National recovery plan for the black-breasted button-quail *Turnix melanogaster*

Australian Government

Queensland Government

Department of Environment & Climate Change NSW

National recovery plan for the black-breasted button-quail *Turnix melanogaster*

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Title page: Plate 1. Male with three chicks.

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Species status
The black-breasted button-quail is currently listed as 'Vulnerable' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is listed as 'Vulnerable' under the Queensland *Nature Conservation Act 1992* (NCA) and 'Endangered' under the New South Wales *Threatened Species Conservation Act 1995*.

Distribution summary
The black-breasted button-quail is known to occur in eastern Queensland (Qld) and New South Wales (NSW) from the Byfield region in the north, to the Border Ranges rainforests in the south, generally east of the Great Dividing Range. Some observations have been made on its western slopes, up to 300 km inland at locations such as Palmgrove National Park and Barakula State Forest in Qld.

In north-eastern NSW, the species appears restricted to the Northern Rivers and Tablelands. There have been only 10 reliable yet unconfirmed records from NSW in the past 20 or so years, from six areas in the far north-east of the state.

Threat summary
Black-breasted button-quail are threatened by the following processes or activities:

- Loss of habitat and habitat fragmentation due to clearing for a range of purposes (timber-harvesting and other forestry-related practices, agriculture, infrastructure construction and urban development).
- Habitat degradation as a result of domestic stock and feral pigs utilising black-breasted button-quail habitat.
- Habitat loss or degradation due to inappropriate fire regimes.
- Predation by feral animals.

Objectives of recovery plan
Improve the status of black-breasted button-quail from its current threatened status under state and Commonwealth legislation through protection and management of habitat for extant populations (to secure survival of existing birds), increasing availability and condition of habitat (to provide opportunity for population increase) and pursuit of actions to minimise threats (to protect existing and expanding populations and prevent further loss).

Summary of actions
Actions required for the recovery of the black-breasted button-quail include mapping the habitat of the species; conducting searches for new populations in mapped habitat; developing management practices and protocols for human activities in black-breasted button-quail habitat and regulating land use; protecting areas of habitat and rehabilitating degraded areas; establishing extension activities with landholders and developing a community network; investigating and implementing feral animal control programs; developing research projects; involving traditional owners in the recovery effort; and coordinating and reviewing the recovery process. The estimated total cost of the implementation of recovery actions is $1,366,000.

1. General information

1.1 Conservation status

The black-breasted button-quail is currently listed as 'Vulnerable' under the Australian Government *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is listed as 'Vulnerable' under the Queensland *Nature Conservation Act 1992* (NCA) and 'Endangered' under the New South Wales *Threatened Species Conservation Act 1995*.

1.2 International obligations

Actions in this plan are consistent with Australia's international obligations.

1.3 Affected interests

Affected interests include the following persons/organisations:

Australian Government

- Department of the Environment, Water, Heritage and the Arts (DEWHA)
- Department of Defence

Queensland Government

- Department of Environment and Resource Management (QDERM)
- Department of Transport and Main Roads
- Department of Employment, Economic Development and Innovation (QDEEDI)

New South Wales Government

- Department of Environment and Climate Change (NSW DECC)
- Department of Planning (NSW DoP)
- Department of Natural Resources (NSW DNR)
- Department of Primary Industries – Forests NSW
- Department of Primary Industries – Agriculture and Fisheries Division
- New South Wales Roads Traffic Authority (NSW RTA)

NRM and CMA bodies

- Northern Rivers Catchment Management Authority (NR CMA)
- SEQ Catchments NRM (SEQ NRM)
- Condamine Alliance (NRM group) (CA NRM)
- Fitzroy Basin Association (NRM group) (FBA NRM)
- Burnett Mary Regional Group for NRM Inc (BMRG NRM)

Local councils

- Banana Shire (Qld)
- Brisbane City
- Bundaberg Regional
- Central Highlands Regional
- Dalby Regional
- Fraser Coast Regional
- Gladstone Regional
- Gold Coast City
- Gympie Regional
- Ipswich City
- Kyogle (NSW)
- Lismore City
- Lockyer Valley Regional
- Moreton Bay Regional
- North Burnett Regional
- Scenic Rim Regional
- Somerset Regional
- South Burnett Regional
- Southern Downs Regional
- Sunshine Coast Regional
- Toowoomba Regional
- Tweed Shire (NSW)
- Tenterfield Shire

Others

- Bush care groups
- Conservation groups
- Universities
- State Threatened Species Networks
- Mining companies
- Indigenous landowners
- Private landholders
- Mary River Catchment Coordinating Committee

These persons/organisations are potentially responsible for and/or involved in the protection, rehabilitation and management of black-breasted button-quail habitat, education of the public and land managers, raising awareness of black-breasted button-quail, habitat assessment, surveys and monitoring.

1.4 Consultation with Indigenous people

The population range and habitat of black-breasted button-quail occurs across areas of cultural significance to numerous Indigenous groups and land claims, ranging from Marlborough, north of Rockhampton, Qld to Yamba, NSW and as far west as Palm Grove National Park (Qld). Documentation of Tindale (1974) and Horton (1994) indicate the area was rich with culture.

The advice of the Indigenous Engagement Unit (QDERM) and Cultural Heritage Unit (NSW DECC) was sought regarding a strategy for engaging indigenous groups and claimants. Traditional owners were provided with the recovery plan and their involvement sought, through Aboriginal Land Management Facilitators from the Natural Resource Management groups in Qld and through Aboriginal Community Support Officers from Catchment Management Authorities in NSW. Responses received from groups such as the South East Queensland Traditional Owners Land and Sea Management Alliance who discussed the plan with Traditional Owner groups expressed interest in being involved in the implementation of the plan. Traditional owners will be encouraged throughout the life of this plan to be involved in further consultation and implementation of recovery actions.

1.5 Benefits to other species or communities

Black-breasted button-quail inhabit fragments of microphyll and notophyll vine forest, thickets and coastal scrubs. Protection and management of the black-breasted button-quail will contribute to the conservation of regional ecosystems and communities listed as 'Of concern' or 'Endangered' under the Qld *Vegetation Management Act 1999* (e.g. semi-evergreen vine thicket, some rainforest communities and some littoral vegetation types such as Regional Ecosystems 12.2.2, 12.2.3, 12.8.13, 12.8.21, 12.8.22, 12.8.23, 12.9-10.6, 12.9-10.15, 12.11.13, 12.12.18, 12.12.26 in Qld and equivalent vegetation communities in NSW) and EPBC Act listed species.

The presence of viable populations of black-breasted button-quail may indicate the conservation value of forest remnants as refugia for the survival of other ground-dwelling fauna. The implementation of the plan will contribute to the conservation of other significant fauna and flora using similar habitats, e.g. invertebrates such as regent skipper *Euschemon rafflesia*, *Nurus brevis*; reptiles such as elf skink *Eroticoscincus graciloides*, Nangur skink *Nangura spinosa* (CE), banded leaf-tail gecko *Phyllurus caudiannulatus;* birds such as Coxen's fig-parrot *Cyclopsitta diophthalma coxeni* (E), Albert's lyrebird *Menura alberti*; mammals such as spotted-tailed quoll *Dasyurus maculatus maculatus* (E), golden-tipped bat *Kerivoula papuensis*, black-striped wallaby *Macropus dorsalis*; and plants including *Alectryon ramiflorus* (E), *Cossinia australiana* (E), *Planchonella eerwah* (E), native jute *Corchorus cunninghamii* (E), *Plectranthus omissus* (E), *Syncarpia hillii, Acianthus amplexicaulis, Liparis simmondsii, Argophyllum nullumense, Cyperus semifertilis,* veiny fontainea *Fontainea venosa* (V), *Callitris baileyi, Cryptocarya floydii, Sarcochilus weinthalii* (E), *Sarcochilus dilatatus* and *Bulbophyllum globuliforme* (V).

(EPBC Status: CE=Critically Endangered; E= Endangered; V=Vulnerable)

1.6 Social and economic impacts

It is expected that this plan will have no significant, deleterious economic or social impacts in the short or long-term.

Any proposed action, including projects, developments or activities likely to have a significant impact on a matter protected by the EPBC Act, including listed threatened species such as the black-breasted button-quail, should be referred to the Department of the Environment, Water, Heritage and the Arts for a decision on whether approval is required. See http://www.environment.gov.au/epbc/approval.html for further information on the referral and assessment process.

2. Biological information

2.1 Species description

The black-breasted button-quail is a large, plump, pale-eyed button-quail. Male black-breasted button-quails are about 18cm long, with a wingspan of 32-35cm, and weigh approximately 65g. Females are larger, measuring up to 19cm and weighing up to 100g (Marchant & Higgins 1993). The sexes differ in plumage and there is no seasonal variation. Males have finely patterned backs and wings with brown, black, grey and white mottling. The face and throat are whitish and the breast is black with numerous white half-moon markings. The female is similar in all respects except for having a black face and throat, a larger dark area over the upper and lower breast with heavier white half-moon markings. The bill is grey and the legs are pale yellow. Juveniles resemble males but are duller (Marchant & Higgins 1993).

Males, juveniles and immature birds may be confused with painted button-quail (*Turnix varius*) which sometimes occur in the drier parts of the environment occupied by black-breasted button-quail (Marchant & Higgins 1993).

2.2 Life history and ecology

In Queensland, the ecology of the black-breasted button-quail in semi-evergreen vine thicket is moderately well understood (Smith, Lees & Aridis 1998; Lees & Smith 2000) however this is not the case in coastal thickets.

The species is a polyandrous (female breeds with several males within a season) ground-dweller and ground-nester, usually producing 3-4 young per clutch, which are incubated and tended solely by the male. Black-breasted button-quails are commonly seen in pairs or occasionally in small groups. Being territorial, females are occasionally seen singly (Hughes & Hughes 1991; Marchant & Higgins 1993). The dispersion patterns of this species are poorly known. It is generally considered to be sedentary, although it can appear intermittently or as a transient in habitats not considered core to the species (Marchant & Higgins 1993; Smith *et al*. 1998; Lees & Smith 2000; Smyth *et al.* 2001).

Black-breasted button-quail are most frequently reported from:

- Vine thickets and rainforest vegetation types that are periodically water-stressed. These include: semi-evergreen vine thicket, low microphyll vine forest, Araucarian microphyll vine forest, Araucarian notophyll vine forest and *Brachychiton* scrubs that may incorporate bottle trees (*Brachychiton* spp.), brigalow (*Acacia harpophylla*) and belah (*Casuarina cristata*) (Flower *et al.* 1996).
- Low thickets or woodlands with a dense understorey but little ground cover, typically dominated by *Acacia* (Flower *et al*. 1996).
- In littoral situations, dry vine scrubs, acacia thickets and areas densely covered in shrubs, particularly midgen berry *Austromyrtus dulcis* (Marchant and Higgins 1993).
- Regrowth of the above vegetation groups, in most cases adjacent to intact remnants.
- Patches of the introduced weed *Lantana camara*, particularly when associated with the above vegetation types.
- Hoop pine plantations where there is a dense understorey, usually comprised of the introduced weed *Lantana camara* and then, generally adjacent to the above-listed forest types.
- Wetter subtropical rainforest sometimes in association with moist eucalypt forest in NSW (Garnett & Crowley 2000). Milledge's (2000) report indicates that they may prefer drier rainforests, even though NSW records don't necessarily concur.

The vegetation types described above generally possess a thick leaf litter layer between 3-10cm deep. It is through this leaf litter that the black-breasted button-quail forages using a technique termed "pivot-feeding". The birds scratch at the leaf litter with one leg while pivoting the body on the other, thus displacing leaves and soil, exposing invertebrate prey. This scratching produces distinctive circular feeding depressions often termed 'platelets' that are between 15 and 25cm in

diameter (Plate 2). Some other button-quail species (e.g. painted button-quail *Turnix varius*) feed in a similar fashion.

The diet of the black-breasted button-quail consists mainly of small, ground-dwelling invertebrates and seeds (Marchant and Higgins 1993).

2.3 Distribution

The black-breasted button-quail is known from scattered localities in eastern Qld and NSW from the Byfield region in the north to at least the Border Ranges rainforests, generally east of the Great Dividing Range, although some observations have been made on its western slopes, up to 300 km inland at locations such as Palmgrove National Park and Barakula State Forest in Qld (Figure 1). There are also reports from the Dorrigo and Yarrowitch-Walcha areas further to the south.

Most populations of this species occur in Qld. Hamley *et al.* (1997) identified 14 sub-populations in the state,(Table 1). Of these, there appear to be two main population centres in south-eastern Qld, specifically in the: (a) semi-evergreen vine thickets of the Yarraman-Jimna region and (b) coastal dune scrubs of the Great Sandy region. As existing suitable habitat in Qld is highly fragmented, a confident and realistic estimation of the size of extant populations is difficult.

Plate 2. Feeding scrape of black-breasted button-quail (platelet) with 20c piece.

The distribution of the species in NSW is almost unknown, hence estimations of the size and density of extant populations cannot as yet, be made. In north-eastern NSW, the species appears restricted to the Northern Rivers and Tablelands (Marchant & Higgins 1993). There are 10 reliable yet unconfirmed records from NSW in the past 20 or so years, from six areas in the far north-east of the state (Milledge & McKinley 1998: Garnett & Crowley 2000; Milledge 2000). Smyth and Young (1996) reported the species from as far south as the Walcha-Yarrowitch area and near Dorrigo, the sightings were made in the 1970s. Many confirmed sightings have also been reported directly adjacent to the Queensland border.

There have been a few records of black-breasted button-quail from the Atherton and Cooktown regions, well north of the accepted distributional range of the species, from the late 1800s-early 1900s (LeSouef 1897, Bravery 1970), but the species has not been sighted since. These records are considered to occur outside the normal distribution of the species and, considering the scarcity of recent sightings, are not considered in this recovery plan. A single record from Victoria, well south of the accepted range, has been considered to be an aviary escapee (Bennett 1985).

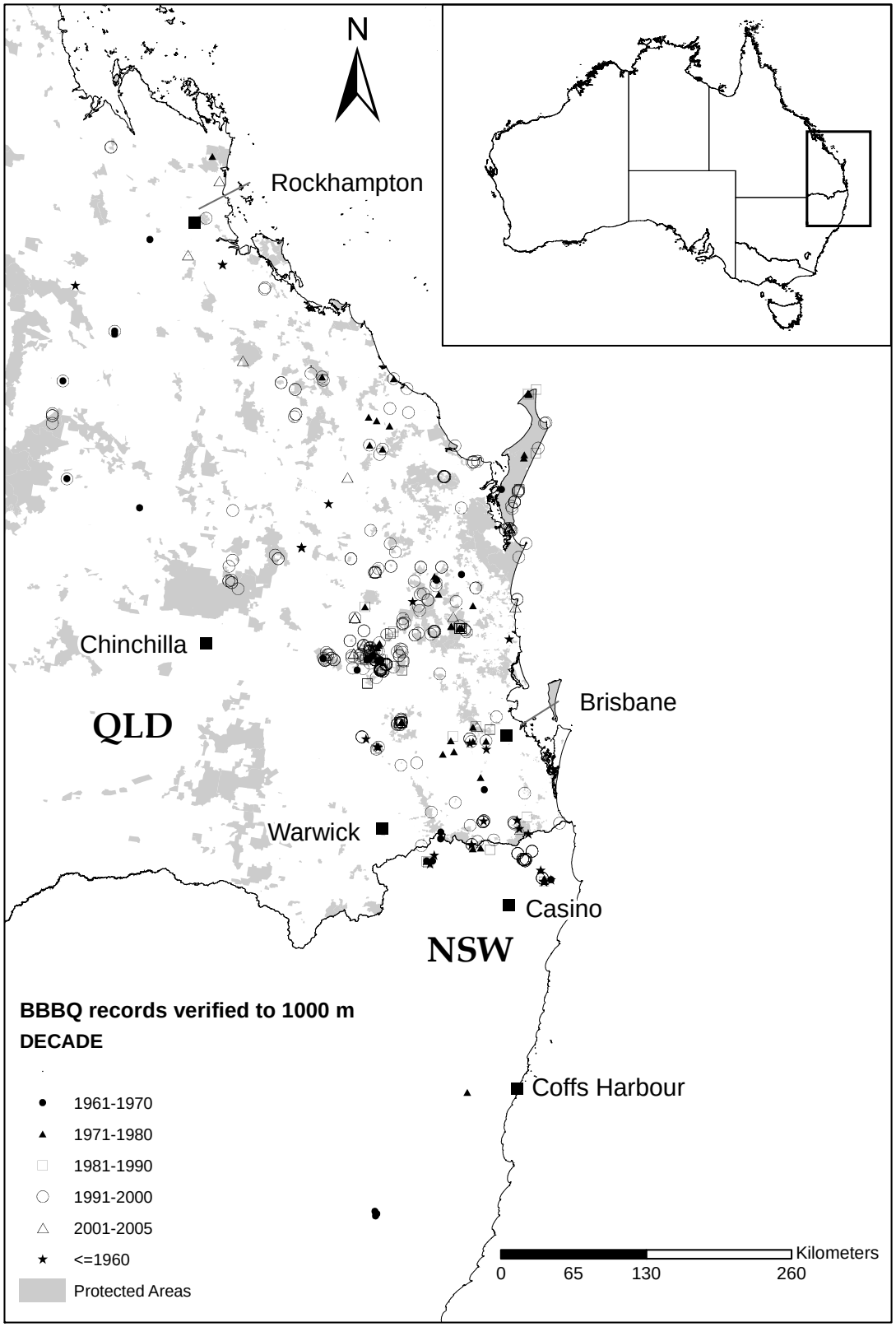

Figure 1. Black-breasted button-quail distribution.

2.4 Habitat critical to the survival of the species

Habitat considered critical to the survival of the black-breasted button-quail includes:

- Vine thickets and rainforest vegetation types that are periodically water-stressed. These include: semi-evergreen vine thicket, low microphyll vine forest, Araucarian microphyll vine forest, Araucarian notophyll vine forest and *Brachychiton* scrubs that may incorporate bottle trees (*Brachychiton sp.*), brigalow (*Acacia harpophylla*) and belah (*Casuarina cristata*)
- Low thickets or woodlands with a dense understorey but little ground cover, typically dominated by *Acacia* spp.
- In littoral situations, dry vine scrubs, acacia thickets and areas densely covered in shrubs, particularly midgen berry *Austromyrtus dulcis*.

This plan does not provide spatial information on habitat critical to survival of the species but Actions 1.1.1 and 1.1.2 identify a process for this to occur within the early stages of implementation of this plan.

2.5 Important populations

Populations of the Yarraman-Nanago, Jimna-Conondale Range and Great Sandy regions are important due to their size and the land on which they occur being state owned. Other important populations include those at the Palmgrove National Park and the Barakula State Forest area because they appear to be the last remnant populations within an area where the species was once widespread (Hamley *et al.* 1997). All populations in NSW are important, particularly those at the southern limit of the species' range near Dorrigo and Walcha. These are important source populations which must be maintained if the species is to persist in the long-term in NSW (Smyth and Young 1996).

3. Threats

3.1 Biology and ecology relevant to threats

The black-breasted button-quail has specific habitat requirements involving soil fertility, leaf litter and litter accumulation and habitat structural attributes that are important determinants of food availability and protection from predation.

Significant populations inhabit littoral habitats in areas that are subject to development pressures. Therefore the potential for further habitat loss is high.

The breeding strategy of the species is polyandrous, which means that a female breeds with several males during the one breeding season. Because few females (which are outnumbered by males in the population) are responsible for the transfer of genetic material from generation to generation, this could potentially lead to genetic "bottlenecks" should the number of females in a population be curtailed drastically.

This species appears to be territorial at least during the breeding season. It also nests, roosts (at night) and feeds on the ground. Because of these ecological attributes, it is vulnerable to ground predators (particularly nocturnal predators which might predate sleeping birds) and to habitat clearance or fragmentation (Smith *et al*. 1997 and Lees and Smith 2000).

3.2 Identification of threats

Known and potential threats to black-breasted button-quail have been outlined by Flower *et al*. (1995), Hamley *et al*. (1997) and by Borsboom and Smith (1997).

1. Habitat loss and fragmentation

Loss of habitat in order to sustain a range of human activities (timber-harvesting and other forestry-related practices, agriculture, infrastructure construction and urban development) leads to fragmentation of habitat and is a serious threat to the viability of populations. Of particular concern

is the continuing trend of residential and resort development along the coast. This will affect areas of littoral habitat that, while possibly significant, occurs at scales too small to be mapped as remnant or as regrowth.

2. Habitat degradation
Impacts resulting from the activities of domestic stock and feral pigs include compaction of soil, destruction of sheltered sites by browsing and establishment of cattle camps, and the introduction of exotic weeds that may bind soil or reduce foraging opportunity. Degradation may be exacerbated in small patches or along narrow strips of vegetation with little buffering to keep out the effects of prolonged drought. Climate change scenarios that predict increasingly frequent and more severe drought events will become an issue in small patches and strips, which may disappear or suffer a decline in habitat quality due to water stress and possible increased frequency and severity of fire events. A history of black-breasted button-quail in the Fitzroy basin indicates that long-lasting drought and cattle stocking led to the disappearance of the species from scrubs in the region (Flower *et al.* 1995).

3. Inappropriate fire regimes
Fires in vegetation surrounding adjoining habitat could have important impacts if not managed and wildfire incursions into preferred habitat could damage remnants irretrievably. Frequent fires, coupled with consistent heavy grazing are likely to reduce the dispersal capabilities of button-quail through grass and shrub understorey.

4. Predation by feral animals (i.e. wild dogs, cats and foxes).
Although the impact of feral predation on the species is not well known, it is likely that predation is a threat. This may be particularly true where birds are forced to disperse through unsuitable habitat.

3.3 Areas under threat
Combined with knowledge of population locations derived from surveys and trends in human activities across the landscape, the most significant areas under threat are likely to include areas:

- where forestry operations still persist (e.g. Yarraman/Blackbutt) within the range of the species;
- of high human population growth and urban expansion (e.g. Maryborough – Bundaberg region) where habitat is being lost for housing and infrastructure and there is a potential increase in feral predators;
- in close proximity to mining enterprises and associated activities such as infrastructure construction and maintenance and tailings repositories (e.g. Yarraman/Tarong and Gladstone areas);
- affected by water infrastructure development such as construction of dams, impoundment of water (e.g. Burnett catchment including Hervey Bay area);
- of vegetation that is not mapped as remnant but which may comprise regrowth of a former vegetation type preferred by the species. Currently these regrowth areas are not protected under the Qld *Vegetation Management Act 1999* or the NSW *Native Vegetation Act 2003* and will require identification and flagging as habitat that should be managed for the species; and
- known in NSW and any discoveries should receive appropriate management attention.

3.4 Populations under threat
Populations in areas where there is a history of significant vegetation fragmentation such as: Dawson, Fitzroy and Burnett catchments, lowlands around Goomeri, Lockyer Valley and Boonah district may not persist because of habitat patch size and limited opportunities for dispersal.

Other populations that may be considered to be under threat are those outside of protected areas.

3.5 Threats summary

Table 1. List of known threats to black-breasted button-quail populations.

Location name	Coordinates (Lat/Long)	Population size	Land tenure	Type of threat	Current actions to reduce threats	Future actions to reduce threats
Lower Fitzroy	22.8 S, 149.9 E	Unknown	Timber Reserve, State Forest, National Park, Freehold	Land clearing, burning practices, timber harvesting	Limited predator control (non-targeted for threats to the species), Species Management Prescriptions, *VMA*	Habitat protection and enhancement, predator control
Palmgrove	24.9 S, 149.4 E	Unknown	National Park (Scientific), Freehold	Burning practices	Species Management under NCA and FA 1959	Habitat protection and enhancement
Kalpower	24.7 S, 151.3 E	Unknown	State Forest	Burning practices, timber harvesting	Species Management under NCA and FA 1959	Habitat protection and enhancement
Bundaberg	25.1 S, 152.6 E	Unknown	Freehold	Agriculture, grazing, burning practices, dam infrastructure	Species Management under NCA and FA 1959	Habitat protection and enhancement
Maryborough-Wide Bay	25.5 S, 153.1 E	Unknown	NP, SF, FH	Agriculture, grazing, burning practices, dam infrastructure	Species Management under NCA and FA 1959	Habitat protection and enhancement
Auburn River	26.1 S, 150.8 E	Unknown	SF, FH	Forest harvesting activities, habitat clearing	Species Management under NCA and FA 1959	Habitat protection and enhancement
Goomeri Lowlands	26.2 S, 152.0 E	Unknown	NP, SF, FH	Forest harvesting activities, habitat clearing	Species Management under NCA and FA 1959	Habitat protection and enhancement
Conondale Ranges	26.5 S, 152.3 E	Unknown	NP, SF, FH	Forest harvesting activities	Species Management under NCA and FA 1959	Habitat protection and enhancement
Yarraman	26.8 S, 151.9 E	Crudely estimated at ~2000 adults	State Forest	Forest harvesting activities	Species Management under NCA and FA 1959	Habitat protection and enhancement
Bunya Mountains	26.9 S, 151.6 E	Unknown	NP, FH	Habitat clearing	Species Management under NCA and FA 1959	Habitat protection and enhancement
D'Aguilar Range	27.5 S, 152.7 E	Unknown	NP, SF, FH	Habitat clearing, burning practices	Species Management under NCA and FA 1959	Habitat protection and enhancement
Toowoomba – Lockyer Valley	27.4 S, 152.1 E	Unknown	NP, SF, FH	Habitat clearing, burning practices, harvesting practices	Species Management under NCA and FA 1959	Habitat protection and enhancement
Boonah – Mt French	28.0 S, 152.6 E	Unknown	NP, FH	Habitat clearing, burning practices, harvesting practices	Species Management under NCA and Forestry Act	Habitat protection and enhancement
Border Ranges (Qld)	28.2 S, 153.1 E	Unknown	NP, SF, FH	Habitat clearing, burning practices, harvesting practices	Species Management under NCA and FA 1959	Habitat protection and enhancement
North-eastern NSW (Upper Tweed, Upper Richmond and Upper Clarence catchments)	28.4 S, 153.1 E	Unknown	Reports from State Forest and National Park	Habitat loss, drought, predation, inappropriate fire regimes, lantana control programs	Limited predator control (non-targeted), site-specific management conditions under the Integrated Forestry Operations Approval on Forests NSW estate*, Native Vegetation Act* 2003	Habitat protection and enhancement

(Note: NCA refers to Queensland *Nature Conservation Act 1992*; VMA refers to *Vegetation Management Act 1999*; FA 1959 refers to *Forestry Act 1959*)

4. Recovery objectives, Performance criteria and Actions

4.1 Overall objective

Improve the status of black-breasted button-quail from its current threatened status under State and Commonwealth legislation through protection and management of habitat for extant populations (to secure survival of existing birds), increasing availability and condition of habitat (to provide opportunity for population increase) and pursuit of actions to minimise threats (to protect existing and expanding populations and prevent further loss).

4.2 Specific objectives, Performance criteria and Recovery actions

The costs associated with and parties involved in implementing the various actions detailed in this recovery plan are provided in Section 6. The strategy for recovery is outlined in Section 4.3, Table 2.

Specific Objective 1

Consolidate current knowledge and define assessment and monitoring strategies for black-breasted button-quail, including an assessment of current status throughout its range and a clear definition of the habitats occupied by the species.

Performance criterion 1.1: Existing habitat mapped.

Action 1.1.1: Collate in a database, critically analyse (verify) and map existing black-breasted button-quail site data.

An accurate, complete knowledge of black-breasted button-quail distribution is required for reassessing conservation status, prioritising sites for active management and determining suitable research sites. An up-to-date, cleaned and verified database of all records of black-breasted button-quail, held on WildNet (QDERM), will be created including historical sightings, specimen-based records and contemporary records. This could be used to create and update essential habitat mapping associated with Queensland's *Vegetation Management Act* 1999. Regular maintenance and review of the database will ensure the data remains accurate and current.

Outcomes: Independent, accurate database compiled.

Potential contributors: QDERM, NSW DECC, educational institutions.

Action 1.1.2: Map existing data on black-breasted button-quail distribution and habitat requirements and develop a predictive model of the species' distribution.

Predictive modelling of the distribution of the black-breasted button-quail will contribute to the species' recovery, honing current understanding of the ecological requirements of these birds. It will be particularly important in New South Wales where black-breasted button-quail are little known. Predictions gained by such analyses will be used as a guide for conducting searches for this species, again particularly in New South Wales and in areas of Queensland where modelling shows the birds may occur but have previously not been observed.

Outcomes: Accurate mapping and up-to-date predictive distribution model available as a planning tool.

Potential contributors: QDERM, NSW DECC, educational institutions

Performance criterion 1.2: Ecological assessment and monitoring strategies established. Assessment of the following key areas where knowledge is deficient with respect to species' presence or habitat is completed:

- In NSW, Yarrowitch/Walcha areas, Border Ranges and potential coastal populations.
- In Queensland, Border Ranges, Bundaberg-Maryborough, Palmgrove, Auburn, Fitzroy populations and alleged records from the Wet Tropics.

Action 1.2.1: Develop and document an effective method of finding and recording black-breasted button-quail and design and implement a monitoring program.

There are currently no standardised methods for assessing population size or habitat details and descriptions.

Outcomes: An effective survey and assessment tool.

Potential contributors: QDERM, NSW DECC, educational institutions such as University of Queensland.

Action 1.2.2: Survey habitat where black-breasted button-quail occurrence is possible but has not yet been detected.

Using the method devised in Action 1.2.1 and modelled potential distribution as per Action 1.1.2, survey for black-breasted button-quail in areas where data is deficient.

Outcomes: Black-breasted button-quail located in New South Wales and in areas of Queensland where they have previously not been reported.

Potential contributors: QDERM, NSW DECC, QDEEDI, Birding groups, Naturalist Clubs, Northern Rivers Catchment Management Authority (NR CMA), SEQ Catchments NRM (SEQ NRM), Condamine Alliance (NRM group) (CA NRM), Fitzroy Basin Association (NRM group) (FBA NRM), Burnett Mary Regional Group for NRM Inc (BMRG NRM), general public.

Specific Objective 2

Protect key ecosystems/habitat that support populations of black-breasted button-quail from human-induced threatening processes, thus maintaining current populations and habitat.

Performance criterion 2.1: Up to date management guidelines for black-breasted button-quail habitat and protection of populations maintained; promotion and adoption by government, industry and community sustained.

Action 2.1.1: Review and promote management guidelines to ameliorate impacts from human activities (housing land development, water infrastructure development, timber harvesting, fire and stock management) on identified black-breasted button-quail habitat.

Outcomes: Management practices for protection, restoration and offsetting of black-breasted button-quail habitat and protection of populations accepted and implemented.

Potential contributors: QDERM, Forestry Plantations Queensland, NSW DECC, industries (mining, timber, power, water, agriculture), affected local councils, fire management authorities.

Performance criterion 2.2: Maintenance of current size of wild populations and available habitat area unless otherwise affected by unpredicted stochastic events.

Action 2.2.1: Regulate land use by state and local authorities.

Gain approval from Queensland and New South Wales state governments and affected local governments, for the management guidelines developed in Action 2.1.1 and assist with their adoption into practice. Various regulatory avenues are available to protect and enhance known and probable habitat for black-breasted button-quail and these can be used with extension activities for land managers and private landholders.

Outcomes: Known or probable black-breasted button-quail habitat will be better protected.

Potential contributors: QDERM, NSW DECC, affected local councils.

Action 2.2.2: Conduct a census during the final year of the life of this recovery plan using the guide produced in Action 1.2.1

Using the method devised in Action 1.2.1, conduct targeted survey for black-breasted button-quail to assess population and habitat condition trend.

Outcomes: Assessment of populations at known sites; finding of new sites.

Potential contributors: QDERM, NSW DECC, NSW State Forests, NSWDNR, QDEEDI, Birding groups, Naturalist Clubs, catchment & NRM groups, general public.

Specific Objective 3

Maintain or improve the extent, condition (quality) and connectivity of black-breasted button-quail habitat.

Performance criterion 3.1: Management guidelines for protecting populations and habitat adopted by government, industry and community and protective status of habitat enhanced.

Action 3.1.1: Investigate and instigate (where appropriate) protection of habitat through nature refuge system and/or other instruments of protection.

Currently, much black-breasted button-quail habitat is contained within state forest boundaries, in Queensland.

Outcomes: Improved habitat linkages and patch sizes across public, leasehold and private lands.

Potential contributors: QDERM, QDEEDI.

Action 3.1.2: Establish extension activities with land managers and private landholders.

Currently, significant areas of black-breasted button-quail habitat is contained within private land holdings, in Queensland and potentially in New South Wales. Essential habitat mapping (either under Queensland's *Vegetation Management Act* 1999 or Biodiversity Planning Assessment process) provides a mechanism for linking to landholders and land developers. Identified areas could be placed under voluntary conservation agreement, such as a nature refuge, which will protect the habitat and if needed allow some use of the land. Landholders may benefit from support in land management through the NatureAssist program and possible eligibility for tax reimbursements.

Outcomes: Nature refuges and other covenants securing long-term, viable black-breasted button-quail habitat on private lands.

Potential contributors: QDERM, NSW DECC, NR CMA, SEQ NRM, CA NRM, FBA RM, BMRG NRM.

Performance criterion 3.2: At least two priority areas of degraded habitat are identified and rehabilitated.

Action 3.2.1: Rehabilitate degraded habitats.

Restoration of degraded habitats to form healthy and viable habitat for black-breasted button-quail will be achieved through appropriate site selection, preparation (e.g. weeding), propagation and planting of appropriate flora. Liaison with relevant rainforest community recovery teams and community groups such as Landcare, Bushcare and Greening Australia is recommended to facilitate selection of methods and species, and to coordinate with other rainforest restoration projects. Where rehabilitation occurs in lantana thickets occupied by black-breasted button-quail, care should be taken to stage removal of lantana and replacement with appropriate planting of native species to ameliorate the impacts of sudden loss of vegetation being utilised by the species.

Outcomes: A major threatening process will be ameliorated by increasing the availability of healthy, viable habitat for the black-breasted button-quail.

Potential contributors: QDERM, community groups such as Greening Australia and Landcare branches, NR CMA, SEQ NRM, CA NRM, FBA RM, BMRG NRM, private landholders and appropriate corporate entities.

Specific Objective 4

Reduce the impacts of introduced predators and competitors.

Performance criterion 4.1: Threats to the species by feral animals are confirmed, areas of high impact identified and feral control commenced.

Action 4.1.1: Investigate feral (fox, dog, pig and cat) control program.

Investigate need for and feasibility of conducting feral control programs in areas where there are potential feral animal problems. Conduct field based assessment and government/stakeholder surveys to assess presence, population size, extent of damage caused by feral species, control programs that have been trialled and the success of control measures to date for each of the feral predator and competitor species.

Outcomes: Identification of problem areas, prioritisation based on severity of impact and suitability for feral control implementation.

Potential contributors: QDERM, NSW DECC, QDEEDI, NSW State Forests, NR CMA, SEQ NRM, CA NRM, FBA RM, BMRG NRM, private contractors.

Action 4.1.2: Implement feral (fox, dog, pig and cat) control program.

Conduct feral control programs in areas where feral animal problems have been identified and prioritised.

Outcomes: Reduction in feral density and hence reduction in predation and disturbance of black-breasted button-quail.

Potential contributors: QDERM, NSW DECC, QDEEDI, NSW State Forests, NR CMA, SEQ NRM, CA NRM, FBA RM, BMRG NRM, private contractors

Action 4.1.3. Ameliorate effects of domestic stock on black-breasted button-quail and its habitat.

Implement measures such as fencing or relocation of infrastructure to reduce or eliminate the effects of grazing (cattle) stock in black-breasted button-quail habitat.

Outcomes: Reduction in damage of black-breasted button-quail habitat.

Potential contributors: QDERM, NSW DECC, QDEEDI, NSW State Forests, NR CMA, SEQ NRM, CA NRM, FBA RM, BMRG NRM.

Specific Objective 5

Increase understanding of the ecology of black-breasted button-quail.

Performance criterion 5.1: Knowledge of black-breasted button-quail conservation status, current distribution and life history is significantly increased.

Action 5.1.1: Design and implement research projects to enhance understanding of the species.

Although moderately well studied in Queensland, many knowledge gaps relating to black-breasted button-quail ecology remain, such as the factors which affect thresholds of local extinction, extent of movement at local and landscape scales, genetic diversity within the species and between populations.

Outcomes: Research projects undertaken on factors, which affect thresholds, by stakeholders and recommendations made to management authorities.

Potential contributors: QDERM, NSW DECC, QDEEDI, universities, Birding groups, Naturalist Clubs, NR CMA, SEQ NRM, CA NRM, FBA RM, BMRG NRM, general public.

Performance criterion 5.2: Active community participation, including that of Traditional Owners, in black-breasted button-quail recovery is achieved and increased participation recorded in reporting.

Action 5.2.1: Develop and maintain community network.

Development of a community network for the conservation of black-breasted button-quail and its habitat will be achieved most effectively through existing projects and established conservation groups. Community networks will assist with targeted field surveys, reporting incidental sightings and projects to rehabilitate habitat. They may also assist in publicity campaigns.

Outcomes: Increased community awareness and ownership of the recovery program shown through an increase in community and individual participation in the recovery program. Location of as yet undocumented populations may result.

Potential contributors: QDERM, NSW DECC, NR CMA, SEQ NRM, CA NRM, FBA RM, BMRG NRM, community groups, Threatened Species Network, Birds Australia, Greening Australia and the Wildlife Preservation Society of Queensland.

Action 5.2.2: Ensure Traditional Owner communities are involved in the recovery effort.

Links between Aboriginal people and black-breasted button-quail are not known, or at least not documented. However, it is important to understand the history and responsibility of Aboriginal communities to their traditional lands and the inhabitants of those lands, and that these are very different than is the case for non-indigenous communities (Bentrupperbaumer and Reser 2000; QPWS 2002).

With the assistance of the Indigenous Engagement Unit (QDERM), Qld NRM Regional Body Indigenous Facilitators and the NSW DECC, Aboriginal communities and Land Councils will be consulted about establishing a preliminary study to:

- Develop a clear understanding of, and documentation of, relationships between Aboriginal communities and quail, but specifically black-breasted button-quail, including the habitat / vegetation types considered as core for the species, and
- Emphasise the role and importance of traditional knowledge in the management of this species and its habitat.

Prepared with the information gained above, the nature and possibilities of Aboriginal participation in black-breasted button-quail management will be explored and documented through direct consultation with individual communities. Jointly developed strategies, that could include initiatives such as habitat restoration, will be developed for each community. Endorsement of the recovery plan and of agreements regarding indigenous involvement will be sought from the relevant Traditional Owner groups. As issues relating to intellectual and cultural property rights and recording and presentation of information must be negotiated with the Traditional Owners in each community, the Indigenous Engagement Unit (QDERM) and the NSW DECC will be utilised for such consultations.

Outcomes: The participation of the indigenous community in the recovery process ensuring knowledge of the links between Aboriginal people and this 'Vulnerable' species are fully explored and documented.

Potential contributors: QDERM, NSW DECC, QLD NRM Indigenous Facilitators, South East Queensland Traditional Owners Land and Sea Management Alliance.

Specific Objective 6

Administer and review the operation of the recovery process.

Performance criterion 6.1: The recovery process is managed effectively with a major review conducted by the end of 2012.

Action 6.1.1: Coordinate the recovery process effectively.

It is proposed that the implementation, monitoring and reporting of this recovery plan be co-ordinated by relevant experts from NSW DECC and QDERM in association with the potential contributors for each action. Communication should occur between the states to progress the implementation of priority actions and ensure reporting of the successes of this plan.

Outcome: Recovery actions will be coordinated to ensure maximum effectiveness.

Potential contributors: QDERM, NSW DECC.

Action 6.1.2: Review of the recovery actions and progress throughout the life of the plan.

Conduct monitoring of the success of the plan, tracking progress throughout the life of the plan, adapting actions to suit any new knowledge or management experience.

Outcome: A continually updated plan, adapting to new knowledge gained.

Potential contributors: QDERM, NSW DECC.

4.3 Summary

Table 2. Summary of relationship between specific objectives, performance criteria, actions and potential contributors.
P#: Priority categories 1,2 and 3 (in terms of significance to the recovery process) Note: ALL actions are considered important.

Specific objective	Performance criteria	Action	Potential contributors	P#
1: Consolidate current knowledge and define assessment and monitoring strategies for black-breasted button-quail, including an assessment of current status throughout its range and a clear definition of the habitats occupied by the species	**1.1:** Existing habitat mapped	**1.1.1:** Collate in a database, critically analyse (verify) and map existing black-breasted button-quail site data	QDERM, NSW DECC, educational institutions.	**1**
		1.1.2: Map existing data on black-breasted button-quail distribution and habitat requirements and develop a predictive model of the species' distribution	QDERM, NSW DECC, educational institutions	**1**
	1.2: Ecological assessment and monitoring strategies established	**1.2.1:** Document a useful method of finding and recording black-breasted button-quail for observers	QDERM, NSW DECC, educational institutions such as University of Queensland.	**2**
		1.2.2: Survey habitat where the species' occurrence is possible but has not yet been detected.	QDERM, NSW DECC, QDEEDI, Birding groups, Naturalist Clubs, CMAs and NRM groups, general public.	**2**
2: Protect key ecosystems and habitat that support populations of black-breasted button-quail from human-induced threatening processes, thus maintaining current populations and habitat	**2.1:** Up to date management guidelines for black-breasted button-quail habitat and protection of populations maintained; promotion and adoption by government, industry and community sustained.	**2.1.1:** Review and promote management guidelines to ameliorate impacts from human activities (housing land development, water infrastructure development, timber harvesting, fire and stock management) on identified black-breasted button-quail habitat	QDERM, Forestry Plantations Queensland, NSW DECC, industries (mining, timber, power, water, agriculture), affected local councils, fire management authorities.	**1**
	2.2: Maintenance of current size of wild populations and available habitat area unless otherwise affected by unpredicted stochastic events	**2.2.1:** Regulate land use by state and local authorities	QDERM, NSW DECC, affected local councils.	**2**
		2.2.2: Conduct a census during the final year of the life of this recovery plan using guide produced in Action 1.2.1	QDERM, NSW DECC, NSW State Forests, NSWDNR, QDEEDI, Birding groups, Naturalist Clubs, catchment & NRM groups, general public.	**3**
3: Maintain or improve the extent, condition (quality) and connectivity of black-breasted button-quail habitat	**3.1:** Management guidelines for protecting populations and habitat adopted by government, industry and community and protective status of habitat enhanced.	**3.1.1:** Investigate and instigate (where appropriate) protection of habitat through nature refuge system and/or other instruments of protection	QDERM, QDEEDI.	**2**

Specific objective	Performance criteria	Action	Potential contributors	P#
		3.1.2: Establish extension activities with land managers and private landholders	QDERM, NSW DECC, CMAs and NRM groups.	**1**
	3.2: At least two priority areas of degraded habitat are identified and rehabilitated	**3.2.1:** Rehabilitate degraded habitats	QDERM, community groups such as Greening Australia and Landcare branches, CMAs and NRM groups, private landholders and appropriate corporate entities.	**1**
4: Reduce the impacts of introduced predators and competitors	**4.1:** Threats to the species by feral animals are confirmed, areas of high impact identified and feral control commenced	**4.1.1:** Investigate feral (dog, cat, pig, fox) control program	QDERM, NSW DECC, QDEEDI, NSW State Forests, CMAs and NRM groups, private contractors.	**1**
		4.1.2: Implement feral (dog, cat, pig, fox) control program	QDERM, NSW DECC, QDEEDI, NSW State Forests, CMAs and NRM groups, private contractors	**1**
		4.1.3: Ameliorate effects of domestic stock on black-breasted button-quail and its habitat	QDERM, NSW DECC, QDEEDI, NSW State Forests, CMAs and NRM groups.	**2**
5: Increase understanding of the ecology of black-breasted button-quail	**5.1:** Knowledge of black-breasted button-quail conservation status, current distribution and life history is significantly increased	**5.1.1:** Design and implement research projects to enhance understanding of the species	QDERM, NSW DECC, QDEEDI, universities, Birding groups, Naturalist Clubs, CMAs and NRM groups, general public.	**3**
	5.2: Active community participation, including that of Traditional Owners, in black-breasted button-quail recovery is achieved	**5.2.1:** Develop and maintain community network	QDERM, NSW DECC, CMAs and NRM groups, community groups, Threatened Species Network, Birds Australia, Greening Australia and the Wildlife Preservation Society of Queensland.	**2**
		5.2.2: Ensure Traditional Owner communities are involved in the recovery effort	QDERM, NSW DECC, QLD NRM Indigenous Facilitators, South East Queensland Traditional Owners Land and Sea Management Alliance.	**1**
6: Administer and review the operation of the recovery process	**6.1:** The recovery process is managed effectively with a major review conducted by the end of 2012.	**6.1.1:** Coordinate the recovery process effectively	QDERM, NSW DECC.	**1**
		6.1.2: Review of the recovery process throughout the life of the plan	QDERM, NSW DECC.	**3**

5. Management practices

Populations of this species cannot begin to be managed unless habitat and populations are identified. Developers, landholders, forestry and the public need to be made aware of distribution and habitat. This is currently being achieved through essential habitat mapping by the Biodiversity Planning Assessment process. People should also be made aware of options suitable for protecting and enhancing populations and habitat of the species, while undertaking sustainable human industry, through information fact sheets, extension and liaison with industry.

Protection of preferred habitat can be effected through appropriate reservation and incorporation into national parks, feature protection areas within state forests, nature refuges or other local government reserves.

Management of habitat will require:

- Protection from fire incursions into preferred habitat;
- Minimal thinning of preferred habitat to maintain habitat values;
- No roads through preferred habitat to prevent fragmentation;
- Protection from stock trampling;
- Retention of size and connectivity to neighbouring patches of suitable habitat (remnant and regrowth) and increase in connectivity;
- Control of feral animals within and adjacent to suitable core habitat; and
- Control of weeds, where these can impact on the ecology of the species.

Management of human activities, particularly associated with development of water and mining infrastructure, housing estates, farming pursuits, to include:

- Assessment of proposed activities for potential impact on habitat and populations, with conditions placed on the proponent subject to development, such as identification of alternatives to the proposal, offsets and rehabilitation of degraded lands/habitat;
- Management of activities as stipulated by the *Nature Conservation Act* 1992 (Queensland) and the *Threatened Species Conservation Act* 1995 (New South Wales);
- In Queensland, adherence to the *Code of Practice for Native Forest Timber Production 2002* which recommends accessing species information for forest management through http://wwwhost.env.qld.gov.au/steps/references/FActSMISApplicationofInfoProceduralGuide.pdf and following recommended guidelines for species protection;
- In Queensland, following codes under the *Vegetation Management Act 1999 (VMA)*, applying to native forest practice on freehold land;
- Voluntary conservation agreements and covenants on freehold land that prevent clearing of habitat, control of pets that may constitute predators, siting of housing infrastructure remotely from habitat, control of garden refuse dumping within habitat; and
- Control of declared weeds (such as cat's claw *Macfadyena unguis-cati* and Madeira vine *Anredera cordifolia*) under *Land Protection (Pest and Stock Route Management) Act 2002* on protected and private land.

6. Costs of recovery

Table 3: Cost of recovery per annum ($)

Action No.	Action description	*Year 1*	*Year 2*	*Year 3*	*Year 4*	*Year 5*	Total
1.1.1	Collate in a database, critically analyse (verify) and map existing black-breasted button-quail site data	7500	2000	2000	2000	2000	**15,500**
1.1.2	Map habitat, both known and potential	10,000	1000	1000	1000	1000	**14,000**
1.2.1	Document a useful method of finding and recording black-breasted button-quail for observers	10,000	1000	1000	1000	1000	**14,000**
1.2.2	Survey habitat where the species' occurrence is possible but has not yet been detected	30,000	15,000	5000	5000	5000	**60,000**
2.1.1	Develop management prescriptions and protocols for human activities in identified black-breasted button-quail habitat	10,000	2500	2500	1000	1000	**17,000**
2.2.1	Regulate land use by state and local authorities	1000	1000	1000	1000	1000	**5000**
2.2.2	Conduct a census during the final year of the life of this recovery plan using guide produced in Action 1.2.1	0	0	0	0	40,000	**40,000**
3.1.1	Investigate potential and feasibility of reserving areas of state forest where black-breasted button-quail occur as protected areas	2500	2500	1000	1000	1000	**8000**
3.1.2	Establish extension activities with land managers and private landholders	5000	5000	5000	5000	5000	**25,000**
3.2.1	Rehabilitate degraded habitats	150,000	100,000	100,000	100,000	100,000	**550,000**
4.1.1	Investigate feral control programme	50,000	0	0	0	0	**50,000**
4.1.2	Conduct feral control program	0	100,000	100,000	50,000	50,000	**300,000**
4.1.3	Ameliorate effects of domestic stock on black-breasted button-quail and its habitat	20,000	20,000	10,000	10,000	10,000	**70,000**
5.1.1	Design and implement research projects to enhance understanding of the species	20,000	20,000	20,000	20,000	20,000	**100,000**
5.2.1	Develop and maintain community network	5000	5000	5000	5000	5000	**25,000**
5.2.2	Establish Traditional Owner interests and insights	5000	5000	5000	5000	5000	**25,000**
6.1.1	Coordinate the recovery process effectively	7500	7500	7500	7500	7500	**37,500**
6.1.2	Conduct a major review of the recovery process	0	0	0	0	10,000	**10,000**
TOTAL		**333,500**	**287,500**	**266,000**	**214,500**	**264,500**	**1,366,000**

7. Evaluation of recovery plan

The co-ordinators of the black-breasted button-quail recovery program, with the assistance of the Black-breasted button-quail Scientific Advisory Group will annually review the plan to assess its progress and to revise the actions and priorities of the plan as necessary. After five years of operation, the recovery plan will be evaluated and revisions made where necessary.

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References

Bennett, S. 1985. The distribution of black-breasted button-quail *Turnix melanogaster* (Gould, 1837). *Emu* **85**:157-162.

Bentrupperbaumer, J. and Reser, J. 2000. *Impacts of visitation and use: Psychosocial and biophysical windows on visitation and use in the WTWHA.* Report to the Wet Tropics Management Authority.

Borsboom, A. and Smith, G.C. 1997. *Turnix melanogaster* Black-breasted Button-quail Species Management Profile. *In* Flora and Fauna Information System. Species Management Manual Volume 1. Queensland Department of Natural Resources, Brisbane.

Bravery, J.A. 1970. The birds of the Atherton Shire, Queensland. *Emu* 70: 49-63.

Flower, P., Hamley, T., Smith, G.C., Corben, C., Hobcroft, D. and Kehl, J. 1995. Black-breasted Button-quail *Turnix melanogaster* (Gould) in Queensland. DPI Forest Service, Internal Report, Fauna Conservation and Ecology Section, Queensland Forest Research Institute, Indooroopilly.

Garnett, S.T. and Crowley, G.M., 2000. *The Action Plan for Australian Birds 2000.* Environment Australia, Canberra.

Hamley, T., Flower, P. and Smith, G.C., 1997. Present and past distribution of the black-breasted button-quail *Turnix melanogaster* (Gould) in Queensland. *Sunbird* **27 (1)**, 1 – 21.

Horton, D. (ed.) 1994. *The Encyclopedia of Aboriginal Australia.* Canberra, Aboriginal Studies Press, [2 vols].

Lees, N. and Smith G.C., 2000. Use of mature hoop pine plantation by the vulnerable black-breasted button-quail (*Turnix melanogaster*), *Australian Forestry*, **62(4)**, 330-335.

LeSouef, D. 1897. Ascent of Mount Peter Botte, North Queensland. *Victorian Naturalist*. 13: 151-153.

Marchant, S. and Higgins, P.J. (eds). 1993, *Handbook of Australian, New Zealand and Antarctic Birds. Vol. 2. Raptors to Lapwings.* Melbourne: Oxford University Press.

Milledge, D.R., 1999. *The distribution, status and habitat of the black-breasted button-quail* Turnix melanogaster *in north-eastern NSW – Stage 2 – Predictive modelling of habitat.* A report prepared for the NSW National Parks and Wildlife Service, 22 May 1999.

Milledge, D.R., 2000. *The distribution, status and habitat of the black-breasted button-quail* Turnix melanogaster *in northern NSW – Stages 3 & 4 – Results of field testing the predictive habitat model and searches in the Brigalow Belt - Final Report.* A report prepared for the NSW National Parks and Wildlife Service, 30 May 2000.

Milledge, D.R. and McKinley, A.L., 1998. *The distribution, status and habitat of the black-breasted button-quail* Turnix melanogaster *in north-eastern NSW – Stage 1 –Collation of habitat data from surveys of known and potential habitat in Queensland and records in New South Wales, with descriptions of survey methods and recommendations for future surveys in New South Wales.* A report prepared for the NSW National Parks and Wildlife Service, 20 February 1998.

QPWS, 2002. *Recovery Plan for the southern cassowary* Casuarius casuarius johnsonii *2001-2005.* Queensland Parks and Wildlife Service, Brisbane.

Smith, G.C., Aridis, J. and Lees, N. 1998. Radio-tracking revealed home ranges of black-breasted button-quail *Turnix melanogaster* in remnant vine scrub between hoop pine plantation and agriculture. *Emu* **98**, 171-177.

Smyth. A.K., Noble, D. & C. Wiley. 2001. Black-breasted button-quail in open eucalypt forest in south-eastern Queensland. Australian Birdwatcher, **19**, 45-47.

Smyth, A.K., and Young, J. 1996. Observations on the endangered black-breasted button quail *Turnix melanogaster* breeding in the wild. Emu 9, 202-207.

Tindale, N. B. 1974. *Aboriginal Tribes of Australia.* Berkeley, University of California Press.