Conservation Action Planning

2015

Mallee Emu-Wren *Stipiturus mallee*

Black-eared Miner *Manorina melanotis*

Western Whipbird (eastern) *Psophodes nigrogularis leucogaster*

Red-lored Whistler *Pachycephala rufogularis*

Regent Parrot (eastern) *Polytelis anthopeplus monarchoides*

Malleefowl *Leipoa ocellata*

Threatened Mallee Birds Project

Compiled by: Rebecca Boulton and Jenny Lau (BirdLife Australia)

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Acknowledgments:

Members of the Threatened Mallee Birds CAP Implementation Team including Rebecca Boulton, Jenny Lau, Wendy Stubbs, Chris Hedger, Vicky-Jo Russell, Jill Fleming, Rohan Clarke, Simon Watson, Sarah Brown, Simon Nally, Liberty Olds, Samantha Vine, David Parker and Peter Copley.

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Abbreviations

MEW	Mallee Emu-wren
BEM	Black-eared Miner
WWB	Western Whipbird
RLW	Red-lored Whistler
RP	Regent Parrot
MF	Malleefowl
CAP	Conservation Action Plan
YTM	Yellow-throated Miner
DEWNR	Department of Environment, Water and Natural Resources
DELWP	Department of Environment, Land, Water and Planning
DEDJTR	Department of Economic Development, Jobs, Transport and Resources
DoE	Department of the Environment, Canberra
OEH	Office of Environment and Heritage, NSW
PV	Parks Victoria
BirdLife	BirdLife Australia
ARI	Arthur Rylah Institute
ANU	Australian National University
TNC	The Nature Conservancy
CCSA	Conservation Council of South Australia

Contents

Tables & Figures

Executive Summary

This report documents progress on the Threatened Mallee Birds Conservation Action Plan (CAP). Information gathered during workshops held in 2014 and 2015 are included in this first iteration CAP.

Overall population health for the six conservation targets were assessed as *poor* for Mallee-Emu-wren, Black-eared Miner and Western Whipbird and *fair* for the Red-lored Whistler, Regent Parrot and Malleefowl.

Base data in the CAP documents 13 threats to the conservation targets. High priority threats were identified as Catastrophic Wildfire, Past Habitat Loss and Fragmentation, Drought, and Inappropriate Fire Management with each threat ranking *very high*, the threat Overall Grazing Pressure ranked *high*. The overall threat ranking for the Mallee-Emu-wren, Black-eared Miner and Western Whipbird was *very high*, with Red-lored Whistler, Regent Parrot and Malleefowl ranking *high*.

There are 12 strategies outlined in this document, grouped under five key program areas, reflecting the implementation approach taken by each operational team to achieve our goals. The current iteration of the CAP focuses on emergency, short-term actions (1-5 years); it is envisaged that more 'long-term' actions will be prioritised in future iterations of the CAP.

A separate, detailed **Work Plan** has been developed to achieve these actions including; the expected duration and timeframe for each action, the likely agency/individual to undertake the work, and an approximate cost and source of possible funding.

1. BACKGROUND

1.1 Introduction

This document summarises the progress of the Threatened Mallee Birds CAP process to May 2015. The original process commenced in May 2014, when an emergency summit was called after a number of wildfires wiped out large tracts of habitat for nationally threatened mallee bird species. The meeting was primarily prompted by the loss of key populations for the endangered Mallee Emu-wren and Black-eared Miner.

The group came together to determine the immediate and ongoing actions and funding needed to prevent these species from becoming extinct, and to align and prioritise actions across multiple species aided by both endorsed and draft National Recovery Plan objectives. Using a multi-species approach we hope to develop an efficient and cost-effective Conservation Action Plan for a number of threatened taxa, tackling both broader landscape threats and individual species' threats.

1.2 Conservation Action Planning

The planning process for the Threatened Mallee Birds Project uses the Open Standards for the Practice of Conservation, developed by the Conservation Measures Partnership to help conservation teams systematically plan, implement, and monitor their conservation initiatives in an adaptive management framework. However, we also utilize the Conservation Action Planning (CAP) framework, The Nature Conservancy's version of the *Open Standards* which is becoming more widely adopted in Australia for planning large scale conservation projects with multiple stakeholders (i.e. WildEyre CAP, Living Flinders CAP).

The *Open Standards* are organized into a five-step project management cycle, very similar to the 10-step framework used within a CAP process. Steps are used as a guide and will vary under different conditions and between projects. Although presented as a sequential series of steps, the entire process is rarely applied in a linear fashion. The *Open Standards* process typically involves a series of conservation planning workshops with participants from multiple organisations (currently 40 people from 12 organisations, Appendix 1). The process is often facilitated by a trained *Open Standards* or CAP coach and uses a standard step-by-step methodology (Conservation Measures Partnership, 2013) using an excel-based program or Miradi software to guide participants through the development of a first iteration CAP.

The Threatened Mallee Birds first iteration CAP spanned one year, during which the team met regularly to refine and develop the CAP for the threatened species (four workshops between May 2014 and February 2015). The details of the Threatened Mallee Birds CAP were developed in Miradi, a software program designed by conservation practitioners to implement the *Open Standards*. This report documents the Threatened Mallee Birds first iteration CAP as of the May 2015:

The major steps in the process, as outlined in this document, are:

STEP 1 Conceptualize the Project Vision and Context

- Define Planning Purpose and Project Team
- Define Scope, Vison, and Conservation Targets

1.3 Threatened Mallee Birds Project Area

The Threated Mallee Birds Project area is largely defined by the distribution of the threatened species it covers. It is centred on the Murray Mallee region of Victoria, New South Wales and South Australia (Fig. 1), within the Murray-Darling Depression bioregion. The region contains some of the most extensive and intact old-growth mallee vegetation in the three States and includes the following Important Bird and Biodiversity Areas (IBAs);

Billiatt
Central NSW Mallee
Peebinga
Wyperfeld, Big Desert and Ngarkat
Riverland Mallee
Murray-Sunset, Hattah and Annuello

Much of the largely intact mallee system north of the River Murray in South Australia is contained in the Riverland Biosphere Reserve (over 900,000 ha) which includes the former pastoral properties of Calperum, Chowilla, and Taylorville and Gluepot to the west, and Danggali Conservation Park in the north-east.

The mallee and mallee-heath systems south and east of the River Murray, South Australia, have largely been cleared. Most of the remaining native vegetation is now contained in two conservation reserves, Billiatt and Ngarkat Conservation Parks. Ngarkat, together with the Big Desert Wilderness Park, Wyperfeld National Park and other Victorian protected areas, form one of the largest remnant areas of native vegetation in south-eastern Australia (approximately 885,000 ha). The Murray-Sunset National Park, at 633,000 ha, is the second largest National Park in Victoria.

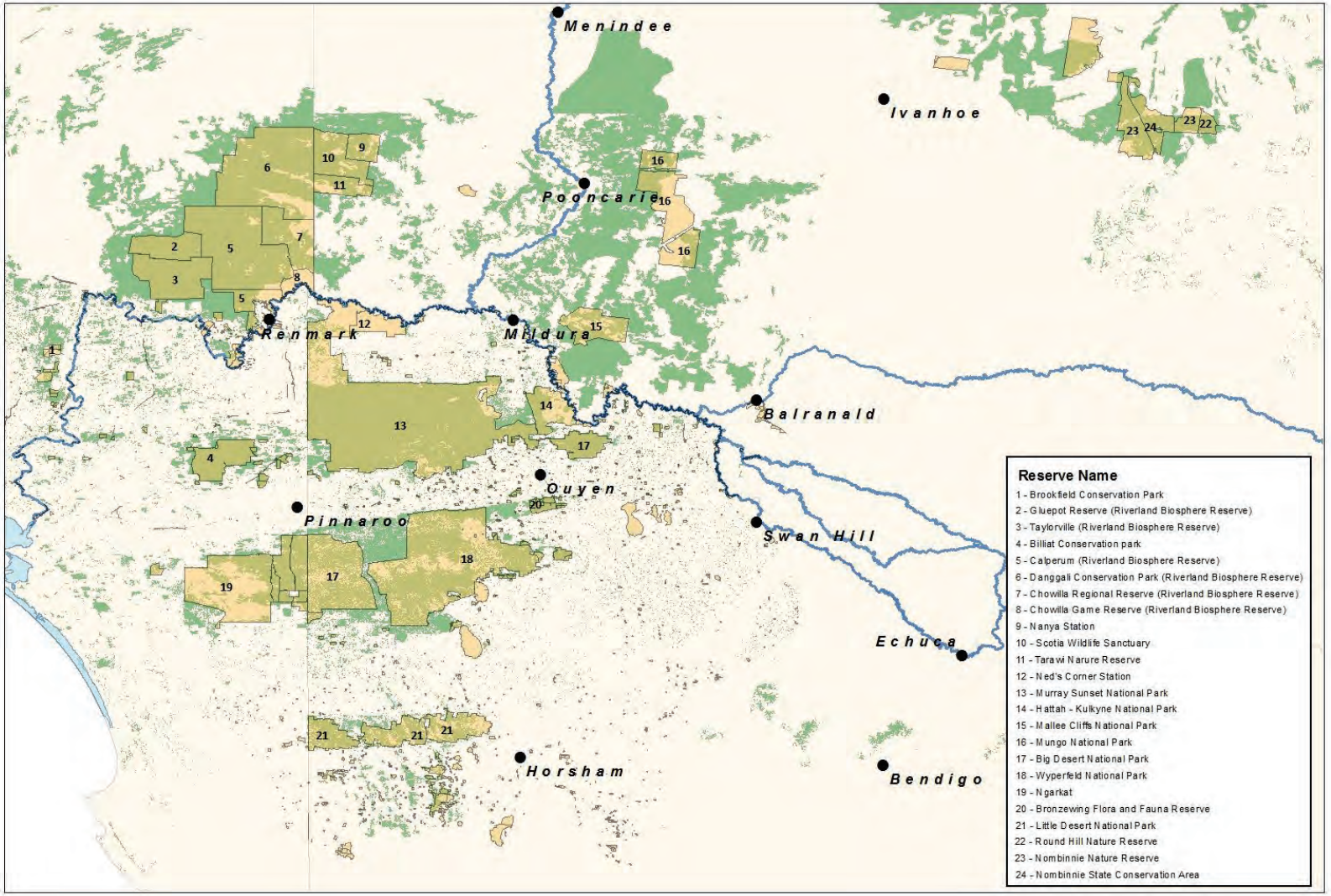

Figure 1. Murray Mallee Region of south-eastern Australia showing the major mallee reserves.

Climate and Rainfall

The northern Murray–Darling Depression bioregion has a semi-arid climate with hot summers, mild winters and rain falling relatively evenly throughout the year. The southern area experiences a slightly more Mediterranean climate with warm to hot summers and cool moist winters when most of the rain falls. Average annual rainfall in the bioregion ranges from around 200 to 550 mm per year.

European Land Use History

Explorers and squatters initially disliked the mallee because it contained little water or grass for stock. Therefore, land with access to the Murray River floodplain was the first to be used for sheep grazing. The first land offered for wheat-farming in the region was in close proximity to the Murray River and its river steamers which were essential in carting the wheat to market.

In the 1870s, the mallee took on enormous value when considered as an extensive farming system for cereal crops. However, the mallee vegetation was particularly difficult to clear because removing the top growth and leaving the tuberous stump simply encouraged new shoots to emerge from the stump. The development of the mallee roller (1868) and the stump-jump plough (1876) together transformed the economics of clearing, cultivating and cropping mallee country. But mallee clearing was still relatively slow as the scrub was dragged down by horses or bullock teams and it was not until the advent of the big crawler tractors and anchor chains in the 1950s that large tracts of previously unoccupied country was cleared.

Native Vegetation

The vegetation of the Murray Mallee region has changed dramatically since European settlement in the 1860s. Areas more favourable for agriculture, such as those with a higher rainfall, lightly wooded areas or fertile soils, have been selectively developed for agriculture (e.g. *Eucalyptus calycogona*, *E. dumosa*, *E. socialis*, *E. leptophylla*). Consequently, the few relatively large tracts of intact mallee remaining today represent vegetation associated with poor soils and lower rainfall; areas perceived to be of little agricultural value.

Native vegetation of the Murray Mallee region is dominated by ‘tree mallee’ vegetation, characterized by multi-stemmed Eucalyptus species occurring as low shrubby trees. Extensive dune systems characterise the region: linear calcareous dunes follow an east–west orientation while siliceous parabolic/irregular dunes are more variable in form. Because of varied topography and soil conditions the vegetation communities are far from uniform in either floristic composition or structure. Due to the jurisdictional boundaries within the Murray Mallee, vegetation classification varies between the three States. Haslem et al. (2010) developed a relatively simplified approach to describing and mapping the vegetation consistently across the region, describing four main vegetation types;

- Triodia Mallee, characterized by an understorey of the hummock grass *Triodia scariosa*, and both *Eucalyptus socialis* and *E. dumosa* generally abundant in the canopy, shrubs included *Acacia rigens*, *Acacia wilhelmiana* and *Beyeria opaca*.
- Chenopod Mallee, dominated by the canopy species, *E. gracilis* and *E. oleosa*, with a variable understorey including *Olearia* spp., *Zygophyllum* spp. and

chenopod species such as *Maireana pentatropis*, *Enchylaena tomentosa* var. *tomentosa* and *Maireana pyramidata*.

- Heathy Mallee, canopy species of *E. costata* subsp. *murrayana* and *Callitris verrucosa* and ground strata commonly dominated by a diverse range of small woody shrubs, including heathy species such as *Phebalium bullatum*, *Cryptandra tomentosa* and *Spyridium subochreatum* var. *subochreatum*.
- Shrubby Mallee, canopy species of *E. socialis* and *E. dumosa* and tall shrubs including *Acacia colletioides*, *Senna* spp., *Dodonaea viscosa* subsp. *angustissima*, *Beyeria opaca* and *Eremophila sturtii*.

The vegetation classification system developed by Haslem et al. (2010) does not include the heath-dominated vegetation of the southern mallee parks: Ngarkat Conservation Park, Big Desert Wilderness Park and Wyperfeld National Park. The heath-like communities, typically found on the plains and swales here, are dominated by *Banksia ornate* and *Allocasuarina pusilla*, and typically lack a mallee eucalypt overstorey. In some areas *Xanthorrhoea caespitose* is dominant. The mallee-heath communities are mostly associated with the dunes and support sparse overstorey of *Eucalyptus* spp. The shrub layer is taller and often denser than found in heath and is characterised by *Baeckea behrii, Leptospermum* spp*., Allocasuarina* spp. among other species and *Triodia*. In areas where clay is relatively close to the surface (mainly in the north), the mallee heath becomes dense *Melaleuca uncinata*.

Native Fauna

The Murray Mallee is an important region for vertebrate fauna, particularly bird species. As well as the six conservation targets identified in the CAP a number of other vulnerable or restricted bird species inhabit the region including; Striated Grasswren (*Amytornis striatus*), Purple-gaped Honeyeater (*Lichenostomus cratitius*), Pied Honeyeater (*Certhionyx variegatus*), Black Honeyeater (*Sugomel niger*), Scarlet-chested Parrot (*Neophema splendida*), Shy Heathwren (*Hylacola cauta*), Chestnut Quail-thrush (*Cinclosoma castanotum*), Southern Scrub-robin (*Drymodes brunneopygia*), Hooded Robin (*Melanodryas cucullata*), Major Mitchell Cockatoo (*Lophochroa leadbeateri*), Purple-crowned Lorikeet (*Glossopsitta porphyrocephala*), Slender-billed Thornbill (*Acanthiza iredalei hedleyi*), and Gilbert's Whistler (*Pachycephala inornata*).

While the mammal diversity is lower in comparison with birds, a number of small mammals inhabit the area including the Common Dunnart (*Sminthopsis murina*), Mallee Ningaui (*Ningaui yvonneae*), Western Pygmy Possum (*Cercartetus concinnus*), Little Pygmy Possum (*Cercartetus Lepidus*), Bolam's Mouse (*Pseudomys bolami*), Mitchell's Hopping Mouse (*Notomys mitchelli*), Silky Mouse (*Pseudomys apodemoides*), Giles' planigale (*Planigale gilesi*), and House Mouse (*Mus musculus*).

The region has a rich reptile assemblage in global terms (approximately 60 species) including dragon lizards (Agamidae), venomous snakes (Elapidae), geckos (Gekkonidae), legless lizards (Pygopodidae), skinks (Scincidae), blind snakes (Typhlopidae), and goannas (Varanidae).

2. PROJECT VISION AND CONTEXT

2.1 Project Team

Current contributors to the Threatened Mallee Birds Project include a number of active organisations (see list below). It is envisaged that additional groups/organisations will become involved as implementation of the work plan begins. Each species is represented by a number of specialist ornithologists. See Appendix 1 for a full list of current and previous members.

Chairperson – Vicky-Jo Russel (Zoos SA)

Interim Chairperson – Jenny Lau (BirdLife Australia)

Project Coordinator – Rebecca Boulton (BirdLife Australia)

BirdLife Australia

Department of the Environment (Canberra)

Department of Environment, Land, Water and Planning (Victoria)

Department of Environment, Water and Natural Resources (South Australia)

Office of Environment and Heritage (New South Wales)

Mallee CMA (Victoria)

Parks Victoria

Zoos SA

Zoos Victoria

La Trobe University, Monash University

Black-eared Miner Recovery Team

Regent Parrot Recovery Team

Malleefowl Recovery Team

MEW advisors – Rohan Clarke, Sarah Brown, Chris Hedger, Simon Watson

BEM advisors – Rebecca Boulton, Rohan Clarke, Chris Hedger

WWB & RLW advisors – Rohan Clarke, Chris Hedger

RP & MF advisors – Victor Hurley, Chris Hedger

2.2 Scope

To protect and help maintain mallee and mallee-heath communities that contain known or potential habitat for one or more targeted threatened mallee bird species.

2.3 Vision

Protect, improve and conserve threatened mallee bird species and appropriate habitat to increase species' resilience and decrease their extinction risk.

2.4 Identification of Conservation Targets

BOX 1 Method for Identifying Conservation Targets

Projects select a limited number of conservation targets (also known as biodiversity targets). Conservation targets are specific species or ecological systems/habitats that are chosen to represent and encompass the full suite of biodiversity in the project area for place-based conservation or the focus of a thematic program. They are the basis for setting goals, carrying out conservation actions, and measuring conservation effectiveness. For place-based conservation, a complete suite of conservation targets will – in theory – ensure the conservation of all native biodiversity within the project site. Because thematic-based projects have a more narrow focus on a species, threat, or other theme, teams implementing these projects will, by definition, not be working to conserve all native biodiversity. Most place-based projects can be reasonably well defined by eight or fewer well-chosen conservation targets. Thematic projects are often characterized by focusing on one main conservation target – or one main threat that affects multiple conservation targets.

The issue of whether to lump individual ecosystems and communities together or split into individual conservation assets is often a difficult one. In general, ecosystems and communities are lumped together if they co-occur across the landscape or share similar ecological processes and threats. Rare, threatened, and endemic species or communities are often not well 'nested' within the broader set of ecosystems or communities and may need to be considered as separate conservation assets.

Source CMP (2013) and TNC (2007)

Six key conservation targets have been identified by the Threatened Mallee Birds CAP Implementation Team (Table 1). All six targets are threatened bird species that exhibit one, or all, key life-history components within relatively long-unburnt mallee. The team resolved that these six species would not be captured under the single landscape target 'Murray Mallee Region' or under the habitat target 'old-growth mallee', as many of the species have specific stand-alone habitat requirements, or varied distributions across the region.

At the time of writing only three of the target species had endorsed National Recovery Plans; Black-eared Miner (2002-2006) (Baker-Gabb, 2003), Regent Parrot (2011-2015) (Baker-Gabb and Hurley, 2011) and Malleefowl (2007-2011) (Benshemesh, 2007). The multi-species National Recovery Plan for the Mallee Emu-wren, Western Whipbird and Red-lored Whistler is currently in draft format awaiting State and Federal approval. These plans helped form the basis of the CAP development where we could use this information in an adaptive management framework. There are National Recovery Teams for the Black-eared Miner, Regent Parrot and Malleefowl, however the first two are considerably less active than the Malleefowl Recovery Team. There are no existing Recovery Teams for Mallee Emu-wren, Western Whipbird or Red-lored Whistler.

The Threatened Mallee Birds Project will not replace the Recovery Plans for these species, nor duplicate activities currently undertaken by active Recovery Teams. The Threatened Mallee Birds Project aims to complement and help foster actions between the teams while adopting an adaptive management framework.

The Threatened Mallee Birds CAP Implementation Team has a diverse set of skills and expertise allowing it to tackle some of the broader landscape actions that are necessary to conserve these species; actions that are somewhat more difficult for Recovery Teams to address. Species specific actions will be undertaken in consultation with regional recovery groups.

Table 1. National and State conservation status of the six target species.

	MEW	BEM	WWB	RLW	RP	MF
Environment Protection and Biodiversity Conservation Act 1999	E	E	V	V	V	V
National Parks and Wildlife Act 1972 (South Australia)	E	E	E	R	V	V
Flora and Fauna Guarantee Act 1988 (Victoria)	T	T	T	T	T	T
Threatened Species Conservation Act 1995 (New South Wales)	-	CR	-	CR	E	E
Advisory List of Threatened Vertebrate Fauna in Victoria 2013	E	CR	CR	E	V	E
Garnett *et al*. (2011)	E	E	V	V	E	V

CR Critically Endangered; E Endangered; T Threatened; V Vulnerable; R Rare; MEW Mallee-emu Wren; BEM Black-eared Miner; WWB Western Whipbird (eastern); RLW Red-lored Whistler; RP Regent Parrot (eastern); MF Malleefowl.

For full species accounts and up-to-date information see;
Species Profile and Threats Database Mallee Emu-wren
National Recovery Plan for Black-eared Miner
Species Profile and Threats Database Western Whipbird
Species Profile and Threats Database Red-lored Whistler
National Recovery Plan for Regent Parrot
National Recovery Plan for Malleefowl

Mallee Emu-wren *Stipiturus mallee*

The Mallee Emu-wren is a tiny (4–6 g) sexually dimorphic passerine endemic to the semi-arid mallee vegetation in the southern Murray Mallee region of south-eastern Australia (Higgins et al., 2001). With their short rounded wings, and a long filamentous tails they are poor flyers and are adapted to scurrying through dense undergrowth of prickly spinifex grass (*Triodia scariosa*) or medium-sized, dense heaths and shrubs with scattered *Triodia*.

In Victoria, the Murray-Sunset National Park and adjacent State forests contain 92% of the global population of the Mallee Emu-wren, with an estimated 15,709 individuals

(range 7939-35,702)(Brown et al., 2009) and Hattah-Kulkyne National Park supports a moderate population (526, range 238-1776). While they were thought to be rare in Wyperfeld National Park (Brown et al. 2009), a small number have recently been discovered (C. Hedger pers. comm., 2015) with further studies required to determine the significance of the population to the species. Refinement in modelling (Watson, 2011, J. Connell unpublished data) and changes in the total amount of suitable habitat available indicate that these figures are over-estimates and more probable towards the lower range. Due to wildfire in 2014 the current situation for the Mallee emu-wren in South Australia is dire, with the species now likely extinct from both Billiatt and Ngarkat Conservation Parks (D. Paton pers. comm., 2014).

Brown (2011) conducted a detailed assessment of habitat preferences and found that in Victoria, the Mallee Emu-wren exhibits a mixed response to fire age-classes and has a strong preference for older habitats, with highest densities in those areas unburnt for 16-29 years. In the heath-dominated areas there appears to be a preference for habitats that have been unburnt for 10-29 years (Clarke, 2005).

Black-eared Miner *Manorina melanotis*

The Black-eared Miner is a stockily built honeyeater, about 20 cm long, and like the other species in the genus *Manorina* is colonial and co-operatively breeding. Black-eared Miners can interbreed with Yellow-throated Miners, resulting in fertile hybrids that display a range of intermediate plumages (Ford, 1981; McLaughlin, 1990). Clarke et al. *(*2001*)* showed that, prior to extensive modification of mallee habitat after 1950, Black-eared and Yellow-throated Miners were clearly separable on phenotypic characters and developed a simple guide to distinguish Black-eared Miners from hybrids and Yellow-throated Miners in the field.

Over 95% of all known Black-eared Miner colonies are located in the Riverland Biosphere Reserve with an estimated 501 (270–927) colonies containing 3,758 (2026–6954) Black-eared Miners, and 2,255 (1215–4170) hybrids. Most of the remaining birds are located in about 53 (32–85) Black-eared Miner/hybrid colonies in the Murray-Sunset National Park (Clarke et al., 2005). However, with a skewed adult sex ratio (1 female: 1.8 males) and complex social organization, the number of mature Black-eared Miners is only about 10% of its total population size. Population estimates have not been updated since two large wildfires in the Riverland Biosphere Reserve (2006 and 2014) in which the species lost up to a third of its breeding habitat.

The Black-eared Miner inhabits shallow-sand mallee and chenopod mallee in both the Sunset Country of Victoria and the Riverland Biosphere Reserve in South Australia (McLaughlin, 1992; Muir et al., 1999). They display a distinct preference for mallee habitats that have not been burnt for at least 45 years (Clarke, 2005), although the frequency of miner detections in the then six-year-old fire scar in the Riverland population was only slightly lower than old growth mallee areas (Cale, 2012). Recent observations (2014-15) within the 2006 fire scar reveal colonies nesting in unburnt patches within the fire scar (R. Boulton pers. comm.).

Western Whipbird *Psophodes nigrogularis leucogaster*

The eastern Western Whipbird is a stoutly built bird growing to about 25 cm in length and 45 g in weight. It has a long graduated tail, short rounded wings and a short triangular erectile crest (Higgins and Peter, 2002). These shy and elusive birds dwell mainly on the ground in dense, low shrubbery and are usually only detected by their loud, unusual squeaking gate like call. They are probably sedentary (Higgins and Peter, 2002), and are weak fliers with restricted dispersal ability across cleared areas (Woinarski et al., 1988).

The total population has been estimated at around 6,000 birds (Garnett et al., 2011). The largest subpopulation of about 5,000 birds is on southern Eyre Peninsula (Innes National Park and Warrenben Conservation Park), with most of the remainder on southern Yorke Peninsula (Lincoln and Coffin Bay National Parks). It is likely that <100 birds remain in South Australia's Murray Mallee, with recent large fires in Ngarkat and Billiatt Conservation Parks reducing the already small populations (C. Hedger and D. Paton pers. comm., 2014). In Victoria Western Whipbird was confined to the Big Desert and Sunset Country. There have been no confirmed records since 1974 (Higgins and Peter, 2002), and it is likely to be extinct in the State (Garnett et al., 2011).

Habitat structure rather than floristics appears to be the most important factor determining habitat preference (Smith, 1991). Preferred habitat consists of a dense shrubby understorey 1.5–2 m tall below an open mallee eucalypt layer 2–5 m tall. Age post-fire is also important, with most records in vegetation 10–25 post-fire (Woinarski et al., 1988).

Red-lored Whistler *Pachycephala rufogularis*

The Red-lored Whistler grows to 20 cm in length and up to 37 g in weight. The species has a conspicuous whistle followed by an indrawn 'see-saw' breath like sound. They have very large territories of around 100 ha in *Triodia* mallee and 20 ha in mallee heath, with territories overlapping by about one-third with their neighbour's (Moise, 2008). The species is generally solitary and its population density is low; about one bird per 50 ha (Woinarski, 1987). Red-lored Whistlers are largely sedentary, although some autumn and winter movements may occur (Higgins and Peter, 2002).

Garnett et al. (2011) estimated the total breeding population to be no greater than 2,000 birds in six subpopulations. The largest population of about 1,000 birds is in South Australia's Riverland Biosphere Reserve (Garnett et al., 2011). There were about 100-200 pairs in the Ngarkat/Big Desert/Wyperfeld complex and 100+ pairs in the Murray-Sunset/Hattah complex (Garnett et al., 2011), with small numbers in Round Hill and Nombinnie Nature Reserves in central New South Wales. The South Australian fires in 2014 have likely reduced numbers in this State, with the species now probably eliminated from at least Billiatt Conservation Park, with few in Ngarkat Conservation Park.

In the Murray-Sunset reserve complex, areas that have remained unburnt for 21–44 years are important for the species (Clarke, 2005). In the Riverland Biosphere Reserve, the Red-lored Whistler has been recorded predominantly in long-unburnt mallee (Moise 2008), with habitats that have remained unburnt for 46–52 years most important, with some ability to utilise habitats last burnt 20–23 years ago (Clarke, 2005). In heath-dominated mallee of Ngarkat Conservation Park the species appears to occupy more recently burnt habitats, with apparent preferences for areas last burnt 10–24 years ago (Clarke, 2005). At least in the Riverland Biosphere this species occurs >6 km from water points and their associated grazing impacts (Harrington, 2002; Moise, 2008)

Regent Parrot *Polytelis anthopeplus monarchoides*

The eastern Regent Parrot is a medium-sized, slender, long-tailed parrot from 37–42 cm in length and 160–190 g in weight. Despite its fast flying speed, Regent Parrots are reluctant to fly over open areas, particularly during the breeding season.

The total adult breeding population of eastern Regent Parrots is estimated at 1,500 pairs, with 600 in NSW, 500 in Victoria and 400 in South Australia (Baker-Gabb and Hurley, 2011). These population estimates are based on the only survey data collected to date and do not include counts of juveniles or non-breeding adults.

Regent Parrots mainly occur in three distinct, widely separated areas: southeast of Mildura, along the Murray River and its hinterland; along the lower reaches of the Wimmera River, centred on Wyperfeld National Park; and in South Australia, along the Murray River between Renmark and Cadell. The species nests almost entirely in River Red Gum forest and woodland. Colonies contain up to 73 pairs (Smith, 2011) (usually 2-10 pairs), where they mostly forage in large blocks of intact mallee woodlands within 20 km (usually 5–10 km) of nest sites (Burbidge, 1985; Webster and Leslie, 1997). Relatively little is known about the habitat utilised by Regent Parrots during the non-breeding season, though they are known to remain within the Murray-Darling Basin all year round.

Malleefowl *Leipoa ocellata*

The Malleefowl is a large and distinctive ground-dwelling bird that grows up to 60 cm in length and can weigh up to 2.5 kg. Malleefowl dedicate 9-11 months per year to building and maintaining a large incubation mound of sand, usually 3-5 metres in diameter and one metre high, within which up to a cubic metre of moist litter is buried. They breed in solitary pairs, rarely flying, instead preferring to walk slowly across the terrain. Malleefowl appear to disperse on foot using corridors of relatively thick vegetation when dispersing through open landscapes. Similarly, birds have been reported to use strips of dense unburnt vegetation when dispersing through an otherwise burnt landscape (Benshemesh, 1992).

The Malleefowl inhabits semi-arid regions of southern Australia. Over the past decade there has been a general increase in Victoria and south-west NSW and numbers have levelled out in South Australia, especially since 2007 following the breaking of a long

drought. However, the long generation time and historical losses means the species remains Vulnerable despite their large population (c. 100,000) size (Garnett et al., 2011).

Habitats on sandy substrates that support *Triodia* are of greatest importance (e.g. Woorinen and Red swale mallee sands) to Malleefowl in the Murray Mallee. Chenopod mallee, which typically forms on heavy soils, and heath-dominated habitat, which usually forms on nutrient-poor sand (e.g. Lowan sands), are among the least preferred mallee habitats for Malleefowl (Clarke, 2005). The effect of fire on Malleefowl is severe, and breeding in burnt areas is usually reduced for at least 30 years. However, the deleterious effect of fire appears to be mitigated if fires burn patchily.

2.5 Viability of Conservation Targets

BOX 2 Method for Assessing Viability of Conservation Targets

The next step is an assessment of the viability (or overall health) of the conservation targets. Viability analysis asks you to look at each of your conservation targets carefully to determine how to measure its "health" over time (**indicator**). And then to identify how the target is doing today and what a "healthy state" might look like (**goal**). This step identifies which of your targets are most in need of immediate attention.

Miradi supports two approaches to viability analysis, the Simple Mode and the Key Attribute Mode. Here we use the Simple Mode to assess the overall status of each target but incorporated additional information about each indicator (under the Key Attribute Mode) as we progressed.

Step 1 Identify specific goals that outline the desired future condition of the conservation target for your project.

Step 2 Develop specific indicators that might be used to measure each goal.

Step 3 Rank the current status of the conservation targets.

Assigning one rating to represent the overall status of most conservation targets is a difficult task that involves making many assumptions. As a general rule, this rating process involves determining one or more attributes and/or indicators that represent the health of the target and then assessing the status of these indicators against a predetermined rating scale;

Very good: Ecologically desirable status; requires little intervention for maintenance.

Good: Within acceptable range of variation; some intervention required for maintenance.

Fair: Outside acceptable range of variation; requires human intervention.

Poor: Restoration increasingly difficult; may result in extirpation of target.

Table 2. *Goals* and *Indicators* for the six conservation targets, including each species overall *status*.

Target / Goal / Indicator	Current measure	Overall Status
MALLEE EMU-WREN **Goal** *Establish and maintain at least four separate reserve populations, each with a minimum effective population size of 250 birds that are stable or positive trending across northern and southern reserve systems by 2034.*		Poor
Indicators Number of populations at the reserve scale	2014-08: Poor	
Distribution of high-quality habitat in each population	2014-08: Good	
Trend in population	2014-08: Poor	
BLACK-EARED MINER **Goal** *Five subpopulations with a combined effective population of 1000 high-quality birds by 2034, each subpopulation with habitat of sufficient quality and extent to maintain these subpopulations.*		Poor
Indicators At least five separate locations	2014-08: Poor, only 1-2	
Degree of introgression with Yellow-throated Miners	2014-08: Fair	
Habitat available for each subpopulation (age class + size + quality vegetation type)	2014-08: Fair	
Combined total Effective Population size (>1,000)	2015-06: Poor	
WESTERN WHIPBIRD **Goal** *Four subpopulations of 500 by 2034 each with habitat of sufficient quality and extent to maintain these subpopulations.*		Poor
Indicators Number of subpopulations	2014-08: Poor, 3 known	
Suitable habitat present for each subpopulation (age class + size + quality vegetation type)	2014-08: Fair	
Population trend	2014-08: Poor	
RED-LORED WHISTLER **Goal** *Five subpopulations of 500 by 2034 each with habitat of sufficient quality and extent to maintain these subpopulations.*		Fair
Indicators Number of subpopulations	2014-08: 5+?	
Vegetation age-class structure in each subpopulation	2015-06: Fair?	
Population trend	2015-06: Poor?	
REGENT PARROT **Goal** *Secure and improve core habitat within 20 km of breeding sites to increase known populations of Regent Parrots by 2034.*		Fair
Indicators Extent and distribution of foraging habitat	2014-08: Poor	
Extent distribution of high-quality breeding habitat	2014-08: Poor	
Total population trend	2014-08: Fair	
Connectivity between foraging and breeding habitat	2015-04: Poor?	
MALLEEFOWL **Goal** *Malleefowl abundance and breeding densities increase or remain stable across its south-eastern range by 2034.*		Fair
Indicators Population distribution of Malleefowl	2015-06: Fair	
Availability of high quality habitat	2014-08: Good	

2.6 Threats to Conservation Targets

BOX 3 Methodology for Assessing Threats

After resolving your conservation targets the next step is to identify the high priority, or critical threats to these targets. There are a number of threat rating and ranking tools that can be used to help in this prioritization process. Most of these assess the scope or extent of the threat and its severity on the conservation targets. Taken together, these two criteria assess overall threat magnitude.

Miradi uses the Simple Threat Rating by default, rating the impact of direct threats on targets. Summary ratings are not entered directly, but are calculated as you rate the specific effects of threats on targets in the cells of the table. Miradi calculates threat ratings using a rule-based system for combining the scope, severity, and irreversibility criteria.

Scope – Defined spatially as the proportion of the target that can reasonably be expected to be affected by the threat within ten years given the continuation of current circumstances and trends. For species, measured as the proportion of the target's population.

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

Severity – Within the scope, the level of damage to the target from the threat that can reasonably be expected given the continuation of current circumstances and trends. For species, usually measured as the degree of reduction of the target population within the scope.

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

Irreversibility – The degree to which the effects of a threat can be reversed and the target affected by the threat restored.

Very High: The effects of the threat cannot be reversed and it is very unlikely the target can be restored, and/or it would take more than 100 years to achieve this.
High: The effects of the threat can technically be reversed and the target restored, but it is not practically affordable and/or it would take 21-100 years to achieve this.
Medium: The effects of the threat can be reversed and the target restored with a reasonable commitment of resources and/or within 6-20 years.

Low: The effects of the threat are easily reversible and the target can be easily restored at a relatively low cost and/or within 0-5 years.

Once threats have been identified and ranked it can be helpful to brainstorm the contributing factors (Indirect threats and Opportunities) for each threat. Miradi produces a conceptual model with each underlying action or event that leads to one or more direct threat. The conceptual model should be considered dynamic. As you learn more about your project site, you should periodically revisit your conceptual model and revise it as necessary.

The key threats to the conservation targets, as assessed by the Team, are displayed in Table 3. Catastrophic Wildfire, Past Habitat Loss and Fragmentation, Drought and Inappropriate Fire Management are all considered very high threats to a number of the conservation targets. Total Grazing Pressure has a high impact on a number of targets, whereas Inappropriate Water Management and Genetic Introgression have high impacts on single targets. The overall threat rating for each conservation target is very high or high.

Contributing factors were identified for the highest ranked threats (very high, high and medium), excluding drought at this stage. See Appendix 2 for the working conceptual model.

Catastrophic Wildfire (landscape scale, high proportion of reserve)

Wildfire is a natural and fundamental process within the mallee ecosystem, shaping vegetation structure and composition across the landscape. Large (>10,000 ha) catastrophic wildfires accounted for 89% of the Murray Mallee burnt between 1972 and 2007 (Avitabile et al., 2013). The frequency and intensity of wildfire is expected to increase with climate change, particularly in south-eastern Australia as the number of extreme fire danger days are predicted to increase (Hughes and Steffen, 2013).

Most mallee birds have no special adaptations to cope with fire, they either perish or flee to unburnt areas. Consequently, large wildfires that burn a high proportion of a reserve have an obvious and immediate impact on bird species. As the capacity for species to recolonise from within the reserve may be lost, the larger the fire, the slower the rate of recolonization (Watson et al., 2012). Threatened species that are already few in number or patchily distributed may not be capable of recolonizing areas after fire. When this is coupled with the poor dispersal capabilities of some species (e.g. Mallee Emu-wren), large-scale wildfires pose a very high risk of species extinction. Such extinction events have occurred in Billiatt and Ngarkat Conservation Parks and Bronzewing Flora and Fauna Reserve early in 2014 when all known habitat containing populations of Mallee Emu-wren and Black-eared Miners within these reserves were burnt.

Past Habitat Loss and Fragmentation (ongoing extinction debt)

This threat includes the impacts of past actions that have resulted in habitat loss and fragmentation, causing a reduction in extent of habitat and the ongoing demise of species in what is referred to as ‘extinction debt’ (Tilman et al., 1994).

Table 3. *Threats* identified for each of the six targets including their individual and overall threat rankings.

Threats \ Targets	Mallee Emu-wren	Black-eared Miner	Western Whipbird	Red-lored Whistler	Regent Parrot	Malleefowl	Summary Threat Rating
*Catastrophic wildfire	Very High	Very High	Very High	High	High	High	Very High
*Past habitat loss and fragmentation	Very High	Very High	Very High	High	Medium	Low	Very High
Drought	Very High	Very High	Very High	High	High	High	Very High
*Inappropriate fire management	Very High	Very High	Very High	High	Medium	High	Very High
*Total grazing pressure	Medium	High	Medium	High	Low	Medium	High
*Inappropriate water management					High		Medium
*Genetic introgression		High					Medium
Predation or competition from native species	Low		Low	Low			Low
Locust spraying knocking out inverts	Medium						Low
Human-caused mortality					Medium	Low	Low
Competition for nest hollows					Low		Low
Feral Predation	Low		Low	Low		Low	Low
Ongoing vegetation Clearance	Low	Low	Low	Low	Medium	Low	Low
Overall threat rating for each target	Very High	Very High	Very High	High	High	High	**Overall Project Rating**
							VERY HIGH

*contributing factors were subsequently identified for these threats. See Appendix 2.

Before European settlement, mallee habitats were extensive and nearly contiguous across the region. Large-scale clearing has largely diminished throughout much of the mallee, however past clearing for agriculture has resulted in a highly fragmented landscape. With little opportunity for dispersal between fragments, small isolated populations are vulnerable to local extinction via demographic stochasticity.

Such extinction events have been observed in Mallee Emu-wren, Red-lored Whistler and Western Whipbird from mallee blocks surrounded by cleared land (e.g. Clarke, 2004; Possingham and Possingham, 1997). A common cause of local extinction in the mallee environment is wildfire. At the landscape scale, remnants need to be linked so that dispersing birds have a greater chance of recolonising suitable habitat.

Drought (temporal suppression of critical resources)

Climate change models predict an increase in the frequency of drought in the Murray Mallee. This is likely to have a negative impact on both the fauna and flora of the region. Drought conditions affect reproductive performance and survival of birds, and in extreme situations some species such as Malleefowl and Black-eared Miners will not breed at all. This is not surprising, given that drought conditions will also impact the growth and survival of many plant species and consequently species food availability (invertebrates and nectar). In Ngarkat Conservation Park, post-fire recovery of mallee heathlands can be hampered by drought conditions, with Mallee Emu-wren population declines attributed to both fire and drought and the interaction between the two (Paton et al., 2009).

Lowland mallee species appear to be very sensitive to climate change, with the predicted disappearance of Western Whipbird and Mallee Emu-wren bioclimates from Victoria and a >90% decline in bioclimatic range for Malleefowl and Red-lored Whistler (Bennett et al., 1991; Brereton et al., 1995).

Inappropriate Fire Management (wildfire and planned burns)

The key to reducing fire risk for threatened birds centres on the prevention of extensive wildfires, with management focussed on the requirements of species that are known to be sensitive to fire, rather than managing for overall species richness (Bennett et al., 2010). In fact, the ‘conventional’ strategy of maintaining a mosaic of different post-fire age classes in the landscape to conserve species diversity appears ill-founded in the Murray Mallee region, with Taylor et al. (2012) finding bird species richness only associated with increased amounts of older mallee.

Maintaining threatened birds that are vulnerable to habitat fragmentation and fire requires landscape-scale management (Woinarski and Recher, 1997). Management objectives that may benefit most mallee bird species include the provision of an ongoing supply of mid-age vegetation in the landscape and the maintenance of extensive areas of older vegetation (Taylor et al., 2013; Watson et al., 2012). Employing fires that maintain unburnt patches will further benefit mallee birds, with the unburnt patches providing important refuges and sources of recolonization (Watson et al., 2012).

Total Grazing Pressure

Total grazing pressure from domestic stock and feral and native herbivores is sufficiently high on most reserves and pastoral properties that it limits the regeneration of many mallee plants, removes understorey plants, modifies vegetation structure, leads to soil disturbance and erosion, decreases leaf litter cover, and reduces invertebrate diversity

and abundance (Ford et al., 2001; Forward and Robinson, 1996). This habitat degradation has negative effects on biodiversity, particularly ground-dwelling fauna. In areas grazed by Sheep (*Ovis aries*), Malleefowl densities were reduced by 85–90% compared to similar ungrazed habitats (Frith, 1962).

At present grazing of mallee, often in remnant patches, is widespread on public and private land, particularly in New South Wales and South Australia on public land under pastoral lease. In 2010, goat numbers in the semi-arid and arid rangelands where estimated at 3.3 million (Pople and Froese, 2012). Analysis of aerial survey data in the Eastern Pastoral Province (SA) indicate that goat populations have shown a consistent, increasing trend of 3-15% since 2005 (Delean et al., 2014). These increases in population growth have occurred despite more than 310,000 goats being removed between 2005 and 2013.

The strategic closure of artificial water points is a key means of reducing total grazing pressure and enhancing biodiversity conservation (Harrington, 2002; Landsberg et al., 1997). This strategy has occurred across Gluepot Reserve and most of the neighbouring Taylorville and Calperum Stations, and is a viable option for conservation managed land, offering a permanent and cost effective means of reducing the capacity of the area to support goat populations (Cale et al., 2014). These closures may benefit many native species, including Red-lored Whistler, that are negatively impacted by the presence of artificial water points. For example, Harrington (2002) found that Red-lored Whistler were only found more than 6 km from artificial water points in the Riverland Biosphere Reserve.

Inappropriate Water Management

River Red Gum forests and woodlands throughout the range of the eastern Regent Parrot are under great stress and many living nest trees are likely to die because of prolonged immersion, reduced flooding and ongoing drought (Smith, 2004). Alterations to river-flow may also reduce or prevent the regeneration of River Red Gums, decreasing successful seedling germination.

In Victoria, a survey of the condition of River Red Gums along the Murray River floodplain found only 30% of stands to be in good condition (Cunningham et al., 2007). Wetlands surveyed throughout Wyperfeld National Park recorded 53% of Black Box and 49% of River Red Gums to be stressed or dead (Hurley, 2006). Overall, the percentage of healthy trees since these surveys has increased from 13% to 36% following the 2010 La Nina rainfall event (V. Hurley pers. comm.)

Human-facilitated Genetic Introgression

One of the major threats to the Black-eared Miner is introgressive hybridisation or ‘genetic swamping’ by the conspecific Yellow-throated Miner (McLaughlin, 1990). Current hybridisation is a recent development facilitated by human disturbance of the birds’ habitat after 1950. Prior to this Black-eared Miners and Yellow-throated Miners were clearly separable on phenotypic characters (Clarke et al., 2001). Further habitat degradation due to grazing pressure, exacerbated around artificial watering points, increases the likelihood of Yellow-throated Miner incursion into areas of continuous mallee. This, coupled with the negative impact of grazing (see above), facilitated the closure of artificial watering points on Gluepot Reserve and many on the neighbouring stations Taylorville and Calperum.

The following threats were ranked Low:

Predation or Competition from Native Species

Locust Spraying Knocking Out Invertebrates

Over-spraying of threatened mallee birds and their habitat is unlikely, as spraying normally occurs in paddocks, however it is recommended that the fungal biocontrol agent Metarhizium be used when undertaking locust control in the vicinity of any threatened mallee bird habitats.

Human-Caused Mortality

See Objective 3 in Regent Parrot Recovery Plan; reduce human-induced mortality.
See Objective 7 in the Malleefowl Recovery Plan; reduce Malleefowl mortality on roads.

Competition for Nest Hollows

See Objective 4 in Regent Parrot Recovery Plan; investigate key aspects of the biology and ecology of the eastern Regent Parrot. Action 4.7 Investigate competition for nest hollows.

Feral Predation (Fox and Cat)

See Objective 4 in the Malleefowl Recovery Plan; reduce predation.

Ongoing Vegetation Clearance

Clearing of habitat still remains a threat to some Threatened Mallee Bird populations, particularly outside of reserves even though controls for clearing mallee on private land has been imposed in New South Wales (*Native Vegetation Act 2003*), Victoria (*Planning and Environment Act 1987*- Clause 52.17) and South Australia (*Native Vegetation Act 1991*).

3. CONSERVATION STRATEGIES AND ACTIONS

BOX 4 Methodology for developing and prioritizing Conservation Strategies

The next phase is to identify your strategies to achieve your goals. Strategies are linked to chains of factors showing the sequence of contributing factors affecting your direct threats and ultimately your targets.

Step 1 Using your conceptual model determine at what points you will intervene, prioritizing where you need to take action.
Step 2 Brainstorm draft strategies that your team could use at various points along the chain. A *strategy* describes a group of actions with a common focus that work together to reduce threats, capitalize on opportunities, or restore natural systems.
Step 3 Rate each draft strategy in terms of its *Potential Impact* and *Feasibility*

Potential Impact – If implemented, will the strategy lead to desired changes in the situation at your project site?
Very High: Strategy is very likely to completely mitigate a threat or restore a target.
High: Strategy is likely to help mitigate a threat or restore a target.
Medium: Strategy could possibly help mitigate a threat or restore a target.
Low: Strategy will probably not contribute to meaningful threat mitigation or target restoration.

Feasibility – Would your project team be able to implement the strategy within likely time, financial, staffing, ethical, and other constraints?
Very High: Strategy is ethically, technically, AND financially feasible.
High: Strategy is ethically and technically feasible, but may require some additional financial resources.
Medium: Strategy is ethically feasible, but either technically OR financially difficult without substantial additional resources.
Low: Strategy is not ethically, technically, OR financially feasible.

Results chains are a key tool for developing strategies as they clarify assumptions about how conservation activities are believed to contribute to reducing threats and achieving the conservation of biodiversity or thematic targets. They are diagrams that map out a series of causal statements that link factors in an "if...then" fashion. In Miradi results chains are composed of a strategy, desired outcomes including intermediate results (blue rectangle) and threat reduction results (purple rectangle), and the ultimate impact that these results will have on the biodiversity target.

The following **strategies** and **action steps** were developed by CAP workshop participants who now constitute the Threatened Mallee Birds CAP Implementation Team. A full list of draft strategies is given in Appendix 3.

While the Team agreed to move ahead with these 12 high to medium ranked strategies, a number of medium ranked, long-term strategies were not developed further. The importance of undertaking these strategies (e.g. acquisition of land for conservation, provide incentives to landholders to restore habitat) cannot be underestimated. This is particularly important for strategies that increase habitat extent and connectivity, which are crucial for long-term recovery of Threatened Mallee Birds, as these strategies reduce the need for intervention in management of wild populations. The current iteration of the CAP focuses on emergency, short-term actions (1-5 years); it is envisaged that more 'long-term' actions will be prioritised in future iterations of the CAP.

The objectives, strategies and action steps are organised into **five key program** areas. An indication of the progress made towards achieving each action is also given in this section using the terms **On Track**, **Completed** or **Minor Issues** next to the Actions (if applicable).

The separate **Threatened Mallee Birds CAP Work Plan** (available on request) illustrates the result chains for each strategy the team developed.

Threatened Mallee Birds Foundational PROGRAM

Target: MEW, BEM, RLW, WWB, RP, MF.

Objective 1.1: By the end of 2015, gain sufficient funding for the successful implementation of key strategies highlighted within the CAP.

01. (E) Threatened Mallee Birds Foundational PROGRAM	**Progress**
Strategy 1.1. Finalise CAP and use the finished document as a lever for fundraising key strategies.	
Finalise CAP	On-Track
Finalise Recovery Plan for MEW, RLW and WWB	On-Track
Form a Threatened Mallee Birds Implementation Team	Completed
Funding strategy to accompany CAP	
Community engagement and strong institutional leadership, partnerships and working group development	

Fire Management PROGRAM

Target: MEW, BEM, RLW, WWB, RP, MF.
Threat: Catastrophic Fire & Inappropriate Fire Management
Contributing Factor: Past Habitat Loss and Fragmentation
Corresponding Recovery Plan Objectives:
MEW, RLW & WWB Recovery Plan Objective 2: Maintain or increase area of long unburnt mallee.
BEM Recovery Plan Objective 3: Appropriate on-ground works to control wildfires is needed in parts of the Bookmark Biosphere Reserve, the core of the Black-eared Miner's distribution.
MF Recovery Plan Objective 3: Reduce fire threats.

Objective 1: By 2020, ecological burns increase the extent and quality of habitat available to all six target species across the Murray Mallee region, stabilizing current subpopulation trajectories and increasing the number (+1) of subpopulations for

a) MEW and BEM by 2020.
and
b) RLW and WWB by 2025.

Objective 2: By 2020, reduce the risk of significant habitat loss, of both occupied and potential suitable habitat, from unplanned fire at >50% of identified key sites for all six target species across the Murray Mallee region.

02. (E) Fire Program for all Threatened Mallee Birds	**Progress**
Strategy 2.1. Community engagement and education regarding threatened species conservation	
Educational material and communication plans	
Mallee *Wing Thing* school brochure	On-Track
Threatened Mallee Birds ID Brochure	On-Track
Strategy 2.2. Apply knowledge for developing ecological burn strategies for target species	
Research spatial and temporal configuration of fire growth stage requirements	
Provide Threatened Mallee Birds fire requirements to planners supported by a metadatabase	
Identify partner to develop metadatabase	
Develop private landholder personal fire plans	
Incorporate Threatened Mallee Birds fire requirements into all bushfire risk management plans	
Step-by-step annual target of area to be protected by and from fire and improvements towards achieving age class/structural targets	
Biosphere control burns	

Strategy 2.3. Prepare bushfire response plans (South Australia): to include preferred and "No Go" emergency control line options; identify whether retardant lines are an acceptable option; prioritise areas for immediate post-fire predator control activities and define what might constitute a situation where "salvage" of surviving Threatened Mallee Birds might be an option; identify what would need to be already in place to support such a salvage occurring.	
Identify priority habitat for RLW and WWB	
Map Threatened Mallee Birds priority habitat	
Advocate for the development of Bushfire Response Plan for the Murray Mallee	
Support them to develop these and provide appropriate ecological values	
Strategy 2.4. Improve response to mallee fire for Threatened Mallee Bird outcomes	
Engage Country fire services about the importance of ecological values	
Brief all regional/group leaders within the CFA, CFS and RFS	
Brief local fire crews about the improved capacity to tackle mallee fires	
Strategy 2.5. Prioritize Threatened Mallee Birds in Strategic risk-based bushfire planning	
Engage with DELWP to make sure Threatened Mallee Birds are incorporated into Strategic Bushfire Management Plan (VIC)	On-Track
Map Threatened Mallee Birds priority habitat	
Engage with SA and NSW to promote the value of a risk-based approach	
Mallee Murray-Goulburn Risk Landscape team engage with other States	

Genetic Introgression PROGRAM

Target: BEM
Threat: Genetic Introgression
Contributing Factor: Past Habitat Loss and Fragmentation, Total Grazing Pressure
Corresponding Recovery Plan Objectives:
BEM Recovery Plan Objective 5: Control genetic introgression of the Black-eared Miner.

Objective 3.1: By 2025, increase the phenotypic quality of 40 core Black-eared Miner colonies.

03. (E) Genetic Introgression PROGRAM	**Progress**
Strategy 3.1. Control genetic introgression: Direct control of genetic introgression involves removing Yellow-throated Miners. This can be targeted at YTM colonies in close proximity to known BEM colonies or individual YTMs within BEM colonies. Removal is achieved by a competent shooter (using a 12g firearm), either experienced in miner identification, or accompanied by a researcher to assist in locating the birds.	
Remove YTM colonies within 5 km of known BEM colonies	
Identify YTM colonies of concern	
Develop strategic removal program	
Remove identified key YTM colonies	
Analyse past YTM removal data	
Remove individual YTMs or potentially poor hybrids within 'core' BEM habitat	
Finalize molecular results to define appropriate phenotype level to remove	On Track

Translocation (wild or captive bred) PROGRAM

Target: MEW, BEM, WWB.
Threat: Catastrophic Fire & Past Habitat Loss and Fragmentation
Corresponding Recovery Plan Objectives:

MEW, RLW & WWB Recovery Plan Objective 7: Investigate the need for translocations, including the degree of genetic isolation of geographically separate subpopulations, and develop trigger points and translocations programs where necessary.

BEM Recovery Plan Objective 7: Increase numbers and quality of Black-eared Miner colonies in Victoria.

Objective 4.1: By mid-2017 >80% of translocated MEW survive during the initial capture and transfer phase.

Objective 4.2: By the end of 2017, four translocated BEM colonies show 95% survival during capture and transfer phase.

Objective 4.3: Three years after translocation, the reintroduced or reinforced populations (either wild or captive bred birds) are stable and able to persist without further intervention.

04. (L) Translocation of MEW, BEM and WWB	**Progress**
Strategy 4.1. Translocation PROGRAM: Develop a translocation program for reintroducing subpopulations or reinforcement of known populations of Threatened Mallee Birds to help establish separate, viable subpopulations (via wild caught birds or captive bred individuals if available).	
Investigate the need for translocation for MEW, BEM & WWB, and develop trigger points and translocations programs where necessary.	
By late 2015 identify specific sites for sourcing MEW individuals for translocation	
Habitat modelling	On Track
Develop PHVAs (source and release sites)	
On-ground assessment of potential source populations	On Track
Compilation of data and risk assessment	
By the end of 2015, identify all the priority release sites for MEW	
Habitat modelling – Annuello	On Track
Fine-scale modelling	
Compilation of data and risk assessment	
By the end of 2015, complete the translocation protocol for MEW including obtaining appropriate permits	
By Autumn 2016, reintroduce a single MEW subpopulation	

Strategy 4.2. Ex-situ captive breeding program: Develop Mallee Emu-wren husbandry techniques to determine if captive breeding will be an effective conservation tool for this species. The short-term aim of the program (3-years) is to establish a successful husbandry protocol. If MEW can be housed and bred in captivity, the long-term role of the program (i.e. insurance or source population) would be discussed.	
Initiate planning phase	
Stakeholder engagement – part of a Nationally managed project for Emu-wren taxa (including Rufous-crowned Emu-wren, Mt Lofty Range Southern Emu-wren (SEW), and SEW subspecies).	
Approval and permits	
Enclosure design	
Build MEW captive breeding facilities by mid-2017	
Capture wild birds to establish captive population	
Complete husbandry manual	
Husbandry Phase	
Release captive bred individuals to wild	

Habitat Improvement PROGRAM

Target: MEW, BEM, RLW, WWB, RP, MF.

Threat: Past Habitat Loss and Fragmentation, Genetic Introgression & Total Grazing Pressure

Corresponding Recovery Plan Objectives:

MEW, RLW & WWB Recovery Plan Objective 4: Manage total grazing pressure from all herbivores by decommissioning artificial water points and controlling introduced herbivores.

MEW, RLW & WWB Recovery Plan Objective 3: Enhance habitat connectivity and quality.

BEM Recovery Plan Objective 3: Further decommissioning of artificial water points is also required to control total grazing pressure, reduce the threat of genetic introgression, and help increase numbers of Black-eared Miners.

RP Recovery Plan Objective 2: Reduce environmental impacts and restore habitat.

MF Recovery Plan Objective 2: Reduce grazing pressure.

MF Recovery Plan Objective 5: Reduce isolation.

Objective 5.1: Within 5 years of targeted artificial water point closure an associated reduction in grazing pressure leads to an increase in palatable perennial plants within 1 km of closure sites and 30% vegetation cover in the 'sacrifice zone'.

Objective 5.2: By 2020, achieve improved vegetation condition via herbivore control across 10 priority sites heavily impacted by feral goats and abundant kangaroos.

Objective 5.3: By 2025, the extent of the target species habitat has increased by >15% via well-informed revegetation programs, including breeding and foraging sites and the number of vegetated flyways/corridors connecting them.

05. (E) Habitat Improvement for target species	**Progress**
Strategy 5.1. Remove artificial water access	
Stocktake remaining artificial watering points on public and conservation managed land	
Build on the Calperum and Danggali priority (for goats) dam assessments	
Decommission or fence identified points after ascertaining and catering for regional water requirements of threatened birds such as the Regent Parrot and water supply for bushfires (both ground and aerial crews). Aim for 90% closure on public land and 50% on private conservation managed land within 5 km of BEM or RLW occupied habitat.	
Remove any YTM colonies around closure sites	
Strategy 5.2. Campaign to harness existing revegetation projects for target species	
Articulate guidelines for effective target species revegetation – what vegetation is required (species, structure), where and for what species	
Liaise with Habitat 141 CAP	On-Track
Educate community groups – specifically about Threatened Mallee Birds revegetation/habitat requirements	
Help community groups apply for revegetation funding – aligned with Threatened Mallee Birds revegetation strategy	
Strategy 5.3 Manage Herbivore numbers	
Manage herbivore numbers in priority areas	

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Appendix 1. Threatened Mallee Birds CAP Participants

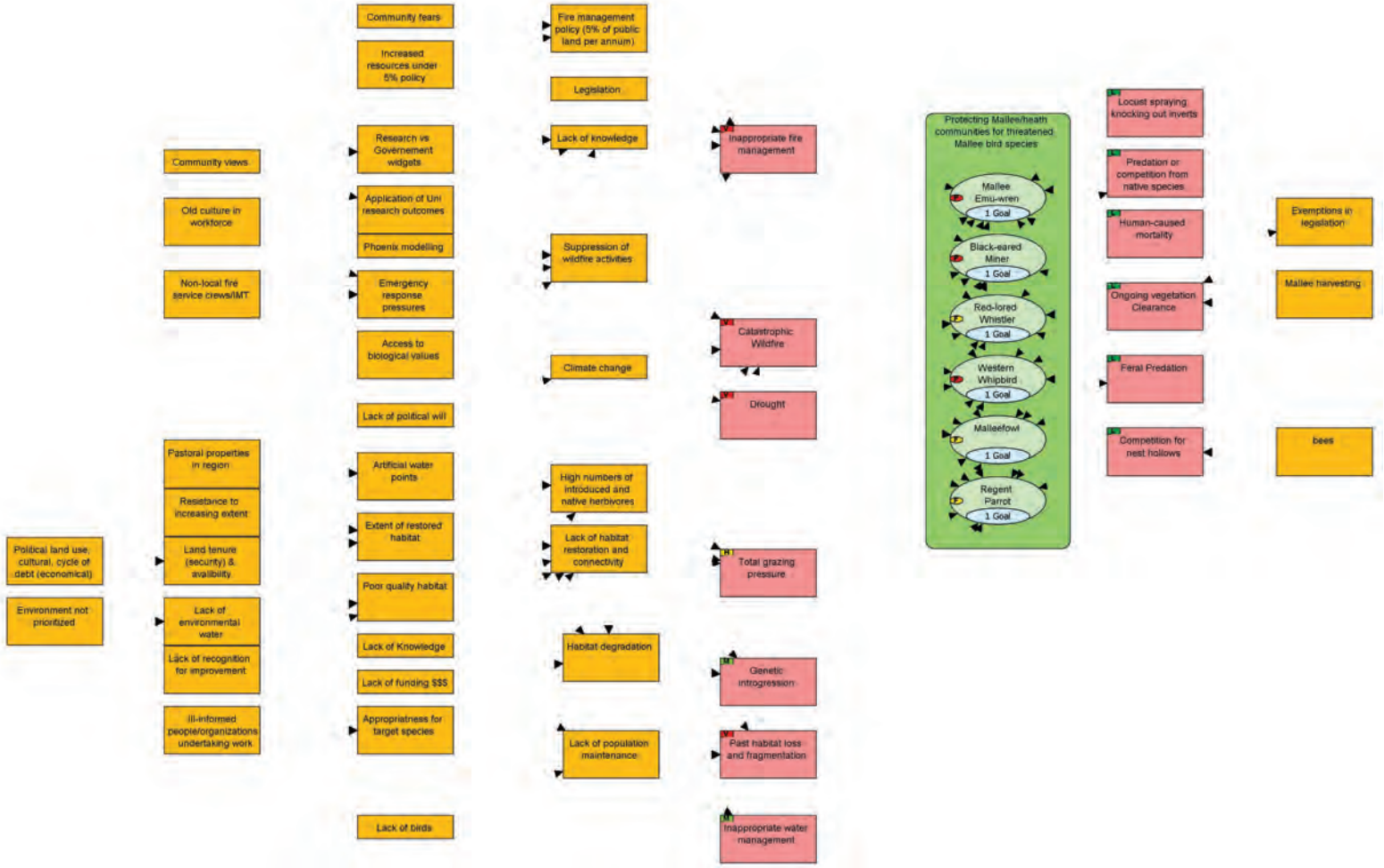
Current and previous participants in the Threatened Mallee Birds Conservation Action Planning process.

Name	Organization	Role, skills & expertise
CHAIRPERSON		
Vicky-Jo Russell	Zoos SA	Director of Conservation
INTERIM CHAIRPERSON		
Jenny Lau	BirdLife	Conservation Manager
PROJECT COORDINATOR		
Rebecca Boulton	BirdLife	Ornithologist, Black-eared Miner expert
ACTIVE WORKING GROUP MEMBERS		
Simon Nally	DoE	Assistant Director, Terrestrial Species Conservation
Wendy Stubbs	DEWNR	Team Leader, Landscape Resilience, Natural Resources SAMDB
Chris Hedger	DEWNR	Threatened Fauna Ecologist, Natural Resources SAMDB
Jill Fleming	DELWP	Program Manager, Terrestrial Biodiversity, Fire Ecologist
David Parker	OEH	Senior Threatened Species Officer, Ecosystems and Threatened Species
Rohan Clarke	Monash Uni	Lecturer in Ecology, Ornithologist, Mallee bird expert
Simon Watson	La Trobe Uni	Research Officer, Fire Ecologist, Mallee bird expert
Sarah Brown	Consultant	Ornithologist, MEW expert
Liberty Olds	Zoos SA	Conservation & Sustainability Coordinator
Samantha Vine	BirdLife	Head of Conservation
MEMBERS		
James O'Connor	BirdLife	Head of Research, Mallee bird expert
Janelle Thomas	BirdLife	Threatened Bird Network Coordinator
Dean Ingwersen	BirdLife	Threatened Bird Program Manager
Golo Maurer	BirdLife	Conservation Partnerships Manager
Natasha Schedvin	DELWP	Senior Biodiversity Officer, Fire Ecologist, Mallee bird expert
Victor Hurley	DELWP	Senior Biodiversity Officer Strategic Bushfire Planning
Tim Allen	DELWP	Australian Government NRM Officer Bio Cons Division
Steffen Schultz	DELWP	Strategic Bushfire Planning Manager
Sam Marwood	DELWP	Fire Ecologist
Peter Latch	DoE	Director Terrestrial Species Conservation
Sam Dutton	DoE	Office of Threatened Species Commissioner
Ashley Leedman	DoE	Assist Director, Wildlife, Heritage & Marine Division
Jessica Pink	DoE	Terrestrial Species Conservation Section
Peter Copley	DEWNR	Senior Ecologist, Threatened Species and Ecological Communities
Angela Duffy	DEWNR	
Mick Todd	OEH	Regional Biodiversity Conservation Officer

Phil Ainsley	Zoos SA	Conservation Manager
Stella Kondylas	Zoos SA	Acting Director of Conservation
Dan Harley	Zoos Vic	Threatened Species Biologist
Michael Magrath	Zoos Vic	Senior Scientist
Kathryn Schneider	PV	Fire and Environment Program Officer
Mark Antos	PV	Environmental Scientist- Fauna
Karen Nalder	Mallee CMA	Land and Biodiversity Manager
Mike Clarke	La Trobe Uni	Head, School of Life Sciences, Fire Ecologist, Mallee bird expert
Jemima Connell	La Trobe Uni	PhD Candidate, Fire Ecologist, Mallee bird expert
David Baker-Gabb	Consultant	Mallee expert
Peter Menkhorst	ARI	Ecologist
Zoe Reynolds	ANU	PhD Candidate studying value of unburnt mallee patches
CONSULTANTS		
Stuart Cowell	Facilitator	Coach in Open Standards for the Practice of Conservation
Ben Carr	TNC	Conservation Projects Manager
Marcus Pickett	CCSA	Mt Lofty Ranges SEW & Fleurieu Peninsula Swamps Recovery Program
Tom Prowse	Uni Adelaide	Population modelling
Andrew Woolnough	DEDJTR	Principal Officer, Invasive Animals, Biosecurity
Mike Durant	Greening Aust	Senior Vegetation Consultant
Paul Koch	Greening Aust	Lead Conservation Planner, South East Australia

Appendix 2. Working Conceptual Map

Working Conceptual Map. Direct threats (pink rectangle) and their *contributing factors* (orange rectangle) identified by the CAP team. Note that some contributing factors can be linked to more than one direct threat.



Appendix 3. Draft Strategies

Draft Strategies for key threats. Strategies are listed under the threat they directly target, however this does not necessarily mean they are inclusive of this threat only as they may be linked to other threatening processes. *Denotes a strategy that was considered appropriate to move forward with and cost-out.

Strategies	Impact	Feasibility	Overall summary rating
TOTAL GRAZING PRESSURE			
S5.1 Remove artificial water access	High	High	High*
S5.3 Manage herbivore numbers	High	Medium $	Medium
PAST HABITAT LOSS AND FRAGMENTATION			
S5.2 Campaign to harness existing revegetation projects for target species	High	High	High*
In-situ habitat manipulation	Medium	Low	Low
Community engagement and education strategy re restoration	Medium	Medium	Medium
More effective research partners	Medium	Medium	Medium
Provide incentives to landholders to restore habitat	Medium	Medium $	Medium
Acquisition of land for conservation	High	Medium $$	Medium
CATASTROPHIC WILDFIRE			
S4.1 Reintroduce or supplement known populations	High	Medium	Medium*
S4.2 Ex-situ captive breeding program	Medium	Medium	Medium*
INAPPROPRIATE WATER MANAGEMENT			
Target environmental flow to critical Red Gums	High	Medium $	Medium
GENETIC INTROGRESSION			
S3.1 Control genetic introgression for BEM	High	High	High*
INAPPROPRIATE FIRE MANAGEMENT			
Fire Knowledge & Education			
S2.1 Community engagement and education regarding threatened species conservation	High	Medium	Medium*
S2.2 Advance our knowledge for developing ecological burn strategies for target species	Very High	Medium	Medium*
Challenge current actions using EPBC Act	High	Medium	Medium
Lobbying for a more strategic approach	Medium	Medium	Medium
Partnerships research/Government agencies	High	Medium	Medium
Fire Suppression			
S2.3 Prepare Bushfire Response Plans	High	High	High*
S2.4 Improve response to mallee fire for Threatened Mallee Bird outcomes	Medium	High	Medium
Fire Preparation & Planning			
S2.5 Prioritize Threatened Mallee Birds in Strategic risk-based bushfire planning	High	High	High*
Mallee fire advisory committee	Medium	Very High	Medium
Maintain current resource levels	High	Medium	Medium