Australian Government

BACKGROUND and IMPLEMENTATION INFORMATION
FOR THE

SOUTH-EASTERN RED-TAILED BLACK-COCKATOO
Calyptorhynchus banksii graptogyne
RECOVERY PLAN

Department of the Environment and Water Resources

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

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BACKGROUND INFORMATION

Summary

The South-eastern Red-tailed Black-Cockatoo 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.

The South-eastern Red-tailed Black-Cockatoo is one of five subspecies (Ford 1980). It is the smallest of the subspecies, and south-eastern females are the brightest and most boldly marked of all Red-tailed Black-Cockatoos (Higgins 1999).

The Red-tailed Black-Cockatoo occurs as a single population in far south-western Victoria and adjacent parts of South Australia. The total population is estimated to be about 1000 including 600-700 breeding birds.

The main threat to the survival of the South-eastern Red-tailed Black-Cockatoo is the destruction of its nesting trees and of its food sources – the cockatoo relies totally on the tiny seeds of Brown Stringybark, Desert Stringybark and, in the northern half of its range, seeds of Buloke in late summer and autumn.

The National Recovery Plan for the Red-tailed Black-Cockatoo provides guidance on:

- Maintaining existing feeding habitat;
- Increasing seed production of habitat;
- Maintaining availability of nest habitat;
- Establishing new feeding habitat;
- Minimising impact of nest predators;
- Increasing awareness and involvement in the community for protecting the species; and
- Establishing long term support plans for the South-eastern Red-tailed Black-Cockatoo.

Species

Red-tailed Black-Cockatoos are large (length 55-60cm, weight 570-870g) birds with an erectile crest (Higgins 1999). Male Red-tails have glossy black plumage with stunning, bright red tail panels. Females are quite different but equally spectacular – they are one of the most brightly marked subspecies of Red-Tail. They have duller brown-black plumage but the feathers of their head, neck and parts of their wing are speckled with yellow. Viewed from below, their body is barred in pale orange-yellow. Their tail barring can be almost all pale yellow or pale yellow grading to pale orange-yellow at the tip. Males have a grey bill. Juveniles and sub-adults (1-3 years old) are separable in the hand (Higgins 1999), but are not readily distinguished from adult females in the field. South-eastern Red-tailed Black-Cockatoos may be seen alone during the breeding season, as family parties of 2-3 birds, or in flocks of 100 or more birds during autumn and winter.

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 *c*. 18 000 km² with c. 28% of this area occupied (Burnard and Hill 2002). It is widespread but rare within this range, and contrary to information provided by Joseph *et al.* (1991), breeds across much of its 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).

Figure 1. Distribution

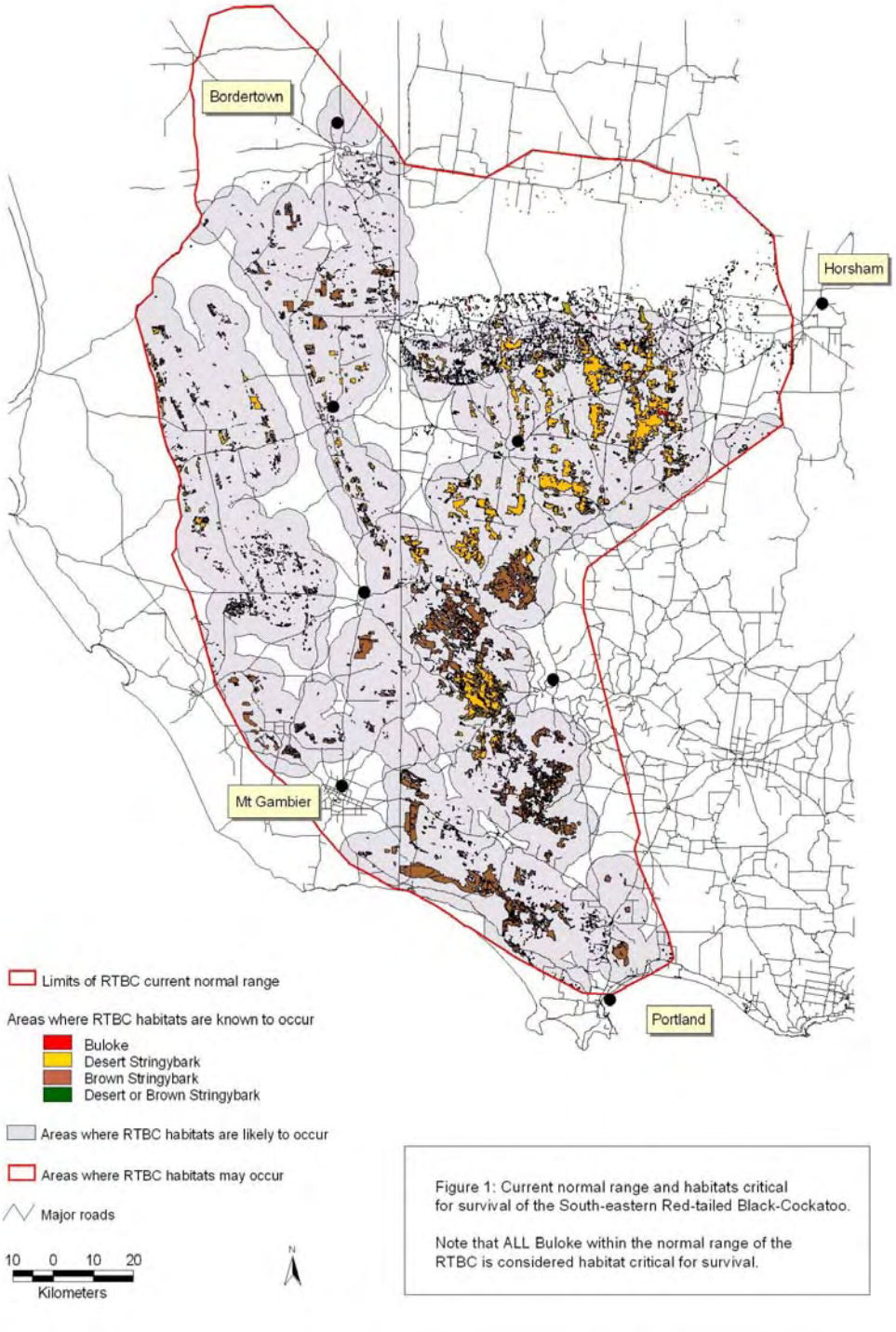

Figure 1: Current normal range and habitats critical for survival of the South-eastern Red-tailed Black-Cockatoo.

Note that ALL Buloke within the normal range of the RTBC is considered habitat critical for survival.

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 has been demonstrated during 1999-2004 as the proportion of adult males in the population has increased from 38% to 44% (R Hill *in litt.*). Flocks of other subspecies of Red-tailed Black-Cockatoos that are not threatened contain c.40% adult males (R Hill in prep). Nevertheless, a change in the proportion of adult males from 38% to 44% 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 c.16 to c.37 years. This calculation is based on a population of 1,000 birds and assumes that if, for example, 40% are adult male then there are 800 adults and 200 juveniles and sub-adults. In the latter group, if 40 are three years old, 50 are two years old and 110 are first-year birds, then it will take 20 years (40 x 20 = 800) to replace the adult birds. Extralimital records (Joseph 1982, Baird 1986) are likely to be vagrants and not evidence of extinct populations.

Surveys

Regular announcements in the media have encouraged many people to report sightings of these large, conspicuous birds to a freecall telephone number. These calls have confirmed established distribution and flock size data. Coordinated annual counts by volunteers of autumn flocks during 2001-04 have provided tallies of 686, 679, 785 and 726 birds. Autumn counts have revealed many more birds than counts at other times of the year. The number of birds counted has increased in line with the numbers of volunteers involved. Annual counts and the freecall telephone service have an important community participation role. Scientists have derived important data on population trends by counting the proportion of adult males in a sample of over 300 birds each autumn during 1999-2004.

Nests are found by observing the behaviour of a lone adult male leaving feeding areas in the late afternoon to fly to a nest site and call his mate from the hollow to be fed in a nearby tree (Joseph *et al.* 1991).

Habitat

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. leucoxylon* and Buloke *Allocasuarina luehmannii.*

Feeding habitat - The South-eastern Red-tailed Black-Cockatoo is highly specialised, feeding primarily on the seeds of two closely related stringybark species, Desert and Brown Stringybark, and seasonally on the seeds of Buloke. Feeding habitat is much more fragmented in South Australia (87% cleared) than in Victoria. Incidental foods in the bird's diet include the seeds of *Banksia ornata* and *Allocasuarina macklineana.* Floristic mapping in South Australia shows that the two stringybark feed-tree species occur in plant communities 11, 12, 80, and 97 (Croft *et al*. 1999). In Victoria, most records of Red-tailed Black-Cockatoos are from three Ecological Vegetation Classes (EVCs): Heathy Woodland, Herb-rich Heathy Woodland and Damp Sands Herb-rich Woodland. However, there are several other EVCs within the bird's range where one of the two species of stringybark can be a dominant or co-dominant tree (Anon 1999).

The distribution of the two stringybark species, the facts that Desert Stringybark fruits on a three year cycle and Brown Stringybark on a 2-4 year cycle, and that their fruit production is depressed for up to ten years after being burnt, has only recently been elucidated by Koch (2003). The birds feed in both blocks of forest and scattered paddock trees. The cockatoos feed almost entirely on the stringybark species that has fruited most recently (Attiwill 1960, Joseph 1982) and there are marked periods of food shortage between new crops which have a profound effect on the birds' annual distribution, movements, and nesting success (Koch 2003). Food availability is limiting the recovery of the South-eastern Red-tailed Black-Cockatoo, and given that Desert Stringybark makes up only 28% of the stringybark habitat in the bird's range, this species is likely to be a more limiting resource than Brown Stringybark (Koch 2003).

The only other food source that the cockatoos use regularly is the seeds of Buloke,which is part of the nationally threatened ecological community - Buloke Woodlands of the Riverina and Murray Darling Depression Bioregions. Nearly all remaining Buloke occurs on private land that is used for agriculture, and no significant area of it 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 be suitable for foraging (Maron 2004). Buloke seed is only available during January to March as the seeds are shed from the trees soon after the fruit ripens. Bulokes do not produce a substantial crop every year, and some trees may be suitable for foraging in one year while their neighbours are suitable the next (Maron and Lill 2004). While cockatoos have only been observed to forage in trees which are larger than 19cm dbh (diameter at breast height), and hence possibly over 100 years old (L. Morcombe, University of Ballarat, unpublished data). They show a preference for trees over 200 years old. They are also able to detect small but significant differences between larger Bulokes that allow them to forage more profitability (Maron and Lill 2004). Buloke seed is used by a large proportion of the cockatoo population when it is available (Joseph 1982, R Hill *in litt.*). Because the South-eastern Red-tailed Black-Cockatoo population is limited by food availability (Koch 2003), Buloke may have an important role in population demography, for example, by enhancing juvenile survival in years with good Buloke seed production.

Nesting habitat - Red-tailed Black-Cockatoos require very old, large, hollow eucalypts for nesting (Joseph *et al.* 1991). Over 95% of known nest sites are within 2km, and all are within 5km, of >5ha block of stringybark (Hill and Burnard 2001). They prefer 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 classified as 'vulnerable' with 9.7% of the estimated original area remaining and 0.3% protected in reserves (Croft *et al*. 1999). In south-west Victoria, Plains Grassy Woodland is classified as 'endangered' with an estimated 4% remaining, of which 1.5% is reserved (Anon 1999). Nests have been recorded in *Eucalyptus camaldulensis, E. baxteri, E. arenacea, E. viminalis, E. leucoxylon* and *E. fasciculosa*. Nest trees range in height from 8-32m (mean = 17.5 ± 5.0) and 48-198cm dbh (115.5 ± 30.0). Recorded nests were 11.4 ± 3.0m above the ground and were more likely to be found in vertical or near vertical 'spouts' rather than hollows in trunks (Hill and Burnard 2001).

Roosting habitat - Red-tailed Black-Cockatoos usually roost 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 (68%) of these sites were on private land. Red Gums chosen for roosting were 80 ± 13cm dbh and 26 ± 3m in height while Manna Gum roost trees were 64 ± 32cm dbh and 20 ± 2m in height.

Refuge habitats - There is little information on refuge areas. The sites where very large flocks of cockatoos have been recorded are Rennick State Forest (360 birds), Pieracle Swamp south-west of Casterton (c. 500 birds), and Dunrobin (460 birds). Large flocks of birds can form in response to shortages of food at a landscape scale and available food being concentrated in just a few patches (Thompson *et al.* 1975).

Movements and range

South-eastern Red-tailed Black-Cockatoos do not make regular annual movements, but move throughout their range in response to changes in the availability of food. In some years most birds are in the northern part of their range as they feed on Desert Stringybark and in other years most move to the south to feed on Brown Stringybark (Koch 2003). Seasonal movement into the far north of their range depends on the availability of Buloke seed (Joseph 1982, Maron and Lill 2004), though even in a year with good Buloke seeding a significant proportion of the population may remain in the south provided there is sufficient stringybark seed there (Hill in prep). Hill (in prep.) found the seasonal home ranges of eight birds radio-tracked over 2-11 months varied from 24 - 110km² (minimum convex polygon method) with activity centres of 4.8 - 68km² (95% kernel method).

Breeding

Adult male plumage in this long-lived species is attained at four years of age, and pairs with sub-adult males occur but have not been recorded nesting. Adult female plumage is indistinguishable in the field from sub-adults for at least two years. Joseph *et al.* (1991) suspected that less than 10% of the adult population was breeding, but based on flock counts, Hill and Burnard (2001) concluded that many adults breed each year. They nest in loose colonies with several nests within 1km² and a minimum of 40m between active nests (Emison *et al.* 1995*)*. The same nesting hollow may be used in successive years in about 25% of cases (R Hill *in litt*.). Nest hollows may also be reused after being vacant for several years (Hill in prep).

The breeding season commences in September, and nests with eggs are often found up until December (Attiwill 1972, Emison *et al*. 1995, Hill in prep). Nests started in January or February are likely to be re-nestings after failures (Emison *et al*. 1995). South-eastern Red-tailed Black-Cockatoos may nest successfully in any season (R Hill *in litt*.). They lay one egg which is incubated for c.30 days and the nestling period is c.87 days (Higgins 1999). Failed nests are sometimes replaced during autumn (Emison *et al.* 1995). Between 1989-94, Emison *et al*. (1995) found 58 nests, mainly in three loose colonies, and about a third of the 33 that were monitored were successful. Hill (in prep) found 50 nests, where the success of ten nests found as eggs in 1998-99 was 30%, but the following year breeding success was much lower, mainly because of food shortages (Jarmyn 2000). Juveniles may be fed by their parents for up to six months after fledging. Flock count data collected during 1997-2000 indicate that recruitment is similar to that of other black cockatoos (R. Hill *in litt*.).

Threats

Threats to food supplies

Food Shortages

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 Desert Stringybark fruiting on a three year cycle and Brown Stringybark on a 2-4 year cycle, with seed production substantially lower in both species of stringybark for up to 11 years after being burnt (Koch 2003), and irregular seasonal fruiting of Bulokes (Joseph 1982, Maron and Lill 2004). The impact of such natural shortages are exacerbated by the historical removal of feeding habitat. Other food shortages are influenced by land management 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).

Dietary specialists are vulnerable

Food availability is an important factor influencing the status and distribution of several cockatoo species (Saunders 1980, Pepper 1997, Cooper *et al*. 2002). The species that have expanded their range and increased numbers since European settlement are generalists such as the Galah *Eolohpus roseicapilla* (Rowley 1983) and inland Red-tailed Black-Cockatoo *Calypterhynchos banksii samueli* (Higgins 1999) that now eat many introduced plants. Other cockatoos such as the Long-billed Corella *Cacatua tenuirostris* declined markedly with the decline of its dietary staple Murnong *Microseris lanceolata*, but recovered with their switch to onion grass *Romulea* spp. and other introduced plants (Temby and Emison 1986). Similarly, the Yellow-tailed Black-Cockatoo *C. funereus* is one of just a handful of native birds to significantly increase in numbers in recent years (Barrett *et al*. 2002) due largely to the inclusion of the seeds of the now widespread Monterey Pine *Pinus radiata* in its diet. By contrast, those cockatoos that have declined to the point of being threatened such as the South Australian Glossy Black-Cockatoo *C. lathami halmaturinus*, Carnaby's Cockatoo *C. latirostris*, South-western Red-tailed Black-Cockatoo *C. banksii naso*, and South-eastern Red-tailed Black-Cockatoo are all largely restricted to feeding on just a few native plant species (Attiwill 1960, Joseph 1982, Saunders 1980, Johnstone and Kirkby 1999).

Natural food shortages

Evidence for reductions in food availability being a major threat for South-eastern Red-tailed Black-Cockatoos comes firstly from the knowledge that they feed mainly on one species of stringybark or the other, depending on which species has fruited most recently (Attiwill 1960, Joseph 1982, Koch 2003). Being unable to switch to other food sources, there are periods of marked food shortage between new stringybark seed crops which has a profound effect on the birds' annual distribution, movements, and nesting success (Koch 2003). The availability of new seed capsules determines feeding profitability, and cockatoos quickly exploit all profitable long-unburnt sites. Large areas of woodland soon assume low foraging value after the cockatoos have selectively used all of the trees with high capsule density (Koch 2003). Birds spend about half of their day feeding on a newly matured seed crop, but a year later a lack of alternative food sources means that they needed to revisit the same trees and forage for three-quarters of each day; and after 18 months this had increased to c. 90% of their day (Koch 2003). The only other important food source is Buloke seed, which is only available for about three months of the year. Buloke seed production is variable, with prolific crops in some years and none in other years (Joseph 1982, Maron and Lill 2004).

In a year when a new Desert Stringybark seed crop (three year cycle) was produced, cockatoo nesting success (30%) was more than double that of the next year (13%), and the prediction that nesting success would be even lower in the third year is supported by flock count data (Jarmyn 2000, Koch 2003, Hill *in litt*.). In the latter years, most male cockatoos are not expected to feed themselves, their mate and successfully raise a chick. A major cause of nest failure in the second year with lower seed availability was due to incubating females leaving the nest at unusual times to supplement the food provided to them by their mates (Jarmyn 2000). These results indicate that the South-eastern Red-tailed Black-Cockatoo population is limited by food supply, and particularly when the interval between seed crops is prolonged.

Impacts of fire on food

Prescribed burns and wildfires will substantially reduce seed capsule availability for at least 9 years, with some effects persisting for more than 11 years after fire (Koch 2003). Red-tailed Black-Cockatoos use a significantly lower percentage of trees in burnt areas, with the percentage of trees used increasing with time since fire (Koch 2003). Despite only a few trees in burnt areas having large seed crops and many trees having none at all, cockatoos still foraged in burnt areas, albeit with reduced efficiency. This is further evidence that food supply is limiting.

Bill Emison suspected that fire suppressed stringybark seed production and encouraged DSE to introduce a moratorium on burning whole blocks of stringybark on public land within the Horsham Forest Management Area in 1989, and a strategy of burning perimeter strips to provide fire protection. This moratorium has increased stringybark food availability in that area. Detailed mapping by DSE of all fires on public land in Victoria in the past 30 years shows that 87% of these stringybark woodlands within the range of the Red-tailed Black-Cockatoo are more than 9 years post fire, and both the Horsham (in prep) and Portland (2004) Fire Management Area Plans aim to maintain at least 85% of all stringybark on public land in this condition. Nearly 70% of all of the cockatoo's stringybark habitat is on public land in Victoria. About half of the stringybark 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 all prescribed burns which will result in reduced canopy scorch and much quicker recovery of trees to full seed production. Additionally, prescribed burns should be timed to avoid years in which any 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 of 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 commited to a prescribed burning plan for all Reserves and a policy to reduce canopy scorch. Department of 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.

Feeding habitat loss

About 57% of all suitable habitat has been cleared within the Red-tailed Black-Cockatoo's range, including stringybark woodland, its principal feeding habitat, and Buloke woodland, a seasonally important feeding habitat. Stringybark feeding habitat is much more fragmented in South Australia (87% cleared) than in Victoria (42% cleared, Burnard and Hill 2002). Desert Stringybark now makes up only 28% of the remaining stringybark habitat in the bird's range, and so this species is likely to be a more limiting resource than Brown Stringybark (Koch 2003). Though both species are important, Desert Stringybark should be given priority in protection and restoration works.

Native vegetation controls in South Australia and Victoria restrict, but do not prevent habitat clearance. Permission to clear blocks of woodland vegetation is rarely granted, but applications to clear paddock trees are regularly approved (Burnard and Hill 2002). 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 these rates of attrition continue (Carruthers and Paton in press). Legislative use of net gain principles in relation to vegetation has been adopted in Victoria and South Australia, however an overall net loss of trees across the landscape is still occurring. 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 (Sullivan and Venning 1982), with 65% of this predicted loss coming 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). The incremental loss of habitat is relatively poorly documented in Victoria.

Maron (2004) investigated Buloke tree retention in Victoria over a 15 year period (1982-1997) by comparing aerial photographs for five separate 25km² areas. Buloke tree loss averaged 33% in three cropping areas and was as low as 4% in a predominantly sheep grazing area (Maron 2004). The most significant factor in the loss of trees was the installation of centre pivot irrigation systems. The ongoing clearing in cropping areas is driven by the fact that the centre pivots are moved every few years, and not by the issuing of any new water licences.

The burning of crop stubble, a common practice in the area, often results in Buloke tree deaths (Maron 2004). The creation of adequate breaks around paddock trees would alleviate losses from fires.

Much of the Buloke regeneration along roadsides is too dense to provide suitable foraging habitat in the medium term (Maron 2004), with natural densities on clay soils of c.31 mature trees per ha (Morcom in prep). Buloke roadside thinning trials should be conducted in a manner similar to those underway in some of Victoria's new box-ironbark national parks (Bennett 2002). A major Buloke replanting program is required incorporating the guidelines provided by Hill *et al.* (2003).

Grazing impacts on foraging sites

Uncontrolled grazing is a major threat contributing to the death and decline of trees on private land throughout the range of the Red-tailed Black-Cockatoo (Cutten and Hodder 2002). For example, in four paddocks near Naracoorte regularly used for feeding, 76% of stringybark trees had some degree of ringbarking caused by cattle, and 15% of the trees were dead (R Hill *in litt*.). Cattle can also kill mature Bulokes (Maron *in litt*.). Fencing of isolated trees and degraded woodlands of stringybark and Buloke is the most effective way of reducing tree death rates and allowing regeneration. Fencing to control grazing is one of the best opportunities to increase food availability for Red-tailed Black-Cockatoos on private land.

Fragmentation of foraging habitat

Red-tailed Black-Cockatoos use both fragmented and intact foraging habitat (Maron 2002, Hill in prep), but the energetic costs of foraging in highly fragmented stringybark areas may be higher than the rewards (Koch 2003) leading to reduced viability of birds in such areas. The disappearance of Carnaby's Cockatoo from parts of its former range was linked to severe habitat fragmentation and problems associated with foraging in a fragmented landscape (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). A landscape approach could include the reservation of key blocks of public land (Ryan 2004), the purchase and reservation of key intact blocks of private land, financial assistance for landholders prepared to protect and covenant their private woodlands, and providing funds for the fencing of degraded woodlands to allow them to recover. 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 of Environment and Heritage (SA Department of Environment and Heritage).

Weed invasion of foraging habitat

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, but these permit conditions have rarely been enforced. ForestrySA with assistance from South Australian Department of Environment and Heritage officers are targetting 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

Nest site availability

Most (81%) known nests of Red-tailed Black-Cockatoos are in dead trees, many of which were ringbarked early last century, and most are on private land. The proportion of birds using live trees is probably slightly higher because birds are far easier to find nesting in dead trees than in live ones. Dead nest trees are falling over at a rate of 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 Caldow (1994) suspected that a reason for the low number of nests that they were able to locate was due to the loss of suitable hollow-bearing trees from traditional areas. They therefore began a program of erecting artificial nest hollows on poles and in dead trees, a few of which were used by Red-tailed Black-Cockatoos and other birds. Hill and Burnard (2001) argued that nest hollow availability is not limiting the Red-tailed Black-Cockatoo population, at least in the short term. In support of their argument they reported a low rate of re-use (33%) of known nest sites with some birds occupying nearby sites in subsequent years. Hill and Burnard (2001) also noted that Yellow-tailed Black-Cockatoos have very similar nest hollow requirements and have been recorded

on several occasions nesting in hollows previously used by Red-tailed Black-Cockatoos, and yet the number of Yellow-tailed Black-Cockatoos is increasing (Barrett *et al*. 2002). Although the birds prefer dead nest trees, where dead trees are now very rare such as along the Naracoorte Range, Red-tailed Black-Cockatoos persist and breeding success as measured by recruitment to flocks is not different to flocks living in areas where dead trees remain common (Hill and Burnard 2001). They concluded that nest hollow availability does not appear to be currently limiting the population and a program of artificial nest hollow provision is not warranted at present. This position would need to be reviewed if significant nesting habitat losses are sustained, for example in a wildfire, or current rates of nest tree loss accelerate.

Notwithstanding the short-term situation, 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 medium to long-term threats to the Red-tailed Black-Cockatoo. Many nest trees were growing before the introduction of domestic grazing animals into Australia, and many are near the end of their lifespan (Gibbons and Lindenmayer 2002). Moreover, 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 hollows do not develop in eucalypts until they are over 120 years old, and 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 e*t al* 2002), seems to be the only long-term solution for the Red-tailed Black-Cockatoo's future nest tree requirements.

Firewood harvesting

Both commercial and private firewood harvesting is a threat to Red-tailed Black-Cockatoo nesting habitat, not to mention some of the more than 300 other species of Australian vertebrate which use hollows (Gibbons and Lindenmayer 2002). The Resource Assessment Commission (RAC 1992) estimated that 6.1 million tonnes of firewood are consumed annually in Australia (compared with 4.8 million tonnes of woodchips). 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 Red-tailed Black-Cockatoo's range (R Hill *in litt.*). Dead trees on private land are not protected by State native vegetation protection in Victoria, but local government controls in Victoria, and State legislation in South Australia now protect large dead trees with hollows across the majority of the Red-tailed Black-Cockatoo's breeding range. However, continued illegal removal and natural decline of dead trees is probably inevitable. The medium to long-term impacts of firewood gathering and other causes of nest tree loss need to be addressed now because of the very long time required to grow hollow-bearing trees.

Nest predators

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 the incubating females to leave their nests unattended and forage for themselves. Because the number of successful Red-tailed Black-Cockatoo 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 the population recovery of Red-tailed Black-Cockatoos. Predators do cause some nest failures and efforts should be made to reduce their impact. Ground predators such as possums can be excluded by collaring nest trees (Jarmyn 2000) and 75 known nest trees have been collared to date (R Hill *in litt*.). Because Red-tailed Black-Cockatoos regularly move to new nest trees, greater protection could be obtained if all potential nest trees (Hill and Burnard 2001) within colonies were collared in addition to known nest trees.

Human interference with nests

The robbing of nests has been identified as a threat of unknown magnitude to the Red-tailed Black-Cockatoo population (J McGuire pers comm). Nestlings and eggs are harvested to supply an illegal avicultural trade. The extent of the threat posed by this illegal take is difficult to assess with only one South-eastern Red-tailed Black-Cockatoo known to be in captivity; however the small total population size of the cockatoo makes it vulnerable to reductions in breeding success. This issue is dealt with by Flora and Fauna Officers in DSE and Resource Protection Officers in Department of Environment and Heritage (SA).

Other Threats

Information gaps

There is a lack of information on the location of some Red-tailed Black-Cockatoo nest colonies, so they are not managed appropriately. Similarly, there is a lack of detailed information on the whereabouts of key blocks of private land for which managers may need financial and management assistance. The relative importance of Buloke woodland to Red-tailed Black-Cockatoos 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 and there is a need to increase the number of flock counts to strengthen the predictive power of this key monitoring tool.

Communication gaps

Beumer (2003) summarised the key findings of a telephone survey of 500 landholders within the range of the Red-tailed Black-Cockatoo, and the responses to these findings of four different groups of land managers and people involved in conservation and extension work. This survey pinpointed some gaps in the recovery team's work and these recommendations are being addressed. A key requirement now is the production of a communication strategy.

Research undertaken

The decline and status of the South-eastern Red-tailed Black-Cockatoo has been the impetus for the following work over the past 25 years:

- Joseph (1982) undertook the first detailed survey for the South Australian Government. He clarified the bird's range, confirmed its dependence on Brown Stringybark seed, reported Buloke as an additional food source, and cited clearing of Brown Stringybark as the main threat to the bird.
- Joseph *et al.* (1991) reported to the Victorian Government that the species was endangered, numbering only 500-1,000 birds. They described feeding, nesting and roosting habitats, and stressed the importance of dead trees as nest sites.
- Emison *et al.* (1995) began studying the nesting habits and success for the Victorian Government in 1988, with support from the World Parrot Trust during 1992-95. They encouraged Victoria's Horsham region of DSE to change to perimeter burns instead of block burns on all public land to maintain seed availability in Brown Stringybark.
- A Victorian Flora and Fauna Guarantee Action Statement (Venn and Fisher 1993) summarised earlier work on habitat clearing, fires, nest trees, the status of blocks of public land, fencing grants to landholders, and extension work. The Action Statement listed a large number of proposed management actions.
- In 1996 Birds Australia assumed a prominent role in work for the Red-tailed Black-Cockatoo with the first draft Recovery Plan produced (Garnett and Crowley 1996), and ongoing support from the Natural Heritage Trust.
- All of the known biological information was collated in Higgins (1999).

- Intensive recovery work has been reported in a 'Habitat Management Plan (Hill and Burnard 2001), a study of the bird's conservation biology (Hill in prep), a revised draft Recovery Plan (Burnard and Hill 2002), habitat clearance guidelines (Hill *et al*. 2003), and farming impacts on Buloke tree loss and recruitment (Maron 2004).
- Landholder's understanding of and attitudes towards conservation of the South-eastern Red-tailed Black-Cockatoo have been surveyed (Beumer 2003).
- Postgraduate work has been completed on factors limiting food supply in stringybark (Koch 2003) and Buloke (Maron 2002, Maron and Lill 2004), and nest predators (Jarmyn 2000).

Biodiversity benefits

The implementation of the Recovery Plan will have benefits for a wide range of woodland species and habitats. Within the range of the Red-tailed Black-Cockatoo 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 (Table 1). Threatened arboreal mammals such as the Brush-tailed Phascogale *Phascogale tapoatafa* occupy the same habitat as Red-tailed Black-Cockatoos and also require large hollow-bearing trees (Gibbons and Lindenmayer 2002). Actions proposed in the Recovery Plan such as: protecting 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.

Table 1. Nationally threatened and declining birds within the range of the Red-tailed Black-Cockatoo. Status follows Garnett and Crowley (2000) (CE = critically endangered, E = endangered, V = vulnerable, and NT = near threatened).

Common name	Species and subspecies	Status	EPBC
Bush Stone-curlew	*Burhinus grallarius*	NT	
Swift Parrot	*Lathamus discolor*	E	E
Masked Owl	*Tyto novaehollandiae novaehollandiae*	NT	
Brown Treecreeper	*Climacteris picumnus victoriae*	NT	
Speckled Warbler	*Chthonicola sagittata*	NT	
Black-chinned Honeyeater	*Melithreptus gularis gularis*	NT	
Hooded Robin	*Melanodryas cucullata cucullata*	NT	
Olive Whistler	*Pachycephala olivacea hesperus*	NT	
Diamond Firetail	*Stagonopleura guttata*	NT	
Pied Currawong	*Strepera graculina ashbyi*	CE	

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