	Foliage & branch gleaner	T		Key
<i>Pachycephala rufogularis</i>	Red-lored Whistler	Pachycephalidae	Foliage & branch gleaner	T; M	A; B	Key
<i>Pardalotus punctatus</i>	Spotted Pardalote	Pardalotidae	Foliage & branch gleaner	M		Key
<i>Polytelis anthopeplus</i>	Regent Parrot	Psittacidae	Omnivore	T; M	A; B	Key
<i>Psophodes nigrogularis</i>	Western Whipbird	Psophodidae	Ground forager	T; M	A; B	Key
<i>Ptilotula ornata</i>	Yellow-plumed Honeyeater	Meliphagidae	Small nectarivore	M	B	Key
<i>Ptilotula plumula</i>	Grey-fronted Honeyeater	Meliphagidae	Small nectarivore	M	A	Key
<i>Purnella albigularis</i>	White-fronted Honeyeater	Meliphagidae	Small nectarivore		A	Key
<i>Stipiturus mallee</i>	Mallee Emu-wren	Maluridae	Lower-stratum insectivore	T; M	A; B	Key
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	Meliphagidae	Small nectarivore		A	Associated
<i>Acanthiza apicalis</i>	Inland Thornbill	Acanthizidae	Foliage & branch gleaner			Associated
<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill	Acanthizidae	Foliage & branch gleaner			Associated
<i>Aegotheles cristatus</i>	Australian Owlet-nightjar	Aegothelidae	Aerial insectivore			Associated
<i>Artamus personatus</i>	Masked Woodswallow	Artamidae	Aerial insectivore			Associated
<i>Artamus superciliosus</i>	White-browed Woodswallow	Artamidae	Aerial insectivore			Associated
<i>Barnardius zonarius</i>	Australian Ringneck	Psittacidae	Large nectarivore			Associated
<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo	Cacatuidae	Omnivore	T	A	Associated
<i>Chalcites osculans</i>	Black-eared Cuckoo	Cuculidae	Nest parasite			Associated
<i>Climacteris affinis</i>	White-browed Treecreeper	Climacteridae	Bark forager	T		Associated
<i>Colluricincla harmonica</i>	Grey Shrike-thrush	Pachycephalidae	Foliage & branch gleaner			Associated
<i>Corvus bennetti</i>	Little Crow	Corvidae	Omnivore		A; B	Associated
<i>Cracticus torquatus</i>	Grey Butcherbird	Corvidae	Omnivore			Associated
<i>Daphoenositta chrysoptera</i>	Varied Sittella	Neosittidae	Bark forager	T		Associated
<i>Dromaius novaehollandiae</i>	Emu	Dromaiidae	Seed disperser		A	Associated
<i>Eurostopodus argus</i>	Spotted Nightjar	Eurostopidae	Aerial Insectivore			Associated
<i>Gerygone fusca</i>	Western Gerygone	Acanthizidae	Foliage & branch gleaner	T		Associated
<i>Malurus lamberti</i>	Variegated Fairy-wren	Maluridae	Lower-stratum insectivore			Associated
<i>Melanodryas cucullata</i>	Hooded Robin	Petroicidae	Pouncer	T		Associated
<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater	Meliphagidae	Small nectarivore	M		Associated
<i>Merops ornatus</i>	Rainbow Bee-eater	Meropidae	Aerial Insectivore			Associated

Species name	Common name	Family	Feeding guild	Threatened spp.	Unique spp.	Key / Associated spp.
<i>Myiagra inquieta</i>	Restless Flycatcher	Monarchidae	Aerial Insectivore	T		Associated
<i>Pachycephala pectoralis</i>	Golden Whistler	Pachycephalidae	Foliage & branch gleaner			Associated
<i>Pardalotus striatus</i>	Striated Pardalote	Pardalotidae	Foliage & branch gleaner			Associated
<i>Petroica goodenovii</i>	Red-capped Robin	Petroicidae	Pouncer			Associated
<i>Plectorhyncha lanceolata</i>	Striped Honeyeater	Meliphagidae	Small nectarivore	T	B	Associated
<i>Pomatostomus ruficeps</i>	Chestnut-crowned Babbler	Pomatostomidae	Ground forager		A	Associated
<i>Pomatostomus superciliosus</i>	White-browed Babbler	Pomatostomidae	Ground forager			Associated
<i>Psephotellus varius</i>	Mulga Parrot	Psittacidae	Large nectarivore			Associated
<i>Smicromis brevirostris</i>	Weebill	Acanthizidae	Foliage & branch gleaner			Associated
<i>Strepera versicolor</i>	Grey Currawong	Corvidae	Omnivore			Associated

Sources: Anon (2015); Birdlife Australia (2015a); Atlas of Living Australia (2020); see also Appendices A, B.

Feeding guild refers to broad guilds ascribed to particular bird species and families by Birdlife Australia (2015a) and Anon (2017).

For Threatened species: T = species threatened in at least one jurisdiction within the Eastern Mallee; M = component of the threatened Victorian Mallee Bird Community; further details are given in Appendix A.

Unique species are bird species considered to be unique to the Eastern Mallee Birds, relative to other identified bird communities, as detailed in Appendix B:

A = based on comparison of woodland bird communities identified by Anon (2015).

B = based on comparison of woodland bird communities identified by Birdlife Australia (2015).

'Key' species are identified as having a dependence on, or relatively stronger affinity for mallee habitats than shown by the 'associated' species. The derivation of key and associated mallee bird species is outlined in Appendix A.

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An indication of which Eastern Mallee Birds are most likely to be encountered is evident from observations of the most commonly reported bird fauna across the Eastern Mallee ([Table 2.2](#)). The number and species of mallee birds that are commonly reported varies across the Eastern Mallee region, but the following species are most likely to be encountered across most of the range: Australian Ringneck, Grey Butcherbird, Grey Shrike-thrush, Spiny-cheeked Honeyeater, Striated Pardalote, and Weebill. Many of the bird species considered unique to the Eastern Mallee are recognised as threatened and occur in highly localised populations, so are unlikely to be widely encountered.

Common and widespread non-mallee bird species are also highly likely to be observed at many sites but are not part of the ecological community. These include the Australian Magpie, Australian Raven, Crested Pigeon, Galah, Magpie-lark, Red Wattlebird, and Willie Wagtail ([Table 2.2](#)). Many other less common birds may also be present, such as the Tawny-crowned Honeyeater or Rufous Whistler but these typically non-mallee species also are not part of the ecological community.

The likely original composition of the Eastern Mallee Birds may be evident from the bird fauna that remains within the most extensive remnants of mallee vegetation in conservation reserves. Bird reporting rates⁴ were collated from standardised surveys in three extensive conservation areas in the MDD bioregion: Murray-Sunset, Danggali-Chowilla-Tarawi, and Ngarkat-Big Desert (see [Table 7.3](#) for more details). Mallee bird species represented over 75% of the 25 most highly reported bird species within these large mallee conservation areas, much higher than the representation of mallee birds across Eastern Mallee landscapes generally ([Table 2.2](#)). The most commonly reported mallee birds in conservation reserves – and presumed to be typical for the original composition of the ecological community – include the: Yellow-plumed Honeyeater; Weebill; Grey Shrike-thrush; Spiny-cheeked Honeyeater; Spotted Pardalote; Grey Butcherbird; and Crested Bellbird.

This assessment divides the bird assemblage into two groups of Key and Associated Mallee species. The Key Mallee bird species comprise 21 bird species that show a dependence on or relatively stronger affinity with mallee habitats ([Table 2.1](#); [Appendix A](#)) and include a large proportion of birds that are listed threatened species and unique to the Eastern Mallee. Key species notably include all six nationally threatened birds, fourteen of the State-listed bird taxa, and 17 members of the Victorian Mallee Bird Community. The group of 31 Associated Mallee birds includes species with a relatively lower relative affinity for, but remain common in, mallee habitats.

[Table 2.2](#) highlights the mallee (and other bird species) most likely to be encountered using standard bird surveys. However, the Eastern Mallee Bird Community is assumed to be present in any larger mallee remnant where standard bird surveys show that most of the bird species observed are members of the Eastern Mallee Birds ([Table 2.1](#)) and most similar to the situation indicated by the surveys in conservation reserves. Appropriate survey methods, as suggested in [Section 5](#), should be adopted to ensure the observations are robust and reflect the actual presence of the bird community.

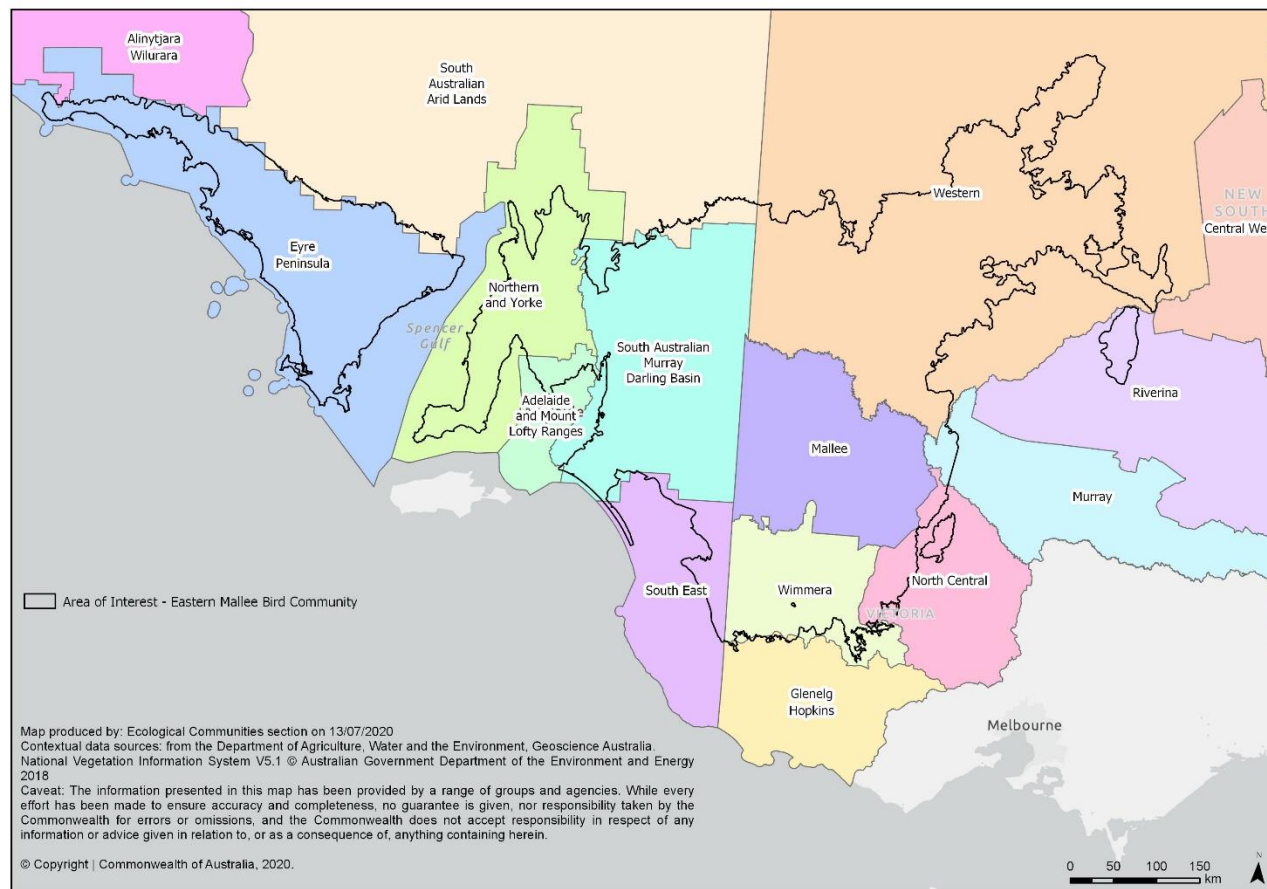
⁴ Bird reporting rate (RR) is a measure of the incidence of a bird taxon. It is the percentage of surveys in which a given bird taxon was observed. RR can be sensitive to low survey efforts, when, for instance, the incidence can be negligible (e.g. no observations) to maximum (50 or 100%) in the case of birds observed from only one or two surveys.

Table 2.2. The 25 most commonly reported birds within NRM and conservation areas of the Eastern Mallee. Birds are listed in order of highest to lowest reporting rate within given parameters. Bolded common names indicate members of the Eastern Mallee Bird Community; the number and proportion of Eastern Mallee Birds in the 25 common species is given in the bottom row.

Mallee Conservation Areas	NSW Western (S of Menindee)	Vic Mallee	Vic Wimmera	SA Murray Darling Basin	SA Northern & Yorke	SA Eyre Peninsula
2,520 surveys	4,090 surveys	8,040 surveys	7,780 surveys	28,240 surveys	15,960 surveys	6,440 surveys
Yellow-plumed Honeyeater	Australian Magpie	Australian Magpie	Australian Magpie	Australian Magpie	Galah	Singing Honeyeater
Weebill	Willie Wagtail	Weebill	Red Wattlebird	Willie Wagtail	Australian Magpie	Welcome Swallow
Grey Shrike-thrush	Weebill	Yellow-plumed Honeyeater	Galah	Galah	White-plumed Honeyeater	Galah
Spiny-cheeked Honeyeater	Grey Shrike-thrush	Galah	White-plumed Honeyeater	Grey Shrike-thrush	Willie Wagtail	Common Starling
Spotted Pardalote	Australian Raven	Grey Shrike-thrush	New Holland Honeyeater	Striated Pardalote	Crested Pigeon	Red Wattlebird
Grey Butcherbird	Galah	Spiny-cheeked Honeyeater	Willie Wagtail	Weebill	Red Wattlebird	Willie Wagtail
Crested Bellbird	Spiny-cheeked Honeyeater	Willie Wagtail	Superb Fairy-wren	Red Wattlebird	Singing Honeyeater	Australian Magpie
White-eared Honeyeater	Magpie-lark	Striated Pardalote	Red-rumped Parrot	Spiny-cheeked Honeyeater	Common Starling	Grey Butcherbird
Striated Pardalote	Striated Pardalote	Grey Butcherbird	Striated Pardalote	Crested Pigeon	House Sparrow	Weebill
White-fronted Honeyeater	Crested Pigeon	Spotted Pardalote	Crimson Rosella	Crimson Rosella	Little Raven	Crested Pigeon
Jacky Winter	White-plumed Honeyeater	Australian Raven	Welcome Swallow	Yellow-plumed Honeyeater	Crimson Rosella	Spiny-cheeked Honeyeater
Chestnut-rumped Thornbill	Grey Butcherbird	Crested Pigeon	Grey Shrike-thrush	Common Starling	Magpie-lark	Australian Raven
Inland Thornbill	Australian Ringneck	Red-rumped Parrot	Eastern Rosella	Singing Honeyeater	Red-rumped Parrot	Grey Shrike-thrush
Galah	Yellow-throated Miner	White-eared Honeyeater	Long-billed Corella	Welcome Swallow	Grey Shrike-thrush	Australian Ringneck
Australian Magpie	Chestnut-rumped Thornbill	Chestnut-rumped Thornbill	Brown Treecreeper	White-plumed Honeyeater	Spiny-cheeked Honeyeater	White-browed Babbler
Australian Ringneck	Red-rumped Parrot	Singing Honeyeater	Laughing Kookaburra	Little Raven	Welcome Swallow	Striated Pardalote
Australian Raven	Pied Butcherbird	Magpie-lark	Sulphur-crested Cockatoo	Magpie-lark	Striated Pardalote	Magpie-lark
White-browed Babbler	Rufous Whistler	Australian Ringneck	Crested Pigeon	Australian Ringneck	Common Blackbird	House Sparrow
Brown-headed Honeyeater	Brown Treecreeper	White-plumed Honeyeater	Australian Raven	Superb Fairy-wren	Yellow-throated Miner	Little Raven
Tawny-crowned Honeyeater	Whistling Kite	Brown Treecreeper	Grey Fantail	Grey Butcherbird	Australian Ringneck	Yellow-throated Miner
Red Wattlebird	Yellow-plumed Honeyeater	Red Wattlebird	Musk Lorikeet	White-browed Babbler	Brown Treecreeper	Nankeen Kestrel
Grey Currawong	Welcome Swallow	Crested Bellbird	Yellow-rumped Thornbill	Red-rumped Parrot	Tree Martin	Yellow-rumped Thornbill
Red-capped Robin	Red-capped Robin	Jacky Winter	White-throated Treecreeper	New Holland Honeyeater	Black-faced Cuckoo-shrike	Silvereye
Willie Wagtail	Black-faced Cuckoo-shrike	Noisy Miner	Noisy Miner	Brown Treecreeper	New Holland Honeyeater	New Holland Honeyeater
Golden Whistler	Blue Bonnet	Welcome Swallow	White-browed Babbler	Spotted Pardalote	Weebill	Grey Currawong
19 mallee bird spp. (76%)	9 mallee bird spp. (36%)	12 mallee bird spp. 48%)	3 mallee bird spp. (12%)	9 mallee bird spp. (36%)	5 mallee bird spp. (20%)	8 mallee bird spp. (32%)

Source: Birdlife Australia (2020a) Birddata database. Database search parameters collated all systematic surveys (2 ha 20 minute plus 500m area searches) undertaken between 1 January 1995 and 31 December 2019. The areas surveyed were: six entire NRM regions that substantially overlap with the Eastern Mallee region (Figure 2.3); and extensive mallee conservation areas as detailed in Appendix A. The data for conservation reserves represent average values collated from three conservation areas in the MDD bioregion: Murray-Sunset, Dangali-Chowilla-Tarawi, and Ngarkat-Big Desert (see Table 7.3 for data on individual reserves).

Figure 2.3. Natural Resource Management (NRM) Regions that overlap with the Eastern Mallee Region, as at July 2020.



Six NRM regions are identified to substantially overlap with the Eastern Mallee region and mallee vegetation as shown in [Figure 2.4](#): Eyre Peninsula, Northern and Yorke, SA Murray Darling Basin, Wimmera, Mallee and Western LLS (southern extent only).

2.1.4 Mallee Habitats

The landforms, vegetation and land use histories for various parts of the Eastern Mallee have been described in earlier studies, including: Foulkes and Gillen (2000, for the Murray Mallee of SA); Arthur Rylah Institute (2003, for north-west Victoria); Benson et al (2008, for Western NSW); and Brandle (2010, for the Eyre Peninsula). Updated information on vegetation has since been, or is in process of being, developed by various State agencies. All these reports and databases provide information about mallee, woodland and other native vegetation types at the community scale and, in some cases, also the regional fauna.

The Mediterranean to semi-arid climate of the Eastern Mallee region supports vegetation adapted to drier landscapes, such as open woodlands (mallee, other eucalypt and non-eucalypt, mainly *Casuarina*), chenopod shrublands and hummock grasslands. Although the natural vegetation is not the primary focus of this listing, it provides context as habitat for the assemblage of Eastern Mallee Birds.

The description of mallee vegetation outlined here describes broad patterns based on NVIS Major Vegetation Groups (MVGs), a high-level Australia-wide vegetation classification, and the review of mallee vegetation across Australia by Yates et al (2017). The mallee vegetation of south-eastern Australia is primarily associated with Aeolian landscapes, notably sandplain, dune field and swale systems (DoEE 2017a, b). It corresponds to two MVGs: 14 *Mallee woodlands and shrublands*; and 32 *Mallee open woodlands and sparse mallee shrublands*. MVG 14 features a more developed tree canopy, with a projective foliage cover⁵ of 10 to 30 percent, while MVG 32 has a very open to sparse tree canopy, with a projective foliage cover of less than 10 percent.

Mallee trees are typically less than six metres tall. The tree canopy structure is variable, and its development depends on a range of factors such as landscape position, soil type, rainfall and fire history. A range of mallee eucalypt species occur within the region, generally from *Eucalyptus* Sections *Bisectaria* and *Dumaria*. Widespread mallee eucalypt species in south-eastern Australia include: *Eucalyptus calycogona* (Gooseberry Mallee), *E. dumosa* (White Mallee), *E. gracilis* (Yorrell), *E. incrassata* (syn. *E. costata*) (Ridge-fruited Mallee), *E. oleosa* (Red Mallee) and *E. socialis* (Red Mallee). However, other mallee species may be present at a given region or locality.

Species of *Callitris*, *Acacia*, *Allocasuarina*, *Melaleuca* and *Hakea* also may co-occur with mallee eucalypts at certain sites, as do non-mallee species of eucalypt. Some of these species form woodlands and shrublands across the region that intergrade with the mallee vegetation. In some areas, mosaics of mallee, non-mallee eucalypt, non-eucalypt woodland, and shrublands occur within the landscape.

The kinds of mallee vegetation of the bioregion can be broadly categorized into a few key types, as summarised by Yates et al. (2017) and Boulton and Lau (2015).

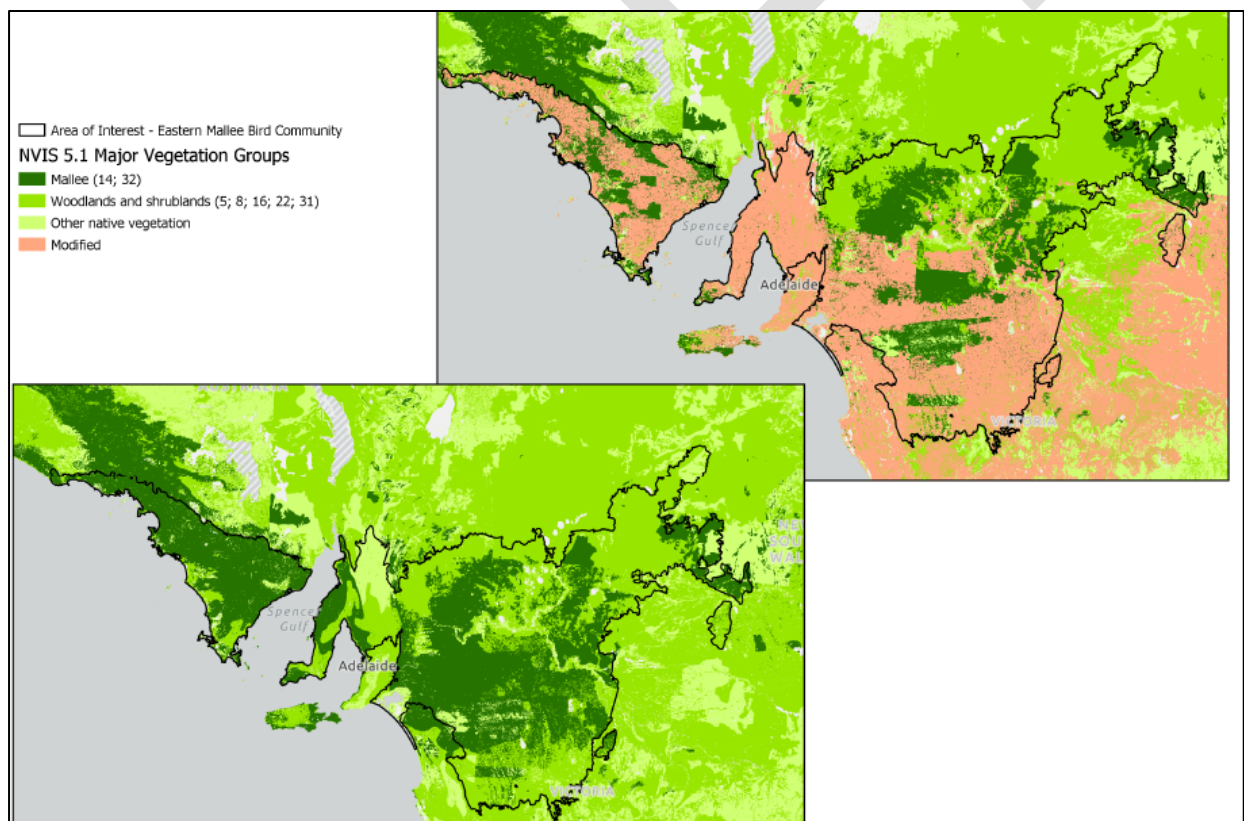
- Triodia Mallee. This type has a relatively open understorey with hummock grass and sparse sclerophyll shrubs with an arid affinity. Key species present include *Eucalyptus socialis* and *E. dumosa* in the tree canopy, the hummock grass *Triodia scariosa*, shrubs in the genera *Acacia* and *Beyeria*, and herbs including a range of ephemeral Asteraceae taxa. This type develops in areas with the lowest relative rainfall, around 150-300 mm/year.
- Chenopod Mallee. This type has a relatively open understorey with semi-succulent chenopod shrubs and tussock grasses. Key species present include *E. gracilis* and *E. oleosa* in the tree canopy, chenopod species such as *Maireana pentatropis*, *Enchylaena tomentosa* var. *tomentosa* and *Maireana pyramidata*, other non-chenopod shrubs in the genera *Olearia* and *Zygophyllum*, and tussock grasses in the genera *Austrostipa* and *Rytidosperma*. This type develops in areas with more moderate rainfall, around 200-300 mm/year.

⁵ Projective foliage cover is the percentage of the sample site occupied by the vertical projection of foliage and woody branches only (National Committee on Soil and Terrain, 2009).

- **Shrubby Mallee.** This type has a relatively open understorey of sclerophyll shrubs with an arid affinity. Key species include *E. socialis*, *E. dumosa* and *E. gracilis* in the tree canopy, an understorey of taller shrubs in the genera *Acacia*, *Dodonea*, *Eremophila* and *Senna*. This type develops in areas with more moderate rainfall, around 200-300 mm/year.
- **Heathy Mallee.** This type has a relatively dense understorey of sclerophyll shrubs with temperate affinities. Key species include *E. incrassata*, *E. diversifolia*, *E. dumosa* and *Callitris verrucosa* in the tree canopy, and a diverse range of small shrubs in the understorey from genera such as *Acacia*, *Cryptandra*, *Daviesia*, *Grevillia*, *Hakea*, *Hibbertia*, *Leucopogon*, *Leptospermum*, *Melaleuca*, *Phebalium* and *Spyridium*. This type develops in areas with the highest relative rainfall, around 300-600 mm/year.

The broad kinds of major vegetation groups present and their extent across the Eastern Mallee region are shown in [Figure 2.4](#) and [Table 2.3](#). Eucalypt woodlands with a mallee growth form were the most widespread vegetation group present: they accounted for almost half the total extent of pre-1750 vegetation in the MDD plus EYB bioregions. Non-eucalypt woodland types also were extensive, especially in the MDD bioregion. The current situation is that mallee woodlands and shrublands continue to be the main broad type of native vegetation remaining in the Eastern Mallee, but their extent has declined to represent around 27% of the region.

Figure 2.4. Distribution of broad native vegetation types within and around the Eastern Mallee. Top – Current distribution as at 2016; Bottom – Estimated pre-1750 distribution.



Source: Maps compiled by the Environmental Resources Information Network (ERIN, DAWE) based on data from NVIS v5.1 (DAWE 2020b). The Eastern Mallee is shown in black outline and covers IBRA bioregions and subregions identified in [Table 2.1](#).

Table 2.3. Extent of vegetated habitats within the MDD and EYB bioregions, based on NVIS Major Vegetation Groups (MVG).

2.3A) Pre-1750 extent

IBRA Bioregion	Murray Darling Depression	Eyre Yorke Block	MDD + EYB
Area of bioregion (ha)	19,958,349	6,120,409	26,078,758
Mallee Woodlands and Shrublands	9,724,798	4,574,159	14,298,957
Non-eucalypt Forest and Woodland	4,596,624	428,651	5,025,275
Non-forest Vegetation	3,363,280	537,045	3,900,325
Non-mallee Eucalypt Forest and Woodland	2,071,247	489,425	2,560,672
<i>Total Native Vegetation</i>	<i>19,755,949</i>	<i>6,029,280</i>	<i>25,785,229</i>
% mallee in bioregions	48.7	74.7	54.8

2.3B) Current extent

IBRA Bioregion	Murray Darling Depression	Eyre Yorke Block	MDD + EYB
Mallee Woodlands and Shrublands	5,601,930	1,452,576	7,054,506
Non-eucalypt Forest and Woodland	3,596,397	83,664	3,680,061
Non-forest Vegetation	2,859,708	438,241	3,297,949
Non-mallee Eucalypt Forest and Woodland	475,466	25,883	501,349
<i>Total Native Vegetation</i>	<i>12,533,501</i>	<i>2,000,364</i>	<i>14,533,865</i>
Cleared, Non-native, Regrowth or Modified	7,209,427	4,013,499	11,222,926
% mallee in bioregions	28.1	23.7	27.1
% region cleared or modified	36.1	65.6	43.0

Source: DAWE (2020b) NVIS v5.1 dataset for Major Vegetation Groups.

Note: MVGs were aligned into broad habitat groups, as follows:

- Mallee Woodlands and Shrublands = MVGs 14 & 32
- Non-mallee Eucalypt Forest and Woodland = MVGs 3, 4, 5 & 11
- Non-eucalypt Forest and Woodland = MVGs 6, 7, 8, 9, 10, 13, 15, 23 & 31
- Non-forest Vegetation = MVGs 16, 17, 18, 19, 20, 21 & 22
- Cleared, Non-native, Modified or Regrowth = MVGs 25 & 29

MVGs 1, 2 & 12 are naturally absent from these bioregions.

Overall, around 7 million hectares of mallee currently remains within the Eastern Mallee but these remnants are unevenly distributed across the landscape. Extensive intact areas of mallee surrounded by mostly native vegetation remains across the northern MDD (Figure 2.4). The central and southern MDD, and the Eyre Peninsula retain some very large areas of mallee, but these are surrounded by a largely modified, cleared landscape. Smaller patches of mallee are dotted throughout the cleared landscape between and around these larger remnants. The overall picture in these parts of the Eastern Mallee is of a fragmented mallee landscape that represents a shift towards less suitable habitats for the Eastern Mallee Bird assemblage.

3 THREATS

The Eastern Mallee Birds is impacted by several threats, primarily clearing of mallee habitats and their fragmentation into smaller, degraded remnants that are more susceptible to invasive species, fire impacts and climate change and hence less suitable to sustain a diversity of birds and the other flora and fauna on which they depend (Arthur Rylah Institute 2003; Mallee CMA 2012; Boulton and Lau 2015).

Table 3.1 outlines the key threats facing the ecological community. The key threats faced by the ecological community are described to help explain why this ecological community merits listing as threatened and supports the assessment against the criteria at section 6. Although presented as a list, these threats often interact rather than act independently.

Table 3.1. Summary of threats facing the ecological community

Threat factor	Threat Status*	Evidence base
Clearing	<p><i>Timing:</i> Mostly past / Some Ongoing</p> <p><i>Severity:</i> Major</p> <p><i>Scope:</i> Majority, to variable extent.</p>	<p>Mallee habitats have been cleared across the Eastern Mallee since European settlement, with an overall loss of about 51%. Most losses have occurred in the Yorke Peninsula, parts of the Eyre Peninsula and southern MDD bioregion. There has been relatively less decline in the northern MDD.</p> <p>Clearing is mostly due to agriculture, the main commodities of the region being cereal crops and fruit. The higher clearing in the southern MDD and parts of the EYB bioregions are due to the climate and soils in these areas being more conducive for agricultural land uses.</p> <p>Remnants may be susceptible to ongoing clearance due to:</p> <ul style="list-style-type: none"> - road maintenance and widening; - other rural and peri-urban infrastructure activities; and - recent changes to native vegetation protection in some jurisdictions, notably in NSW, that may lead to expanded agricultural activities. <p>There are also valuable mineral sand deposits in the Murray Mallee region, especially on the mineral rich and accessible Loxton-Parilla sand deposits. Mining sites that impact on mallee habitats include Mindarie Mineral Sands, a mine in the Loxton region of SA; Snapper Mineral Sands and Gingko mines to the west of Pooncarie in NSW; and mines proposed or approved in the Balranald region of NSW.</p> <p>Large-scale linear clearing, such as for high-voltage transmission lines, has the potential to expose remnants to a range of degradation stresses. Smaller-scale clearing and “tidying” of bushland around houses, buildings and other infrastructure, including for fuel reduction purposes, adds to this threat.</p> <p>The reduction of mallee vegetation across the Eastern Mallee landscape affects the extent and quality of habitats and available resources for bird assemblages. Many of the impacts are mediated through fragmentation, as discussed in the next section, below.</p>

Threat factor	Threat Status*	Evidence base
Fragmentation	<p><i>Timing:</i> Mostly Past/Some Ongoing</p> <p><i>Severity:</i> Major</p> <p><i>Scope:</i> Most severe in Eyre-Yorke Block and southern Murray Darling Depression</p>	<p>Historic clearance of mallee habitats for the ecological community has resulted in fragmentation of the vegetation. About 45% of the mallee mapped across the landscape provide 10-60% total extent of mallee while about a quarter of occurrences account for less than 10% mallee cover. The mallee vegetation that remains in the most heavily cleared regions occurs as smaller, widely scattered patches surrounded by a largely agricultural landscape. However, some extensive remnants persist, mainly in the Murray Mallee.</p> <p>Fragmentation can lead to ongoing loss of species diversity and ecological function of assemblages of plants and animals. Smaller areas of habitat are more vulnerable and have reduced resilience to stochastic events. They are, overall, more difficult to manage for long-term biodiversity.</p> <p>Small fragments of habitat have a high edge-to-area ratio, which makes them more susceptible to edge effects. These include a greater risk of weed and feral animal invasion, and encroachment of adjoining land use impacts such as chemical spray drift and livestock grazing.</p> <p>Isolated and smaller areas of mallee habitats are less likely to support the range of resources required to maintain a diverse or abundant bird assemblage. Birds with limited dispersal capability, such as emu-wrens, are more likely to be heavily impacted by fragmentation. Fragmentation can result in populations being broken into many smaller populations which are at greater risk of local extinctions and decreased likelihood of repopulation (Saunders et al. 1991).</p>

Threat factor	Threat Status*	Evidence base
Altered fire regimes	<p><i>Timing:</i> Ongoing</p> <p><i>Severity:</i> Most seasons minor, as only some areas impacted. Major during extreme fire seasons.</p> <p><i>Scope:</i> Minor across the range. Major impacts to specific areas, if burnt</p>	<p>Mallee vegetation are fire-prone systems where much of the vegetation is adapted to cope with fires, if they are not too intense and/or prevalent. Many plant species show adaptations for recovery after fire through resprouting from epicormic or basal buds, or mass germination from a seed bank or serotinous fruits in the canopy.</p> <p>This is not necessarily the case for all mallee birds, however. Many birds have no special adaptations to fire other than to temporarily flee to unburnt areas (Boulton and Lau 2015). Fires in the MDD bioregion often occur as catastrophic events that burn extensive, if not entire areas of vegetation remnants: such fires accounted for 89% of the area of Murray Mallee burnt between 1972 and 2007. However, fires do not sweep across the entire bioregion, so are limited to particular areas. There is an immediate decline in bird populations due to fire deaths after mallee habitats are burnt. There is also a reduction in available habitat for mallee birds that may lead to starvation if resources become too depleted or replenish slowly. The capacity for bird species to recolonise into recovering burnt areas is variable. It can be slow for certain species because of declines in population and habitat but also inherent features.</p> <p>Some species have a poor capacity to disperse from available refuges, such as the Mallee Emu-wren. This may contribute to declines and even local extinctions after fire. For instance, the Mallee Emu-wren and Black-eared Miner both disappeared from Billiatt and Ngarkat Conservation Areas when these were extensively burnt in 2014 (Boulton and Lau 2015).</p> <p>Different species respond differently to post-fire changes in vegetation composition and structure. Bird species richness in the Murray Mallee system generally is positively associated with the presence of older mallee trees. These often contain nesting hollows that can take decades to develop if older mallee trees have been entirely removed. Consequently, maintaining and protecting stands of mature trees is vital when considering which sites provide the best longer-term refuges during planned burns and wildfires (Boulton and Lau 2015).</p> <p>The already fragmented landscape means that fire poses a serious threat to smaller remnants that may be suitable for the bird community (Sluiter et al. 1997). Fire impacts to smaller remnants could result in loss of suitable habitat, or reduced value as refuges for mallee bird species. However, smaller remnants may be afforded some protection from larger-scale fires due to their isolation and potential buffering, if the surrounding modified land use is less flammable.</p> <p>Fire can also affect ecological processes by affecting pollinators, dispersers and food resources. For example, where birds are not killed outright by catastrophic bushfires, their responses to fire correspond with postfire changes in the vegetation and associated other fauna on which different members of the bird assemblage may rely upon.</p>

Threat factor	Threat Status*	Evidence base
Pest animals	<p><i>Timing:</i> Ongoing</p> <p><i>Severity:</i> Major</p> <p><i>Scope:</i> Majority</p>	<p>Pest animals are a serious problem that can affect mallee birds in several ways. Pest herbivores can alter the structure and composition of native vegetation communities by exerting selective grazing pressure on native species and removing large amounts of biomass. They compete with native fauna for grasses, herbs and seeds and affect the regeneration of woody trees and shrubs (Sandell 2009). Herbivore pests in the Eastern Mallee include rabbits, goats and, in some parts of the range, deer (Foulkes & Heard 2003). Their presence can degrade the quality of native vegetation remnants as useful habitat for many bird and other fauna species (Mallee CMA 2012). Goats and rabbits are effective in preventing the regeneration of woody plants where their populations exist at high densities (Parks Victoria 2002). Rabbits also severely disturb soil and the biological soil crust and have caused widescale erosion and destruction of vegetation in the landscape of the MDD bioregion through their warrens (White <i>et al</i> 2003).</p> <p>Goats disperse weeds through their droppings and can cause considerable soil disturbance and compaction (Mallee CMA 2012). Goat numbers are high in semi-arid rangelands, estimated to be about 3.3 million, with a trend of rising populations in some areas (Boulton and Lau 2015).</p> <p>Pest species such as foxes and cats prey on native animals, and ground dwelling birds, such as malleefowl, bellbirds and quail-thrushes may be most at risk from these predators. The removal of dense understorey, as happens after fire or clearing does not benefit mallee birds or other native fauna because feral predators take advantage of diminished shelter to more easily prey on native fauna.</p> <p>The Noisy Miner is a native honeyeater present throughout eastern Australia, including the MDD bioregion, but are not present on the Eyre Peninsula. They favour fragmented, open eucalypt woodlands with a simplified understorey structure (Clarke and Grey 2010). Their belligerent behaviour towards other woodland birds can progressively lead to their dominance at the exclusion of other woodland bird species. Noisy Miners are more likely to impact on mallee remnants and bird assemblages that are already degraded, to some extent.</p> <p>Kangaroos can and do become overabundant due to land use changes, such as clearing and creation of artificial water sources, as well as from control of dingos. They have the potential to exert significant pressure on vegetation, especially understorey grasses and herbs, therefore affecting ground layer regeneration in mallee systems (Mallee CMA 2012).</p>

Threat factor	Threat Status*	Evidence base
Weeds	<p><i>Timing:</i> Ongoing</p> <p><i>Severity:</i> Minor</p> <p><i>Scope:</i> Unknown, likely to be localised</p>	<p>Some mallee remnants can be impacted by weeds, especially in landscapes where native vegetation has become severely fragmented. Native species in the shrub and ground layers are particularly threatened by competition from invasive plants with the potential for significant changes to flora composition in remnants (Major 2010).</p> <p>Weeds of National Significance present in the region include African boxthorn (<i>Lycium ferocissimum</i>); bridal creeper (<i>Asparagus asparagoides</i>); cactus species (<i>Opuntia</i> spp.); and athel pine (<i>Tamarix aphylla</i>). Athel pine prevents understory vegetation from growing underneath it due to a build-up of salty leaf litter. Coordinated action has currently limited its distribution in the Murray Mallee (Mallee CMA 2010). Bridal creeper impacts on native vegetation by smothering plants with its twining shoots, and by competitive exclusion of native seedlings from the dense mat of root tubers produced just under the soil surface. However, the extent to which these weeds specifically invade mallee vegetation is not known.</p> <p>Other common weeds include species introduced by agriculture, such as narrow-leaved clover (<i>Trifolium angustifolium</i>); pasture grasses such as Wimmera ryegrass (<i>Lolium rigidum</i>), brome grasses (<i>Bromus</i> spp.) and fescues (<i>Vulpia</i> spp.); mustards (<i>Brassica</i> spp.); and Horehound (<i>Marrubium vulgare</i>). Ward's Weed (<i>Carrichtera annua</i>) is another species that has spread widely along roadsides and public land, even where disturbance is absent (Mallee CMA 2008).</p> <p>Crop trees currently being widely planted across the Mallee and Riverina districts, such as olives and almonds, are also becoming established in remnant vegetation (Mallee CMA 2008). Dense stands of olives crowd out the native understorey and their flammable branches promotes fire (DNR 2015). The fruits are sought after by birds and foxes. Consequently, the spread of olives may lead to changes in the relative abundance of bird assemblages, promoting those that adapt to olives for food at the expense of species that prefer more intact native habitat and resources.</p> <p>Weeds can also impact on the fauna. Their presence can change pollinator relationships, for instance by providing competing sources of nectar that attract insects away from native species. Certain weeds also promote habitat for pest animals (Mallee CMA 2008), for example, the thorny stands of African boxthorn provide protective habitat for rabbits and foxes. Impacts through predators and potential food resources (insects and plants) are means by which weeds may indirectly impact upon the Mallee Bird Community.</p> <p>Rubbish dumping can act as a vector for the introduction and spread of weeds. The degree of this threat is uncertain but is likely to be a problem closer to human habitations.</p>

Threat factor	Threat Status*	Evidence base
Climate change and severe weather	<p><i>Timing:</i> Ongoing; Future</p> <p><i>Severity:</i> Minor; likely Major impacts in future.</p> <p><i>Scope:</i> Majority</p>	<p>Climate change projections are available for the entire region with a focus on the MDD (CSIRO and BOM, 2015). The forecast over the next century is for higher temperatures, declining rainfall, especially in the cooler seasons, and harsher drought and fire weather.</p> <p>Projected climatic change is likely to compound the existing impacts from habitat loss, fragmentation, edge effects, invasive species and broad-scale bushfires. Impacts on mallee habitats, such as potentially more severe fire impacts and constrained capacity for habitats to regenerate are likely to have negative impacts on the Eastern Mallee Birds.</p> <p>The capacity of species to adapt by genetic selection or migration are less likely in areas where ecological communities are highly fragmented, as in north-western Victoria and the Eyre Peninsula. Species most at risk include those with restricted/specialised habitat requirements, poor dispersal abilities and small populations (Mallee CMA 2012). Many members of the Eastern Mallee Birds fit these criteria, especially those species already recognised as threatened, such as the Mallee Emu-wren. Research on the anticipated effects of climate change on the ecological community is necessary to assist potential adaptation.</p>

***Timing** – the threat occurs in the **past** (and unlikely to return), is **ongoing** (present/continuing), is likely to occur/return in the **future**, or timing is **unknown**
Severity – the threat causes or has the potential to cause impacts that are **extreme** (leading to loss or transformation of affected patches/occurrences), **major** (leading to degradation of affected patches/occurrences), **minor** (impacting some components of affected patches/occurrences), **negligible** or **unknown**
Scope – the threat is affecting the **whole** (>90%), a **majority** (>50%), a **minority** (<50%), a **negligible** amount, or **unknown** amount of the ecological community

3.1 Key threatening processes

The EPBC Act provides for the identification and listing of key threatening processes. A process is defined as a key threatening process if it threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community. The following are nationally listed key threatening processes, current at the date of writing, that may be relevant to the ecological community or specific species that comprise it:

- Aggressive exclusion of birds from potential woodland and forest habitat by over-abundant noisy miners (*Manorina melanoccephala*)
- Competition and land degradation by rabbits
- Competition and land degradation by unmanaged goats
- Land clearance;
- Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases;
- Novel biota and their impact on biodiversity;
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants;
- Predation by European red fox
- Predation by feral cats; and
- Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs

Any approved threat abatement plans or advice associated with these items provides information to help landowners manage these threats and reduce their impacts to biodiversity. These can be found at <http://www.environment.gov.au/cgi-bin/sprat/public/publicgetkeythreats.pl>.

4 EXISTING PROTECTION

4.1 Existing protection in reserves

The Australian Government collates information on lands under conservation tenure through the Collaborative And Protected Area Database (CAPAD; DAWE 2020a). About 3.7 million hectares, or 52.1%, of the estimated current extent of mallee vegetation occurs within some form of conservation tenure (Table 4.1), mostly within formal conservation reserves (IUCN IA, IB, II) such as national parks. Of this, about 2 million hectares occurs within extensive conservation reserves that contain over 100,000 hectares of mallee habitats: Murray-Sunset, Wyperfeld, Danggali, Ngarkat, Pinkawillinie, Big Desert and Little Desert parks.

However, presence in conservation tenure does not confer full protection because several threats identified in Section 3 operate regardless of land tenure. For instance, weeds, feral animals, wildfires and climate change also occur within national parks and need to be appropriately managed within these landscapes.

In addition, Birdlife Australia monitors sites known as Key Biodiversity Areas (also known as Important Biodiversity Areas) (KBAs / IBAs) that are habitat refuges for birds and other fauna. KBAs often coincide with conservation areas but also extend into adjacent areas outside of reserves that retain some natural values. Extensive KBAs occur in the Murray Darling Depression bioregion and currently include about 3.1 million hectares of mallee vegetation (Table 4.2). Although KBAs are monitored and have regular to occasional landscape health checks, there are no formal protective protection measures that apply to protect them.

Table 4.1. Extent of mallee vegetation across the Eastern Mallee region present in reserves, by IUCN protected area categories.

IUCN Protected Area Category	Description	Mallee MVG current extent (ha)
IA	Strict Nature Reserve (e.g. Ngarkat CP, Nombinnie NR, Mallee Cliffs NP, Yathong NR)	631,858
IB	Wilderness Area (e.g. Danggali WPA, Big Desert WP, Sunset WZ, N & S Wyperfeld WZ, Billiat WPA, Hincks WPA)	883,852
II	National Park (e.g. Murray-Sunset NP, Wyperfeld NP, Little Desert NP, Mungo NP, Scotia PNR)	1,272,280
III	Natural Monument/Feature (e.g. various unnamed Heritage Agreements)	505,864
IV	Habitat/Species Management Area (e.g. various Bushland Reserves and Conservation Covenants)	22,623
V	Protected Landscape/Seascape (e.g. Heritage River Reserves)	48,616
VI	Protected Area with Sustainable Use (e.g. Pinkawillinie CP, Chowilla RR & GR)	313,743
Total		3,678,836

Sources: CAPAD and NVIS databases (DAWE 2020a; b). IUCN protected area categories are fully described by IUCN (2020).

Table 4.2. Key Biodiversity Areas (KBAs) identified by Birdlife Australia within the Murray Darling Depression bioregion that retain substantial areas of mallee habitats.

Key Biodiversity Area	Jurisdiction	Area (ha)	Mallee MVGs - current (ha)
Peebinga	SA	3,370	3,357
Wandown	Vic	4,844	4,016
Billiat	SA	59,411	59,241
Little Desert	Vic	135,593	92,214
Central NSW Mallee	NSW	249,314	131,023
Murray-Sunset, Hattah & Annuello	Vic	700,421	619,586
Southern NSW Mallee	NSW	823,157	646,766
Wyperfeld, Big Desert & Ngarkat	SA		132,714
Wyperfeld, Big Desert & Ngarkat	Vic		537,766
Wyperfeld, Big Desert & Ngarkat	SA + Vic	974,268	670,480
Riverland Mallee	NSW		250,960
Riverland Mallee	SA		672,594
Riverland Mallee	NSW + SA	1,221,833	923,554
Total KBAs	NSW, SA, Vic	4,171,889	3,150,216

Source: Birdlife Australia (2020a) dataset for KBAs intersected with the NVIS Major Vegetation Group data for the current extent of mallee (MVGs 14 + 32).

Note: This table only shows KBAs present within the region that have a substantial extent of mallee woodlands. There are other KBAs in the area of interest that have only a minor extent of mallee or are primarily wetlands that focus on waterbird habitats.

4.2. Existing protection under state laws.

The Victorian Mallee Bird Community is listed as a threatened community under the Victorian *Flora and Fauna Guarantee Act 1988*. Species and communities listed under Victorian legislation are only protected on public land tenures. The Victorian Mallee Bird Community protects twenty mallee-dependent bird species within north-western Victoria. Eighteen bird species from this community are members of the Eastern Mallee Birds. No other mallee bird communities are recognised as threatened in other States.

Currently, 21 of the 52 Eastern Mallee Birds are individually listed as threatened taxa (Appendix A): six taxa are nationally listed, sixteen taxa in SA, thirteen in NSW and ten in Victoria. Thirteen of the birds are listed as threatened in more than one jurisdiction.

4.3 Existing management plans relevant to the ecological community

At the time this Conservation Advice was developed, there was no existing management plan specifically for this ecological community. However, there are national conservation advices and recovery plans for the nationally threatened bird species, as well as similar documents that accompany some State listings. Several other plans and guidelines for managing bushland and threatened species habitats may be relevant. These include:

Boulton, R.L. and Lau, J. 2015. Threatened Mallee Birds Conservation Action Plan, Report June 2015. Report to the Threatened Mallee Birds Implementation Team, Birdlife Australia.

Department of Environment, Land, Water and Planning. 2016. National Recovery Plan for the Mallee Emu-Wren *Stipiturus mallee*, Red-lored Whistler *Pachycephala rufogularis* and Western Whipbird *Psophodes nigrogularis leucogaster*. Australian Government, Canberra.

Mallee CMA (2012). *Mallee Ecology Manual 2012*. Mallee Catchment Management Authority, Mildura Victoria.

Parks Victoria 2019. Conservation Action Plan for Parks and Reserves Managed by Parks Victoria. Mallee. Parks Victoria, Melbourne.

South Australian Department for Environment and Heritage 2009. *Fire Management Plan Billiatt District* Department for Environment and Heritage, Adelaide.

South Australian Department for Environment and Heritage 2009. *Fire Management Plan Ngarkat District* Department for Environment and Heritage, Adelaide.

5 CONSERVATION OF THE ECOLOGICAL COMMUNITY

5.1 Identification of the ecological community

The Eastern Mallee Birds overlaps with other woodland bird communities in south-eastern Australia (see [Appendix B](#)). Key diagnostic characteristics are used to identify an assemblage of native birds as being the ecological community, and the particular habitats and vegetation types they occur in, all of which define the features that distinguish it from other communities. It is noted that additional information to assist with identification is provided in the other sections of this document, particularly the description ([section 2.1](#)).

The key diagnostic characteristics are designed to allow identification of the ecological community irrespective of the season.

Occurrences that do not meet the key diagnostics are not the nationally listed ecological community.

The ecological community is defined as the assemblage of native birds meeting the description in [section 2.1](#) that meet the following key diagnostic characteristics:

5.1.1. LOCATION

1. Distribution is limited to the Eastern Mallee – the Murray Darling Depression and Eyre Bock bioregions plus the intervening FLB 02 Broughton subregion and elements of the Riverina and Darling Riverine Plains bioregions that comprise channels of the Murray and Darling River anabranches which intrude into the MDD bioregion (as described above).

EMBC could be present	Possible outlier of EMBC	EMBC not present
Site falls entirely within the outer bioregional boundaries above. <i>May be present</i>	Most or all of a site falls within 10 kilometres outside of the bioregional boundaries above. <i>May be present</i>	Site is more than 10 kilometres from the bioregional boundaries. <i>Not present</i>

EMBC = Eastern Mallee Bird Community

5.1.2 HABITAT

2. The vegetation of a site must be a remnant of native vegetation with these features.
 - The vegetation structure is a woodland to shrubland where the tree canopy is present and at least sparse but never closed⁶; AND
 - Mallee trees are the dominant tree canopy type present, dominance being defined as the most common tree structural type, typically representing 50% or more of crown cover of the tree canopy or the majority of trees present. Other trees may be present in the tree canopy but do not represent the most common structural type averaged across the remnant or site. These may include non-mallee eucalypt species or non-eucalypt native species. The typical genus of the tallest stratum is *Eucalyptus*, usually with a mallee growth form though non-mallee species of eucalypts also may be present. Other tree genera that may be present, sometimes locally dominant in patches, include *Allocasuarina* / *Casuarina*, *Acacia*, *Callitris*, *Melaleuca* or other larger woody genera native to the Eastern Mallee region. AND

⁶ Mallee woodlands typically have a crown cover of >20% while that for open mallee vegetation is <20%. However the vegetation of the Eastern Mallee can be spatially heterogenous, with open areas of shrubland with sparse tree cover to denser groves of non-mallee woodland, sometimes interspersed within mallee. There is also the influence of disturbances, notably fire regimes, that can temporarily remove the tree canopy or stimulate regeneration with impacts on some of the component bird species. These should be noted and taken into account when assessing habitat, as suggested below.

- The understorey has a variable structure and composition and may include areas of litter and bare ground. It can be shrubby, heathy, grassy, chenopod, open or a mosaic of structures. The understorey should be dominated by plant species native to the region.

5.1.3. BIRD ASSEMBLAGE

3. The presence of the bird assemblage should be determined using a standard survey method, preferably a 2ha 20minute survey, or 500m area search, or equivalent effort (Birdlife Australia 2020b) and undertaking multiple surveys, where possible. The timing and conditions of the survey effort should be noted and taken into consideration, as discussed under Survey Requirements, below. All aquatic/marine bird species observed in any surveys should first be disregarded in determining if the ecological community is present⁷. The Eastern Mallee Birds is present if survey results show the following, with reference to the bird assemblage as listed in [Table 2.1](#):

- A minimum of ten different terrestrial bird species in total should be recorded, of which 70% or more of the terrestrial bird species in the surveys are mallee birds from the full list of 52 species; OR
- If five to nine different terrestrial birds species are observed in total, then 60% or more of the terrestrial bird species in the surveys are mallee birds from the full list of 52 species.

Contra-indicators

- If less than five different terrestrial bird species in total are observed, then further standard surveys are warranted. In the unlikely event that this is consistently the case, then the ecological community is not considered to be present.
- Bird surveys in which the birds consistently recorded are mainly widespread or introduced species, for instance the Australian Magpie, Galah, Willie Wagtail, Red Wattlebird, Australian Raven, Common Starling or Noisy Miner, are evidence of degraded or disturbed bird assemblages.

5.1.4. ADDITIONAL INFORMATION TO ASSIST IN IDENTIFYING THE ECOLOGICAL COMMUNITY

The following information should also be taken into consideration when applying the key diagnostic characteristics to assess if a site may include the ecological community. Landuse and disturbance history will influence the state in which an occurrence of the ecological community or its habitat is currently expressed.

IDENTIFYING A PATCH

The concept of patch best applies to the mallee habitats that the Eastern Mallee Bird Community relies on. A patch is a discrete and mostly continuous area of vegetative habitats, as defined by the description and key diagnostics. It can include small-scale variations, gaps and disturbances within this area. The minimum patch size that can be identified is 100 ha, as a substantial area of intact habitat is required to support a diverse mallee bird assemblage.

BREAKS IN A PATCH

When it comes to defining a patch of mallee habitat, allowances are made for “breaks” up to 100 metres between areas that meet the habitat description. The 100 m gap allows for the ability of most birds in the community to traverse up to this distance. Such breaks may be the result of watercourses or drainage lines, tracks, paths, roads, gaps made by exposed areas of soil, leaf litter or cryptogams, and areas of localised variation in vegetation that do not meet the description. For example, a single patch could include two areas of the ecological community that are separated by a narrow strip of different vegetation along a drainage line. Such breaks do not significantly alter the overall functionality of the ecological

⁷ A consistent or high count of aquatic or marine bird species may happen if surveys are undertaken close to waterholes or wetland sites. Such areas also are important water sources for mallee birds. If a more permanent type of waterbody is in the vicinity, bird survey design should consider placing surveys at various distances from the water source to balance the detection of terrestrial versus aquatic species.

community and form a part of the patch. Watercourses or drainage lines, gaps made by exposed areas of soil, leaf litter or cryptogams, and areas of localised variation in vegetation should be included in the calculation of the size of the patch and be taken into account when determining the overall condition of the patch. Wider areas, especially due to man-made disturbances, should be excluded from the calculation of patch size and condition. Where there is a break in mallee habitats of 100 metres or more then the gap indicates that separate patches are present.

VARIATION WITHIN A PATCH

Patches of the ecological community may contain areas that vary in structural or biological characteristics. For example, one part of a patch may consist of mallee woodlands, whereas another part of the same patch may be dominated other woodland trees; or one part of a patch may have been more recently burnt and therefore at a different stage of regeneration. Variation in vegetation across a patch should not be considered to be evidence of multiple patches, so long as it meets the general description.

REVEGETATION AND REGROWTH

Revegetated or replanted sites or areas of regrowth are not excluded as habitats for the ecological community so long as these areas meet the description of habitat.

SURVEY REQUIREMENTS

The Eastern Mallee Birds is best identified using standardised bird survey techniques to determine what species are present and what proportion of the terrestrial species observed are members of the ecological community. Standard bird surveys are 2 hectare 20 minute surveys and 500 metre area searches, or an equivalent effort. Guidance on how to undertake such surveys is available online from Birdlife Australia (2020). Consultation with expert local birdwatchers or bird group representatives is highly recommended.

The outcomes of the survey may be influenced by timing and conditions surrounding the survey effort and these should be noted. For instance, the season, time of day, and any disturbances due to drought, heavy rains, recent fires or other influences. Some of these can be taken into account by survey design, such as observations at different times of the day or avoiding very rainy days, while other factors are not subject to control without delaying surveys, such as long-term drought.

Patches of mallee habitats relevant to the bird ecological community can vary markedly in their shape, size, condition and features. Thorough and representative on-ground surveys are essential to accurately assess the extent and condition of patches. The Australian Soil and Land Survey Field Handbook (National Committee on Soil and Terrain, 2009) provides guidance on how to undertake proper vegetation surveys. Local floras and handbooks also give information on the vegetation in a given region. The size, number and spatial distribution of plots or transects must be adequate to represent variation across the patch. Sampling should address likely variation in species composition and significant variation in the vegetation (including areas of different condition), landscape qualities and management history (where known) across the patch.

Recording the search effort for both bird and habitat surveys (number of person hours spent per survey and across the entire patch; surveyor's level of expertise and limitations at the time of survey) is useful for future reference.

Whilst identifying the ecological community and habitat condition is possible at most times of the year, consideration must be given to the role that season, rainfall and disturbance history may play in an assessment. For example, after a fire one or more vegetation layers, or groups of species (e.g. obligate seeders), may not be evident for a time. Timing of surveys should allow for a reasonable interval after a disturbance (natural or human-induced) to allow for regeneration of species to become evident, and be timed to enable diagnostic species to be identified. At a minimum, it is important to note climate conditions and what kind of disturbance may have happened within a patch, and when that disturbance occurred.

MAPPING AND OTHER COMMUNITIES

The distributions of individual bird species are provided by various field guides and databases (e.g. Morcombe 2003; Atlas of Living Australia 2020). [Appendix C](#) notes some recent woodland bird communities that have been delineated by geography and association with particular vegetative habitats. All of the bird communities identified in [Appendix C](#) overlap to various degrees in their bird species composition with the Eastern Mallee Birds. The overlap can be used to characterise which bird species are unique to the Eastern Mallee Birds relative to the other bird communities identified.

As at July 2020, four woodland types that occur in the Eastern Mallee region are listed as nationally threatened ecological communities:

- Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions
- Eyre Peninsula Blue Gum (*Eucalyptus petiolaris*) Woodland
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia
- Weeping Myall Woodlands

Each of these communities is listed as nationally Endangered. They are all distinguished from mallee habitats by being non-mallee woodlands, that is they don't have mallee trees as a dominant feature of the tree canopy. Each community is dominated to co-dominated by a specific non-mallee tree species that is characteristic for that ecological community. Patches of some of these communities may intergrade with or be interspersed among patches of mallee vegetation. Under those circumstances, some local occurrences of these listed woodlands may be included as part of the habitat for the Eastern Mallee Birds.

5.2. Regulated areas of the ecological community

5.2.1. CONDITION THRESHOLDS

National listing focuses legal protection on occurrences of the ecological community that are the most functional, relatively natural and in comparatively good condition. Condition is generally easier to assess for vegetation-based than for faunal communities that are mobile or transient in nature. Condition thresholds for the Eastern Mallee Birds are not applied except to specify: a minimum size for the mallee / native vegetation remnant which can reasonably be expected to accommodate some diverse assemblage of mallee bird species and the presence of at least one bird species most characteristic of the mallee assemblage.

- Minimum size that meets the diagnostic features for mallee bird habitats: 50 hectares of continuous native vegetation with mallee present. This is considered sufficient for a relictual fragment to support a diversity of mallee bird species or act as a corridor; AND
- At least one species is from the list below, representing a mallee bird species that is recognised as a nationally or State-listed threatened bird species or a species most unique to the Eastern Mallee bird assemblage.

Common name	Species name
Black-eared Miner	<i>Manorina melanotis</i>
Chestnut Quail-thrush	<i>Cinclosoma castanotum</i>
Chestnut-crowned Babbler	<i>Pomatostomus ruficeps</i>
Crested Bellbird	<i>Oreoica gutturalis</i>
Gilbert's Whistler	<i>Pachycephala inornata</i>
Grey-fronted Honeyeater	<i>Ptilotula plumula</i>
Hooded Robin	<i>Melanodryas cucullata</i>
Major Mitchell's Cockatoo	<i>Cacatua leadbeateri</i>
Mallee Emu-wren	<i>Stipiturus mallee</i>
Malleefowl	<i>Leipoa ocellata</i>
Purple-gaped Honeyeater	<i>Lichenostomus cratitius</i>
Red-lored Whistler	<i>Pachycephala rufogularis</i>
Regent Parrot	<i>Polytelis anthopeplus</i>
Restless Flycatcher	<i>Myiagra inquieta</i>
Scarlet-chested Parrot	<i>Neophema splendida</i>
Shy Heathwren	<i>Calamanthus cautus</i>
Southern Scrub-robin	<i>Drymodes brunneopygia</i>
Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>
Striated Grasswren	<i>Amytornis striatus</i>
Striped Honeyeater	<i>Plectorhyncha lanceolata</i>
Varied Sittella	<i>Daphoenositta chrysoptera</i>
Western Gerygone	<i>Gerygone fusca</i>
Western Whipbird	<i>Psophodes nigrogularis</i>
White-browed Treecreeper	<i>Climacteris affinis</i>
White-eared Honeyeater	<i>Nesoptilotis leucotis</i>
White-fronted Honeyeater	<i>Purnella albifrons</i>
Yellow-plumed Honeyeater	<i>Ptilotula ornata</i>

Further guidance is provided in [Table 5.1](#), for habitat and bird assemblage features that may help determine the likely quality of the ecological community as observed at a given site at a given time.

5.2.2. AREA CRITICAL TO THE SURVIVAL OF THE ECOLOGICAL COMMUNITY

The areas most critical to the survival of the ecological community are those occurrences that represent better quality mallee habitats that can support a diversity of mallee birds. These represent those parts of the ecological community closest to the original mallee bird assemblage, that preserve the species composition and ecological function, and have the highest chance of persisting for the long-term.

The places where the ecological community occurs often coincide with, but are not limited to, conservation areas that retain extensive areas of mallee habitat. There are also occurrences outside of conservation tenure where large areas of mallee remain that support mallee birds. These are also critical to survival because they function as wildlife

corridors that connect conservation areas and as havens for some populations of threatened mallee birds that have severely limited distributions.

5.2.3. AREAS OF HIGH VALUE - SURROUNDING ENVIRONMENT AND LANDSCAPE CONTEXT

For natural resource management activities or actions that may have 'significant impacts' and require approval under the EPBC Act, it is important to consider the whole environment surrounding occurrences of the ecological community. This is because occurrences of the ecological community do not occur in isolation and the surrounding landscape influences how they function and may persist. Areas that are spatially linked, whether ecologically or by proximity, are important as wildlife corridors and to ensure future viability. Where the broader landscape has become more heavily cleared and modified, occurrences of the ecological community are more likely to be isolated. These require protection and restoration activities to improve their linkages, viability and conservation value.

Table 5.1. Guidelines on likely condition for the Eastern Mallee Birds. An occurrence can be rated as:

- 'Better quality' if most of the features are rated as Better;
- 'Good quality' if most of the features are rated as Good
- If ANY feature is rated as 'Not the Community' then the ecological community with its habitat is considered too degraded to be present.

FEATURE	BETTER QUALITY	GOOD QUALITY	NOT THE COMMUNITY
Features of the Woodland Habitat			
Remnant size	>1,000 hectares	>50 hectares	Less than 50 hectares
Remnant location	Close to another sizeable vegetation remnant; connectivity apparent.	Isolated and smaller patch.	-
Mallee vegetation, across the remnant or site.	A range of mallee tree species and mallee types present and dominant at the site.	Mallee trees and vegetation present but of less diversity.	Mallee trees absent, allowing for disturbance impacts.
Non-mallee canopy species	Non-mallee tree species are present as part of the habitat mosaic.	Other woodland trees may or may not be present	-
Understorey species	Mosaic of different understorey types and composition	Understorey mostly native but with low diversity of species or structural variation.	-
Older mature trees	Good representation of older, mature trees (including dead trees). Hollows present.	Older trees few or absent.	-
Cohort	Range of age cohorts present	Single-aged stands or age structure relatively even with little recruitment.	-
Features of the Mallee Bird Assemblage			
Threatened species	Several threatened species observed per survey.	Few to no threatened species observed	-
Bird species richness - total	Larger number of mallee bird species observed.	Fewer mallee species observed in total	Bird species do not meet the diagnostic or condition criteria.
Feeding guilds (refer Table 2.1)	Diversity of feeding guilds evident from surveys.	Few bird feeding guilds evident from surveys.	-
Size range	Good representation of both large and smaller birds.	Size range skewed away from smaller birds.	-
Invasive bird species (especially Noisy Miners)	Absent	Moderate observations of pest bird species.	High numbers or reporting rate of noisy miners or other pest / common birds observed

The following indicators of high-value should be considered when assessing the impacts of proposed actions under the EPBC Act, or when determining priorities for protection, recovery, management and funding.

- Occurrences of this ecological community that are most intact in terms of quality of mallee habitat and diversity of mallee bird species. These may be based on on-site observations or known past records and management history.
- Occurrences present in larger remnants with a diversity of mallee and other woodland habitats features present. A wider range of habitat types provides more resources to support a diversity of bird species in the assemblage.
- Mallee habitats that show evidence of recruitment of key native plant species (including through successful assisted regeneration or management of sites), and presence of a range of age cohorts. It is particularly important to retain mature trees old enough to form hollows because their formation is very slow, taking many decades to develop.
- Occurrences that are in areas where the ecological community has been most heavily impacted, or that are at the natural edge of its range. These provide important refuges of mallee bird populations that potentially enable dispersal and recolonisation after catastrophic impacts.
- Areas of woodland that contain nationally or state-listed threatened species, not necessarily limited to members of the Eastern Mallee Birds.
- Mallee areas with relatively low levels of pest animals, especially feral predators such as foxes and cats that can devastate the bird fauna, or areas where these can be managed efficiently.

5.2.4. HOW THE ECOLOGICAL COMMUNITY SHOULD BE ASSESSED FOR A GIVEN ACTION.

With regard to the description, diagnostic features and condition criteria for the Eastern Mallee Birds given above, the following steps are a guide to determine if the ecological community is present and could be impacted by an action.

FIRST – Determine if your site or property lies in the area of interest.

- Distribution is limited to the Eastern Mallee region, as shown in the map at [Figure 2.2](#).

SECOND – Determine if the right kinds of habitat are present.

- The vegetation at the site must be a native vegetation remnant.
- The remnant should be native woodland or shrubland in which mallee trees are the most common type of canopy tree present. That means 50% or more of the crown cover of the tree canopy or a majority of tree stems present are mallee. The understorey should also be mainly native plant species but can be variable with shrubs, heath, chenopods, grasses and/or spinifex.
- The minimum area of such a mallee remnant is 100 hectares. This is because large areas of intact mallee are more viable for supporting diverse bird populations.
- Areas that have been converted to non-native pastures and crops or otherwise modified are not included.

THIRD – Determine if most of the birds present are from the ecological community.

- Use standard bird survey methods - a 2ha 20minute survey, 500m area search, or equivalent effort - to survey if the bird community is present. Guidance on survey methods is given by Birdlife Australia (2020). Bird survey results should consider only terrestrial bird species and disregard any aquatic or marine bird species observed. Expert local birdwatchers should have the knowledge to do systematic bird surveys.
- With regard to the bird assemblage listed in [Table 2.1](#), the Eastern Mallee Birds is present if survey results show:

- 70% or more of the terrestrial bird species observed in surveys are from the list of 52 mallee bird species; AND at least one species is a key mallee bird species; OR
- 60% or more of the terrestrial bird species observed or counted in surveys are from the list of 52 mallee bird species; AND at least one of the species is recognised as a nationally or State-listed threatened bird species.

The ecological community is present if all these steps are followed and the criteria are met.

Use the information in Table 5.1 to determine the likely condition of the occurrence of the Eastern Mallee Birds.

5.3. Priority Research and Conservation Actions

5.3.1. Conservation Objective

The conservation objective (see Section 1 above) provides the goal and rationale for the priority actions identified here. The objective is:

To prevent further loss and degradation of the **Eastern Mallee Bird Ecological Community** and help recover its biodiversity, function and extent, by protecting it from significant impacts as a Matter of National Environmental Significance under national environmental law and by guiding implementation of management and recovery, consistent with the recommended priority conservation and research actions set out in this advice.

5.3.2. Principles and standards

In undertaking priority actions to meet the conservation objective, the overarching principle is that it is preferable to maintain existing areas of the Eastern Mallee Birds that are relatively intact and of good quality. There are good, practical reasons to do so. It is typically more successful and cost-effective to retain an intact occurrence and habitats than to allow degradation and then attempt to restore it or another area. The more disturbed and modified an occurrence of the ecological community is, the greater the recovery effort that is required. Also, intact remnants are likely to retain a fuller suite of native plant and animal species, and ecological functions. Certain species may not be easy to recover in practice, if lost from a site.

This principle is highlighted in the National Standards for the Practice of Ecological Restoration in Australia (Standards Reference Group SERA 2017⁸):

“Ecological restoration is not a substitute for sustainably managing and protecting ecosystems in the first instance. The promise of restoration cannot be invoked as a justification for destroying or damaging existing ecosystems because functional natural ecosystems are not transportable or easily rebuilt once damaged and the success of ecological restoration cannot be assured.”

Standards Reference Group SERA (2017) – Appendix 2.

The principle discourages ‘offsets’ where intact remnants or habitats are removed with an undertaking to set aside and/or restore other sites. The destruction of intact sites always results in a net loss of the functional ecological community because there is no guarantee all the species and ecological functions of the intact site can be replicated elsewhere. Where restoration is to be undertaken, it should be planned and implemented with reference to the National Standards for the Practice of Ecological Restoration in Australia. These Standards guide how ecological restoration actions should be undertaken and are available online from the Standards Reference Group SERA (2017). They outline the principles that convey the main ecological, biological, technical, social and ethical underpinnings of ecological restoration practice. More specific guidance regarding restoration of the Eastern Mallee Birds, or information that is regionally specific, may also become available. As restoration ecology is continually developing, it is also important to reflect on the experience of others who have

⁸ Society for Ecological Restoration: <http://www.seraustralasia.com/standards/home.html>

worked on restoring the ecological community or reintroducing / recovering its component species, as well as adapting restoration projects as site-level experience accumulates. To achieve cost-effective investments in conservation management it is important to consider the likely interaction of the various management actions being undertaken at any one site, as these may be synergistic or antagonistic. There are also likely to be interactions between sites. Additionally, when allocating management resources, it is important to consider what is the minimum investment required for success and the follow-up required to secure long-term recovery (for example, for how many years should monitoring of bird populations recovering from an impact such as catastrophic fire be repeated).

5.3.3. Priority actions

Priority actions are recommended for the abatement of threats and supporting recovery of the ecological community. These recommended actions are designed to provide guidance for:

- planning, management and restoration of the ecological community by landholders, NRM and community groups and other land managers;
- determining conditions of approval for relevant controlled actions under national environment law; and
- prioritising activities in applications for Australian Government or other funding programs.

Detailed advice on actions may be available in other documents, such as management plans for individual mallee bird species, control of pest animals, fire or certain parks or regions. The most relevant are listed in section 6.4 below.

This conservation advice identifies priority conservation actions under the following key approaches:

- PROTECT the ecological community to prevent further losses;
- RESTORE the ecological community by active abatement of threats, appropriate management, restoration of habitats and other conservation initiatives;
- COMMUNICATE, ENGAGE WITH AND SUPPORT people to increase understanding of the value and function of the ecological community and encourage their efforts in its protection and recovery; and
- RESEARCH AND MONITORING to improve our understanding of the ecological community and the best methods to aid its management and recovery.

These approaches overlap in practice; and form part of an iterative approach to management that includes research, planning, management, monitoring and review.

The actions below do not necessarily encompass all actions in detail that may benefit the Eastern Mallee Birds community. They highlight general but key actions required to at least maintain survival of the ecological community at the time of preparing this Conservation Advice. Actions inconsistent with these actions and that are likely to significantly adversely affect the ecological community should be avoided.

5.3.3.1 Protect the ecological community

This key approach includes priorities intended to protect the ecological community by preventing further losses to extent and integrity – i.e. minimise decline of component bird species, prevent vegetation clearance and direct habitat degradation.

Prevent vegetation clearance and direct habitat degradation

- Prevent further clearance, fragmentation or detrimental modification of important and intact habitats for the ecological community, for example, clearing for agricultural purposes or mining. Remnants in high condition that retain older growth such as mature, hollow-bearing trees and Spinifex in the understorey are particularly important for retention and management. The Mallee Emu-wren for example requires large mature Spinifex Grass (*Triodia scariosa*) hummocks to forage (Brown 2011) while the Red-lored Whistler's distribution in mallee and mallee heath is limited by the presence of Spinifex Grass.

- Identify and protect high quality remnants and recognise remnants in important landscape positions (for example, connecting other important patches of native vegetation) in advance of zoning and development planning decisions. Do not commit these high priority areas to clearing and land development. Ensure that planning includes sufficient buffers to avoid impacts on the ecological community from activities in adjacent areas.
- Include any remnants that retain a high diversity of mallee birds or occur in important landscape positions in secure conservation reserves and allocate resources to their management for conservation purposes – if they are not already in conservation tenure.
- Apply local protection methods to individual trees or significant remnants in a local area that are important to maintaining local mallee bird populations.
- Avoid disturbances to soil if likely to affect member birds in the ecological community (including the soil seed bank).
- Protect mature trees, particularly with hollows, even if they are dead. Large and old trees provide many kinds of habitat. Following disturbance, regeneration is slow and may take decades to meet the habitat requirements of certain species (Benshemesh 1990; McLaughlin 1992; Silveira 1993). In most areas large, hollow-bearing mallee stems are limited or absent as their presence relies on over 100 years to have passed since the last fire (Haslem et al (2012); Gibbons & Lindenmayer 2002). Large and old trees can also act as 'stepping stones' for fauna moving between remnants in an otherwise cleared landscape or vantage points for raptors. These very large trees may maintain their habitat value for threatened species, even if they do not meet other requirements for identification as a patch of the nationally protected ecological community. They are also important landscape carbon stores.
- Prevent full or partial loss of isolated patches, for example, those surrounded by land used for agriculture, where these are the last remnants of the ecological community within a local area.
- Ensure that planning supports increased resilience within the landscape, for example, by retaining appropriate connectivity between patches of native vegetation and mature paddock trees near patches of the ecological community. An understanding of fragmentation impacts resulting from clearing and large fires, patch size limitations and the characteristics of functional corridors is required to protect and enhance habitat connectivity and quality (Department of Environment, Land, Water and Planning 2016).
- Include the areas that form important landscape connections in formal reserve tenure or other conservation related tenure for protection and management in perpetuity. Some existing reserves no longer support species, and additional habitat and corridors need to be included in formal reserves. For example, the Mallee Emu-wren previously occurred in Bronzewing, Wathe and Annuello Flora and Fauna Reserves (Silveira 1999), but Brown *et al.* (2009) and Watson (2011) have concluded that the species is now extinct within these reserves.
- All possible options for avoiding impacts should be exhausted before mitigation and offsets are considered. Further, it is not appropriate to offset losses to this ecological community with any other ecological community. Further information is in Section 6.4 Offsets.
- Retain habitat features important for a suite of birds and other mallee fauna, noting many threatened mallee bird species' requirements for older aged mallee habitats. Specific habitat features include dense cover, tree hollows and particular vegetation structures such as mature Spinifex Grass, known to benefit certain mallee birds. Retaining habitat features for invertebrate diversity and abundance is important and includes large rocks, leaf litter cover and large or hollow logs – many of which are lost due to grazing, clearing and inappropriate fires.

- Close and rehabilitate unnecessary roads and tracks and otherwise control access for patches that are to be protected and maintained. Temporary tracks created for Mallee tree harvesting for example, allow introduced predators and herbivores to access areas, and increases the likelihood of introducing or spreading weeds and pathogens (Department of Environment, Land, Water and Planning 2016). Many threatened mallee birds are affected by frequent Mallee harvesting which removes mid-late growth stage mallee vegetation. Avoiding this may have multiple benefits for mallee flora and fauna.
- Prevent wood collection (for example, for firewood and fencing) that leads to loss and damage of trees and logs. This includes dead 'stag' trees, as these may still play important ecological roles for mallee birds.
- Prevent impacts to native vegetation, native fauna, hydrology, or soil structure from any developments and activities adjacent to or near occurrences of the ecological community by planning for and appropriately mitigating off-site effects.
- Plan new roads, trails, walking or bike tracks, playgrounds and other structures to avoid impacts to the ecological community.
- Prior to removal of any trees or use of heavy machinery that may also damage the understorey, ensure comprehensive flora and fauna surveys have identified threatened species on site and their potential shelter and nesting sites, for example hollows, burrows, rocks and tree crevices, as well as visible nests. Damage to these should be avoided altogether, but if approved for removal, care should be taken to appropriately relocate fauna.
- Monitor tree recruitment and protect areas where there is natural recruitment (for example, use fences or tree guards to manage grazing).

Preventing invasion by weeds, introduced animals, and diseases

- Due to foraging on the ground, many threatened mallee birds are vulnerable to predators such as the feral Cat (*Felis catus*) and Red Fox (*Vulpes vulpes*). Addressing this requires effective feral animal management and maintaining or restoring habitat required by species for predator avoidance, such as dense cover.
- Negative impacts of native predators, such as currawongs (*Strepera* spp.) and ravens (*Corvus* spp.) may be ameliorated by decommissioning artificial water points and reducing high edge to area ratios in remnants (Gardner 1998; Major et al. 1996; Luck et al. 1999b).
- Keep disturbance to a minimum (e.g. minimise tracks, firebreaks). Control runoff, for example, during and after road construction, and urban development, to prevent movement of weed material into natural areas.
- Control introduced grazing animals.
- Where prescribed burning is planned in a remnant, ensure that a full weed risk assessment has been undertaken prior to the burn and that follow up weed management is budgeted for and implemented in the first and subsequent growing seasons with appropriate monitoring to guide when and where to eliminate weeds.
- Use local plants from accredited nurseries (e.g. see the Nursery Industry Accreditation Scheme: Nursery and Garden Industry Australia undated) in rehabilitation areas.
- Use appropriate hygiene to minimise the introduction or spread of weeds and diseases at susceptible sites. For example, keep vehicles and machinery to dedicated roads and out of remnants wherever possible. If vehicles must be taken into remnants ensure vehicles are washed first to remove soil, potential fungal pathogens and weed seeds; ensure that soil and road works use materials such as soil, gravel and water that are free of weeds and disease.
- Prevent stock from carrying weeds into patches of the ecological community. Provide advice and support to landholders to assist with this.

- Assist commercial and domestic apiaries to minimise feral bee colonisation of tree hollows and remove existing feral bee colonies.

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5.3.3.2 Restore the ecological community

This section includes priorities to restore the ecological community by active abatement of threats, appropriate management, restoration and other conservation initiatives.

- Liaise with land managers to promote and undertake programs that ameliorate threats such as human disturbance and inappropriate fires.
- Connect and restore mallee, and any other important native vegetation remnants, so that habitats are of sufficiently large size and viability to support larger assemblages of birds and other fauna.

Preventing detrimental fire impacts

- Manage mallee systems as single continuous blocks, irrespective of tenure and jurisdictional boundaries. This helps ensure that conservation decisions account for the large scale, long-term nature of fire impacts and a mosaic of habitats suitable for supporting a variety of fauna species.
- Minimise the risk of large-scale (>100,000 ha), frequent fires that damage entire vegetation remnants and leave no havens for the bird fauna. Such fires 'simplify' mallee habitats by resulting in single age-class stands that tend to be inhabited by fewer bird species.
- Use fire history mapping and data on the fire scale and timing requirements of mallee birds to develop fire management strategies for multiple species, different locations and different types of mallee.
 - Focus on the requirements of fire-sensitive species as this approach is likely to accommodate many other species.
 - Incorporate threatened mallee bird fire scale and frequency requirements into all fire management plans and annual work plans.
- Mitigate detrimental effects of fire on key habitat resources by prioritising their protection in fire management plans. In the instance of the loss of these habitat resources, consider interim options including artificial structures and nest boxes to enable species to continue to use the landscape. Habitat resources such as tree hollows and mature canopy layers develop slowly, after 40+ years, while other features such as cover of a dense understorey or spinifex hummocks develop sooner, within 20-30 years.
 - Protect tree hollows, for example by minimising high intensity fires, removing fuel from around trees without damaging understorey plants, and extinguishing fires from the bases of the relevant trees after the fire front has passed.
 - Consider protective actions for individual trees with significant ecological value, such as hand removal of flammable materials from their base to prevent tree loss.
 - Maintain a variety of vegetation composition and structure. This is a key driver of bird response and recovery after fire since it provides a diversity of food, shelter and refuges. The extent of uncontrolled fire and fragmentation of habitats affects the ability of species to recolonise from within, or from outside of, remnants.
 - Consider information on habitat responses to fire, for instance germination and growth requirements of key plant species (canopy and understorey cover). Ensure fire frequencies allow sufficient recovery time to allow adequate regeneration of all vegetation layers in a typically dry and variable climate. It is likely that fire suppression measures may be necessary at some sites to ensure long-term recovery.
- Use a landscape-scale approach and available regionally specific knowledge on fire histories and age of stands, considering Indigenous knowledge and results from research to develop fire management strategies that protect, enhance and promote conservation of the ecological community.

- Consider fire regimes appropriate for other nearby ecological communities (as well as mallee habitats) when planning burning.
- Consider potential weed problems following fires and plan for their management. For example, fire regimes and follow up actions need to be tailored to ensure weeds are managed and not encouraged. Ensure that a weed risk assessment and weed management program is planned and budgeted for well ahead of any prescribed burning program.
- Before any prescribed burning involving this ecological community, consider other options to achieve protection, for example biomass control, slashing, and weed management measures to remove flammable components.
- Manage fires to avoid disrupting the life cycles of component bird species of the ecological community; support rather than degrade their necessary habitats; avoid invasion by exotic species; and avoid increased impacts of other disturbances such as grazing or predation by feral predators. Populations of birds and other animals in isolated remnants may be more vulnerable to permanent extinction following fires.
 - Before burning consider soil moisture and weather conditions.
 - Within large remnants, burn different parts in rotation, rather than the entire area. Retaining some unburnt areas provides refuges and source populations for recovery.
 - Avoid physical damage to the habitat and individuals of any threatened species during and after fire operations.
 - Ensure that the season of burning does not have negative impacts on the integrity of the community and understorey, species diversity and natural life cycles of component species, for example do not burn during reproductive seasons of threatened or functionally important species
 - Avoid native vegetation removal as part of fire management or creation of new tracks or use of machinery through bushland. Slashing to maintain low native understorey as a fire break is preferred over a mineral earth fire break.
 - Manage grazing levels following fires. In patches with elevated kangaroo numbers and/or stock grazing there is potential for significant impact to post-fire recruitment of vegetative cover unless grazing is managed.
 - Monitor outcomes of fire and manage consequences at the appropriate time, for example, monitoring and management of feral predators must take place immediately and be followed up; weed management must also be rapid and ongoing as, in many cases, stored soil seed may contain substantial weed propagules.
 - Take monitoring results into account when managing future fire regimes and prioritise long-term monitoring.

Preventing grazing damage

- Manage populations of feral herbivores that damage native vegetation, including rabbits.
- Ensure that numbers of stock and timing of grazing allows regeneration of native plants and habitat. Wherever possible avoid grazing during peak native plant flowering and seeding times within habitats; and avoid nesting and breeding periods for mallee birds, especially ground-dwelling species most likely to be impacted by grazing animals.
 - In NSW, where mallee on public land may be leased for grazing, determine areas of high conservation value which require protection and exclusion from stock grazing.
 - Ensure that stock do not introduce or spread weed propagules further into remnants.
 - Provide alternative shelter areas for stock, so they do not rest in any intact remnants. For example, plant shade trees in nearby cleared areas and move watering points away from the ecological community.

- Artificial watering points in the mallee may can negatively affect the bird community. They impact on native vegetation and habitats by maintaining high numbers and densities of introduced and native herbivores. The Red-lored Whistler, in one survey, was only found distant from (more than 6 km) any artificial watering points.
 - Consider decommissioning at least some artificial water points to reduce numbers of pest animals and allow regeneration of native habitats.
 - Undertake a full inventory of which artificial watering points are still operational and which have been closed or decommissioned. Determine which remaining watering points are likely to have the greatest detrimental impact on native vegetation and fauna, considering the regional water requirements of threatened birds, such as the Regent Parrot and Major Mitchell Cockatoo.
- Where feasible, fence the highest quality remnants to prevent access by herbivores including stock and native herbivores where present in high densities. In particular, protect regrowth, revegetation areas, or sites with threatened or regionally important species.
 - In some cases, allowing, or increasing connectivity between areas of suitable habitat may reduce the impacts of kangaroos on any one area.
 - If fencing or natural regeneration are not practical, undertake restoration plantings to fill critical gaps in corridors.

Manage weeds, pests and diseases

- Implement effective integrated control and management techniques for weeds, pests and diseases affecting the ecological community and manage sites to prevent the introduction of new, or further spread of, invasive species.
 - Manage introduced pest animals through coordinated landscape-scale control programs.
- Identify potential new weed incursions early and manage for local eradication, where possible.
- Prioritise weeds and remnants within which management is most urgent.
 - Target control of key weeds that threaten the ecological community using appropriate methods that avoid impacts to non-target species.
 - Ensure chemicals, or other mechanisms used to manage weeds, do not have significant adverse, off-target impacts on the ecological community.
 - Use alternative methods such as careful use of herbicides on flammable weeds to reduce fuel loads where this is required.

Undertake restoration

- Undertake restoration, including bush regeneration and revegetation, of poor to medium quality remnants to restore them to high quality.
 - Maintain stags, logs, and mature and old-growth trees with hollows as they provide important habitat for mallee birds and other fauna.
 - Use local native species in restoration/revegetation projects for mallee habitats and restore understorey vegetation to a structure and diversity appropriate to the site.
 - In general, use locally collected seeds, where available, to revegetate native plant species. However, choosing sources of seed closer to the margins of their range may increase resilience to climate change.
 - Ensure commitment to follow up after planting, such as the care of newly planted vegetation by watering, mulching, weeding and use/removal of tree guards.
 - Consider the landscape context and other relevant species and communities when planning restoration works. For example, ensure adjacent vegetation communities and

threatened and migratory species are not adversely impacted by tree planting or other restoration activities for the ecological community.

- Implement effective adaptive management regimes using information from available research and management guidelines, for example, see the *National Standards for the Practice of Ecological Restoration in Australia* (Standards Reference Group SERA, 2016), relevant research or advice from local authorities.

5.3.3.3 Communicate, engage with and support

This approach includes priorities to promote the ecological community to build awareness and encourage people and groups to contribute to its recovery. This includes communicating, engaging with and supporting the public and key stakeholders to increase their understanding of the value and function of the ecological community and to encourage and assist their efforts in its protection and recovery. Key groups to communicate with include landholders, land managers, land use planners, researchers, community members and Indigenous communities.

Raise awareness

- Encourage the activities of, and seek support from, local birdwatching groups, as well as national groups, such as Birdlife Australia.
 - Encourage participation in the monitoring and management of Important Biodiversity Areas in the mallee region.
- Public education, rapid detection and fire suppression strategies to control fire, especially catastrophic wildfires, are recommended.
- Ensure resource managers in Government agencies are aware of threatened mallee bird habitat present or adjacent to their region, including its fire management requirements. This includes Catchment Management Authorities and local government authorities.
- Communicate with landholders/managers, relevant agencies and the public to emphasise the value of the ecological community, the key threats, its significance, and appropriate management. Encourage landholders to talk with local NRM organisations and other knowledgeable groups.
- Undertake effective community engagement and education to highlight the importance of minimising disturbance (e.g. during recreational activities) and of minimising pollution and littering (e.g. via signage).
- Inform landholders about incentives, such as conservation agreements, stewardship projects, funding and government NRM programs etc. that may apply to help look after sites on private lands.

Provide information

- Develop education programs, information products and signage to help the public recognize the presence and importance of the ecological community, and their responsibilities under state and local regulations and the EPBC Act.
- Install signage to discourage damaging activities such as the removal of dead timber, dumping garden waste and other rubbish, creating informal paths and tracks, and the use of off-road vehicles where the ecological community remains.
- Install significant vegetation and fauna markers along roads to designate habitat areas of the ecological community to protect and prevent inappropriate roadside maintenance from occurring.
- Promote knowledge about local weeds and what garden plants to avoid planting. Recommend local native species for revegetation and landscaping or safe alternative garden plants.

Coordinate efforts

- Encourage local participation in birdwatching, restoration and Landcare efforts through local conservation groups, birdwatchers, creating 'friends of' groups, field days and planting projects, etc.
- Liaise with local fire management authorities and agencies and engage their support in fire management of the ecological community. Ensure land managers are given information about how to manage fire risks to conserve any threatened species and ecological communities.
- Support opportunities for traditional owners or other members of the Indigenous community to manage the ecological community.
- Promote awareness and protection of the ecological community with relevant agencies and industries. For example, with:
 - state and local government planning authorities, to ensure that planning takes the protection of remnants into account, with due regard to principles for long-term conservation;
 - landowners and developers, to minimise threats associated with land conversion and development;
 - local councils and state authorities, to ensure infrastructure or development works involving substrate or vegetation disturbance do not adversely impact the ecological community. This includes avoiding the introduction or spread of weeds;

5.3.3.4 Research and monitoring

This approach includes priorities for research into the ecological community, and monitoring, to improve understanding of the ecological community and the best methods to aid its recovery through restoration and protection. Relevant and well-targeted research and other information gathering activities are important in informing the protection and management of the ecological community.

Mapping

- Collate existing information about bird records and observations, as well as vegetation mapping information and associated data for this ecological community and identify gaps in knowledge.
- Comprehensively record the occurrences and habitat condition of the ecological community across its range.
 - Support further field observations based on systematic bird surveys plus other vegetation and habitat information from aerial photographs and satellite images to more accurately document current extent, condition, threats, function, presence and use by regionally significant or threatened species.
 - Identify the most intact, high conservation value mallee and woodland habitat remnants and gain a better understanding of variation across the ecological community.

Options for management

- Investigate key ecological interactions, such as the role of mallee birds and other fauna in pollination, seed dispersal and nutrient cycling.
- Research into appropriate and integrated methods to manage pest animals and weeds that impact on the ecological community.
 - Research the spread of Noisy Miners into mallee remnants, their impacts on mallee birds and options for effectively limiting their impacts.
- Assess the vulnerability of the ecological community to climate change and investigate ways to improve resilience through other threat abatement and management actions.

- Conduct research leading to the development of effective landscape-scale restoration techniques and reintroduction methods for the ecological community. Investigate the interaction between disturbance types, such as fire and invasion by weeds and feral animals, to determine how an integrated approach to threat management can be implemented.
- Investigate the most cost-effective options for restoring landscape function, including re-vegetation or assisted regeneration of priority areas, potentially buffering, connecting and protecting existing remnants.
- Research into key attributes of functional corridors most beneficial to threatened mallee birds is required

Monitoring

- It is important that any monitoring is planned before management commences and considers what data are required to address research questions. Monitoring must also be resourced for management activities, especially for those using a novel approach, and applied during and following the management action.
 - Monitor for signs of decline, in terms of known problems and following fires.
 - Monitor changes in the condition, composition, structure and function of the ecological community, including response to all types of management actions and use this information to increase understanding of the ecological community and inform recommendations for future management.
- Undertake targeted monitoring in accordance with monitoring protocols at sites recovering from fire and where on-ground works are occurring. Community involvement in recovery is particularly beneficial where it contributes to long-term monitoring. The Black-eared Miner Recovery Team has developed useful monitoring protocols and effectively involved hundreds of volunteers.
- Promote long-term monitoring of species by volunteers through the Atlas of Australian Birds' national monitoring program.
- Monitor at different levels for birds - species, infraspecific taxa and relevant subpopulations, especially for threatened species.
- Research the need for translocations, including the degree of genetic isolation of geographically separate subpopulations to inform thresholds and the development of translocation programs.

6 LISTING ASSESSMENT AND RECOVERY PLAN RECOMMENDATION

6.1 Eligibility for listing against the EPBC Act criteria

Based on available information, it is recommended that the Eastern Mallee Bird Community is eligible for listing as **Endangered**. This was the highest conservation category met at the time of assessment.

This assessment uses the criteria set out in the [EPBC Regulations](#) and the [Guidelines](#) for nominating and assessing ecological communities.

6.1.1. Criterion 1. Decline in geographic distribution			
Category	Critically endangered	Endangered	Vulnerable
Its decline in geographic distribution is either :	very severe	severe	substantial
a) Decline relative to the longer-term (beyond 50 years ago e.g. since 1750); or ,	$\geq 90\%$	$\geq 70\%$	$\geq 50\%$
b) Decline relative to the shorter-term (past 50 years).	$\geq 80\%$	$\geq 50\%$	$\geq 30\%$
A past decrease sufficient to meet the criterion is considered to be a measurable change whereby: <ul style="list-style-type: none"> the ecological community has contracted to less than some threshold proportion of its former range; or the total area occupied by the community is less than the threshold proportion of its former area; or less than the threshold proportion of the former area of the community is in patches of a size sufficiently large or well connected with other patches for them to be likely to persist beyond the <i>near future</i>. 			

Eligibility for listing under Criterion 1: Vulnerable

Evidence:

This criterion considers changes in the geographic extent of the ecological community. The evidence that best applies to Criterion One includes available data on:

- changes to the geographic extent of the Eastern Mallee Bird assemblage, particularly the key mallee component and
- decline in the extent of intact mallee habitat available to the bird assemblage.

Have mallee woodlands and other native habitats declined substantially across the Eastern Mallee?

Data on vegetation extent and decline at the broad level of NVIS Major Vegetation Group shows there has been considerable loss of mallee vegetation habitat for the ecological community across the Eastern Mallee since non-Indigenous settlement ([Table 6.1](#)). The overall decline is about 50.7%, which marginally meets the threshold for a substantial geographic decline of at least 50%.

There are variable patterns of decline across IBRA subregions within the Eastern Mallee ([Table 6.1](#)). The EYB bioregion has generally undergone a more severe decline in mallee (68.3%) than the MDD bioregion (42.4%). Five of the thirteen component subregions showed no substantial decline in mallee, especially in the northern MDD. However, another five subregions had severe to very severe declines in mallee of more than 70%. These extensive declines were evident in the Eyre and Yorke Peninsulas, and the Murray Mallee and Wimmera subregions of the central to southern MDD.

In conclusion, the answer to question of whether mallee habitats for the ecological community have declined substantially across the Eastern Mallee is: yes but only marginally so, overall.

Table 6.1. Extent and decline of mallee woodlands and shrublands by relevant IBRA subregions that overlap with the Eastern Mallee. Mallee woodlands and shrublands are based on aggregated data for NVIS Major Vegetation Groups 14 and 32.

IBRA Subregion	Pre-1750 (ha)	Current (ha)	Decline (%)
EYB01 Southern Yorke	197,351	47,226	76.07
EYB02 St Vincent	605,077	14,079	97.67
EYB03 Eyre Hills	882,624	216,800	75.44
EYB04 Talia	736,647	438,051	40.53
EYB05 Eyre Mallee	2,151,355	735,961	65.79
Total EYB	4,573,054	1,452,117	68.25
FLB02 Broughton	25,907	11,644	55.05
MDD01 South Olary Plain	2,974,705	2,699,802	9.24
MDD02 Murray Mallee	3,840,134	755,332	80.33
MDD03 Murray Lakes and Coorong	9,773	4,756	51.34
MDD04 Lowan Mallee	1,856,445	1,283,283	30.87
MDD05 Wimmera	245,740	71,076	71.08
MDD06 Darling Depression	750,038	743,600	0.86
MDD07 Braemar	43,379	43,054	0.75
Total MDD	9,720,214	5,600,903	42.38
Total Eastern Mallee key subregions	14,319,175	7,064,664	50.66

Source: DAW (2020). NVIS Major Vegetation Group data v5.1 intersected with geographic layers for IBRA subregions v7. The IBRA subregions that cover the Murray River and Darling River anabranches that intrude into the MDD are minor components not included here.

Has there been a substantial decline in the geographic distribution of the bird assemblage across the Eastern Mallee?

The geographic range of the ecological community may be estimated using extensive records of the bird fauna, for example data collated by the Atlas of Living Australia (ALA). The presence and number of mallee bird species can be determined within individual ten by ten kilometre grids overlain across the Eastern Mallee ([Figure 6.1](#)), from which Extent of Occurrence and Area of Occupancy may be estimated. This analysis focuses on the past 50 years, 1970 - 2020, where there are sufficient observations available to cover the period from 1970 to 1999 and the subsequent period from 2000 to 2020.

The collated ALA records show a pattern of species richness being concentrated around the Murray Mallee of north-western Victoria and south-eastern South Australia ([Figure 6.1](#)). This coincides with areas where very large remnants of mallee vegetation persist and known conservation areas. These areas also are likely to be more intensively surveyed for birds. Regions where there are no to few records, such as the northern Yorke Peninsula, the central MDD within NSW, and the Braemar subregion in SA, coincide with areas where mallee vegetation was originally absent or has since been heavily cleared (see [Figure 2.4](#)).

Estimates of EOO show no clear trend of change between the 1970-1999 and 2000-2020 time periods ([Table 6.2](#)). However, AOO declined by around 30% or more over the same time period. This trend was broadly consistent across the range of minimum mallee bird species used to calculate AOO, the main exception being for the highest minimum of 40 bird species, which showed a larger decline of around 60%⁹. The decline in AOO during 2000-2020 was evident despite a large increase in the number of observations during this timeframe. The number of observations for 2000-2020 was more than double that for 1970-1999 and was extensive across both timeframes, at least 20,000 records of bird species ([Table 6.2](#)).

⁹ The decline in AOO during 2000-2020 was evident despite a large increase in the number of observations. The number of observations for 2000-2020 was more than double that for 1970-1999 and was extensive across both timeframes, at least 20,000 records of bird species (see legend to [Table 6.2](#)). The spatial extent of observations is shown in [Figure 6.1](#). Grid cells with higher mallee bird species richness often overlay conservation areas.

Table 6.2. Estimated Extent of Occurrence (EOO) and Area of Occupancy (AOO) for the Eastern Mallee Birds, based on minimum presence of bird species in ten by ten kilometre grids.

Eastern Mallee Birds		EOO (Alpha hulls)			AOO (10x10 km grids)		
Minimum no. species	% species in assemblage	1970-99 (km ²)	2000-20 (km ²)	Change (%)	1970-99 (km ²)	2000-20 (km ²)	Change (%)
≥3	5	232,335	233,256	+0.4	131,208	95,207	-27.4
≥5	10	204,105	248,482	+21.7	101,951	68,403	-32.9
≥10	20	188,167	159,323	-15.3	56,428	34,534	-38.8
≥18	35	129,060	98,336	-23.8	22,852	13,152	-42.5
≥25	50	64,250	59,700	-7.1	10,394	7,322	-29.6
≥40	75	950	4,800	+405	1,000	400	-60.0

Source: Atlas of Living Australia (2020). Data were collated from 73,015 records of mallee bird species from 1970 to April 2020. Of these, 21,830 records were from the period 1970 to 1999 and 51,185 observations from the period 2000-2020.

The minimum bird species richness categories were selected to represent key proportions of the total mallee bird assemblage present per grid cell during the time period.

For EOO, alpha hulls were calculated using 10x10 km grids that contained the minimum mallee bird species richness based on a point in the centre of grid cells and using $\alpha = 2.5$.

For AOO, estimates were based on 10x10 km grid cells that contained the minimum mallee bird species richness. All such grids and any partial grid cells clipped to the Eastern Mallee boundary were summed to determine the AOO.

In conclusion, the answer to the question of whether the Eastern Mallee Bird Community has declined substantially in extent is: yes, a decline in AOO of around 30% or more over the short-term (past 50 years) is indicative of a substantial reduction in the geographic extent of the bird assemblage.

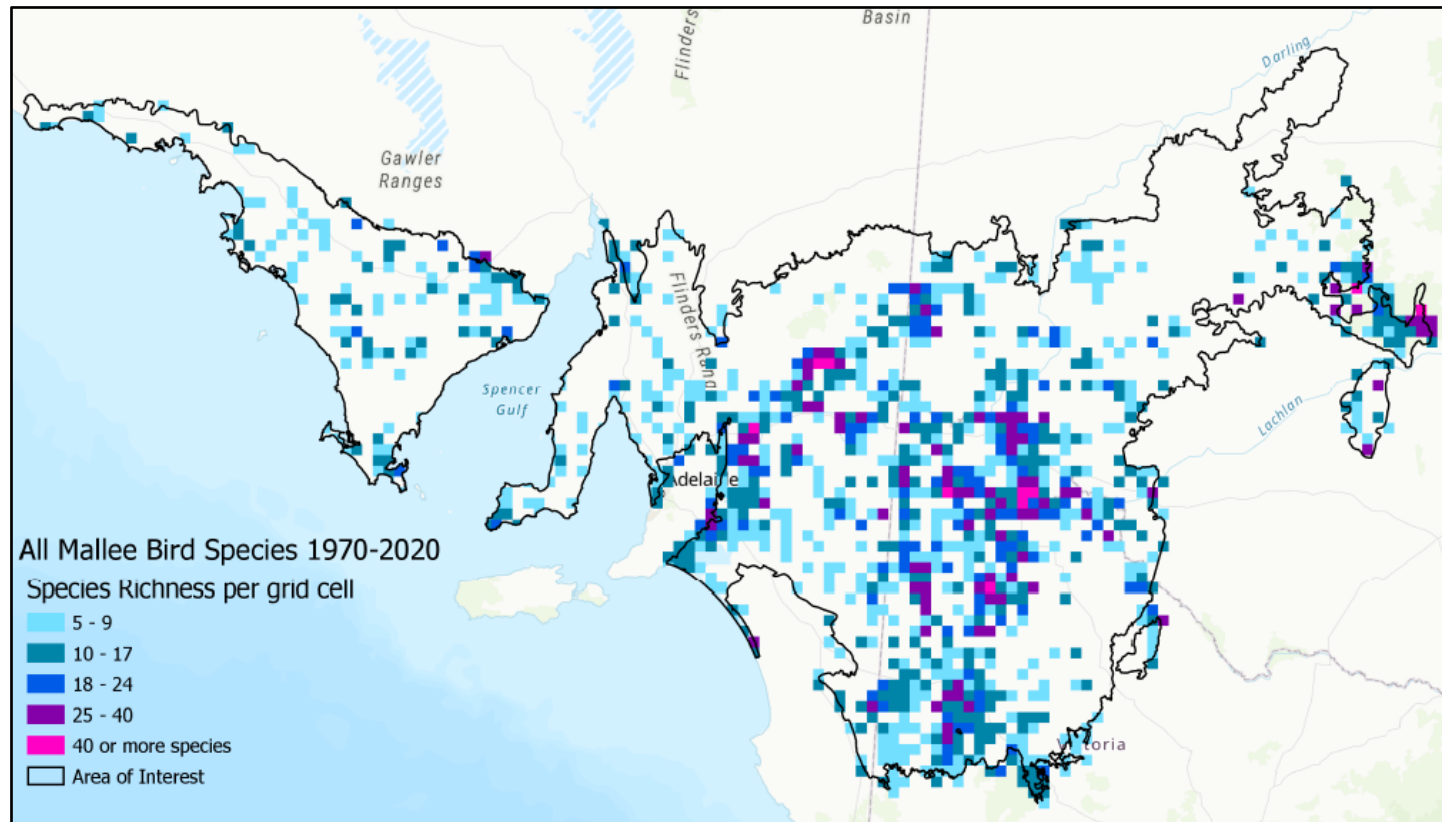
Conclusion

Have mallee woodlands and other native habitats declined substantially across the Eastern Mallee? Yes. The decline in mallee habitat is about 51%, indicating it is substantial.

Has there been a substantial decline in the geographic distribution of the bird assemblage across the Eastern Mallee? Yes. AOO has declined by at least 30% in the past fifty years, indicating a substantial decline.

The Committee notes the available information supports a substantial decline in geographic distribution and, therefore, the Eastern Mallee Birds is **eligible** for listing as **Vulnerable** under this criterion.

Figure 6.1. Ten by ten kilometre grids across the Eastern Mallee showing species richness of mallee birds within each grid.



Source: Atlas of Living Australia (2020). Data collated from 73,020 observations for the assemblage of 52 Eastern Mallee bird species collected between January 1970 and April 2020. Grids are highlighted if they have a minimum presence of five mallee bird species. Black outline shows the Eastern Mallee region. The bird species richness categories represent observations of about 10% (5 spp), 20% (10 spp), 35% (18 spp), 50% (25 spp), and 75% (40 spp) of the total mallee bird assemblage within each 10x10 km grid during the time period.

6.1.2. Criterion 2 - Limited geographic distribution coupled with demonstrable threat			
Its geographic distribution is:	Very restricted	Restricted	Limited
2.1. Extent of occurrence (EOO)	< 100 km ² = <10,000 ha	<1,000 km ² = <100,000 ha	<10,000 km ² = <1,000,000 ha
2.2. Area of occupancy (AOO)	< 10 km ² = <1,000 ha	<100 km ² = <10,000 ha	<1,000 km ² = <100,000 ha
2.3. Patch size	< 0.1 km ² = <10 ha	< 1 km ² = <100 ha	-
AND the nature of its distribution makes it likely that the action of a threatening process could cause it to be lost in:			
the Immediate future [within 10 years, or 3 generations of any long-lived or key species, whichever is the longer, up to a maximum of 60 years.]	Critically endangered	Endangered	Vulnerable
the Near future [within 20 years, or 5 generations of any long-lived or key species, whichever is the longer, up to a maximum of 100 years.]	Endangered	Endangered	Vulnerable
The Medium-term future [within 50 years, or 10 generations of any long-lived or key species, whichever is the longer, up to a maximum of 100 years.]	Vulnerable	Vulnerable	Vulnerable

Criterion 2 aims to identify ecological communities that are geographically restricted to some extent. It is recognised that an ecological community with a distribution that is small and/or fragmented, either naturally or that has become so through landscape modification, has an inherently higher risk of extinction if it continues to be subject to ongoing threats that may cause it to be lost in the future.

The indicative measures that apply to this criterion are:

- extent of occurrence, an estimate of the total geographic range over which the ecological community occurs or is likely to occur;
- area of occupancy, an estimate of the area actually occupied by the ecological community, which generally equates with its present extent;
- patch size and distribution, an indicator of the vulnerability of small and/or isolated patches to particular threats; and
- an assessment of timeframes over which threats could result in further loss of the ecological community.

Eligibility for listing under Criterion 2: Not eligible.

Evidence:

Does the Extent of Occurrence (EOO) indicate at least a limited geographic distribution?

The Eastern Mallee Birds occurs from the Eyre Peninsula to the MDD bioregion (Figure 6.1), an area of more than 260,000 km². Estimates of EOO based on ALA records of mallee birds lie within the range of 4,800 to 233,000 km² (Table 6.2), with the lowest estimate reflecting very large aggregates of mallee bird species. Given the extensive region over which the Eastern Mallee Birds occurs, EOO is likely to exceed the minimum thresholds. The ecological community cannot be considered to have a limited geographic distribution.

Does the Area of Occupancy (AOO) indicate at least a limited geographic distribution?

The AOO for the Eastern Mallee Birds may be estimated as the current extent of mallee habitats, about 70,000 km² (Tables 2.5; 6.1), much of which occurs as large conservation reserves (see section 4.1). Estimates of EOO based on ALA records of mallee birds lie within the range of 400 to 95,000 km² (Table 6.2), with the lowest estimates reflecting very large aggregates of mallee bird species. Given the extensive nature of the remaining mallee habitats for the Eastern Mallee Birds occurs, AOO is likely to exceed the minimum thresholds. Consequently, the ecological community cannot be considered to have a limited geographic distribution.

Does the patch size distribution indicate at least a limited geographic distribution?

Determining patch size distributions for a bird assemblage cannot be applied with the same certainty as for mapped vegetation communities. While some species, such as the Mallee Emu-wren, are geographically very limited species with low dispersibility, many other mallee birds are more mobile and widespread across the region. This makes it difficult to apply patch sizes for occurrences of the Eastern Mallee Bird community.

However, it is possible to apply patch size considerations to extant mallee habitats across the Eastern Mallee. The scheme outlined by McIvor and McIntyre (2002) for classifying altered natural landscapes (Figure 6.2) was applied to mallee patches present within each 10x10 km grid cell across the Eastern Mallee. Where mallee remains, the pattern of its current extent lies mostly within the Fragmented category, with about a third of grid cell occurrences being more Intact-Variiegated and a quarter in the most severely fragmented categories of Relictual-Minimal (Figure 6.3). This accords with the distribution of mallee shown in Figure 2.4 that shows extensive areas of mallee still remain across the Eastern Mallee. The minimum threshold for this part of the criterion is <100ha, so applies to communities characterised by very small and restricted patch sizes. Relatively few of the grid cells fall into the Minimal category that equates with such small areas of mallee (Figure 6.3). Consequently, the ecological community cannot be considered to have a limited geographic distribution based on the patch size threshold prescribed for this criterion.

Are there demonstrable threats to the ecological community and what timeframes apply?

The key threats to the Eastern Mallee Bird community are outlined in Section 3. The ecological community does face several threats that are serious and ongoing. These include clearing and the persistent consequences of fragmentation of native habitats to bird populations; the impacts of fires, especially altered fire frequency; the impact of feral animals including noisy miners; and the potential exacerbation of these impacts by climate change.

Given the ecological community does not meet the criteria for a limited geographic distribution, there is no requirement to consider the timeframes over which these threats may operate.

Conclusion.

Does the EOO indicate at least a limited geographic distribution? No. EOO exceeds 10,000 km².

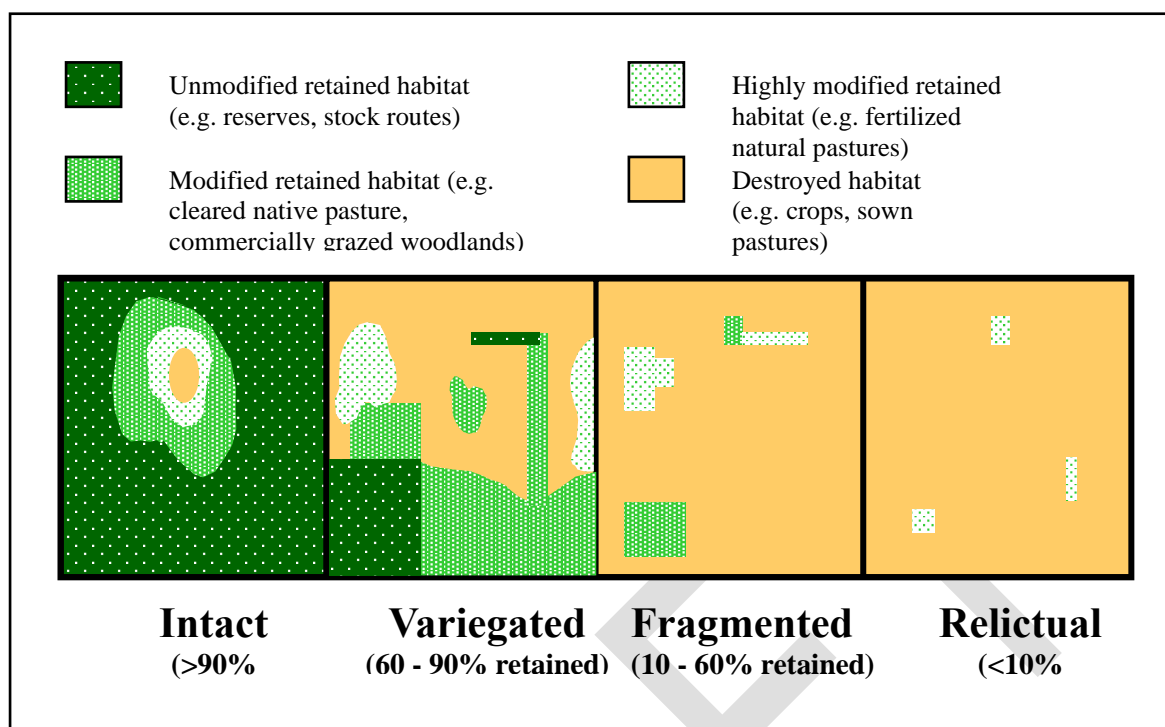
Does the AOO indicate at least a limited geographic distribution? No. AOO exceeds 1,000 km².

Does the patch size distribution indicate at least a limited geographic distribution? No. A large proportion of mallee occurrences within 10x10 km grid cells exceed 100 ha across the landscape.

Are there demonstrable threats to the ecological community? Yes.

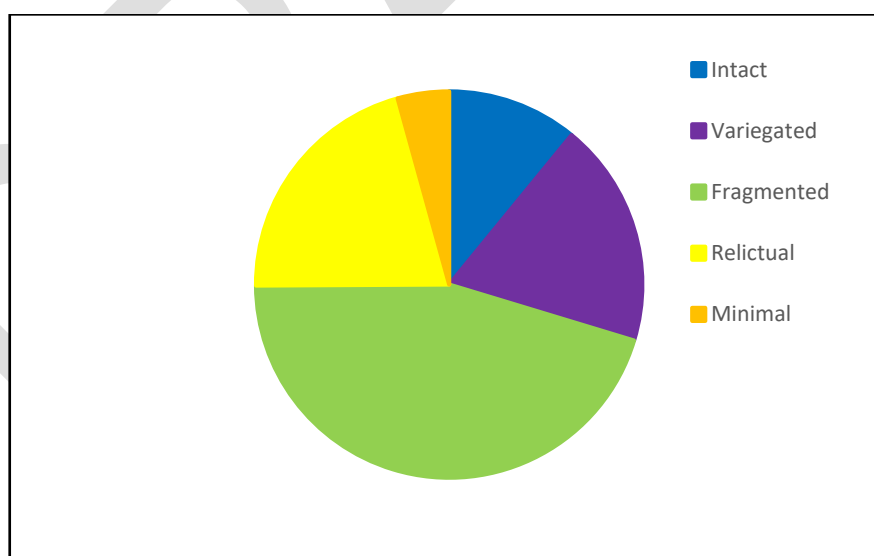
The Committee notes that none of the measures for a limited geographic distribution (EOO, AOO, patch size) apply. The Eastern Mallee Birds occurs at a scale that cannot be considered restricted or limited. Therefore, it is **not eligible** for listing under this criterion.

Figure 6.2. Patterns of altered natural landscapes associated with rural lands, defined by the extent of habitat destruction and amount of native habitat remaining.



Source: Figure by S. McIntyre, redrawn from McIvor & McIntyre (2002). Although the focus of the source was on grassy systems, the concept can apply to other natural systems in landscapes modified by intensive land use.

Figure 6.3. Proportion of extant mallee vegetation across the Eastern Mallee landscape by category of altered landscape.



Source: DAWE (2020b). NVIS v5.1 data aggregated for Mallee MVGs 14 and 32.

Data based on occurrences of mallee within 10x10 km grids across the Eastern Mallee, with mallee patches separated by distances up to 1 km grouped into single polygons. This large buffer allowed for potential movement of many mallee bird species between remnants. The maximum area that can be occupied per grid cell is ten thousand hectares. Grid cells without mallee patches were not included.

The legend refers to the landscape modification scheme in Figure 6.2 with corresponding percentages of mallee presence. A severe degree of fragmentation would relate to the Minimal, Relictual and lower end (say 10-30%) of the Fragmentation categories. The data on which the pie chart is based are presented with further explanation in Appendix A.

6.1.3. Criterion 3 - Loss or decline of functionally important species			
Category	Critically endangered	Endangered	Vulnerable
For a population of a native species likely to play a major role in the community, there is a:	very severe decline	severe decline	substantial decline
3.1 Estimated decline over the last 10 years or three generations, whichever is longer of:	at least 80%	at least 50%	at least 20%
to the extent that restoration of the community is not likely to be possible in:	the immediate future	the near future	the medium-term future
3.2: <i>restoration</i> of the ecological community as a whole is <i>unlikely</i> in	10 years, or 3 generations of any long-lived or key species, whichever is the longer, up to a maximum of 60 years.	20 years, or 5 generations of any long-lived or key species, whichever is the longer, up to a maximum of 100 years.	50 years, or 10 generations of any long-lived or key species, whichever is the longer, up to a maximum of 100 years.

Eligibility for listing under Criterion 3: Vulnerable to Endangered

Evidence:

This criterion considers whether there has been a decline of any particular species that are functionally important to the persistence of an ecological community. The constraints that apply in addressing this criterion Include:

1. A lack of studies on, or biological knowledge about, the full functional roles of the species in a community that can identify which are keystone or umbrella species, or otherwise of significance.
2. Availability of data to reliably determine loss or decline of such species.
3. Lack of knowledge about restorability of entire faunal assemblages, as distinct from restoration of the vegetation or habitat components or individual bird species.

Can functionally important or other species significant to the ecological community be identified?

While information on the biology of the 52 component species of the Eastern Mallee Birds is available, it is not possible to ascribe any one species as being a keystone or umbrella species, such that its loss would foster decline or collapse of the entire assemblage. Despite this, significant groups within the assemblage can be identified. For instance:

- Bird species are allocated to feeding guilds and it is possible to analyse the relative declines of individual feeding guilds within the assemblage.
- Many of the component bird species are formally recognised as threatened by at least one jurisdiction in which the Eastern Mallee is present.
- Certain bird species are identified as being unique to the Eastern Mallee ecological community.

There is considerable overlap between the groups of threatened and unique bird species and, together, they identify the species that are most characteristic of the bird assemblage and most vulnerable to extinction risk ([Table 2.1](#)). While it may be difficult to demonstrate a functional importance for these groups, it is the set of unique and threatened species that best

characterises the Eastern Mallee Bird assemblage and gives it 'identity'. Any significant declines in this group may still be regarded as important, if not functionally so.

Has there been any loss or decline of significant species over a relevant timeframe?

Data are available to analyse trends in reporting rates for mallee birds, based on systematic surveys undertaken since 2000 (Table 6.3). Given the assemblage of 52 bird species covers species with a range of generation lengths from longer-lived species, such as Emu and Malleefowl, to shorter-lived wrens, a generic timeframe for the past ten to twenty years is appropriate. The analysis shows a general pattern of a high proportion of species undergoing declines during the 20-year period 2000-2019, and relatively fewer but still a considerable proportion of species showing declines over the past decade, 2010-2019.

Table 6.3. Trends in reporting rate for Eastern Mallee bird species by bird feeding guilds, species unique to the Eastern Mallee Birds, and species recognised as threatened. The table shows the percentage of Mallee Bird species per category in which reporting rates declined by >30% or >50% over the past ten and twenty year periods.

Category	No spp	20 year Trend (2000-2019) % species		10 year Trend (2010-2019) % species	
		>30% decline	>50% decline	>30% decline	>50% decline
Total Eastern Mallee birds	52	63.5	32.7	36.5	11.5
<i>Bird feeding guilds</i>					
Foliage and branch gleaners	11	54.5	36.4	18.2	18.2
Small nectarivores	9	77.8	44.4	11.1	0
Aerial insectivores	6	66.7	33.3	50.0	16.7
Ground foragers	5	60.0	40.0	40.0	20.0
Omnivore	5	60.0	0	60.0	0
Lower-stratum insectivore	4	25.0	25.0	50.0	25.0
Pouncer	4	100	25.0	75.0	0
Large nectarivore	3	33.3	0	33.3	33.3
Bark foragers	2	100	100	50.0	0
Decomposers	1	100	100	100	0
Nest parasite	1	0	0	0	0
Seed disperser	1	100	0	0	0
<i>Bird species unique to the Eastern Mallee Birds</i>					
Group A (Anon 2017)	18	72.2	44.4	50.0	27.8
Group B (BA 2015)	14	71.4	57.1	42.9	21.4
Not unique	30	56.7	23.3	33.3	3.3
<i>Threatened species</i>					
Listed threatened species	21	76.2	61.9	57.1	23.8
Vic Mallee Bird Community	18	77.8	61.1	44.4	22.2
Not threatened	24	45.8	4.2	20.8	4.2

Source: Birdlife Australia (2020a) Birddata database. Refer to Tables 6.14 and 6.15 for a fuller dataset showing trends for each of the 52 mallee bird species. The determination of bird species unique to the Eastern Mallee is outlined in Appendix B, noting there are overlaps between unique group A and B species. Similarly, there also are species overlaps between the listed threatened bird species and members of the Victorian Threatened Mallee Bird Community.

The analysis of Birddata records focussed on bird systematic surveys (2ha, 20 minute surveys plus 500m area searches) within six NRM regions that overlapped with the Eastern Mallee (Figure 2.3). For each NRM region, data were aggregated by survey type and over 5-year periods to increase survey sample size, and smooth out annual variations to highlight longer-term trends. The reporting rate (RR) for each mallee bird species was noted and an average RR calculated across NRM regions to obtain a value relevant to the entire Eastern Mallee. These averaged values were compared between 2000-2004 and 2015-2019 timeframes to determine the twenty-year trends; and between 2010-2014 and 2015-2019 to determine the ten-year trends. The sampling effort underlying the dataset is outlined in Appendix A.

These trends were most evident:

- Among bird feeding guilds, declines are most evident among those groups with fewer member species (4 or less) represented in the ecological community, for instance Pouncers, Decomposers and Bark foragers. All members of these groups declined by at least 30% over the past 20 years and the latter two groups by more than 50%, and most continued to show a similar level of decline during the past decade ([Table 6.3](#)).
- With regard to feeding guilds with five or more member species, the Aerial insectivores and Omnivore groups had at least half their member species decline by at least 30% during the past ten and twenty year timeframes ([Table 6.3](#)).
- Both threatened and unique bird species showed similar trends in declining reporting rates. This is not surprising, given the considerable overlap between threatened and unique bird species. About half of the bird species in these groups declined by at least 30% over the decade since 2010, and about 21-27% declined by at least 50% in the same period ([Table 6.3](#)). These values are much higher than corresponding values for member species that are not threatened or not unique to the ecological community.

The trends in threatened and unique species are of particular concern because it is these species that are most characteristic of the Eastern Mallee Birds and identified as being more vulnerable to extinction. The trends confirm that these component species are facing a disproportionately greater risk of decline within the Eastern Mallee Bird assemblage and that their declines have generally been at least substantial and severe for others over the past decade.

Is restorability of the ecological community unlikely over a relevant timeframe?

With regard to restorability of faunal communities, there are techniques to reintroduce birds into areas, e.g. captive breeding and translocation of populations, but these are not always successful, particularly if the key threats remain that caused their decline in the first place. Restoration and maintenance of mallee and adjacent non-mallee woodland habitats also are necessary to support existing and new bird populations by increasing habitat quality, extent and connectivity. Some elements of mallee habitats, for instance hollows and understorey diversity, can take years to many decades to develop and recover.

A combination of population and habitat approaches is likely to be a more effective way to ensure the maintenance and restorability of an entire bird community at a landscape-scale and over the medium-term. While such efforts are more readily applied and have shown mixed past success with individual threatened bird species, the effort required for restoring suites of bird species that are declining is even more difficult and potentially impractical, given limited resources for longer-term threat management and recovery efforts.

Conclusion

Can functionally important or other species significant to the ecological community be identified? Possibly. A suite of 'iconic' threatened and unique species can be identified, as can feeding guilds for the bird species. However the functional importance of these groups is unclear.

Has there been any loss or decline of significant species over a relevant timeframe? Yes. A considerable proportion of the suite of unique and threatened species, and certain feeding guilds have declined at least substantially, by 30% in their reporting rates; and many of these have declined severely by over 50%. This is most apparent over the past twenty year period but still evident over the immediate past ten years.

Is restorability of the ecological community unlikely over a relevant timeframe? While further research is required, restoration of the Eastern Mallee Birds is unlikely over the near-term future.

The Committee has taken available information and uncertainties into consideration, and concludes the Eastern Mallee Birds is **eligible** for listing as **Vulnerable**, possibly **Endangered** under this criterion.

6.1.4. Criterion 4 - Reduction in community integrity			
Category	Critically endangered	Endangered	Vulnerable
The reduction in its integrity across most of its geographic distribution is:	very severe	severe	substantial
as indicated by degradation of the community or its habitat, or disruption of important community processes, that is:			

Reference should also be made to the indicative restoration timeframes as outlined under Criterion 3, above.

Eligibility for listing under Criterion 4: Vulnerable to Endangered

Evidence:

This criterion considers whether there has been a loss of ecological integrity for the Eastern Mallee Birds. There are many factors that influence integrity and this assessment focuses on those with available supporting information. These factors include: impacts of fragmentation of the mallee habitat; changes to the composition of the avian fauna; encroachment of pest species, such as the noisy miner; and impacts of fire regimes.

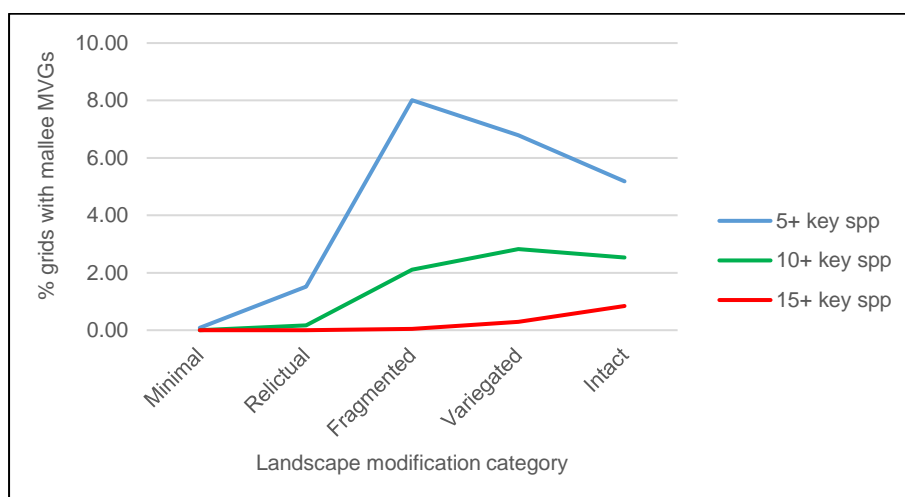
Loss of integrity due to fragmentation of mallee habitats.

The patterns of extent, decline and fragmentation of mallee vegetation and habitats across the Eastern Mallee are shown in [Figures 2.3 and 6.3](#), and [Tables 2.5 and 6.1](#). The pre-1750 extent comprised a series of extensive, near-continuous areas of mallee in the far eastern part of the MDD, the central to southern MDD, and much of the Yorke and Eyre Peninsulas. Gradation into smaller patches occurred at the edges of some of these large expanses. Clearing has resulted in uneven declines of the mallee vegetation over the Eastern Mallee. The formerly extensive areas of mallee have generally been broken into some smaller, but still very large, remnants, with intervening areas of smaller fragments dotting the landscape between and around these large remnants. The presence of very small, isolated remnants due to historic clearing is most evident in the southern parts of the MDD bioregion (Mallee CMA, 2012) and the EYB bioregion. The main native vegetation that now persists in the southern MDD comprises older paddock trees and narrow roadside corridors.

The pattern of mallee habitat fragmentation across the Eastern Mallee was described under Criterion 2, above; in general about 30% of grid cells with mallee had an Intact to Variegated cover (>60%), while very severe fragmentation (Relictual to Minimal, <10% cover) was evident in about 25% of grid cells that currently contained mallee.

The fragmentation of mallee into smaller remnants can impact on the Eastern Mallee Birds. The presence of mallee vegetation remnants and mallee bird species per 10 x 10 km grid cell (as outlined in the legends to [Figures 6.1 and 6.3](#)) was used to analyse the relationship of mallee habitat fragmentation on presence of key mallee bird species. The suite of 21 key mallee bird species represent those bird species most closely associated with mallee habitats, with strong representation of bird species that are threatened and/or unique to the Eastern Mallee Birds. The presence of larger aggregations of key bird species (10+ to 15+ key mallee birds) were associated with grid cells in which the mallee vegetation was more intact and were generally absent in grid cells with relictual remnants ([Figure 6.4](#)). Smaller assemblages of 5+ key mallee bird species, however, persisted to some extent when smaller remnants were present. However, they also appeared to decline when mallee vegetation fell below 10% cover per grid cell. This confirms the value of maintaining larger and intact mallee remnants for retaining larger assemblages of the key mallee bird species.

Figure 6.4. Richness of key mallee bird species present within 10x10 km grids across the Eastern Mallee region, by landscape modification category (refer to Figure 6.1).



Source: Atlas of Living Australia records, as at April 2020, for 21 key mallee bird species (Table 2.1); data were collated over a 50-year timeframe (1970-2020). Refer to the legends for Figures 6.1, 6.2 and 6.3 for explanations of landscape categories and methods.

The known impacts of habitat fragmentation to biodiversity are considerable (Saunders et al 1991; Mallee CMA 2012) and these mechanisms likely explain its impact on the Eastern Mallee Birds. Isolated patches lose connectivity and separation of patches limits key processes such as pollination and natural regeneration. Small patches surrounded by modified land uses, such as crops and pastures suffer edge effects where proximity to non-native landscapes and disturbances leads to heightened encroachment by weeds and feral animals. This is especially severe in narrow linear fragments where short distances demarcate edges from the remnant's core. Overall, smaller patches are less likely to support a diverse and abundant species assemblage due to limitations of resources and habitat diversity. Patches that remain within a matrix of intensive land use, such as the central NSW mallee and wheatbelt show a much simplified biodiversity, yet an element of resilient species may persist (Cunningham et al 2012). The extent of native vegetation cover remaining and the land use practices within agricultural landscapes influences the nature of the farmland mosaic that, in turn, affects richness of native species, notably woodland birds that can persist (Haslem and Bennett 2008). Consequently, it is reasonable to expect the mallee bird fauna of highly fragmented landscapes to be depauperate, to variable degrees, relative to sites that retain more intact woodlands.

Fragmentation also impedes recovery after catastrophic impacts, such as bushfires, if the nearest viable populations of a species are too far away to recolonise. One example in the Eastern Mallee Birds is the Mallee Emu-wren, a short-range endemic species that has a host range of only a few hectares and maximum dispersal of up to ten km (DEH 2009a,b). Consequently, when Billiatt Conservation Park was entirely burnt in the 2013-14 fire season, critical habitats and populations for this wren were destroyed with no chance of natural recolonisation (Brown 2014). Translocation from other viable populations may be the only means for reintroduction, though it would require about 20 years for the habitat to return to a condition favoured by the Mallee Emu-wren. However, such concerns may not apply for other members of Eastern Mallee Birds that are more abundant and have a wider dispersal capability.

Areas where larger mallee remnants remain are likely to comprise a diversity of habitat types, with different kinds of mallee (triodia, chenopod, shrubby) and mosaics of mallee with non-mallee woodlands and shrublands being present. The diversity of canopy and understorey plants provide a greater variety of food, shelter and other resources that may support a wider membership of the bird assemblage.

In conclusion, mallee vegetation and habitats across the Eastern Mallee are now fragmented to a variable degree. The former very extensive occurrences have broken into a series of very

large remnants that are disconnected by areas of altered land uses. The larger remnants allow for the persistence of a fuller, more diverse component of the bird assemblage. Remnants that are smaller and disconnected, generally along a matrix of modified land uses, are more likely to support only a depauperate, less diverse mallee bird assemblage.

Loss of integrity due to changes in bird species composition and abundance.

The Eastern Mallee Birds is more prominent within the extensive mallee remnants that have had long-term protection as conservation reserves and as Birdlife Key Biodiversity Areas. Bird systematic surveys in these conservation areas shows they retain a distinctive and predominantly mallee bird fauna as their most commonly reported species ([Table 2.2](#)).

Identification of the 25 most highly reported species within each NRM region and selected conservation areas shows that mallee species accounted for a very high proportion, about 76% of species, within the larger mallee conservation areas. However, in the surrounding broader NRM regions, the proportion of mallee species is lower, varying from 12 to 48%. NRM regions with the higher proportion of mallee birds are those that overlap most with areas of extensive mallee conservation reserves. Mallee species tend to be replaced across the broader NRM regions by a suite of common and widespread bird species, such as the Australian, Magpie, Galah and Willie Wagtail.

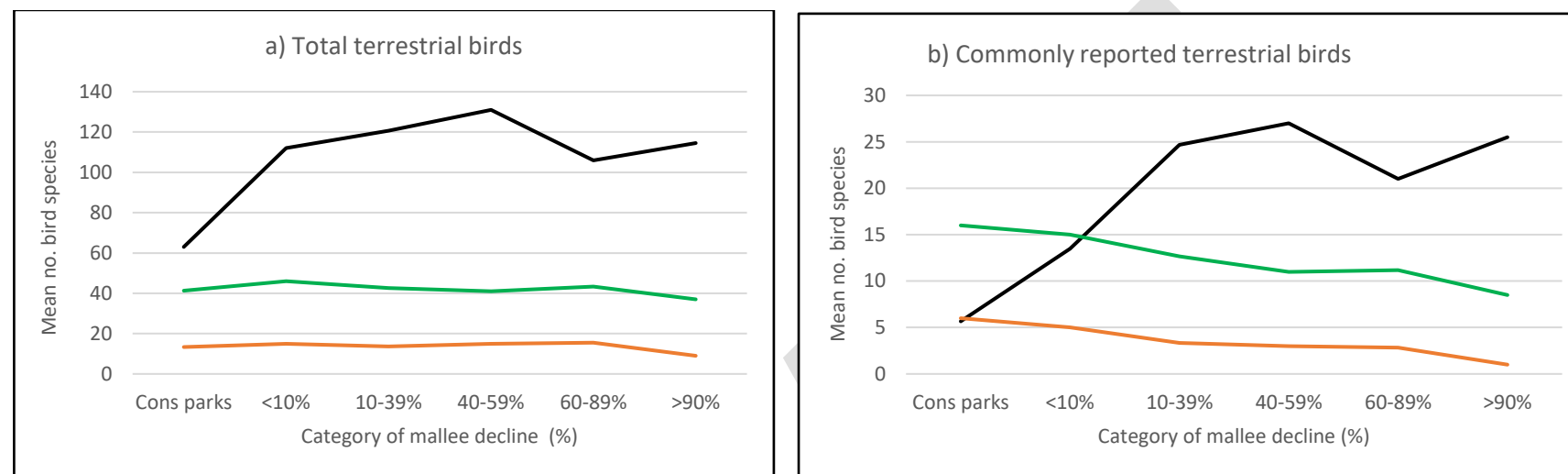
A closer examination of trends in the composition of the entire bird fauna with respect to altered mallee landscapes is shown in [Figures 6.5 and 6.6](#). Mallee birds, including the key mallee bird component, are present, to some degree, across all categories of mallee habitat decline, even relictual areas that have undergone declines of 90% or more ([Figure 6.5a](#)). The main trends with respect to the entire bird fauna are that:

- The number of non-mallee bird species was much lower in significant mallee conservation reserves;
- The total number of mallee birds is consistently in the vicinity of about 40 species; and
- The number of key mallee bird species also was reasonably consistent at around fifteen but declined to about nine where mallee habitats were most heavily cleared.

However, stronger trends are evident if only suites of commonly reported birds are considered, i.e. the most prominent species from standardised bird surveys ([Figure 6.5](#)). More mallee birds than non-mallee bird species were prominent at intact sites (conservation areas and with <10% loss). The number of non-mallee bird species rose to far exceed the number of mallee birds in regions where mallee habitats had undergone >10% decline. These areas also experienced a progressive decline in the numbers of mallee and key mallee bird species to the point that, in relictual landscapes, very few key mallee bird species remained prominent in bird surveys. Both increased decline and smaller current extent of mallee habitats reduces the relative proportions of mallee birds and, especially, key mallee bird species that are commonly reported ([Figure 6.6](#)). Intact mallee areas have a predominantly mallee-dominated bird fauna that quickly shifts to a situation where mallee birds comprise only a third to a quarter of prominently reported birds as mallee habitat declines.

In conclusion, the mallee bird assemblage does not disappear entirely with declining mallee habitats. The richness of mallee bird species appears resilient to all but the most severe fragmentation scenarios, albeit coexisting with an increasing richness of other bird species. The changing relative proportions of species reflect shifts in dominance away from a predominantly mallee bird fauna as their habitats are increasingly impacted, and towards a bird fauna mainly comprising a general and widespread bird fauna capable of living in modified landscapes.

Figure 6.5. Impact of decline in mallee habitats on mean number of terrestrial mallee and non-mallee bird species in the Murray Mallee.
a) Total terrestrial bird fauna; b) Commonly reported bird species with reporting rates >10%, as described below.

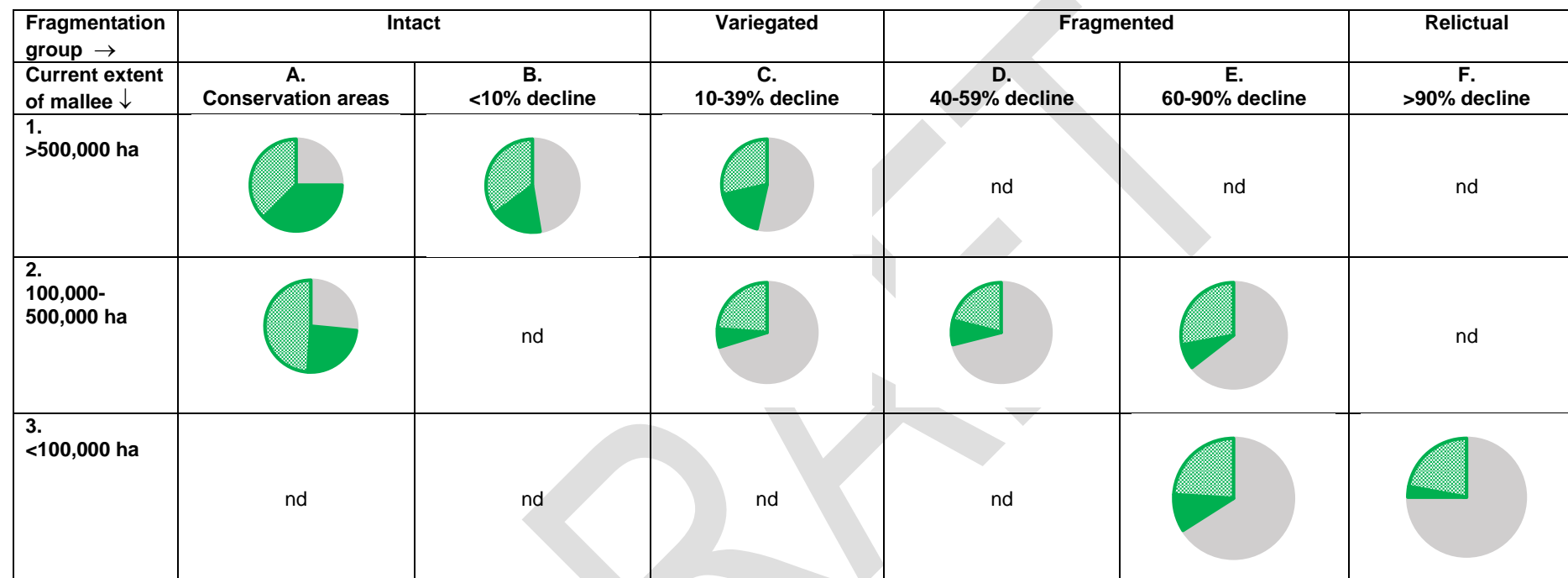


Source: Birdlife Australia (2020a) Birddata database. Mallee decline based on NVIS v5.1 data for mallee MVGs 14 and 32 identified for specific areas of interest.

Legend: **Black** shows non-mallee bird species; **Green** shows total mallee birds (52 species); **Orange** shows the subset of Key mallee birds (21 species).

Reporting rates are based on collated bird list data downloaded for all 2ha 20 minute + 500m area searches undertaken between 1 January 1995 to 31 December 2019. The areas of interest were local government areas (LGAs) and selected large conservation park areas within the Murray Mallee region used as search layers on Birddata. LGAs and conservation areas were used as a means to obtain landscape-level comprehensive bird lists and reporting rates that are not available through the ALA database (c.f. [Figure 6.4](#)). Details of the areas surveyed and data obtained are [Tables 7.3 and 7.x](#). Each LGA and park were allocated to a mallee decline category and the mean values for each category calculated.

Figure 6.6. The relative proportions of mallee and non-mallee terrestrial bird species, in relation to the current extent and decline of bird mallee habitats. The focus is on birds that were most common (collated reporting rates >10%) across the Murray Mallee part of the Eastern Mallee.



Source: Birdlife Australia (2020a) Birddata database. Mallee extent and decline based on NVIS v5.1 data for mallee MVGs 14 and 32 identified for specific areas of interest.

Legend: Grey shows non-mallee bird species; Green shows the mallee birds: solid green wedges are key mallee birds (21 species) while stippled green wedges are associated mallee birds (31 species). 'nd' refers to no data i.e. none of the areas of interest fell into these categories with regard to mallee extent or decline. In some cases, the categorisation does not apply to the regional scale applied, e.g. a situation where >500,000ha remains after 90% clearance would only be evident at an entire bioregional scale.

Reporting rates are based on bird counts collated from numerous bird surveys. Collated bird list data were downloaded for all 2ha 20 minute + 500m area searches undertaken between 1 January 1995 to 31 December 2019. The areas of interest were local government areas and selected extensive conservation parks within the Murray Mallee region. Details of the areas surveyed, and data obtained are [Tables 7.3 and 7.x](#). Each LGA and park were allocated to a mallee decline category and the mean values for each category calculated.

Loss of integrity due to pest animals.

Several pest animals impact on biodiversity throughout the Eastern Mallee region. These include predators such as foxes and feral cats, and feral herbivores such as rabbits, deer and goats (DEH 2009b; DENR 2011). Rabbits, goats, deer and domestic stock contribute to the total grazing pressure affecting native vegetation, along with native herbivores, notably kangaroo populations. The landscape also includes exotic species of birds, such as the common starling and house sparrow, and competitive native birds, notably the noisy miner, that exclude resident native species (Mallee CMA 2012; Parks Victoria 2019).

All these pest animals may adversely interact directly or indirectly with the mallee bird assemblage, especially the threatened species component. Introduced grazers are rated to have a high impact and feral predators a moderate impact overall on threatened mallee birds across the southern agricultural zone of SA, that lies in the vicinity of the Billiatt and Ngarkat conservation reserves (DENR 2011). A preliminary risk assessment noted the actions of introduced grazers on mallee habitats in this zone are a major risk to populations of seven bird species: the Western Whipbird, Red-lored Whistler, Malleefowl, Crested Bellbird, Striated Grasswren, Southern Scrub-robin and Chestnut Quail-thrush (DENR 2011). The pressure from feral predators was rated a major risk to only one threatened mallee bird species: the malleefowl, probably because it is a large ground-dwelling species that is readily hunted by predators. These risk assessments would likely also apply to similar heavily cleared agricultural zones in north-western Victoria and the Eyre and Yorke Peninsulas. The main caveat is that certain threatened mallee bird species are now absent from some of these regions, for instance the Western Whipbird has not been observed in Victoria and the Red-lored Whistler is no longer on the Eyre Peninsula.

The Noisy Miner is an aggressive native honeyeater that competitively excludes other small bird species in woodland remnants and has expanded considerably in abundance though not necessarily in its range (Clarke and Grey 2010; Montague-Drake et al 2011; Threatened Species Scientific Committee 2014). Noisy miners may exacerbate the impact of fragmentation in several ways. They live in large colonies in fragmented to intact woodlands and open forests. Fragmentation of woodlands, by its nature, leads to a reduction in woodland avifauna that small remnants are capable of supporting. However, the persistence of noisy miner colonies in woodland fragments exacerbates avifaunal decline because their aggressive behaviour can lead to the entire exclusion of smaller passerines from woodland remnants. This has been confirmed through exclusion studies that show recolonisation of small woodland birds into sites where noisy miners had been experimentally removed, without any change to the condition of the woodland habitats.

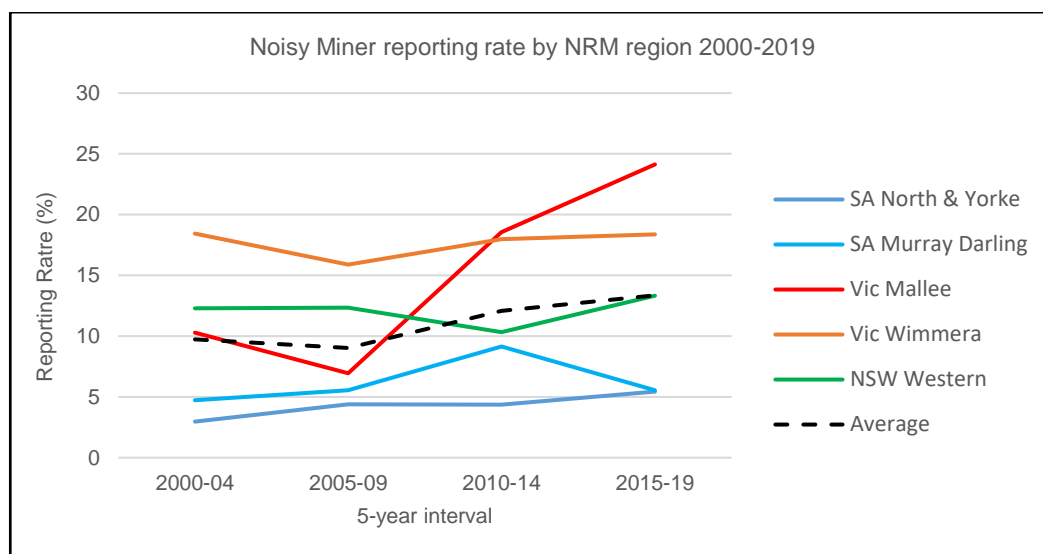
There is also evidence that noisy miners foster dieback and poor tree health in woodlands (Threatened Species Scientific Committee 2014). The smaller insectivorous birds excluded by noisy miners are more effective regulators of insect herbivores, such as leaf miners and leaf beetles. The recolonisation of these birds in woodland fragments where noisy miners were removed leads to significantly lower levels of leaf damage in tree canopies.

Noisy miners occur across most of the Eastern Mallee but are absent from the Eyre Peninsula and have a low abundance in the Yorke Peninsula. The Wimmera and NSW Western regions had consistently high (>10%) reporting rates of noisy miners. There were generally minor variations in the reporting rate for noisy miners across most NRM regions during 2000-2019, with one exception: the reporting rate for noisy miners in the Mallee Catchment Management Authority of north-western Victoria increased by at least three-fold between 2005-09 and 2015-19 ([Figure 6.7](#)). This region coincides both with the southern edge of the core distribution of Noisy Miners (Morcombe 2003) and heavily cleared agricultural landscapes that occur in the Victorian part of the Eastern Mallee. By 2019, the Mallee CMA of Victoria had the highest reporting rate for Noisy Miners across the Eastern Mallee.

The patterns of Noisy Miner abundance suggest they are most likely to affect the already depauperate assemblage of mallee birds that persist in the relictual and fragmented patches of the southern MDD bioregion. They are unlikely to impact on the more prominent and diverse

mallee bird assemblage that remain in the larger mallee conservation areas. In fact, Noisy Miners were not detected in any of the standard bird surveys from three extensive conservation areas during 2000-2019. It therefore remains imperative that these sites continue to be properly managed to prevent any future catastrophic impacts that would lead to deterioration of habitat sufficient to allow expansion of these pest birds into these areas.

Figure 6.7. Reporting rates of Noisy Miners over 5-year intervals (2000-2019) by NRM regions that overlap with the Eastern Mallee.



Source: Birdlife Australia (2020a) Birddata database. The RR refers to a collation of all standard bird surveys (2ha 20 minute plus 500m area searches) in each NRM region overlapping the Eastern Mallee. Bird data were downloaded for 5-year intervals over a two-decade span between 2000 to 2019. Average trend across all NRM regions is shown by the dashed black line.

Loss of integrity due to inappropriate fires

Fire is a key driver of mallee systems across Australia (Bradstock and Cohn, 2002), because mallee vegetation occurs in dry, semi-arid areas with poor rainfall and is highly flammable, with plant species adapted to recover after fires (Yates et al 2017). Lightning is the main source of ignition for fires in mallee systems and can result in fires that burn over very large areas. However, such fires are typically infrequent, with intervals of one to several decades.

Fires, in themselves, are a natural event and not the threat to mallee systems. Rather, the threats to the plants and animals of the mallee arise from altered fire regimes imposed by human activities and, increasingly, climate change; and how the fragmentation of mallee landscapes has exacerbated the impacts of fires. The notion of altered fire regimes includes the long-term lack of burning as well as fires becoming more frequent and intense. There has been considerable research to better understand the response of mallee systems to fire through the Mallee Fire and Biodiversity project (summarised by Watson et al. 2012; Parks Victoria 2019).

A pattern of recurring extensive wildfires affects vegetation in ways that impact on faunal assemblages. The result of single extensive fire events is to reduce variation due to different aged stands prior to the fire and replace them with a single-aged area of vegetation. This post-fire immature vegetation phase may last for ten to twenty years, so recovery of some important habitat features necessary for animal survival is slow. A key example is the loss of tree hollows necessary for the shelter and breeding of many animals. Hollows in mallee trees only begin to develop after 35 years and become large in mallee trees after 80 years. Members of the Eastern Mallee Birds that most rely on hollows include the Regent Parrot, Scarlet-chested Parrot, Mulga Parrot and Major Mitchell Cockatoo. As an example of the impact of reduced hollow availability, a significant population of breeding Major Mitchell's Cockatoos in Wyperfeld

National Park is limited by a lack of suitable tree hollows due to losses of larger, old trees from a combination of age, clearing, storm damage and fires (Parks Victoria 2019).

Tree hollows are not the only valuable habitat feature of long unburnt sites (>50 years) that benefit mallee birds and other fauna. Unburnt areas retain deeper layers of leaf litter, more bark ribbons and large fallen logs. These provide important resources for the Malleefowl, Black-eared Miner, Regent Parrot, Red-lored Whistler, Crested Bellbird and other birds, as well as mallee reptiles (Parks Victoria 2019). In *Triodia mallee*, the spinifex hummocks reach peak size at an intermediate post-fire stage of 20-50 years (Mallee CMA 2012; Parks Victoria 2019). *Triodia* provides shelter from predators, food and other resources for fauna, notably the threatened Mallee Emu-wren and Striated Grasswren that live amongst older spinifex hummocks. Consequently, extensive fires that remove the spinifex can result in the loss of these species for at least 3-8 years or longer (DEH 2009a,b) until the *Triodia* regenerates sufficiently to provide habitat.

However, different members of the mallee bird assemblage vary in their preferences and responses to fire. The general preference for many mallee bird species is for long unburnt mallee remnants (Watson et al 2012). Even in areas that are burnt, the persistence of small unburnt patches provides refuges that support more bird species. Some examples of the variable responses of Eastern Mallee Bird species to fire include (DEH 2009a,b; Mallee CMA 2012):

- Chestnut-rumped Thornbill - prefers the early stages of regrowth.
- White-eared Honeyeater - most abundant in mid-successional vegetation (15 to 40 years post-fire).
- Yellow-plumed Honeyeater - strongly associated with older vegetation (40 to 100 years post-fire).
- Malleefowl - too frequent fire considered one of the main threatening processes. Large-scale fire likely to cause high mortality and can delay breeding to 6-17 years post-fire. Found in vegetation burnt 26-80 years ago with highest densities at sites burnt 60-80 years ago. Malleefowl do not reach maximum breeding capacity at sites until at least 40 years post-fire.
- Mallee Emu-wren - recorded 4-42 years post-fire in *Triodia*.
- Western Whipbird - preferred vegetation structure is generally 10-30 years post-fire.
- Chestnut Quail-thrush and Shy Heathwren - found in vegetation burnt 4-40 years ago with highest densities in sites burnt <10 years ago.

Any management of fire regimes or response to a fire event would need to take these different species requirements into consideration to maintain a mosaic of vegetation patterns and prioritise the protection of the elements that are most threatened or difficult to restore. These would include protection of long-unburnt remnants that take almost a century to restore critical habitat features and are becoming rarer in the landscape (DEWNR 2011).

The other key issue noted for fire is its interaction with fragmentation. Catastrophic fires are now more likely to burn entire patches of vegetation if they take hold in smaller remnants. This could give rise to local or temporary extinctions of bird populations. Land clearance has left many bird species with a reduced number of viable refugia from which they could eventually recolonise into burnt patches as the vegetation recovers from the fire (DEWR 2009b). Large fires do not benefit any bird species, and have impeded the long-term survival of threatened species, such as the Mallee Emu-wren and the Western Whipbird. Successive fire events have pushed these bird species to critically low levels in Ngarkat Conservation Park. Major fires during the 2013-14 fire season entirely burnt 67,000 ha in Billiatt Conservation Park and parts of Ngarkat Conservation Park, both of which had important populations of the Mallee Emu-wren. It is likely that the species became extinct in South Australia because of these catastrophic fires, though translocation efforts have reintroduced it to Ngarkat (Natural Resources SA MDB, 2018).

The loss of connectivity and isolation of mallee and woodland remnants has exacerbated the impacts of fire on fragments. But fires also can worsen other threats in remnants. The more open areas and regrowth after fires allows influx of weeds, feral predators and grazers (Parks

Victoria 2019). The activities of these pests can limit the regeneration of plants and opportunities for native animals to re-establish post-fire.

Fire weather has become more severe since the 1990s, with fire seasons starting earlier and extending over a longer season (Clarke et al 2019). Climate change models project, with high confidence, harsher fire weather for at least the Murray Basin in the future (CSIRO and BOM 2015). This is due to projected increases in temperature and the number of hot to very hot days, plus a general decline in rainfall. However, there is likely to be considerable seasonal variability in rainfall patterns that makes it difficult to project how much harsher the fire weather will become. There could be increased risk of droughts and extreme storm weather, bringing more lightning strikes.

Conclusion

The Eastern Mallee landscape has undergone a variable degree of fragmentation of habitats. While some extensive areas of mallee remain, e.g. in the northern and central MDD bioregion, habitats have undergone more extensive clearing in other parts of the range. Clearing and fragmentation has impacted on the abundance and composition of the Eastern Mallee Birds through reduction of available habitats and increasing the vulnerability of birds to impact from fires and feral predators. Feral cats, foxes and other pest animals are pervasive throughout the range of the ecological community. That recent catastrophic fires have destroyed entire, or significant proportions of, mallee remnants and caused at least one local extinction of a mallee bird species, the Mallee Emu-wren, is a cause for concern. In light of the available observations and data, the Committee considers the Eastern Mallee Birds has undergone at least a severe reduction in its ecological integrity that is unlikely to be restored to any significant degree over the medium-term (i.e. within 20 years). The ecological community is therefore eligible for listing as **Endangered**.

6.1.5. Criterion 5 - Rate of continuing detrimental change

Category	Critically endangered	Endangered	Vulnerable
Its rate of continuing detrimental change is:	very severe	severe	substantial
as indicated by a) degradation of the community or its habitat, or disruption of important community processes, that is:			
or b) intensification, across most of its geographic distribution, in degradation, or disruption of important community processes, that is:			
5.1 An observed, estimated, inferred or suspected <i>detrimental change</i> over the <i>immediate</i> [#] past or projected for the <i>immediate</i> future of at least:	80%	50%	30%

[#]The immediate timeframe refers to 10 years, or 3 generations of any long-lived or key species believed to play a major role in sustaining the community, whichever is the longer, up to a maximum of 60 years.

Eligibility for listing under Criterion 5: Vulnerable

Evidence:

This criterion considers recent past or projected trends in degradation of the Eastern Mallee Birds. A lot of conservation attention has focused on the subset of nationally threatened mallee bird species that are characterised by their generally low reporting rates and geographic restriction to relatively few small areas and are most likely at risk of further decline. These 'iconic' threatened mallee birds include the Black-eared Miner, Mallee Emu-wren, Malleefowl, Red-lored Whistler, Scarlet-chested Parrot and Western Whipbird. This assessment, however, considers trends in observations for the entire assemblage of mallee birds, not just the suite of highly threatened species.

The Eastern Mallee Woodland Trends report (Birdlife Australia 2015a) identified that the suite of mallee-dependent bird species has shown generally negative trends in reporting rates during the period 1999-2013 (Table 6.4). This decline mostly related to the earlier part of this period, 2001-2006, which coincided with the onset of the severe Millennium drought. The subsequent period, 2006-2013, showed positive trends in reporting rates for most, but not all, mallee bird species, indicative of post-drought recovery that happened from around 2010. However, these data only indicated general trends, and did not refer to the thresholds of degradation for this criterion.

An analysis of reporting rate trends from the Birddata database over a 20-year timeframe but extended to 2019 showed overall strong declines across the whole Eastern Mallee for several mallee bird species. Of the 52 bird species in the mallee assemblage, 17 declined strongly by 50% or more, while another 16 species declined moderately by 30-50% (Figure 6.8). The remainder showed no strong changes or minor increases in reporting rate. Overall, 33 species or 63% of the assemblage declined by at least 30%. This is indicative of at least a substantial rate of decline over the past 20 years. There were patterns of decline for many mallee species across several NRM regions, especially for the subset of key mallee bird species.

A similar analysis of reporting rate trends for the past 10-year timeframe from 2010 to 2019 indicated weaker trends in decline for this period across the whole Eastern Mallee. Only six mallee species declined strongly by 50% or more, mainly key mallee bird species (Figure 6.9). Another 13 species, mostly associated mallee bird species, declined moderately by 30-50%. About a third of mallee species showed overall declines of at least 30% during 2010-2019. The remainder showed only minor differences except for the Western Whipbird, which had a strong

increase in reporting rate during the ten-year interval. The broad trends across the Eastern Mallee, however, masked some NRM region-specific trends during this period. More bird species in the Mallee CMA, i.e. north-western Victoria, showed strong declines while many bird species in the Eyre Peninsula showed increased reporting rates.

Table 6.4. Broad trends in bird reporting rates from systematic bird surveys analysed for the Eastern Mallee Woodlands bird trends report (Birdlife Australia, 2015a)

Common name	1999-2013	2001-06	2006-13
Australian Owlet-nightjar	No trends noted		
Australian Ringneck		negative	positive
Black-eared Cuckoo	No trends noted		
Black-eared Miner	negative	negative	
Brown-headed Honeyeater		negative	positive
Chestnut Quail-thrush	negative	negative	positive
Chestnut-crowned Babbler	negative	negative	
Chestnut-rumped Thornbill	negative	negative	
Crested Bellbird	negative	negative	positive
Emu	negative	negative	positive
Gilbert's Whistler		negative	negative
Golden Whistler	No trends noted		
Grey Butcherbird	negative	negative	positive
Grey Currawong	negative	negative	positive
Grey Shrike-thrush	negative	negative	positive
Grey-fronted Honeyeater	No trends noted		
Hooded Robin	No trends noted		
Inland Thornbill			positive
Jacky Winter	negative	negative	positive
Little Crow	negative	negative	
Major Mitchell's Cockatoo		negative	
Mallee Emu-wren	No trends noted		
Malleefowl	No trends noted		
Masked Woodswallow		negative	positive
Mulga Parrot	negative	negative	positive
Purple-gaped Honeyeater	No trends noted		
Rainbow Bee-eater	No trends noted		
Red-capped Robin		negative	positive
Red-lored Whistler	No trends noted		
Regent Parrot	No trends noted		
Restless Flycatcher	negative	negative	
Scarlet-chested Parrot	No trends noted		
Shy Heathwren	negative	negative	
Southern Scrub-robin	negative	negative	
Spiny-cheeked Honeyeater	negative	negative	positive
Splendid Fairy-wren	negative	negative	
Spotted Nightjar	No trends noted		
Spotted Pardalote	negative	negative	negative
Striated Grasswren	No trends noted		
Striated Pardalote	No trends noted		
Striped Honeyeater	negative	negative	
Varied Sittella		negative	
Variegated Fairy-wren	negative	negative	
Weebill		negative	
Western Gerygone	No trends noted		
Western Whipbird	No trends noted		
White-browed Babbler		negative	
White-browed Treecreeper			positive
White-browed Woodswallow		negative	positive
White-eared Honeyeater	negative	negative	
White-fronted Honeyeater	No trends noted		
Yellow-plumed Honeyeater	negative	negative	

Source: Birdlife Australia (2015a).

Figure 6.8 Trends in mallee bird reporting rates comparing the 5-year periods 2000-2004 and 2015-2019, by NRM region (Figure 2.3) and averaged across all NRM regions where a bird species was reported for the Eastern Mallee value was reported.

Legend:

	Absent from all surveys within NRM
NR	Not recorded at a time period
	Minor change $\pm 30\%$
	Decline by 30-50%
↓	Decline by >50%
	Increase by 30-100%
↑	Increase by >100%

Species name	Western	Mallee	Wimmera	SA MDB	Nth & Yorke	Eyre Pen	East Mallee
<i>Acanthagenys rufogularis</i>							
<i>Acanthiza apicalis</i>			↑	↓			
<i>Acanthiza uropygialis</i>			↑		↓		
<i>Aegotheles cristatus</i>	↓	↓	↓			↑	
<i>Amytornis striatus</i>				↓			↓
<i>Artamus personatus</i>	↓	↑	↑		↓	↓	
<i>Artamus superciliosus</i>				↓		↑	
<i>Barnardius zonarius</i>			↑			NR	
<i>Cacatua leadbeateri</i>	↓	↓			NR	↑	
<i>Calamanthus cautus</i>	↓	↓	↑	↑	↓	↓	↓
<i>Chalcites osculans</i>		↓	↑		↓		
<i>Cinclosoma castanotum</i>	↓	↓	NR	↓			↓
<i>Climacteris affinis</i>	↓				NR	NR	↓
<i>Colluricincla harmonica</i>		↓					
<i>Corvus bennetti</i>	↓	↓		↓		↑	
<i>Cracticus torquatus</i>							
<i>Daphoenositta chrysoptera</i>	↓	↓	↓			↓	↓
<i>Dromaius novaehollandiae</i>			↓		↓	↓	
<i>Drymodes brunneopygia</i>	↓	↓		↓	↓		↓
<i>Eurostopodus argus</i>	↓	↓	NR	↓	NR		↓
<i>Gerygone fusca</i>		↓	NR	↓	NR	↓	
<i>Leipoa ocellata</i>	↓	↓			↓	↓	↓
<i>Lichenostomus cratitius</i>		↓			↓		↓
<i>Malurus lamberti</i>					↓		
<i>Malurus splendens</i>			↑				
<i>Manorina melanotis</i>		↓					↓
<i>Melanodryas cucullata</i>	↓	↓				↑	
<i>Melithreptus brevirostris</i>	↓	↓			↓	↓	
<i>Merops ornatus</i>			↓				
<i>Microeca fascians</i>	↓	↓	↓				
<i>Myiagra inquieta</i>		↓	↓	↓	↓		↓
<i>Neophema splendida</i>					NR		
<i>Nesoptilotis leucotis</i>		↓					
<i>Oreoica gutturalis</i>	↓	↓	NR		↓		↓
<i>Pachycephala inornata</i>	↓				↓		↓
<i>Pachycephala pectoralis</i>		↓			↓		
<i>Pachycephala rufogularis</i>		↓		↓			↓
<i>Pardalotus punctatus</i>	↓	↓	↓		↓		↓
<i>Pardalotus striatus</i>							
<i>Petroica goodenovii</i>		↓			↓	↓	
<i>Plectorhyncha lanceolata</i>			NR		NR		
<i>Polytelis anthopeplus</i>	↑		↑	↓	NR		
<i>Pomatostomus ruficeps</i>							
<i>Pomatostomus superciliosus</i>							

Species name	Western	Mallee	Wimmera	SA MDB	Nth & Yorke	Eyre Pen	East Mallee
<i>Psephotus varius</i>			NR		↓		
<i>Psophodes nigrogularis</i>					↓		
<i>Ptilotula ornata</i>	↓	↓					↓
<i>Ptilotula plumula</i>	↓	NR		↓	↓	↓	↓
<i>Purnella albifrons</i>	↓						
<i>Smicromis brevirostris</i>							
<i>Stipiturus mallee</i>							
<i>Strepera versicolor</i>	↓	↓	↓				

Source: Birdlife Australia (2020a) Birddata database. Based on aggregated data from all systematic surveys over 5-year periods in each NRM region shown (Figure 2.3). Systematic surveys involve 2ha, 20 minute surveys plus 500m area searches. Trends compare reporting rates for each mallee species between the 5-year periods of 2000-2004 and 2015-2019, i.e. over a 20-year interval.

In conclusion, the trend in reporting rates for all component Eastern Mallee bird species across the entire region over the past ten to twenty years are suggestive of at least a substantial decline over the longer-term. However, more recent trends in reporting rates, since 2010, show fewer species to be declining across the Eastern Mallee, although there are region-specific trends indicative of continued substantial declines in parts of the community's range. The Committee therefore considers, in the preliminary, that the Eastern Mallee Birds is eligible for listing as **Vulnerable** against this criterion.

Figure 6.9. Trends in mallee bird reporting rates comparing the 5-year periods 2010-2014 and 2015-2019, by NRM region (Figure 2.3) and averaged across all NRM regions where a bird species was reported for the Eastern Mallee value.

Legend:

	Absent from all surveys within NRM
NR	Not recorded at a time period
	Minor change $\pm 30\%$
	Decline by 30-50%
↓	Decline by >50%
	Increase by 30-100%
↑	Increase by >100%

Species name	Western	Mallee	Wimmera	SA MDB	Nth & Yorke	Eyre Pen	East Mallee
<i>Acanthagenys rufogularis</i>							
<i>Acanthiza apicalis</i>		↓		↓			
<i>Acanthiza uropygialis</i>					↓		
<i>Aegotheles cristatus</i>	↓	↓					
<i>Amytornis striatus</i>	↑	↓		↓			
<i>Artamus personatus</i>			↑		↓	↓	
<i>Artamus superciliosus</i>				↓	↓	↑	
<i>Barnardius zonarius</i>			↑			NR	
<i>Cacatua leadbeateri</i>		↓			NR	↑	
<i>Calamanthus cautus</i>		↓		↓	↑	↑	↓
<i>Chalcites osculans</i>		↓			↓	↑	
<i>Cinclosoma castanotum</i>		↓	NR	↓		↑	↓
<i>Climacteris affinis</i>	↑				NR	NR	
<i>Colluricincla harmonica</i>							
<i>Corvus bennetti</i>	↓			↓	↓	↑	
<i>Cracticus torquatus</i>		↓					
<i>Daphoenositta chrysoptera</i>						↓	
<i>Dromaius novaehollandiae</i>							
<i>Drymodes brunneopygia</i>	↓	↓		↓	↓	↑	
<i>Eurostopodus argus</i>	↓		NR	↓	NR		↓
<i>Gerygone fusca</i>		↑	NR	↓	NR	↑	
<i>Leipoa ocellata</i>		↓	↑	↑		↑	
<i>Lichenostomus cratitius</i>			↑				
<i>Malurus lamberti</i>							
<i>Malurus splendens</i>		↓			↑	↑	
<i>Manorina melanotis</i>		↓					
<i>Melanodryas cucullata</i>		↓		↓		↑	
<i>Melithreptus brevirostris</i>		↓					
<i>Merops ornatus</i>							
<i>Microeca fascians</i>		↓					
<i>Myiagra inquieta</i>			↓				
<i>Neophema splendida</i>				↓	NR		↓
<i>Nesoptilotis leucotis</i>		↓				↑	
<i>Oreoica gutturalis</i>		↓	NR		↑		
<i>Pachycephala inornata</i>					↓		
<i>Pachycephala pectoralis</i>		↓				↑	
<i>Pachycephala rufogularis</i>		↓		↓			↓
<i>Pardalotus punctatus</i>					↑		
<i>Pardalotus striatus</i>							
<i>Petroica goodenovii</i>				↓	↓		
<i>Plectorhyncha lanceolata</i>			NR		NR		
<i>Polytelis anthopeplus</i>					NR		
<i>Pomatostomus ruficeps</i>							
<i>Pomatostomus superciliosus</i>			↑			↓	

Species name	Western	Mallee	Wimmera	SA MDB	Nth & Yorke	Eyre Pen	East Mallee
<i>Psephotus varius</i>			NR		↓		
<i>Psophodes nigrogularis</i>					↓	↑	↑
<i>Ptilotula ornata</i>			↑				
<i>Ptilotula plumula</i>		NR		↑	↓	NR	
<i>Purnella albifrons</i>			↑				
<i>Smicromis brevirostris</i>							
<i>Stipiturus mallee</i>		↓		↓			↓
<i>Strepera versicolor</i>		↓	↓				

Source: Birdlife Australia (2020a) Birddata database. Based on aggregated data from all systematic surveys over 5-year periods in each NRM region shown (Figure 2.3). Systematic surveys involve 2ha, 20 minute surveys plus 500m area searches. Trends compare reporting rates for each mallee species between the 5-year periods of 2000-2004 and 2015-2019, i.e. over a 20-year interval.

6.1.6. Criterion 6 - Quantitative analysis showing probability of extinction			
Category	Critically endangered	Endangered	Vulnerable
A quantitative analysis shows that its probability of extinction, or extreme degradation over all of its geographic distribution, is:	at least 50% in the immediate future.	at least 20% in the near future.	at least 10% in the medium-term future.

Eligibility for listing under Criterion 6: Insufficient data.

Quantitative analysis of the probability of extinction or extreme degradation over all its geographic distribution has not been undertaken for this ecological community. Therefore, there is **insufficient information** to determine the eligibility of the ecological community for listing in any category under this criterion.

6.2 Recovery plan recommendation

A recovery plan is not recommended for this ecological community at this time.

The main threats to the ecological community and the priority actions required to address them are largely understood.

The Conservation Advice sufficiently outlines the priority actions needed for this ecological community and many of the threats affecting the ecological community are best managed at a landscape scale, coordinated with management of other ecological communities. Therefore, listing under national environment law, plus the information contained within this Conservation Advice and implementation of the priority conservation actions are sufficient to guide protection and recovery of this ecological community.

In addition, there are many plans and management documents prepared by various agencies and experts that are available and relevant to the maintenance and/or recovery of this ecological community and its component species, or that address its threats. Some of these are outlined in section 4.3.

7 APPENDIX A - SPECIES LISTS AND INFORMATION

This Appendix provides background information on the assemblage of native species that characterises the ecological community throughout its range at the time of listing, based on the sources cited. Further details on the mallee habitat within which the ecological community occurs also are given.

The assemblage of Eastern Mallee Bird species is given in [Table 2.1](#). These bird species may be abundant, rare, or not necessarily present in any given area of mallee habitat, and other native species not listed here may be present. The total list of species that may be found in the area is considerably larger than the species listed here.

Species presence and relative abundance varies naturally across the range of the ecological community based on factors such as historical biogeography, localised habitat features, topography, water availability and climate. They also change over time, for example, in response to disturbance (by logging, fire, or grazing), or to the climate and weather (e.g. seasons, floods, drought and extreme heat or cold). The species recorded at a particular site can also be affected by sampling scale, season, effort and expertise. In general, the number of species recorded is likely to increase with the sampling frequency of the site. Standardised bird surveys, as described by Birdlife Australia, are recommended to establish the likely presence of the Eastern Mallee Birds.

Scientific names used in this Appendix are nationally accepted names as per the Atlas of Living Australia, as at the time of writing.

7.1 Eastern Mallee Bird Ecological Community

Table 7.1. Conservation status under national and State environmental legislation for component species of the Eastern Mallee Bird Ecological Community.

Species name	Common name	Conservation status				
		EPBC	SA	NSW	VIC	Vic MBC
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater					
<i>Acanthiza apicalis</i>	Inland Thornbill					
<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill					
<i>Aegotheles cristatus</i>	Australian Owlet-nightjar					
<i>Amytornis striatus</i>	Striated Grasswren		R	V		*
<i>Artamus personatus</i>	Masked Woodswallow					
<i>Artamus superciliosus</i>	White-browed Woodswallow					
<i>Barnardius zonarius</i>	Australian Ringneck					
<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo		R	V	T	
<i>Calamanthus cautus</i>	Shy Heathwren		R	V		*
<i>Chalcites osculans</i>	Black-eared Cuckoo	M				
<i>Cinlosoma castanotum</i>	Chestnut Quail-thrush		R	V		*
<i>Climacteris affinis</i>	White-browed Treecreeper		R		T	
<i>Colluricincla harmonica</i>	Grey Shrike-thrush					
<i>Corvus bennetti</i>	Little Crow					
<i>Cracticus torquatus</i>	Grey Butcherbird					
<i>Daphoenositta chrysoptera</i>	Varied Sittella			V		
<i>Dromaius novaehollandiae</i>	Emu					
<i>Drymodes brunneopygia</i>	Southern Scrub-robin			V		*
<i>Eurostopodus argus</i>	Spotted Nightjar	M				
<i>Gerygone fusca</i>	Western Gerygone		R			
<i>Leipoa ocellata</i>	Malleefowl	V	V	E	T	*
<i>Lichenostomus cratitius</i>	Purple-gaped Honeyeater			V		*
<i>Malurus lamberti</i>	Variegated Fairy-wren					
<i>Malurus splendens</i>	Splendid Fairy-wren					*
<i>Manorina melanotis</i>	Black-eared Miner	E	E	CE	T	*
<i>Melanodryas cucullata</i>	Hooded Robin				T	
<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater					*
<i>Merops ornatus</i>	Rainbow Bee-eater	M				
<i>Microeca fascians</i>	Jacky Winter					*
<i>Myiagra inquieta</i>	Restless Flycatcher		R			
<i>Neophema splendida</i>	Scarlet-chested Parrot		R	V	T	
<i>Nesoptilotis leucotis</i>	White-eared Honeyeater					*
<i>Oreocia gutturalis</i>	Crested Bellbird				T	
<i>Pachycephala inornata</i>	Gilbert's Whistler		R	V		
<i>Pachycephala pectoralis</i>	Golden Whistler					
<i>Pachycephala rufogularis</i>	Red-lored Whistler	V	R	CE	T	*
<i>Pardalotus punctatus</i>	Spotted Pardalote					*
<i>Pardalotus striatus</i>	Striated Pardalote					
<i>Petroica goodenovii</i>	Red-capped Robin					
<i>Plectorhyncha lanceolata</i>	Striped Honeyeater		R			
<i>Polytelis anthopeplus</i>	Regent Parrot (eastern)	V	E	E		*
<i>Pomatostomus ruficeps</i>	Chestnut-crowned Babbler					
<i>Pomatostomus superciliosus</i>	White-browed Babbler					
<i>Psephotus varius</i>	Mulga Parrot					
<i>Psophodes leucogaster</i>	Western Whipbird (Mallee)	V	E		T	*
<i>Ptilotula ornata</i>	Yellow-plumed Honeyeater					*
<i>Ptilotula plumula</i>	Grey-fronted Honeyeater					*
<i>Purnella albifrons</i>	White-fronted Honeyeater					
<i>Smicronis brevirostris</i>	Weebill					
<i>Stipiturus mallee</i>	Mallee Emu-wren	E	E		T	*
<i>Strepera versicolor</i>	Grey Currawong					

Sources: DAWE (2020c).

Determinations of conservation status are based on assessments against criteria for environmental legislation that is specific to each jurisdiction.

Legend to the symbols: T = Threatened; R = Rare; V = Vulnerable; E = Endangered; CE = Critically endangered; M = listed Marine and Migratory species under the EPBC Act;

* = Mallee-dependent component of the Victorian Mallee Bird Community, listed as Threatened in Victoria.

Table 7.2. Bird species with the highest reporting rates (RR, %) in three major mallee conservation areas in the Murray Darling Depression Bioregion. This table is indicative of the original composition and relative abundance of the bird fauna within larger, intact mallee remnants.

Common name	Murray-Sunset	Danggali-Chowilla	Big Desert-Ngarkat	Average RR (%)
No. standard surveys	1,930	330	260	2,520
Yellow-plumed Honeyeater	63.42	64.56	7.92	45.30
Weebill	40.02	44.44	43.40	42.62
Grey Shrike-thrush	39.08	47.75	28.30	38.38
Spiny-cheeked Honeyeater	23.19	68.17	19.25	36.87
Spotted Pardalote	41.53	9.91	42.64	31.36
Grey Butcherbird	31.47	44.74	10.94	29.05
Crested Bellbird	26.52	54.95	2.64	28.04
White-eared Honeyeater	31.63	15.02	26.42	24.36
Striated Pardalote	25.17	39.04	6.79	23.67
White-fronted Honeyeater	7.50	39.64	18.49	21.88
Jacky Winter	21.78	32.13	-	17.97
Chestnut-rumped Thornbill	10.53	39.64	1.51	17.23
Inland Thornbill	6.88	10.81	31.70	16.46
Galah	11.20	8.71	29.06	16.32
Australian Magpie	11.72	13.81	15.47	13.67
Australian Ringneck	9.95	24.02	6.42	13.46
Australian Raven	6.20	18.62	15.47	13.43
White-browed Babbler	8.75	27.03	4.15	13.31
Brown-headed Honeyeater	5.00	14.11	20.00	13.04
Tawny-crowned Honeyeater	0.05	-	38.87	12.97
Red Wattlebird	10.11	1.80	26.04	12.65
Grey Currawong	9.17	9.61	16.23	11.67
Red-capped Robin	3.80	17.42	13.21	11.48
Willie Wagtail	10.89	16.52	6.79	11.40
Golden Whistler	3.80	-	28.30	10.70
Southern Scrub-robin	3.54	17.12	9.43	10.03
Gilbert's Whistler	3.28	24.62	1.13	9.68
Mulga Parrot	7.30	21.32	-	9.54
Rufous Whistler	2.87	23.72	1.51	9.37
Common Bronzewing	1.82	20.12	6.04	9.33
Striped Honeyeater	8.23	18.32	0.38	8.98
Chestnut Quail-thrush	13.03	13.21	0.38	8.87
Silvereye	-	-	22.64	7.55
Variegated Fairy-wren	2.50	10.51	7.92	6.98
Rainbow Bee-eater	1.25	17.72	0.75	6.57

Source: Birdlife Australia (2020a) Birddata database. Search polygons were created at least one km within the boundaries of each of the conservation areas and collated bird list data downloaded for all 2ha 20 minute + 500m area searches undertaken between 1 January 1995 to 31 December 2019. The conservation areas selected were Murray-Sunset National Park in Victoria; Danggali-Chowilla-Tarawi nature reserves/parks that conjoin in SA and NSW; and Ngarkat and Big Desert National Parks that conjoin in SA and Victoria.

Legend: Red = Eastern Mallee Bird species;

Black = Non-mallee bird species.

- = species was not observed in the given area during the timeframe.

Reporting rates from downloaded searches for each reserve area are shown. An average RR across all three conservation areas was calculated for each bird species listed and the top 35 birds are presented in average RR rank order. All these species had RR >10% in least one reserve.

Table 7.3. Survey efforts underlying data downloaded from publicly available data from the Birddata database (Birdlife Australia 2020a) used in various analyses for this assessment. Values rounded to nearest ten.

a) Number of surveys compiled for analysis of trends across relevant Natural Resource Management (NRM) regions overlapping the Eastern Mallee.

5-year period	NSW Western LLS	Vic. Mallee	Vic Wimmera	SA Murray Darling Basin	SA Northern and Yorke	SA Eyre Peninsula	Total - Eastern Mallee
1995-99	460	880	670	2,890	920	1,000	6,810
2000-04	1,300	2,750	1,670	12,200	3,650	2,410	23,970
2005-09	600	2,000	2,270	5,060	2,560	1,520	14,000
2010-14	840	1,000	1,990	4,360	5,160	1,360	14,700
2015-19	790	1,310	1,190	3,810	3,700	830	11,650
2000-2019	3,540	7,060	7,120	25,430	15,060	6,120	64,340
1995-2019	4,000	7950	7,790	28,330	15,980	7,110	71,150

Database search and download parameters: Program = General Birddata; Surveys = 2ha 20min and 500m area; Layer = NRM; Time period = 01/01/1995-31/12/2019 by five-year intervals.

b) Number of surveys compiled for analysis of trends across relevant Local Government Areas (LGAs) overlapping the Murray Mallee part of the Eastern Mallee.

Local Government Area	No surveys 1995-2019
Mildura, Vic	6,540
Swan Hill, Vic	780
West Wimmera, Vic	1,070
Hindmarsh, Vic	1,480
Yarriambiack, Vic	930
Buloke, Vic	610
Horsham, Vic	3,230
Wentworth, NSW	1,200
Balranald, NSW	750
Unincorporated SA, S of Yunta	8,950
Loxton Waikerie, SA	1,940
Southern Mallee, SA	590
Tatiara, SA	1,510
Karoonda East Murray, SA	310
Mid Murray, SA	2,830
Total – Murray Mallee	32,710

Database search and download parameters: Program = General Birddata; Survey = 2 ha 20 min and 500 m area search; Layer = LGA; Time period = 01/01/1995-31/12/2019 by five-year intervals.

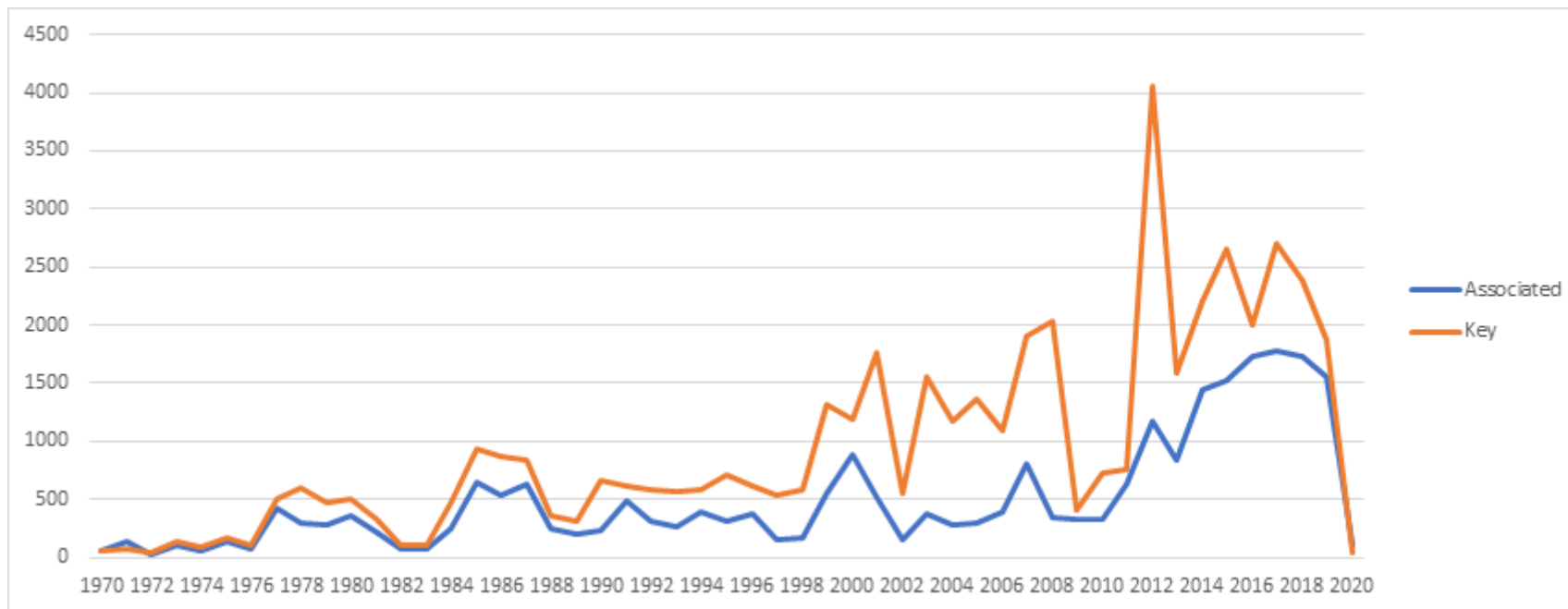
c) Number of surveys compiled for analysis of selected major conservation areas containing extensive mallee in the Eastern Mallee.

5-year period	Murray-Sunset (Vic.)	Danggali-Chowilla- Tarawi (SA-NSW)	Big Desert – Ngarkat (SA-Vic)
1995-99	40	30	20
2000-04	1,050	270	180
2005-09	680	5	30
2010-14	120	20	30
2015-19	30	10	10
2000-2019	1,870	300	250
1995-2019	1,910	330	270

Database search and download parameters: Program = General Birddata; Survey = 2 ha 20 min and 500 m area search; Layer = search polygons at least one km inside reserve boundaries; Time period = 01/01/1995-31/12/2019 by five-year intervals.

Table 7.x. Number of observations of Eastern Mallee bird species from data available from the Atlas of Living Australia, downloaded April 2020.

Time period	Associated Bird spp. n = 31 species	Key Bird spp. n = 21 species	Total Bird spp. n = 52 species
1970-1999	8,008	13,822	21,830
2000-2020	17,157	34,028	51,185
Total	25,165	47,850	73,015



Fragmentation of mallee habitats based on area of mallee within 10x10 km grid cells across the Eastern Mallee region.

Modification scheme	Extent of Mallee (ha per grid cell)	No. grid cells	% total grid cells
Intact (>90%)	>9,000 – 10,000	259	7.8
Variegated (60-90%)	>6,000 – 9,000	445	13.3
Fragmented (10-60%)	>1,000 – 6,000	1,073	32.1
Relictual (<10%)	>100 – 1,000	493	14.7
Minimal (<1%)	≤100	102	3.1
Mallee Absent (0)	0	972	29.1
Total	-	3,344	

Table 7.4. Extent and decline of individual NVIS Major Vegetation Groups present in the MDD and EYB bioregions.

MVG no. and name	Murray Darling Depression			Eyre Yorke Block		
	pre1750 (ha)	2016 (ha)	Change (%)	pre1750 (ha)	2016 (ha)	Change (%)
03 Eucalypt Open Forests	16,146	15,697	2.8	3,135	3,134	0.03
04 Eucalypt Low Open Forests	261	260	0.4	0	0	0
05 Eucalypt Woodlands	2,020,160	426,391	78.9	452,772	21,708	95.2
06 Acacia Forests and Woodlands	3927	3478	11.4	1,994	1,994	0
07 Callitris Forests and Woodlands	343,486	342,952	0.2	12,236	12,236	0
08 Casuarina Forests and Woodlands	1,215,123	262,102	78.4	30,267	30,267	0
09 Melaleuca Forests and Woodlands	176	176	0	12,678	12,678	0
10 Other Forests and Woodlands	46,687	4	99.9	215	215	0
11 Eucalypt Open Woodlands	34,680	33,118	4.5	33,518	1,041	96.9
13 Acacia Open Woodlands	1108	1108	0	1,689	0	100
14 Mallee Woodlands and Shrublands	8,898,742	5,242,554	41.1	4,495,593	1,425,485	68.3
15 Low Closed Forests and Tall Closed Shrublands	290	284	2.1	1,134	1,134	0
16 Acacia Shrublands	862,068	862,037	0	7,770	7,770	0
17 Other Shrublands	86,040	74,142	13.8	210,796	196,183	6.9
18 Heathlands	308,354	300,603	2.5	0	0	0
19 Tussock Grasslands	340,638	122,634	64.0	112,753	72,378	35.8
20 Hummock Grasslands	208	208	0	5,765	5,765	0
21 Other Grasslands, Herblands, Sedgeland and Rushlands	29,177	25,523	12.5	15,836	15,836	0
22 Chenopod, Samphire Shrublands and Forblands	1,736,795	1,474,561	15.1	184,125	140,309	23.8
23 Mangroves	0	0	0	11,591	11,590	0.01
31 Other Open Woodlands	2,985,827	2,986,293	+0.02	356,847	13,550	96.2
32 Mallee Open Woodlands and Sparse Mallee Shrublands	826,056	359,376	56.5	78,566	27,091	65.5

Source: DAWE (2020b) NVIS v5.1 dataset for Major Vegetation Groups.

Notes: Some MVGs are naturally absent from these bioregions: 01 Rainforests and Vine Thickets; 02 Eucalypt Tall Open Forests; 12 Tropical Eucalypt Woodlands/Grasslands. MVGs that code for non-vegetated, unclassified or modified groups also were not included.

7.2 Identifying component birds of the Eastern Mallee Birds

The first step in determining the species assemblage was to consider the community nominated in 2015 as the *Woodland and Heathland Bird Community of the Murray Mallee Bioregion*. This was an assemblage of 21 bird species that included all 20 species in the *Victorian Mallee Bird Community*, a threatened community under the Victorian *Flora and Fauna Guarantee Act* (1988), plus the White-browed Treecreeper (*Climacteris affinis*) (Table 7.5). The nominated assemblage was limited to IBRA subregions around the Murray Mallee in the southern part of the MDD bioregion in south-eastern SA and north-western Victoria.

Table 7.5. Bird species of the *Woodland and Heathland Bird Community of the Murray Mallee Bioregion*, as nominated for national listing.

Scientific Name	Common Name
<i>Acanthiza iredalei</i>	Slender-billed Thornbill
<i>Amytornis striatus</i>	Striated Grasswren
<i>Calamanthus cautus cautus</i>	Shy Heathwren
<i>Cinclosoma castanotus castanotus</i>	Chestnut Quail-thrush
<i>Climacteris affinis</i>	White-browed Treecreeper
<i>Drymodes brunneopygia</i>	Southern Scrub-robin
<i>Leipoa ocellata</i>	Malleefowl
<i>Lichenostomus cratitius</i>	Purple-gaped Honeyeater
<i>Lichenostomus leucotis novaenorca</i>	White-eared Honeyeater
<i>Lichenostomus ornatus</i>	Yellow-plumed Honeyeater
<i>Lichenostomus plumulus graingeri</i>	Grey-fronted Honeyeater
<i>Malurus splendens</i>	Splendid Fairy-wren
<i>Manorina melanotis</i>	Black-eared Miner
<i>Melithreptus brevirostris pallidiceps</i>	Brown-headed Honeyeater
<i>Microeca fascians assimilis</i>	Jacky Winter
<i>Pachycephala rufogularis</i>	Red-lored Whistler
<i>Pardalotus punctatus xanthopyge</i>	Yellow-rumped Pardalote
<i>Polytelis anthopeplus monarchoides</i>	Regent Parrot
<i>Psophodes nigrogularis leucogaster</i>	Western Whipbird
<i>Pyrholaemus brunneus</i>	Redthroat
<i>Stipiturus mallee</i>	Mallee Emu-wren

Source: Anon.(2015) Nomination for the *Woodland and Heathland Bird Community of the Murray Mallee Bioregion*.

Note: bird scientific names have not been updated from that used in the listing.

In the same year as the Murray Mallee Bird Community was nominated, Birdlife Australia (2015) released a report on 'State of Australian Birds: Headline Trends in Terrestrial Birds'. It included an analysis of trends in birds of the Eastern Mallee woodlands. The Eastern Mallee woodlands covered the main extent of mallee vegetation in south-eastern Australia, from the Eyre Peninsula to the Murray Darling Depression bioregion. It is a broader and more inclusive representation of mallee than the nominated region. It similarly identifies a wider suite of 48 bird species as mallee-dependent, based on literature sources and bird survey metrics (Table 7.6).

However, the Eastern Mallee report did not mention four bird species in the nominated assemblage (Slender-billed Thornbill, Striated Grasswren, Regent Parrot, Western Whipbird) and rated another two species as not mallee habitat dependent (Redthroat, White-browed Treecreeper). These issues were checked using the extensive records held by the Atlas of Living Australia to examine the bioregional and habitat occurrences of each species identified (Table 7.7). The ALA records confirmed that many identified bird species were strongly associated with mallee bioregions and vegetation groups.

Table 7.6. Bird species identified as mallee habitat dependent within the Eastern Mallee by Birdlife Australia, with their habitat and spatial metrics. Two species that did not meet the criteria for mallee habitat dependence but were nominated in Table 7.2.1 are also included. Species are listed in descending order of their Mallee habitat metric.

Scientific name	Common name	Mallee habitat dependent	Mallee woods - literature	Mallee - habitat metric	Common spp.	Spatial representation	Spatial endemism
<i>Manorina melanotis</i>	Black-eared Miner	X	1	98.87		11.96	99.92
<i>Pachycephala rufogularis</i>	Red-lored Whistler	X	1	96.34		15.73	99.25
<i>Neophema splendida</i>	Scarlet-chested Parrot	X	1	95.65		43.54	6.43
<i>Cinclosoma castanotum</i>	Chestnut Quail-thrush	X	1	95.30		67.47	7.05
<i>Stipiturus mallee</i>	Mallee Emu-wren	X	1	92.47		7.69	99.25
<i>Ptilotula ornata</i>	Yellow-plumed Honeyeater	X	1	86.92	X	93.13	20.71
<i>Oreica gutturalis</i>	Crested Bellbird	X	1	85.40	X	90.84	4.20
<i>Leipoa ocellata</i>	Malleefowl	X	1	84.85		74.98	11.98
<i>Calamanthus cautus</i>	Shy Heathwren	X	1	82.13		66.09	25.64
<i>Purnella albifrons</i>	White-fronted Honeyeater	X	1	80.91		95.40	6.14
<i>Pachycephala inornata</i>	Gilbert's Whistler	X	1	80.45		82.57	21.73
<i>Drymodes brunneopygia</i>	Southern Scrub-robin	X	1	78.21		60.50	29.75
<i>Ptilotula plumula</i>	Grey-fronted Honeyeater	X	1	77.72		54.99	3.12
<i>Nesoptilotis leucotis</i>	White-eared Honeyeater	X	1	77.14	X	76.57	11.37
<i>Microeca fascians</i>	Jacky Winter	X	1	73.60		100.49	4.51
<i>Plectorhyncha lanceolata</i>	Striped Honeyeater	X	1	72.81		48.95	8.43
<i>Pardalotus punctatus</i>	Spotted Pardalote	X	1	72.53	X	89.78	12.00
<i>Eurostopodus argus</i>	Spotted Nightjar	X	1	70.30		99.99	3.87
<i>Lichenostomus cratitius</i>	Purple-gaped Honeyeater	X	1	69.30		54.30	47.04
<i>Artamus personatus</i>	Masked Woodswallow	X	1	67.63		100.92	3.70
<i>Psephotus varius</i>	Mulga Parrot	X	1	66.92		92.48	8.01
<i>Climacteris affinis</i>	White-browed Treecreeper		0	65.67		48.95	5.91
<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill	X	1	64.15	X	97.90	6.39
<i>Cracticus torquatus</i>	Grey Butcherbird	X	1	64.13	X	94.29	4.50
<i>Malurus splendens</i>	Splendid Fairy-wren	X	1	63.52		79.27	6.81
<i>Acanthiza apicalis</i>	Inland Thornbill	X	1	63.41		89.27	5.19
<i>Corvus bennetti</i>	Little Crow	X	1	61.55		63.52	3.19
<i>Strepera versicolor</i>	Grey Currawong	X	1	61.11	X	73.66	13.98
<i>Smicromis brevirostris</i>	Weebill	X	1	60.89	X	101.84	3.95
<i>Pomatostomus ruficeps</i>	Chestnut-crowned Babbler	X	1	59.26		50.67	14.08
<i>Artamus superciliosus</i>	White-browed Woodswallow	X	1	57.36		100.92	5.62
<i>Chalcites osculans</i>	Black-eared Cuckoo	X	1	56.91		101.26	3.83

Scientific name	Common name	Mallee habitat dependent	Mallee woods - literature	Mallee - habitat metric	Common spp.	Spatial representation	Spatial endemism
<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater	X	1	55.12		95.86	12.70
<i>Pachycephala pectoralis</i>	Golden Whistler	X	1	55.05		102.28	12.03
<i>Melanodryas cucullata</i>	Hooded Robin	X	1	52.74		102.43	3.93
<i>Aegotheles cristatus</i>	Australian Owlet-nightjar	X	1	51.94		100.46	3.60
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	X	1	50.51	X	101.58	4.67
<i>Petroica goodenovii</i>	Red-capped Robin	X	1	49.22		101.85	4.36
<i>Barnardius zonarius</i>	Australian Ringneck	X	1	48.01	X	95.62	5.10
<i>Dromaius novaehollandiae</i>	Emu	X	1	47.84		100.92	3.63
<i>Colluricincla harmonica</i>	Grey Shrike-thrush	X	1	47.76	X	101.85	3.58
<i>Merops ornatus</i>	Rainbow Bee-eater	X	1	47.32		100.62	3.62
<i>Pomatostomus superciliosus</i>	White-browed Babbler	X	1	45.46	X	101.75	5.99
<i>Daphoenositta chrysoptera</i>	Varied Sittella	X	1	45.09		101.85	4.22
<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo	X	1	44.21		59.44	4.26
<i>Myiagra inquieta</i>	Restless Flycatcher	X	1	43.67		101.85	6.26
<i>Gerygone fusca</i>	Western Gerygone	X	1	42.42		43.26	2.33
<i>Malurus lamberti</i>	Variegated Fairy-wren	X	1	42.39		98.32	4.20
<i>Pardalotus striatus</i>	Striated Pardalote	X	1	41.53	X	100.62	3.96
<i>Pyrrholaemus brunneus</i>	Redthroat		1	10.79		54.72	4.65

Source: Birdlife Australia (2015a). An explanation of the metrics is presented below, as quoted by Birdlife Australia (2015d):

Habitat association - literature (applied to habitat specific indices only): A binary classification of whether a species is noted in ecological literature as utilising a habitat for feeding ('obtaining a non-trivial proportion of its nutrient and energy intake') or breeding, based on (Garnett et al. Australian Bird Data Version 1.0 - Scientific data, in review). [1 means the species has been recorded to use mallee as a significant habitat.]

Habitat association - metric (applied to habitat specific indices only): The proportion of a species occurrence records as determined by all bird data which has a reliable spatial accuracy (recorded metadata) of 500m or better, which intersect a habitat type - as determined by groupings of NVIS mapping. The threshold applied varies based on regional characteristics and ecological characteristics of the focal habitat (this is noted on composite index graphs). [The higher the metric, the more associated a species is to mallee habitat. For instance, Black-eared Miners are very strongly associated with mallee woodlands while the Redthroat is poorly associated with mallee.]

To qualify as a habitat indicator a species must be noted in ecological literature, have a habitat association of at least the threshold amount and have a majority association with the focal habitat. [A threshold of >40 was applied for the Eastern Mallee habitat.]

Spatial representation: the proportion of a region over which a species occurs (as determined by the species core Extent of Occurrence) - i.e. how widespread the species is in the region. [A higher metric means a species occurs more widely across the Eastern Mallee region. For instance, the Black-eared Miner is found only within about 12% of the Eastern Mallee region, while the Redthroat is found over about half the region's area.]

Spatial endemism: the proportion of a species range that occurs within a region - i.e. how confined the species is to that region. [A higher metric means a species is more limited to the Eastern Mallee region. For instance, almost the entire known national range of the Black-eared Miner occurs within the Eastern Mallee region, while only 4.64% of the known national range for the Redthroat occurs in the Eastern Mallee.]

Species must have a spatial representativeness of at least 25% or a spatial endemism at least 75% to qualify as an indicator for a region or in the case of common species indices have a spatial representativeness of at least 50%.

Table 7.7. Atlas of Living Australia records for eastern mallee bird species identified in [Tables 7.5](#) and [7.6](#). Data refer to the proportion of available records per species associated with (1) the key Eastern Mallee IBRA bioregions (MDD and/or EYB) and (2) Mallee Major Vegetation Groups. The rank in terms of number of records given to the bioregions or MVGs of interest also are shown. Species are listed in descending order of % records ascribed to mallee MVGs.

Species name	% IBRA records in MDD+EYB	Rank of MDD or EYB	% records in Mallee	Rank of Mallee MVG
<i>Manorina melanotis</i>	98.1	1	94.3	1
<i>Pachycephala rufogularis</i>	92.9	1	87.5	1
<i>Amytornis striatus</i>	89.2	1	85.6	1
<i>Leipoa ocellata</i>	80.6	1	79.3	1
<i>Cinclosoma castanotum</i>	86.6	1	79.0	1
<i>Ptilotula ornata</i>	77.0	1	75.8	1
<i>Stipiturus mallee</i>	79.7	1	75.6	1
<i>Calamanthus cautus</i>	66.5	1	71.5	1
<i>Psophodes nigrogularis</i>	72.7	1	71.0	1
<i>Polytelis anthopeplus</i>	67.3	1	68.9	1
<i>Lichenostomus cratitius</i>	67.0	1	68.1	1
<i>Drymodes brunneopygia</i>	86.0	1	66.8	1
<i>Purnella albifrons</i>	62.1	1	58.3	1
<i>Neophema splendida</i>	42.1	1	57.1	1
<i>Oreoica gutturalis</i>	49.8	1	47.3	1
<i>Pachycephala inornata</i>	50.3	1	44.6	1
<i>Psephotellus varius</i>	55.4	1	44.4	1
<i>Ptilotula plumula</i>	35.2	1	43.2	1
<i>Malurus splendens</i>	65.8	1	40.9	1
<i>Acanthiza apicalis</i>	41.4	1	40.5	1
<i>Eurostopodus argus</i>	78.7	1	38.3	1
<i>Climacteris affinis</i>	62.2	1	36.1	1
<i>Acanthiza iredalei</i>	6.3	3	34.5	2
<i>Acanthiza uropygialis</i>	41.5	1	34.2	1
<i>Barnardius zonarius</i>	37.7	1	31.9	1
<i>Acanthagenys rufogularis</i>	36.7	1	28.2	1
<i>Smicornis brevirostris</i>	30.0	1	27.9	2
<i>Pomatostomus superciliosus</i>	33.0	1	26.7	2
<i>Artamus personatus</i>	31.5	1	26.7	2
<i>Pomatostomus ruficeps</i>	37.6	1	25.8	1
<i>Pyrholaemus brunneus</i>	27.0	2	21.8	2
<i>Cacatua leadbeateri</i>	39.9	1	21.1	1
<i>Artamus superciliosus</i>	26.8	1	21.1	2
<i>Petroica goodenovii</i>	25.4	1	20.7	2
<i>Melanodryas cucullata</i>	28.2	1	20.4	2
<i>Chalcites osculans</i>	24.0	1	20.1	2
<i>Nesoptilotis leucotis</i>	17.1	2	17.6	3
<i>Melithreptus brevirostris</i>	17.4	2	16.1	3
<i>Microeca fascinans</i>	17.8	1	15.0	3
<i>Plectorhyncha lanceolata</i>	17.5	1	15.0	3
<i>Strepera versicolor</i>	16.6	5	14.4	3
<i>Dromaius novaehollandiae</i>	20.3	1	13.8	3
<i>Malurus lamberti</i>	16.7	3	13.3	3
<i>Merops ornatus</i>	15.6	1	12.6	3
<i>Aegotheles cristatus</i>	12.2	3	10.8	3
<i>Corvus bennetti</i>	14.2	2	10.2	4
<i>Pardalotus striatus</i>	13.0	3	9.9	3
<i>Daphoenositta chrysoptera</i>	11.7	4	8.8	3
<i>Cracticus torquatus</i>	9.2	5	8.4	3
<i>Colluricincla harmonica</i>	9.7	5	8.3	3
<i>Pardalotus punctatus</i>	8.4	5	8.0	3

Species name	% IBRA records in MDD+EYB	Rank of MDD or EYB	% records in Mallee	Rank of Mallee MVG
<i>Myiagra inquieta</i>	9.9	4	7.1	3
<i>Gerygone fusca</i>	5.6	7	5.2	4
<i>Pachycephala pectoralis</i>	4.4	9	3.8	5

Source: *Atlas of Living Australia* (ALA) records for each species, accessed March 2020.

The analysis focused on ALA records from across NSW, SA and Victoria, to determine the proportion of south-eastern Australian occurrences within the Eastern Mallee region and habitat of interest. This allowed consideration of a potentially wider timeframe of records, dating back to the late 19th century, than was available from the Birddata database. Data did not take accuracy of records into account, given the broad landscape scale of the analysis. Records where habitat or bioregion were designated as not recorded, unknown or no data were disregarded.

The percentage of IBRA or MVG records only includes those where an IBRA or MVG was assigned to the record. It is calculated as the number of records assigned to a given bioregion or MVG divided by the total number of records where these were attributed for each species.

The rank of Mallee bioregion or MVG shows the rank of the item when each bioregion or MVG allocated to a species was ordered from highest to lowest number of records. In the case of bioregion, the focus was on either the MDD or EYB bioregions and the rank shown is for the highest ranked bioregion.

The combination of data from the nomination, Birdlife Australia (2015a) and the Atlas of Living Australia was used to confirm an assemblage of Eastern Mallee birds and establish a subset of 21 key mallee species mallee bird species more strongly tied to mallee habitats and a subset of 31 associated mallee species ([Table 7.7](#)). Key mallee species are determined as those bird species that have either: a very high BA mallee habitat metric >80; or a mallee habitat metric >60 plus either ALA records show >60% of available records are associated with mallee, or the species is part of the threatened Victorian Mallee Bird community.

The Striated Grasswren, Regent Parrot, Western Whipbird and White-browed Treecreeper are confirmed as members of the Eastern Mallee Birds, while the Redthroat and Slender-billed Thornbill are not included in the Eastern Mallee bird assemblage.

Table 7.7. Summary of Eastern Mallee bird characteristics used to determine key and associated mallee bird species.

Species name	Common name	BA mallee metric	ALA (% mallee MVG)	Vic MBC	Common species
Key mallee bird species: BA Mallee metric >80; or >60 + ALA mallee records >60 or part of Vic Mallee Bird community					
<i>Manorina melanotis</i>	Black-eared Miner	98.87	94.3	*	
<i>Pachycephala rufogularis</i>	Red-lored Whistler	96.34	87.5	*	
<i>Neophema splendida</i>	Scarlet-chested Parrot	95.65	57.1		
<i>Cinclosoma castanotum</i>	Chestnut Quail-thrush	95.30	79.0	*	
<i>Stipiturus mallee</i>	Mallee Emu-wren	92.47	75.6	*	
<i>Ptilotula ornata</i>	Yellow-plumed Honeyeater	86.92	75.8	*	x
<i>Oreoica gutturalis</i>	Crested Bellbird	85.40	47.3		x
<i>Leipoa ocellata</i>	Malleefowl	84.85	79.3	*	
<i>Calamanthus cautus</i>	Shy Heathwren	82.13	71.5	*	
<i>Purnella albifrons</i>	White-fronted Honeyeater	80.91	58.3		
<i>Pachycephala inornata</i>	Gilbert's Whistler	80.45	44.6		
<i>Drymodes brunneopygia</i>	Southern Scrub-robin	78.21	66.8	*	
<i>Ptilotula plumula</i>	Grey-fronted Honeyeater	77.72	43.2	*	
<i>Nesoptilotis leucotis</i>	White-eared Honeyeater	77.14	17.6	*	x
<i>Microeca fascians</i>	Jacky Winter	73.60	15.0	*	
<i>Pardalotus punctatus</i>	Spotted Pardalote	72.53	8.0	*	x
<i>Lichenostomus cratitius</i>	Purple-gaped Honeyeater	69.30	68.1	*	
<i>Malurus splendens</i>	Splendid Fairy-wren	63.52	40.9	*	
<i>Amytornis striatus</i>	Striated Grasswren	-	85.6	*	
<i>Psophodes nigrogularis</i>	Western Whipbird	-	71.0	*	
<i>Polytelis anthopeplus</i>	Regent Parrot	-	68.9	*	
Associated mallee bird species: BA Mallee metric >40 + ALA mallee records <60					
<i>Plectorhyncha lanceolata</i>	Striped Honeyeater	72.81	15.0		
<i>Eurostopodus argus</i>	Spotted Nightjar	70.30	38.3		
<i>Artamus personatus</i>	Masked Woodswallow	67.63	26.7		
<i>Psephotus varius</i>	Mulga Parrot	66.92	44.4		
<i>Climacteris affinis</i>	White-browed Treecreeper	65.67	36.1		
<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill	64.15	34.2		x
<i>Cracticus torquatus</i>	Grey Butcherbird	64.13	8.4		x
<i>Acanthiza apicalis</i>	Inland Thornbill	63.41	40.5		
<i>Corvus bennetti</i>	Little Crow	61.55	10.2		
<i>Strepera versicolor</i>	Grey Currawong	61.11	14.4		x
<i>Smicromis brevirostris</i>	Weebill	60.89	27.9		x
<i>Pomatostomus ruficeps</i>	Chestnut-crowned Babbler	59.26	25.8		
<i>Artamus superciliosus</i>	White-browed Woodswallow	57.36	21.1		
<i>Chalcites osculans</i>	Black-eared Cuckoo	56.91	20.1		
<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater	55.12	16.1	*	
<i>Pachycephala pectoralis</i>	Golden Whistler	55.05	3.8		
<i>Melanodryas cucullata</i>	Hooded Robin	52.74	20.4		
<i>Aegotheles cristatus</i>	Australian Owlet-nightjar	51.94	10.8		
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	50.51	28.2		x
<i>Petroica goodenovii</i>	Red-capped Robin	49.22	20.7		
<i>Barnardius zonarius</i>	Australian Ringneck	48.01	31.9		x
<i>Dromaius novaehollandiae</i>	Emu	47.84	13.8		
<i>Colluricincla harmonica</i>	Grey Shrike-thrush	47.76	8.3		x
<i>Merops ornatus</i>	Rainbow Bee-eater	47.32	12.6		
<i>Pomatostomus superciliosus</i>	White-browed Babbler	45.46	26.7		x
<i>Daphoenositta chrysoptera</i>	Varied Sittella	45.09	8.8		
<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo	44.21	21.1		
<i>Myiagra inquieta</i>	Restless Flycatcher	43.67	7.1		
<i>Gerygone fusca</i>	Western Gerygone	42.42	5.2		
<i>Malurus lamberti</i>	Variegated Fairy-wren	42.39	13.3		
<i>Pardalotus striatus</i>	Striated Pardalote	41.53	9.9		x

Sources: Tables 7.3-5, above.

8 APPENDIX B - RELATIONSHIP TO OTHER CLASSIFICATIONS

Ecological communities are complex to classify. Each jurisdiction applies their own system to classify vegetation communities, while faunal communities generally are poorly and less systematically defined. Reference to vegetation and mapping units as equivalent to an ecological community, at the time of listing, should be taken as indicative rather than definitive. A unit that is generally equivalent may include elements that do not meet the key diagnostics and minimum condition thresholds. Conversely, areas mapped or described as other units may sometimes meet the key diagnostics for the ecological community. Judgement of whether the ecological community is present at a particular site should focus on how the site meets the description (section 0), the key diagnostic characteristics and any minimum condition thresholds. On-ground assessment is vital to properly determine if any occurrence is part of the ecological community.

The Eastern Mallee Bird Community overlaps in its distribution, habitat, and/or species composition with three other broad woodland bird communities identified from southern Australia (Anon. 2017).

- Temperate South Australia woodland bird community. It occurs in the Eyre Yorke Block, Flinders Lofty Block, Kanmantoo, and Naracoorte Coastal Plain bioregions. This community overlaps with the Eastern Mallee in the EYB bioregion and the FLB02 Broughton subregion. Extensive mallee woodlands occurred in this region but their remnants are not habitat for this bird community. Key differences with the Temperate SA bird community are: the Eastern Mallee Birds preferentially occupies, but is not necessarily limited to, mallee habitats; and it contains 18 bird species not part of the Temperate SA Birds.
- Temperate South-eastern Mainland Australia woodland bird community. It occurs in bioregions within, and south of, the Darling Riverine Plain and New England Tablelands bioregions, and east from the MDD bioregion to the south-east coast but excluding the Australian Alps bioregion. This community overlaps with the Eastern Mallee in its westernmost extent, in the MDD bioregion. Extensive mallee woodlands occurred in this region but their remnants are not habitat for this bird community. Key differences with the Temperate SE Mainland bird community are: the Eastern Mallee Birds preferentially occupies, but is not necessarily limited to, mallee habitats; and it contains 18 bird species not part of the Temperate SE Mainland Birds.
- South-west Western Australia Eucalypt woodland bird community. It occurs in all bioregions across south-western Australia within, and south of, the Geraldton Sandplains and Yalgloo bioregions, east to the Nullarbor, but excluding the Swan Coastal Plain bioregion. The distribution of this community does not overlap with that of the Eastern Mallee Birds, being further west. The WA Eucalypt birds contains some extensive mallee woodlands, notably within the Great Western Woodlands. Key differences with the WA Eucalypt bird community are: the Eastern Mallee Birds does not extend into the mallee habitats of WA; and it contains nine bird species not part of the WA Eucalypt Birds.

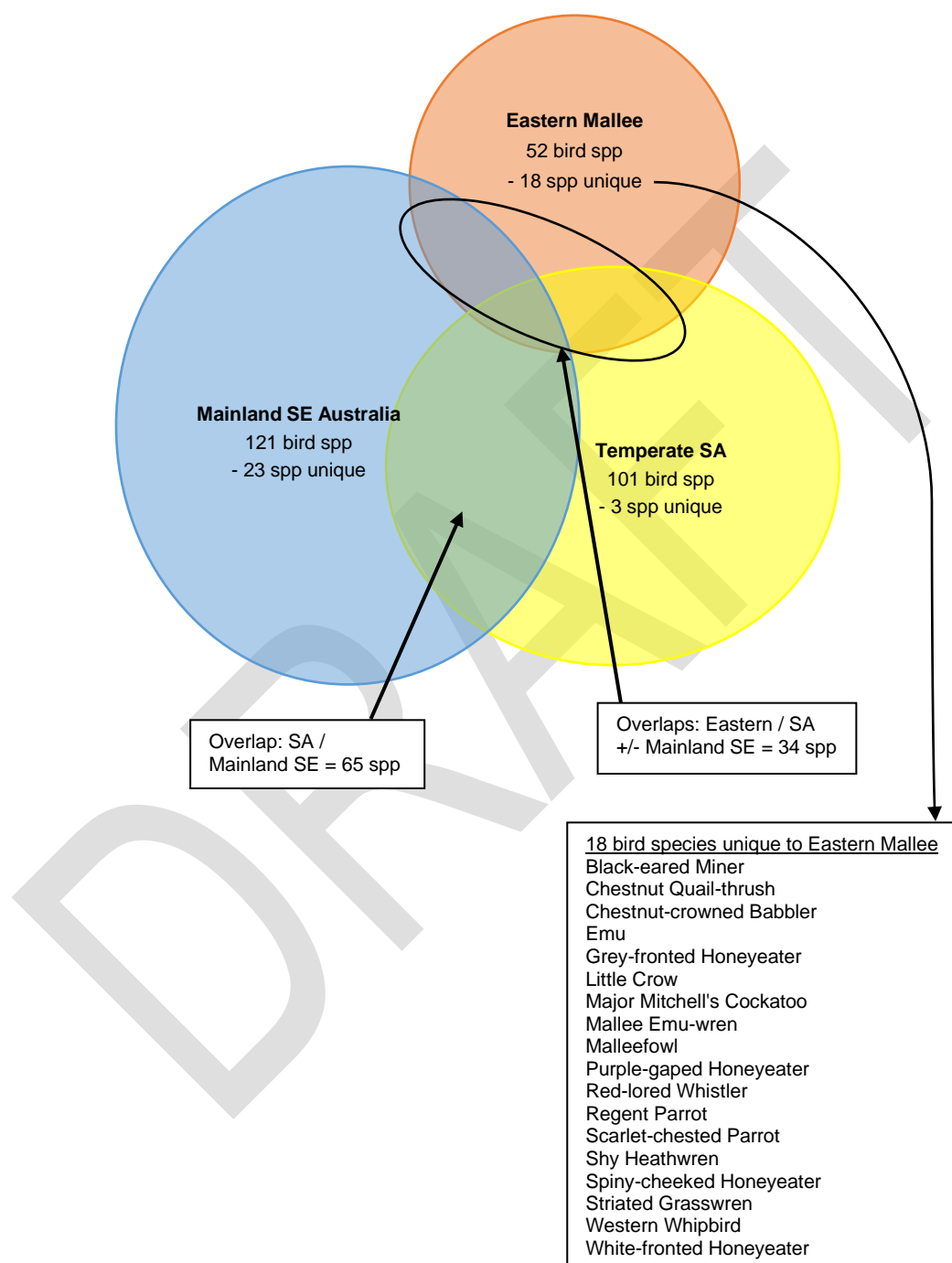
The overlaps in species composition between the Eastern Mallee Birds and the three southern mallee bird communities are detailed in [Table 8.1](#). Nine of the 52 Eastern Mallee bird species are entirely unique to the Eastern Mallee Bird Community, the remainder being present in one or more of the SA, WA or South-eastern Mainland bird communities.

However, if only the two bird communities that directly overlap in distribution and habitat are considered (i.e. just the two south-eastern bird communities - Temperate SA and SE Mainland – and excluding WA Eucalypt), then the degree of overlap is relatively less and the number of bird species unique to Eastern Mallee rises to eighteen ([Figure 8.1](#)). Most of the unique mallee bird species are key mallee species that are threatened and have restricted distributions.

The proportion of the bird fauna that overlaps between the Eastern Mallee Birds and each of the other southern woodland bird communities is in the order of a quarter to a third of species (27% of the 121 Mainland SE birds; 33% of the 101 Temperate SA birds; and 36% of the 110 WA

birds). The proportion of species unique to each bird community is generally higher for the WA and SE Mainland communities, low for the Eastern Mallee and few for the Temperate SA bird community.

Figure 8.1. Relationships of broad woodland bird communities in south-eastern Australia. The three woodland bird communities are the Eastern Mallee Birds, which overlaps with the Temperate South Australia Birds (in the EYB and FLB bioregions), and the Temperate Mainland South-eastern Australia Birds (in the MDD bioregion).



Sources: Anon (2017); data in Section 7.2. The overlaps between the Eastern Mallee and the other two south-eastern bird communities comprises 32 bird species common to all three bird communities; one species (Australian Ringneck) common to Eastern Mallee and Mainland SE; and one species common to Eastern Mallee and Temperate SA (Spotted Nightjar).

Table 8.1. Overlap between the Eastern Mallee birds and the Temperate SA, Temperate SE Mainland Australia and WA Eucalypt woodland bird communities.

Common Name	Eastern Mallee	SE Mainland	Temperate SA	WA Eucalypt
Total no of birds in assemblage	52	121	101	109
Australian Owlet-nightjar	X	X	X	X
Black-eared Cuckoo	X	X	X	X
Brown-headed Honeyeater	X	X	X	X
Chestnut-rumped Thornbill	X	X	X	X
Crested Bellbird	X	X	X	X
Gilbert's Whistler	X	X	X	X
Golden Whistler	X	X	X	X
Grey Butcherbird	X	X	X	X
Grey Currawong	X	X	X	X
Grey Shrike-thrush	X	X	X	X
Hooded Robin	X	X	X	X
Inland Thornbill	X	X	X	X
Jacky Winter	X	X	X	X
Masked Woodswallow	X	X	X	X
Mulga Parrot	X	X	X	X
Rainbow Bee-eater	X	X	X	X
Red-capped Robin	X	X	X	X
Restless Flycatcher	X	X	X	X
Splendid Fairy-wren	X	X	X	X
Spotted Pardalote	X	X	X	X
Striated Pardalote	X	X	X	X
Varied Sittella	X	X	X	X
Variegated Fairy-wren	X	X	X	X
Weebill	X	X	X	X
Western Gerygone	X	X	X	X
White-browed Babbler	X	X	X	X
White-eared Honeyeater	X	X	X	X
Yellow-plumed Honeyeater	X	X	X	X
Australian Ringneck	X	X		X
Southern Scrub-robin	X	X	X	
Spotted Nightjar	X		X	X
Striped Honeyeater	X	X	X	
White-browed Treecreeper	X	X	X	
White-browed Woodswallow	X	X	X	
Chestnut Quail-thrush	X			X
Emu	X			X
Little Crow	X			X
Major Mitchell's Cockatoo	X			X
Malleefowl	X			X
Regent Parrot	X			X
Shy Heathwren	X			X
Spiny-cheeked Honeyeater	X			X
White-fronted Honeyeater	X			X
Black-eared Miner	X			
Chestnut-crowned Babbler	X			
Grey-fronted Honeyeater	X			
Mallee Emu-wren	X			
Purple-gaped Honeyeater	X			
Red-lored Whistler	X			
Scarlet-chested Parrot	X			
Striated Grasswren	X			
Western Whipbird	X			

Sources: Anon (2017). This table is sorted according to whether birds are widespread across all four bird communities, occur among 2-3 communities, or are unique to the Eastern Mallee.

Birdlife Australia (2015) identified a separate group of bird assemblages. Two of these are woodland/shrubland assemblages adjacent in distribution and with overlapping bird compositions to the Eastern Mallee.

- South-eastern Mainland Dry Sclerophyll Woodland/Forests (SEM DSF) bird community. This assemblage occurs from Kangaroo Island, Fleurieu Peninsula and the Coorong of SA into Victoria and central NSW east of the MDD bioregion. It overlaps with the Eastern Mallee to a minor degree around the Coorong. The SEM DSF bird assemblage comprises 81 species identified as being indicative of its presence. Of these, 17 bird species overlap with the Eastern Mallee Birds.
- The Arid Zone Woodlands and Shrublands bird community covers the extensive arid regions to the north of the Eastern Mallee into the Northern Territory, much of Western Australia and the far western parts of NSW and Queensland. It overlaps with areas of mallee that lie outside of the Eastern Mallee, for instance in the Gawler and Great Victoria Desert bioregions. The Arid Zone WS bird assemblage comprises 104 species identified as being indicative of its presence. Of these, 33 bird species overlap with the Eastern Mallee Birds.

The overlaps in species composition between the Eastern Mallee Birds and these two adjacent bird communities are detailed in [Table 8.2](#). Fourteen of the 52 Eastern Mallee bird species are entirely unique to the Eastern Mallee Bird Community, the remainder being present in one or more of the South-eastern or Arid Zone bird communities.

Table 8.2. Overlaps between Birdlife Australia's (2015) terrestrial bird assemblages: Eastern Mallee, South-eastern Mainland dry sclerophyll woodlands/forests (SEM DSF), and Arid Zone woodlands/shrublands (Arid Zone WS). The comparison is based on the SE and Arid zone bird species identified as being indicative for these bird communities.

Common name	Eastern Mallee	SEM DSF	Arid Zone WS
Total no birds in assemblage	52	81	104
Australian Owlet-nightjar	X	X	X
Australian Ringneck	X	X	X
Crested Bellbird	X	X	X
Emu	X	X	X
Grey Shrike-thrush	X	X	X
Hooded Robin	X	X	X
Jacky Winter	X	X	X
Masked Woodswallow	X	X	X
Rainbow Bee-eater	X	X	X
Restless Flycatcher	X	X	X
Spotted Nightjar	X	X	X
Striated Pardalote	X	X	X
Brown-headed Honeyeater	X	X	
Gilbert's Whistler	X	X	
Golden Whistler	X	X	
Grey Currawong	X	X	
Spotted Pardalote	X	X	
Black-eared Cuckoo	X		X
Chestnut Quail-thrush	X		X
Chestnut-crowned Babbler	X		X
Chestnut-rumped Thornbill	X		X
Grey Butcherbird	X		X
Grey-fronted Honeyeater	X		X
Inland Thornbill	X		X
Major Mitchell's Cockatoo	X		X
Mulga Parrot	X		X
Red-capped Robin	X		X
Scarlet-chested Parrot	X		X
Spiny-cheeked Honeyeater	X		X
Splendid Fairy-wren	X		X
Varied Sittella	X		X
Variegated Fairy-wren	X		X
Weebill	X		X
Western Gerygone	X		X
White-browed Babbler	X		X
White-browed Treecreeper #	X		X
White-browed Woodswallow	X		X
White-fronted Honeyeater	X		X
Black-eared Miner	X		
Little Crow	X		
Mallee Emu-wren	X		
Malleefowl	X		
Purple-gaped Honeyeater	X		
Red-lored Whistler	X		
Regent Parrot #	X		
Shy Heathwren	X		
Southern Scrub-robin	X		
Striated Grasswren #	X		
Striped Honeyeater	X		
Western Whipbird #	X		
White-eared Honeyeater	X		
Yellow-plumed Honeyeater	X		

Source: Birdlife Australia (2015). This table is sorted according to whether birds are widespread across all three bird communities, occur among 2 communities, or are unique to the Eastern Mallee.

= not identified as a BA index species for the Eastern Mallee but present in the national community.

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