Plan of Management

for the

Glossy Black-cockatoo

at the

Koala Beach Estate

Original Plan

Prepared in Accordance with conditions of the NSW National Parks and Wildlife Licence No. TS 0092

December 2000

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For
The Australian Koala Foundation

Revised December 2017

Introduction

Koala Beach is a residential development south-west of Hastings Point on the Tweed coast in north-eastern New South Wales. Development plans include the eventual establishment of 499 lots over 87.52 hectares of a 364 hectare site.

The need for a Plan of Management for the Glossy Black-cockatoo (*Calyptorhynchus lathami*) at Koala Beach arose due to New South Wales National Parks and Wildlife Service (NPWS) Licence TS0092 requirements relating to the construction of stage 2 of the residential development.

Significant foraging habitat for Glossy Black-cockatoos was identified within the area proposed for residential development during surveys for a Fauna Impact Statement for the original "Searanch" project (AKF 1995).

The Glossy Black-cockatoo is listed as 'Vulnerable' in New South Wales under the *Threatened Species Conservation Act* 1995. Reasons given for the original listing as " Vulnerable and Rare " on the prior Schedule 12 of the *National Parks and Wildlife Act*, 1974 were:

population severely reduced; poor recovery potential; ecological specialist

(Lunney et al. 1992).

Fauna Impact Statement Results

The Glossy Black-cockatoo was one of 19 threatened fauna species recorded from the Koala Beach site.

Glossy Black-cockatoos were recorded on the site on 11 occasions during fauna surveys carried out for the 1995 FIS. Birds were recorded feeding in 10 Forest Oaks in the significant habitat stands and in Forest Oaks in 5 additional locations to the north in land zoned 7(l) for environmental protection.

Areas considered "critical to essential behavioural patterns of this species" were identified within the 2(c) zone proposed for development as residential allotments. This comprises several stands of dry sclerophyll forest dominated by Forest Oak (*Allocasuarina torulosa*) on the north-westerly facing slopes of a low ridge.

The significant habitat is depicted in Figure 1. Additional recorded feed tree locations adjacent to the reserved habitat area are depicted in Figure 2.

NSW NPWS Decision Report

Condition 7.3 of the Section 120 Licence issued by NPWS required that the area of habitat critical for the Glossy Black-cockatoo be retained and that a plan of management be prepared for this species. The area of habitat critical for the Glossy Black-cockatoo was reserved from development.

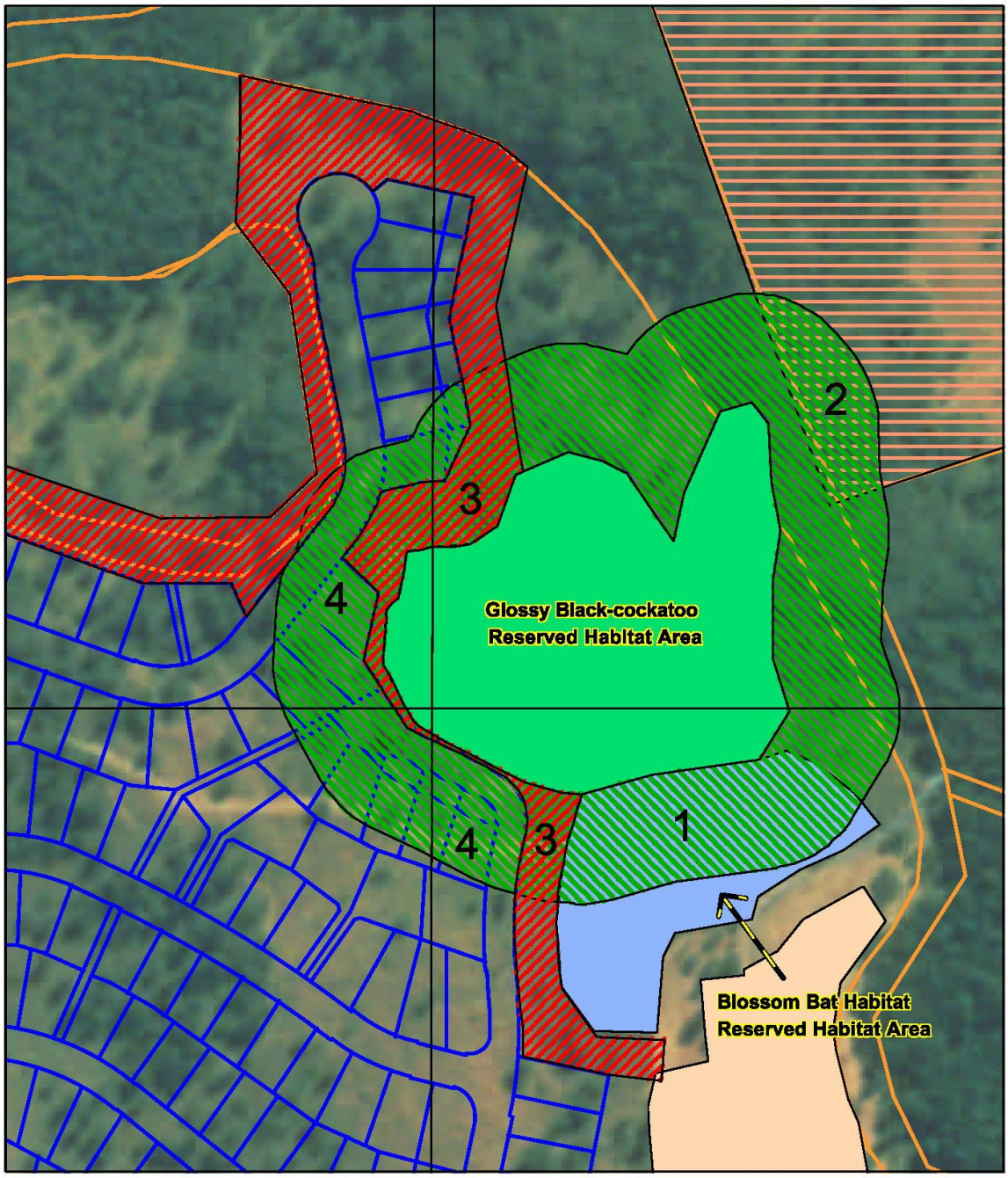

Figure 1: Glossy Black-cockatoo Reserved Habitat Area Showing 50m Buffer Zone Overlaps Koala Beach Estate, Pottsville

Scale: 1: 2,600

Glossy Black-cockatoo Reserved Habitat Area
Blossom Bat Reserved Habitat Area
Buffer Overlap Zones 1-4

Developmental Stages

Stage 4
Stage 5
Proposed Stage 7
Bushfire Asset Protection Zone for Stage 5
Cadastral Boundary
Site Boundary
500m Grid

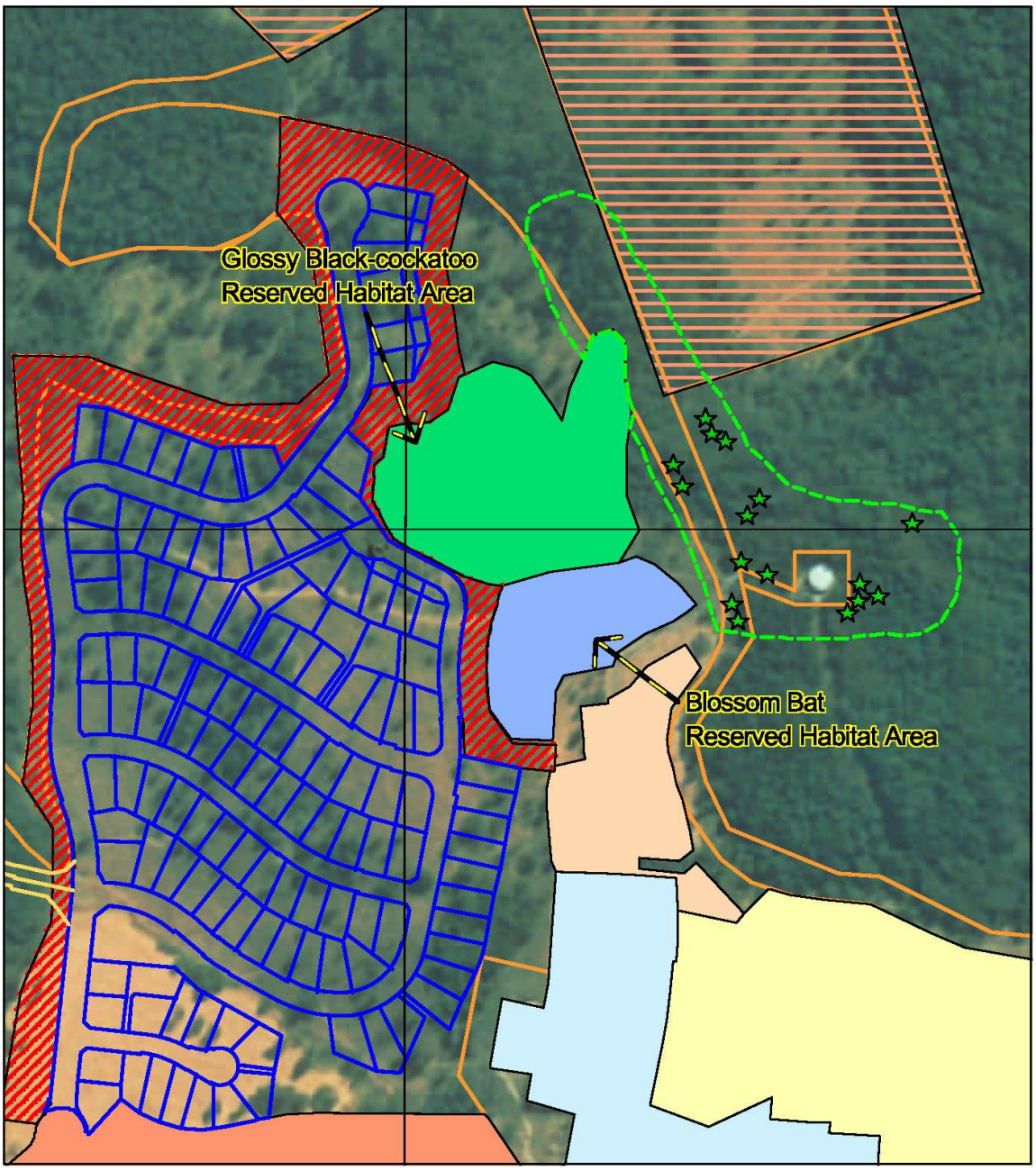

Figure 2: Feed Tree Locations and Search Area adjacent to Glossy Black-cockatoo Reserved Habitat Area Koala Beach Estate, Pottsville

Scale: 1: 4,000

Glossy Black-cockatoo Reserved Habitat Area
Blossom Bat Reserved Habitat Area
Glossy Black-cockatoo Known Feed Tree Locations
Search Area
Developmental Stages
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Proposed Stage 7
Bushfire Asset Protection Zone for Stage 5
Cadastral Boundary
Site Boundary
500m Grid

Plan of Management Revision

The original Plan of Management was prepared in December 2000. Subsequent recommendations in the eight Part Tests of Significance prepared for Stages 5 & 6 of the Koala Beach Estate were included as part of the conditions of development consent for those stages.

Recommendations in the Glossy Black-cockatoo eight part test prepared for Stage 5 included making an amendment to the GBC Plan of Management to accommodate proposed changes to the designated 50m buffer area.

In addition to revising the provisions that relate to the buffer zone, the original plan is further revised by: updating development details; provision of the results of monitoring to date; provision of mapping of buffer zone overlaps and of previously recorded feed trees (Figures 1 & 2).

Ecology of the Glossy Black-cockatoo

Habitat & Behaviour

The Glossy Black-cockatoo is a species of sclerophyllous forests (Schodde et al. 1993) where it prefers the lower slopes of dry ridges (Turner and Kavanagh 1990, in Pugh 1994). Birds are also found in sclerophyll and rainforest ecotones where Forest Oak is common (pers. obs).

Glossy Black-cockatoos are usually seen in pairs, family parties or small flocks (Forshaw 1981) not far from Casuarina trees where they spend up to 88% of their time feeding (Clout 1989). Birds are often detected while feeding due to the soft clicking noise as they tear into the tough Casuarina cones (Forshaw 1981). It is suggested that feeding locations are usually in shaded trees (Saunders, in Schodde and Tidemann 1988). Glossy Black-cockatoos at Koala Beach Estate have not used isolated trees despite heavy cone crops, apparently preferring to feed within the interior of stands (pers. obs).

Diet

Glossy Black-cockatoos feed almost exclusively on the seeds of Casuarinas or Sheoaks. In northeastern New South Wales the seeds of *Allocasuarina littoralis* and *A. torulosa* are usually eaten. Birds leave a distinctive and persistent litter of chewed cones beneath feed trees (Clout 1989). Seeds of *Acacia*, *Angophora* and *Eucalyptus* as well as wood-boring insect larvae are also eaten (Forshaw 1981).

Recent observations of birds eating seeds of the introduced Horse-tail Sheoak (*Allocasuarina equisetifolia*) in rehabilitated sand-mining areas on the Tweed Coast (R. James pers. comm.) demonstrate that this species is also sometimes utilised. Observations of Glossy Black-cockatoos feeding in Swamp Oak *Casuarina glauca* at Koala Beach Estate indicate that this species may also sometimes be used as food. However it is suggested that these birds' bill size restricts them to feeding from larger cones (Saunders, in Schodde and Tidemann 1988).

Glossy Black-cockatoos are highly selective of feed trees, preferentially utilising those trees with a high yield of seeds per cone. Birds also select cones at an advanced stage of maturity for optimal nutrient yield, but before cones become too woody and difficult to open Clout 1989, Joseph 1982). Extraction of seeds from the cones is a learned

behaviour (Crome and Shields 1992) and young birds take some time to develop adequate cone handling skills (Clout 1989, Joseph 1982a).

Reproduction

Glossy Black-cockatoos pair for life and produce one egg each year, usually breeding between March and August (Forshaw 1981) however, females may begin inspecting nest sites as early as February (Joseph 1982a).

Glossy Black-cockatoos require large hollows in the trunk or branch (usually of a dead tree) from 13-22 metres above the ground for breeding (Beruldsen 1980, Forshaw 1981, Slater 1989). In the Kangaroo Island population few birds were successful in raising nestlings. Only 24 breeding pairs were identified in a population of 115 birds (Joseph 1982a).

Competition for nesting hollows may limit reproductive output in this species. Glossy Black-cockatoos may compete for nest hollows with Mountain Brushtail Possums, Owls, Yellow-tailed Black-cockatoos, Sulphur-crested Cockatoos (I. Mason pers. comm) and Honeybees (Garnett 1993).

The female broods the egg and later the nestling in the nest hollow continually until the nestling is around a week old. During this time she and the young are fed by the male (Clout 1989). The female then broods the chick only at night. Subsequently both male and female feed the young “in the morning and evening” (Saunders, in Schodde and Tidemann 1988). Breeding areas must be close to Casuarina stands. After fledging, the young associate with parents for an indefinite period of time (Crome and Shields 1992).

Threats

Generally, threats to Glossy Black-cockatoo populations include the destruction, degradation and fragmentation of habitat, loss of feed trees, loss of roosting and nest trees, disturbance of habitat by logging and predation (SFNSW 1995).

Destruction of Casuarinas for firewood was recorded as a cause of Glossy Black-cockatoo population decline in the Sydney area (Crome and Shields 1992). In South Australia destruction of Casuarinas by clearance and fire are recorded as causes of reduction in abundance of the species (Joseph 1989).

Fire is nominated as the cause of extinction of Glossy Black-cockatoos on King Island (Baird 1986). Clearance for agriculture was listed as a confirmed threat to the endangered Kangaroo Island subspecies (Garnett, undated). Wildfire and grazing by rabbits are listed as threats to Casuarina stands and therefore to the species (Joseph 1989).

Predation by feral cats of Red-tailed (*C. magnificus*) and White-tailed Black-cockatoos (*C. latirostris*) at nest sites in Western Australia is recorded (Joseph 1982a). It is likely that Glossy Black-cockatoos are exposed to similar predation.

At Koala Beach a range of threats exist including;

- loss of feed trees through fire, deliberate destruction or inadequate habitat management;

- alienation of feed trees through disturbance of birds at feeding stands;
- disturbance of birds at nest trees;
- predation by feral cats;
- deliberate killing of birds by vandals; and
- nest robbing of eggs or nestling birds.

Use of the Koala Beach site by Glossy Black-cockatoos

Appendix 1 lists original details of sightings of Glossy Black-cockatoos in the Koala Beach area prior to this revision of the Plan. Appendix 2 lists details of all sightings of Glossy Black-cockatoos at Koala Beach. Figure 2 depicts the location of known feed trees in the vicinity of the reserved habitat area.

Observations demonstrate that there are roost trees and feed trees on the site, but the location of Glossy Black-cockatoo nest trees in the area is undetermined.

Occasional inspections of the significant habitat stands indicated reduced use of the stand for foraging in 1997, possibly due to disturbance from construction of the nearby reservoir. Records of feeding sign in the significant habitat and of birds on the site and in the vicinity indicate that Glossy Black-cockatoos continue to forage in the area. For example, in September 2000, a local resident described use of the stands by a group of 6 birds (T. Chigwidden, pers. comm.). Thirteen trees in the significant habitat stands had recent feed sign beneath them and a pair of birds was seen on site in August 2000. A pair of birds was observed on site in October 2000 and high levels of use (> 50 & > 150 cones beneath individual trees) were recorded in the reserved habitat area and nearby in 7 (l) Environment Protection (Habitat) zoned land in November 2000.

Recorded use of feed trees at the Koala Beach site by Glossy Black-cockatoos is included in Appendix 3.

Forest Oaks are distributed patchily through land zoned 7(l) for environmental protection to the north of the reserved habitat area, mainly on the crest and upper slopes of the ridge, extending almost to the Christie's Creek estuary. Few feed trees were identified in these areas during surveys in 1994-5. The significance of these areas to the Glossy Black-cockatoos is as yet undetermined. However, numerous feed trees have been located on upper slopes and ridge tops in the vicinity of the reservoir. This area is depicted in Figure 2.

Regional Occurrence of Glossy Black-cockatoos

Northeastern New South Wales is regarded as a stronghold for the Glossy Black-cockatoo (NPWS 1994). Glossy Black-cockatoos using the Koala Beach site are part of a regionally significant population which may be centred upon the Round Mountain area. In a review of fauna of the Murwillumbah Management Area, the Glossy Black-cockatoo was described as an "Uncommon, locally dispersed resident" with a total population of "…probably not more than 50 individuals" (CSIRO 1995).

Records of 7 birds (CSIRO 1995) and of 22 birds (D. Charley pers. comm) from Round Mountain support the suggested importance of this locality for the regional population. Birds observed on the Koala Beach site in September 2000 flew toward Round Mountain each evening (T. Chigwidden, pers. comm.).

Persistence of Glossy Black-cockatoos on the Koala Beach site is contingent upon the existence of sufficient suitable habitat in the broader area as well as at Koala Beach.

Objective for Management of Glossy Black-cockatoos at Koala Beach

The principal objective of this management plan is;

- to preserve habitat value for Glossy Black-cockatoos by maintaining the significant Forest Oak *Allocasuarina torulosa* stands, roost trees and potential or actual nest trees at Koala Beach.

Actions to achieve the principal objective

- map, describe and protect significant Glossy Black-cockatoo habitat on the site. This action was implemented in accordance with the original GBC Plan of Management and was the basis for the identification and reservation of the reserved habitat area as depicted in Figure 1;

- monitor and record patterns of use of the site so that levels of foraging in the reserved habitat area, new feed trees and roost trees are identified;

- conduct inspections of the reserved habitat area and act to resolve observed fire hazards, weed problems, degradation or inappropriate use of the site;

- reduce existing fuel loads in and around the significant habitat by careful application of herbicide when required;

- collect seed from favoured feed trees and plant seedling *Allocasuarina* to fill in gaps, and to replace senescent and dead trees if natural regeneration is inadequate; and

- liaise with the Koala Beach Wildlife and Habitat Management Committee (KBWHMC) and interested residents to encourage local support for and involvement with ongoing maintenance and monitoring.

Assessment of plan performance

Plan Objective	Management Actions	Performance Indicators
Preserve habitat value for Glossy Black-cockatoos by maintaining *Allocasuarina* stands, roost trees and potential nest trees throughout the site.	Map, describe and identify habitat stands, roost trees (see Figures 1 and 2).	The map and description of the reserved habitat area and other use trees is regularly updated; the reserved habitat area is clearly identifiable on the ground.

	Protect individual roost trees and nest trees if found outside the significant habitat protection area.	Roost and nest trees remain. Glossy Black-cockatoos continue to use the site and feed in the reserved habitat area and other use trees**
	Annual monitoring and stand inspection, collate residents records.	A report of Glossy Black-cockatoo activity and reserved habitat condition is provided annually to the KBWHMC.
	Remove major weeds.	Stand inspection reveals no significant weed infestation.
	Restrict access.	A locked gate is provided on the vehicle access near the start of the overall habitat protection area.
	Remove tall grass around the reserved habitat area.	Exotic Grass is reduced around the reserved habitat edges.
	Reduce fuel loads by applying herbicide to weeds in and around the edge of the reserved habitat area when required.	Fuel loads in and around the reserved habitat area are reduced or low.
	Collect seed and plant seedlings from feed tree *Allocasuarina* if required.	Recruitment of young Forest Oak is at an acceptable replacement level; seedlings are established for supplementary planting; plantings take place when required and survive.
	The KBWHMC annually distribute and receive record pro formas to residents; together with material on identification of birds.	Residents records and concerns are effectively incorporated into annual monitoring reports.

** Persistence of Glossy Black-cockatoo foraging in the reserved habitat area, and nearby, is an indicator of the success of management of this habitat.

While disturbance levels during construction of the water reservoir and dwellings appear to have resulted in temporarily reduced use of the site in 1997 (pers. obs.), persistence of birds at the site up to the time of this revision indicates tolerance of the early stages of the residential Estate, but apparent intolerance of heavy machinery noise and construction activity.

Forest Oaks on Koala Beach Estate form part of the broader food resource upon which the local Glossy Black-cockatoo population are likely to depend. This resource (fruiting Casuarinas) has no guarantee of supply for the future. Substantial numbers of Forest Oaks were lost during clearing of the nearby Yelgun to Chinderah Pacific Highway bypass route, and future development on the Tweed coast is likely to result in the destruction and alienation of additional Glossy Black-cockatoo food tree stands in the region.

It remains to be seen whether reserved areas (Round Mt. NR, Cudgen Lake NR, Tweed Environmental Gardens, Tweed Coast Littoral Rainforest Nature Reserves and areas at Forest Hill) will be adequate to sustain Glossy Black-cockatoos on the Tweed Coastal Plain.

Evidence of continued use of the Koala Beach site by Glossy Black-cockatoos will provide an indication that habitat at Koala Beach continues to be available to the birds.

Management Issues

Management of fire, weeds and human encroachment will be essential to maintain habitat values for Glossy Black-cockatoos on the Koala Beach site.

Fire

Sapling and seedling Forest Oak present within the significant habitat stands are particularly at risk from fire. Mature Forest Oak can withstand a low intensity fire and are stimulated to open cones and shed seed; however they are killed by intense fire (Clout 1989). Seedlings and saplings require from 7–10 years free from fire in order to become mature enough to set seed (DPI 1996).

In a 'worst case' situation a hot fire could destroy the habitat stands. If regeneration were well-managed and climatic conditions suitable, some Forest Oaks would commence fruiting after ~ 7 years.

Fire management

A possibly suitable fire regime for the significant Glossy Black-cockatoo habitat is an infrequent and patchy low intensity cool burn of < 20 % of the significant habitat area (no more often than every ~ 7 to 10 years). However using fire for habitat management has substantial and serious attendant risks. Any fire in the Glossy Black-cockatoo habitat has the potential to degrade adjacent fire-sensitive Blossom Bat habitat, to escape into the forested lands zoned 7(l) to the north and to damage residential properties in the vicinity.

Ultimately the habitat will be partially surrounded by residences, rendering fire an entirely inappropriate management tool.

Regeneration of Forest Oak seedlings in the 5 years since the FIS demonstrated that fire is not required to stimulate seedling establishment. Similarly, ground fuel loads within stands remain relatively low despite the absence of fire and of grazing. Tall grass growth around the margins of the Forest Oak stands probably represents the greatest fire risk and this can largely be managed by spot application of herbicides and by subsequent planting of Forest Oak.

It is recommended that fuel loads be controlled around the habitat margins where necessary by strategic manual reduction of grass (by whipper-snipping or spot applications of Roundup).

Weeds

Invasive plant species occur within the significant habitat stands and if not controlled will begin to degrade the value of the habitat by smothering individual trees. Effort to delineate the habitat and to remove weeds took place in August 1996 when Bitou Bush, (*Chrysanthemoides monilifera ssp rotundata*), Lantana (*Lantana camara*), Giant Groundsel (*Baccharis halimifolia*), Asparagus Fern (*Protasparagus sp*.) and Farmer's Friend (*Bidens pilosa*) were manually removed from within the significant habitat stands.

Currently Lantana plants extending into the canopy of individual Forest Oaks are present at scattered locations within the significant habitat stands and in the 7(l) zone. Dumping of garden waste (including propagules of *Sansevieria*) on the south-eastern edge of Glossy Black-cockatoo habitat demonstrates that additional weed species were being introduced to the area.

Regular removal of weeds, either manually or by spot application of a low toxicity herbicide or by a combination of these methods is necessary to prevent degradation of habitat. Since the original Plan on-going weed removal activities have kept weed levels low through most of the significant habitat stands and vicinity. Continuation of weed removal is necessary to address residual Lantana and Setaria patches.

Human Encroachment & Disturbance

Inspection of the site in February 2000 revealed the recent removal of 5 mature live Forest Oaks from an area in the south-western section of significant habitat. Signs of vehicle access were present. Further examination of the site recently (18/8/00) revealed that additional live mature Forest Oaks from an adjacent stand have had limbs removed.

Recommended actions to resolve these issues include;

- erection of a locked gate across the bitumen access road to the reservoir; and

- sign-posting if unauthorised vehicular use of the reserved habitat area continues and erection of bollards at key locations.

A personal approach by residents or by Council rangers may be sufficient to prevent further dumping of garden waste and tree removal.

Buffer Zone

Completion of the Koala Beach development will entail the establishment of 499 residential lots which will partially surround the reserved Glossy Black-cockatoo habitat. To maximise the likelihood that birds will continue to use the site, a minimum buffer zone of 50 metres from the reserved habitat boundary was recommended. Mechanical slashing of the outer 10 metres of this zone was recommended where it adjoined residential areas to reduce fire risks to residents. Tree growth in the remaining 40 metres was recommended to be managed as for the significant habitat.

However, the proposed development of Stage 5 and its Asset Protection Zone for bushfire protection encroach upon the recommended 50 metre buffer. The buffer also

substantially overlaps with the reserved significant Queensland Blossom Bat habitat adjacent to the Glossy Black-cockatoo habitat (See Figure 1). Substantial regeneration of Coast Banksia *Banksia integrifolia* within the buffer has contributed to habitat values for Blossom Bats, Flying-foxes and nectivorous bird species at the site. Slashing is no longer an appropriate recommendation for management in this context.

Therefore, precise management regimes are required for the various buffer areas according to their status. Table 1 lists the buffer zone overlaps, their spatial area and recommended management regimes.

Table 1: Glossy Black-cockatoo Significant Habitat and Buffer Zone Overlaps

Zone	**Area occupied (ha)**	**Management**
Core Glossy Black-cockatoo habitat	2.259	As per Glossy Black-cockatoo Plan of Management
(1) GBC Buffer overlap with Queensland Blossom-bat habitat	0.6239	As per Queensland Blossom-bat Plan of Management; planting of Forest Oak where compatible with QBB PoM provisions.
(2) GBC Buffer overlap with EPZ land – including that in Stage 7	1.7606	As per Environment Protection Zone Plan of Management; planting of Forest Oak where compatible with EPZ PoM provisions.
(3) GBC Buffer overlap with Asset Protection Zone for Stage 5	0.5097	As per Bushfire Management Plan; preference to be given to the retention of female Forest Oak *Allocasuarina torulosa* wherever possible.
(4) GBC Buffer overlap with residential allotments in Stage 5	1.0090	Encourage plantings of Forest Oak where compatible with management of fuel loads for bushfire protection.

Enhancement Planting

Most Forest Oaks present in the reserved habitat area are of a similar age-class (mature/late mature). As natural regeneration is slow it is recommended to establish recruit trees so the habitat will remain a long-term resource for Glossy Black-cockatoos. Many Forest Oaks in the stands are fire-scarred at the base and potentially vulnerable to windthrow, occasional individual trees are senescent or dead.

In 1994 the Forest Oak significant foraging habitat stands had for some years been grazed by cattle, resulting in an open stony groundlayer with browsed shrubs. Browsing, heavy layers of shed needles (cladodes) and canopy cover characteristics inhibited groundlayer plant growth. Grass and Lantana have begun to invade the edges of stands since the removal of cattle. As well as increasing the risk of fire, this dense plant growth to some extent inhibits the natural regeneration of Forest Oaks.

Suitable areas for enhancement planting include;

- grassy areas between existing stands;
- gaps within stands; and
- along the edges of stands.

Seed should be collected from preferred feed trees, and seedlings established by a suitable local nursery. Seedlings will need to be protected from wallaby grazing during the establishment phase by provision of a suitable tree guard.

Monitoring Program

Monitoring of Glossy Black-cockatoo use of the site is essential to identify preferred feeding areas, additional feed trees and roost trees, seasonal patterns of use and to determine whether local birds are reproducing.

Ideally monitoring will proceed as an integrated activity, initiated and conducted by a wildlife ecologist and involving the KBWHMC and local residents

Monitoring actions will include;

- Recording the number, location, sex and age of birds visiting the site during annual monitoring and from community reports throughout the year (Consultant, KBWHMC, residents).
- Assessment of feeding stand demography and condition to identify and predict stand declines. Recording of feeding patterns during most intensive foraging period (Consultant, KBWHMC, residents).
- Searches for nest trees (Consultant).
- Identification of emerging additional threatening processes (e.g. human incursion, new weed species) and development of remedial action (Consultant, KBWHMC).
- Identify areas for enhancement planting (Consultant).
- Revision of the Plan of Management if deemed necessary (Consultant, KBWHMC).

An annual report detailing results of maintenance and monitoring (Consultant in consultation with residents) will be provided to the KBWHMC.

Nest Trees

Despite intensive and purposeful searches of the greater Koala Beach site and vicinity during surveys for the FIS no nest trees were located. Suitable tall hollow-bearing trees exist in the land zoned 7(l) and in nearby Round Mountain Nature Reserve, but the

location of nest trees for the birds feeding on Koala Beach Forest Oaks is not currently known.

If nest trees are located in the adjoining 7(l) land special effort will be required to protect nest trees from fire and from human disturbance egg or nest robbing. Measures to conserve any nest trees found will be detailed in future habitat management reports and may require revision of the Plan of Management.

Recent Inspection of the habitat

Inspection of the reserved Glossy Black-cockatoo habitat area in June 2004 indicated that after minor management effort the stands are in equivalent or better condition than in 1994. Rates of regeneration have been adequate to replace dying trees and minor replanting effort each year (~30 to 50 seedling forest oaks) will suffice to maintain or improve stand demographics.

Weed development is patchy and recent application of herbicide has resulted in the elimination of most weeds which were present in the stand. Some further weed removal (of Lantana and Setaria) will be required.

Regeneration of Coast Banksia (*Banksia integrifolia*) since 1994 has resulted in the expansion and improvement of significant habitat for Blossom Bats (*Syconycteris australis*) immediately to the east of the Glossy Black-cockatoo habitat. Currently the two habitat types are in places contiguous and form a single block of woodland which would be most effectively managed under a single integrated regime.

Costs of Monitoring & Maintenance

Costs of Monitoring & Maintenance are contingent upon several factors, including;

- Weed removal already taking place under the original PoM.
- The level of Glossy Black-cockatoo activity in the significant habitat and its surrounds: low levels of activity will require less time for reporting than high levels. A full search and count of feed sign (~ 800 cones) in 1996 occupied 4 days.
- Catastrophic events; e.g. fire.
- The scope of work described in the following outline of monitoring requirements.

Indicative costs described in the original Plan are provided below. These estimates will vary according to the above factors, and are provided as a guide only.

Cost Estimate

Year 1 (2004)

Manual weed removal, seed collection and spot application of herbicide;

3 days @ $120 per day	$360
Monitoring:	
Stand inspection, feed sign assessment, search for nest trees.	
4 days @ $350 per day	$1400
Report preparation and liaison with KBWHMC	
2 days @ $350	$700
Total	$2460

Year 2 and subsequently to year 5 (2008)

Manual weed removal, seedling plant out and spot application of herbicide;	
2 days @ $120 per day	$240
Monitoring:	
Stand inspection, feed sign assessment, search for nest trees.	
4 days @ $350 per day	$1400
Report preparation and liaison with KBWHMC	
2 days @ $350	$700
Total	$2340

Outline of Monitoring Requirements for Glossy Black-cockatoo Habitat at Koala Beach Estate

Project: Carry out monitoring of Glossy Black-cockatoo habitat at Koala Beach; provide a report of monitoring results; and recommend revisions to the Plan of Management if deemed necessary.
Monitoring is to be undertaken in accordance with the current adopted Glossy Black-cockatoo Plan of Management.

1. Monitor use of the Glossy Black-cockatoo habitat area and adjacent Forest Oak *Allocasuarina torulosa* habitat between June and December, biennially. Monitoring should include two (2) surveys approximately 30-60 days apart and timing of surveys should be determined by the presence of feed sign and/or birds.

(a) Search for, quantify and record the location of feed sign (chewed *Allocasuarina* cones) in the Glossy Black-cockatoo habitat area and adjacent Forest Oak habitat. The search area is indicated in Figure 2 in the Plan of Management.

(b) Search for Glossy Black-cockatoos in the Glossy Black-cockatoo habitat area and adjacent Forest Oak habitat with mid-morning traverses of the Forest Oak stands listening for sounds of feeding and calling birds. Use binoculars to count birds and identify sex and age within groups.

2. Use a pole camera or similar telemetry technique to monitor artificial hollows on two occasions between late January and June, annually, preferably 20-30 days apart.

3. Assess the condition of the Glossy Black-cockatoo habitat area and adjacent Forest Oak habitat and provide information including but not restricted to: general tree health and any tree death; recruitment of Forest Oak *Allocasuarina torulosa;* and disturbance e.g. tree removal, branch lopping, dumping of garden wastes, fire, and weed development. Report on condition of plantings, if any.

4. Provide a report of monitoring results including any recommended revisions to the Glossy Black-cockatoo Plan of Management.

(a) The report should include a summary of any sighting records collected by residents or reported to relevant databases.

(b) The report should be provided as a Word document and as a printed hard copy.

(c) Copies of the report should be provided to:

- Koala Beach Wildlife and Habitat Management Committee.
- Office of Environment and Heritage (Threatened species Unit in Coffs Harbour).

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Introduction- Appendices and Tables

The following appendices and tables present the results of recording Glossy Black-cockatoos at Koala Beach. Searches for feed sign and birds in July and August 1996 were directed towards complying with the Plan of Management. Other records derive incidentally or opportunistically from various fauna survey activities and inspections at Koala Beach. Some additional records were omitted if the information lacked accurate dates or specific locations.

The data below are indicative, rather than exhaustive, but provide important clues to the spatial and seasonal pattern of occurrence of Glossy Black-cockatoos at Koala Beach.

Appendix 2 differs from the original Appendix 1 by the addition of more recent sighting records and the deletion of 4 records from outside the Koala Beach Estate.

Appendix 1: Glossy Black Cockatoo sightings in the Koala Beach area

DATE	**DETAILS/LOCATION**	**TYPE OF RECORD**	**NUMBER OF BIRDS & observer**
18/7/94	Flying north over Grey Gum Gully	sighting	5 MF
25/8/94	Heard calling western edge of Searanch	calls	? GL
14/9/94	Heard calling, current reservoir area	calls	? GL
4/10/94	Roosting in Tallowwood near Christie's Ck. barrage	calls	3 MF
16/11/94	Flying west along Christie's Ck.	sighting	3 GL
29/1/95	Perched in Forest Oak, western edge of Searanch	sighting	2 GL
31/1/95	Flying across Coast Rd nr. Round Mt. Rd	sighting	5 GL
29/8/95	Searanch	sighting	3 GL
20/11/95	Roosting in dead tree nr. Tallowwood # 126	sighting	8 GL**
27/11/95	Pair preening & young calling in Swamp Oak, Searanch	sighting	3 GL
?/12/95	Pair with young, northwestern part of Searanch	sighting	3 SP
24/2/96	Flying over Grey Gum Gully	sighting	3 SP?
20/3/96	Flying across Coast Rd nr. Round Mt. Rd	sighting	2 SP?
3/4/96	Flying over Pottsville Bowls Club	sighting	3 GL
6/4/96	Young bird begging calls behind Pottsville Bowls Club	calls	? GL
26/7/96	Pair feeding in reserved habitat area	sighting	2 MF
3/8/96	Pair flying over reserved habitat area	sighting	2 MF
18/8/00	Pair flying N of reserved habitat area	sighting	2 MF
20/10/00	Pair flying over reserved habitat area	sighting	2 MF

** includes 3 juveniles

Appendix 2: Glossy Black Cockatoo sightings within the Koala Beach Estate

DATE	DETAILS/LOCATION	TYPE OF RECORD	NUMBER OF BIRDS & observer
18/7/94	Flying north over Grey Gum Gully	sighting	5: MF
25/8/94	Heard calling western edge of 'Searanch'	calls	?: GL
14/9/94	Heard calling, current reservoir area	calls	?: GL
4/10/94	Roosting in Tallowwood near Christie's Ck. barrage	calls	3: MF
16/11/94	Flying west along Christie's Ck.	sighting	3: GL
29/1/95	Perched in Forest Oak, western edge of 'Searanch'	sighting	2: GL
29/8/95	'Searanch'	sighting	3: GL
20/11/95	Roosting in dead tree nr. Tallowwood # 126	sighting	8: GL**
27/11/95	Pair preening & young calling in Swamp Oak, 'Searanch'	sighting	3: GL
??/12/95	Pair with young, northwestern part of Searanch	sighting	3: SP
24/2/96	Flying over Grey Gum Gully	sighting	3: SP
26/7/96	Pair feeding in the reserved habitat area	sighting	2: MF
3/8/96	Pair flying over the reserved habitat area	sighting	2: MF
18/8/00	Pair flying N of the reserved habitat area	sighting	2: MF
20/10/00	Pair flying over the reserved habitat area	sighting	2: MF
3/11/00	Group feeding in Forest Oak near reservoir	sighting	4: GL
??/4/02	Pair feeding in Swamp Oak entrance to Stage 3	sighting	2: RJ, GL&JC
5/6/02	Feeding in previously used feed trees near reservoir	Calls; sighting	2: MF
12/6/02	Roost tree in Stage 5A; fly over Stage 5	Calls; sighting	3: MF
20/9/02	Feeding in Forest Oak SE of reservoir	sighting	2: MF
23/2/03	Feeding in Forest Oak ridge track SW of reservoir	sighting	4: JC
23/2/04	Pair feeding in Forest Oak: proposed reservoir site	sighting	2: JC

** includes 3 juveniles. Observers: RJ = Rhonda James; GL = Graeme Lloyd; SP = Steve Phillips; JC = John Callaghan: MF = Mark Fitzgerald.

Appendix 3: Recent Records of Glossy Black-cockatoo feed sign at Koala Beach

Date	Details/Location All feed trees are Forest Oak *Allocasuarina torulosa*	Total Number of chewed cones	Number of trees	Observer
26/7/96	Reserved habitat area	305	8	MF
27/7/96	Trackside tree 80 m uphill from reservoir	93	1	MF
27/7/96	Old banana plantation site	100	2	MF
30/7/96	Reserved habitat area	249	4	MF
3/8/96	Feed tree on margin of forest near reservoir, nr Stake 102	20		MF
9/8/96	Reserved habitat area	Not counted		MF
15/8/96	Reserved habitat area	Not counted		MF
30/8/96	Trackside tree 80 m uphill from reservoir	200	1	MF
4/9/96	Track to Stage 7	14	1	MF
4/9/96	Reserved habitat area	691	20	MF
29/2/00	Reserved habitat area	10	1	MF
22/11/00	Top of Ridge track to Stage 7	50	1	MF
22/11/00	Reserved habitat area	50	2	MF
22/11/00	Trackside tree 80 m uphill from reservoir	150	1	MF
30/3/01	Trackside tree 80 m uphill from reservoir	25	1	MF
13/9/01	Trackside tree 80 m uphill from reservoir	50	1	MF
8/5/02	ETG 75 in Stage 5	20	1	MF
5/6/02	Reserved habitat area	20	1	MF
5/6/02	Trackside tree 80 m uphill from reservoir	50	1	MF
5/6/02	New feed trees on pipeline route E of reservoir	150	2	MF
12/6/02	New feed tree W of ridge track Stage 5B	20	1	MF
15/7/02	Feed tree on margin of forest near reservoir, nr Stake 102	20	1	MF
15/7/02	Old banana plantation site	20	2	MF
24/10/02	Tree beside road near reservoir	15	1	MF
20/3/03	2 Trees on track to Stage 7	Not counted	2	MF
20/3/03	10 trees to S & SW of the reservoir	Not counted	10	MF
4/8/03	Tree beside bitumen road near reservoir	10	1	MF
22/4/04	2 Trees, SW of reservoir below road to Stage 7	20	2	MF
1/6/04	Reserved habitat area	40	1	MF

Table 1: Summary of Recorded Glossy Black-cockatoo Locations

Location	Sightings	Feed Sign	Total Records
Reserved habitat area	4	9	13
Trackside tree 80 m N of reservoir	-	5	5
Vicinity of reservoir	6	6	12
Other	12	9	21
Total	22	29	51

Table 2: Records of Glossy Black-cockatoos at Koala Beach: by Year

Year	Sightings	Feed Sign	Total
1994	5	-	5
1995	5	-	5
1996	3	10	13
2000	3	4	7
2001	-	2	2
2002	4	8	12
2003	1	3	4
2004	1	2	3
Total	22	29	51

Table 3: Seasonal distribution of records of Glossy Black-cockatoos at Koala Beach

Record Type	Spring	Summer	Autumn	Winter
Feed Sign	7	1	5	16
Sightings/calls	8	5	1	8
Total	15	6	6	24

Table 4: Distribution of records by month

Type of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Feed sign	-	1	3	1	1	5	6	5	3	1	3	-
Sightings/calls	1	3	-	1	-	2	2	4	2	2	4	1
Total	1	4	3	2	1	7	8	9	5	3	7	1