RECOVERY PLAN
for the
BLACK-EARED MINER *Manorina melanotis*

2002 - 2006:

Conservation of old-growth dependent mallee fauna

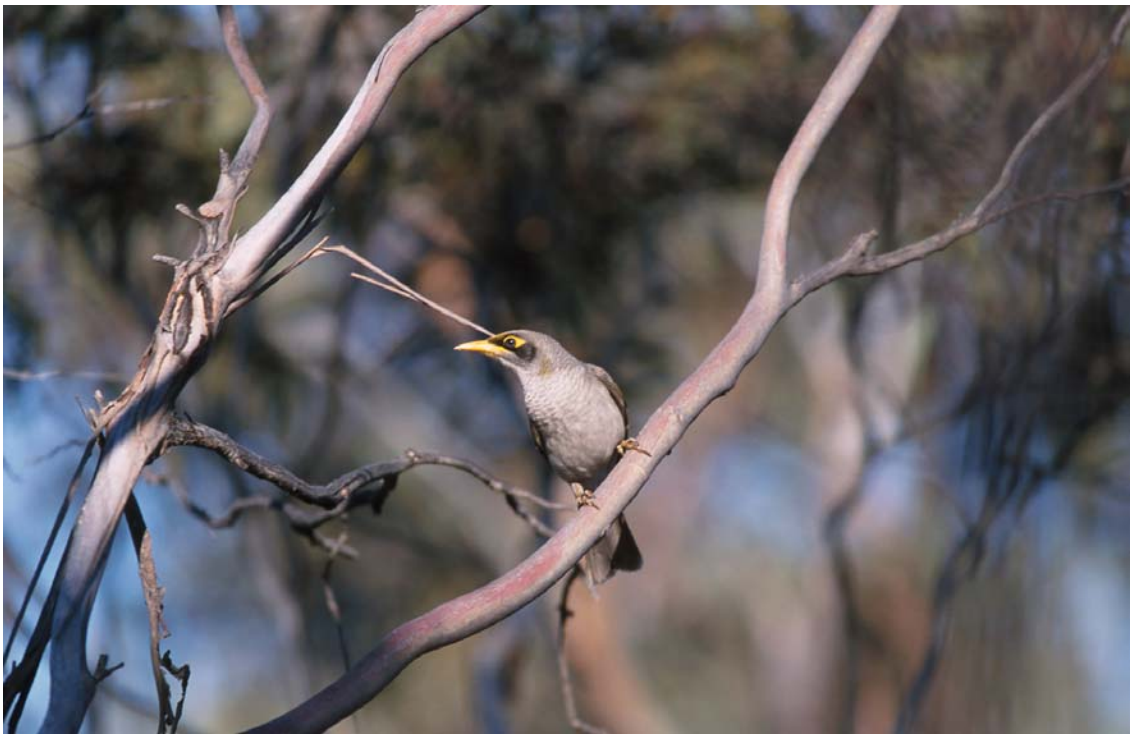

Photo Courtesy of Rohan Clarke

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Prepared by David Baker-Gabb
for the Black-eared Miner Recovery Team

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Assistant Secretary
Natural Resource Management Policy Branch
Department of the Environment and Heritage
GPO Box 787
CANBERRA ACT 2601

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A Recovery Plan prepared under the Commonwealth *Environment Protection and Biodiversity Conservation* Act 1999

CONTENTS

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This Recovery Plan for the Black-eared Miner has been developed from earlier versions of recovery, research and management plans prepared for the species (eg Backhouse *et al* 1997), and from extensive discussions and deliberations amongst members of the Black-eared Miner Recovery Team. In particular, Geoffrey Allen, Khia Atkins, Rebecca Boulton, Matt Cameron, Les Christidis, Mike Clarke, Rohan Clarke, Peter Copley, Anne Cowden, Mark Craig, Sonia Dominelli, Beryl English, John English, Ian Falkenberg, Mick Fendley, Bob Goodfellow, Mike Harper, Alec Hawtin, Doug Holly, Russell Manning, Peter Menkhorst, Michael Miller, Emma Moysey, Janette Norman, Vicki-Jo Russell, Gary Slater, Adrian Stokes, Andrew Willson and Mike Wouters provided extensive comments on and contributions to the Plan.

SUMMARY

Current Species Status

The Black-eared Miner *Manorina melanotis* is classified as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. Using the IUCN threat categories and criteria, the Black-eared Miner was Critically Endangered (Collar *et al* 1994). The short-term goal of the 1997-2001 Recovery Plan (Backhouse *et al* 1997) was to stabilise the Black-eared Miner in the Critically Endangered category. More than this was achieved, and in three years its status has improved to Endangered (Garnett and Crowley 2000).

The Black-eared Miner formerly occurred in the 'Murray Mallee' region of South Australia, Victoria and New South Wales, but is now absent from much of its range. Few birds remain in Victoria and New South Wales, with most colonies now confined to a limited area of mallee to the north-west of Renmark in South Australia. An intensive management program is under way to conserve the Black-eared Miner.

Major Achievements of the 1997-2001 Recovery Plan

In the first four years of the Recovery Program major progress was made including:

- Increasing the number of known Black-eared Miners by >95% through the discovery of a population of c3,600 birds in the Bookmark Biosphere Reserve.
- Surveys and discovery of Black-eared Miners in western NSW.
- Purchase, reservation and effective management of Gluepot Station (54,390 ha) in 1997 and Taylorville Station (90,600 ha) in 1999 which secured the remaining two-thirds of the Black-eared Miner population which was outside the Bookmark Biosphere Reserve.
- Prominent incorporation of Black-eared Miner habitat requirements into Victoria's fire management plans for mallee National Parks.
- Confirmation of the taxonomic status of the species.
- Significant new information on the ecology, social organisation, population dynamics and numbers of Black-eared Miners.
- Implementation of a successful monitoring program supported by a simple field guide.
- Further clarification and definition of the habitat requirements of the species.
- Initiation of measures to control genetic introgression through closing artificial water points and culling Yellow-throated Miners.
- Successful translocation from South Australia and establishment in a Victorian National Park of four colonies of Black-eared Miners containing 68 birds.
- Establishment of a captive population of Black-eared Miners at four localities.
- Outstanding community involvement in field surveys, land management and support for the work of the project officer and students.

Habitat Requirements and Limiting Factors

The Black-eared Miner occurs in extensive mallee eucalypt shrublands, particularly in areas unburnt for >40 years[1]. Its marked decline since 1950 has been attributed to habitat clearance and to genetic introgression with the abundant, open-woodland dwelling Yellow-throated Miner *Manorina flavigula*. Major current threats include continued introgression from Yellow-throated Miners (and hybrids), large wildfires, too frequent fires and ongoing habitat degradation by grazing herbivores.

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[1] *Definition of 'old growth' mallee - For the purposes of this Recovery Plan 'old growth' mallee is defined as 'mallee that has remained unburnt for 40 years or more'.*

Recovery Goals 2002 - 2006

Short-term Goal

In five years to expand the current range and numbers of the Black-eared Miner in at least three locations and to improve the genetic quality of selected colonies.

Recovery criteria:
(1) no loss of habitat or colonies in large reserves
(2) increasing knowledge of colony numbers, quality and population density in SA
(3) increasing the number colonies and tripling the number of birds to 400 in Victoria
(4) increasing the number of colonies and tripling the number of birds to 150 in NSW
(5) implementing measures to increase the quality of colonies in three States
(6) using experience developed with captive birds to assist recovery in the wild

Long-term Goal

Within 20 years to achieve and maintain a population of high-quality Black-eared Miners with a total **effective** population size of at least 1000 birds in viable populations in at least five separate locations across its known former range.

Recovery criteria:
(1) maintaining at least the current range and numbers in South Australia
(2) further increasing the number of birds and colonies in Victoria
(3) further increasing the number of birds and colonies in New South Wales
(4) increasing the quality of colonies as a result of threat control and manipulation

Recovery Objectives and Actions 2002 - 2006:

1. Manage, review and report on the Recovery Program
1.1 Operate the Recovery Team
1.2 Manage the Operations Groups
1.3 Revise the Black-eared Miner Action Statement for Victoria
1.4 Produce a Black-eared Miner Recovery Plan for New South Wales
1.5 Undertake Recovery Program review and evaluation
1.6 Prepare Recovery Program termination criteria

2. Refine knowledge of the distribution and abundance
2.1. Undertake field surveys in South Australia
2.2. Undertake field surveys in New South Wales
2.3. Undertake field surveys in Victoria

3. Maintain and enhance habitat
3.1. Produce coordinated Fire Response Plans and Fire Management Plans
3.2. Upgrade fire access tracks in Bookmark
3.3. Install water tanks and strategic fire breaks in Bookmark
3.4. Protect critical habitat from overgrazing in Bookmark
3.5. Protect habitat critical for survival in Victoria and New South Wales

4. Monitor quality of Black-eared Miner colonies
4.1. Implement the monitoring protocol
4.2. Train more observers to score phenotype
4.3. Determine movement patterns between colonies
4.4. Continue to identify the most valuable colonies

5. Control genetic introgression of the Black-eared Miner
5.1 Interpret results and develop a control protocol
5.2 Implement and monitor on-ground control of introgression

6. Maintain captive populations of Black-eared Miners
6.1 Maintain captive colonies of Black-eared Miners
6.2 Use experience with captives to assist translocations
6.3 Prepare a captive management plan

7. Increase numbers of colonies in Victoria and NSW
7.1 Undertake translocations to Victoria and monitor impacts
7.2 Undertake translocations to New South Wales and monitor impacts
7.3 Collect biological samples
7.4 Develop translocation termination criteria

8. Use population viability modelling
8.1 Develop a population viability model

9. Communication to increase community awareness and involvement
9.1 Involve the community in the Recovery Program
9.2 Provide information on the Recovery Program
9.3 Produce a media strategy

Estimated Cost of Recovery 2002 - 2006 ($000s) (TC = Total Cost Other = Funds to be raised)

Objective		**2002**	**2003**	**2004**	**2005**	**2006**	**Total**
1	TC	45	42	41	42	43	**213**
	Other	19	20	21	22	23	**105**
2	TC	12	15	9	0	0	**36**
	Other	2	2	0	0	0	**4**
3	TC	78	82	47	17	52	**276**
	Other	10	25	20	0	0	**55**
4	TC	27	23	29	24	28	**131**
	Other	13	9	15	10	14	**61**
5	TC	15	10	10	10	10	**55**
	Other	13	9	9	9	9	**49**
6	TC	98	98	105	105	105	**511**
	Other	0	0	0	0	0	**0**
7	TC	123	126	135	127	98	**609**
	Other	68	67	70	73	76	**354**
8	TC	0	25	0	0	0	**25**
	Other	0	25	0	0	0	**25**
9	TC	37	17	17	17	17	**105**
	Other	4	4	4	4	4	**20**
Total	TC	**435**	**438**	**393**	**342**	**353**	**1961**
	Other	**129**	**161**	**139**	**118**	**126**	**673**

Biodiversity Benefits and Wider Values of this Recovery Program

Purchase of Gluepot and Taylorville Stations
These two properties (145,000 ha) were purchased in 1997 and 1999, primarily to conserve the Black-eared Miner. They also contain six other nationally threatened species of bird and 17 bird species that are listed as threatened in one or more of the Murray Mallee States (Baker-Gabb 2000). Destocking of these properties will assist the recovery of a range of threatened ground-foraging species such as the Malleefowl, Chestnut Quail-thrush and Southern Scrub-robin (Mack 1970, Benshemesh 1999).

Decommissioning of artificial water points on Gluepot Reserve and parts of Calperum Station has begun in order to reduce the impacts of genetic introgression on the Black-eared Miner. CSIRO studies (Landsberg *et al* 1997) indicate that this will reduce total grazing pressure and have major biodiversity benefits. Artificial water points have also been closed in Victoria's mallee National Parks and Tarawi Nature Reserve in NSW.

Maintenance of old-growth mallee
The requirement of long-unburnt mallee by the Black-eared Miner has been a key influence on the fire management policies of State agencies and community land managers such as the Australian Landscape Trust and Birds Australia. These policies will also assist the Malleefowl which prefers old-growth mallee too (Benshemesh 1999), and a range of other threatened species such as the Major Mitchell Cockatoo and Scarlet-chested Parrot and many other species of birds, reptiles and bats which require old, hollow-bearing mallees for nesting or roosting (Robertson *et al* 1989, Higgins 1999).

Community awareness and involvement
While the survival of all species of birds is important to Aboriginal people, small, uncommon species such as the Black-eared Miner are unlikely to have been of major cultural or ecological significance (A Rigney "First Peoples of the River Murray and Mallee Region" pers comm), and there is no published information on indigenous peoples' interactions with them. This contrasts with larger malle birds such as the Malleefowl, Emu *Dromaius novaehollandiae*, Wedge-tailed Eagle *Aquila audax* and crow *Corvus* spp. which are of great cultural significance (Benshemesh 1999, AHC 2000).

Through their work as Volunteer Rangers or Assistant Rangers on Gluepot Reserve, more than 40 people have each spent at least two months assisting the Black-eared Miner Recovery Program during 1997-2000. This depth of involvement for people who will move back into the general community is unusual in a recovery program. The Australian Landscape Trust and La Trobe University have provided a smaller number of volunteer Landcarers and students with extended involvement in the Recovery Program, and the Bookmark Biosphere Trust has involved local schools. These positive experiences will benefit a range of biodiversity initiatives beyond the Black-eared Miner Recovery Program.

More than 200 flora and fauna monitoring sites have been established on Calperum and Taylorville Stations and Gluepot Reserve. Community volunteers and students are trained to undertake the monitoring and their skills will in turn be utilised by the wider community.

Translocations
The successful trial translocation of four colonies of Black-eared Miners from the Bookmark Biosphere Reserve and their establishment c200km east in the Murray-Sunset National Park was an internationally significant event. This was the first successful translocation of colonies of a cooperatively breeding bird. The lessons from this successful trial have implications for a number of species. For example, NRE is considering translocations of isolated colonies of Grey-crowned Babblers in Victoria (Robinson *et al* 1997).

Scientific publications and postgraduate degrees

Publications in international scientific journals by Ewen *et al* (in press) and Clarke *et al* (in press) provide new information on the conservation implications of shifts in primary versus adult sex ratios in birds, and the need for scientific rigour in taxonomic studies. Three PhD studies have been supported by the Black-eared Miner Recovery Program. These postgraduate students will produce a number of scientific publications and move on to careers in biodiversity conservation.

1. INTRODUCTION

The Black-eared Miner *Manorina melanotis* (Wilson 1911) formerly occurred in the Murray Mallee region of South Australia, Victoria and New South Wales, but is no longer present over much of its historical range. Few birds remain in Victoria and New South Wales, with most colonies now confined to the Bookmark Biosphere Reserve about 50 km north-west of Renmark in South Australia. An intensive management program is under way to save the Black-eared Miner from extinction.

Several publications have highlighted the rarity and plight of the bird in the past (Favaloro 1966; Considine 1986; Starks 1988). A Recovery Program for the species commenced in Victoria in 1991, with subsequent actions based on plans by Fitzherbert *et al* (1992), Middleton (1993), and McLaughlin (1993b).

Clarification of the taxonomic status of the Black-eared Miner resulted in a commitment from regional, State and national organisations and agencies to save the species, and the production of a national Recovery Plan (Backhouse *et al* 1995). This plan was in turn revised when in 1995 many colonies of Black-eared Miners were discovered in the Bookmark Biosphere Reserve (Backhouse *et al* 1997). This latest (2002-2006) Recovery Plan sets out the actions required to continue and build on the successes already achieved in the recovery of this endangered species.

This Recovery Plan conforms to the requirements of the Commonwealth *Environment Protection and Biodiversity Conservation* Act 1999. It is intended to be the national Recovery Plan for the Black-eared Miner, so that local plans and actions in relevant States clearly originate from the national plan. Subsidiary documents will be prepared as required under relevant State legislation to provide further detail of implementation within that State.

2. THE BLACK-EARED MINER

Description

The Black-eared Miner is one of four species of colonial and co-operatively breeding honeyeaters in the genus *Manorina*. The Black-eared Miner has a stocky build, is about 20 cm long and is dark grey above, paler below, with a dark facial mask and orange-yellow bill and legs. The species is most similar in appearance to the Yellow-throated Miner *Manorina flavigula*, but can be distinguished readily in the field by its much darker rump, lack of pale terminal band on the tail and a greater contrast between the colour of the feathering on the lower jaw and throat (Clarke and Clarke 1999a).

Taxonomy

There has been controversy over the taxonomic status of the Black-eared Miner. Various authors have considered it a species (Wilson 1911; Schodde 1975; Christidis and Boles 1994; Clarke *et al* in press), a subspecies or morphological variant of the Yellow-throated Miner (Matthews 1912, 1913; RAOU 1913; Silveira 1995; Schodde and Mason 1999) and a subspecies of the Western Australian 'Dusky Miner' *Manorina flavigula obscura* (Ashby 1922; Matthews 1925; RAOU 1926).

There are morphological and behavioural differences between Black-eared and Yellow-throated Miners (Ford 1981; Joseph 1986; Starks 1987; McLaughlin 1990, 1992; Clarke *et al* in press), and evidence for marked ecological separation exists (Joseph 1986; McLaughlin 1992). This morphological and ecological evidence supports the contention that the two miners are separate species (Fitzherbert *et al* 1992). Molecular assessment by Christidis (1995) also indicated that the Black-eared Miner is a distinct species. Moreover, Clarke *et al* (in press) showed that Black-eared and Yellow-throated Miners were clearly separable on phenotypic characters prior to extensive modification of mallee habitat that occurred after 1950. They argue that the Black-eared Miner should be afforded full species status given that widespread hybridisation is a recent development facilitated by human disturbance of their habitat.

Black-eared Miners can interbreed with Yellow-throated Miners, resulting in fertile hybrids that display a range of intermediate plumages (Ford 1981; McLaughlin 1990, 1993a). Clarke and Clarke (1999a) have developed a simple guide to distinguish Black-eared Miners from hybrids and Yellow-throated Miners in the field.

Distribution

The historical distribution of the Black-eared Miner included the Murray Mallee of Victoria, South Australia and New South Wales (Blakers *et al* 1984; Joseph 1986; Starks 1987) (Figure 1). The Black-eared Miner's current distribution (Figure 2) is much reduced with over 95% of known colonies in the Bookmark Biosphere Reserve (Clarke and Clarke 1998).

The only recent records from New South Wales are of about five hybrid colonies (Franklin 1996; Boulton and Clarke 2000a). In Victoria there are six known widely-dispersed colonies of hybrid birds (Clarke and Clarke 1999b). In South Australia there are over 200 known colonies in the Bookmark Biosphere Reserve and one at Glenburr Scrub near Murray Bridge (McLaughlin 1996; Clarke and Clarke 1999b). Small captive colonies of hybrid birds have been established at three zoos.

Habitat Critical for Survival

The Black-eared Miner inhabits Shallow-sand Mallee and Chenopod Mallee in both the Sunset Country of Victoria and the Bookmark Biosphere Reserve in South Australia (McLaughlin 1992; Muir *et al* 1999). In both States the vegetation is dominated by multi-stemmed mallee eucalypts, including *Eucalyptus dumosa*, *E gracilis*, *E oleosa* and *E socialis,* usually in association with a ground layer dominated by either Porcupine Grass *Triodia scariosa,* or shrubs of the families Chenopodiacae and Zygophyllaceae (Starks 1987; McLaughlin 1992; Muir *et al* 1999).

Black-eared Miners occur predominantly in old-growth habitats that have not been burnt for at least 40 years, although post-fire regenerating mallee of 5-10 years or older may provide occasional foraging habitat (Starks 1987; C Silveira and J McLaughlin unpubl). In the Bookmark Biosphere Reserve and Tarawi Nature Reserve in NSW >80% of the mallee is older than 40 years and hence suitable for breeding birds. In Victoria where there is much less old-growth mallee, the age and distribution of cohorts of mallee regenerating from fires have been mapped and digitised so that the amount of critical habitat and potential critical habitat can be calculated.

Within large areas of contiguous mallee in Bookmark Biosphere Reserve, sites with highest quality colonies of Black-eared Miners are more than 5 km from dams and man-made clearings (Clarke and Clarke 1999b, Muir *et al* 1999). In contrast, all known Yellow-throated Miner colonies in the Bookmark region have been located within 2 km of permanent water and man-made clearings. The extensive areas of mallee that have remained unburnt for over 40 years that Black-eared Miners need are also important for other nationally threatened birds such as the Malleefowl and hollow-nesting Major Mitchell's Cockatoo (Benshemesh 1999, Garnett and Crowley 2000).

In Victoria, colonies known to have contained Black-eared Miners were in blocks of contiguous mallee vegetation larger than 12,000 ha (McLaughlin 1994). In South Australia and New South Wales all but one known colony occurs in areas of contiguous mallee larger than 100,000 ha. Black-eared Miners were once known to occur in small remnant patches of mallee (McGilp and Parsons 1937; Rix 1937; McGilp 1943) which were probably occupied immediately following large-scale clearing, but prior to the expansion into and subsequent habitation of these areas by Yellow-throated Miners (Starks 1987). Even larger isolated blocks of suitable mallee such as the reserves at Bronzewing (20,000 ha) and Annuello (35,000 ha) have proved unable to retain viable populations of Black-eared Miners and protect them from genetic swamping in the medium term (Boulton and Clarke 2000b).

Life History and Social Organisation

Colony size and quality

Like other members of the genus *Manorina,* the Black-eared Miner is colonial. Each colony typically contains several breeding pairs whose nests may be as little as 15 m apart. When breeding, the species is co-operative with up to 12 juvenile and adult non-breeding individuals (helpers) assisting at a nest. Helpers are predominately male (E Moysey unpubl data), as is the case with other miners (Dow 1978; Clarke 1988). Larger colonies (10+ individuals) contain several well-defined social units. However, the colony still functions as a whole to repel potential predators and other undesirable intruders. Breeding colonies in the Bookmark region contain an average of 18.4 individuals (range 8-40+; Clarke and Clarke 1999b). In Victoria where the species is declining, McLaughlin (1994) calculated the then average number of birds in a colony was 6.3.

All colonies in Victoria that have contained Black-eared Miners in recent times have also contained hybrid birds (Starks 1987; McLaughlin 1990, 1994). Colony quality has continued to decline in Victoria (Boulton and Clarke 2000b). In South Australia colony quality is much higher with 38% of 87 ranked colonies consisting of exclusively or mainly pure Black-eared Miners, and colony quality is also stable there (Boulton and Clarke 2000b).

Effective population size

In the Bookmark Biosphere Reserve there are over 200 colonies (Clarke and Clarke 1999b) containing more than 3,600 birds, of which about 1,400 are Black-eared Miners and the rest are hybrids. The adult sex ratio in colonies is biased towards males, some of which help at nests but do not breed. Based on adult sex ratio data (64% male, Ewen *et al* in press), and an average of five breeding pairs per colony (R Boulton unpubl

data), the effective breeding population in Bookmark is about 2,000 mature individuals, including 760 Black-eared Miners. There are about 50 hybrids in New South Wales (Boulton and Clarke 2000a). After the translocations in 2000, there are about 150 Black-eared Miners and hybrids in Victoria (Clarke and Clarke 1999b, BeM Recovery Team unpubl).

Territoriality and seasonal movement

When breeding, adults typically forage short distances from the nest (up to 0.8 km; E Moysey unpubl data). When not breeding birds move as groups (either as an entire colony or in smaller aggregations) over greater distances to forage. Non-breeding birds remain within a non-breeding territory of several hundred hectares and sightings of marked individuals have been made up to 2 km from the core home range during these non-breeding periods (Clarke and Clarke 1999b). A colony of 11 birds in Victoria occupied a 16 ha core home range and a total home range in excess of 40 ha (Backhouse *et al* 1997). A colony containing 40+ individuals in Bookmark occupied a core breeding range of 12 ha and a total non-breeding home range of 100+ ha (E Moysey unpubl data). At their greatest density colonies breed approximately 2 km apart in the Bookmark region (approximately one colony per 400 ha of total available habitat) (Clarke and Clarke 1999b). However, in Victoria where the species is almost extinct, colonies occurred at densities of about one colony per 1450 ha of apparently suitable habitat in 1993 (McLaughlin 1994).

Social organisation

The Black-eared Miner is monogamous and pairs appear to remain together for life, only re-pairing upon the loss of a mate (Clarke and Clarke 1999b). Breeding males within a colony are close relatives, whereas females, the dispersing sex, are not (E Moysey unpubl data). Adult population sex ratio of breeding colonies in the Bookmark region is significantly male biased (64% male; J Ewen unpubl data). In contrast the sex ratio of nestling Black-eared Miners is significantly female biased (61% female). Since the nestling sex ratio is significantly different from the sex ratio of the adult population it would appear that females are experiencing higher mortality than males between fledging and gaining reproductive status (Ewen *et al* in press).

Breeding and recruitment

Black-eared Miners are opportunistic breeders, breeding when conditions are suitable. Nests have been found in all months. However, breeding typically extends from September to December. Widespread breeding has also been observed from March to May on three occasions (Backhouse *et al* 1997, Boulton and Clarke 2000b). Breeding appears to be linked to rainfall events during mild to warm seasons which promote elevated insect activity, increased lerp abundance and flowering events, both of mallee and understory shrubs. Within a breeding period, birds will usually re-build and lay within two weeks of nest failure. Nests are usually built in mallee eucalypts, either in upright forks, amongst small twigs and foliage, or on epicormic shoots, between 1.5-4.5m above ground (McLaughlin 1990; BANRS). The modal clutch size is three (BANRS).

For a large colony in the Bookmark Biosphere Reserve reproductive success was high for a honeyeater, with 56 % of nests containing eggs producing at least one fledgling (E Moysey unpubl data). In 2000, 38 (26%) of 145 recorded breeding attempts produced

fledglings resulting in high rates of recruitment. However, reproductive success of nests from several Victorian sites has been reported to be substantially lower (J. McLaughlin unpubl data in Backhouse *et al* 1997).

Foraging behaviour and diet

The Black-eared Miner eats mainly invertebrates and lerp (the sugary exudate produced by psyllids). Prey is obtained mainly from gleaning and probing decorticating bark, limbs and twigs of eucalypts and gleaning from foliage, although birds will also forage on the ground and hawk for flying insects (McLaughlin 1990). Nectar from *Eucalyptus spp*, *Eromophila spp* and *Grevillea huegelii* is also taken. In captivity Black-eared Miners are successfully maintained on a diet of commercial honeyeater and lorikeet mix and invertebrates (Clarke and Clarke 1999b).

3. CONSERVATION STATUS

The Black-eared Miner has been listed as Endangered (ANZECC 1991; Garnett 1992), and Critically Endangered (criteria C2a, D1) (Collar *et al* 1994; IUCN 1996). The species is classified as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation* Act 1999, the South Australian *National Parks and Wildlife Act* 1972 (amended May 1991) and the New South Wales *Threatened Species Conservation Act* 1995, and is listed as a threatened taxon under the Victorian *Flora and Fauna Guarantee Act* 1988. The discovery of large numbers of Black-eared Miners in the Bookmark Biosphere Reserve and recovery actions such as land purchase for reserves has led to the status of the bird being changed from Critically Endangered to Endangered (criteria B1+ 2bde, C2a, D) (Garnett and Crowley 2000).

4. DECLINE AND THREATS

Most data on the species' decline come from Victoria. Black-eared Miners were once considered either common or locally common within their mallee habitat prior to 1940 (Wilson 1912; Howe and Tregellas 1914; Favaloro 1966; Starks 1987; McLaughlin 1990). However, there have been few recent records. In Victoria, the decline of the Black-eared Miner has been in the number of colonies, the numbers of birds within colonies and the quality of birds (Considine 1986; Starks 1987; McLaughlin 1990, 1994). This decline has continued despite the retention of a considerable area of apparently suitable habitat within conservation reserves (LCC 1989).

Joseph (1986) summarised the decline of the Black-eared Miner in South Australia and considered the species very nearly, if not already, extinct. However, following sightings of hybrid miners in the extensive mallee habitat of the Bookmark Biosphere Reserve north-west of Renmark in the early 1990s, surveys were conducted in this region in 1996, which resulted in over 80 sightings of miners (McLaughlin 1996; Backhouse *et al* 1997), and over 200 colonies are now known from this area (Clarke and Clarke 1999b). Although containing many hybrids, over a third of colonies contain mainly phenotypically pure Black-eared Miners.

In New South Wales the Black-eared Miner was less well-known, with only eight likely records up until 1985 (Franklin 1996). However, hybrid birds were observed in 1997 and 1999 in two areas of the Scotia Mallee region adjacent to the border with South Australia (Boulton and Clarke 2000a).

Four major causes of decline of the Black-eared Miner have been postulated.

Clearing and habitat fragmentation

A major factor implicated in the decline of the Black-eared Miner is the loss and modification of suitable habitat (Favaloro 1966; Schodde 1981, 1990; Joseph 1986; Starks 1987; McLaughlin 1990, 1992). In Victoria, Johnson (1989) and McLaughlin (1990, 1992) identified the most fertile dunefield soils as being important to Black-eared Miners. Historically, these soil types have been selectively cleared for agricultural use, primarily wheat production (LCC 1987; Blakers and MacMillan 1988), and conservation reserves in the Murray Mallee substantially under-represent the vegetation of fertile soils.

Clearance and modification of vegetation has also favoured a range expansion of the Yellow-throated Miner which prefers open habitats (Schodde 1981, 1990; Joseph 1986; Starks 1987). Prior to widespread clearing in the Murray Mallee, the Yellow-throated Miner occurred infrequently in open woodlands (Chandler 1937; Ashby 1922; Joseph 1986; Emison *et al* 1987; Starks 1987). However, it is now abundant and commonly recorded occupying shelter belts and roadside vegetation adjacent to cleared farmland (Emison *et al* 1987; Starks 1987; McLaughlin 1990, 1992).

Immediately post-clearing, Black-eared Miners were known to occur in remnant patches of mallee scrub, such as shelter belts adjacent to roads and fences (McGilp and Parsons 1937; Rix 1937; McGilp 1943). They occupied these areas prior to expansion into this vegetation by Yellow-throated Miners. Observers who recorded Black-eared Miners in these habitats did not record Yellow-throated Miners (Starks 1987). Black-eared Miners were apparently rapidly eliminated from these remnants, due possibly to a combination of competition, introgressive hybridisation or reduced population viability (McLaughlin 1994).

Clearing of habitat still remains a threat in some parts of the Black-eared Miner's range, though nowadays it has much less impact than in past decades. There are controls on the clearing of mallee on private land in Victoria, although some small-scale clearing still occurs. Further extensive loss of habitat through land clearing is also possible in New South Wales. In South Australia, while there are clearing controls for both public and private land under the *Native Vegetation* Act 1991, exemptions in the Act mean that clearing for mineral exploration and extraction, and public utilities such as power lines can still occur. In addition, joint proclamation of conservation reserves under both the *National Parks and Wildlife Act* 1972 and the *Mining* Act 1972 makes it possible for mineral exploration and mining to proceed within conservation reserves. Therefore, much of the habitat of the Black-eared Miner in South Australia is potentially still under threat from clearing.

Habitat degradation

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 and encourages the growth of woody shrubs (Forward and Robinson 1996). Strategic closure of artificial water points is a key means of reducing total grazing pressure and enhancing biodiversity conservation (Landsberg *et al* 1997). Dams and their associated clearings and degradation attract Yellow-throated Miners and so they are a threat to Black-eared Miners which do not need permanent water (Clarke and Clarke 1999b). A program to decommission all artificial water points or make them unavailable to herbivores is under way in the core of the Black-eared Miner's range in the Bookmark Biosphere Reserve. Most dams in Victorian and New South Wales mallee reserves where Black-eared Miners occur have been decommissioned. An exception is the private reserve, Scotia Sanctuary, in western New South Wales which contains small numbers of Black-eared Miners and numerous artificial water points.

Hybridisation

One of the major causes of decline in this species is introgressive hybridisation or 'genetic swamping' by the conspecific Yellow-throated Miner (Schodde 1981; Starks 1987; McLaughlin 1990). Black-eared and Yellow-throated Miners were clearly separable on phenotypic characters before extensive clearing occurred after 1950 (Clarke *et al* in press). Starks (1987) proposed that miners exhibiting intermediate plumages resulted from hybridisation between the two species, not because Yellow-throated Miners moved into uncleared areas, but because Yellow-throated Miners were able to colonise habitats newly created by land clearing, and come into contact with populations of Black-eared Miners then occupying remnant stands of mallee. Starks (1987) further proposed that hybrid birds created in these situations were physically and behaviourally intermediate, and as such were able to move into areas of uncleared mallee and become incorporated into colonies of phenotypically pure Black-eared Miners.

McLaughlin (1992) demonstrated that habitat occupied by breeding Black-eared Miners is significantly structurally dissimilar from Yellow-throated Miner habitat, and that the two species are predominantly allopatric. However, colonies of distinctly intermediate-plumaged miners were found to occupy a range of habitat types that in structure overlapped both Black-eared and Yellow-throated Miner habitat. This suggests that although Yellow-throated Miners and Black-eared Miners would not normally come into contact (as would have been the case when Black-eared Miners were occupying remnant habitat), the flow of genetic material between the two species is maintained by the presence of hybrid miner colonies (these colonies would not have been present prior to extensive land clearing). In this situation, the hybrid birds in these colonies are able to act as a 'genetic bridge' (Sibly 1961).

The range of the Yellow-throated Miner now encompasses the distribution of the Black-eared Miner. In most areas Yellow-throated Miners and hybrids are more numerous than Black-eared Miners, and the Black-eared Miner now represents an insular population. Under these conditions, uncontrolled genetic introgression will

eventually result in the loss of the biological and genetic diversity contributed by the Black-eared Miner (eg Cade 1983).

Hybridisation is occurring in all Black-eared Miner populations, but it has been particularly severe in small (eg 20,000 ha) reserves in Victoria such as Annuello and Bronzewing. Habitat fragmentation by extensive wildfires has probably promoted the more extensive hybridisation exhibited in Murray-Sunset National Park than is seen in the relatively intact populations in Bookmark Biosphere Reserve. Hybridisation has been extensive in the Scotia mallee in western New South Wales.

Fire

Mallee habitats are some of the most flammable habitat types in the semi-arid zone, and rates of litter accumulation in these habitats may be sufficient to support large sustainable fires every 10-20 years (Noble 1984). Black-eared Miners prefer mallee vegetation that has not been burnt for at least 40 years (Starks 1987; McLaughlin 1990, 1992), and habitats of this age possessing suitable structural characteristics are now uncommon throughout the historical distribution of the Black-eared Miner (eg LCC 1987), except in the Bookmark Biosphere Reserve. In New South Wales, occasional large-scale intentional burning of leasehold land has occurred, ostensibly to increase productivity for pastoral activities (Hodgkinson *et al* 1984; Noble 1984; Choate 1989; MacLeod 1990; Muir 1992).

Although conservation and other reserves that recently supported or still support Black-eared Miner and hybrid populations are large (several hundred thousand hectares), the potential scale of wildfire in mallee habitats suggests that even the largest reserves may be consumed by fire (Benshemesh 1990,1999, Clarke and Clarke 1999b). Single wildfires have burnt many hundreds of thousands of hectares of Murray Mallee vegetation in most decades (LCC 1987; Noble *et al* 1980; Noble 1984; Blakers and MacMillan 1988), and large wildfires remain one of the most serious threats to the Black-eared Miner (McLaughlin 1990, 1992).

Habitat fragmentation from both large wildfires and extensive clearing accelerates the decline of small, isolated colonies of Black-eared Miners by impeding the dispersal of young independent females from colonies. Even in the relatively intact Bookmark Biosphere Reserve where female nestlings outnumber males, adults in colonies are male-biased as a consequence of more dispersing females being lost from the population. The loss of just a single breeding female resulting in the disintegration of small, isolated colonies has been recorded in Victoria (Boulton and Clarke 2000b).

Fire management planning to address the threat from large wildfires is more advanced for sites with Black-eared Miners in Victoria and New South Wales than it is for the Bookmark Biosphere Reserve in South Australia. The lack of a regional fire management plan for Bookmark, and a full complement of appropriate on-ground works, is one of the gravest threats now confronting the Black-eared Miner.

5. EXISTING CONSERVATION MEASURES

The Recovery Program is a complex effort involving many agencies, organisations and individuals, with considerable risk and uncertainty. There are inherent problems in managing a program covering three States, and in coordinating and communicating amongst all participants, given the large distances involved. The remote nature of the bird's habitat also poses problems. Nonetheless, substantial progress has been achieved, particularly in the last four years. The following is a summary of the principle recovery activities undertaken to date.

Taxonomy and Identification

Confusion over the taxonomic status of the Black-eared Miner hampered early recovery efforts, and so an important action was to resolve the bird's taxonomic identity. A molecular study to clarify the phylogenetic relationships and genetic distinctiveness of the Black-eared Miner was completed by Museum of Victoria staff in 1996. This study confirmed that the Black-eared Miner is a distinct species (Christidis 1995). Clarke *et al* (in press) undertook by far the most rigorous phenotypic study to date and also concluded that the Black-eared Miner is a species. To aid identification of Black-eared Miners and hybrids in the field, an improved identification guide was devised by Clarke and Clarke (1998).

Survey and Monitoring

Field surveys have been conducted in Victoria, New South Wales and South Australia, largely by Birds Australia staff and volunteers, and more recently by La Trobe University project officers and Bookmark volunteers (Joseph 1986; Starks 1988; McLaughlin 1990, 1994, 1996; Franklin 1996, Clarke and Clarke 1998, 1999a, Boulton and Clarke 2000a, 2000b). Monitoring of some colonies in Victoria was undertaken by NRE (Johnson 1988, 1989). Since 1996 the extensive mallee habitat in and around the Bookmark Biosphere Reserve in South Australia has been the major focus for surveys and a monitoring program.

Habitat Preferences

Work to determine the habitat preferences, including structure, floristics and fire history, of the Black-eared Miner, and identifying habitat critical to the conservation of the species has been undertaken in Victoria (McLaughlin 1992) as described in Section 2 of this Plan. More recently habitat preferences were studied in South Australia (Muir *et al* 1999), but because all of the habitat was old-growth, fire history preferences could not be distinguished. Further work is needed on this topic and a PhD study commenced in 2000 to look at landscape use by Black-eared Miners, including fire history impacts.

Habitat Protection

South Australia

Clearing of mallee has largely ceased in South Australia. The central importance of Black-eared Miner habitat in South Australia has only been widely known since 1995, although the nature conservation values of the area have been recognised for some time. The purchase of the lease for Calperum Station by Environment Australia and the Chicago Zoological Society in 1993, and the creation of the Bookmark Biosphere Reserve to cover Calperum and neighbouring conservation reserves recognised the

importance of maintaining one of the largest contiguous mallee remnants in Australia, and the region's outstanding nature conservation values.

The situation was enhanced in 1997 when Birds Australia purchased Gluepot Station. This 54,400 ha pastoral lease joins the western boundary of Calperum Station and contains seven globally threatened species of birds including the Black-eared Miner. Gluepot Reserve is now the largest area under a Heritage Agreement in South Australia. In 1999 Environment Australia and the Australian Landscape Trust purchased the neighbouring pastoral lease for Taylorville Station (92,600 ha) to protect the Black-eared Miner. Both Gluepot Reserve and Taylorville Station have been added to the Bookmark Biosphere Reserve. Most of the habitat critical for the survival of the Black-eared Miner in South Australia is now reserved and managed by community representatives and volunteers. Habitat protection for the Black-eared Miner and other threatened mallee flora and fauna is a high priority in the internationally significant Bookmark Biosphere Reserve (BBT 1995). Areas of mallee containing potential Black-eared Miner habitat also receive protection in several conservation reserves south of the Murray River.

The policy of rapid suppression of wildfires throughout Bookmark, including direct attack when feasible, will aid in protecting Black-eared Miner habitat from wildfires. Nevertheless, vegetation and fire history mapping, followed by strategic strip burns and other on-ground works (eg Willson 1999) are needed. Managers of the Bookmark Biosphere Reserve have campaigned vigorously to remove threats from mineral exploration and extraction and power line easements that could result in large areas of old-growth mallee being cleared or further fragmented.

Victoria

Clearance of mallee has largely ceased in Victoria, and 80% of all remaining mallee has been incorporated into conservation reserves. This includes all areas containing, or known to have contained, Black-eared Miner colonies. Strategic closure of artificial water points has also taken place. Fire management on public land in north-western Victoria has shifted from widespread controlled burning to planned strategic fire breaks and a rapid response to suppressing wildfire (Fitzherbert *et al* 1992; J Cooke pers comm.), which will aid protection of Black-eared Miner habitat. A fire management plan that includes protection of remaining old-growth mallee and facilitates regeneration of burnt habitat has been implemented for Victorian mallee reserves. Black-eared Miner habitat has been mapped and digitised and is given high priority in fire planning and suppression (M Wouters pers comm).

New South Wales

There are large areas of mallee protected in New South Wales. The 33,600 ha Tarawi Nature Reserve includes 20,000 ha of mallee habitat not burnt for at least 80 years. Tarawi has implemented a model fire plan and replaced earth dams with sealed tanks (Willson 1999). Tarawi adjoins c80,000 ha of mallee in privately-owned Scotia Sanctuary. Although the 58,000 ha Mallee Cliffs National Park has extensive areas of mallee, most of the park was burnt during the wildfires of 1974-75. The park may provide suitable habitat in the long-term as the mallee vegetation ages post-fire. About 40,000 ha of mallee will be protected when the additions to Mungo National Park are finalised.

Research into Black-eared Miner Biology and Ecology

Since 1996 a three-year PhD has greatly increased our knowledge of the reproductive biology and ecology of the Black-eared and Yellow-throated Miner. This project has supported the captive and field management components of the Recovery Program, helped to address land management issues and paved the way for the successful trial translocations. Research on the biology of Yellow-throated Miners increased our understanding of interactions between the two species. Three years of work by the Project Officer have provided vastly more information than existed before on breeding season and success, population numbers and density, and colony quality and stability.

Captive Populations

Hybrid Black-eared Miners from a colony in Wyperfeld National Park in Victoria were established in captivity in late 1995, supplemented with additional birds captured from South Australia in January 1997. Both groups successfully bred within their first year in captivity, but overall breeding success has been low. In early 2000 there were 15 birds at Healesville Sanctuary, one pair at Adelaide Zoo and two pairs at Monarto.

Trial Translocations

In 1999 a translocation proposal for the Black-eared Miner was produced (Clarke and Clarke 1999b). In late 2000, four colonies (56 adults and 12 fledglings) were moved c200 km from Bookmark to the Murray-Sunset National Park. Twelve nestlings and eight eggs which could not be translocated were hand-reared. Two colonies were released and monitored and two were kept in field aviaries for a week and then released. The birds remained in their general release area for the two months that they were monitored, and at least ten nests were built and two nests produced one fledgling each (Boulton 2001). Hence the first year of translocation trials was remarkably successful.

Community Support

For a bird living in a generally remote and inhospitable region, community support for Black-eared Miner conservation has been substantial. With the recent purchase of Gluepot Station by Birds Australia and Taylorville Station by Environment Australia and the Australian Landscape Trust, the majority of the South Australian Black-eared Miner habitat is now being managed by conservation organisations or agencies. Both Birds Australia and the Australian Landscape Trust have raised funds, contributed to surveys, managed research and land management programs to benefit threatened mallee species (BBT 1995, Baker-Gabb 2000). At Calperum Station and Gluepot Reserve accommodation and resources are provided for the Black-eared Miner Project Officer and numerous volunteers who assist the recovery of the species. Gluepot Reserve also provides facilities for bird-watchers and opportunities for the public to see the Black-eared Miner and other mallee birds. Community members involved in the Bookmark Biosphere Reserve program have been instrumental in survey work and raising local awareness of the Black-eared Miner and issues affecting its conservation. Members of field naturalist and bird clubs have assisted in survey and monitoring work, particularly in Victoria.

Recovery Planning

A Recovery Team was formed in 1991 to coordinate preparation and implementation of recovery efforts for the Black-eared Miner, particularly in Victoria. A variety of planning processes have been used to guide recovery of the Black-eared Miner (Fitzherbert *et al* 1992; McLaughlin 1993b; Middleton 1993). Once the taxonomic status of the Black-eared Miner was confirmed in 1995, a new national Recovery Plan was prepared and additional funding for implementation of the Recovery Program obtained (Backhouse *et al* 1995). The Recovery Team was expanded to incorporate additional expertise and to manage the Recovery Program across all range States and land tenures. Discovery of the miner colonies in the Bookmark Biosphere Reserve in South Australia necessitated a major revision of the 1995 recovery plan to incorporate the new information into the Recovery Program (Backhouse *et al* 1997). The Team concentrates on preparing and monitoring implementation of the recovery plan and strategic planning, with day to day implementation and operations the responsibility of the Captive Management and Field Management Operations Groups. Organisations, agencies and individuals at a national, State and regional level, including both government and community groups, are represented on the Recovery Team (Appendix 1). These groups have made substantial contributions in expanding the range of expertise available for the Black-eared Miner recovery effort.

Publications

Many published and unpublished reports and papers on Black-eared Miner biology, conservation and management have been prepared (most are included in the Bibliography section of this Recovery Plan). These reports and papers provide a detailed record and wealth of information on Black-eared Miner conservation and also include many issues applicable to broader biodiversity conservation in the mallee. An information brochure on conservation and management of the Black-eared Miner in Victoria has also been prepared.

6. BROAD RECOVERY GOALS AND CRITERIA

Broad directions for recovery for the duration of this Recovery Plan will be:

- Providing greater security for habitat from wildfire and other threats, particularly in South Australia.
- Controlling genetic introgression.
- Monitoring trends in numbers and colony quality.
- Supplementing isolated colonies at three sites in Victoria (eastern and western Murray-Sunset National Park, and Wyperfeld National Park) and New South Wales (Tarawi Nature Reserve) with birds translocated from South Australia.

The short-term goal of the 1997-2001 Recovery Plan was to stabilise the species within the Critically Endangered category (Backhouse *et al* 1997). More than this was achieved in four years with the Black-eared Miner's status improving to Endangered (Garnett and Crowley 2000). Achieving the short-term goal of this Recovery Plan will see a further improvement with the status of the Black-eared Miner still being Endangered but moving towards Vulnerable (IUCN 1996). Attaining the Recovery Plan's long-term goal should result in removal of the Black-eared Miner from an IUCN threat category included under the *EPBC* Act 1999, but it would still be Conservation Dependent and require ongoing management works.

Short-term Goal

In five years to expand the current range and numbers of the Black-eared Miner in at least three locations and to improve the quality of selected colonies.

Recovery criteria:

(1) no loss of habitat or colonies in large reserves
(2) increasing knowledge of colony numbers, quality and population density in SA
(3) increasing the number colonies and tripling the number of birds to 400 in Victoria
(4) increasing the number of colonies and tripling the number of birds to 150 in NSW
(5) implementing measures to increase the quality of colonies in three States
(6) using experience developed with captive birds to assist recovery in the wild

Long-term Goal

Within 20 years to achieve and maintain a population of high-quality Black-eared Miners with a total **effective**[2] population size of at least 1000 mature individuals in viable populations at least five separate locations across its known former range.

Recovery criteria:

(1) maintaining at least the current range and numbers in South Australia
(2) further increasing the number of birds and colonies at three sites in Victoria
(3) further increasing the number of birds and colonies at one site in NSW
(4) increasing the quality of colonies as a result of threat control and manipulation

[2] In the Bookmark Biosphere Reserve there are currently over 200 colonies containing more than 3,600 birds, of which about 1,400 birds are Black-eared Miners, the rest being hybrids. However, there are many non-breeding helpers in colonies and the effective breeding population is about 2,000 birds including 760 Black-eared Miners.

7. RECOVERY OBJECTIVES, CRITERIA AND ACTIONS

1 Manage, review and report on the Recovery Program

The Black-eared Miner Recovery Program is a complex, multi-disciplinary operation covering a wide range of organisational, biological, technical, management and social issues. On the other hand, some issues are simplified because all land containing Black-eared Miners is reserved for conservation. The Recovery Team has members representing 14 agencies and organisations with an interest in, and responsibility for, Black-eared Miner conservation (Appendix 1).

Objective

- To maintain an effective Recovery Team which organises, reviews and reports on the recovery effort.

Criteria

- Progress towards meeting the Recovery Plan objectives and actions is achieved on time with high levels of community, institution and Government stakeholder support and involvement. Progress is evaluated and reported on annually to relevant organisations.

Action 1.1 Operate the Recovery Team

- Appoint a part-time Recovery Team Convenor to organise meetings, to prepare minutes and organise annual reviews of progress, to communicate and liaise both within and outside the Recovery Team, and to ensure that Recovery Team members fulfil their agreed responsibilities.
- Identify targets, responsibilities and timelines for the completion of actions, as well as monitor and assess implementation of the Recovery Plan.

Responsibility: BeMRT

Source	2002	2003	2004	2005	2006
BeMRT	10	10	10	10	10
Other	19	20	21	22	23
Total Cost	**29**	**30**	**31**	**32**	**33**

Action 1.2 Manage the Captive, Field and Land Management Groups

- Establish a Land Management Group to coordinate the recovery efforts of Bookmark Biosphere Reserve land managers.
- Oversee the day-to-day implementation of operational aspects of the recovery effort, and communicate with field staff, land managers and captive population managers.

Responsibility: BeMRT

Source	2002	2003	2004	2005	2006
BeMRT	5	5	5	5	5
Total Cost	**5**	**5**	**5**	**5**	**5**

Action 1.3 Black-eared Miner Action Statement for Victoria

- Revise the Action Statement for the Black-eared Miner (Fitzherbert *et al* 1992) which is overdue for review and updating.

Responsibility: NRE

Source	2002	2003	2004	2005	2006
NRE	3	0	0	0	0
Other	0	0	0	0	0
Total Cost	**3**	**0**	**0**	**0**	**0**

Action 1.4 New South Wales Recovery Plan

- Produce a Recovery Plan for New South Wales with more operational detail for that State as required under the NSW *Threatened Species Conservation* Act 1995.

Responsibility: NSW National Parks and Wildlife Service

Source	2002	2003	2004	2005	2006
NPWS	3	0	0	0	0
Total Cost	**3**	**0**	**0**	**0**	**0**

Action 1.5 Recovery Program annual review and reporting

- Undertake an annual review and evaluation to ensure recovery objectives are being met. Report results to participating organisations and provide a summary for the general public.

Responsibility: BeMRT

Source	2002	2003	2004	2005	2006
BeMRT	5	5	5	5	5
Total Cost	**5**	**5**	**5**	**5**	**5**

Action 1.6 Recovery Program termination criteria

- Develop termination criteria for the Recovery Program, and include a time-frame for various stages of recovery, plus the determination of success and failure criteria for captive and field management.

Responsibility: BeMRT

Source	2002	2003	2004	2005	2006
BeMRT	0	2	0	0	0
Total Cost	**0**	**2**	**0**	**0**	**0**

Objective 2 Refine knowledge of distribution and abundance

Recent surveys have covered substantial areas of the Black-eared Miner's likely range in three States, but there are still areas of potential habitat in all States to be searched. An improved knowledge of colony numbers, quality and density is also essential for assessing the cost of translocations on donor populations, and for knowing when recovery program goals have been achieved.

Criteria

- Colony numbers refined in the Bookmark region, and potential translocation sites in Victoria (3) and New South Wales (1) surveyed during 2002-04.

Action 2.1 Undertake field surveys in South Australia

- Define the boundary of Black-eared Miner occurrence in the Bookmark region, and survey likely habitat south of the Murray River.
- Use Malleefowl grids and transects to refine estimates of colony numbers, quality and density in the Bookmark region.

Responsibility: LTU, ALT, BA

Source	2002	2003	2004	2005	2006
LTU	2	2	0	0	0
ALT	1	1	0	0	0
BA	1	1	0	0	0
Other	2	2	0	0	0
Total Cost	**6**	**6**	**0**	**0**	**0**

Action 2.2 Undertake field surveys in New South Wales

- Undertake further searches of the Scotia mallee land system before translocating birds there.

Responsibility: NPWS

Source	2002	2003	2004	2005	2006
NPWS	0	3	3	0	0
Total Cost	**0**	**3**	**3**	**0**	**0**

Action 2.3 Undertake field surveys in Victoria

- Survey past colony locations and particularly areas in the western and eastern Murray-Sunset National Park and Wyperfeld National Park before translocations take place.

Responsibility: NRE, PV

Source	2002	2003	2004	2005	2006
NRE	2	2	2	0	0
PV	4	4	4	0	0
Total Cost	**6**	**6**	**6**	**0**	**0**

Objective 3 Maintain and enhance habitat

Appropriate on-ground works to control wildfires have been implemented in Victoria and NSW, but much more is needed in parts of the Bookmark Biosphere Reserve, the core of the Black-eared Miner's distribution. 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.

Criteria

- A coordinated Fire Response Plan for the Bookmark Biosphere Reserve produced by 2002. Fire history mapping completed for the Bookmark Biosphere Reserve mallee by 2002 and a Fire Management Plan completed by 2003. All non-essential artificial water points in mallee closed and revegetated, and replaced with above-ground tanks as necessary for fire fighting by 2004. An agreed system of strategic fire breaks commenced by 2004.

Action 3.1 Planning to protect habitat from wildfire in South Australia

- Produce a coordinated Fire Response Plan for the Bookmark Biosphere Reserve.
- Undertake fire history mapping of mallee in the Bookmark Biosphere Reserve and produce a Fire Management Plan.

Responsibility: ALT, BA, DEH

Source	2002	2003	2004	2005	2006
ALT	2	2	0	0	0
BA	2	2	0	0	0
DEH	10	40	0	0	0
Total Cost	**14**	**44**	**0**	**0**	**0**

Action 3.2 Upgrading works to protect habitat from wildfire in South Australia

- Implement the Fire Response Plan and improve on-ground fire control measures including upgrading fire access tracks.

Responsibility: ALT, BA, DEH

Source	2002	2003	2004	2005	2006
ALT	20	0	0	0	20
BA	5	0	0	0	5
DEH	10	0	0	0	10
Total Cost	**35**	**0**	**0**	**0**	**35**

Action 3.3 Implement the Fire Management Plan to protect habitat from wildfire in South Australia

- Install above-ground water tanks (2003) new fire access tracks (2004), and narrow, linear fire breaks (2004-06).

Responsibility: ALT, BA, DEH

Source	2002	2003	2004	2005	2006
ALT	0	0	5	5	5
BA	0	0	5	5	5
DEH	0	0	5	5	5
Other	0	15	10	0	0
Total Cost	**0**	**15**	**25**	**15**	**15**

Action 3.4 Protect habitat from overgrazing in South Australia

- Based on a study of introgression potential, implement the strategic closure of non-essential artificial water points in Bookmark and revegetate these sites.

Responsibility: ALT, DEH

Source	2002	2003	2004	2005	2006
ALT	5	5	5	0	0
DEH	5	5	5	0	0
Other	10	10	10	0	0
Total Cost	**20**	**20**	**20**	**0**	**0**

Action 3.5 Protect habitat critical for survival in NSW and Victoria

- Conduct an audit of fire control measures and any remaining artificial water points in Victorian and New South Wales mallee reserves where Black-eared Miners are to be translocated and upgrade as necessary.
- Integrate the Tarawi/Scotia and Danggali fire response plans.

Responsibility: PV, NRE, NPWS, DEH

Source	2002	2003	2004	2005	2006
PV	1	1	1	1	1
NRE	1	1	1	1	1
NPWS	6	1	0	0	0
DEH	1	0	0	0	0
Total Cost	**9**	**3**	**2**	**2**	**2**

Objective 4 Monitor Black-eared Miner colonies

Numbers and quality of birds in colonies need to be monitored to identify the most valuable colonies to the Recovery Program, those that may be an avenue for genetic introgression, and for determining the effect of management actions and translocations.

Criteria

- At least ten community volunteers and agency staff trained each year and contributing essential monitoring data. Biological samples collected from over 50 birds each year.

Action 4.1 Implement the monitoring protocol

- Monitor selected breeding colonies using the established protocol to determine size, composition, phenotypic quality and trends.

Responsibility: Consultant

Source	2002	2003	2004	2005	2006
Consultant	2	2	2	2	2
Other	6	2	8	4	8
Total Cost	**8**	**4**	**10**	**6**	**10**

Action 4.2 Train more observers to score phenotype of Black-eared Miners

- Train more volunteers and agency staff to use the simple field identification technique (Clarke and Clarke 1998, 1999a) to assist ongoing monitoring.

Responsibility: Consultant

Source	2002	2003	2004	2005	2006
Consultant	.5	.5	.5	.5	.5
BA	.5	.5	.5	.5	.5
Other	1	1	1	1	1
Total Cost	**2**	**2**	**2**	**2**	**2**

Action 4.3 Determine movement patterns between colonies

- Assist volunteers to determine dispersal of colour-banded birds away from and between colonies.

Responsibility: ALT, BA, Consultant

Source	2002	2003	2004	2005	2006
ALT	3	3	3	3	3
BA	3	3	3	3	3
Consultant	1	1	1	0	0
Total Cost	**7**	**7**	**7**	**6**	**6**

Action 4.4 Continue to identify the priority colonies

- Assess phenotype, threats and vulnerability to identify priorities for colony protection and translocation, and as a basis for monitoring changes in quality over time.

Responsibility: Consultant, BeMRT

Source	2002	2003	2004	2005	2006
Consultant	3	3	3	3	3
BeMRT	2	2	2	2	2
Other	5	5	5	5	5
Total Cost	**10**	**10**	**10**	**10**	**10**

Objective 5 Control genetic introgression of the Black-eared Miner

Genetic introgression is a major current threat which is promoted by habitat fragmentation and degradation. The key issue is to prevent the flow of Yellow-throated Miner genes into colonies containing Black-eared Miners.

Criteria

- A key threatening process controlled through the removal of selected colonies of Yellow-throated Miners and (see Action 3.4) decommissioning of dams.

Action 5.1 Interpret results and develop a control protocol

- Interpret the efficacy of the trial control program and field sampling to define the extent of introgression, the location and feasibility of remedial action to counter introgression, and the development of a protocol for the removal of problem Yellow-throated Miners and colonies.

Responsibility: Consultant

Source	2002	2003	2004	2005	2006
Consultant	1	0	0	0	0
Other	4	0	0	0	0
Total Cost	**5**	**0**	**0**	**0**	**0**

Action 5.2 Implement and monitor on-ground control of introgression

- Identify, cull and monitor the removal of Yellow-throated Miners and their colonies, particularly those in close proximity to Black-eared Miner colonies.

Responsibility: Consultant

Source	2002	2003	2004	2005	2006
Consultant	1	1	1	1	1
Other	9	9	9	9	9
Total Cost	**10**	**10**	**10**	**10**	**10**

Objective 6 Maintain captive populations of Black-eared Miners

The captive populations play a key role by enabling experimental manipulation in a controlled environment, increasing staff expertise, and raising community awareness. Zoo staff have played a vital role in successful trial translocations.

Criteria

- Zoo staff participate in annual translocations, achieve captive breeding success similar to wild populations, produce a husbandry manual, and help raise community awareness.

Action 6.1 Maintain captive colonies of Black-eared Miners

- Maintain captive colonies of hybrid Black-eared Miners at Healesville Sanctuary, Adelaide Zoo and Monarto to test population manipulation techniques and improve captive breeding techniques.
- Display excess birds and interpret the activities of the Recovery Program to the general public.

Responsibility: ZPGB, RZSSA, DEH

Source	2002	2003	2004	2005	2006
ZPGB	30	30	40	40	40
RZSSA	15	15	15	15	15
DEH	15	15	15	15	15
Total Cost	**60**	**60**	**70**	**70**	**70**

Action 6.2 Use experience with captive birds to assist translocations

- Involve zoo staff in animal care, transport, veterinary and hand-rearing tasks during translocations.

Responsibility: RZSSA, ZPGB, DEH

Source	2002	2003	2004	2005	2006
RZSSA	15	15	15	15	15
ZPGB	15	15	15	15	15
DEH	5	5	5	5	5
Total Cost	**35**	**35**	**35**	**35**	**35**

Action 6.3 Prepare a captive management plan

- Include in a captive management plan locations of captive colonies, numbers in captivity, disease assessment, maintenance of studbook and preparation of a husbandry manual.

Responsibility: ZPGB, RZSSA

Source	2002	2003	2004	2005	2006
ZPGB	2	2	0	0	0
RZSSA	.5	.5	0	0	0
DEH	.5	.5	0	0	0
Total Cost	**3**	**3**	**0**	**0**	**0**

Objective 7 Increase numbers and quality of Black-eared Miner colonies in Victoria and New South Wales

Bookmark is the single area known to contain large numbers of Black-eared Miners, and as such the species faces a high risk of extinction from wildfire. Establishing viable populations of the species in other regions is fundamental to reducing the extinction risk and achieving the long-term of goal of the Recovery Plan. The trial translocation in 2000 of four colonies containing 69 birds from Bookmark to Murray-Sunset National Park in Victoria was outstandingly successful.

Criteria

- The number of Black-eared Miners in Victoria and NSW is tripled in five years through translocations.

Action 7.1 Translocations of South Australian birds to Victoria

- Translocate c250 birds (13 colonies) from South Australia to Victoria over three years and monitor the impact on both recipient and donor populations.

Responsibility: Consultant, PV, NRE, DEH, BA, ALT, ZPGB, RZSSA

Source	2002	2003	2004	2005	2006
Consultant	5	5	5	5	5
PV	10	10	5	10	5
NRE	5	5	1	5	1
DEH	1	1	0	1	0
BA	1	1	0	1	0
ALT	1	1	0	1	0
ZPGB	20	20	0	20	0
RZSSA	10	10	0	10	0
Other	60	63	0	69	36
Total Cost	**113**	**116**	**11**	**112**	**47**

Action 7.2 Translocation of South Australian birds to New South Wales

- Translocate c100 birds (5 colonies) from South Australia to New South Wales in one year and monitor the impact on both recipient and donor populations.

Responsibility: Consultant, NPWS, DEH, BA, ALT, ZPGB, RZSSA

Source	2002	2003	2004	2005	2006
Consultant	0	0	5	5	5
NPWS	0	5	15	5	5
DEH	0	0	1	0	0
BA	0	0	1	0	0
ALT	0	0	1	0	0
ZPGB	0	0	20	0	0
RZSSA	0	0	10	0	0
Other	0	0	66	0	36
Total Cost	**0**	**5**	**119**	**10**	**46**

Action 7.3. Collect biological samples from translocated Black-eared Miners

- Collect faecal samples to test for the presence of diseases, particularly in Victoria.
- Collect blood samples from translocated birds for sex determination.

Responsibility: Consultant

Source	2002	2003	2004	2005	2006
Consultant	1	1	1	1	1
Other	4	4	4	4	4
Total Cost	**5**	**5**	**5**	**5**	**5**

Action 7.4. Translocation termination criteria

- Develop criteria to determine when the translocation program should cease.

Responsibility: Consultant

Source	2002	2003	2004	2005	2006
Consultant	1	0	0	0	0
Other	4	0	0	0	0
Total Cost	**5**	**0**	**0**	**0**	**0**

Objective 8 Use population viability modelling

Computer simulations can be beneficial in guiding decision-making when dealing with populations of endangered species, help refine targets for recovery, and predict the effect of management actions.

Criteria

- A Population Viability assessment model is produced which helps refine targets, particularly with respect to translocations and genetic introgression.

Action 8.1 A PVA model specifically for the Black-eared Miner

- Develop a PVA model specific to the Black-eared Miner which includes introgressive hybridisation as a threatening process in a cooperatively breeding bird.

Responsibility: BeMRT

Source	2002	2003	2004	2005	2006
Other	0	25	0	0	0
Total Cost	**0**	**25**	**0**	**0**	**0**

Objective 9 Communication to increase community awareness and involvement
Volunteers, and especially those from Birds Australia, Australian Landscape Trust, and La Trobe University have made a major contribution to fund raising, field surveys, monitoring and manipulation. Community volunteers manage most of the Bookmark Biosphere Reserve where Black-eared Miners occur. Community participation in endangered species recovery programs can increase the likelihood of successful outcomes.

Criteria
- Land managers and Country Fire Service fully aware and participating in the Recovery Program, at least ten new volunteers actively involved each year, and two media stories circulated to the general public annually.

Action 9.1 Involve the community in the Recovery Program
- Involve Australian Landscape Trust, Birds Australia and other volunteers in the Black-eared Miner Recovery Program, particularly in training, surveys and monitoring.

Responsibility: BeMRT, BA, ALT

Source	2002	2003	2004	2005	2006
BeMRT	1	1	1	1	1
BA	5	5	5	5	5
ALT	2	2	2	2	2
Other	2	2	2	2	2
Total Cost	**10**	**10**	**10**	**10**	**10**

Action 9.2 Communicate information on the Black-eared Miner and the Recovery Program
- Ensure that the coordinated Fire Response Plan and Fire Management Plan (see Action 3.1) for Bookmark are communicated to the Country Fire Service and other stakeholders.
- Prepare an annual review of the Black-eared Miner Recovery Program for contributing agencies and participants.
- Provide an annual summary of results for the general public and media information on 'one-off' events such as successful translocations.

Responsibility: BeMRT

Source	2002	2003	2004	2005	2006
BeMRT	5	5	5	5	5
Other	2	2	2	2	2
Total Cost	**7**	**7**	**7**	**7**	**7**

Action 9.3 Produce a media strategy
- Prepare and distribute a media strategy with a media kit, information for contributing organisations' web sites, and displays to the general public.

Responsibility: ZPGB, RZSSA

Source	2002	2003	2004	2005	2006
ZPGB	10	0	0	0	0
RZSSA	10	0	0	0	0
Total Cost	**20**	**0**	**0**	**0**	**0**

8. GUIDE TO DECISION MAKERS

There are four major causes of decline of the Black-eared Miner that land managers and other decision makers need to be aware of: (i) clearing and habitat fragmentation, (ii) habitat degradation, (iii) genetic introgression and (iv) large fires (see also section 4 "Decline and Threats"). The following actions may therefore hamper the Black-eared Miner's viability and recovery:

Clearing and fragmentation
Clearing or fragmentation of blocks of intact mallee has caused regional extinctions of Black-eared Miners and is therefore highly undesirable. Clearing and fragmentation may result in the death of birds or their subsequent genetic swamping by Yellow-throated Miners. Fragmentation may result from clearing several small areas within or around an intact block, or by clearing wide easements through it. Fire access tracks about 5m wide do not constitute a wide easement or a threat.

Habitat degradation
Dams with their associated clearings and degradation by herbivores attract Yellow-throated Miners, thereby increasing the likelihood of genetic introgression. Putting new dams in blocks of intact mallee is highly undesirable and allowing current dams to persist and provide water for herbivores in conservation reserves is not recommended. Above-ground tanks are recommended for fire fighting purposes.

Genetic introgression
Yellow-throated Miners have genetically swamped Black-eared Miners in the past and continue to do so in some fragmented areas. Allowing individual Yellow-throated Miners or their colonies to remain in close proximity to Black-eared Miners is therefore undesirable because of the hybridisation that is likely to take place.

Large fires
Because Black-eared Miners require mallee that has not been burnt for 40 or more years, large wildfires constitute a threat of only slightly lesser magnitude than clearing. Fires may also lead to habitat fragmentation and regional extinctions. Strip burns c100m wide with lengths of 1-5 km burnt in a year (eg Willson 1999) to provide strategic fire breaks and protect large blocks of intact mallee should not pose a threat. Every effort should be made to contain the spread of wildfires in Black-eared Miner habitat.

In mallee where Black-eared Miners occur, even large fires generally leave substantial pockets of unburnt mallee where the birds can breed and still forage in the surrounding regenerating areas.

Definition of 'old growth' mallee

For the purposes of this Recovery Plan 'old growth' mallee is defined as 'mallee that has remained unburnt for 40 years or more'.

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10 APPENDICES

Appendix 1 Black-eared Miner Recovery Team Membership and Abbreviations

ALT	Australian Landscape Trust
BA	Birds Australia
BBT	Bookmark Biosphere Trust
DEH	Department for Environment and Heritage, South Australia
NRE	Department of Natural Resources and Environment, Victoria
Elanus	Elanus Pty Ltd
EA	Environment Australia
LTU	La Trobe University
MoV	Museum of Victoria
NPWS	National Parks and Wildlife Service, New South Wales
PV	Parks Victoria
SunBOC	Sunraysia Bird Observers Club
TSN	Threatened Species Network, South Australia
RZSSA	Royal Zoological Society of South Australia
ZPGB	Zoological Parks and Gardens Board, Victoria

Other Abbreviations

BANRS	Birds Australia Nest Record Scheme
BeMRT	Black-eared Miner Recovery Team

Appendix 2 Implementation Schedule

Task	Description	Priority	Feasibility	Resp Party	Cost estimate ($000s/year)					
					2002	2003	2004	2005	2006	Total
1	*Recovery program*									
1.1	Recovery Team	1	100%	BeMRT	29	30	31	32	33	**155**
1.2	Operations groups	1	100%	BeMRT	5	5	5	5	5	**25**
1.3	Action Statement	2	100%	NRE	3	0	0	0	0	**3**
1.4	Recovery Plan	1	100%	NPWS	3	0	0	0	0	**3**
1.5	Review & reporting	1	100%	BeMRT	5	5	5	5	5	**25**
1.6	Termination criteria	2	100%	BeMRT	0	2	0	0	0	**2**
2	*Distribution and Abundance*									
2.1	South Australia	1	100%	Consultant	6	6	0	0	0	**12**
2.2	New South Wales	1	100%	NPWS	0	3	3	0	0	**6**
3.3	Victoria	1	100%	NRE, PV	6	6	6	0	0	**18**
3	*Maintain Habitat*									
3.1	Fire Plans, SA	1	100%	DEH	14	44	0	0	0	**58**
3.2	Upgrade tracks, SA	1	100%	ALT, DEH	35	0	0	0	35	**70**
3.3	Install tanks, breaks	1	100%	ALT, BA	0	15	25	15	15	**70**
3.4	Reduce grazing, SA	1	100%	ALT, DEH	20	20	20	0	0	**60**
3.5	Habitat in Vic NSW	1	100%	PV, NPWS	9	3	2	2	2	**18**
4	*Monitoring*									
4.1	Monitor in SA	1	100%	Consultant	8	4	10	6	10	**38**
4.2	Train observers	1	100%	Consultant	2	2	2	2	2	**10**
4.3	Movement patterns	2	80%	ALT, BA	7	7	7	6	6	**33**
4.4	Identify colonies	1	100%	BeMRT	10	10	10	10	10	**50**
5	*Control introgression*									
5.1	Develop protocol	1	100%	Consultant	5	0	0	0	0	**5**
5.2	Implement control	1	100%	Consultant	10	10	10	10	10	**50**
6	*Captive population*									
6.1	Maintain colonies	1	100%	Zoos	60	60	70	70	70	**330**
6.2	Assist translocations	1	100%	ZoosS	35	35	35	35	35	**175**
6.3	Captive mgt plan	2	100%	ZPGB	3	3	0	0	0	**6**
7	*Increase numbers in Victoria & NSW*									
7.1	Translocations to Vic	1	100%	Consultant	113	116	11	112	47	**399**
7.2	Translocations NSW	1	100%	Consultant	0	5	119	10	46	**180**
7.3	Biological samples	1	100%	Consultant	5	5	5	5	5	**25**
7.4	Termination criteria	1	100%	Consultant	5	0	0	0	0	**5**
8	*Population viability*									
8.1	Develop PVA model	2	100%	BeMRT	0	0	0	25	0	**25**
9	*Communication*									
9.1	Involve community	1	100%	BeMRT	10	10	10	10	10	**50**
9.2	Provide information	1	100%	BeMRT	7	7	7	7	7	**35**
9.3	Media strategy	1	100%	Zoos	20	0	0	0	0	**20**
	Totals ($000s)				**377**	**359**	**366**	**372**	**317**	**1961**

Location of all remaining Black-eared Miner and Black-eared Miner hybrid colonies