Recovery plan for the golden-shouldered parrot *Psephotus chrysopterygius* 2003-2007

Dr Stephen Garnett and Dr Gabriel Crowley in collaboration with the golden-shouldered parrot recovery team.

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Contents

Summary

Species

The golden-shouldered parrot *Psephotus chrysopterygius* Gould 1858 is a small granivore closely related to the extinct paradise parrot *P. pulcherrimus* (Gould, 1845), and more-distantly-related to the secure hooded parrot *P. dissimilis* Collett, 1898 (Christidis and Norman 1996).

Species status

Listed as endangered under Schedule 2 of the *Nature Conservation (Wildlife) Regulation 1994*, and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Fits the criteria of endangered under IUCN Red List categories (IUCN SSC 2001) Category B1a,b(i)(ii)(iii)(iv) (extent of occurrence <5000/sq.km, occurs at fewer than five locations, continuing projected decline in extent of occurrence, area of occupancy, quality of habitat, number of mature individuals; Garnett and Crowley, 2000). Listed under Appendix I of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

The species is restricted to far north Queensland. The population is fewer than 2000 individuals and, though it declined in parts of its range between 1992 and 1998, this contraction may now have stabilised.

Distribution summary

The golden-shouldered parrot is restricted to two populations in central Cape York Peninsula. The range of the Morehead population, in the headwaters of the Morehead River catchment, is currently about 1380 km^2, but is still contracting, at least along its eastern boundary for which detailed distributional data is available. The Staaten population, primarily on Staaten River National Park, is contained in an area of about 300 km^2. The historical distribution was more extensive, covering most of Cape York Peninsula (McLennan 1923; Thomson 1935; Weaver 1982; Garnett and Crowley 1997, 1999).

Threat summary

The golden-shouldered parrot occurs in tropical savanna woodland, nests in termite mounds and feeds on a range of annual and perennial grasses. A shortage of food occurs annually in the early wet season and this can be made worse by a lack of burning and intense cattle and pig grazing. Altered fire patterns and grazing have also resulted in an increase in the density of woody shrubs which, it is thought, increases the vulnerability of the parrots to predators.

Objectives

Overall objectives

A. Improve the conservation status of the golden-shouldered parrot from endangered to vulnerable.
B. Develop and implement land management strategies that restore grassland and grassy woodlands to the benefit of dependent fauna and in sympathy with co-existing land values.
C. Assist recolonization of known former golden-shouldered parrot habitat.
D. Operate the recovery program efficiently, cost-effectively, and with high levels of community participation.

Specific objectives during the life of the current recovery plan

1. Manage habitat for golden-shouldered parrots at a landscape scale.
2. Maintain parrot population at receding edge of distribution.
3. Determine population trends.
4. Determine and manage impacts of pied butcherbirds on nest success

5. Determine and manage impacts of change in vegetation structure on black-faced woodswallows.
6. Assess and minimize adverse impacts of cattle and pigs on food plants and termite mounds.
7. Increase the number of wild populations of golden-shouldered parrots.
8. Downlist species from endangered to vulnerable.
9. Support recovery process.

Performance criteria

C.1.1: Management plans on relevant National Parks on Cape York Peninsula include specific actions for maintaining structure of grasslands and grassy woodlands.
C.1.2: Management of grasslands and grassy woodlands on designated National Parks is consistent with guidelines.
C.1.3: Property plans on at least two pastoral properties include specific actions for conservation of golden-shouldered parrots.
C.1.4: Management on designated pastoral properties for golden-shouldered parrots compliant with property plans.
C.2.1: Parrots attending at least one wet season feeding station on eastern edge of distribution.
C.3.1: Population trends are quantified.
C.4.1: Pied butcherbird project plan approved.
C.4.2: Influence of pied butcherbird predation on nest productivity quantified and recommendations incorporated into parrot management.
C.5.1: Relationship between nesting success of black-faced woodswallows and vegetation structure quantified, management implications determined and recommendations incorporated into parrot management.
C.6.1: Levels of cattle and pig damage on cockatoo grass and termite mounds are quantified.
C.6.2: Interim guidelines for cattle stocking rates and pig control measures are provided.
C.6.3: Recommended guidelines for cattle stocking rates and pig control measures are incorporated into management plans.
C.7.1: Management of reintroduction trial area complies with strategy for management of golden-shouldered parrot habitat on National Parks.
C.7.2: Nursery stocks of cockatoo grass are adequate to supply re-vegetation requirements.
C.7.3: Reintroduction trial area contains healthy population of seeding cockatoo grass.
C.7.4: A captive breeding program to provide golden-shouldered parrots for reintroduction is operating within IUCN guidelines.
C.8.1: Submission made to Threatened Species Scientific Committee to reclassify golden-shouldered parrot as vulnerable *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).
C.8.2: Submission made to reclassify golden-shouldered parrot as vulnerable under Schedule 3 of the *Nature Conservation (Wildlife) Regulation 1994.*
C.9.1: Continued functioning of a recovery team to direct the recovery process, a major review and a new recovery plan.

Summary of Actions

A.1.1.1: Advise National Park management regarding fire management of grasslands and grassy woodlands.
A.1.2.1: Implement and assess adherence to grassland and grassy woodland management guidelines on designated National Parks.
A.1.3.1: Participate in property planning on Cape York Peninsula.
A.1.4.1: Implement and assess adherence to golden-shouldered parrot habitat management guidelines on designated pastoral properties.

A.2.1.1: Provide seed for parrots during wet season at one or more feeding stations on north-eastern edge of distribution.

A.3.1.1: Sequentially monitor populations at selected sites once every five years.

A.4.1.1: Develop research plan to determine effects of pied butcherbird predation.
A.4.1.2: Obtain ethics approval for pied butcherbird research plan.
A.4.2.1: Undertake quantitative study of pied butcherbird predation on golden-shouldered parrot nests.
A.4.2.2: Determine management implications of pied butcherbird research for golden-shouldered parrots.
A.4.2.3: Incorporate pied butcherbird recommendations into parrot management guidelines.

A.5.1.1: Complete research into the relationship between vegetation structure and fecundity of black-faced woodswallows.
A.5.1.2: Determine management implications of black-faced woodswallow research for golden-shouldered parrots.
A.5.1.3: Incorporate black-faced woodswallow recommendations into parrot management guidelines.

A.6.1.1: Monitor and assess cattle and pig impacts on cockatoo grass and termite mounds.
A.6.2.1: Develop and implement management strategies to minimize cattle impacts on cockatoo grass and termite mounds in golden-shouldered parrot habitat if this is determined to be necessary in A.6.1.1.
A.6.2.2: Develop and implement management strategies for the control of pigs in golden-shouldered parrot habitat if this is determined to be necessary in A.6.1.1.
A.6.3.1: Advise National Park managers regarding appropriate levels of pig control.

A.7.1.1: Restore and maintain grassland structure of reintroduction trial area using appropriate fire regime, in co-operation with leaseholders and traditional owners.
A.7.2.1: Establish and maintain nursery stocks of cockatoo grass for re-establishing in reintroduction trial area.
A.7.3.1: Establish and maintain cockatoo grass in reintroduction trial area.
A.7.4.1 Prepare a full justification for reintroduction against appropriate IUCN guidelines.
A.7.4.2 Consult with aviculturists about aviary design and the best means of building up stock for release.
A.7.4.3 Negotiate with potential donors to construct aviaries, and construct aviaries at appropriate sites.
A.7.4.4 Capture an appropriate number of wild parrots of an appropriate age class for captive breeding.
A.7.4.5 Initiate captive breeding program.

A.8.1.1: If appropriate on basis of A.3.1.1 write submission to Threatened Species Scientific Committee to reclassify golden-shouldered parrot as vulnerable under *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).
A.8.2.1: If appropriate on basis of A.3.1.1 write submission to reclassify golden-shouldered parrot as vulnerable under Schedule 3 of the *Nature Conservation (Wildlife) Regulation 1994*.

A.9.1.1: Manage the recovery process through a recovery team.
A.9.1.2: Consult with interested parties and keep them informed of progress.
A.9.1.3: Support non-government stakeholder attendance at meetings.
A.9.1.4: Conduct a major review of the recovery process.
A.9.1.5: Rewrite the recovery plan at the end of five years.

1. General information

Species

The golden-shouldered parrot Gould 1858 is one of three small granivorous parrots that nest in termite mounds (antbeds). Common name synonyms most frequently used for the species are the golden-winged and ant-bed parrot (Higgins 1999). It is closely related to the extinct paradise parrot *P. pulcherrimus* (Gould, 1845) of south-east Queensland, and more-distantly to the secure hooded parrot *P. dissimilis* Collett, 1898 of the Northern Territory (Christidis and Norman 1996). Golden-shouldered parrots are restricted to Cape York Peninsula, far north Queensland. Their distribution once covered most of Cape York Peninsula (McLennan 1923; Thomson 1935; Weaver 1982; Garnett and Crowley 1997, 1999), but is now restricted to two small areas.

The male is turquoise with a black crown, bright yellow on the wing and forehead and with a salmon pink belly. Females and immature birds are mostly green with a turquoise rump. They have considerable iconic value and are often illustrated in publications.

Listed as endangered under Schedule 2 of the *Nature Conservation (Wildlife) Regulation 1994*, and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Assessment of population statistics from 1992 to 1998 indicated that it met the criteria for endangered under IUCN Red List categories (IUCN SSC 2001: Category B1a,b(i)(ii)(iii)(iv) (extent of occurrence <5000/km^2, occurs at fewer than five locations: continuing projected decline in extent of occurrence, area of occupancy, quality of habitat, number of mature individuals; Garnett and Crowley 2000). The population is probably fewer than 2000 individuals and its range contracted by 2.6% between 1992 and 1998. There has been no measurable contraction in the last three years (Table 1) but short-term stability is not necessarily indicative of long-term trends. Confirmation of these trends, however, within the period of the current recovery plan should enable the species to be reclassified as vulnerable. Even with such recovery, however, the species occupies only a small fraction of its former range.

Table 1. Estimates of population parameters of the golden-shouldered parrot from 1992 to 2002.

	1992 – 1998		1999 – 2002	
Parameter	**Estimate**	**Reliability**	**Estimate**	**Reliability**
Extent of occurrence	3,000 km^2	medium	3,000 km^2	medium
trend	decreasing	high	stable	medium
Area of occupancy	1,670 km^2	medium	1,630 km^2	medium
trend	decreasing	high	stable	medium
No. of breeding birds	2,370	medium	2,330	medium
trend	decreasing	high	stable	medium
No. of sub-populations	2	medium	2	medium
Largest sub-population	1,300	medium	1,300	medium

Biological information

Food

Throughout the dry season, golden-shouldered parrots feed on the fallen seeds of annual grasses, particularly fire grass *Schizachyrium* spp. The parrots may spend many months feeding in small areas where seeds are abundant, and prefer open habitat created by dry season fires where the seed is most accessible. As the dry season progresses, frequented areas are depleted of seeds (Crowley and Garnett 1999), and the birds become more

mobile, searching for areas of higher seed abundance. Abrupt declines in seed availability occur in the early wet season. Even short-lived rain events influence access to food, while repeated or extended rainfall causes changes in the abundance of food. On the morning after the first heavy thunderstorm of the wet season the parrots switch food from fire grass to glimmer grass *Planichloa nervilemma*, doubling the time required to procure enough food. In subsequent dry periods the parrots gradually return to fire grass. After successive storms, however, with increasingly less fire grass seed available, the parrots shift to the seed of species that require more rain to cause germination — *Mnesithea*, *Ischaemum*, *Thaumastochloa* and *Scleria*. Eventually this seed also germinates and the parrots switch to taking partially burnt seed, ungerminated seed on rocks and the growth buds and flowers of *Melaleuca viridiflora*.

Excessively heavy falls at the start of the wet season are likely to disadvantage the parrots because most seed will germinate before new seed is available (Crowley and Garnett 1999). At this time the parrots probably rely heavily on flowers and the growth buds of trees. The parrots do not feed in heavy rain but sit quietly in trees. Several days of continuous heavy rain, as is often associated with cyclones, is likely to prevent the birds from meeting their food requirements and thus cause heavy mortality. By the middle of the wet season (January–February), all fallen seed becomes scarce and the parrots eat flowers or new seed of herbs, early-seeding annual grasses and perennial grasses. Judging from the time spent feeding, the flowers do not appear to yield much nutritional value. The herbs and early-seeding annual grasses also produce small seed that is time-consuming for the birds to obtain. The early-flowering perennial grass cockatoo grass *Alloteropsis semialata* has large seed and it appears the size of its seed crop influences the onset and duration of the subsequent breeding season for the golden-shouldered parrots.

If storms have been patchy in both time and space, as usually happens at the start of the wet season, the availability of remnant seeds overlaps with the production of seed of cockatoo grass and various quick-growing annual grasses and herbs which become available four to six weeks after the first heavy rains. Storm-burning[1] extends the time seed is available to the parrots by removing rampantly growing ground layer vegetation, exposing ungerminated seed and killing seed that is just starting to germinate. It also increases density of seeding herbs, increasing feeding efficiency of the parrots, and delays cockatoo grass flowering, increasing the length of time its seed is available (Crowley and Garnett 2001).

Seed production of cockatoo grass appears to be highest in the first wet season after a fire, regardless of season of burn, probably because of greater nutrient availability and reduced demands for nutrients by the larger co-occurring perennial grass, plume sorghum *Sorghum plumosum*. But patterns of rainfall may also influence seed production, with intermittent, small falls leading to smaller yields than occur after enduring heavy rains.

Because of the lag between germination of fire grass and the production of cockatoo grass seeds, the early wet season has probably always been a period of high mortality for the tropical granivores, particularly of inexperienced immature birds (Garnett and Crowley 1994, 1995b). However, seed production by cockatoo grass has probably been reduced by cattle grazing (Crowley and Garnett 2001), and even more severely by selective rooting up of cockatoo grass plants by pigs. As the wet season progresses, a variety of seeds of ephemeral, annual and perennial plants mature, the availability of which appears to influence breeding success.

Nest sites

Golden-shouldered parrots nest in the terrestrial mounds of grass-feeding termites. In the area around Artemis, most nests are built in the conical mounds of *Amitermes scopulus*,

[1] Burning within 5 days of the first heavy rains (≥ 50 mm over 72 hours) of the wet season.

although the magnetic mounds of *A. laurensis*, and, occasionally the bulbous mounds of *Nasutitermes triodeae* are also used. Parrots on Bulimba Station and Staaten River National Park mostly nest in the domed mounds of *Amitermes vitiosus.* While mounds of a suitable size for nesting are abundant through the parrot's present and former distribution, factors affecting mound suitability are still unclear. Mounds are rarely occupied more than once, possibly because of the persistence of nest parasites, such as lice, or because mounds repaired by termites are difficult to excavate. In some areas, most mounds of a suitable size have already been used. Mounds of *A. scopulus* and *A. laurensis* grow remarkably slowly. Mounds are likely to be at least 30 years old when they are first suitable for nesting, and most mounds with nests are at least 50 years old. Factors that affect growth rates, and hence nest site availability, are likely to include length and intensity of the wet season, fire regime, grazing pressure and damage by pigs and cattle. Analysis of these factors is to be undertaken in the current plan.

Breeding

The nest is excavated, largely by the female, in a termite mound between March and June. Initiation of egg-laying appears to be a consequence of nest mound suitability and the availability of green seed. The entrances to chambers excavated too early in the wet season are often covered over by termites. Termites stop building when the rain stops, after which no nest chambers are occluded. Termites also sometimes kill early eggs by cementing them to the floor of the chamber. The increase in sulphur amino-acids associated with newly-formed seed is also postulated to be necessary for egg-formation, as with other grass seed-eating birds. First breeding for the year is sometimes associated with the flush of cockatoo grass seed on storm-burnt areas but these efforts sometimes fail if other seed is not available, particularly the seed of later-seeding plume sorghum. Food during the remainder of the breeding season largely consists of annual grasses (*Sorghum angustum*, *Schizachyrium* spp.), supplemented with that of legumes (*Desmodium* spp., *Stylosanthes* spp.) and annual herbs (*Hyptis suaveolens*). Egg-laying ceases when green grass seed is no longer available.

An average of 5 to 6 eggs is laid at two day intervals. Of these 74% hatch after about 3 weeks. The female broods the young for less than a week after hatching, and then only returns to feed them. Of the birds that hatch, 65% fledge about five weeks after hatching. The principal reason for nest failure is predation, particularly in late April and early May. The principal predator of eggs and young in the nest is thought to be reptiles, particularly small goannas *Varanus* spp. Predation of nestlings and newly-fledged young by pied butcherbirds *Cracticus nigrogularis* is also thought to be high. Re-nesting has only been observed after the failure or desertion of nests early in the breeding season, with two out of three known cases being by birds that had nested in storm-burnt areas.

Dispersal

By the mid dry season (July–August) most nestlings have fledged. Young birds stay with their parents within about 2 km of the nest for the first six weeks after fledging, often in a flock with other birds. Some chicks then disperse, young males generally moving further from the nest than young females. Young birds then join flocks at a number of traditional locations. These flocks contain subadult males from the breeding season and some adult pairs. Other adult pairs apparently remain independent of the flock. By July most of these flocks feed on areas that have been burnt early in the dry season. Flocks with a choice of burnt and non-burnt areas have chosen the burnt areas where the seed is easy to find and where it is easy to see predators. Pairing appears to occur in these flocks.

Many of the traditional sites where flocks gather through the dry season are areas occupied by black-faced woodswallows *Artamus cinereus*. Through the late dry season (September–October) remaining flocks move to woodswallow sites. Again some adults are in these flocks, particularly during the early wet season, but others remain independent. The flocks remain

with the woodswallows until well after the wet season has begun. Parrots leave woodswallow flocks and disperse as the early wet season proceeds. Increased access to food means that they stay longer in areas that have been storm-burnt, provided those areas had not been burnt the previous year. In addition, some birds move from unburnt areas to storm-burnt areas. The accessibility of seed in storm-burnt areas and on gravel slopes during the early wet season appears to enhance rates of survival, particularly among young, inexperienced birds, suggesting that food supply and/or accessibility is inadequate to support the parrots in the remainder of the landscape. Parrots radiate out from these wet season feeding areas to re-occupy nest sites. Contraction of parrots from the east of the Great Dividing Range suggests that sites closest to the hills are occupied first.

International obligations

The golden-shouldered parrot is listed under Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This recovery plan is consistent with CITES and with Australia's other obligations under international agreements.

Affected Interests

Golden-shouldered parrots occur on lands of two tenures: land managed by Queensland Parks and Wildlife Service (Staaten River National Park) and pastoral leases (Artemis, Bulimba, Dixie, Imooya, Kalinga, Killarney and Mary Valley). The parrot's distribution covers lands of traditional owners represented by the Kuku Thaypan, Ukele and Uwoykand. Recovery actions are ongoing on Artemis, Kalinga, Mary Valley, Killarney and Bulimba Stations and on Staaten River National Park. Planned recovery actions include the reintroduction of golden-shouldered parrots to traditional land of Kandju people on Mungkan Kandju National Park.

This recovery plan recognises the multiple uses and values associated with lands within the distribution of golden-shouldered parrots, and wherever possible management actions are designed to advance the aspirations of all interested parties. The golden-shouldered parrot recovery team includes leaseholders of all currently affected properties, or their representatives, and representatives of Aboriginal traditional owner groups and non-government conservation organizations.

All actions are undertaken in collaboration with leaseholders on any lands directly affected by those actions and traditional owners are also consulted wherever appropriate. The valuable involvement of leaseholders and traditional owners has been acknowledged in several publications arising from earlier recovery plans (Garnett and Crowley 1997; Crowley and Garnett 2000). The interest of traditional owners and other indigenous interests, are represented directly or through Balkanu. This co-operative approach will continue as a feature of the current plan.

Organisations that directly represent resident or traditional owner interests on Cape York Peninsula and whose interests could be affected by land use changes recommended as part of golden-shouldered parrot recovery include Peninsula Cattlemen's Association, Coen Land and Sea Management Centre, Balkanu, Cape York Land Council and Cook Shire Council. Other community organisations with a special interest in conservation of golden-shouldered parrots or conservation on Cape York Peninsula include Birds Australia and Cairns and Far North Environment Council (CAFNEC).

Planned recovery actions include employment of affected leaseholders in survey work and ecological studies undertaken on their lands. Arrangements have been made through the Coen Land and Sea Management Centre to employ traditional owners of Mungkan Kandju National Park in habitat restoration on their traditional lands. Traditional owners have

also been invited through Balkanu to be employed in parrot surveying and vegetation monitoring on their affected lands as part of property planning.

National Parks staff members responsible for Staaten River National Park are members of the recovery team, and make land management decisions for the park based on the ecological needs of golden-shouldered parrots. They are directly involved in maintaining appropriate fire regimes and undertaking five-yearly nest surveys. On-ground staff members have been consulted regarding extending recovery actions over Mungkan Kandju National Park. Staff members over-seeing NRM on National Parks have been consulted regarding the incorporation of appropriate fire management and it's monitoring into NRM plans for each park.

Consultation with indigenous people

Implementation of recovery actions under this plan includes consideration of the role and interests of indigenous communities in the region. The recovery team includes representatives of traditional owners (Balkanu and Coen Land and Sea Management Centre), with the expressed purposes of involving traditional owners and other indigenous people in planned actions and to allow indigenous concerns to be taken into account in the formulation of actions. In addition to these representatives attending recovery team meetings, they are consulted directly by officers of the recovery team during the recovery process. They have the role of identifying individuals and groups affected by the recovery plan, and where appropriate arranging for these stakeholders to attend recovery meetings, or be otherwise consulted.

Officers involved in the recovery process have also directly consulted with individual traditional owners at different stages and their input into the recovery process has been appropriately acknowledged (Garnett and Crowley 1997; Crowley and Garnett 2000). This co-operative approach will continue as a feature of the current plan.

Benefits to other species or communities

Golden-shouldered parrots are indicative of processes affecting granivorous birds and associated species in the tropical savannas, particularly on Cape York Peninsula (Franklin, 1999). Successful management of the parrot on private land could lead to modification of management of pastoral lands on many parts of the peninsula, with benefits for regional biodiversity.

Work arising from earlier golden-shouldered parrot recovery plans (Garnett and Crowley 1995a, 1999) helped to identify the decline of grasslands on Cape York Peninsula, as well as the threatening processes of altered fire regimes in the presence of cattle grazing (Crowley and Garnett 1998, 1999), with the result that the regional ecosystem perennial sorghum/kangaroo grass grasslands (RE 3.3.59) is now classified as *of concern* (Neldner 1999). Management actions involving storm-burning in association with spell-grazing were developed and trialed during the second phase of the recovery plan, and shown to be successful at halting and at least partially reversing the invasion of broad-leaved ti-tree (Garnett and Crowley 1999) and have been an important component of conservation planning for properties in the region (QPWS 1999a,b). Planned actions during the current recovery plan include more widespread adoption of the management regime to ensure the recovery of both *Sorghum plumosum* ± *Themeda arguens* grasslands and *Melaleuca stenostachya* ± *Melaleuca viridiflora* low open-woodland, which is also classified as *of concern* (regional ecosystem 3.5.17; Table 2). The actions undertaken, particularly the adoption of appropriate fire management, should also benefit grassland-dependent fauna, notably the endangered star finch *Neochmia ruficauda clarescens* (Hartert, 1899) and buff-breasted button-quail *Turnix olivii* Robinson, 1900 and the near threatened black-faced woodswallow *Artamus cinereus normani* Mathews, 1923.

Table 2. Regional ecosystems of conservation concern (Neldner 1999) that will be managed as part of the golden-shouldered parrot recovery process.

Regional Ecosystem	Description	Status	Beneficial actions
3.3.59	*Sorghum plumosum* ± *Themeda arguens* grasslands	Of concern	A.1.1.1 A.1.2.1 A.1.3.1 A.1.4.1 A.6.2.1 A.6.2.2 A.7.1.1
3.5.17	*Melaleuca stenostachya* ± *Melaleuca viridiflora* low open-woodland	Of concern	A.1.1.1 A.1.2.1 A.1.3.1 A.1.4.1 A.6.2.1 A.6.2.2

Habitat restoration recommended for golden-shouldered parrot recovery entails the reversal of invasion by broad-leaved ti-tree *Melaleuca viridiflora* of grasslands on drainage depressions. Communities dominated by broad-leaved ti-tree cover 14.2% of Cape York Peninsula, whereas the threatened grassland communities occupy less than 0.2% (Neldner and Clarkson 1999; Crowley and Garnett 1998). Recovery of this habitat will therefore not impact adversely on broad-leaved ti-tree, habitats dominated by broad-leaved ti-tree, or dependent fauna.

Research findings arising from earlier golden-shouldered parrot recovery plans (Garnett and Crowley 1995a, 1999), particularly the role of, and threats to, cockatoo grass, have contributed to the understanding of processes affecting the endangered gouldian finch *Erythrura gouldiae* (Gould, 1844) and the endangered northern bettong *Bettongia tropica* Wakefield, 1967 (Table 3). Planned actions during the current recovery plan include further assessing threats to cockatoo grass, notably grazing by pigs and cattle. These actions will be undertaken in cooperation with the recovery plan for the northern bettong, and information gained will contribute to the recovery of all three species.

Golden-shouldered parrot nests are the only known habitat of the antbed parrot moth *Trisyntopa scatophaga* (Table 3). The decline of the parrot thus implies that the antbed parrot moth is also endangered, although no direct assessment of the species status has been made. Plans to re-introduce golden-shouldered parrots to Mungkan Kandju National Park will also involve re-introduction of this species.

Table 3. Other rare and threatened species that will benefit from recovery actions. Action plans: Birds: Garnett and Crowley 2000, Mammals: Maxwell *et al*. 1996; EPBC: Environment Projection and Biodiversity Conservation Act 1999; E: endangered; V: vulnerable.

Common Name	Scientific Name	Status		Notes	Beneficial actions
		Action plans	EPBC		
Birds					
buff-breasted button-quail	*Turnix olivii*	V	E	grassland specialist, distribution overlaps with golden-shouldered parrot	A.1.1.1 A.1.2.1 A.1.3.1 A.1.4.1
black-faced woodswallow (Cape York Peninsula)	*Artamus cinereus normani*	NT		open woodland species, important for wet season survival of golden-shouldered parrot	A.1.1.1 A.1.2.1 A.1.3.1 A.1.4.1 A.5.1.1
star finch (Cape York Peninsula)	*Neochmia ruficauda clarescens*	E		grassland specialist, distribution overlaps with golden-shouldered parrot	A.1.1.1 A.1.2.1 A.1.3.1 A.1.4.1 A.6.2.1
crimson finch (white-bellied)	*Neochmia phaeton evangelinae*	E	V	grassland specialist, distribution overlaps with golden-shouldered parrot	A.1.1.1 A.1.2.1 A.1.3.1 A.1.4.1 A.6.2.1
gouldian finch	*Erythrura gouldiae*	E	E	feeds on cockatoo grass	A.6.2.1
Mammals					
northern bettong	*Bettongia tropica*	-	E	feeds on cockatoo grass	A.6.2.1
Insects					
antbed parrot moth	*Trisyntopa scatophaga*	-	not listed	known only from the nests of golden-shouldered parrots	A.1.1.1 A.1.2.1 A.1.3.1 A.1.4.1 A.6.2.1 A.7.1.1 A.7.4.1 A.7.5.1

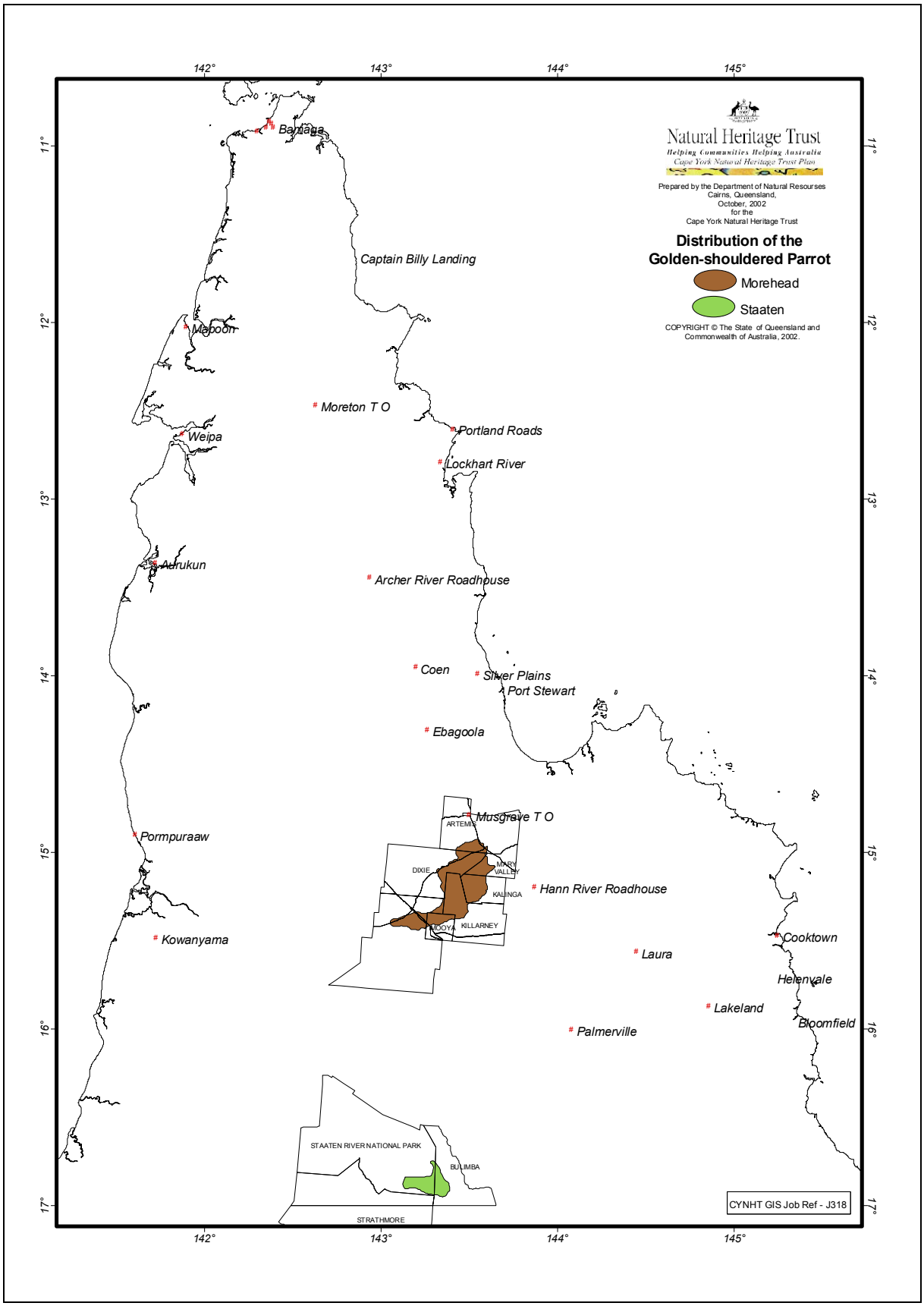
Social and economic impact

This recovery plan aims to contribute positively to communities within the distribution of the golden-shouldered parrots by (1) providing employment to residents and traditional owners, (2) improving ecological sustainability of pastoral activities through the improvement of fire management, vegetation structure and perennial grass composition. The implementation of this recovery plan is unlikely to cause significant adverse social and economic impacts. Unforeseen adverse effects should be avoided through comprehensive consultation processes described above.

Distribution

The golden-shouldered parrot occurs in the headwaters of the Morehead River and adjacent westward flowing streams (Morehead population) and the upper tributaries of the Staaten River (Staaten population). The range of the Morehead population is currently about 1380 km^2. Until 1998, it was still contracting, at least along its eastern boundary for which detailed distributional data is available. The Staaten population is currently thought to be contained in an area of about 300 km^2 west of the Lynd River in the headwaters of Cockburn, Back and White Horse creeks. Recent reports of parrots in other parts of the species' former

range are unconfirmed. Where searches have been made, additional populations were not found. If other populations do exist, they are likely to be threatened by the same processes that are affecting the known populations.



Habitat critical for survival

Critical and important habitats of the golden-shouldered parrot are described in Table 4. Although the parrots occupy a range of habitats, only a subset of these is thought to be irreplaceable within its life history. In the wet season the parrots appear to require the gravelly slopes of quartzite gravel that occur in association with metamorphic rocks and granites. These areas are refuges early in the wet season when most fallen seed has germinated and no storm-burnt seed is available on the flatter country. Seed on the gravels appears to germinate less readily because it is less vulnerable to early saturation. The other critical habitat is that used by the parrots for breeding. For nesting, the parrots require termite mounds, particularly those of *Amitermes scopulus* in the Morehead population and *A. vitiosus* in the Staaten population. They primarily occur along grassy drainage flats fringed by woodland, although they are also present on the gravel slopes. Where these habitats have an open structure, nesting appears to have a higher success rate than where the grass has been invaded by woodland. In the dry season, habitat choice appears to be based on the availability of annual grass seed. Seed is abundant in many different habitat types, so none can be considered critical.

The vegetation of the Morehead distribution has been mapped at 1:100,000 (Neldner and Clarkson 1999; Neldner 1999). Critical habitat occurs in a range of recognized vegetation units (Table 4). However, the habitat of the parrots is a complex and fine mosaic of many vegetation types. Many of these vegetation units have been inadequately mapped, partly because habitat units are of a size that is too small to map, and partly because much of the nesting habitat is difficult to access. Vegetation maps of the area are made up of polygons that represent vegetation mosaics, with up to four units listed at each location. Using the primary vegetation element shown on the maps, it is possible to predict nesting habitat occurring at only 14.8% of 741 known nests. When all vegetation elements of the polygons are used, vegetation maps can be used to predict the occurrence of nesting habitat at 66% of nest sites. Nest sites that were poorly predicted by mapping were predominantly in hills, with15.7% (116 nests) of all known nests being mapped as occurring in *Eucalyptus cullenii* ± *Corymbia clarksoniana* woodland, even though no nests occurred in this habitat. Vegetation mapping in the hills is in particular need of refinement, with at least two vegetation mapping units (153 and 159) not being recognized as occurring there. A further 12.3% (91) of nests were mapped as occurring within *Eucalyptus tetrodonta* ± *Corymbia clarksoniana* ± *Erythrophleum chlorostachys* woodland, even though no nests were found in this habitat. Revised mapping of critical habitat in the core study area is under way, with the aim of identifying critical habitat. Critical wet season feeding habitat occurs at an even finer scale than nesting habitat. Much of the critical habitat also occurs in poorly mapped hills. Revised mapping will assist in identifying this habitat, but many sites are too small to be identified at 1:100,000.

The vegetation of the Staaten distribution has been mapped at 1:1,000,000 (Morgan 1999). Critical habitat also occurs in a range of recognized vegetation units (Table 4). However, because of the scale of current mapping, no attempt has been made to reconcile nest locations with vegetation mapping units. Hence no attempt should be made to identify extent of critical habitat from the vegetation maps that are currently available.

Table 4. Critical (shaded) and important (not shaded) Golden-shouldered parrot habitat.

Habitat	Wet season feeding	Breeding	Breeding season feeding	Dry season feeding	Roosting	VMU[1]	RE[2]	Biodiversity status	Structural type	Dominant species	Critical/ important habitat characteristics	Artemis	Mary Valley	Dixie	Kalinga	Killarney	Imooya	Staaten R. NP	Bulimba
Gravel slopes	***	***		*		153	(3.3.47)		Low open-woodland	*Melaleuca citrolens* ± *Melaleuca foliolosa* ± *Melaleuca viridiflora* ±*Melaleuca acacioides*	Termite mounds: *Amitermes scopulus* Gravel and rocks *Alloteropsis semialata*, *Schizachyrium* spp., *Eriachne obtusa*, *Fimbristylis* spp. *Scleria* spp. *Hybanthus enneaspermus*, *Aneilema siliculosum*, *Heliotropium* sp	+	+	+	+	+	0	0	0
	***	***		*	*	159	(3.3.50)		Low open-woodlands	*Melaleuca viridiflora* ± *Petalostigma pubescens* ± *Corymbia clarksoniana*		+	+	+	+	+	0	0	0
Planichloa flats	***			*		153	3.3.47		Low open-woodland	*Melaleuca citrolens* ± *Melaleuca foliolosa* ± *Melaleuca viridiflora* ±*Melaleuca acacioides*	Gaps in woody vegetation dominated by *Schizachyrium* spp ± *Planichloa nervilemma* ± legumes.	+	+	+	+	+	0	0	0
Broad flats	*	***	*			158	2.3.28/ 3.3.49		Low open-woodlands	*Melaleuca viridiflora* ± *Petalostigma banksii*	Termite mounds: *Amitermes scopulus* ± *Amitermes laurensis*	1	1	1	0	0	0	1	1
	*	***	*			184	3.3.59	Of concern	Closed tussock grassland	*Sorghum plumosum* ± *Themeda arguens*	*Alloteropsis semialata*, *Ischaemum fragile*, Storm-burnt *Ischaemum* fragile *Digitaria* spp.,±*Paspalum scrobiculatum*, ±*Desmodium* sp., ±*Echinochloa colona* ±*Ischaemum decumbens*	+	0	0	0	0	0	0	0
		***				180	3.3.56		Closed tussock grassland	*Eriachne* spp. ± *Aristida* spp. ± *Eragrostis* spp. ± *Fimbristylis* spp.	Termite mounds: *Amitermes scopulus* ± *Amitermes laurensis*	0	0	0	1	0	0	0	0

Habitat	Wet season feeding	Breeding	Breeding season feeding	Dry season feeding	Roosting	VMU[1]	RE[2]	Biodiversity status	Structural type	Dominant species	Critical/ important habitat characteristics	Artemis	Mary Valley	Dixie	Kalinga	Killarney	Imooya	Staaten R. NP	Bulimba
Closed flats	*	***		*		144	2.3.28/ 3.5.14		Low woodlands	*Melaleuca viridiflora* ± *Acacia spp.* ± *Asteromyrtus symphyocarpa*	Termite mounds: *Amitermes scopulus* ± *Amitermes laurensis*	0	0	0	0	1	0	1	1
	+	***		*		153	3.3.47		Low open-woodland	*Melaleuca citrolens* ± *Melaleuca foliolosa* ± *Melaleuca viridiflora* ±*Melaleuca acacioides*		0	0	1	1	1	0	0	0
	*	***		*	*	159	2.3.28/ 3.3.42/ 3.3.50		Low open-woodlands	*Melaleuca viridiflora* ± *Petalostigma pubescens* ± *Corymbia clarksoniana*		1	1	1	1	1	1	1	1
	*	***		*		156	3.5.17	Of concern	Low open-woodland	*Melaleuca stenostachya* ± *Melaleuca viridiflora*		1	0	1	0	0	0	0	0
Flat edges		***		*	*	57	3.3.15		Woodland	*Eucalyptus brassiana*	Termite mounds: *Amitermes scopulus* ± *Amitermes laurensis*± *Schizachyrium* spp. ± *Thaumastochloa* spp.	+	0	+	0	0	0	0	0
		***		*		110	3.3.33		Woodland	*Thryptomene oligandra*, *Melaleuca viridiflora* ± *Acacia torulosa* ± *Grevillea pteridifolia* ± *Neofabricia mjoebergii*		1	1	1	1	1	1	0	0
Rocky hills	+					69	3.11.7		Woodland	*Eucalyptus cullenii* ± *Corymbia clarksoniana* ± *Eucalyptus chlorophylla* ± *Corymbia confertiflora*	Boulders or storm burnt areas with seed of *Hyptis suaveolens* ± *Aneilema siliculosum*	0	1	1	1	1	1	0	0
	+					70	3.11.8/ 3.12.10		Woodland	*Eucalyptus cullenii* ± *Corymbia clarksoniana*		1	1	1	1	1	0	0	0
Box flats			+	*		113	2.3.10/ 3.9.2/ 3.3.36		Open-woodland	*Eucalyptus chlorophylla*	*Sorghum plumosum*, *Heteropogon triticeus* ± *Heteropogon contortus*	1	1	1	1	1	1	1	1

Habitat	Wet season feeding	Breeding	Breeding season feeding	Dry season feeding	Roosting	VMU[1]	RE[2]	Biodiversity status	Structural type	Dominant species	Critical/ important habitat characteristics	Artemis	Mary Valley	Dixie	Kalinga	Killarney	Imooya	Staaten R. NP	Bulimba
Sand ridges/ hills	+		+	*	*	63	2.5.5/ 3.3.20		Woodland	*Corymbia clarksoniana* ± *Erythrophleum chlorostachys* ± *Melaleuca viridiflora* ± *Eucalyptus leptophleba*± *Eucalyptus tetrodonta* ± *Eucalyptus chartaboma*	*Eriachne obtusa*, *Alloteropsis semialata*, *Sorghum plumosum*, *Heteropogon triticeus*, *Eragrostis* spp., *Panicum* spp., *Schizachyrium* spp., *Thaumastochloa* spp. ±*Digitaria* spp. ±*Brachyachne convergens* ± *Brachiaria holosericea* ±*Phyllanthus* spp.	1	0	0	0	0	0	1	1
	+		+	*	*	92	2.5.5/ 3.5.7		Woodland	*Eucalyptus tetrodonta* ± *Corymbia clarksoniana* ± *Erythrophleum chlorostachys* (± *Parinari nonda*)		1	1	1	1	1	1	1	1
	+		+	*		98	3.5.9		Woodland	*Eucalyptus tetrodonta* ± *Corymbia hylandii* subsp. *peninsularis* ± *Erythrophleum chlorostachys* ± *Corymbia setosa* subsp. *pedicillaris*		0	0	1	0	0	1	0	0
	+		+	*	*	101	3.5.10		Woodland	*Eucalyptus tetrodonta* ± *Corymbia nesophila* (± *Parinari nonda*)		1	0	0	0	0	0	0	0
	+		+	*	*	104	3.5.12		Woodland	*Eucalyptus tetrodonta* ± *Corymbia nesophila* ± *Corymbia clarksoniana* (± *Parinari nonda*)		1	1	1	1	1	0	0	0
Bare areas				*		198	3.2.6		Stream beds			+	+	+	+	+	+	+	+
	*			*		-	-		Roads and bare areas			+	+	+	+	+	+	+	+
Riparian forest					*	48	3.3.10		Open forest	*Melaleuca argentea* ± *Melaleuca fluviatilis* ± *Melaleuca leucadendra*		1	1	1	1	1	1	0	0
Swamp edge					*	53	2.2.28/ 3.3.14		Woodland	*Melaleuca saligna* ± *Melaleuca viridiflora* ± *Asteromyrtus symphyocarpa* ± *Melaleuca spp.*		+	+	+	+	+	+	1	1

[1]. Vegetation Mapping Unit (Neldner and Clarkson 1999). [2]. Regional Ecosystem (Neldner 1999; Morgan 1999).

Critical habitat is found throughout the parrot's distribution, and on all of the eight properties on which the parrots are currently found (Table 4). Landholders and traditional owners of each of these properties have been consulted in developing the current recovery plan and each of the two previous recovery plans (Table 5). As most work so far has been undertaken on the Morehead population, consultation with landholders and traditional owners associated with this population's distribution has been most comprehensive. Changes to ownership of some properties have meant that it has been necessary to establish contact with new owners from time to time. Similarly, the nature of consultation with traditional owners, either directly or through representative bodies, is evolving as aspirations of traditional owners groups clarify.

Threats and appropriate management relating to each habitat category are described in detail in the *Threats* and *Management practices* sections.

Important populations

Breeding is known from two areas. The Morehead population is known to occur over an area of approximately 1,380 km^2 from the Peninsula Development Road at Windmill Creek in the north-east to Dixie Station in the north-west south-west along Eight Mile Creek west of Imooya Station and south-east as far as Tobacco Yard on Kalinga Station. The north-east boundary of this population is known to have retreated by 40 km^2 since 1992 when nesting occurred at South Five Mile Creek and Kalkah on Artemis Station. Previously this population was known to have extended at least as far north-east as Violetvale Station, where it was last recorded in 1974, and possibly Marina Plains. Breeding also occurred on the eastern block of Kalinga and probably on Koolburra Station in the 1970s and may also have occurred on Olive Vale and Kalpowar in the 1960s and early 1970s. Repeated surveys on Killarney station have failed to find nests south of Six Mile creek which represents the southern boundary of the population. Limits to and trends in the western distribution of this population are poorly known. The population is at its lowest during the breeding season. During the dry season flocks of immature birds inflate the apparent abundance. Many of these appear to die during the wet season. Population size is therefore estimated on the basis of the number of birds alive during the breeding season. Of about 620 km^2 surveyed in detail, 250 km^2 had an estimated density of one pair/ km^2 with 10% having subsidiary immature males associated with them. The remaining areas had a density of about one pair per 5 km^2. Assuming the same ratio of high density to low density pertains over the entire range of the Morehead population (approximately 1,380 km^2), the population size during the breeding season before any birds have fledged is 1,070 individuals of which 500 are females. The contraction of breeding distribution is likely to have been associated with the loss of about 40 breeding birds.

Table 5. Distribution of critical golden-shouldered parrot habitat and consultation processes.
N/A not applicable; *** critical habitat; * important habitat; + occasional habitat.

Property	Habitat	VMU	RE	Biodiversity status	Wet season feeding	Breeding	Landholders				Traditional owners			Notes
							Consulted	Recovery team representation	Conservation agreement	Property planning	Group(s)	Consulted	Recovery team representation	
Morehead population														
Artemis	Flat edges	57	3.3.15			***	Yes	Yes	Yes	Yes	Kuku Thaypan, Ukele	Yes	Yes	Leaseholder involvement since 1992. Traditional owners consulted directly since 1992 and through Balkanu since 1999.
	Flat edges	110	3.3.33			***								
	Gravel slopes	153	(3.3.47)		***	***								
	Planichloa flats	153	3.3.47		***									
	Closed flats	156	3.5.17	Of concern	*	***								
	Broad flats	158	3.3.49		*	***								
	Gravel slopes	159	(3.3.50)		***	***								
	Closed flats	159	3.3.42/ 3.3.50		*	***								
	Broad flats	184	3.3.59	Of concern	*	***								
Mary Valley	Flat edges	110	3.3.33			***	Yes	-	-	-	Kuku Thaypan	Yes	Yes	New leaseholders, invited to recovery team membership October 2002. Traditional owners consulted directly since 1992 and through Balkanu since 1999.
	Gravel slopes	153	(3.3.47)		***	***								
	Planichloa flats	153	3.3.47		***									
	Broad flats	158	3.3.49		*	***								
	Gravel slopes	159	(3.3.50)		***	***								
	Closed flats	159	3.3.42/ 3.3.50		*	***								

Property	Habitat	VMU	RE	Biodiversity status	Wet season feeding	Breeding	Landholders				Traditional owners			Notes
							Consulted	Recovery team representation	Conservation agreement	Property planning	Group(s)	Consulted	Recovery team representation	
Dixie	Flat edges	57	3.3.15			***	Yes	Yes	-	-	Ukele	Yes	Yes	Involvement since 1992. Current managers representing leaseholders since 1999. Traditional owners consulted through Balkanu since 1999.
	Flat edges	110	3.3.33			***								
	Gravel slopes	153	(3.3.47)		***	***								
	Planichloa flats	153	3.3.47		***									
	Closed flats	153	3.3.47		+	***								
	Closed flats	156	3.5.17	Of concern	*	***								
	Broad flats	158	3.3.49		*	***								
	Gravel slopes	159	(3.3.50)		***	***								
	Closed flats	159	3.3.42/ 3.3.50		*	***								
Imooya	Flat edges	110	3.3.33			***	No	No	No	No	Ukele	Yes	Yes	Leaseholder consulted 1992-1999. Current absentee leaseholder has not been located. Traditional owners consulted through Balkanu since 1999.
	Closed flats	159	3.3.42/ 3.3.50		*	***								
Kalinga	Flat edges	110	3.3.33			***	Yes	Yes	-	Yes	Kuku Thaypan	Yes	Yes	Leaseholders involvement since 1995. Traditional owners consulted directly since 1992 and through Balkanu since 1999.
	Gravel slopes	153	(3.3.47)		***	***								
	Planichloa flats	153	3.3.47		***									
	Closed flats	153	3.3.47		+	***								
	Gravel slopes	159	(3.3.50)		***	***								
	Closed flats	159	3.3.42/ 3.3.50		*	***								
	Broad flats	180	3.3.56		*	***								

Property	Habitat	VMU	RE	Biodiversity status	Wet season feeding	Breeding	Landholders				Traditional owners			Notes
							Consulted	Recovery team representation	Conservation agreement	Property planning	Group(s)	Consulted	Recovery team representation	
Killarney	Flat edges	110	3.3.33			***	Yes	Yes	-	-	Kuku Thaypan, Ukele	Yes	Yes	Involvement since 1993, present leaseholders since 1999. Traditional owners consulted directly since 1992 and through Balkanu since 1999.
	Closed flats	144	3.3.28/ 3.5.14			***								
	Gravel slopes	153	(3.3.47)		***	***								
	Planichloa flats	153	3.3.47		***									
	Closed flats	153	3.3.47		+	***								
	Gravel slopes	159	(3.3.50)		***	***								
	Closed flats	159	3.3.42/ 3.3.50		*	***								
Staaten population														
Bulimba	Closed flats	144	2.3.28			***	Yes	Yes	-	-	Uwoykand	Yes	Yes	Current landholders and traditional owners consulted directly since 1998.
	Broad flats	158	2.3.28		*	***								
	Closed flats	159	2.3.28		*	***								
Staaten River NP	Closed flats	144	2.3.28			***	Yes	Yes	NA	NA	Uwoykand	Yes	Yes	Traditional owners consulted directly since 1998.
	Closed flats	159	2.3.28		*	***								
	Broad flats	158	2.3.28		*	***								

The range of the Staaten population is less well known. It occurs west of the Lynd River on Bulimba Station and on Staaten River National Park, a particularly remote site with no vehicular access. Surveys in 1997 and 2002 have defined the eastern and northern boundaries with the surveys subscribing an area of approximately 300 km^2. The western and southern limits to the population, however, are unknown and may extend beyond the surveyed area. However they are known to have bred on Bulleringa Station to the southeast of the currently known population in the 1960s, but were not be found there in searches during the 1990s. From the number of nests encountered in short surveys and the number of birds seen, including a single flock of over 100 individuals, the density of Staaten population is probably at least twice that of the Morehead population. The population is therefore estimated to be 1,300 individuals, of which about 600 are females.

The total breeding population is estimated to total approximately 2,300 individuals in two populations of approximately equal size. In the non-breeding season, assuming an average productivity of 1.2 fledglings/nest attempt, the population is thought to swell to about 3,600.

While there have been reports of birds away from these areas in the last decade, no nesting has been confirmed. Those reports it has been possible to investigate have proved erroneous. Previously a third breeding population was known north-east of Coen on Mt Croll Station and Mungkan Kandju National Park and to the south-east of Coen on Silver Plains Station. Breeding was last definitively known north of Coen in 1922 (White 1922) and on Silver Plains in 1927 but individuals were seen on Silver Plains in the 1950s and a young bird was caught north of Coen in 1970.

Threats

Predation appears to be the immediate cause of decline, possibly in combination with a shortage of food in the early wet season. Both threats have come about as a result of a change in fire regime, particularly in combination with cattle grazing. One result of the change in fire regime has been an increase in the density of woody plants, notably broad-leaved ti-tree *Melaleuca viridiflora*. This appears to have increased the vulnerability of birds to predation during the wet season and while nesting. The second effect has been the development of a coarser mosaic of burning histories, which is thought to decrease the chances of dispersing parrots finding suitable habitat in the wet season. Cattle affect the parrot by reducing seed production by wet season grasses and reducing the fuel load, particularly in the habitat used by the parrots when breeding.

Disappearance of golden-shouldered parrots from Lakefield National Parks in the 1970s to 1980s has been attributed to loss of grasslands and thickening of grassy woodlands associated with inappropriate fire regimes (Garnett and Crowley 1999). Similar loss of habitat as a result of inappropriate fire regimes has also occurred on Mungkan Kandju National Park (Neldner *et al.* 1997), where birds were lasted recorded nesting in the 1920s.

Table 6. Threats summary. ***, significant current or probable potential threat; * possible potential threat

Location name	Coordinates	Population size	Land tenure	Type of threat	Status of threat	Wet season feeding	Breeding	Breeding season feeding	Dry season feeding	Roosting	Current actions to reduce threats	Future actions to reduce threats
A Morehead population	15°15' S 143°30' E	1,500	Pastoral leases	Increased success of predators as a result of vegetation thickening	Current/ primary	***	***				• Fencing to allow stock control • Firebreak network of early dry season fires • Storm-burning[2] at 2-4 year intervals • Monitoring effects of pigs and cattle	• Fencing to allow stock control • Firebreak network of early dry season fires • Storm-burning at 2-4 year intervals • Monitoring effects of pigs and cattle • Conservation agreements (property planning)
				Loss of perennial grasses	Current/ primary	***		***			• Fencing to allow stock control • Monitoring effects of pigs and cattle	• Control of pig numbers (fencing, poisoning and hunting) • Conservation agreements (property planning)
				Loss of termite mounds	Potential/ primary		***				• Monitoring effects of pigs and cattle	• Monitoring effects of pigs and cattle • Actions that will derive from the results of monitoring
				Inappropriate fire regime (vegetation thickening; loss of perennial grasses; loss of termite mounds)	Current/ secondary	***	***	***			• Fencing to allow stock control • Firebreak network of early dry season fires • Storm-burning at 2-4 year intervals	• Conservation agreements (property planning)
				Overgrazing (vegetation thickening; loss of perennial grasses)	Current/ secondary	***		***			• Fencing to allow stock control • Destocking of National Parks • Monitoring effects of cattle	• Conservation agreements (property planning)

[2] Burning within 5 days of the first heavy rains (≥ 50 mm over 72 hours) of the wet season.

Location name	Coordinates	Population size	Land tenure	Type of threat	Status of threat	Wet season feeding	Breeding	Breeding season feeding	Dry season feeding	Roosting	Current actions to reduce threats	Future actions to reduce threats
				Pig rooting (vegetation thickening; loss of perennial grasses; loss of termite mounds)	Current/ secondary	***	***	***			• Monitoring effects of pigs	• Control of pig numbers (fencing, poisoning and hunting) • Conservation agreements (property planning)
				Clearance (habitat loss)	Potential/ secondary	*	*	*	*	*	• Conservation agreement (one area)	• Conservation agreements (property planning)
				Disease	Potential/ primary	Effect not habitat specific					• None	• Action will be taken only if there is evidence that disease is affecting the population. Such actions may include quarantine and limitations to keeping birds in the vicinity
				Trapping and trade	Potential/ Historical/ primary	Effect not habitat specific					• Restrictions on export (CITES App. I listing) • Prohibition of wild take (*Nature Conservation Act 1992* Section 88 (1)) except under license	• Continue existing measures
				Predation by feral cats	Potential/ primary	Effect not habitat specific					• Feral cats shot when encountered, which is rarely	• Continue existing actions unless feral cat predation shown to be of greater significance than currently believed

Location name	Coordinates	Population size	Land tenure	Type of threat	Status of threat	Wet season feeding	Breeding	Breeding season feeding	Dry season feeding	Roosting	Current actions to reduce threats	Future actions to reduce threats
B Staaten Population	16°50' S 143°20' E	500	Pastoral lease/ National Park	Increased success of predators as a result of vegetation thickening	Current/ primary	***	***	***			• Firebreak network of early dry season fires • Storm-burning at 2-4 year intervals	• Continue existing measures
				Loss of perennial grasses	Current/ primary	***		***			• Firebreak network of early dry season fires • Storm-burning at 2-4 year intervals •	• Continue existing measures
				Loss of termite mounds	Potential/ primary		***				• Firebreak network of early dry season fires • Storm-burning at 2-4 year intervals	• Continue existing measures
				Inappropriate fire regime (vegetation thickening; loss of perennial grasses; loss of termite mounds)	Current/ secondary	***	***	***			• Firebreak network of early dry season fires • Storm-burning at 2-4 year intervals	• Continue existing measures
				Overgrazing (vegetation thickening; loss of perennial grasses)	Current/ secondary	***		***			• Monitoring trends in parrot numbers	• Continue existing measures and take further action if decline evident
				Pig rooting (vegetation thickening; loss of perennial grasses; loss of termite mounds)	Current/ secondary	***	***	***			• Monitoring trends in parrot numbers	• Continue existing measures and take further action if decline evident

Location name	Coordinates	Population size	Land tenure	Type of threat	Status of threat	Wet season feeding	Breeding	Breeding season feeding	Dry season feeding	Roosting	Current actions to reduce threats	Future actions to reduce threats
				Clearance (habitat loss)	Potential/ secondary	*	*	*	*	*	• Half the area is National Park	• Conservation agreements if clearing applied for
				Disease	Potential/ primary	Effect not habitat specific					• None	• Action will be taken only if there is evidence that disease is affecting the population. Such actions may include quarantine and limitations to keeping birds in the vicinity
				Trapping and trade	Potential/ Historical/ primary	Effect not habitat specific					• Restrictions on export (CITES App. I listing) • Prohibition of wild take (*Nature Conservation Act 1992* Section 88 (1)) except under license	• Continue existing measures
				Predation by feral cats	Potential/ primary	Effect not habitat specific					• Monitoring trends in parrot numbers	• Continue existing measures and take further action if decline evident

2. Objectives and criteria

Overall objective

A. Improve the conservation status of the golden-shouldered parrot from endangered to vulnerable.
B. Develop and implement land management strategies that restore grassland and grassy woodlands to the benefit of dependent fauna and in sympathy with co-existing land values.
C. Assist recolonization of known former golden-shouldered parrot habitat.
D. Operate the recovery program efficiently, cost-effectively, and with high levels of community participation.

Each overall objective is supported by a range of specific objectives, performance criteria and actions (Appendix 2).

Specific Objectives

1. Manage habitat for golden-shouldered parrots at a landscape scale.
2. Maintain parrot population at receding edge of distribution.
3. Determine population trends.
4. Determine and manage impacts of pied butcherbirds on nest success.
5. Determine and manage impacts of change in vegetation structure on black-faced woodswallows.
6. Assess and minimize adverse impacts of cattle and pigs on food plants and termite mounds.
7. Increase the number of wild populations of golden-shouldered parrots.
8. Downlist species from endangered to vulnerable.
9. Support recovery process.

Performance criteria

C.1.1: Management plans on relevant National Parks on Cape York Peninsula include specific actions for maintaining structure of grasslands and grassy woodlands.
C.1.2: Management of grasslands and grassy woodlands on designated National Parks is consistent with guidelines.
C.1.3: Property plans on at least two pastoral properties include specific actions for conservation of golden-shouldered parrots.
C.1.4: Management on designated pastoral properties for golden-shouldered parrots compliant with property plans.
C.2.1: Parrots attending at least one wet season feeding station on eastern edge of distribution.
C.3.1: Population trends are quantified.
C.4.1: Pied butcherbird project plan approved.
C.4.2: Influence of pied butcherbird predation on nest productivity quantified and recommendations incorporated into parrot management.
C.5.1: Relationship between nesting success of black-faced woodswallows and vegetation structure quantified, management implications determined and recommendations incorporated into parrot management.
C.6.1: Levels of cattle and pig damage on cockatoo grass and termite mounds are quantified.
C.6.2: Interim guidelines for cattle stocking rates and pig control measures are provided.
C.6.3: Recommended guidelines for cattle stocking rates and pig control measures are incorporated into management plans.
C.7.1: Management of reintroduction trial area complies with strategy for management of golden-shouldered parrot habitat on National Parks.
C.7.2: Nursery stocks of cockatoo grass are adequate to supply re-vegetation requirements.
C.7.3: Reintroduction trial area contains healthy population of seeding cockatoo grass.

C.7.4: A captive breeding program to provide golden-shouldered parrots for reintroduction is operating within IUCN guidelines.
C.8.1: Submission made to Threatened Species Scientific Committee to reclassify golden-shouldered parrot as vulnerable *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).
C.8.2: Submission made to reclassify golden-shouldered parrot as vulnerable under Schedule 3 of the *Nature Conservation (Wildlife) Regulation 1994.*
C.9.1: Continued functioning of a recovery team to direct the recovery process, a major review and a new recovery plan.

Evaluation of recovery plan

A recovery team will meet on a regular basis (generally at an annual recovery team meeting) to assess the progress of the recovery plan (Action 9.1.1). Consultant(s) will be contracted to review the recovery plan in the fourth year (Action 9.1.4).

3. Recovery Actions

Specific objective 1 Manage habitat for golden-shouldered parrots at a landscape scale

Action 1.1.1 Advise National Park management regarding fire management of grasslands and grassy woodlands.

Justification

Habitat management, particularly using fire, is part of current National Parks practice, and involves consultation with traditional owners, other stakeholders and environmental advisors, as appropriate. Guidelines for the maintenance of golden-shouldered parrot habitat (Crowley *et al.* 2002), which were prepared as part of the ongoing recovery planning process, should be adopted as part of this process. Maintenance of open vegetation structure, particularly of grassland nesting habitat and wet season feeding areas, is considered essential to the persistence of golden-shouldered parrots. Persistence of parrots on Staaten River National Park is thought to be attributable to regular fires at the time of the first wet season storms, which maintain the open structure of grasslands and grassy woodlands. Recovery of grasslands and grassy woodlands may also permit the recolonization of abandoned habitat on Mungkan Kandju National Park. Recovery of grasslands and grassy woodlands in Mungkan Kandju National Park will increase the availability of potential habitat for the golden-shouldered parrot and other dependent fauna (including the antbed parrot moth, and buff-breasted button-quail).

Methods

Fire management plans for Staaten River and Mungkan Kandju National Parks will be prepared in consultation with a member of the golden-shouldered parrot recovery team. For relevant habitats see Table 6 (above). Action is to be carried out annually with the pattern from 2003 being used as a template for future years. Funding is required to cover the salary of the recovery team officer.

Responsibility

Administration: QPWS. Fieldwork: QPWS; traditional owners.

Action 1.2.1 Implement and assess adherence to grassland and grassy woodland management guidelines on designated National Parks.

Justification

Implementation of NRM guidelines regarding maintenance of grasslands and grassy woodlands is required to ensure the protection of existing habitat on Staaten River National

Park, and to recover abandoned habitat on Mungkan Kandju National Park. Implementation will be undertaken as part of existing National Park management.

Methods
Annual workshops will be held during the wet season to assess the compliance of the previous year's burn program with planned burns and to plan the burn program for the coming year. National Park management consults with park traditional owners as a part of this annual process. Country is then burnt to fit, as far as possible, with proposed burning schedules. For relevant habitats see Table 6 (above). Action is annual. No additional funding is required; action is core QPWS activity.

Responsibility
Administration: QPWS. Fieldwork: QPWS, traditional owners.

Action 1.3.1 Participate in property planning on Cape York Peninsula.

Justification
Property planning provides the most effective means of implementing management consistent with golden-shouldered parrot conservation.

Methods
Property planning is an ongoing process on two Cape York Peninsula properties where golden-shouldered parrots occur and involves leaseholders, traditional owners and government. Plans produced limit grazing in golden-shouldered parrot habitat and provide guidelines for ongoing management that reflect the results of monitoring. For relevant habitats see Table 6 (above). Action is ongoing and has to fit with wider timetables. For plans to be ratified, funds are required for on-ground works (to be provided from outside the recovery plan budget). Parrot-related discussion as part of property planning is provided as in kind support for the recovery process.

Responsibility
Administration: QPWS, leaseholders, traditional owners.

Action 1.4.1 Implement and assess adherence to golden-shouldered parrot habitat management guidelines on designated pastoral properties.

Justification
The primary recommendation for the first two property plans being negotiated is fencing to enable spell grazing. Spell grazing will allow fuel build-up for storm-burning and the recovery of cockatoo grass from grazing.

Methods
Fences will be erected to enable parts of each property important for golden-shouldered parrot to be spelled from grazing. Annual grazing regimes will be determined after discussion with QPWS and will depend on pasture condition, amount of rain in the wet season and fire history. At the same time compliance with previous plans will be assessed. Fencing is an ongoing process as material becomes available. For relevant habitats see Table 6 (above). On-ground action will be timetabled into the annual work program. Other activities are annual and would be timed to coincide with traditional owners as part of conditions under an Indigenous Land Use Agreement. Funds are required for fencing materials and some labour (from outside recovery plan budget). Annual meeting costs relating to parrot management are provided as in-kind support to the recovery process.

Responsibility
Fieldwork: leaseholders, traditional owners.

Specific objective 2 Maintain parrot population at receding north-eastern edge of distribution

Action 2.1.1 Provide seed for parrots during wet season at one or more feeding stations on north-eastern edge of distribution.

Justification

The distribution of golden-shouldered parrots contracted at its eastern fringe between 1974 and 1997 (Garnett and Crowley 1999). Since 1996, supplementary feeding appears to have been successful in arresting this decline. Previously abandoned nesting areas close to one feeding station have been continually occupied since supplementary wet season food was supplied. Monitoring will determine whether this service is continuing to provision the parrots.

Methods

Feeding stations are supplied with seed as required from the late dry season to the mid wet season. On one morning per fortnight, the size and composition of parrot flocks attending the feeding station will be counted in the first two hours after dawn. Actions are annual. Funding is required to provide seed and for salary.

Responsibility

Administration: QPWS. Fieldwork: QPWS.

Specific objective 3 Determine population trends

Action 3.1.1 Sequentially monitor populations at selected sites once every five years.

Justification

Mapping and determining the success of nests is the most effective means of measuring the success of population trends (Garnett and Crowley 1999). Yearly monitoring of nest sites on Artemis station indicates that following population declines between 1992 and 1998, the population is stabilizing. Five-yearly monitoring of remote nest sites in 1996/7 and 2001/2 has established that the monitored populations at most other sites are stable. Five-yearly monitoring of key areas is therefore considered adequate to establish trends throughout the parrot's distribution.

Methods

Surveys involve riding along suitable habitat searching for nests during the period May-July and recording locations of survey path and locations of nests. Comparisons of populations will be made using minimum convex polygon within nesting habitat. Subject to permission from relevant leaseholders and traditional owners, the surveys would be conducted according to the following timetable:

2003: lowlands between Sugarloaf Creek and Mary's Creek; south of the road to Dixie Station:

2004: lowlands between Sugarloaf Creek and Artemis bullock paddock; north of the road to Dixie Station;

2005: east from Artemis bullock paddock from South Five Mile Creek to Seventeen Mile Creek;

2006: previously surveyed sites on Kalinga, Mary Valley, Killarney;

2007: Bulimba Station and Staaten River National Park.

Funds are required for salary, and for motorcycle fuel and maintenance. Funds are also sought for hire of an additional motorcycle for surveys away from Artemis.

Responsibility

Administration: QPWS. Fieldwork: QPWS, leaseholders, traditional owners.

Specific objective 4 Determine impacts of pied butcherbirds on nest success
Action 4.1.1 Develop research plan to determine effects of pied butcherbird predation.

Justification
Pied butcherbirds are thought to be a major predator of young golden-shouldered parrots, particularly immediately before and after fledging when they have already survived predation from other sources. It has never been possible to quantify this to determine whether it is a major influence on the fecundity of the parrots. To do this properly necessitates careful design of the research plan, preferably with refereeing by others who have done similar research.

Methods
Prepare a research plan and circulate for comment. Incorporate comments as appropriate.
Responsibility
Administration: QPWS.

Action 4.1.2 Obtain ethics approval for pied butcherbird research plan.

Justification
Almost certainly butcherbird predation cannot be quantified without first removing some butcherbirds. This process requires public consultation and ethics approval before the work begins.

Methods
Prepare an ethics approval proposal and disseminate among the recovery team and other interested parties for comment.

Responsibility
Administration: QPWS.

Action 4.2.1 Undertake quantitative study of pied butcherbird predation on golden-shouldered parrot nests.

Justification
Assuming a project plan has been written (Action 4.1.1) and approved (Action 4.1.2), research will be required for at least two breeding seasons to determine comparative productivity between manipulated and control nests to determine whether there is any change in productivity. Support will be needed for fieldwork and for a student if one with appropriate aptitude can be located.

Methods
Methods will be determined in Action 4.1.1.

Responsibility
Administration: QPWS. Fieldwork: QPWS, student if appropriate.

Action 4.2.2 Determine management implications of pied butcherbird research for golden-shouldered parrots.

Justification
The research should provide results that can give guidance on the management of golden-shouldered parrots. This may involve removal of selected butcherbirds or other means of protecting parrot nests.

Methods
Researcher will produce a report on how their results can be used to improve the conservation status of the golden-shouldered parrot.

Responsibility
Administration: QPWS.

Action 4.2.3 Incorporate pied butcherbird recommendations into parrot management guidelines.

Justification
Protection of parrots from butcherbird predation, if thought necessary as a result of 4.2.1, needs to be incorporated into parrot management plans if it is to be effective.

Methods
Recovery team will decide how recommendations will be incorporated into the revised recovery plan.

Responsibility
Administration: QPWS.

Specific objective 5 Determine and manage impacts of change in vegetation structure on black-faced woodswallows

Action 5.1.1 Complete research into the relationship between vegetation structure and fecundity of black-faced woodswallows.

Justification
Black-faced woodswallows have an important role during the early wet season as they protect their nests against predators and thus warn parrots feeding nearby. They have become less abundant however, in the area from which the parrot has disappeared, possibly for the same reasons, since the Cape York Peninsula subspecies is a bird of open woodland and the more closed woodland that is developing as a result of vegetation thickening may not be suitable for them. Research on the woodswallows has already been started by a PhD student from Northern Territory University. The results of this research should answer questions on whether this is the case.

Methods
Fecundity of the woodswallows will be determined in relation to the structure of the vegetation.

Responsibility
Administration: QPWS. Fieldwork: NTU student, QPWS.

Action 5.1.2 Determine management implications of black-faced woodswallow research for golden-shouldered parrots.

Justification
The research should provide results that can give guidance on the management of golden-shouldered parrots. This may involve intense management of traditional woodswallow breeding areas.

Methods
Researcher will produce a report on how their results can be used to improve the conservation status of the golden-shouldered parrot.

Responsibility
Administration: NTU student, QPWS.

Action 5.1.3 Incorporate black-faced woodswallow recommendations into parrot management guidelines.

Justification
Management of woodswallow habitat, if thought necessary as a result of 5.1.1, needs to be incorporated into parrot management plans if it is to be effective.

Methods
Recovery team will decide how recommendations will be incorporated into the revised recovery plan.

Responsibility
Administration: QPWS.

Specific objective 6 Assess and minimize adverse impacts of cattle and pigs on food plants and termite mounds

Action 6.1.1 Monitor and assess cattle and pig impacts on cockatoo grass and termite mounds.

Justification
During the period 2000-2002, heavy pig predation was noted in areas where termite mounds of the type used for nesting and cockatoo grass has been monitored. It is not known whether this has a long-term detrimental effect at a scale likely to threaten the persistence of the parrots. Trial plots have been erected to exclude cattle or cattle and pigs in selected habitat on Artemis Station. Similar plots may be set up on other properties as part of property planning. These plots need to be monitored over a range of climatic conditions to determine the impact of the two species.

Methods
Biennial visits to monitor treatment and control plots: to determine condition of cockatoo grass immediately after the wet season; and fuel load at the end of the dry season. Where possible, monitoring would be undertaken with leaseholders and traditional owners as part of property planning and would include perennial grasses important for pastoralists (*Sorghum, Heteropogon*) and plants of cultural importance. The monitoring would also consider woody plants to verify the conclusions of the management recommendations on fire and grazing management being drawn up as part of the 1998-2002 Recovery Plan. Actions would be biennial. Funding is required for labour to support monitoring.

Responsibility
Administration: QPWS. Fieldwork: QPWS; traditional owners.

Action 6.2.1 Develop and implement management strategies to minimize cattle impacts on cockatoo grass and termite mounds in golden-shouldered parrot habitat if this is determined necessary in A.6.1.1.

Justification
If cattle exclusion demonstrates significant differences in the availability of cockatoo grass seed in the early wet season, then methods should be devised to exclude cattle from key wet season feeding areas or to amend spell-grazing regimes. Rotation of stock in association with storm-burning may be adequate to elevate seed availability (A.1.4.1). However, fencing of small areas may also be required.

Methods
Assess abundance of cockatoo grass after storm-burning in association with stock reduction using methods of Crowley and Garnett (2001). If necessary, fence off small areas of wet season feeding habitat to exclude cattle (e.g. along existing fence lines). For relevant habitats see Table 6 (above). Time of action is to be determined. Funding is required for surveys, and may also be required for fencing.

Responsibility
Administration: QPWS; fieldwork: QPWS, leaseholders; traditional owners.

Action 6.2.2 Develop and implement management strategies for the control of pigs in golden-shouldered parrot habitat if this is determined necessary in A.6.1.1.

Justification
If the impact of pigs on control plots is shown to be sufficiently intense to be detrimental to golden-shouldered parrots, control of pigs may be necessary.

Methods
The methods used to control pigs may range from more intensive baiting to shooting to exclusion fencing of selected sites depending on the site and the scale of control thought necessary. For relevant habitats see Table 6 (above). Actions would be conducted when necessary, and may be necessary only after wet years when pig numbers are high. Funding may be required to supplement that expended on normal leaseholder activities.

Responsibility
Administration: QPWS. Fieldwork: QPWS, leaseholders, traditional owners.

Action 6.3.1 Advise National Park managers regarding appropriate levels of pig control.

Justification
Pig control may also be necessary on protected areas to reduce damage to resources needed by golden-shouldered parrots.

Methods
An estimate of the impact of pigs will be made as part of Action 5.2.1. Advice to National Park management will be made on the basis of observations made as part of that action. For relevant habitats see Table 6 (above). Action would occur when necessary. Funding may be required to supplement QPWS core business.

Responsibility
Administration: QPWS. Fieldwork: QPWS, traditional owners.

Specific objective 7 Increase the number of wild populations of golden-shouldered parrots

Action 7.1.1 Restore and maintain grassland structure of reintroduction trial area using appropriate fire regime, in co-operation with leaseholders and traditional owners.

Justification
The area of Mungkan Kandju National Park designated for restoration has been grazed by cattle and pigs for over 100 years. Fencing and destocking will allow recovery of this area. The burning regime for the destocked area will then need to be managed using fire in accordance with the principles being adopted under 1.1.2.

Methods
Fire planning and verification will be conducted on fenced area as per Action 1.1.2. For relevant habitats see Table 6 (above). Action will occur annually. No extra funds needed.

Responsibility
Administration: QPWS. Fieldwork: QPWS, traditional owners.

Action 7.2.1 Establish and maintain nursery stocks of cockatoo grass for re-establishing in reintroduction trial area.

Justification
A nursery is to be established near the Land and Sea Centre in Coen. One of its tasks will be to establish cockatoo grass from which seed can be obtained for broad scale propagation once the right conditions for germination and recruitment have been established. The stocks are needed as a means of increasing the availability of cockatoo grass on the trial release area for golden-shouldered parrots.

Methods
Base stock will be collected from central Cape York Peninsula and established in pots in the nursery. Propagation trials and training in nursery management will be undertaken at Coen and Lake Eacham. Action will take place starting late 2002 and will be ongoing according to the results of trials and to demand. Funds may be required after existing project for further training and for nursery maintenance.

Responsibility
Administration: QPWS. Fieldwork: QPWS, traditional owners.

Action 7.3.1 Establish and maintain cockatoo grass in reintroduction trial area.

Justification
Cockatoo grass appears to be an important component of the wet season diet for a range of granivorous birds. Dense stands of the species should enhance the probability that reintroduced golden-shouldered parrots will flourish.

Methods
In a range of suitable sites, areas fenced against cattle and pigs will be planted out with young cockatoo grass at high density to maximize seed production and availability during the wet season. For relevant habitats see Table 6 (above). Action would begin in 2003 wet season. Funds may be needed to establish further plots after current project, but requirements cannot be predicted at this stage.

Responsibility
Administration: QPWS. Fieldwork: QPWS, traditional owners.

Action 7.4.1 Prepare a full justification for reintroduction against appropriate IUCN guidelines.

Justification
Arguments for reintroduction and release need to be prepared against IUCN guidelines (IUCN/SSC 1995) to satisfy government agencies that such a program can be justified.

Methods
A justification will be prepared for captive breeding and release. It is known that the most important prerequisites for such a program have been met. These are that the species is absent from an area from which it was once present and that rehabilitation of habitat under secure tenure is under way to make it possible for the species to live there again. Captive breeding and release is preferred over translocation as released birds will be more likely to stay near the release site, making it possible to feed them during the wet season in their first inexperienced year as well as to determine whether the release program has been successful. Action will be completed early 2003. No extra funds are required.

Responsibility
Administration: QPWS.

Action 7.4.2 Consult with aviculturists about aviary design and the best means of building up stock for release.

Justification
Golden-shouldered parrots are difficult to breed in captivity but substantial captive stocks will be required before enough birds are available to make a release possible. The skills in captive breeding are held by the avicultural community. It is hoped members of this community will be able to play a major role in any captive release program. It is thought captive breeding should occur.

Methods
Letters will be written to the Parrot Society of Australia and local avicultural clubs asking their advice on how the numbers of captive animals will be increased, designs for aviaries and instructions on parrot management in aviaries. Action will be undertaken when release area has been secured and the recovery of the parrot habitat has been initiated. No extra funds required.

Responsibility
Administration: QPWS, aviculturists.

Action 7.4.3 Negotiate with potential donors to construct aviaries, and construct aviaries at appropriate sites.

Justification
The level of interest among aviculturists wishing to become involved in recovery of the species in the wild is such that it is hoped they will be able to fund the construction of aviaries at appropriate sites.

Methods
Applications/appeals for funds will be directed towards appropriate Australian and international funding agencies. When funding is secured, breeding aviaries will be built at two separate localities with a release aviary at the release site. Action will be undertaken when the release area has been secured and the recovery of the parrot habitat has been initiated. Extra funds may be required to top up external contributions but extent cannot currently be predicted.

Responsibility
Administration: QPWS, traditional owners, aviculturists.

Action 7.4.4 Capture an appropriate number of wild parrots of an appropriate age class for captive breeding.

Justification
A small number of wild parrots will need to be captured for the breeding program.

Methods
A small number of parrots will be captured for the breeding program. It is envisaged that these will be nestlings taken from nests with a low probability of success.

Responsibility
Administration: QPWS. Fieldwork: QPWS, traditional owners, aviculturists.

Action 7.4.5 Initiate captive breeding program.

Justification
Once the breeding stock has been captured a breeding program will be necessary to build up captive stock before release.

Methods
Breeding of captive stock will be initiated with all birds being micro-chipped and genetically typed. A studbook will be maintained. No release will take place until a minimum of 50 birds is available for release at the release site. It is not anticipated that any release will take place in the life of the current recovery plan. Techniques for release will be influenced by those being trialed at Mareeba Wetlands for the Gouldian Finch.

Responsibility
Administration: QPWS. Fieldwork: QPWS, traditional owners, aviculturists.

Specific objective 8 Downlist species from endangered to vulnerable

Action 8.1.1 If appropriate on basis of A.3.1.1 write submission to Threatened Species Scientific Committee to reclassify golden-shouldered parrot as vulnerable under *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).

Justification
If all actions are successful it should be possible to downlist the species from Endangered to Vulnerable.

Methods
The appropriate application will be completed when the full round of monitoring is complete in 2007 and trends are known from across the species' range. The timetable for this action is consistent with the 1998-2002 Recovery Plan. Action will take place in 2007 if appropriate. No extra funding required.

Responsibility
Administration: QPWS.

Action 8.2.1 If appropriate on basis of A.3.1.1 write submission to reclassify golden-shouldered parrot as vulnerable under Schedule 3 of the *Nature Conservation (Wildlife) Regulation 1994.*

Justification
If all actions are successful it should be possible to downlist the species from Endangered to Vulnerable.

Methods
The appropriate application will be completed when the full round of monitoring is complete in 2007 and trends are known from across the species' range. The timetable for this action is consistent with the 1998-2002 Recovery Plan. Action will take place in 2007 if appropriate. No extra funding required.

Responsibility
Administration: QPWS.

Specific objective 9 Support recovery process

Action 9.1.1 Manage the recovery process through a recovery team.

Justification
The appropriate body to undertake reviews of the recovery plan is a recovery team drawn from representatives of funding bodies, land management agencies, community stakeholders and other people with appropriate expertise.

Methods
The recovery team will usually meet once a year and consists of: representatives of the Queensland Parks and Wildlife Service (chair and participating employees), leaseholders with golden-shouldered parrots on their properties; representatives of traditional owners and other indigenous communities, with Birds Australia and the Cairns and Far North Environment Centre representing other community interests. Meetings would take place annually, usually around October. Funds are required for the administration of meetings.

Responsibility
Administration: QPWS. Attendance: leaseholders (Artemis, Bulimba, Dixie, Kalinga, Killarney, Mary Valley, others where appropriate); traditional owners; QPWS (Cairns, Atherton, Chillagoe, Coen, Lake Eacham), Birds Australia (representative), Cairns and Far North Environment Centre. An appropriate avicultural society may be invited to join the team in the event of success in rehabilitating habitat.

Action 9.1.2 Consult with interested parties and keep them informed of progress.

Justification
Most golden-shouldered parrots live on leasehold land that is managed for pastoral purposes and where native title applies. Native title also applies on Mungkan Kandju National Parks, from which the parrots have disappeared. Leaseholders and traditional owners are therefore stakeholders who have the right to be informed of any actions or policies that affect these lands. Their cooperative involvement will ensure that actions developed are consistent with their various aspirations for affected land. The golden-shouldered parrot is also an iconic species of interest to specialist bird and conservation organizations (Australian Conservation Foundation, Birds Australia, Cairns and Far North Environment Centre, Threatened Species Network for Queensland, Wildlife Preservation Society of Queensland, WorldWide Fund for Nature, avicultural societies) that wish to be informed of progress in the recovery process. Actions affecting land on Cape York Peninsula can also affect interest groups that do not have direct interest in affected lands. These stakeholders (Cook Shire Council, Cape York Peninsula Development Association, several pastoralist associations) should also have the opportunity to assess the potential effects of recovery action on their communities.

Methods
Prepare a newsletter *Antbed* as occasion demands and other information as the need arises. Funds are needed for salary, illustrations and postage.

Responsibility
Administration: QPWS.

Action 9.1.3 Support non-government stakeholder attendance at meetings.

Justification
The attendance of non-government stakeholders at recovery meetings is frequently contingent on financial support. Financial support also indicates the esteem with which stakeholder involvement is regarded by government agencies.

Methods
Funds will be made available for the attendance of non-government members of the recovery team. Funding will be required to cover travel costs, and, where appropriate, overnight accommodation.

Responsibility
Administration: QPWS.

Action 9.1.4 Conduct a major review of the recovery process.

Justification
A major review is a requirement of the recovery process to assess the progress made toward meeting the recovery plan objectives. It should include input from people not involved in the recovery plan and may require contracting a consultant(s).

Methods
A major review of the recovery program will occur in the final year of the recovery plan. Action will take place early in 2007 to allow results of the review to be incorporated in the next recovery plan. Funds are required for a consultant to carry out the review.

Responsibility
Administration: QPWS. Report: consultant.

Action 9.1.5 Rewrite the recovery plan at the end of five years.

Justification
A recovery plan is necessary to carry forward actions into the next period.

Methods
All data will be drawn together from the recovery process to consider actions required for the next recovery plan. Action will take place in mid-late 2007. Funds will be required for the lead author of the recovery plan.

Responsibility
Administration: QPWS; recovery plan preparation and review: consultant, recovery team.

Management practices

Critical habitat of golden-shouldered parrot (Table 4) should be managed to maintain an open grassland/grassy woodland structure, to protect termite mounds suitable for nesting

and maintain seeding populations of perennial grasses (particularly cockatoo grass and plume sorghum).

Critical habitat should not be cleared. Clearance elsewhere in the parrot's distribution is unlikely to have adverse effects, as long as substantial areas of eucalyptus/corymbia woodland with fire grass remain (>70% original cover on sand ridges, >50% other land forms).

Critical habitat should be managed using low stocking rates (or destocking) and storm-burning every two to four years. In most habitats, three-yearly storm-burning is ideal. This should maximize fuel loads. Where stock are present, numbers should be reduced at least 6 months before burning, to maximize fuel loads, and up to six months after burning, to allow recovery of perennial grasses.

Critical habitat needs to be protected from unintentional fire through the dry season. The most effective method for doing this is to use early dry-season burning to create firebreaks around designated areas, especially between critical habitat and public roads.

Pig numbers should also be controlled in critical habitat, through the use of baiting, fencing and hunting.

Management practices essential to the maintenance of critical habitat:

(1) moderate stocking rates or destocking,
(2) effective pig control,
(3) regular storm-burning,
(4) effective firebreak networks.

Signs of habitat degradation are:

(1) golden-shouldered parrots no longer present,
(2) golden-shouldered desert traditional nesting areas,
(3) black-faced woodswallows desert traditional nesting areas,
(4) dense suckering of broad-leaved ti-tree and/or lemon-scented ti-tree,
(5) cockatoo grass population declines, or its seed production reduced,
(6) plume sorghum population declines,
(7) increase in annual grass at the expense of perennial grass.

Management practices most likely to degrade critical habitat:

(1) clearance,
(2) inadequate pig control,
(3) overstocking,
(4) inappropriate fire regime (frequent dry season fires or inter-fire intervals of five or more years).

4. Cost of Recovery

Included in the following account are the costs of actions undertaken as part of National Park and/or pastoral management, where that management is deemed to contribute to the maintenance or recovery of golden-shouldered parrots. Most of these costs are being borne by the leaseholders, and are listed here in recognition of their contributions.

Table 8. Cost of recovery per annum (* actions for which funding assistance is required)

Action no.	Action description	2003	2004	2005	2006	2007	Total
A.1.1.1*	Advise National Park management regarding fire management of grasslands and grassy woodlands	$3,000	$1,500	$1,500	$1,500	$1,500	$9,000

A.1.2.1	Implement and assess adherence to grassland and grassy woodland management guidelines on designated National Parks	$20,000	$20,000	$20,000	$20,000	$20,000	$100,000
A.1.3.1	Participate in property planning on Cape York Peninsula	$3,000	$1,000	$1,000	$1,000	$1,000	$7,000
A.1.4.1	Implement and assess adherence to golden-shouldered parrot habitat management guidelines on designated pastoral properties	$2,000	$2,000	$2,000	$2,000	$2,000	$10,000
A.2.1.1*	Provide seed for parrots during wet season at one or more feeding stations on north-eastern edge of distribution	$3,000	$3,000	$3,000	$3,000	$3,000	$15,000
A.3.1.1*	Sequentially monitor populations at selected sites once every five years	$15,000	$15,000	$12,000	$18,000	$20,000	$80,000
A.4.1.1	Develop research plan to determine effects of pied butcherbird predation	$2,000	-	-	-	-	$2,000
A.4.1.2	Obtain ethics approval for pied butcherbird research plan	$500	-	-	-	-	$500
A.4.2.1*	Undertake quantitative study of pied butcherbird predation on golden-shouldered parrot nests	-	$5,000	$5,000	$5,000	-	$15,000
A.4.2.2	Determine management implications of pied butcherbird research for golden-shouldered parrots	-	-	-	$500	-	$500
A.4.2.3	Incorporate pied butcherbird recommendations into parrot management guidelines	-	-	-	$500	-	$500
A.5.1.1*	Complete research into the relationship between vegetation structure and fecundity of black-faced woodswallows	$19,000	$19,000	$7,000	-	-	$45,000
A.5.1.2	Determine management implications of black-faced woodswallow research for golden-shouldered parrots	-	-	$500	-	-	$500
A.5.1.3	Incorporate black-faced woodswallow recommendations into parrot management guidelines	-	-	$500	-	-	$500
A.6.1.1*	Monitor and assess cattle and pig impacts on cockatoo grass and termite mounds	$10,000	$10,000	$15,000	$15,000	$15,000	$65,000
A.6.2.1*	Develop and implement management strategies to minimize cattle impacts on cockatoo grass and termite mounds in golden-shouldered parrot habitat if this is determined necessary in A.6.1.1	$1,500	$1,500	$1,500	$3,000	$3,000	$10,500
A.6.2.2	Develop and implement management strategies for the control of pigs in golden-shouldered parrot habitat if this is determined necessary in A.6.1.1	$1,500	$1,500	$1,500	$1,500	$1,500	$7,500
A.6.3.1*	Advise National Park managers regarding appropriate levels of pig control	-	$3,000	$2,000	$1,000	$1,000	$7,000
A.7.1.1*	Restore and maintain grassland structure of reintroduction trial area using appropriate fire regime, in co-operation with leaseholders and traditional owners	$3,000	$3,000	$3,000	$3,000	$3,000	$15,000
A.7.2.1*	Establish and maintain nursery stocks of cockatoo grass for re-establishing in reintroduction trial area	$15,000	$15,000	$15,000	$15,000	$15,000	$75,000
A.7.3.1*	Establish and maintain cockatoo grass in reintroduction trial area	$4,000	$4,000	$4,000	$4,000	$4,000	$20,000

A.7.4.1*	Prepare a full justification for reintroduction against appropriate IUCN guidelines	$2,000	-	-	-	-	$2,000
A.7.4.2*	Consult with aviculturists about aviary design and the best means of building up stock for release	$2,000	-	-	-	-	$2,000
A.7.4.3*	Negotiate with potential donors to construct aviaries, and construct aviaries at appropriate sites	-	-	-	$40,000	$10,000	$50,000
A.7.4.4*	Capture an appropriate number of wild parrots of an appropriate age class for captive breeding	-	-	-	-	$25,000	$25,000
A.7.4.5*	Initiate captive breeding program	-	-	-	-	$25,000	$25,000
A.8.1.1*	If appropriate on basis of A.3.1.1 write submission to Threatened Species Scientific Committee to reclassify golden-shouldered parrot as vulnerable under *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)	-	-	-	-	$3,000	$3,000
A.8.2.1*	If appropriate on basis of A.3.1.1 write submission to reclassify golden-shouldered parrot as vulnerable under Schedule 3 of the *Nature Conservation (Wildlife) Regulation 1994*	-	-	-	-	$3,000	$3,000
A.9.1.1*	Manage the recovery process through a recovery team	$4,000	$4,000	$4,000	$4,000	$4,000	$20,000
A.9.1.2*	Consult with interested parties and keep them informed of progress	$1,000	$1,000	$1,000	$1,000	$1,000	$5,000
A.9.1.3*	Support non-government stakeholder attendance at meetings	$2,000	$2,000	$2,000	$2,000	$2,000	$10,000
A.9.1.4*	Conduct a major review of the recovery process	-	-	-	-	$10,000	$10,000
A.9.1.5*	Rewrite the recovery plan at the end of five years.	-	-	-	-	$5,000	$5,000
	Funding assistance required	$84,500	$87,000	$76,000	$115,500	$153,500	$516,500
	Funded from other programs	$29,000	$24,500	$25,500	$25,500	$24,500	$129,000
Total		$113,500	$111,500	$101,500	$141,000	$178,000	$645,500

5. Acknowledgments

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Cover photograph generously provided by Sam Abell.

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7. Appendix 1

Recovery team members

Participant	Organization	Details
Stephen Garnett	QPWS	Chair/biologist
Gabriel Crowley	QPWS	Botanist
Peter Latch	QPWS	Threatened species manager
Lana Little	QPWS	District manager (Staaten River National Park)
Leasie Felderhof	QPWS	National resources management
Nigel Tucker	QPWS	Nursery
Susan Shephard	Artemis	Leaseholder
Tom Shephard	Artemis	Leaseholder
Alan Holmes	Kalinga	Leaseholder
Merrilyn Holmes	Kalinga	Leaseholder
Glen Ide	Killarney	Leaseholder
Jeff Ide	Killarney	Leaseholder
Roddy Chong	Bulimba	Leaseholder
Glen O'Donaghue	Dixie	Leaseholder
Karen O'Donaghue	Dixie	Leaseholder
Anne Creek	Coen Land and Sea Management Centre	Traditional owner and indigenous communities representative
Matt Salmon	Balkanu	Traditional owner and indigenous communities representative
Graham Harrington	Birds Australia	Community group representative
John Rainbird	Cairns and Far North Environment Centre	Community group representative
Peter Thompson	Cape York Peninsula Development Association	Fire management specialist

8. Appendix 2

Recovery Plan Project Design 2003-2007

Overall objectives		Specific objectives		Performance criteria		Actions
A. Improve the conservation status of the golden-shouldered parrot from endangered to vulnerable	→	S.O.2: Maintain parrot population at receding edge of distribution	→	C.2.1: Parrots attending at least one wet season feeding station on eastern edge of distribution	→	A.2.1.1 Provide seed for parrots during wet season at one or more feeding stations on north-eastern edge of distribution
	→	S.O.3: Determine population trends	→	C.3.1: Population trends are quantified	→	A.3.1.1: Sequentially monitor populations at selected sites once every five years
	→	S.O.8: Downlist species from endangered to vulnerable	→	C.8.1: Submission made to Threatened Species Scientific Committee to reclassify golden-shouldered parrot as vulnerable under *Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)*	→	A.8.1.1: If appropriate on basis of A.3.1.1 write submission to Threatened Species Scientific Committee to reclassify golden-shouldered parrot as vulnerable under *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
			→	C.8.2: Submission made to reclassify golden-shouldered parrot as vulnerable under Schedule 3 of the *Nature Conservation (Wildlife) Regulation 1994*	→	A.8.2.1: If appropriate on basis of A.3.1.1 write submission to reclassify golden-shouldered parrot as vulnerable under Schedule 3 of the *Nature Conservation (Wildlife) Regulation 1994*
B. Develop and implement land management strategies that restore grassland and grassy woodlands to the benefit of dependent fauna and in sympathy with co-existing land values	→	S.O.1: Manage habitat for golden-shouldered parrots at a landscape scale	→	C.1.1: Management plans on relevant National Parks on Cape York Peninsula include specific actions for maintaining structure of grasslands and grassy woodlands	→	A.1.1.1: Advise National Park management regarding fire management of grasslands and grassy woodlands
			→	C.1.2: Management of grasslands and grassy woodlands on designated National Parks is consistent with guidelines	→	A.1.2.1: Implement and assess adherence to grassland and grassy woodland management guidelines on designated National Parks
			→	C.1.3: Property plans on at least two pastoral properties include specific actions for conservation of golden-shouldered parrots	→	A.1.3.1: Participate in property planning on Cape York Peninsula
			→	C.1.4: Management on designated pastoral properties for golden-shouldered parrots compliant with property plans	→	A.1.4.1 Implement and assess adherence to golden-shouldered parrot habitat management guidelines on designated pastoral properties
	→	S.O.4: Determine and manage impacts of pied butcherbirds on nest success	→	C.4.1: Pied butcherbird project plan approved	→	A.4.1.1: Develop research plan to determine effects of pied butcherbird predation
					→	A.4.1.2: Obtain ethics approval for pied butcherbird research plan
			→	C.4.2: Influence of pied butcherbird predation on nest productivity quantified and recommendations incorporated into parrot management	→	A.4.2.1: Undertake quantitative study of pied butcherbird predation on golden-shouldered parrot nests
					→	A.4.2.2: Determine management implications of pied butcherbird research for golden-shouldered parrots

Overall objectives	Specific objectives	Performance criteria	Actions
			→ A.4.2.3: Incorporate pied butcherbird recommendations into parrot management guidelines
	→ S.O.5: Determine and manage impacts of change in vegetation structure on black-faced woodswallows	→ C.5.1: Relationship between nesting success of black-faced woodswallows and vegetation structure quantified, management implications determined and recommendations incorporated into parrot management	→ A.5.1.1: Complete research into the relationship between vegetation structure and fecundity of black-faced woodswallows → A.5.1.2: Determine management implications of black-faced woodswallow research for golden-shouldered parrots → A.5.1.3: Incorporate black-faced woodswallow recommendations into parrot management guidelines
	→ S.O.6: Assess and minimize adverse impacts of cattle and pigs on food plants and termite mounds	→ C.6.1: Levels of cattle and pig damage on cockatoo grass and termite mounds are quantified	→ A.6.1.1: Monitor and assess cattle and pig impacts on cockatoo grass and termite mounds
		→ C.6.2: Interim guidelines for cattle stocking rates and pig control measures are provided	→ A.6.2.1: Develop and implement management strategies to minimize cattle impacts on cockatoo grass and termite mounds in golden-shouldered parrot habitat if this is determined necessary in A.6.1.1 → A.6.2.2: Develop and implement management strategies for the control of pigs in golden-shouldered parrot habitat if this is determined necessary in A.6.1.1
		→ C.6.3: Recommended guidelines for cattle stocking rates and pig control measures are incorporated into management plans	→ A.6.3.1: Advise National Park managers regarding appropriate levels of pig control
C. Assist recolonization of known former golden-shouldered parrot habitat	→ S.O.7: Increase the number of wild populations of golden-shouldered parrots	→ C.7.1: Management of reintroduction trial area complies with strategy for management of golden-shouldered parrot habitat on National Parks	→ A.7.1.1: Restore and maintain grassland structure of reintroduction trial area using appropriate fire regime, in co-operation with leaseholders and traditional owners
		→ C.7.2: Nursery stocks of cockatoo grass are adequate to supply re-vegetation requirements	→ A.7.2.1: Establish and maintain nursery stocks of cockatoo grass for re-establishing in reintroduction trial area
		→ C.7.3: Reintroduction trial area contains healthy population of seeding cockatoo grass	→ A.7.3.1: Establish and maintain cockatoo grass in reintroduction trial area
		→ C.7.4: A captive breeding program to provide golden-shouldered parrots for reintroduction is operating within IUCN guidelines	→ A.7.4.1: Prepare a full justification for reintroduction against appropriate IUCN guidelines → A 7.4.2: Consult with aviculturists about aviary design and the best means of building up stock for release → A.7.4.3: Negotiate with private interests to construct aviaries, and construct aviaries at appropriate sites → A.7.4.4: Capture an appropriate number of wild parrots of an appropriate age class for captive breeding

Overall objectives		Specific objectives		Performance criteria		Actions
					→	A.7.4.5: Initiate captive breeding program
D. Operate the recovery program efficiently, cost-effectively, and with high levels of community participation.	→	S.O.9: Support recovery process	→	C.9.1 Continued functioning of a recovery team to direct the recovery process, a major review and a new recovery plan	→	A.9.1.1: Manage the recovery process through a recovery team
					→	A.9.1.2: Consult with interested parties and keep them informed of progress
					→	A.9.1.3: Support non-government stakeholder attendance at meetings
					→	A.9.1.4: Conduct a major review of the recovery process
					→	A.9.1.5: Rewrite the recovery plan at the end of five years.