



Australian Government

**NATIONAL RECOVERY PLAN FOR THE
SOUTH-EASTERN RED-TAILED BLACK-COCKATOO**

Calyptrorhynchus banksii graptogyne

Department of the Environment and Water Resources

Based on a document prepared by David Baker-Gabb, for the Australian Government
Department of the Environment and Water Resources.

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Note: This recovery plan sets out the actions necessary to stop the decline of, and support the recovery of, the listed threatened species or ecological community. The Australian Government is committed to acting in accordance with the plan and to implementing the plan as it applies to Commonwealth areas.

The plan has been developed with the involvement and cooperation of a broad range of stakeholders, but individual stakeholders have not necessarily committed to undertaking specific actions. The attainment of objectives and the provision of funds may be subject to budgetary and other constraints affecting the parties involved. Proposed actions may be subject to modification over the life of the plan due to changes in knowledge.

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Copies of this plan are available at:

www.environment.gov.au/biodiversity/threatened/recovery/list-common.html

or:

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*Detailed background information on the species and implementation of this plan can be found in the document “Background and Implementation Information on for the South-eastern Red-tailed Black-Cockatoo, *Calyptorhynchus banksii graptogyne* Recovery Plan”, available at www.environment.gov.au/biodiversity/threatened/recovery/list-common.html*

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1. Species Information

1.1 Legal status

The South-eastern Red-tailed Black-Cockatoo is one of five subspecies (Ford 1980). It is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In Victoria it is listed under the *Flora and Fauna Guarantee Act 1988*, and classified as endangered (DSE 2003). It is listed as endangered in South Australia (*National Parks and Wildlife Act 1972*). The South-eastern Red-tailed Black-Cockatoo is also listed under the Japan-Australia Migratory Bird Agreement (due to being a threatened Australian species), and the Convention on International Trade in Endangered Species.

1.2 Distribution

The endemic South-eastern Red-tailed Black-Cockatoo occurs as a single population in a small area of south-eastern Australia delimited by Keith to Lucindale to Mt Gambier in South Australia and Portland to Casterton, Toolondo, Natimuk, Dimboola, Nhill, and Kaniva in Victoria (Hill and Burnard 2001, Figure 1). The total extent of occurrence is approx. 18 000 km² with 28% of this area occupied (Burnard and Hill 2002). The cockatoo is widespread but rare within this range, and breeds across much of the range. While the bird's range has been described as severely contracted (Garnett and Crowley 2000), and may well have extended further to the west than current records indicate (Hill in prep), there are no previous data to allow an assessment of decline in distribution. About half of all suitable habitat has been cleared within the bird's current range (Koch 2003). Extralimital records (Joseph 1982, Baird 1986) are likely to be vagrants and not evidence of extinct populations.

1.3 Populations

The size of the single population was estimated to be 500-1,000 birds in 1989 (Joseph *et al.* 1991), with a highest count of 785 birds in 2003 (R Hill *in litt.*). As about 42% of these were mature males in 2003 (R Hill *in litt.*), the minimum number of breeding birds is estimated at 660. A continuing population decline has been inferred from habitat loss (Hill and Burnard 2001), and demonstrated during 1999-2004, when the proportion of adult males increased by 6% (R Hill *in litt.*). This may be a seriously negative population trend as it indicates that in just six years, production of young has fallen such that the time required to replace the adult population has more than doubled from 16 to 37 years.

1.4 Habitat critical for survival

The habitat critical to survival of the South-eastern Red-tailed Black-Cockatoo is defined as all potential habitat within its 'current normal range' (Figure 1). Potential habitat includes feeding, nesting and roosting habitat as described in Section 1.5. Potential habitat has been mapped to the extent possible (Figure 1) as areas where habitats are known to occur, areas where habitats are likely to occur and areas where habitat may occur (but the location is unknown).

The South-eastern Red-tailed Black-Cockatoo is restricted to Desert Stringybark *Eucalyptus arenacea* and Brown Stringybark *E. baxteri* woodlands occurring on deep aeolian sands in the Glenelg, Wimmera and Naracoorte Plains, and adjacent woodlands of River Red Gum *Eucalyptus camaldulensis*, Yellow Gum *E. leucoxydon* and Buloke *Allocasuarina luehmannii*. Much of the stringybark feeding habitat in Victoria is on public land, whereas much of the Buloke feeding habitat and breeding habitat throughout its range, and stringybark feeding habitat in South Australia, is on private land (Hill and Burnard 2001, Koch 2003). None of the habitat critical to survival identified is within Commonwealth areas.

1.5 Habitat requirements

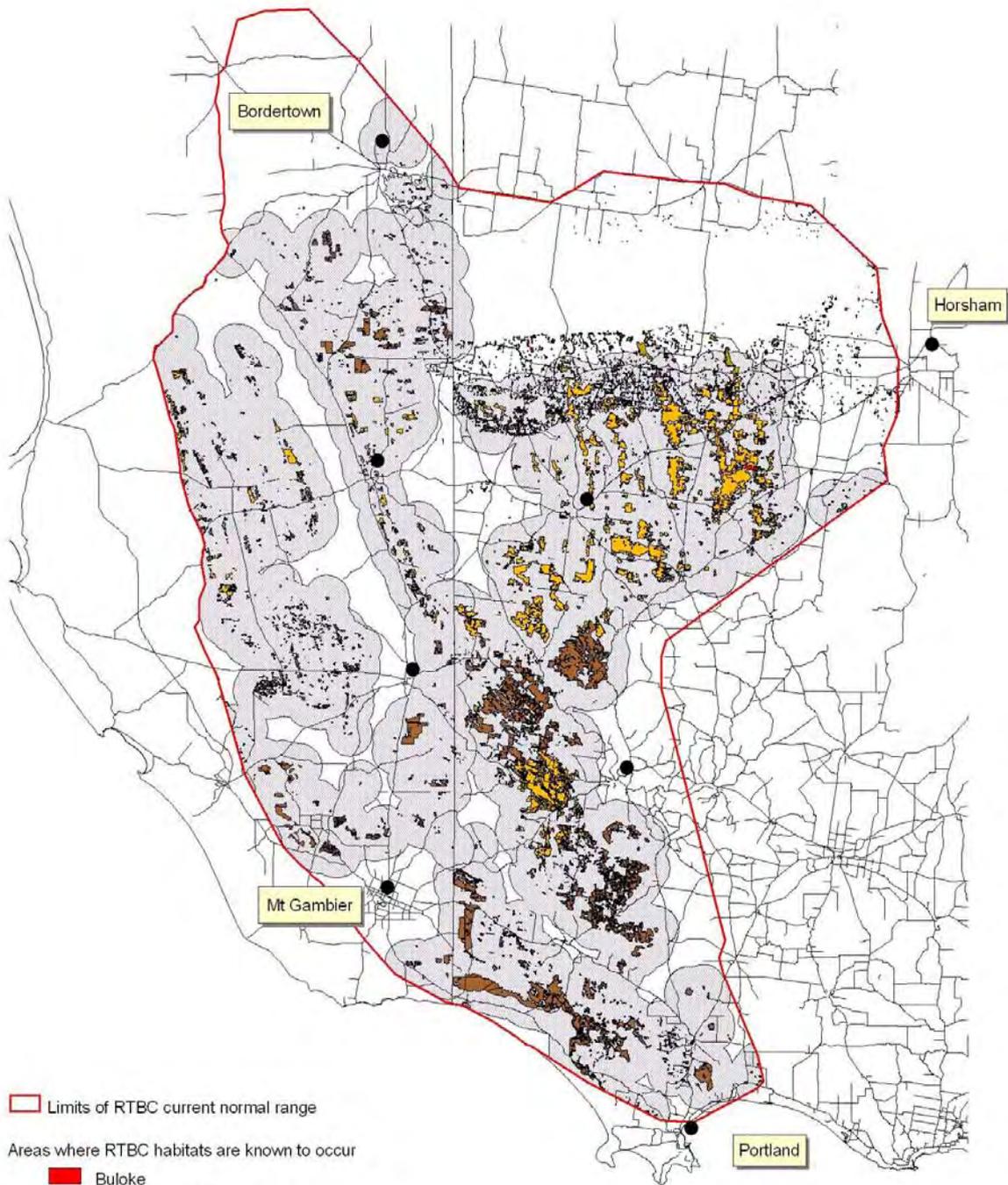
Feeding habitat - The cockatoo is highly specialised, feeding primarily on the seeds of Desert and Brown Stringybark (*Eucalyptus baxteri* and *E. arenacea*), and seasonally on the seeds of Buloke (*Allocasuarina leuhmannii*). Feeding habitat is much more fragmented in South Australia (87% cleared) than in Victoria (42% cleared). In South Australia the two stringybarks occur in plant communities 11, 12, 80, and 97 (Croft *et al.* 1999). In Victoria, most records of the birds are from three Ecological Vegetation Classes (EVC): Heathy Woodland, Herb-rich Heathy Woodland and Damp Sands Herb-rich Woodland. However, there are several other EVCs within the range where one of the two stringybark species can be a dominant or co-dominant tree (DPMC 1999).

The birds feed in blocks of forest and scattered paddock trees. Desert Stringybark fruits on a three year cycle and Brown Stringybark on a 2-4 year cycle (Koch 2003), with the cockatoos feeding almost entirely on the species that has fruited most recently (Attiwill 1960, Joseph 1982). Desert Stringybark makes up only 28% of the stringybark habitat in the range, and this species is likely to be a more limiting resource than Brown Stringybark (Koch 2003).

The only other food source regularly used is the seeds of Buloke, which is part of the nationally threatened ecological community - 'Buloke Woodlands of the Riverina and Murray Darling Depression Bioregions. These woodlands have been extensively cleared in the past, and the remnants that survive face ongoing major threats from incremental clearance, grazing by rabbits and stock, invasion by exotic plants, weedicide application and fertiliser drift. The community is poorly represented in conservation reserves throughout its range. Nearly all remaining Buloke occurs on private land used for agriculture, and no significant area is reserved. Most remnant Buloke occurs as scattered trees in grazed or cultivated paddocks (practices that prevent regeneration), or as thick regrowth of trees on roadsides which are too young and too dense to produce large amounts of seed, and to be suitable for foraging by Red-tailed Black-Cockatoos (Maron 2004). Buloke seed is only available during January to March, and Bulokes do not produce a substantial crop every year (Maron and Lill 2004). While cockatoos have only been observed to forage in trees larger than 19cm dbh (diameter at breast height), and hence possibly over 100 years old (L. Morcombe, University of Ballarat, unpublished data), they prefer trees over 200 years old (Maron and Lill 2004).

Nesting habitat - The cockatoo requires very old, large, hollow eucalypts for nesting (Joseph *et al.* 1991). Over 95% of known nest sites are within 2km, and all within 5km, of >5 ha blocks of stringybark (Hill and Burnard 2001). They show a preference for dead trees (81%), but also use live trees. Nests are most often found in farmland with scattered live and dead Red Gums (Joseph *et al.* 1991). In South Australia, the remaining Red Gum communities in the lower South-East are 'vulnerable' with 9.7% of the estimated original area remaining and 0.3% in reserves (Croft *et al.* 1999). In south-west Victoria, Plains Grassy Woodland is 'endangered' with an estimated 4% remaining, of which 1.5% is reserved (DPMC 1999). Nests have been recorded in *Eucalyptus camaldulensis*, *E. baxteri*, *E. arenacea*, *E. viminalis*, *E. leucoxylon* and *E. fasciculosa*.

Roosting habitat - The cockatoo usually roosts in clumps of tall eucalypts, and sometimes use the same site each night for many months (R Hill *in litt.*). Of 19 roost sites, 79% were in copses of Red Gums, 16% in Yellow Gums and 5% in Manna Gums. Thirteen of these sites (68%) were on private land.



- Limits of RTBC current normal range
 - Areas where RTBC habitats are known to occur
 - Buloke
 - Desert Stringybark
 - Brown Stringybark
 - Desert or Brown Stringybark
 - Areas where RTBC habitats are likely to occur
 - Areas where RTBC habitats may occur
 - Major roads
- 10 0 10 20
Kilometers

Figure 1: Current normal range and habitats critical for survival of the South-eastern Red-tailed Black-Cockatoo.
Note that ALL Buloke within the normal range of the RTBC is considered habitat critical for survival.

2. Threats

Threats have been identified through a number of studies on the South-eastern Red-tailed Black Cockatoo, undertaken since 1997. Threat priority has been determined by the recovery team members with expert advice and with relevant land managers responsible for threatened species. Recovery actions have been prioritised on the basis of the level of threat posed and the likely success of removing the threat and support to implement the action.

Threats to food supplies

2.1 Food shortages (High priority)

Food shortages are the main threat to the long-term survival of the South-eastern Red-tailed Black-Cockatoo (Koch 2003, Hill in prep). Some food shortages are natural and due to the fruiting cycles of feeding trees. The cockatoos feed on the species of stringybark that has fruited most recently (Attiwill 1960, Joseph 1982, Koch 2003), quickly exploiting all new seed so that large areas of woodland soon assume low foraging value (Koch 2003). Birds initially spend about half their day feeding on a newly matured seed crop, but after 18 months, a lack of alternative sources can mean they need to revisit the same trees and forage for 90% of the day (Koch 2003). In a year when a new Desert Stringybark seed crop was produced, nesting success (30%) was more than double that of the next year (13%) (Jarmyn 2000, Koch 2003). In the second year with lower seed availability most male cockatoos are not expected to feed themselves and their mate. A major cause of failure in the second year was due to incubating females leaving the nest at unusual times to supplement food provided by their mates (Jarmyn 2000). The only other important food is Buloke, available prolifically for three months of some years and not at all in others (Joseph 1982, Maron and Lill 2004).

Dietary specialisation and food shortages have a profound effect on the birds' annual distribution, movements, and nesting success (Koch 2003). The impact of natural shortages are exacerbated by the historical removal of feeding habitat and by current activities such as clearing of habitat, scattered tree removal, tree decline and death due to damage from domestic animals, and deliberately lit fires (Burnard and Hill 2002).

2.2 Impacts of fire on food (High priority)

Prescribed burns and wildfires substantially reduce seed availability in stringybarks for at least nine years, with some effects persisting for more than 11 years (Koch 2003). Nearly 70% of all stringybark habitat is on public land in Victoria. About half of the stringybark in areas burnt less than 9 years ago is in priority fuel-reduction areas, where the aim is to control the spread of wildfire and there is little opportunity to reduce fire frequency. However, there is an important opportunity to reduce fire intensity in prescribed burns, which will result in reduced canopy scorch and thus much quicker recovery of trees to full seed production. Additionally, prescribed burns should be timed to avoid years in which a given block of woodland has a newly matured seed crop.

Burning of the of stringybark habitat privately owned in Victoria is commonplace and may occur at a much higher frequencies than on public land (R Hill *in litt.*). In South Australia, reserves managed by Department for Environment and Heritage (1% of total habitat available) tend not to be burnt for management reasons, land managed by Forestry SA (2%) is burnt more frequently (Burnard and Hill 2002). ForestrySA has committed to a prescribed burning plan for all Reserves and a policy to reduce canopy scorch. The Department for Environment and Heritage are embarking on a prescribed burning program too so fire in South-eastern Red-tailed Black Cockatoo habitat will be more frequent in South Australia over the next 10-20 yrs. Stringybark in the lower south-east of South Australia which occurs on private land tends to be long unburnt

(Burnard and Hill 2002). The greatest opportunity for substantial gains in food availability by increasing fire intervals appears to be on private land in Victoria.

2.3 Feeding habitat loss (High priority)

About 57% of all suitable habitat has been cleared within the range. Stringybark habitat is much more fragmented in South Australia than in Victoria (Burnard and Hill 2002). As Desert Stringybark is likely to be a more limiting resource than Brown Stringybark it should be given priority in protection and restoration works.

Paddock trees provide important food and nest sites. Permission to clear blocks of woodland vegetation in South Australia and Victoria is rarely granted, but applications to clear paddock trees continue (Burnard and Hill 2002). In Victoria, applications to clear paddock trees may be granted where the trees do not qualify as South-eastern Red-tailed Black Cockatoo habitat as defined in guidelines prepared in accordance with Victoria's Vegetation Framework, or where agreed offset protection of other Buloke habitat provides a clear and significant net gain in South-eastern Red-tailed Black Cockatoo habitat security. Estimated rates of loss of paddock trees in south-eastern Australia of up to 40% in 30 years indicate that few paddock trees will survive past the next century if current attrition rates continue (Carruthers and Paton in press). In the south-east of South Australia, paddock tree decline over the next 50 years has been estimated to be as high as 36%, based on authorised clearance records (Carruthers *et al.* 2004) and regional dieback estimates, with 65% of the predicted loss from authorised clearance. Research indicates that revegetation offsets are yet to be proven as effective replacement habitat, at least in the short to medium term (Carruthers and Paton in press). Offset plantings of Buloke will not become suitable cockatoo foraging habitat for at least 100 years (Maron and Lill 2004).

Maron (2004) found that over a 15 year period (1982-1997) Buloke tree loss averaged 33% in three cropping areas and was as low as 4% in a predominantly sheep grazing area. The most significant factor in the loss of trees was the installation of centre pivot irrigation systems. The burning of crop stubble, a common practice in the area, also resulted in Buloke tree deaths. In addition, much of the Buloke regeneration along roadsides is too dense to provide suitable foraging habitat (Maron 2004).

2.4 Grazing impacts on foraging sites (High priority)

Uncontrolled grazing is a major threat contributing to the death and decline of trees on private land throughout the range (Cutten and Hodder 2002). For example, in four paddocks near Naracoorte regularly used for feeding, 76% of stringybarks had some degree of ringbarking caused by cattle, and 15% were dead (R Hill *in litt.*). Cattle can also kill mature Bulokes (Maron *in litt.*).

2.5 Fragmentation of foraging habitat (Medium priority)

Red-tailed Black-Cockatoos use both fragmented and intact foraging habitat (Maron 2000, Hill in prep), but the energetic costs of foraging in highly fragmented stringybark areas may lead to reduced viability in such areas (Koch 2003). The disappearance of Carnaby's Cockatoo from parts of its former range was linked to severe habitat fragmentation (Saunders 1990). Habitat fragmentation brings with it a host of degrading impacts which need to be addressed at a landscape scale (Reid and Landsberg 2000, Radford *et al.* 2004, Ryan 2004). ForestrySA assisted through funding from South-East NRM Board are beginning to link South-eastern Red-tailed Black Cockatoo habitat sites to private land sites in consultation with South Australia's Department for Environment and Heritage (SA DEH).

2.6 Weed invasion of foraging habitat (Medium priority)

Substantial areas of foraging habitat have been cleared for Pine *Pinus radiata* plantations. Subsequently, wildling pines have established themselves in large numbers in nearby remnant stringybark woodlands, particularly in southern areas. Pines suppress the growth of young stringybarks and most understorey plants, and can kill trees that they overtop. Since 1989, planning permits to establish plantations in Victoria have required the control of wildlings. ForestrySA with assistance from SA DEH officers are targeting pine removal in National Parks, Heritage Agreements and Native Forest Reserves since late 1990's early 2000's. Similar work is also being undertaken in Victoria. Coastal and Sallow wattle also have the potential to impact on habitat regeneration of Stringybarks. This is due to the change in structure of a patch and increase fuel height and loading.

Threats to nest sites

2.7 Nest site availability (Medium priority)

Dead nest trees are falling over at 4 - 7% per year (Hill and Burnard 2001), and this rate is likely to increase as the trees age. Many other dead trees are felled for firewood or when paddocks are cultivated. Emison and Calow (1994) instigated an artificial nest site program, but Hill and Burnard (2001) argued that nest hollow availability is not limiting the population, at least in the short term, because there is a low rate of re-use (33%) of known nest sites, with some birds occupying nearby sites in subsequent years. They also noted that Yellow-tailed Black-Cockatoos have very similar requirements and have been recorded on several occasions using hollows previously used by Red-tailed Black-Cockatoos, yet the number of Yellow-tailed Black-Cockatoos is increasing (Barrett *et al.* 2002). Although the birds prefer dead nest trees, in areas where dead trees are now very rare, Red-tailed Black-Cockatoos persist and breeding success is not different to flocks in areas where dead trees remain common (Hill and Burnard 2001). The need for an expanded artificial nest hollow program would need to be reviewed if significant nesting habitat losses are sustained, for example in a wildfire, or if current rates of nest tree loss accelerate.

In the medium to long-term the continuing loss of dead hollow-bearing trees, lack of regeneration of future hollow-forming trees and declining health of scattered trees on private land are potentially serious threats. Many nest trees are near the end of their lifespan (Gibbons and Lindenmayer 2002) and there is a landscape-scale cessation of eucalypt regeneration in the sheep-wheat belt of south-eastern Australia (Robinson and Traill 1996, Reid and Landsberg 2000). Given that trees containing larger hollows used by Red-tailed Black-Cockatoos are likely to be over 220 years old (Gibbons and Lindenmayer 2002), there is likely to be a serious shortfall in suitable hollow-bearing trees in the decades to come. Replanting the required scattered trees in the landscape would be logistically impossible and prohibitively expensive (Reid and Landsberg 2000). Natural regeneration of trees after the cessation of grazing, often facilitated by fencing (Spooner *et al.* 2002), seems to be the only long-term solution for future nest tree requirements.

2.8 Firewood harvesting (Medium priority)

Both commercial and private firewood harvesting is a threat to Red-tailed Black-Cockatoo nesting habitat. In Victoria 1-1.4 million tonnes of firewood are collected each year from all land tenures, more than twice the volume of hardwood timber harvested from public land (Read Sturgess and Assoc. 1995). Most firewood is taken from standing and fallen dead timber, principally gum species, but also stringybarks. Dead standing timber is protected on public land in both States but illegal felling of dead standing timber on public land is common within the range (R Hill *in litt.*). Local government controls in Victoria and State legislation in South Australia now protect large dead trees with hollows across the majority of the breeding range, but illegal removal and natural decline of dead trees continues.

2.9 Nest predators (*Medium priority*)

Jarmyn (2000) found that the main proximate cause of nest failure in one year was nest predators such as Common Brush-tailed Possums *Trichosurus vulpecula* and ravens *Corvus* sp., but the ultimate cause was a shortage of food which forced incubating females to leave their nests unattended and forage for themselves. Because the number of successful nests is much higher in years with adequate seed availability, and Yellow-tailed Black-Cockatoos use the same or similar nest sites and are increasing in numbers, it is unlikely that nest predators are a major factor limiting recovery of Red-tailed Black-Cockatoos. Predators do cause some nest failures and efforts are reduce their impact.

2.10 Human interference with nests (*Low priority*)

Robbing of nests for the illegal avicultural trade has been identified as a threat of unknown magnitude to the population (J. McGuire pers. comm.). While only one South-eastern Red-tailed Black-Cockatoo is known to be in captivity, the bird's small total population size makes it vulnerable to reductions in breeding success due to human interference with nests.

Other threats

2.11 Information gaps (*Medium priority*)

Some nest colonies are not managed appropriately due to a lack of information on their location. Similarly, there is a lack of detailed information on the whereabouts of some key blocks of private land, whose owners may need financial and management assistance. The relative importance of Buloke woodland could be confirmed by collecting time budget data on birds foraging in Buloke and comparing these with data from stringybark woodlands in years of adequate and poor seed availability.

The flock count data and growth rate data for chicks need further analysis if they are to inform managers. There is also a need to increase the number of flock counts, to strengthen the predictive power of this key monitoring tool.

2.12 Communication gaps (*Medium priority*)

Beumer (2003) summarised the key findings of a telephone survey of 500 landholders within the range of the Red-tailed Black-Cockatoo, pinpointing gaps in the recovery team's work. A key requirement is the production of a communication strategy.

3. Recovery Objectives

Overall Objective

To demonstrate within 5 years a reversal of recent population declines, and to initiate longer-term measures designed to ensure the persistence of a viable breeding population.

Specific Objectives

To improve the status of the South-eastern Red-tailed Black-Cockatoo within 5 years by:

1. Increasing the total population size and maintaining its extent of occurrence by implementing threat abatement strategies to deal with shortages of food.
2. Increasing the total population size by implementing strategies to address impacts on nest sites and reproductive output.
3. Improving management of newly identified colonies and key woodlands.
4. Increasing community awareness and involvement in the conservation of the South-eastern Red-tailed Black-Cockatoo and its habitats.

4. Recovery Actions:

Action 1. Identify and protect feeding habitat from clearing: revise feeding area maps, train relevant staff to identify feeding habitat, and monitor clearing 'offsets'

- a) Revise feeding area maps with Buloke (3% left) and Desert Stringybark (28%) as priorities for remnant protection and enhancement.
- b) Train Catchment Management Authorities /Natural Resource Management, agency and local government staff to identify and understand the values of feeding habitat which includes both intact remnants and scattered trees.
- c) Where clearing of feeding habitat is permitted, ensure 'offset' works meet the States' net gain objectives and take into account guidelines issued by the Recovery Team.
- d) Monitor and document habitat loss, offset works compliance and success.

Buloke and Desert Stringybark are priorities for remnant protection and enhancement, both as intact blocks and scattered trees. CMA/NRM, agency and local government staff need to identify the values of feeding habitat and incorporate these into net gain calculations for 'offset' works where clearing is permitted. Habitat loss, offset works compliance and success should be monitored and documented.

Action 2. Link and reserve feeding habitat

- a) Support a landscape approach to habitat protection which replicates in the Glenelg-Hopkins CMA the Conservation Management Network (ECC 2000) partnership between private and public land managers for the Wimmera CMA and Trust for Nature.
- b) Promote the concept of a 'Biolink' of habitat stepping stones comprised of remnants on public and private land, guided by a Conservation Management Network, in south-east South Australia (Naracoorte Range to Lucindale, Padthaway to Penola), and assess similar proposals in Victoria (eg Ryan 2004).
- c) Support a review of uncommitted public land within the bird's Victorian range, as listed as an action in the FFG Action Statement (Venn and Fisher 1993).
- d) Support organisations such as the Australian Bush Heritage Fund, Trust for Nature, Parks Victoria and Department for Environment and Heritage (SA) that purchase and protect higher quality remnants on private land.
- e) Support Trust for Nature and Department for Environment and Heritage (SA) efforts to covenant remnants on private land, and promote their programs of rate relief and financial assistance for covenanted land.

Action 3. Encourage fencing of feeding habitat to protect it from stock

- a) Distribute information on stringybark and Buloke feeding habitat establishment that advocates fencing to control grazing as one of the most effective and cheapest ways to improve tree health.
- b) Promote natural tree regeneration, and assist Red-tailed Black-Cockatoos protection on private land.

Action 4. Replant feeding habitat

- a) Support Greening Australia's project to have unused plantation land revegetated.
- b) Support planting of native species in critical areas, but only where fencing and natural regeneration cannot take place.
- c) Encourage local governments to develop roadside management strategies that promote feeding habitat, particularly in areas with Buloke.
- d) Promote a Buloke replanting program using established guidelines (Hill et al. 2003) and new information.

Action 5. Identify and reduce threats from fire

- a) Produce maps of Victorian stringybark feeding habitat by 'age-since-fire' classifications to inform managers and underpin monitoring.
- b) Assess the age of seed crops well in advance of planned burns on public land to ensure that better quality crops of buds, flowers and newly matured seed crops are not burnt, and prescribed burns are directed towards areas with older or poorer seed crops.
- c) Produce guidelines for burning stringybark woodlands and distribute to public and private land managers of Red-tailed Black-Cockatoo feeding habitats.
- d) Negotiate agreements with public land managers in South Australia to retain the majority of Red-tailed Black-Cockatoo stringybark feeding habitat as long-unburnt.
- e) Liaise with Department for Environment and Heritage (SA) fire management officer on ecological burning.
- f) Continue to support trials of 'cool' burns with reduced canopy scorch as a means of achieving both fire protection outcomes and improved food availability.
- g) Use GIS data for both canopy scorch area and prescribed burns directed away from newly matured seed crops, supplied by DSE in Victoria annually, to determine the percentage change in seed availability.
- h) Promote the desirability of increasing fire intervals, together with perimeter burns or reduced canopy scorch burns, on private land, as a means of improving food availability.

The aim is to retain the majority of stringybark feeding habitat as long-unburnt across all land tenures. Fire history mapping will inform managers and underpin monitoring. Seed crops should be assessed to ensure better quality buds, flowers and newly matured seed crops are not burnt, and prescribed burns are directed towards areas with older or poorer seed crops. Burns with reduced canopy scorch can achieve both fire protection outcomes and improve food availability. ForestrySA have detailed records of burns in Native Forest Reserves that will inform production of age-since-fire maps.

Action 6. Reduce threats from weed invasion in feeding habitat

- a) Enforce existing planning permit conditions that require plantation owners to control wildling pines.
- b) Encourage and assist agencies to increase control of pine infestations in stringybark woodlands.

This includes agencies enforcing planning permit conditions, such as those in existence in Victoria since 1989 where plantation owners are required to control wildling pines, encouraging owners of older plantations to do likewise, and using agency staff and volunteers to control other pine infestations.

Action 7. Monitor the population, range and area of occupancy: conduct an annual count, expanded flock counts and analyses, and map location records

- a) Conduct an annual count to determine minimum population size, range and area of occupancy.
- b) Expand to the north the annual flock counts in autumn to determine the proportion of adult males and other birds in flocks as an index of recruitment.
- c) Map annual location records showing separately (i) nesting season locations, (ii) post-fledging locations, and (iii) winter roost locations.
- d) Analyse flock count data and compare results with food availability information.

The annual count determines minimum population size, helps estimate range, and area of occupancy, and should also be compared with food availability information. The expanded autumn flock counts provide an index of recruitment. Mapping annual locations will show nesting season, post-fledging and winter roost locations, to enable appropriate management.

Action 8. Expand nest site statutory protection

- a) Expand the coverage of the Environmental Significance Overlays of West Wimmera and Glenelg Shires to provide legal protection for both living and dead trees that have suitable nest hollows or the potential to develop such hollows.
- b) Extend Environmental Significance Overlays to include relevant parts of Horsham and Southern Grampians Shires.

Action 9. Reduce the threat from reductions in nest sites

- a) Distribute information on how to identify and protect nest trees, noting the very high conservation value of large living and dead trees with hollows.
- b) Promote natural regeneration of trees after fencing and the cessation of grazing as the main long-term solution for future nest tree needs.
- c) Encourage Victorian agencies to ensure that firewood collectors operating in woodlands on public land are under regular supervision (see Venn and Fisher 1993).
- d) Encourage the Victorian and South Australian governments to finalise and implement their draft firewood strategies.
- e) Reduce the impacts of the firewood collection industry on nest sites, and encourage the use of alternatives such as plantation timber or smaller trees (< 30 cm dbh) such as those in dense stands of regrowth which can accommodate thinning.

Action 10. Maintain existing artificial nests and monitor their use

- a) Maintain existing artificial nests, monitor and report on their use.

Action 11. Identify and protect nest sites from ground predators

- a) Continue to seek nest locality information from the community and conduct volunteer-based searches for nests.
- b) Collar all known nest trees to exclude ground predators, using volunteers wherever possible.
- c) Collar all potential nest trees in known nesting colonies.
- d) Provide landholders who do not wish to reveal nest sites on their land with information and materials for protecting nests.

Action 12. Assess and reduce illegal trade

- a) Determine the level of illegal trade in the species from Australian and overseas aviculturalists and agencies, and the number of South-east Red-tailed Black-Cockatoos held in captivity.
- b) Should the illegal trade in live birds and eggs be biologically significant, liaise with landholders in known breeding areas, and carry out targeted operations to detect and prosecute offenders.

Action 13. Locate new nest colonies and identify key blocks of private land

- a) Locate new nest colonies so that they can be managed appropriately, and communicate relevant information to land managers.
- b) Identify key blocks of private land so that financial and management assistance can be provided if required.

Action 14. Collect information on Buloke use and management

- a) Identify management strategies to increase Buloke seed production.
- b) Collect time budget data for cockatoos foraging in Buloke to compare with stringybark.
- c) Undertaking roadside thinning trials of dense Buloke regrowth to promote the health and growth rates of remaining trees.
- d) Compare seed production of suckers versus seedlings will inform revegetation and regeneration projects.

Action 15. Produce and implement a communication strategy

- a) Produce a communication strategy and monitor its effectiveness by reviewing annually the numbers of: 1800 calls, participants in the annual count, website visits, revegetation projects, and vegetation clearance permits issued.
- b) During development of the strategy determine the level of community engagement required to engender long-term support for the recovery program.
- c) Guided by the communication strategy, establish effective tools (eg 'Red-tail News') for communication with key stakeholders including land managers, State and local government, CMA/NRM personnel and volunteers.
- d) Maintain the network of volunteer observers, 1800 number and web site.
- e) Attend field days, Landcare meetings, schools, and other relevant events.
- f) Conduct a community survey every five years to determine the effectiveness of extension work and the direction of future activities.
- g) Develop marketing strategies linked to the selection of the Red-tailed Black-Cockatoo as the official mascot for the Melbourne 2006 Commonwealth Games.
- h) Encourage education about Red-tailed Black-Cockatoo conservation in the region's schools and farm management training programs at tertiary institutions.
- i) Develop promotional material for farmers in consultation with the Farmer's Federation and Landcare groups, to emphasize improved farm productivity and conservation.
- j) Develop a good understanding of the legislative and conservation requirements of the Red-tailed Black-Cockatoo among agency and conservation extension staff who liaise with landholders.

Supporting Actions

Action 17. Operate the recovery program

- a) Coordinate implementation actions identified as a high and medium priority.

Action 16. Seek additional sponsorship partners

- a) Supervise the recovery program and manage its budget.
- b) Ensure the recovery team functions efficiently and communicates well.
- c) Report on progress against objectives and performance criteria yearly.
- d) Undertake a review of the recovery program after four years.

5. Recovery Plan Objectives, Performance Criteria and Actions

Objective	Performance Criteria	Actions
1. Implement threat abatement strategies to deal with shortages of food.	<ol style="list-style-type: none"> 1. No net loss of existing feeding habitat from clearing. 2. At least 500ha of stringybark woodland and 50ha of Buloke woodland protected or revegetated each year. 3. A 15% increase in seed availability in stringybark woodland from 2005 levels resulting from improved fire management. 4. A 20% reduction in pine infestation of stringybark woodland from 2005 levels. 5. Annual count of at least 900 birds recorded across range of last ten years, of which not more than 39% are adult males (c.700 adults and 200 juveniles). 	<ol style="list-style-type: none"> 1. Identify and protect feeding habitat from clearing 2. Link and reserve feeding habitat 3. Encourage fencing of feeding habitat to protect it from stock 4. Replant feeding habitat, particularly Buloke 5. Identify and reduce threats from fire 6. Reduce threats from weed invasion in feeding habitat 7. Monitor and analyse the populations, range and area of occupancy
2. Implement threat abatement strategies for nest sites and reproductive output.	<ol style="list-style-type: none"> 6. Statutory protection of large dead trees with hollows across the range. 7. The number of nest sites increased to allow for current rates of natural decline and illegal clearing. 8. All known nest trees, and potential nest trees in colonies, protected from ground predators. 9. The magnitude of the illegal trade determined and controlled. 	<ol style="list-style-type: none"> 8. Expand nest site statutory protection 9. Reduce threats from reductions in nest sites 10. Maintain existing artificial nests and monitor their use 11. Identify and protect nest sites from ground predators 12. Assess and reduce illegal trade
3. Improve management of new colonies and key woodlands.	<ol style="list-style-type: none"> 10. Improve management of new colonies and key woodlands located. 11. New information on Buloke management obtained and implemented. 	<ol style="list-style-type: none"> 13. Locate nest colonies and key blocks of private land 14. Collect information on Buloke use and management
4. Increase community awareness and involvement in the conservation of the South-eastern Red-tailed Black-Cockatoo and its habitats.	<ol style="list-style-type: none"> 12. The number of people involved in and aware of the recovery program increased. 13. Structures in place to ensure ongoing support for recovery actions in the long term 	<ol style="list-style-type: none"> 15. Produce and implement a communication strategy <p><i>Supporting Actions</i></p> <ol style="list-style-type: none"> 16. Seek additional sponsorship partners 17. Operate the recovery program

6. Costs of the Recovery Plan

The total cost of the recovery program is \$514,000 over five years, with major costs being for a part-time Project Officer and Extension Officer to undertake the bulk of the work.

	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Total	\$ 112,000	\$107,000	\$98,000	\$95,000	\$102,000	\$514,000

7. Biodiversity Benefits

Implementation of this Recovery Plan will have benefits for a wide range of woodland species and habitats. Within the range there are a number of nationally threatened and declining woodland birds (Garnett and Crowley 2000) which, like this cockatoo, require large areas of intact habitat. Threatened arboreal mammals such as the Brush-tailed Phascogale *Phascogale tapoatafa* occupy the same habitat and also require large hollow-bearing trees (Gibbons and Lindenmayer 2002). The Heath mouse will likely benefit from improved ecological burning practices (pers comms Peter Menkhorst). Actions proposed such as the protection of nest sites, fencing foraging habitat, addressing firewood issues, implementing fire management strategies, and involving the community in surveys, are all likely to assist a large number of other native species.

8. Management Practices

Habitat protection and fencing to allow its regeneration is the main focus of this plan. Effective links have been established with local industry sponsors, and with regional and agency personnel who deliver advice and incentives to landholders. A number of avenues already exist for funding remnant vegetation protection and revegetation works such as the Natural Heritage Trust, Catchment Management Authorities and the South-east NRM. The Recovery Team will also continue to work with Trust for Nature and DEH SA to promote the use of covenants and heritage agreements to protect habitat on private land and attain rate reductions for landholders who commit land to conservation. The Recovery Team will assist the Australian Bush Heritage Fund, SADEH, DSE and Parks Victoria in their search for suitable land to acquire as reserves, and will continue its work with other agencies including Australian Trust for Conservation Volunteers, Greening Australia and Trees for Life, to assist landholders with costs and labour associated with habitat protection.

The current Horsham and Portland Fire Management Area Plans aim to maintain at least 85% of all stringybark on public land older than nine years since being burnt. DSE have also commenced a trial program of 'cool burns' trying to achieve fire protection objectives with minimum impact on Red-tailed Black-Cockatoo feeding habitat. Dead nest trees have been given special legal protection through Environmental Significance Overlays by two Victorian Shires and the South Australia Government.

9. Monitoring, reporting and review

Progress will be monitored and evaluated yearly by members of the Recovery Team through an annual review, including compiling information and data, assessing progress made for all actions with the criteria and objectives of the Recovery Plan in mind (data comparisons performed by participating biologist), and monitoring the implementation of the communication strategy.

There will be an external review after four years of Recovery Plan implementation.

10. Interests that will be affected by the Recovery Plan's implementation

- SA Department for Environment and Heritage
- Vic Department of Sustainability and Environment; Parks Victoria
- ForestrySA
- Vic CMAs: Wimmera and Glenelg-Hopkins; SA NRM: South-East
- Local Governments: Vic: West Wimmera, Glenelg and Horsham Shires; SA: Grant, Tattayara, Naracoorte-Lucindale, and Wattle Range District Councils
- Private landholders, leaseholders and 22 Landcare Groups
- Indigenous people (including Goolum Goolum, Kungari Assoc, SE Nungas Community Organisation, Tattayara Aboriginal Heritage Consultancy, traditional owners – Wadjaballick and Gundij-mara
- Non-government reserve management and covenanting organisations
- Non-government organisations such as bird clubs and field naturalists clubs
- Research organisations such as universities

This list of stakeholders covers the main bodies but should not be considered exhaustive. There may be other interest groups which need to be considered when particular tasks need to be undertaken.

11. Social and economic impacts

The main potential impacts on landholders are covered by existing legislation for native vegetation retention in Victoria and South Australia. Protection of habitat by determining authorities when considering clearing applications could result in economic impacts on a small number of individuals by restricting the development of areas for cropping.

Restrictions on timber harvesting within known nesting areas will have minor economic impacts as most such areas are currently excluded from harvesting or no longer contain suitable timber. Exclusion of harvesting of firewood from known habitat on public lands will possibly have an economic impact on local communities. Any exclusion of harvesting on these reserves will force individuals to use alternative fuel sources or buy firewood at commercial rates.

Fencing will allow areas to recover from continual grazing resulting in an increase in plant and structural diversity. Fencing areas on private land to exclude grazing may result in some small economic impact, however, the benefits gained from structurally and floristically diverse woodlands should outweigh any losses.

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