Glossy Black-Cockatoo Conservation Guidelines

For South-Eastern Queensland and far North-Eastern New South Wales

Glossy Black Conservancy
2010

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Purpose of Document

The Glossy Black Conservancy has produced these Conservation Guidelines in its capacity as a collaborative NGO for the purpose of facilitating the management and conservation of the Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*) in south-eastern Queensland and far north-eastern New South Wales (the 'Specified Purpose'). This information and any recommendations in this document are particular to the Specified Purpose and are based on facts, matters and circumstances particular to the subject matter of the document and the Specified Purpose at the time of production. This document is not to be used, nor is it suitable, for any purpose other than the Specified Purpose. The Glossy Black Conservancy disclaims all liability for any loss and/or damage whatsoever arising either directly or indirectly as a result of any application, use or reliance upon the document for any purpose other than the Specified Purpose.

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Signed on behalf of
The Glossy Black Conservancy

Date: 23 August 2010

Adrian Caneris

Executive Summary

The Glossy Black-Cockatoo *Calyptorhynchus lathami* (GBC) is a rare and threatened cockatoo that is listed as a Vulnerable bird species under the Queensland Nature Conservation Act 1992 and New South Wales *Threatened Species Conservation Act 1995.* Past coastal development and clearance of suitable feeding habitat for agriculture have reduced its range and substantially reduced its overall abundance. South-eastern Queensland (SEQ) and far north-eastern New South Wales (NE NSW) have some of the most significant populations of GBC in Australia, in areas that are still experiencing rapid growth in urban development, yet currently no integrated protection program exists for the GBC in SEQ and NE NSW.

To address this deficiency, the Glossy Black Conservancy (the Conservancy) was formed in 2005 as a partnership between government, community groups and business to facilitate the management and conservation of GBC in the region. A major focus for the Conservancy has been the collaborative development of this Conservation Guidelines document that summarises the ecology, threats and appropriate research and management actions for addressing the conservation needs of the GBC.The principal guidelines are to:

1. **Identify and conserve feeding habitat**. High priority actions include developing a habitat suitability map for GBC in SEQ and NE NSW to include in future Biodiversity Planning Assessments undertaken at State level, identifying the habitat management requirements for maintaining sufficient areas of feeding habitat, and protecting feeding habitat from land clearing and tree removal through the development approval process;

2. **Identify new nest sites**, monitor the use of known nest sites, and protect nest sites and suitable nesting habitat through the development approval process and the range of incentives available for conservation on private land;

3. **Encourage ecological research on the GBC**, particularly its movements and use of the broader landscape, and the fire responses of its principal feed tree species;

4. **Survey GBC populations on a regular basis** to monitor population trends, recruitment, and distribution;

5. **Promote and facilitate community interest** and understanding of GBC habitat requirements and conservation;

6. **Promote and facilitate community participation** in GBC conservation; and

7. **Adopt a strategic planning approach** to GBC conservation at the local and regional level by maintaining the Conservancy and implementing the recommended actions as resources permit.

The guidelines are accompanied by a summary of current statutory and policy frameworks relevant to GBC conservation.

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List of Abbreviations

CITES	Convention on International Trade In Endangered Species
DERM	Queensland Department of Environment and Resource Management
GBC	Glossy Black-Cockatoo
Govt	Government
LGA	Local Government Area
NE NSW	Far North-eastern New South Wales
NGO	Non-Government Organisation
NSW	New South Wales
Qld	Queensland
RE	Regional Ecosystem
RTBC	Red-tailed Black-Cockatoo
SEQ	South-eastern Queensland
Uni.	University
YTBC	Yellow-tailed Black-Cockatoo

Glossy Black-Cockatoo Conservation Guidelines

For South-Eastern Queensland and far North-Eastern New South Wales

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1. Introduction

1.1 Document Background

The Glossy Black-Cockatoo *Calyptorhynchus lathami* (GBC) is a rare and threatened species restricted to eastern and south-eastern Australia. It is currently listed as Vulnerable under the *Queensland Nature Conservation Act 1992* and New South Wales *Threatened Species Conservation Act 1995*. South-eastern Queensland (SEQ) and far north-eastern New South Wales (NE NSW) have some of the most significant populations of GBC in Australia. Although there have been a number of local conservation initiatives, particularly on the Moreton Bay islands, currently no integrated protection programs exist for the GBC in SEQ and NE NSW (e.g. recovery plans, breeding programs, population monitoring). This represents a significant limitation to ensuring the bird's future conservation. Nevertheless, there is a considerable amount of community support and interest in protecting the species, as demonstrated by the ongoing involvement of the partners in the Glossy Black Conservancy.

The Glossy Black Conservancy (the 'Conservancy') was officially formed in 2005 with the vision of enabling a coordinated approach between government, community and business to increase the awareness, protection and conservation of Glossy Black-Cockatoos within South-eastern Queensland. The geographical scope of the Conservancy has since been extended to include far north-eastern NSW. To achieve this vision, and to address the lack of an established plan of management, one of the main aims of the Conservancy has been the development of a Regional Management Plan for Glossy Black-Cockatoos in SEQ and NE NSW in order to facilitate the management and conservation of the species.

Following further consideration of the contextual implications of a 'Management Plan' that is to be applied across Local Government and State boundaries, it was decided that the development of 'Conservation Guidelines' would be a more appropriate and achievable outcome, and one that could form the consistent basis of individual Management Plans for each of the authorities. It is also anticipated that these Conservation Guidelines could be applied as a template for other regions, with the inclusion of additional, specific issues to be considered, as deemed appropriate.

This Conservation Guidelines document has been developed collaboratively over a one-year period. A first draft was developed by key Conservancy partners and circulated in early 2009 to all partners for comment. A revised second draft, circulated to all Conservancy partners in early November 2009, formed the background to individual feedback meetings between a Conservancy coordinator and representatives of each of the city and regional council partners in the Conservancy, and a meeting with a Queensland Department of Environment and Resource Management (DERM) representative. Council representatives involved in these meetings included staff from the planning, development assessment, parks, community partnerships, and environment sections. The outcomes of these meetings were presented at a two-day workshop (2-3 December 2009) involving most Conservancy partners, where the proposed guidelines were discussed and commented on in detail. This feedback informed the preparation of a final draft of the Conservation Guidelines that was circulated to all partners for final comment in mid-December 2009. It is anticipated that the guidelines will continue to be periodically updated as new research, data and planning tools become available.

1.2 Objectives

The overall objectives of the Conservation Guidelines are to:

1. Facilitate the conservation of viable populations of GBC and their habitats across SEQ and NE NSW;
2. Improve our knowledge and understanding of the interactions between GBCs, the environment and threats across SEQ and NE NSW;
3. Provide stakeholders with the information to establish and implement strategic, adaptive management actions and associated monitoring regimes that achieve the conservation objectives for the species and its habitats;
4. Provide advice on practical measures that can be used to achieve enhanced protection and conservation of GBC habitat;
5. Assist the implementation of management actions by coordinating a collaborative effort of stakeholders via a consistent approach;
6. Raise public awareness of the GBC, the threats it faces, and what the community can do to ameliorate these threats.

1.3 Stakeholders

The development of these Conservation Guidelines has involved input from various official Conservancy members, including (in alphabetical order):

- Biodiversity Assessment and Management (BAAM);
- Bird Observation and Conservation Australia, Brisbane/Gold Coast Branch (BrisBOCA);
- Birds Australia Southern Queensland (BASQ);
- Birds Queensland (BQ);
- Brisbane City Council (BCC);
- Bundaberg Regional Council (BRC);
- Byron Shire Council (BSC);
- Gold Coast City Council (GCCC);
- Griffith University (GU);
- Gympie Regional Council (GRC);
- Ipswich City Council (ICC);
- Logan City Council (LCC);
- Moreton Bay Regional Council (MBRC);
- Mt Barney Lodge;
- North Burnett Regional Council (NBRC);
- Queensland Department of Environment and Resource Management (DERM);
- Redland City Council (RCC);
- Scenic Rim Regional Council (SRRC);
- SEQ Catchments (SEQC);
- Sunshine Coast Regional Council (SCRC);
- Tweed Bird Observers Club (TBO); and
- Tweed Shire Council (TSC).

While many of these agencies will also be primarily responsible for the implementation of the actions identified and recommended within these Conservation Guidelines, the participation of numerous other stakeholders, including various other State agencies, private industry bodies/developers and private land managers, will be critical for achieving desired outcomes.

It is also acknowledged that most new sightings and records of the species in SEQ and NE NSW come from the general community and that none can monitor these regions as easily and effectively as the local residents and visitors. As such, public participation is also crucial to ensuring a more secure future for the bird.
The habitual nature of the species provides an additional linkage to community-based monitoring, facilitating year round observation of the use of habitat elements such as watering sites and feed resources.

2. Species Profile

2.1.1 Species and Subspecies Descriptions

The Glossy Black-Cockatoo *Calyptorhynchus lathami* is the smallest of Australia's 'black' cockatoos. Three subspecies are recognised: (1) the core population in south-eastern Australia, *C. l. lathami;* (2) an outlying population in central eastern Queensland, *C. l. erebus;* and (3) an isolated population on Kangaroo Island in South Australia, *C. l. halmaturinus* **(Figure 2.1)**. The following descriptions are taken from Forshaw (2002).

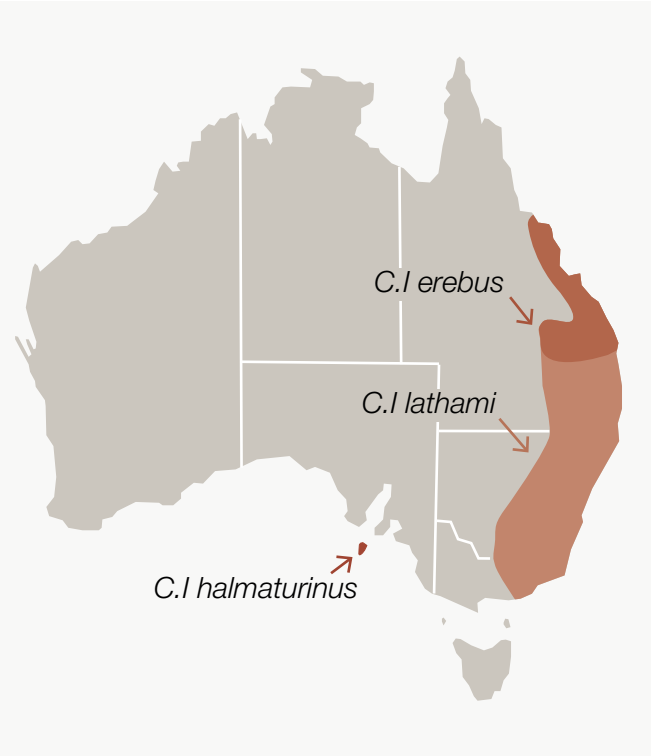

Figure 2.1: Distribution ranges of the three subspecies of Glossy Black-Cockatoo in Australia.

2.1.2 Calyptorhynchus lathami lathami

The geographical area covered by these Conservation Guidelines is within the range of the eastern subspecies of GBC *Calyptorhynchus l. lathami*, which is described as follows.

Adult Male – Head, neck and underparts dark sooty brown, merging into brown-black on undertail-coverts; feathers of forehead and crown only slightly elongated to form inconspicuous crest; back and wings black, a faint brownish-green sheen on primaries and upper wing-coverts; central tail-feathers black, lateral feathers

black with broad subterminal band of bright red; bill grey; iris dark brown; legs dark grey; weight 422-480 g **(Photo 2.1).**

Length 46-51cm, wing 360 mm, tail 218 mm, exposed culmen 46 mm, tarsus 25 mm.

Photos 2.1 and 2.2: Adult male (top) and female (bottom) Glossy Black-Cockatoo. Source: John McCann.

Adult Female – differs from male by having yellow feathers scattered throughout head and neck, in some birds only a few feathers, but in others large patches of yellow, often narrowly margined darker orange-yellow; red tail-band washed yellow and divided by narrow black barring, both yellow wash and black barring diminishing with age; bill greyish-horn suffused darker grey at sides of upper mandible and tipped dark grey; weight 430-500 g **(Photo 2.2)**.

Wing 340 mm, tail 211 mm,
exposed culmen 45 mm, tarsus 25 mm.

Juveniles – feathers of sides of head variably spotted with pale yellow; a few yellow spots on upper and lower wing-coverts, at times extending to flanks, and these usually darker yellow in males; feathers of lower breast to under tail-coverts subterminally barred with pale yellow, in females more pronounced and becoming strong speckling on under-tail coverts; no yellow feathers on head or neck; lateral tail-feathers like adult female, though darker red in young males, and barring more pronounced; bill horn-coloured suffused grey at base.

2.1.3 Calyptorhynchus lathami erebus

Adults – like *C. l. lathami*, but with a disproportionately small bill.

Occurs in the Dawson-Mackenzie-Isaac Rivers basin, in coastal central-eastern Queensland, north to Paluma in the Paluma Range, south to the Dawes Range plateau, and inland to the Expedition Range and probably to the Peak and Denham Ranges including the Blackdown Tableland.

2.1.4 Calyptorhynchus lathami halmaturinus

Adults – similar to *C. l. lathami*, but with a disproportionately large bill.

Confined to Kangaroo Island, South Australia, and formerly in the southern Mount Lofty Ranges on the adjacent mainland.

2.2 Confusing Species

In SEQ and NE NSW, the GBC shares much of its range with other black-cockatoo species, including the Red-tailed Black-Cockatoo *Calyptorhynchus banksii* (RTBC, **Photo 2.3**) and the Yellow-tailed Black-Cockatoo *C. funereus* (YTBC, **Photo 2.4**), and it is possible to confuse the three species. In terms of appearance, the most reliable distinguishing features of GBCs are a broad, bulbous bill and dull, brownish tinge on the head and breast. By contrast, YTBCs and RTBCs are both larger, 'blacker' birds, the former with distinctive, large yellow panels in a long tail (as opposed to the predominantly red tail panels of the other two species) and the latter with a larger, helmet-like crest (as opposed to the low, rounded crest of GBCs) (Pizzey and Knight 2003).

Photo 2.3: Adult male (left) and female (right) Red-tailed Black-cockatoo. Source: Bob McPherson

Unlike YTBCs, RTBCs and most other cockatoos, GBCs are generally inconspicuous in their behaviour, are usually seen feeding or flying in pairs or small groups, and are not raucous – they call little and then in subdued notes. This contrasts markedly with the conspicuous, noisy behaviour of other species, which are seen more frequently in large flocks. The GBC's call (a distant, drawn-out "tarr-red") is softer and more feeble than that of RTBCs (far-carrying, drawn out trumpet sound "kree", like a rusty windmill) and YTBCs (weird, far-carrying squeal - "wee-lar") (Pizzey and Knight 2003).

GBCs also have a highly specialised diet, which is discussed further in **Section 2.5.**

Photo 2.4: Adult Yellow-tailed Black-Cockatoo. Source: Bob Inglis.

2.3 Conservation Status

The conservation status of the GBC within national, state and local government jurisdictions is outlined below. Details of current statutory and policy frameworks relevant to GBC conservation at international, national, state and local government (SEQ and NE NSW) levels are summarised in **Appendix 1.**

2.3.1 National and International

The southern subspecies of the GBC (*Calyptorhynchus l. halmaturinus*) is currently listed as Endangered in South Australia under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999. This subspecies has been listed because of its small population size and dramatic decrease in its range after it became extinct on the mainland as a result of habitat loss following European settlement. It is now restricted to Kangaroo Island, where intensive conservation efforts guided by a species recovery plan have led to a recent increase in the size of the island's population (Mooney & Pedler 2005).

The species, *C. lathami*, is not listed nationally but is listed under Appendix II of CITES (see **Appendix 1**) with other members of the taxonomic order Psittaciformes (Parrots), which provides protection with respect to illegal trade in this species.

2.3.2 State

At the State level, the GBC is listed in Queensland (*Nature Conservation Act 1992*), New South Wales (*Threatened Species Conservation Act 1995*) and Victoria (*Flora and Fauna Guarantee Act 1988*) as Vulnerable, and in South Australia (*National Parks and Wildlife Act 1972*) as Endangered. These listings are motivated by the overall decrease in the range and severe decrease in abundance of State populations of GBCs, the ongoing increase in the pressures that have been responsible for these decreases, and the species being an ecological specialist with poor recovery potential (Lunney et al. 2000).

In order to give effect to the State level classification as a threatened species, several councils within SEQ have recognised the need to conserve the GBC at a local level **(Table 2.1)**, and most council partners in the Conservancy are actively involved in promoting awareness programs and assisting conservation efforts to protect the species.

Table 2.1:
Local conservation status of the Glossy Black-Cockatoo in SEQ and NE NSW local government areas (LGAs).

LGA	Conservation status of GBC	Key Document
Brisbane City	Listed as a significant species	Natural Assets Planning Scheme Policy (BCC 2000)
Byron Shire	Priority species for recovery planning & action through habitat protection	Biodiversity Conservation Strategy (BSC 2004)
Gold Coast City	Listed as a regionally & LGA significant species	Nature Conservation Strategy (GCCC 2009)
Moreton Bay	Nominated for listing as significant species	Local Biodiversity Strategy (draft)
Redland City	Protection & enhancement recognised as a Desired Environmental Outcome	Redlands Planning Scheme (RCC 2008)
Scenic Rim	Listed as a significant species	Planning Scheme Policy 3 - Ecological Assessment (SRRC 2009)
Sunshine Coast	Listed as a significant species	Sunshine Coast Regional Council draft Biodiversity Strategy (SCRC 2009)
Tweed Shire	Priority species for recovery planning & action through habitat protection	Vegetation Management Strategy (Kingston et al. 2004)

Due to differences in planning law, local councils in NSW do not usually "list" threatened or otherwise significant species in order to protect them from threats. In NSW, recovery actions for listed threatened species are a legal requirement of the *Threatened Species Conservation Act 1995* and threatened species assessments are required for all development. Not withstanding this, many local councils prepare and adopt strategies or management plans to better protect and manage biodiversity values.

2.4 Distribution and Population Size

2.4.1 General

The GBC is endemic to Australia and has a widespread but sparse distribution in the east of Australia, south from Paluma in northern Queensland (Garnett et al. 2000) to the Gippsland area of Victoria and inland to south-central Queensland, and the Central Western plains and Riverina of NSW. An isolated population exists on Kangaroo Island, South Australia (Schodde et al. 1993; Higgins 1999; Forshaw 2002).

Since European settlement, GBC abundance and distribution has decreased throughout its range (Paterson 1997, Mooney & Pedler 2005). The South Australian subspecies *C. l. halmaturinus* has become locally extinct on the mainland, where the last confirmed sighting was made in 1977 (Joseph 1989, Mooney & Pedler 2005). It is now restricted to Kangaroo Island, where intensive conservation recovery efforts have led to a recent population increase from less than 200 in 1995 to around 300 by 2005 (Mooney & Pedler 2005). Breeding population size and area of occupancy have been estimated at 12,000 birds occupying 50,000 km^2 for *C. l. lathami* and 5,000 birds occupying 1,000 km^2 for *C. l. erebus* in 2000 (Garnett & Crowley 2000). The Queensland population of *C. l. lathami* appears to be more abundant in SEQ where more frequent records are made within an area of 25,000 km^2 (Paterson 1997).

2.4.2 SEQ and NE NSW Distribution

Glossy Black-Cockatoos are found throughout the SEQ and NE NSW regions. In SEQ, three significant populations have been identified (based on sightings and feed tree localities): (1) the southern Moreton Bay Islands; (2) the hinterland of the Gold Coast; and (3) Noosa (BAAM 2007). Concentrations of known historical records and feeding habitat for GBCs in the Gold Coast region include the Mudgeeraba, Bonogin, Coomera and Pimpama areas, which are located in peri-urban areas that are mostly designated for future urban development. The largest populations west of the Great Dividing Range in southern Queensland are found in the Barakula, Chinchilla and Dunmore areas.

North-eastern NSW is also a stronghold for GBC; the NSW Wildlife Atlas website (NSWWA 2010) has around 6500 GBC records, with significant concentrations at numerous locations throughout the region. Specific localities in Tweed and Byron shires include Bogangar, Round Mountain, Hastings Point, Ocean Shores and Broken Head along the coast, and Mt Nullum, Mt. Jerusalum, Byrill Creek Koonum and Nightcap Ranges in the hinterland. The population in the Round Mountain area has been estimated at less than 50 individuals (CSIRO 1995).

Based on the abundance, age and proportion of *Allocasuarina* with feeding evidence (orts), Stock (2008) estimated a population size of 390-520 birds feeding in the Gold Coast region, whereas a coordinated survey of 31% of 1km^2 grid cells with historical records for GBC on the Gold Coast **(Figure 2.2)** yielded a count of 51 birds in 2009 (Castley & Stock, unpublished).

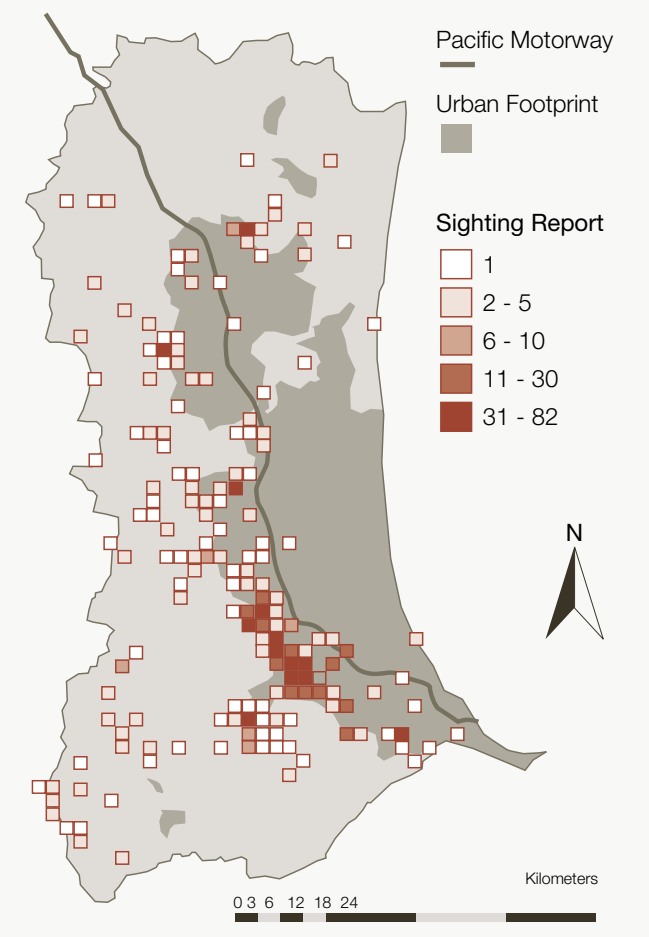

Figure 2.2: Historical sighting reports of Glossy Black-Cockatoo locations from the Gold Coast, SEQ. Compiled from Gold Coast City Council, WildNet (DERM), Glossy Black Conservancy and Griffith University data (Castley & Stock, unpublished).

Local movement of GBCs may be due to a number of factors, including seasonality of food resources and

the ephemeral nature of water sources that lead to a shifting pattern of habitat use, loss of feeding sites, and loss of nesting sites. This emphasises the importance of managing multiple resources within the landscape to protect the species.

2.5 Ecology

2.5.1 Preferred Habitat

Glossy Black-Cockatoos are essentially temperate zone birds. Towards the north of their range they become restricted to highland areas such as mountain ranges, isolated ridges or plateaus, and their irregular visits to surrounding lowlands are probably motivated by food supplies.

Except when on the move, GBCs are rarely found away from *Allocasuarina* or *Casuarina* (she-oak) trees, which provide their primary food source (Clout 1989; Pepper et al. 2000; Crowley & Garnett 2001; Chapman 2007). They have a strong preference for woodland dominated by *Allocasuarina*, or open sclerophyll forests or woodlands, with a middle stratum of *Allocasuarina* below *Eucalyptus*, *Corymbia* or *Angophora*. They are also observed in mixed *Allocasuarina, Casuarina, Callitris* or *Acacia harpophylla* (Brigalow) woodland assemblages, or dense sclerophyll forests. To the west of the Great Dividing Range in southern Queensland, GBCs feed in remnant Belah (*Casuarina cristata*) and Bull Oak (*Allocasuarina luehmannii*) forests.

Glossy Black-Cockatoos breed mainly within woodland or remnant woodland containing large, old trees, but have also been recorded in dead, ringbarked eucalypts in cleared country. The species is an obligate hollow nester and requires a hollow stump or limb, living or dead, or a hole in the trunk of a large, old tree, usually a eucalypt, for breeding (Garnett et al. 1999; Forshaw 2002; Cameron 2006).

Glossy Black-Cockatoos generally roost in the canopy of live, leafy trees, particularly eucalypts, but will use other species, including patches of Brigalow (Forshaw 2002). Roost sites are usually <1 km from a reliable water source and, during the breeding season, tend to be within 30 m of a nesting tree (Garnett et al. 1999).

In SEQ, urbanised areas can retain important habitat/ resource values and the birds are known to utilise small pockets of feed trees or even individual feed trees within urban areas (EMS 2003). The repeated, albeit infrequent, use of individual feed trees (e.g. a single tree in a roundabout or on a freeway median strip) is also known to occur (Higgins 1999; Pepper et al. 2000). However, this contrasts with a consistent preference for feeding in the interior of she-oak patches at Koala Beach (Mark Fitzgerald, Tweed Shire Council, pers. comm.).

2.5.2 Diet and Foraging Habits

Glossy Black-Cockatoos have a highly specialised diet, feeding almost exclusively on the seeds of *Allocasuarina spp.* (Clout 1989; Pepper et al. 2000; Chapman & Paton 2006a, b; Cameron & Cunningham 2006), but also certain species of *Casuarina* (Higgins 1999). Throughout their range, they are reported to feed on nine species, of which the majority are *Allocasuarina spp.* (Chapman 2007). Yet, within a local area, feeding by the GBC is often restricted to a single species of she-oak (Clout 1989; Pepper et al. 2000; Crowley & Garnett 2001; Forshaw 2002; Cameron & Cunningham 2006). Within SEQ and NE NSW, GBC show a distinct preference for *A. littoralis* (Black She-oak) and *A. torulosa* (Forest She-oak). However, they have also been recorded feeding on *C. equisetifolia* (Coastal She-oak), and to a lesser extent *C. cunninghamiana* (River She-oak) and *C. glauca* (Swamp She-oak) during limited periods of the year (John Birbeck, Sunshine Coast CC, pers. comm; John Callaghan & Graeme Lloyd pers. comm.). *Allocasuarina littoralis* appears to be the favoured feed tree on the islands in Moreton Bay and coastal lowlands, while *A. torulosa* appears to be favoured along mountain ridges and slopes and higher ground generally. There is evidence of *A. torulosa* in coastal plains but it appears to be isolated and infrequently distributed.

Individuals spend as much as 88% of each day foraging (Clout 1989). They are rarely found foraging in other than *Allocasuarina* and *Casuarina* species **(Photo 2.5)**, and while they have been reportedly observed foraging in *Acacia, Hakea, Angophora* or *Eucalyptus* for seeds and insect larvae, many such observations are possibly misidentifications or birds not actually eating (Blakers et al. 1984; Pepper 1997; Higgins 1999; Forshaw 2002). Glossy Black-Cockatoo are also known to fly from *Allocasuarina* forage trees into others to process cones (Chapman 2007). Birds prefer to forage at sites with relatively higher *Allocasuarina* cover and avoid open sites where the predation risk may be greater (Cameron & Cunningham 2006).

Photo 2.5: Adult male (left) and immature male (right) GBC feeding on she-oak cones. Source: Marg Eller.

Glossy Black-Cockatoos are selective with respect to both the trees and the cones on which they choose to forage. Birds show strong fidelity to particular trees, returning to feed in selected trees, and ignoring other nearby trees, over consecutive years (Clout 1989; Higgins 1999; Pepper et al. 2000; Crowley & Garnett 2001). Glossy Black-Cockatoos preferentially select the trees bearing cones with a high ratio of total seed weight to cone weight, which is an index of the Food Value from each cone-opening effort (Clout 1989; Pepper 1996, 1997; Pepper et al. 2000; Crowley & Garnett 2001; Cameron & Cunningham 2006). Seed Fill (percentage of seeds containing kernels) and Kernel Ratio (average kernel weight/average cone weight) contribute significantly to Food Value (weight of kernels/total cone weight), both of which can be rapidly assessed by birds sampling the cone tips of a small number of cones in a tree (Crowley & Garnett 2001). Birds may also select trees with larger cone crops but there is little evidence that they select trees on the basis of cone size (Clout 1989) or tree height (Wild et al. 2002).

Within a tree, foraging birds select younger, russet-brown cones produced in the previous year, often ignoring older, grey-brown cones (Pepper et al. 2000; Cameron & Cunningham 2006). Foraging by GBCs may differ with habitat, and the tree/cone characteristics of the *Allocasuarina* species upon which they are feeding (Chapman & Paton 2006b). The feeding status of *Allocasuarina* in SEQ appears to be a function of individual seed weight, germination potential and the abundance of cones for *A. littoralis*, and trunk circumference and ground slope for *A. torulosa* (Wild et al. 2002).

This feeding specialisation and the low rates of food intake place the GBC in a position where it may be vulnerable to even small changes in the food supply (Benkman 1993; Cameron 2005). However, within the SEQ region, the availability of food resources is not thought to be limiting for GBC, and the population may be limited by other factors (Wild et al. 2002).

During feeding sessions, GBCs drop the remains of cones they have processed using the bill. These chewed remains, termed orts, have a characteristic appearance and may litter the ground beneath favoured feed trees **(Photo 2.6)**. Orts can be persistent; the discarded remains of *A. littoralis* cones last about 4-6 months before disintegrating, whereas those of *A. torulosa* last longer. Factors involved in the persistence of orts include soil moisture and fire history.

Photo 2.6: Chewed she-oak cones (termed 'orts') lying beneath an *Allocasuarina* tree. Source: Eli Szandala.

It is possible to categorise the age of the orts based on their colouration. Fresh (less than 24 hours old) chewings tend to be pale green to creamy white. As the chewings age, they lose their cream colouration and become more orange (about a week old), turning orange-brown (about six weeks old) and then finally brown or grey when cones are up to a year old. These characteristics of orts, which provide an index of GBC foraging activity, can be used to study the use of habitat within landscapes by an otherwise cryptic and sparsely distributed species (Cameron & Cunningham 2006; BAAM 2007).

2.5.3 Reproduction and Development

The egg-laying season of *C.l. lathami* lasts from March to June (Higgins 1999). South Australian *C.l. halmaturinus* commence nesting in January and lay eggs through to July (Mooney & Pedler 2005). Forshaw (2002) describes the courtship display to be similar to other *Calyptorhynchus* species, with the crest raised, head feathers fluffed out, and tail fanned to reveal tail colouring. The male struts along the branch toward the female whilst bowing and bobbing his head, making squeaky call notes.

The nest is usually found within a hollow limb or a hole in the trunk of a tree **(Photo 2.7)**, usually a eucalypt and mostly between 10 m and 20 m above the ground (Forshaw 2002). Potential GBC nest trees are large eucalypts (living or dead) with a diameter at breast height over bark >40 cm, with developing hollows (Garnett et al. 1999). Potential GBC nest hollows have the following characteristics: (i) hollow >8 m above ground level, (ii) situated in branches or stems >30 cm in diameter, (iii) angle of branch or stem not more than 45° from vertical, and (iv) a minimum entrance diameter of >15 cm (Cameron 2006). In central NSW, nest hollows were vertical or near vertical spouts (77%), trunk cavities exposed by the loss of a large branch at a fork in the trunk (19%) or trunk cavities with a side entrance (3%), and were located in *Eucalyptus crebra* (74%), *E. nubila* (16%) and *E. blakelyi* (10%) trees (Cameron 2006). Nest trees were typically large, senescent or standing, dead trees (snags), with 80% having a diameter at breast height over bark ≥60 cm (mean = 70 cm, range = 39–96 cm). On Kangaroo Island, most nests were in large (20–40 m), living *E. cladocalyx* trees, and nest hollows were vertical or near vertical, usually in the trunk or upper limbs where branches had broken off (Garnett et al. 1999). The average diameter of the nest hollow is 22.5 cm (Higgins 1999). Glossy Black-Cockatoos also make use of artificial nests, such as those of PVC piping that have been erected on Kangaroo Island (Garnett et al. 1999). Nests are lined with chewings from the interior of the nest and little else (Garnett et al. 1999). Birds will use the same nest in successive seasons and will often nest in close proximity to nests of other pairs (Garnett et al. 1999; Mooney & Pedler 2005).

Photo 2.7: Female and juvenile GBC at nest cavity. Source Boyd Essex.

On Kangaroo Island, nests are located within 1.5 km of a permanent water source, usually closer (average 200 m), and within 12 km of principal feeding areas (average 2.9 km; Garnett et al. 1999).

As with most cockatoos, the GBC has a slow lifecycle; the clutch size is usually one, and pairs that successfully fledge a youngster generally do not breed in the subsequent season because of the extended period of juvenile dependency (Garnett et al. 1999). If the egg or small nestling is lost, some females replace the egg within 21 days, laying up to three clutches in a season, although re-laying appears to be less likely if the nest is predated by the Common Brushtail Possum (*Trichosurus vulpecula*) (Garnett et al. 1999; Mooney & Pedler 2005).

The female incubates the egg and broods the chick until fledging. Incubation lasts approximately 30 days after which the female remains in the nest. During this time the male forages and returns to the nest to provide food for the female, who feeds the nestling. The female

resumes foraging once the nestling is three weeks old. The nestling fledges (leaves the nest) 84-96 days after hatching and is then fed by both parents until at least the onset of the following breeding season. During this period of dependency, the juvenile accompanies its parents at all times, including roosting in physical contact (Garnett et al. 1999; Mooney & Pedler 2005).

Nest success has been quantified only on Kangaroo Island, South Australia, where Common Brushtail Possums are abundant and are responsible for high levels of nest predation (Garnett et al. 1999; Mooney & Pedler 2005). Prior to protection of nests from possums, breeding productivity was 0.17 young/nest, but increased to an eight-year average of 0.51 young/nest at nests protected from possums (Mooney & Pedler 2005). By comparison, breeding productivity has been measured as 0.34-0.63 young/nest for Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) (Saunders 1986) and 0.11 young/pair/year for Palm Cockatoo (*Probosciger aterrimus*) (Murphy et al. 2003).

Wild et al. (2002) argue that it is perhaps the availability of nesting trees that is currently the limiting factor affecting GBC populations in SEQ as there appear to be sufficient forage resources within this region. The ongoing removal and clearing of nesting habitat is therefore a concern for the future persistence of the species in SEQ and NE NSW.

2.5.4 Movement Patterns

The movement patterns and ranging behaviour of the GBC are poorly known, even for the Kangaroo Island population which is the most intensively studied within Australia. The species is variously considered sedentary, resident or nomadic, either locally or partially. Some birds may also undertake movements over longer distances, being regular or unpredictable visitors to some areas.

The population on Kangaroo Island is segregated into six 'flocks', where each 'flock' is a group of birds that restricts its movements to within a well-defined area, with only some movement between 'flocks'. Most individuals remain within their natal 'flocks'; 27% of birds were never observed away from the general area where they had fledged, and of those that moved, most remained in the 'flock region', with only 23% observed moving into a different 'flock region' (Southgate 2002). Movement patterns may be related to the availability of resources around roosting and nesting sites and there is certainly some level of local movement among these resources. Glossy Black-Cockatoos are said to fly at considerable height when moving between feeding areas. During breeding, some birds may make daily, round-trip flights of up to 30 km to forage (Pepper 1996; Garnett et al. 1999; Mooney & Pedler 2005).

GBC are often considered as being seasonal in several locations within SEQ, which suggests the birds are moving around the region in response to resource availability or breeding requirements (Stock & Wild 2005). Seasonal movements may be more prevalent on mainland Australia, where resources are more dispersed, than on Kangaroo Island. New research in SEQ is attempting to track the movements of the GBC within the region.

Glossy Black-Cockatoos do form aggregations and these may be in response to local resource availability, such as water sources, or may be due to local movement between upland and lowland areas. On Kangaroo Island, GBCs disperse locally to the coast at the end of the breeding season (Joseph 1982; Pepper 1996; Higgins 1999). These patterns are also expected in SEQ where local movement of birds between the hinterland areas and the offshore islands, particularly North Stradbroke Island, is reported.

The GBC is present throughout the year in many areas, and groups reportedly occupy areas permanently, though with some local movement. In Queensland the species is often recorded in mountainous regions, and is said to make irregular visits probably in search of food to surrounding lowlands, including coastal areas, where it feeds on both *Allocasuarina littoralis* and *Casuarina equisetifolia* (Stock & Wild 2005). The birds are unpredictable visitors to some inland areas, where they possibly wander more widely in response to dry conditions (Forshaw 2002).

2.5.5 Behavioural Traits

Glossy Black-Cockatoos are inconspicuous and cryptic. Unlike other cockatoos they are not raucous – their vocalisations are relatively infrequent and subdued. They sit still and silent when approached and can easily be overlooked. Usually, their presence is detected by hearing the soft clicking action of the bill on the cones as they feed. Even so, once located, the birds are confiding and tolerate close approach.

Glossy Black-Cockatoos apportion their time throughout the day to various activities. The primary activities include feeding, roosting/resting and flying while less frequent activities include drinking, mating and nesting (during the breeding season). Daily activity patterns differ between breeding and non-breeding birds. Among birds followed for the whole day on Kangaroo Island, non-breeding birds spent 73% of the day resting and 26% foraging, whereas breeding birds increased foraging time to 36% and reduced resting time to 23%, spending the remaining 38% of the day on nesting activities (Chapman & Paton 2006a).

In SEQ and NSW, GBCs appear to spend a greater proportion of their time feeding than those birds on Kangaroo Island. Among birds located randomly in feeding habitat (breeding status not reported), birds in south-eastern NSW spent 88% of the time they were under observation on feeding, 4% on resting and 8% on other activities (Clout 1989), and birds in central NSW were observed feeding during 55-87% of all observations (Cameron 2005). In SEQ, birds spent 66% of time under observation feeding and 23% resting (Stock 2008). Feeding activity is greatest in the early morning and late afternoon, whereas the birds spend much of the hotter parts of the day resting (Cameron 2005). Cameron (2005) has also recorded an increase in the foraging efficiency of adult birds when compared to juveniles and sub-adults.

2.6 Threats

2.6.1 Causes of Past Declines

Throughout its range, population changes in the GBC have been linked to changes in the extent of feeding habitat. The decline and extinction of *C. l. halmaturinus* on the South Australian mainland was due mainly to the loss of she-oak feeding habitat as a consequence of land clearing, possibly exacerbated by an increased frequency of fires (Mooney & Pedler 2005). A decline in the population size of *C. l. halmaturinus* on Kangaroo Island was reversed when breeding success was increased through protection of nesting trees from predation by Common Brushtail Possums (Garnett et al. 1999; Mooney & Pedler 2005). The density of possums typically increases when native vegetation is cleared and fragmented for forestry, agriculture or residential development (Garnett et al. 1999; Lindenmayer et al. 2002; Harper et al. 2008). The range of *C. l. lathami* has contracted at its edges, particularly south and west of the Great Dividing Range, and coastal development and clearance of suitable feeding habitat for agriculture are thought to have reduced the population density by at least half (Garnett & Crowley 2000). The range of *C. l. erebus* is thought to be expanding northwards, and the area of mature she-oak may be increasing in some areas as a result of a change in fire regime, to the advantage of the cockatoos (Garnett et al. 2000).

2.6.2 Loss of Feeding Habitat

The greatest threat to the GBC throughout its range is the loss of habitat in which *Allocasuarina* or *Casuarina* is a dominant or sub-dominant tree species (Garnett and Crowley 2000; Forshaw 2002; Cameron and Cunningham 2006). Habitat loss occurs mainly through land clearing for agriculture, residential and infrastructure development, and rural subdivisions, but the selective thinning of *Allocasuarina* and *Casuarina* on grazing land (to increase grazing potential) and residential land (e.g. for fire risk management) also degrades feeding habitat for GBCs. Although remnant vegetation and Endangered regrowth vegetation in Queensland is now protected under the *Vegetation Management Act 1999*, GBC food trees are often concentrated in regrowth areas that are not classified as Endangered. Consequently, much of this regrowth is not protected and is therefore often subject to more focused clearing.

She-oaks are pioneer species in disturbed areas, and are replaced in time by later-successional native

vegetation. Therefore, protection of she-oaks from occasional fire and other forms of habitat disturbance will cause the natural loss of she-oaks as the process of vegetation succession advances. Along the Tweed coast of far NE NSW, GBC have been commonly observed feeding on *C. equisetifolia* (Coastal She-oak) which were extensively planted on coastal dunes following sand mining in the 1960s and 1970s. Many of these trees are now senescing, are threatened by coastal development or are being progressively replaced by assisted regeneration to more closely approximate naturally occurring coastal vegetation communities.

Burning of fire-sensitive she-oaks (e.g. *Allocasuarina littoralis*) can easily kill these trees, rendering feeding habitat unsuitable for up to 10 years while the she-oaks grow sufficiently to recover their fruiting potential (Mooney & Pedler 2005). Although periodic fire is required to regenerate GBC feeding habitat, frequent fire reduces the abundance and recovery of she-oaks and prevents seedlings from reaching maturity (Mooney & Pedler 2005). High frequency burning is considered a major threat to GBC feeding habitat and hollow-bearing trees on agricultural lands in parts of SEQ (Michael Anderson, Scenic Rim Regional Council, pers. comm.). The appropriate fire regime to maintain suitable habitat in the long term is not yet well understood.

Other threats to feeding habitat include grazing by livestock and rabbits that may prevent regeneration of *Allocasuarina* (Cooke 1987), weed infestations that may increase fire intensities or prevent regeneration, and the unpredictable impacts of future climate change.

2.6.3 Loss of Nesting Trees and Drinking Sites

The loss of large, hollow-bearing trees as a result of land clearing and tree-thinning for agriculture and residential and infrastructure development, hot fires, and removal for fire-wood or reasons of public safety reduces the availability of nest sites and can limit breeding by GBC (Mooney & Pedler 2005). Trees that develop suitable GBC nest hollows are thought to be at least 100 years old and possibly much older (Mooney & Pedler 2005). If the recruitment of such trees is reduced, this will also reduce future breeding opportunities for the cockatoos. On Kangaroo Island, nest sites are also only occupied by GBC if they are located within relatively close proximity (average distance 200 metres and greatest distance 1.4 km) to a permanent source of accessible drinking water (Garnett et al. 1999). Therefore, loss or a scarcity of suitable drinking sites may exclude GBC from breeding in otherwise suitable areas. A scarcity of watering sites has also been noted as a limiting factor on the southern Moreton Bay islands (BAAM 2002).

2.6.4 Threats to Breeding Success

Land clearing for agriculture, residential development and rural subdivisions typically increases the abundance of Common Brushtail Possum, Galah (*Eolophus roseicapillus*), Long-billed Corella (*Cacatua tenuirostris*), Little Corella (*Cacatua sanguinea*), Sulphur-crested Cockatoo (*Cacatua galerita*) and Common Myna (*Acridotheres tristis*), which compete with GBCs for the reduced number of nest hollows (Garnett et al. 1999; Cameron 2006). Populations of these species have increased in SEQ and NE NSW generally, but the influence on GBC breeding recruitment in these regions remains unknown. Glossy Black-Cockatoos are also displaced from nest hollows by feral honeybees (*Apis mellifera*) (Garnett et al. 1999).

Common Brushtail Possums are important predators of cockatoo eggs and young (Garnett et al. 1999) and can severely depress breeding success. Nest success on Kangaroo Island increased from 17% to 51% after protection of nests from possum predation (Mooney & Pedler 2005). Feral cats have been associated with cockatoo predation in Western Australia (Joseph 1982). The influence of possum and cat predation on GBC nesting success in the SEQ and NE NSW regions has not been quantified.

The illegal robbing of nests for egg collecting or poaching of young birds for the avicultural trade are currently considered minor additional threats (Mooney & Pedler 2005).

The GBC has a relatively long lifespan, so the full impact of these cumulative threats on the GBC population in SEQ and NE NSW may not yet have become apparent, particularly if they act on recruitment rather than adult survival.

3. Conservation Goals And Guidelines

3.1 Conservation Goals

Managing a long-lived, slow-breeding species like the GBC requires a long-term perspective in conservation planning (Burbidge and Raines 2003). Recognising that the threats that have led to a substantial decline in GBC populations in SEQ and NSW are ongoing, the species is listed as Vulnerable in both Queensland and NSW. If action is not taken to relieve these threats, the GBC may become endangered across this region. The long-term goal of these conservation guidelines is consequently to achieve viable populations of GBC in the regions of SEQ and NE NSW participating in the Conservancy.

3.2 Conservation Guidelines

All Conservancy partners are committed to contributing to the implementation of the conservation guidelines, but certain action items are of greater relevance to a subset of Conservancy partners, as indicated in the 'Contributing partners' column below.

Guidelines	Actions	Contributing partners	Priority
Identify and conserve feeding habitat Aims: *To identify important feeding habitat and prevent any further loss in the extent and condition of this habitat in the long-term by managing it appropriately, protecting it from land clearing, tree thinning and other forms of degradation, and restoring feeding habitat that has been cleared or degraded by previous impacts*	Identify and record the locations of 'core' feeding habitat for GBC, defined as she-oak trees (*Allocasuarina and Casuarina* spp.) with evidence of past feeding by GBC (see **Section 2.5.2**).	All	High
	Produce an accurate map of potential feeding habitat for GBC. The prevalence of GBC feeding tree species is linked to other natural vegetation communities. Consequently there are currently no accurate measures that enable agencies responsible for natural resource management to spatially identify such stands that may be important for GBC. This deficiency could be addressed by using a geographic information system (GIS) modelling approach. Intersecting the geographically precise records of feed trees collected by the Conservancy members and partner organisations across the region with the existing layer of Regional Ecosystem (RE) types should enable the relevant REs utilised by GBCs to be identified. Recognising the geographical bias inherent in such recording effort, the GIS-based model can then be used to map the distribution of these key REs elsewhere in the region, even if no actual sightings of birds have been recorded there, and so provide a habitat suitability map or predicted distribution for GBCs in SEQ and NE NSW.	DERM[a]; Griffith Uni.	High
	Demarcate 'essential habitat' for GBCs as part of future Biodiversity Planning Assessments undertaken by DERM. These assessments function as biodiversity and nature conservation information tools to assist land use and land management decision-making, e.g. assessment of clearing applications under Queensland's *Vegetation Management Act 1999* and *Vegetation Management (Regrowth Clearing Moratorium) Act 2009*. This approach should, therefore, lead to improved protection of important habitats for the species.	DERM[a]	High

Guidelines	Actions	Contri-buting partners	Priority
	Protect known feeding habitat from land clearing and tree removal through the development approval process. Appropriate actions are to: • adopt minimum buffer distances of 50 metres[b] between the outer envelope of any approved development and GBC preferred feed trees (see **Section 2.5.2** for list of preferred feed trees) for nature conservation purposes, to protect the growing conditions for feed trees and promote ongoing recruitment of feed trees; • adopt minimum buffer distances of 50 metres[b] between the outer envelope of any approved development and identified GBC drinking sites for nature conservation purposes and to maintain the hydrology of natural waterholes; • include locally-occurring GBC preferred feed tree species (see **Section 2.5.2**) into landscape and rehabilitation plans within known habitat areas ; • prevent the clearing of preferred feed tree species; • maintain known waterholes if possible, but if a known waterhole is lost, it should be replaced with an artificial waterhole that meets GBC requirements – seek advice on these requirements where necessary.	Local govt	High
	Include internal development offset provisions for developments that result in the loss of GBC feeding habitat. See **Appendix 2** for offset principles.	Local govt	High
	Encourage the use of available incentives by landholders and land managers to manage sites with key feeding habitat, including the restoration of feeding habitat that has been cleared or degraded by previous impacts.	Local govt; NGOs.	Medium
	Assist landholders who wish to enter into voluntary conservation agreements or Nature Refuge declarations at sites with key feeding habitat.	Local govt; NGOs; DERM[a].	Medium
	Identify the management requirements for maintaining sufficient areas of 'core' feeding habitat for GBC over the long term, particularly in currently protected areas.	All	High

Guidelines	Actions	Contri-buting partners	Priority
	Adopt an appropriate fire management plan for GBC feeding habitat. Appropriate actions are to: • prevent extensive areas of feeding habitat being burnt in single or consecutive wildfires by adopting a mosaic burning strategy across landscapes containing feeding habitat, preferably using low intensity fires; • prevent extensive areas of feeding habitat being burnt too frequently, preferably using an average burning frequency no greater than one fire in 15 years where appropriate; • prevent burning of important known feeding patches in highly fragmented landscapes (small scale); • undertake litter raking around cone-producing trees where required for the retention of important known feed trees during prescribed burning.	Local govt; Land mana-gers	High
	Identify areas that might act as critical refugia during drought, assuming that cone production by GBC feed trees is reduced during drought. Prioritise these refugia for future protection.	Griffith Uni.	
Identify new nest sites, protect known nest sites and conserve suitable nesting habitat. Aims: *To prevent the loss of identified nest trees and potentially suitable nest trees and nesting habitat in the long-term by protecting them from land clearing, tree thinning and other forms of degradation.hem from land clearing, tree thinning and other forms of degradation.*	Locate new nest sites, monitor the use of known nest sites, and maintain a confidential database and map of known nest sites	All	High
	Determine the association of known nest sites with specific REs to identify and map important nesting habitat using the Biodiversity Assessment and Mapping Methodology (BAMM).	DERM[a]; Griffith Uni.	Medium
	Protect nesting habitat from land clearing and tree removal through the development approval process. Appropriate actions are to: • prevent the clearing of large, hollow-bearing eucalypt trees; • establish minimum buffer distances of 50 metres[b] between the outer envelope (including firebreaks) of any approved development and known GBC nesting sites for nature conservation purposes, to protect active nests from disturbance during the breeding season and to protect nest-site trees from clearing or hazard reduction activities; • within forestry areas, no timber harvesting should occur within a 50 metre[b] radius of a known GBC nesting tree;	Local govt; Land mana-gers	High

Guidelines	Actions	Contri-buting partners	Priority
	• impacts on tree health of known roost trees, which are often located close to nest sites and feed trees; • ensure known GBC nesting sites remain protected and are not subject to biodiversity offsets, given that artificial nests have not been shown to be an effective solution to the loss of natural nest hollows in SEQ and NE NSW.		
	Identify water sources used by GBC within a 1 km radius of known nest sites, maintain this water supply, at least during the breeding season, and control foxes in the vicinity.	All	High
	Where owners of private land containing known GBC nest sites are, promote the range of incentives available for conservation and management of the species and its nest sites.	Local govt	Medium
	Secure known nest sites on undeveloped lots with development approval using the range of incentives available for conservation and management of the nest sites.	Local govt; Land mana-gers	High
	Maintain and augment feeding habitat within a 12 km radius of known nest sites.	Land mana-gers	High
	Adopt an appropriate fire management plan for known GBC nest sites: • prevent burning of GBC nesting habitat during the breeding season (January to October); • undertake regular litter raking around all known nest trees.	Land mana-gers	High
	Where and when necessary, protect known nest sites from predator access.	Land mana-gers	High
	Manage competition for known nest sites from feral species.	Land mana-gers	High
	Establish nest boxes as artificial hollows, with appropriate management, in known breeding habitat areas where natural nest sites are limiting, and close to preferred feeding habitat and drinking sites, subject to available resources for monitoring and maintenance of nest boxes.	Land mana-gers	Medium

Guidelines	Actions	Contri-buting partners	Priority
Encourage ecological research on GBC across the SEQ and NE NSW region. Aims: *To improve the understanding of GBC ecological requirements, including GBC movements and use of the broader landscape within its range.*	The Conservancy is to set up a research sub-committee to identify and prioritise research needs.	All	High
	Encourage further research to assess the fire response of GBC feed tree species and use of feeding habitats post-fire to improve understanding of appropriate fire management strategies.	Griffith Uni.	Medium
	Encourage research that studies the movements of individual birds through radio-tracking, satellite-tracking or use of individually marked birds, to assess the home-range sizes and habitat requirements of individuals at different times of the year. Research studies should include investigations of local dynamics, population requirements, and spatial and temporal use of the landscape.	Griffith Uni.	High
	Encourage research to assess dispersal between breeding populations.	Griffith Uni.	Medium
Conduct surveys to improve understanding of GBC population demography, distribution and use of the landscape. Aims: *To survey GBC on a regular basis to obtain accurate information on population trend, flock structure, recruitment and distribution.*	Conduct a professional, systematic landscape survey to identify feed trees and nest sites to improve the understanding of distribution and use of the landscape.	All	Medium
	Conduct a coordinated survey of GBC populations in SEQ and NE NSW on a regular (e.g. annual) basis. Use the map of important feeding habitat and knowledge of key areas of occupancy to inform the selection of a set of sites to survey each time. Given that it is impractical to census the whole population, the population trend is best established through surveying the same sites repeatedly using standardised survey effort. Sites could also be selected to test factors thought to influence habitat occupancy e.g. degree of habitat fragmentation.	All	High
	Establish a standardised process for recording, managing and sharing data on: (1) incidental sightings; (2) feed trees; (3) watering sites; and (4) nest sites. Sightings data must be submitted to WildNet and Wildlife Atlas for them to be considered in development assessments.	All	High
	Monitor recruitment (i.e. breeding success) on a regular (e.g. annual) basis. The most cost-effective method for measuring recruitment is to census flock size and composition at the end of the breeding season; the ratio of juvenile birds to adult females provides a measure of recruitment. This activity could be included in a population survey conducted at the end of the breeding season.	All	High

Guidelines	Actions	Contri-buting partners	Priority
	Monitor nesting success, comparing nests on islands to nests on the mainland, to identify constraints on nesting success (e.g. possum predation, competition for nest holes) and assess the need for specific nest protection measures.	Griffith Uni.	Medium
	Maintain a record of fire history on public lands to assist future research into the effect of fire on GBC feeding habitat, and to inform adaptive management of fire regimes.	Local govt; DERM[a].	Medium
Promote and facilitate community interest and understanding of GBC habitat requirements and conservation. Aims: *To maintain community awareness, interest in and ownership of the Conservancy; to encourage beneficial land management practices to conserve GBC habitat; to ensure that community visitation of sites frequented by GBCs does not adversely impact on feeding and breeding activity.*	Maintain the structure and aims of the Conservancy, and a high profile for the Conservancy through good communication with major stakeholders and sponsors.	All.	High
	Promote the GBC as an icon animal for the Southern Moreton Bay Islands in all communication opportunities.	Redland City Council	Medium
	Maintain and update the Conservancy website to keep it relevant.	Griffith Uni.	High
	Produce a newsletter that is distributed to active participants and others with an interest in the Conservancy.	All	Medium
	Give presentations to schools, clubs and organisations as opportunities present themselves.	All	Medium
	Prepare and submit regular articles to the local press, and occasional articles targeting the wider State and Australian communities.	All	Low
	Submit regular articles for publication in relevant national and local environmental and ornithological newsletters and websites.	All	Low
	Participate in TV and film projects, as opportunities present themselves.	All	Low
	Develop and provide relevant and updated information packages to students and other interested parties on request.	All	Medium
	Maintain links with other groups involved with the recovery of the GBC, including the Kangaroo Island GBC Recovery Program, and with other threatened species recovery teams and networks.	All	Low

Guidelines	Actions	Contri-buting partners	Priority
Promote and facilitate community participation in GBC conservation. Aims: *To establish, maintain and coordinate a group of volunteers trained to assist with searches for feed trees and nest sites, monitoring of active nests during the breeding season, the annual population survey and other tasks that benefit GBC conservation.*	Recruit and train volunteers to assist with the annual population survey.	All	High
	Recruit and train volunteers to assist with nest searching and monitoring.	All	Medium
	Promote volunteer involvement in other aspects of the conservation program, such as publicity.	All.	Medium
	Draft a letter for a general request for volunteer involvement in Conservancy activities.	All	High
	Ensure good feedback to volunteers regarding the GBC conservation program and regular acknowledgment of their contribution, both personally and in publicity material.	All	High
Adopt a strategic planning approach for GBC at the local and regional level.	Encourage, maintain or increase participation in the Conservancy.	All	High
	Launch the conservation guidelines with coordinated media events.	All	High
	Adopt and implement the conservation guidelines.	All	High

[a] Together with NSW Department of Environment, Climate Change and Water (DECCW) should they become a Conservancy partner.

[b] DECCW (2010) advises that: (a) within a 200 m radius of any GBC sighting record, all she-oaks with evidence of foraging by GBC should be protected ; and (b) no timber harvesting should occur within a 50 m radius of a known GBC nesting tree.

Photo: GBC in flight Alan Rash

Photo: Eli Szandala

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Appendix 1:

Summary of current statutory and policy frameworks relevant to GBC conservation at international, national, state and local government (SEQ and NE NSW) levels

International and National Statutory and Policy Frameworks

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between governments that regulates international trade in specimens of wild animals and plants to ensure that it does not threaten their survival. Further info: www.cites.org/

Environment Protection and Biodiversity Conservation Act 1999.
Further info: www.environment.gov.au/epbc/about/index.html

National Strategy for the Conservation of Australia's Biological Diversity 1996.
Further info: www.environment.gov.au/biodiversity/publications/strategy/index.html

The Great Eastern Ranges Initiative (formerly the Alps to Atherton Initiative) is a national conservation project intended to connect and conserve ecosystems through the Great Dividing Range, escarpment and associated ranges from the Australian Alps in Victoria to Atherton in Queensland. Further info: www.environment.nsw.gov.au/conservationprograms/index.htm

State Statutory and Policy Frameworks

Queensland

Nature Conservation Act 1992 lists threatened species (GBC listed as Vulnerable) and states that protected wildlife is to be managed to conserve it to the greatest possible extent.
Further info: www.austlii.edu.au/au/legis/qld/consol_act/nca1992237/

Vegetation Management Act 1999 regulates the clearing of remnant vegetation by providing codes for the Integrated Planning Act that are applicable codes for the assessment of vegetation clearing. It provides for the protection of listed significant fauna species through the mapping of remnant vegetation and associated Essential Habitat for listed significant fauna species.
Further info: www.austlii.edu.au/au/legis/qld/consol_act/vma1999212/

Sustainable Planning Act 2009 is new legislation that replaces the Integrated Planning Act 1997. It seeks to achieve sustainable planning outcomes through managing the process by which development takes place, managing the effects of development on the environment, and continuing the coordination and integration of local, regional and state planning.
Further info: www.dip.qld.gov.au/planning-and-development/sustainable-planning-act-2009.html

Environment Protection Act 1994 regulates "environmentally relevant activities" such as mining and provides an Environmental Impact Assessment process for such activities otherwise subject to the Sustainable Planning Act 2009. Under the EP Act, proposed activities that will have a significant impact on "environmentally sensitive areas" require the preparation of an Environmental Impact Statement and associated Environmental Management Plan.
Further info: www.austlii.edu.au/au/legis/qld/consol_act/epa1994295/

Queensland Government Environmental Offsets Policy provides principles and guidelines for environmental offsets to be used to counterbalance loss of environmental values, such as native vegetation. Further info: www.derm.qld.gov.au/environmental_management/planning_and_guidelines/policies_and_strategies/environmental_offsets/

Coastal Protection and Management Act 1995 provides for the protection, conservation, rehabilitation and management of the coast including its resources and biological diversity.
Further info: www.austlii.edu.au/au/legis/qld/consol_act/cpama1995309/

State Coastal Management Plan outlines directions for effective protection and management of the coastal zone. Further info: www.derm.qld.gov.au/environmental_management/coast_and_oceans/coastal_management/state_coastal_management_plan/

Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016 provides for vegetation offsets and restoration of koala habitat, but has been superceded by the ***State Planning Policy 2/10 Koala Conservation in South-east Queensland*** (see under Regional Policy Frameworks below)

New South Wales

Threatened Species Conservation Act 1995 provides for the conservation of listed threatened species, including the GBC which is listed as Vulnerable. Further info: www.austlii.edu.au/au/legis/nsw/consol_act/tsca1995323/

Catchment Management Authorities Act 2003 provides for financial assistance to implement catchment management activities. Further info: www.austlii.edu.au/au/legis/nsw/consol_act/cmaa2003316/

Crown Lands Act 1989 provides for the management of crown land, including council reserves, travelling stock reserves and road reserves, in such a way that environmental protection principles are observed. Further info: www.austlii.edu.au/au/legis/nsw/consol_act/cla1989134/

Environmental Planning and Assessment Act 1979 provides State and Local Government with land-use planning and development assessment powers. Land-use planning instruments include State Environmental Planning Policies (SEPPs), Regional Environmental Plans (REPs), Local Environmental Plans (LEPs), and Development Control Plans (DCPs). SEPPs relevant to GBC in NE NSW include:
SEPP 14 – Coastal Wetlands www.austlii.edu.au/au/legis/nsw/consol_reg/seppn14w543/
SEPP 26 – Littoral Rainforests www.austlii.edu.au/au/legis/nsw/consol_reg/seppn26r621/
SEPP 44 – Koala Habitat Protection www.austlii.edu.au/au/legis/nsw/consol_reg/seppn44hp603/
SEPP 71 – Coastal Protection www.austlii.edu.au/au/legis/nsw/consol_reg/seppn71p578/
Further info: www.austlii.edu.au/au/legis/nsw/consol_act/epaaa1979389/

Native Vegetation Act 2003 regulates the clearing of native vegetation on all land in NSW except national parks and other conservation areas, State forests and reserves, and urban areas.
Further info: www.austlii.edu.au/au/legis/nsw/consol_act/nva2003194/

Rural Fires Act 1997 provides for the prevention, mitigation and suppression of bush and other fires, with consideration given to the protection of environment and biodiversity values.

Rural Fires and Environmental Assessment Legislation Amendment Act 2002 amends the Rural Fires Act 1997 and several environmental assessment-related Acts to streamline the assessment process for hazard reduction works, and provides for the development of a Bush Fire Environmental Assessment Code.

The Nature Conservation Trust Act 2001 is a non-government body set up under the Nature Conservation Trust Act 2001 that acquires properties with high conservation values which are under-represented within the public reserve system and then sells them to a new owner with a conservation covenant attached. Further info: www.naturetrust.org.au/

NSW Coastal Policy 1997 has nine goals (including to protect, rehabilitate and improve the natural environment and accommodate natural processes), each underpinned by objectives that are to be achieved by strategic actions. Responsibilities for these actions have been appointed to appropriate government agencies, councils and other organisations. Further info: www.planning.nsw.gov.au/plansforaction/coastalpolicy.asp

The ***NSW Threatened Species Priorities Action Statement*** outlines the broad strategies and detailed priority actions in NSW that are required to promote the recovery of threatened species, populations and ecological communities; and manage key threatening processes.
Further info: www.threatenedspecies.environment.nsw.gov.au/index.aspx

The ***NSW Natural Resources Commission 2006-2015*** is an independent body that was established under the Natural Resources Commission Act 2003, which has established a series of resource condition targets to achieve a resilient ecologically sustainable environment that functions at a range of landscape scales and supports environmental, economic, social and cultural community values. Further info: www.nsw.gov.au/stateplan/index.aspx?id=f782cbd-0528-4077-9f40-75af9e4cc3e5

The ***NSW Threatened Species Conservation Amendment (Biodiversity Banking) Bill 2006*** inserts a new Part 7A in the Threatened Species Conservation Act 1995 (TSC Act) to enable a biodiversity banking and offsets scheme. Further info: www.environment.nsw.gov.au/biobanking/biobankframework.htm

Regional Policy Frameworks

Queensland

South-east Queensland Regional Plan 2009–2031 embodies Regional Policies that set out the desired regional outcomes, principles, policies and programs to manage regional growth and change in a sustainable way. Further info: www.dip.qld.gov.au/regional-planning/regional-plan-2009-2031.html

South-east Queensland Regional Coastal Management Plan provides direction for implementing the State Coastal Management Plan and the South-east Queensland Regional Plan 2009-2031. Further info: www.epa.qld.gov.au/environmental_management/coast_and_oceans/coastal_management/regional_coastal_management_plans/southeast_queensland_coast/southeast_queensland_regional_coastal_management_plan.html

South-east Queensland Natural Resource Management Plan 2009–2031 is a non-statutory environment and natural resource management plan that incorporates measurable targets for the condition and extent of environment and natural resources that are aligned to desired regional

outcomes and policies of the South-east Queensland Regional Plan 2009–2031.
Further info: www.derm.qld.gov.au/regional_planning/seq_nrm_plan.html

South-east Queensland Climate Change Management Plan (Draft) has the potential to influence restoration activities in the region. Further info: www.dip.qld.gov.au/regional-planning/management-plan.html

South-east Queensland Koala State Planning Regulatory Provision regulates new development in koala habitat areas, which includes areas with mature eucalypts.
Further info: www.dip.qld.gov.au/koalas

State Planning Policy 2/10 Koala Conservation in South-east Queensland outlines how new or amended planning schemes should maintain or enhance koala habitat to achieve desired environmental outcomes and create a network of koala habitat and movement areas across South-east Queensland's Urban Footprint. Further info: www.dip.qld.gov.au/koalas

New South Wales

North Coast Regional Environmental Plan 1988 provides guidance for Councils in preparing Local Environmental Plans (LEPs) and in the assessment of development applications. Further info: www.austlii.edu.au/au/legis/nsw/consol_reg/ncrep384/

NSW Far North Coast Regional Strategy 2006-2031 provides the NSW Government's land-use strategy to guide local planning in the local government areas of the region.
Further info: www.planning.nsw.gov.au/plansforaction/pdf/fncrs_strategy_fin.pdf

The ***Northern Rivers Catchment Action Plan (CAP)*** is a statutory 10 year plan for delivery of natural resource management investment and outcomes across the Northern Rivers Region, as required under the Catchment Management Authorities Act 2003.
Further info: www.northern.cma.nsw.gov.au/region_catchment_action_plan.php

The ***Northern Rivers Regional Biodiversity Management Plan*** meets the recovery planning requirements for threatened species, populations and ecological communities in the Northern Rivers region listed under the NSW Threatened Species Conservation Act 1995.
Further info: www.environment.nsw.gov.au/biodiversity/nrrbiomanagemntplan.htm

The ***Border Ranges Rainforest Biodiversity Management Plan*** incorporates existing state and national recovery and threat abatement plans, as well as NSW Threatened Species Priority Action Statement actions, to identify actions to be taken to ensure the long-term viability for groups of listed threatened species in the Border Ranges region. Further info: www.environment.gov.au/biodiversity/threatened/publications/recovery/border-ranges.html

Local Statutory and Policy Frameworks

There area a variety of mechanisms whereby regional and city councils in both SEQ and NE NSW can protect biodiversity values, including Voluntary Conservation Agreements, Conservation Covenants, Land for Wildlife agreements, and a variety of codes, policies and local laws in local Planning Schemes (SEQ) or Development Control Plans (NE NSW).

Queensland

The table below provides a summary of planning scheme policies and codes relating to biodiversity and vegetation in Queensland local government area Conservancy partners.

Planning Scheme			
Local Government area	DEOs	Codes	Planning Scheme Policies
Brisbane City Council	3.1	• Biodiversity Code • Waterway Code • Wetland Code • Landscape Code	• Brisbane River Corridor Planning Scheme Policy • Environmental Impact Assessment Planning Scheme Policy
Bundaberg Regional Council		• Ecology Protection Code • Landscaping Code	• Landscaping Policy • Riverside Parklands Masterplan
Gold Coast City Council	1.0 DEO Ecol.1; & 2.0 DEO Ecol.2	• Natural Wetland Areas and Natural Waterways Constraint Code • Nature Conservation Constraint Code • Landscape Code • Vegetation Management Code	• Policy 8: Ecological Assessment Guidelines • Policy 10: Guidelines for Preparing Management Plans and Plans of Development • Policy 15: Management of Coastal Dune Areas
Gympie Regional Council		• Conservation Significant Areas Code	PSP5: Landscaping Policy
Ipswich City Council	3(b)	• Development Constraints Overlays: • Land Affected by Key Resource Areas, • Haul Routes and Existing Mines • Buffers to Highways and Regional Transport Corridors • Rail Corridor Noise Impact Management	
Logan City Council	1(h); 2(a); 2(c); & 3(k)	• Vegetation Management Area • Wetland and Waterway Area Code • Flood Plain Management Area • Acid Sulphate Soils Area • Wetland and Waterway Area	

Moreton Bay Regional Council	Caboolture: (i); & (xiv) Pine Rivers: 3.2; 3.4; 3.5 Redcliffe: (B	Caboolture: • Catchment Protection Overlay Code • Koala Conservation Overlay • Nature Conservation Overlay Pine Rivers: • Biodiversity Overlay Code • Waterways Overlay Code Redcliffe: • Natural Features or Resources Overlay Code • Natural Values Code	Caboolture: • Planning Scheme Policy 13: Koala Conservation • Pine Rivers: PSP31 • Demonstrating Compliance with the Biodiversity and Waterways Overlay Codes
Redland City Council	2.3.8 (a); & (b)	• Conservation Zone Code • Environmental Protection Zone Code • Habitat Protection Overlay Code • Waterways, Wetlands and Moreton Bay Overlay Code	• Planning Scheme Policy 4 – Ecological Impacts • Planning Scheme Policy 14 – Waterways, Wetlands and Moreton Bay
Scenic Rim Regional Council	Beaudesert: 1(b); 1(e); 1(g); 1(h) Boonah: C(16); C(17)	Beaudesert: • Nature Conservation Catchment Management, Waterways and Wetlands Boonah: • Natural Features Overlay Code	Beaudesert: • Planning Scheme Policy 4: Vegetation Management Plan • Planning Scheme Policy 3 - Ecological Assessment
Sunshine Coast Regional Council	Caloundra: 3(a) Maroochy: (1); & (2) Noosa: (g)	Caloundra: • Habitat and Biodiversity Code • Natural Waterways and Wetlands Code Maroochy: • Nature Conservation and Biodiversity • Waterways and Wetlands Noosa • Landscaping Code • Biodiversity Overlay Code	Caloundra: • Planning Scheme Policy: Environmental Assessment and Management Maroochy: • Planning Scheme Policy 3: Rehabilitation Plans • Planning Scheme Policy 12: Biodiversity Noosa: • Planning Scheme Policy 3 – Landscaping Plants and Guidelines • Planning Scheme Policy 18 – Ecological Assessment Guidelines

New South Wales

Local Environment Plans (LEPs) guide development at the local government level. They set appropriate zonings and zoning provisions for all land within a local government area, and provide criteria for land-use and development standards. Further info: www.austlii.edu.au/au/legis/nsw/consol_reg/epaar2000480/

A ***Development Control Plan (DCP)*** is a detailed guideline of the various standards, policies and guidelines adopted by Council for development in its Local Government Area. These plans refine or supplement a regional environment plan or local environment plan and are made in accordance to the EPA Act. Further info: www.austlii.edu.au/au/legis/nsw/consol_reg/epaar2000480/

The ***Tweed Local Environmental Plan 2000*** restricts land uses in specified Environmental Protection Zones and makes provision for Tree Preservation Orders. Further info: www.austlii.edu.au/au/legis/nsw/consol_reg/tlep2000278/

The ***Byron Local Environmental Plan 1988*** restricts land uses in specified Environmental Protection Zones and makes provision for Tree Preservation Orders. Further info: www.austlii.edu.au/au/legis/nsw/consol_reg/blep1988295/

The ***Tweed Vegetation Management Strategy 2004*** promotes the protection, rehabilitation and management of native vegetation and wildlife habitat of high conservation value. Further info: www.tweed.nsw.gov.au/YourEnvironment/VegMgtHome.aspx

The ***Byron Biodiversity Conservation Management Strategy 2004*** provides a long-term approach to guide development and aims identify, protect, restore and maintain ecosystems and ecological processes by delivery on-ground works and planning controls. Further info: www.byron.nsw.gov.au/Biodiversity/Strategy.aspx

Appendix 2: Offset Principles

The following key principles, based on a document prepared by Tweed Shire Council, should underpin the internal offset provisions for developments that result in the loss of important GBC habitat features:

1. No other options: Offsetting can only be considered when all means of avoiding the impacts from a development proposal on a site's biodiversity values have been exhausted. This involves following the mitigation sequence of avoidance, minimisation, restoration and compensation.

2. Maintain and improve: Offsets must achieve no net loss; they must result in maintenance and preferably improvement of the biodiversity values being impacted by a development.

3. Like-for-like: Offsetting must be on a like-for-like basis; that is, the biodiversity values of the offset must closely approximate at regional, landscape and local scales the values being affected by a development.

4. Measurable process: Offsetting must be a measurable process, using established tools and information in the assessment of impacts and the design and implementation of offsets.

5. Improvement of offset: Offset implementation should result in an improvement in the condition and security of the offset.

6. Limitations: Where development impacts on biodiversity, there will be an inevitable loss of some values that are irreplaceable; this is the reason that all options for avoiding impacts and retaining biodiversity values onsite are required to be fully investigated and offsetting should always be considered as a last resort. In addition, in some cases there may be a short to medium-term loss of values during the time it takes for an offset to improve in condition and maturity; and there is also the chance of an offset failing.

7. Commitment and transparency: Offsetting is a commitment to a process that ensures biodiversity values are maintained in perpetuity.

8. Offset Management Plan: Offsetting must be facilitated by an Offset Management Plan that incorporates monitoring, evaluation and reporting and allows for adaptive management.

Appendix 3: Relevant Contacts

Conservancy Partner	Contact Name	Contact's Email Address
Key Document Contacts		
Biodiversity Assessment and Management (BAAM)	Adrian Caneris Jedd Appleton Penn Lloyd	adrian@biodiversity.tv jedd@biodiversity.tv penn@biodiversity.tv
Griffith University	Guy Castley	g.castley@griffith.edu.au
DERM	Ian Gynther	ian.gynther@derm.qld.gov.au
SEQ Catchments	Liz Gould	lgould@seqcatchments.com.au
Council Contacts		
Brisbane City Council	Robyn Jones	robyn.jones@brisbane.qld.gov.au
Bundaberg Regional Council	Nick Maclean	Nick.Maclean@bundaberg.qld.gov.au
Gold Coast City Council	Jason Searle	JSEARLE@goldcoast.qld.gov.au
Gympie Regional Council	Amy Gosley	amy.gosley@gympie.qld.gov.au
Ipswich City Council	Mark Panter	MPanter@ipswich.qld.gov.au
Logan City Council	Lyndall Rosevear	LyndallRosevear@logan.qld.gov.au
Moreton Bay Regional Council	Bernadette May	bernadette.may@moretonbay.qld.gov.au
North Burnett Regional Council	Lee Dorahy	lee.dorahy@northburnett.qld.gov.au
Redland City Council	Lisa Bailey	lisa.bailey@redland.qld.gov.au
Scenic Rim Regional Council	Michael Anderson	michael.a@scenicrim.qld.gov.au
Sunshine Coast Regional Council	Conor Jenkins	Conor.Jenkins@sunshinecoast.qld.gov.au
Byron Shire Council	Scott Hetherington	scott.hetherington@byron.nsw.gov.au
Tweed Shire Council	Mark Kingston	mkingston@tweed.nsw.gov.au
Other Partner Contacts		
Birds Australia (Southern Qld)	Eric Anderson	plainswanderer@powerup.com.au
Birds Queensland	Lyn Cole	Lynette.cole@three.com.au
BrisBOCA	Rod Bloss	brisboca@birdobservers.org.au
Mt Barney Lodge	Tracey Larkin	mtbarneylodge@bigpond.com