

# Recovery plan for the southern cassowary *Casuarius casuarius johnsonii* 2001–2005

*Prepared by staff of the Queensland Parks and Wildlife Service*



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**Prepared by:** staff of the Queensland Parks and Wildlife Service

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## Explanation of terms

CAG — Cassowary Advisory Group

C4 — Community for Coastal and Cassowary Conservation (Mission Beach)

CSIRO TFRC — Commonwealth Scientific and Industrial Research Organisation, Wildlife Ecology and Tropical Forest Research Centre, Atherton.

DNR — Queensland Department of Natural Resources

EPA — Environmental Protection Agency

GIS — Geographic Information System - computerised storage systems for geographical information including vegetation maps, fauna survey data and cadastral property boundaries.

JCU — James Cook University

MOU — Memorandum of Understanding (see section 3.1.4).

*Nature Conservation Act 1992* — the principal Act in Queensland by which the conservation of nature is carried out.

*Nature Conservation (Wildlife) Regulation 1994* — subordinate legislation to the NCA. This prescribes species of wildlife by class - protected wildlife (presumed extinct, endangered, vulnerable, rare, or common), international wildlife or prohibited wildlife.

Protected Area — an area of land declared under the *Nature Conservation Act 1992* and includes a National Park, a Conservation Park and a Nature Refuge.

Qld — Queensland

QPWS — Queensland Parks and Wildlife Service

Rainforest CRC — Cooperative Research Centre for Tropical Rainforest Ecology and Management

VCA — Voluntary Conservation Agreement

WTMA — Wet Tropics Management Authority

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cassowary Casuarius casuarius johnsonii  
2001–2005***



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## Summary

The southern cassowary *Casuarius casuarius johnsonii* is the largest native vertebrate in the Australian rainforests. It is an icon species attracting regional, national and international attention. The southern (Wet Tropics) population is classified as endangered under the Queensland *Nature Conservation (Wildlife) Regulation 1994* and the northern (Cape York) population is classified as vulnerable. The species is classified as endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. The primary cause of the species' decline in the wet tropics is thought to be habitat loss and fragmentation. Over 80 percent of the wet tropical coastal lowlands has been cleared. This area is considered a stronghold for the species in Australia. Population estimates by scientists, although crude, put the total adult population of cassowaries in Australia at less than 2500 with more conservative estimates at less than 1500.

Approximately 22 percent of the remaining cassowary habitat in the Wet Tropics has no conservation protection. Continuing loss of cassowary habitat for residential, agricultural and other industrial development is contributing to the decline of this species. Known causes of death, including vehicle strike and dog attack, are considered significant threats for local populations.

In order to arrest the human-derived threatening processes, a range of recovery initiatives has been identified. This plan outlines actions necessary to recover the southern cassowary and provides estimated costs for those actions over a five year period.

### Overall objective

The overall objective of the recovery process is to secure and enhance the status of the cassowary through an integrated program of investigations, on ground management, public awareness raising and capacity building during the life of this plan. It is unrealistic, at this stage, to estimate a timeframe for the whole recovery process.

Specific objectives within the period of this plan

1. To protect significant areas of suitable but currently unprotected habitat throughout the range of the cassowary by declaring new nature refuges, coordinated conservation areas, national parks and conservation parks.
2. To re-establish broad linkages between significant areas of suitable habitat in the Wet Tropics. These include north/south connections and a series of broad linkages between coastal habitat and the footslopes and ranges to the west.
3. To develop and implement strategies to manage threats arising from human-cassowary interaction.
4. To develop effective population monitoring techniques and to establish monitoring programs throughout the range of cassowaries.
5. To effectively involve the wider community in the recovery and conservation effort.
6. To gather knowledge of the species' ecology and on the impact of different threats on the viability of populations.

## 1. Introduction

### 1.1 The species

#### **Species covered by plan**

The plan specifically addresses the Australian population of the southern cassowary *Casuarius casuarius johnsonii*.

#### **Current conservation status**

The southern cassowary is currently listed as Endangered under Schedule 1 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and Endangered (southern or Wet Tropics population) and Vulnerable (northern or Cape York population) under the Queensland *Nature Conservation (Wildlife) Regulation 1994*.

#### **Region covered**

This plan refers to three distinct cassowary populations, two on Cape York Peninsula and one within the Wet Tropics biogeographic region of northern Queensland (Map 1). The Cape York Peninsula area covered by the plan stretches over 350km along the eastern part of the Cape between the Stewart River (Silver Plains) in the south and the Jardine River in the north. The plan covers the full extent of the Wet Tropics bioregion with particular focus on areas of cassowary occurrence between the Paluma Range north of Townsville to the Big Tablelands near Cooktown, a distance of over 400 km.

### 1.2 Cassowary recovery planning

#### **Plan contributors**

This plan has been developed by the Queensland Parks and Wildlife Service with the assistance of staff from the Environmental Protection Agency Planning and Assessment Unit, the Cassowary Scientific Advisory Group and members of the Cassowary (community) Advisory Group and its Technical Advisory Group, including the Rainforest CRC, cassowary conservation groups and the Queensland Wildlife Parks Association. Refer to membership details of Cassowary Scientific Advisory Group and Cassowary Advisory Group (Appendix 2 and 3).

#### **People affected by plan**

The plan details actions which will involve a range of stakeholders. Key stakeholders include :

- Private landholders
- Broader Australian community
- Queensland Parks and Wildlife Service
- Environmental Protection Agency
- Wet Tropics Management Authority
- Queensland Department of Natural Resources
- Queensland Transport
- Education Queensland
- Local government
- Aboriginal communities and councils
- Community conservation action groups
- Birds Australia
- Scientific research organisations (e.g. CSIRO and JCU)
- Sponsors

The extent of implementation will depend on the level of available funding, the level of community involvement and the level of acceptance of voluntary conservation initiatives by land owners.

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### **Links to other planning processes**

The principal planning mechanisms which may affect the recovery of this species are:

- FNQ Regional Planning Project,
- individual Strategic Plans for the Atherton, Cairns, Cardwell, Douglas, Eacham, Johnstone, Herberton and Mareeba Shires,
- the Wet Tropics Management Plan 1998,
- Cape York Peninsula Land Use Strategy,
- shire Strategic Plans,
- regional Coastal Management Plans:
  - Cape York Peninsula
  - Wet Tropical Coast
  - Cardwell / Hinchinbrook.

Other endangered species recovery plans which overlap cassowary habitat with related recovery actions include:

- mahogany glider *Petaurus gracilis*,
- northern bettong *Bettongia tropica*,
- spotted-tailed quoll *Dasyurus maculatus gracilis*.

### **1.3 Biodiversity Benefits**

Cassowaries are major long distance dispersal agents for rainforest trees with large fruit. Because they are large animals requiring large areas of habitat, the protection of their habitat will also protect a range of other threatened communities and species, particularly on the coastal lowlands where the rapid expansion of agriculture, tourism and urban development is resulting in a significant loss of biodiversity (Appendix 1).

Protection of cassowary habitat will have significant environmental benefits through maintaining clean air and water. Waterway health, wetlands and fish habitat areas will also benefit. The flow-on benefits to off shore habitats, including the Great Barrier Reef World Heritage area, cannot be over-stated.

### **1.4 Threats**

Several studies have identified the major factors contributing to the decline of the cassowary. These list the major threats as: habitat loss, fragmentation and modification, traffic accidents, visitor impacts, dogs, competition and nest predation by pigs, catastrophic events and disease (Crome & Moore 1990, Crome & Moore 1993, Goosem 1992, Bentrupperbaumer 1998).

#### **Habitat Loss**

The destruction of rainforest, be it for housing, roads or agriculture, threatens the survival of the cassowary and ultimately decreases its resilience to natural disasters (Bond 1987). Clearing the rainforest and the associated communities upon which cassowaries rely not only reduces resident cassowary numbers but may severely affect the ability of sub-adults to survive and establish territories (Bond 1987).

Significant clearing of the coastal plains and foothills between the Russell and Murray Rivers has resulted in the elimination of most of the best country for the species. Habitat loss, especially from coastal development, is still of significant concern (Bentrupperbaumer 1998). Habitat loss has been most extensive in the lowland areas where cassowary densities are thought to be highest. This has been caused by clearing of vegetation for agriculture and residential development. In the wet tropical lowlands (< 80m) 1983 estimates put the amount of rainforest cleared at 56.9 percent with much of the remaining habitat highly fragmented (Winter *et al.* 1987). By 1997, 80.7 percent of all natural vegetation in the wet tropical lowlands had been cleared. Clearing has been particularly intense in an area that was once the most important cassowary area, the Russell River to Murray River lowlands (Crome & Moore 1988, 1990). Up to 85 percent of cassowary habitat has been cleared in this region (QPWS records).

On the Atherton Tableland, habitat loss has been nearly as extensive as in the lowlands (Winter *et al.* 1987). In this area, cassowaries may have previously occurred in similar densities as in the lowlands.

However, under the *Vegetation Management Act 1999*, endangered regional ecosystems are now protected on all lands and of concern regional ecosystems are protected on state lands.

#### **Fragmentation**

Isolated forest patches appear to be particularly prone to the loss of cassowaries. Crome and Moore (1988, 1990) have documented several forest patches from which populations have disappeared or severely declined, and areas where clearing and development have isolated populations.

For cassowaries, access to watering points and alternative feeding areas is essential for the maintenance of populations, especially as there is variation in seasonal food availability (Bond 1987, Crome and Moore 1988, Bentrupperbaumer 1998).

Cassowaries living in small isolated forest patches may not be secure. As cassowaries are long-lived, they may persist in areas without breeding (Crome and Moore 1990). In addition, in small populations surrounded by development there may be no substantial recruitment of new individuals due to increased predation of chicks and juveniles by dogs and due to the absence of areas where juveniles may establish territories away from resident adults.

#### **Habitat Degradation**

Crome and Moore (1988) suggest that cassowaries can tolerate some structural damage to their habitat and that an intermediate level of damage, particularly that which promotes high species diversity, may favour them. But they believe that there appears to be a threshold of damage beyond which cassowaries decline. The proliferation of pioneer trees, such as *Alphitonia* and *Acacia* species, in response to disturbance would be of no short to medium-term benefit. Greater plant diversity, including fruit bearing climax species, would be of benefit upon maturity.

In the past, rainforest logging which removed fruit bearing trees had a major effect on food availability for the cassowary (Bond 1987). Large-scale changes in habitat structure and composition, including the invasion of weed species, has been attributed to inappropriate fire regimes (Humphries and Stanton 1992, Sattler and Williams 1999). Severe fires can progressively destroy rainforest on steep slopes, however the maintenance of sclerophyll communities utilised by cassowaries is dependant on the presence of fire.

#### **Natural Catastrophic Events**

In February 1986, Cyclone Winifred devastated much of the lowland rainforest areas around Innisfail, destroying the natural fruit supply upon which the local cassowaries were dependent (Bond 1987). Immediate impacts on the cassowary population included loss of shelter leading to heat stress and loss of food (Bentrupperbaumer 1998). Cassowaries were forced out of the forests in search of food. Supplementary feeding to increase short-term survival resulted in conflict problems at a later stage as birds became dependant on 'free feeding' (Bentrupperbaumer 1998).

Cyclonic events will continue to adversely affect cassowary populations where habitat areas are smaller and fragmented (Bentrupperbaumer 1998).

---

### **Roads and Traffic**

Motor vehicles are a major killer in some districts and road proliferation and widening not only fragments habitat but is a direct mortality factor (Bentrupperbaumer 1998).

Approximately 40 cassowaries were killed on Mission Beach Roads between 1989 and 1998 (Moore and Moore 1998). The high incidence of road kills in this area was attributed to the attraction of cassowaries to roadsides for feeding (Crome and Moore 1990, Bentrupperbaumer 1998). Given that cassowaries are long-lived, slow-reproducing animals with lengthy parental care and low juvenile survival, each road death of an adult bird may potentially influence population dynamics and the population's reproductive fitness (Bentrupperbaumer 1998).

### **Human Interaction**

Hand-feeding of cassowaries can cause them to associate humans with food and become dependent on being fed (Bond 1987). Members of the community have been feeding cassowaries for many years (Jorissen 1978). A feeding program was established in the Mission Beach area after Cyclone Winifred in 1986. Casual and uncontrolled feeding can alter birds' behaviour (Bond 1987).

Hand-feeding in developed areas may make birds more vulnerable to dog attack and road mortality. Hand-feeding at roadsides by tourists and tour operators results in cassowaries being attracted to roads and being hit by traffic. Birds that are fed regularly may become a hazard to humans (Kofron 1999). The majority of encounters between cassowaries and people are the direct result of hand-feeding. When cassowaries or people are at risk in these incidents, there is generally a great deal of community pressure to relocate the "problem bird", either for its own sake or for the protection of neighbouring residents. Translocation is in itself a contentious issue. Survival of the translocated bird and the impact on populations in the release area must be considered.

### **Dogs**

Dogs directly affect cassowaries by attacking them, resulting in deaths and injuries, and indirectly through their presence, which affects their feeding, movements and behaviour (Crome and Moore 1988, 1990). Bentrupperbaumer (1998) observed that dog attack was the second most important recorded source of cassowary mortality. Unattended dogs are able to prey on chicks and sub-adults. This is thought to be a significant impediment to recruitment near rural areas and along the edges of residential development. Dogs in packs are known to harass adults until they are exhausted and injure or kill them.

Pig dogs have been implicated as a substantial threat to cassowaries (Crome and Moore 1990). Deaths or injuries occur during hunting trips, and when dogs are lost and subsequently abandoned (Bentrupperbaumer 1998).

### **Hunting**

The literature indicates that cassowaries were hunted by non-Aboriginals (Crome and Moore 1990). They are reported to have been shot out of Malanda Scrub and were shot around Millaa Millaa in the 1960's (A. Macauliffe and R. Hill, in Crome and Moore 1990). Crome and Moore (1990) also reported encountering cassowaries that had been shot and butchered.

Crome and Moore (1988) suggested that cassowaries may be shot by pig shooters so as to limit pig dog injuries during encounters and to re-divert the dogs attention to pig hunting. The extent of non-traditional hunting which still occurs is unknown.

### **Indigenous utilisation**

Cassowaries are the largest native game in Australian and New Guinea rainforests and have been an important part of Aboriginal life and diet for centuries (Crome and Moore 1990). Aboriginal communities in the Wet Tropics region and Cape York hunt cassowaries and take their eggs for food but the extent of this utilisation has not been documented.

### **Pigs**

Pigs have a direct and an indirect impact on the cassowary (Mitchell 2000). Crome and Moore (1988) documented reports of pigs destroying nests and causing declines of cassowaries in the Daintree and the remaining forested areas of the southern Atherton Tableland. Bentrupperbaumer (1998) noted that cassowary eggs were left mostly unattended for up to two weeks while a clutch was being formed (laying period). Egg predation by pigs may occur at this time. Pigs also affect temporary water sources in cassowary habitat (Bentrupperbaumer 1998).

Pig control programs, including pig hunting and pig trapping, are known to affect cassowaries (Bentrupperbaumer 1998). Dogs used for with pig hunting will attempt to attack cassowaries if encountered. Injuries to both the dogs and cassowaries have been reported. Cassowaries can be attracted to baited pig traps and are occasionally captured. Traps not modified with cassowary proof triggers and traps not designed to allow quick release of non-target species can result in injury and death of cassowaries.

### **Disease**

Disease in cassowaries is thought to be a potential management issue, particularly for local populations under stress (Crome and Moore 1990). Tuberculosis has been diagnosed in several wild cassowaries at post mortem (Romer 1997). The organism has not been confirmed by culture, although *Mycobacterium avium* (avian TB) is suspected. Aspergillosis is also believed to be a secondary disease of debilitated cassowaries causing respiratory symptoms and ultimately mortality (Romer 1997).

## **1.5 Habitat critical for survival**

The concept of critical habitat is difficult to apply to this species. As habitat loss through direct clearing and fragmentation has been identified as the major cause of the species' decline, all remaining habitat utilised by cassowaries is considered important. The aim of action 3.1.1 is to identify the highest priority areas for conservation management.

### **Habitat utilised**

Cassowaries use a variety of habitat types, from rainforest communities, mangroves, melaleuca and various eucalypt woodlands, to swamps and swamp forests (Crome & Moore 1990, Bentrupperbaumer 1998). For example, in Hull River National Park, which supports a high density of cassowaries, Bentrupperbaumer (1998) found that cassowaries used a complex array of habitats including rainforest, swamp, woodland and beach/foreshore. In that area the most important habitat was swamps which were used, to varying degrees, throughout the whole year.

While some habitats may be important only briefly in the annual cycle of food production, Bentrupperbaumer (1998) warns that these may be crucial to the survival of cassowaries whose home ranges encompass them. Crome and Moore (1990) suggest that at times of food stress in the rainforest, such as after cyclones, food resources in non-rainforest habitats may be more important.



Areas of apparent high density within the Wet Tropics Crome and Moore (1990) identified areas of high activity or 'hot spots' around Mission Beach, Coquette Point (Moresby Range), Graham Range, Woopen/Badgery Creeks (upper Russell and North Johnstone River valleys), and the Wallaman Falls/Mt Fox State Forest. They further suggested that the Black Mountain corridor (Macalister Range), the Lamb Range to Davies Creek and the slopes on the north and east shores of Lake Tinaroo, appeared to be important for cassowary populations.

#### Habitat protection initiatives

Protection of cassowary habitat on state forest, Unallocated State Land (USL) and state reserves, is considered a high priority for the Wet Tropics population as these areas are generally intact and provide some scope for protection with minimal disruption to existing use. Approximately 6 percent of remaining cassowary habitat in the Wet Tropics occurs on state lands outside of the Wet Tropics World Heritage Area (Figure 1). Protection and management of cassowary habitat on state land will be addressed under the Memorandum of Understanding (action 3.1.4) between state government departments. Where the highest and best use for cassowary habitat on Unallocated State Land and other appropriate Government land is assessed as conservation or environmental protection, the Environmental Protection Agency will seek to have the area designated as a protected area under the *Nature Conservation Act 1992*, subject to the provisions of the Government Land Management System (GLMS).

Approximately 16 percent of remaining cassowary habitat in the Wet Tropics occurs on freehold and leasehold tenures with no protection status. Initiatives targeting these areas are addressed under section 3.1 of this plan. Land of high conservation value declared as an 'area of high nature conservation value' under the *Vegetation Management Act 1999* or 'critical habitat' under the *Nature Conservation Act 1992*, may provide further protection to cassowary habitat.

Some Shire Councils, including Johnstone Shire, Cardwell Shire and Mareeba Shire have implemented a voluntary conservation agreement program linked to a rate deferral scheme. Areas of cassowary habitat on private land have been targeted for a number of these agreements.

The QPWS has a regional extension officer dedicated to the Wet Tropics bioregion. Protection of cassowary habitat through Nature Refuge Agreements is a priority role for that position.

The Environmental Protection Agency works closely with shire councils through the review process of shire strategic plans. Protection of remnant habitat, particularly threatened regional ecosystems and habitat of threatened species, is a very high priority during these negotiations.

#### Unoccupied habitat

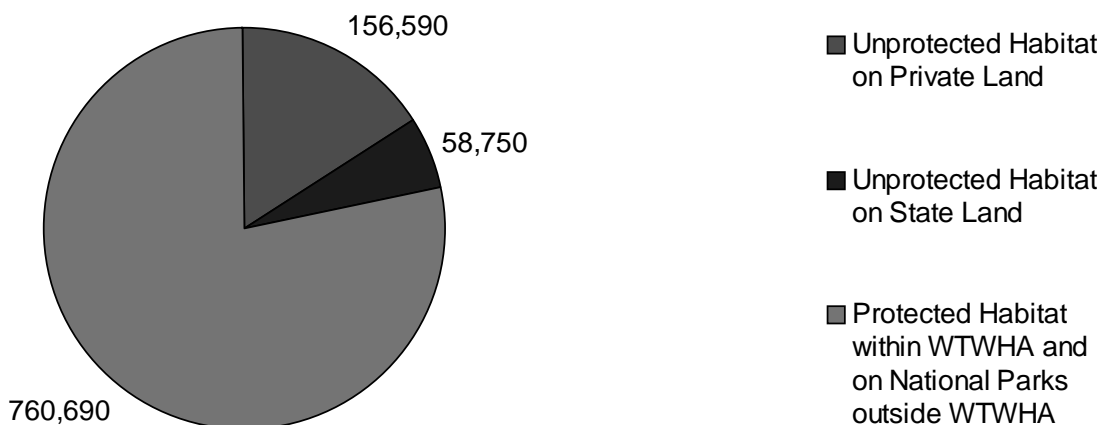
Crome and Moore (1988) found that cassowaries had declined significantly from a number of regions and appeared to have disappeared from some areas including the Atherton area and the Lower Goldsborough Valley. The decline and disappearance of cassowaries has been attributed to loss of habitat and severe habitat fragmentation (Crome and Moore 1988, 1990).

Cassowaries have been recorded moving significant distances over the agricultural landscapes of the Atherton Tablelands and coastal lowlands around Innisfail and Tully (Crome and Moore 1990, C4 records). The species appears to have the ability to independently reoccupy vacated areas, presumably through sub-adult dispersal, as adults do not migrate once they have established a home territory (Bentrupperbaumer 1998). The presence of a single cassowary is, however, not an indication of population recovery (successful breeding activity). Until the causes of the initial population decline are addressed (e.g. habitat loss and fragmentation), it is likely that replacement cassowaries would suffer the same fate (Crome and Moore 1988).

Within the lifetime of this plan, it is not a priority to undertake captive breeding and translocation or reintroduction for the purpose of species recovery. In the future, if vacated areas are restored and reconnected, such actions may be more useful. It is, however, likely that in such situations, the areas would be naturally recolonised from nearby stable populations.

### Level of protection of cassowary habitat in the Wet Tropics

(Area in ha)



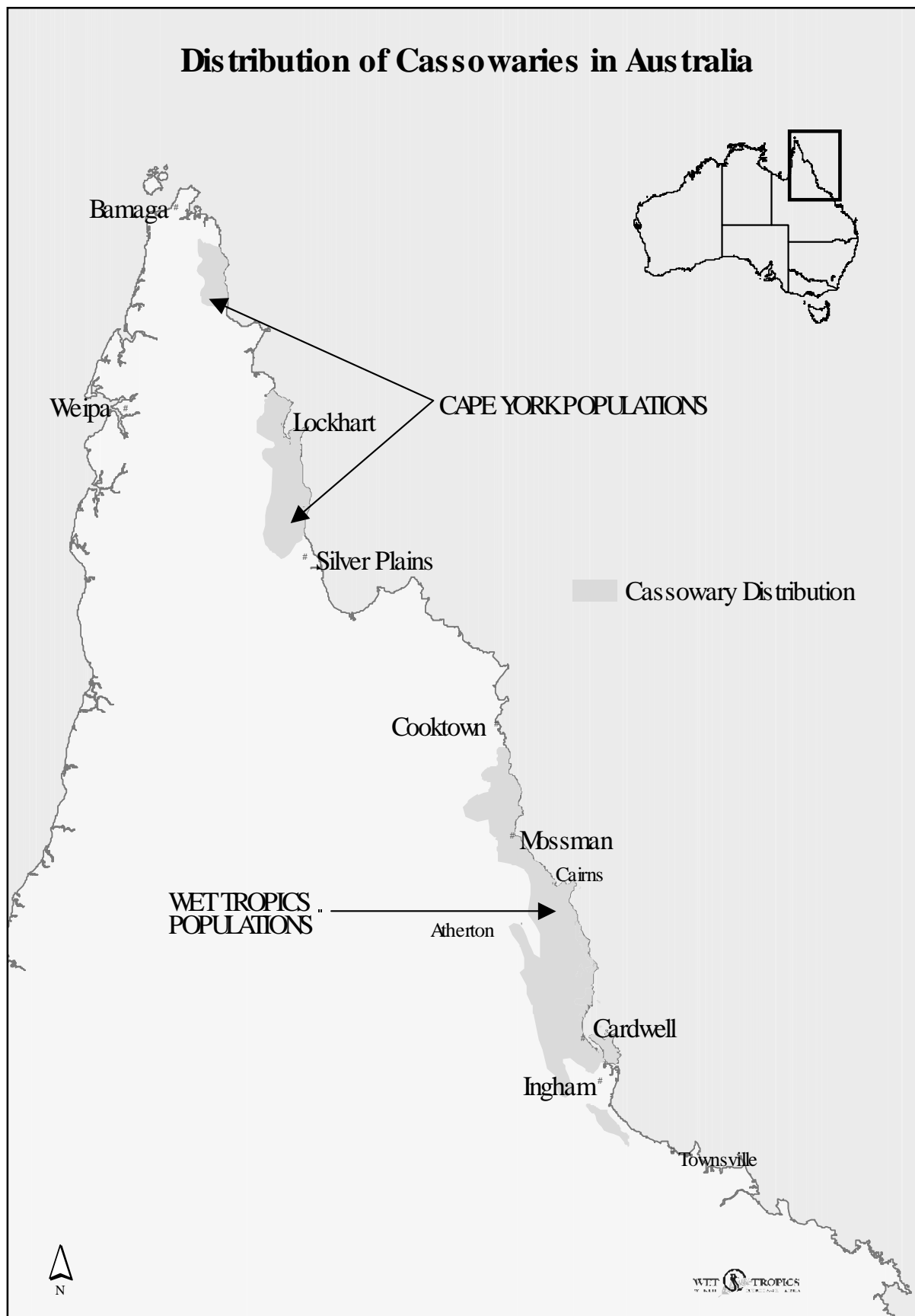
\* Total area of cassowary habitat derived from 1982 Tracey & Webb vegetation mapping = 976,030 ha.

Figure 1. Level of protection of cassowary habitat in the Wet Tropics.

Captive husbandry can contribute greatly to education about the role of the wider community in cassowary conservation and could provide opportunities for physiological studies on the species. The Queensland Wildlife Parks Association are represented on the Cassowary Advisory Group and have assisted in the development of this plan.

### 1.6 Spatial information (maps)

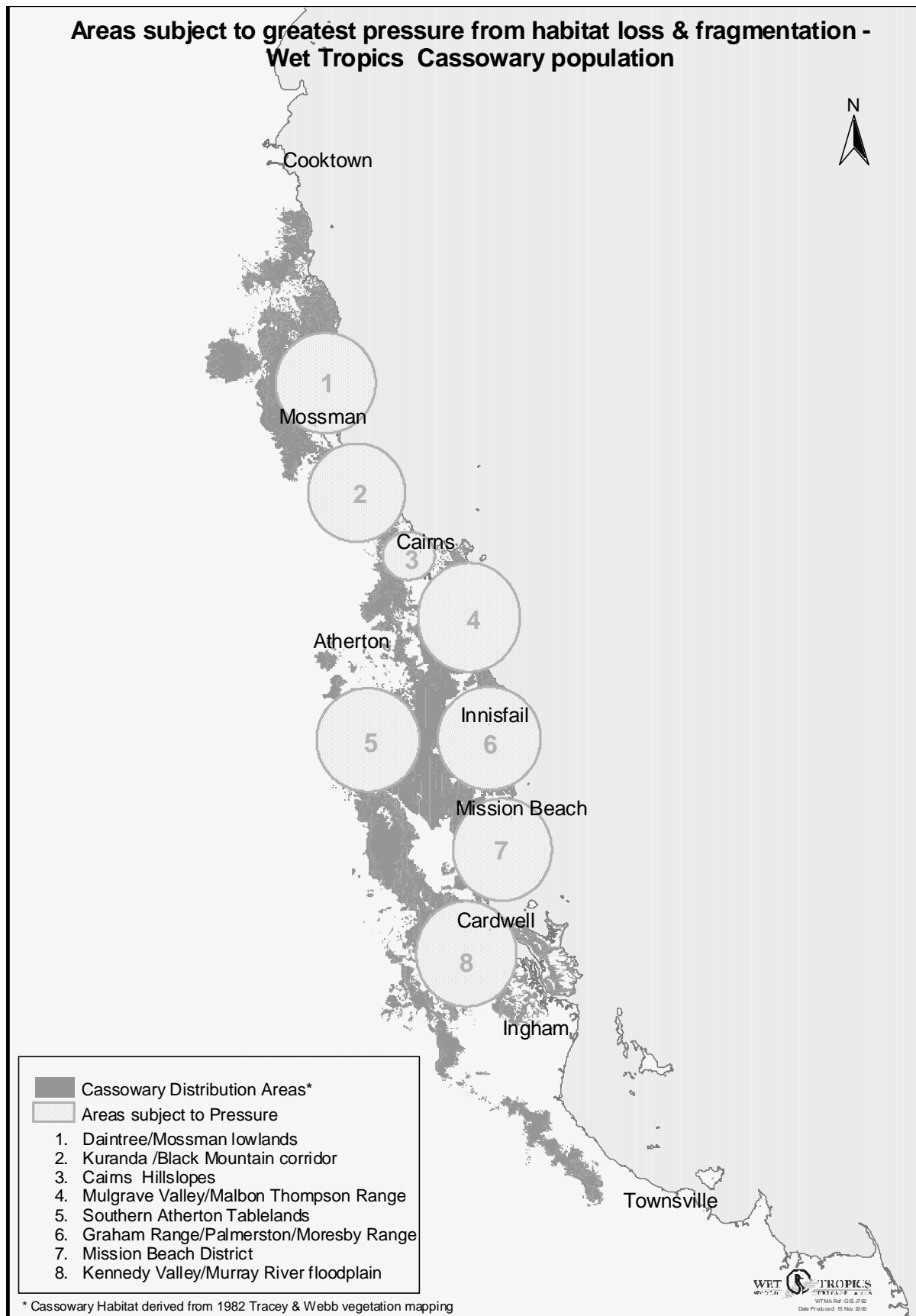
- Map 1 Distribution of cassowaries in Australia
- Map 2 Areas subject to greatest pressure from habitat loss and fragmentation
  - Wet Tropics cassowary population
- Map 3 Level of protection of cassowary habitat in the Wet Tropics.



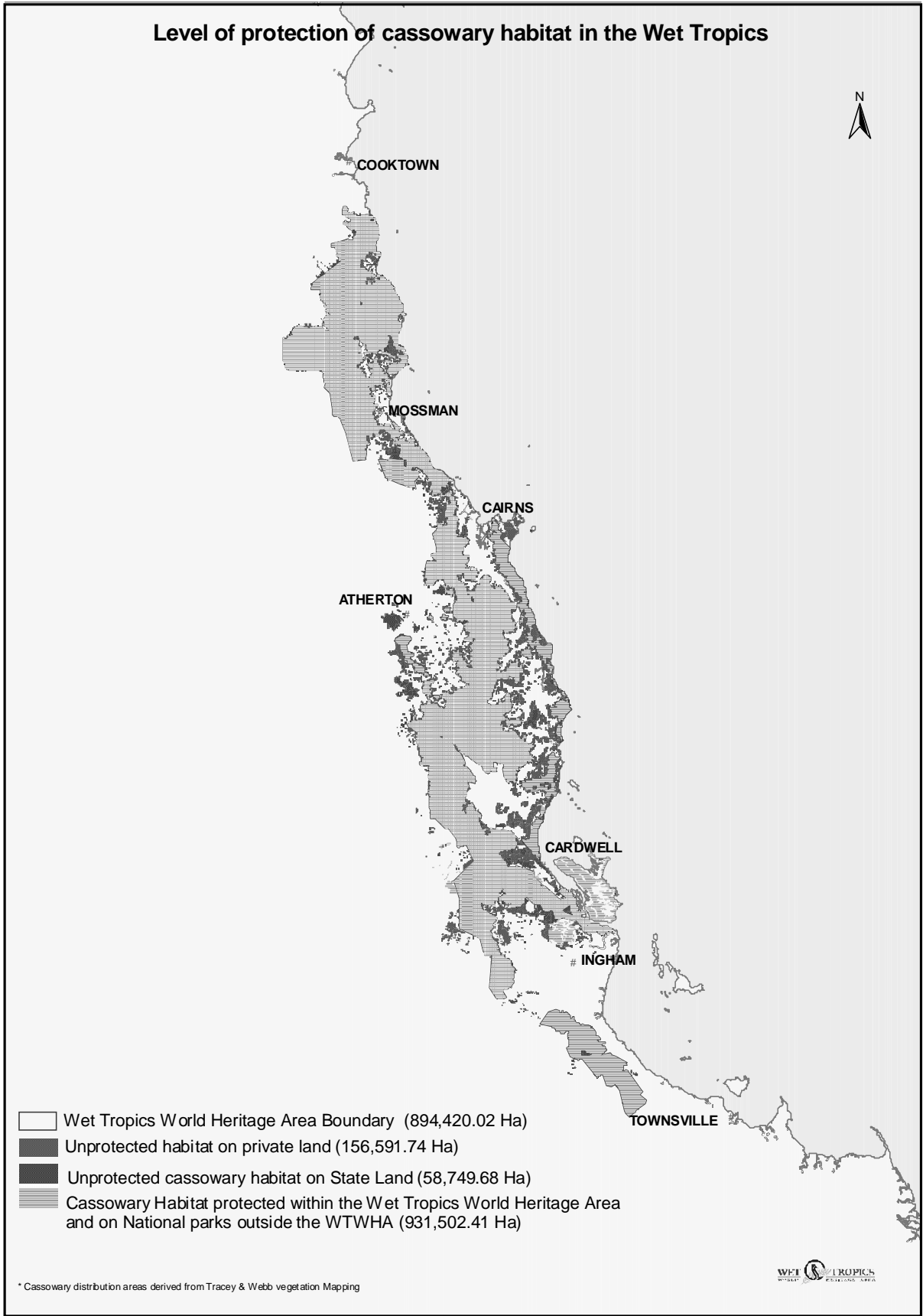
Map 1. Distribution of cassowaries in Australia

Detailed vegetation mapping at regional ecosystem level has not been completed for much of the cassowary range. This level of detail is expected to be available in late 2001. Habitat mapping and area calculations for the Wet Tropics described in this plan, are based on 1982 vegetation mapping by Tracey and Webb. A significant proportion of the habitat mapped by Tracey and Webb on the coastal lowlands has been cleared since the early 1980's.

The levels of abundance in different habitat types and across the species' range are not currently known. Storch and Bentrupperbaumer (in preparation) intend to describe populations throughout their range in Australia. This information should provide the basis for identifying core populations for the purpose of conservation management. Maps 2 and 3 provide clear direction for priority action on the conservation of cassowary habitat at risk.



**Map 2.** Areas subject to greatest pressure from habitat loss and fragmentation, Wet Tropics.



**Map 3.** Level of protection of cassowary habitat, Wet Tropics.

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## 2. Recovery objectives and criteria

### 2.1 Recovery objectives

#### Overall objective

The overall objective of the recovery process is to secure and enhance the status of the cassowary through an integrated program of investigations, on ground management, public awareness raising and capacity building during the life of this plan. It is unrealistic, at this stage, to estimate a timeframe for the whole recovery process.

Specific objectives within the period of this plan

1. To protect significant areas of suitable but currently unprotected habitat throughout the range of the cassowary by declaring new nature refuges, coordinated conservation areas, national parks and conservation parks.
2. To re-establish broad linkages between significant areas of suitable habitat in the Wet Tropics. These include north/south connections and a series of broad linkages between coastal habitat and the footslopes and ranges to the west.
3. To develop and implement strategies to manage threats arising from human-cassowary interaction.
4. To develop effective population monitoring techniques and to establish monitoring programs throughout the range of cassowaries.
5. To effectively involve the wider community in the recovery and conservation effort.
6. To gather knowledge of the species' ecology and on the impact of different threats on the viability of populations.

### 2.2 Performance criteria

- 1 a) Develop criteria by which to assess conservation priority of unprotected cassowary habitat by June 2001.  
b) Cassowary habitat areas identified and assigned conservation priority ranking by December 2001.  
c) Habitat protection and management strategies implemented for all priority areas by the end of year 4.
- 2 a) Priority linkages identified for the Wet Tropics population by June 2001.  
b) Restoration strategies developed and initiated for all key linkages by December 2002.
- 3 a) Threat management policies and management strategies are developed and operating by December 2001.  
b) All relevant local government and state government agencies are actively involved in the management of threats by the end of year 4.
- 4 a) A program of study aimed at developing and describing monitoring techniques initiated by June 2001.  
b) Population monitoring programs initiated for Cape York Peninsula and Wet Tropics sub-populations with base-line assessments completed by December 2002.
- 5 a) Level of local community acceptance and involvement in cassowary conservation has measurably improved over the life of the plan, demonstrated through target community surveys, number of landowner and volunteer hours directed toward cassowary conservation actions, and percent of remaining habitat on private land protected through voluntary conservation agreements.  
b) Aboriginal communities associated with cassowary habitat are involved with the management and monitoring of cassowaries under an organised community-based management plan in their area by December 2005.

- 6 a) Data including information on sub-adult mortality, recruitment and survival aspects collected and assembled to allow dynamic population modelling (population and habitat viability analysis) to be conducted during the next recovery plan period (2005-2010).  
b) Ecological and management information is available and accessible to the general public and landholders through a variety of printed and electronic information formats including brochures, management guideline booklets, and web sites by December 2002.

## 3. Recovery actions

### 3.1 Protect and restore habitat

#### 3.1.1 Identify priority areas for protection

##### Aims

To identify priority conservation areas and develop and implement a conservation strategy for their protection.

##### Justification

Habitat loss and fragmentation is considered to be the principal threat to the species and the primary cause of the species' decline.

Approximately 78 percent of the remaining cassowary habitat in the Wet Tropics is protected within the Wet Tropics World Heritage Area (WTWHA) and National Parks outside of the WTWHA. Habitat linkages between protected habitat are generally not well protected and are rapidly disappearing with the pressures of residential and agricultural development. Some areas of cassowary habitat vital to the survival of local populations, particularly the diverse coastal lowland remnants, have no protection and are under threat. Unless areas of unprotected significant habitat, including key corridors, are identified and a strategy for their protection developed and implemented, the Wet Tropics population of the southern cassowary will continue to decline and more local populations will disappear.

##### Methods

The Environmental Protection Agency and QPWS will develop and implement initiatives targeting the protection of biodiversity in the Wet Tropics bioregion. The identification of priority target areas is a crucial aspect of biodiversity conservation planning. Regional ecosystem mapping work currently being conducted by the Queensland Herbarium and Wet Tropics Management Authority will assist in this exercise. Assessment criteria will be developed to ensure that a consistent and defensible approach is taken to priority ranking. The priority assessment process will be based on GIS and field-derived data.

Regional vegetation management plans offer protection from broadscale clearing through declaration of 'areas of high nature conservation value'.

The Cape York Peninsula and Wet Tropical Coast Regional Coastal Management Plans and the FNQ Regional Plan will complement this action.

The Cassowary Advisory Group 'Coastal Wildlife Corridor Project' involves the identification of high priority conservation areas for protection and restoration in the coastal lowlands between Cairns and Ingham. This project will be supported.

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### **3.1.2 Restore linkages to reverse the problems of habitat fragmentation**

#### **Aims**

- To reduce the impact of habitat fragmentation by identifying, restoring and protecting connecting habitat.
- To involve the wider community in the conservation effort.
- To monitor the efficiency of implementation and ecological effectiveness of a range of restoration techniques to assist future habitat restoration initiatives.

#### **Justification**

Cassowary populations are particularly likely to disappear from isolated patches of forest. Crome and Moore (1988, 1990) have documented several forest patches from which populations have disappeared or severely declined and areas where clearing and development have isolated populations. Factors causing localised declines and extinctions are: decreased available habitat area, increased mortality associated with proximity to human settlements, and increased distances separating remnants of suitable habitat.

In small populations surrounded by development there may be no substantial recruitment of new individuals due to lack of opportunity (i.e. available habitat is occupied by adults) and increased mortality of chicks and juveniles caused by dogs, cars, diseases and hunting. A lack of areas suitable for juveniles to forage away from resident adults will also increase pressures on available resources, reducing the capacity of the local population to withstand cycles of environmental stress, for example, periods of low fruiting and cyclones. The genetic health of isolated populations may be compromised by the effects of genetic drift and the loss of viability due to inbreeding depression.

The presence of a cassowary in a small forest patch is not an indication that the local population is secure. As cassowaries are long-lived species, they may persist in areas but individuals may no longer breed due to age, or sub-adults may fail to survive (Crome and Moore 1990). Connecting habitat provides an opportunity for the sheltered movement of cassowaries between larger habitat blocks for feeding, drinking and breeding activities and for sub-adult dispersal (Bond 1987, Crome & Moore 1990, Bentrupperbaumer 1998).

While a range of habitat restoration initiatives have been operating in north Queensland for over 20 years, the success of this significant amount of effort in terms of resource efficiency and ecological outcomes is poorly understood (Tucker 2000). A monitoring program co-ordinated through the Rainforest CRC, involving the full range of groups involved in habitat restoration in the Wet Tropics, is considered essential to the long-term success of habitat restoration for the cassowary and other threatened wildlife.

#### **Methods**

Work has already commenced on identifying key core habitat areas and linkages and developing strategies to rehabilitate and protect them (Cassowary Advisory Group 2000). Johnstone Shire Council have identified priority corridors and associated individual parcels of land requiring conservation management. Cardwell Shire is proceeding down the same track. Several shire councils in the Wet Tropics have instigated a rate deferral incentive scheme to encourage voluntary habitat retention. It is proposed that this level of knowledge and action be extended to the other shires within the Wet Tropics bioregion under a Coastal Wildlife Corridor Project and other community driven habitat conservation and restoration projects.

The Wet Tropics Rainforest Foundation has been approached to assist with the acquisition of strategic properties. The intent is that these areas would be purchased by the Foundation, protected under a conservation agreement binding on title, then put on the open market with some development opportunities. The type of development opportunity would be negotiated with the relevant shire council. The involvement of other foundations, land trusts and rolling fund managers will be sought.

State-controlled land within these corridors will be addressed under the MOU (section 3.1.4). QPWS will seek to have such areas afforded an appropriate tenure which provides for their conservation.

A Technical Advisory Group to this project is investigating opportunities to monitor aspects of the restoration initiatives. On ground works involving strategic fencing, weed control and revegetation will be required to rehabilitate strategic areas. This work will be undertaken by existing shire, departmental and community based revegetation units. The nursery infrastructure to support this action is already in place.

#### **Responsibility**

QPWS, Wet Tropics Management Authority and Cassowary Corridor Project working groups, the Wet Tropics Rainforest Foundation, Rainforest CRC.

### **3.1.3 Incentives to protect cassowary habitat on private lands**

#### **Aims**

To encourage the retention and protection of cassowary habitat on private lands.

#### **Justification**

Conservation of this species will be significantly enhanced if cassowary habitat outside of the protected area estate is retained. Areas of significant habitat, including connecting habitat, occur on private land throughout the species' range. The probability of long-term survival of the cassowary in Australia will be improved by the protection of these areas.

#### **Methods**

Documentation and evaluation of the range of current and potential incentives for the maintenance of biodiversity outside of protected areas will be undertaken. Legislation, taxation schemes, planning strategies, funding programs and community participation will be investigated. Although the program will focus on areas deemed to be important for the conservation of the cassowary in the Wet Tropics of Queensland, the results will benefit other threatened species and communities, remnant vegetation, and areas of significant conservation value on private lands throughout the state.

Substantial liaison will be sought with the community through established community networks, including Aboriginal communities, to canvass opinion regarding incentives for the protection and management of significant lands. Local authorities, which have a fundamental role in decision-making relating to the use of private lands, will be involved in documenting the best ways to maximise vegetation protection through local planning schemes.

Outcomes from this process will provide an indication of the level of funding required from the various tiers of government to achieve effective conservation and management of native vegetation on private lands for the conservation of the cassowary. The project will document the effectiveness of existing measures and monitor the implementation of strategies to provide recommendations for future activities and preferred community options.

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An initial study will engage a student or consultant to review previous social research in the region. A community assessment program will be developed based on the findings of this study. Community sampling strategies including Participatory Rural Appraisal, focus group techniques and unobtrusive measures such as analysis of newspaper coverage and review of organisational files may be applied.

#### **Responsibility**

QPWS to supervise and assist with the work program and outcomes with the assistance of the Cassowary Advisory Group.

#### **3.1.4 Memorandum of Understanding between State Government Departments**

##### **Aims**

To involve other state government departments in the conservation and recovery effort, particularly in managing cassowary habitat and threatening processes.

##### **Justification**

Cassowary habitat occurs on a range of land tenures under the control of various state government departments. Two of the main threats to cassowary populations, land development and vehicle kills, are able to be addressed on state lands with the assistance of relevant departments.

##### **Methods**

The Memoranda of Understanding will be developed for the protection and management of cassowary habitat on State controlled lands in consultation with relevant Departments especially the Department of Natural Resources. Managing road design, construction, maintenance and signage is the responsibility of the Main Roads Department. The MOU will identify avenues for closer involvement of Main Roads in the recovery process. The MOU will seek to protect habitat deemed to be critical or important for the cassowary and minimise impact on other habitat that the cassowary utilises.

##### **Responsibility**

QPWS.

### **3.2 Reducing other threatening processes**

#### **3.2.1 Management of road mortality**

##### **Aims**

To minimise the incidence of cassowary mortality resulting from transport corridors and vehicle strikes.

##### **Justification**

A cause of cassowary mortality of particular concern is vehicle strikes. Road kills represent the major known cause of mortality of cassowaries in the Mission Beach region (Bentrupperbaumer 1998, Moore 1998). Moore (1998) reported that approximately 40 cassowaries were killed on Mission Beach Roads between 1989 and 1998. Bentrupperbaumer (1998) suggests, for the Mission Beach area, that as the remaining cassowary habitat becomes increasingly fragmented by roads and development, the increased mortality rates due to vehicle collisions will eliminate many local populations.

##### **Methods**

Refer to actions 3.4.2.2 Mortality analysis, 3.1.1 Identification of priority areas for conservation, 3.1.4 Memorandum of Understanding, and 3.3.1 Education, communication and community action.

Moore (1998) details a range of cassowary and road management options based on extensive field observation in the Mission Beach area. In a series of reports to the Wet Tropics Management Authority, Moore has identified risks associated with roads, and proposed management actions to reduce those risks in the Daintree, Kuranda and Atherton Tableland regions.

A combination of wildlife crossing designs, road signage, traffic calming techniques and speed regulation will be trialed in the Daintree, Kuranda, Southern Tableland and Mission Beach areas. Driver behaviour and vehicle strike frequencies will be monitored to assess the effectiveness of the different techniques. Effective outcomes will be applied in other areas as required.

Road construction, upgrade and maintenance programs in cassowary habitat areas will be the subject of a MOU between QPWS and Main Roads. QPWS will liaise with Main Roads over medium to long term road transport strategies in the wet tropics with a view to identifying opportunities, during preliminary planning stages, to avoid impact on cassowary habitat.

Hand feeding of cassowaries by motorists will be addressed by appropriate signage and on-site education by QPWS rangers and cassowary conservation action group volunteers.

##### **Responsibility**

QPWS, cassowary conservation action groups and the Department of Main Roads pursuant to the MOU.

#### **3.2.2 Dog control**

##### **Aims**

To minimise the risks to local cassowary populations from dog attacks.

##### **Justification**

Dogs affect cassowaries directly through attacks that result in death and injury, and indirectly through their presence which affects their feeding, movements and behaviour. Dog attacks are most common adjacent to residential areas. Attacks from pig hunting dogs, both during hunting activities and after being lost, have been recorded.

##### **Methods**

Shire councils will be encouraged to adopt and enforce dog registration and control regulations and incentives to minimise the incidence of roaming dogs. A range of regulatory mechanisms and financial inducements will be investigated and appropriate models will be provided to all shires throughout the Wet Tropics bioregion.

The Wet Tropics Community Pig Trapping Program will be supported and encouraged in an attempt to phase out pig hunting activities in areas of cassowary habitat.

##### **Responsibility**

QPWS, WTMA and cassowary conservation groups.

#### **3.2.3 Pig control**

##### **Aims**

To encourage the adoption of feral pig control programs that reduce the environmental impact of pigs but do not adversely affect cassowary populations.

##### **Justification**

The control of feral pigs is important for socio-economic and environmental reasons. The presence of pigs may be detrimental to cassowaries. The level of impact is not known. Potential effects include damage to habitat, competition for food, disturbance of nests, predation on eggs and chicks, and spread of disease.

Pig control methods have been based on hunting (use of dogs and shooting), trapping and baiting (poisons). Of these methods, trapping is believed to represent the least risk to cassowaries. Cassowaries have, however, been captured in pig traps, resulting in injury and death. Trap design, trigger mechanism design and trap baiting strategies can be modified to reduce the risk of non-target capture.

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## Methods

The Wet Tropics Community Based Feral Pig Trapping Program provides an effective and well coordinated control program for this pest species in the Wet Tropics bioregion. The program centres around the use of pig traps set in strategic locations. The adoption of this program will be encouraged and supported in areas of cassowary habitat. Support will be given to funding applications aimed at perpetuating this program.

Standard trap designs and trap management protocols are being developed to minimise the impact of the trapping program on local cassowary populations.

## Responsibility

DNR, Feral Pig Advisory Committee, Program Trappers.

### 3.2.4 Cassowary Rescue Program

#### Aims

To build on existing rescue initiatives and develop an ongoing cassowary rescue program supported by private and corporate sponsors for emergency response and palliative care of injured and orphaned cassowaries.

#### Justification

Individual cassowaries will continue to be injured or killed as a result of vehicle strike, dog attack, entanglement in fences and other factors. Successful rehabilitation or rearing of injured and orphaned cassowaries and subsequent return to the wild is an appropriate community responsibility. The rescue program directly involves the wider community in the recovery effort through cassowary conservation action groups, volunteer carers and the Queensland Wildlife Parks Association (QWPA).

Encounters with injured, orphaned and dead cassowaries provide opportunities to conduct research into the health of wild birds including research into the prevalence of disease and parasites. Experience can also be gained and techniques refined in rearing, rehabilitation and translocation. Detailed post mortems of dead birds and DNA analysis can provide valuable information on the species without causing further impact on wild populations.

## Methods

Cassowary Rescue Kits which include tranquillising equipment, restraining equipment, transportation box and safety equipment will be located at the northern (Mossman), central (Cairns), Tableland (Atherton) and southern (Mission Beach) parts of the range of the Wet Tropics population. Short-term care centres and long-term husbandry facilities will be established to enable effective rehabilitation and wild release. These facilities will be located as close as practical to the areas of highest incidence, e.g. Mission Beach.

Trials will continue to be conducted on the use of various drugs for the capture and sedation of cassowaries. The most suitable products will be incorporated into handling protocols.

Training will be provided for QPWS staff, veterinarians and volunteers who will comprise an emergency response group. Members of the Queensland Wildlife Parks Association have also offered the services of their staff experienced in cassowary husbandry and handling.

All cassowaries encountered should be tested for micro bacteria, and a blood, feather, or tissue sample should be taken for DNA analysis.

In the initial stages of the recovery program, released cassowaries may be fitted with a radio-transmitter to assess survival rates for rehabilitated and fostered birds. All radio telemetry work will be subject to animal ethics approval and review.

Protocols will be developed for care of injured and orphaned cassowaries, and for translocation, to minimise risks to wild populations including social disruption, competition for food and disease transfer.

Wildlife parks involved in the rescue program will display information on the program and the role of the Queensland Wildlife Parks Association (QWPA).

Sponsorship will be sought to provide the annual revenue necessary to support the rescue program.

## Responsibility

QPWS, cassowary conservation action groups and the QWPA.

### 3.3 Protecting important populations

#### 3.3.1 Cassowary population monitoring

##### Aims

To monitor the status of populations throughout the species' range. To identify populations at threat and actions required to ameliorate those threats. To monitor the effectiveness of recovery actions.

#### Justification

The conservation status of the cassowary in Australia is based on the extent of habitat loss and absence of sightings and signs from areas of previously known occurrence.

Crome and Moore's 1988 survey and subsequent surveys by Moore and Moore (1999) found that cassowary populations had declined in the Mission Beach, Southern Tablelands, and Cairns hillslope areas.

The population trends of the Cape York populations are not known, although the species is listed as endangered under Commonwealth legislation and vulnerable on Cape York under State legislation.

Review of populations based only on extent of habitat loss and presence or absence of cassowaries provides very little indication of the stability or viability of the populations. In order to ascertain if populations are stable, increasing or declining, some level of population monitoring is necessary.

## Methods

Techniques and sampling strategies developed under section 3.4.1 population assessment techniques, will be applied throughout the species' range. A structured monitoring program will be developed and implemented for each population. Monitoring will occur at spatial and temporal scales dependent on the level of available resources and funds. Ideally, monitoring sites and transects will be established in year 1, and baseline data collected.

Monitoring activity may be supported by research staff from CSIRO or JCU as part of other research activities, by QPWS rangers on parks, by QPWS NatureSearch volunteers, by local indigenous communities, by cassowary conservation group volunteers, or by Birds Australia members, depending on the techniques adopted.

Incidental sightings and cassowary incidents, including causes of mortality, will be recorded in the cassowary database (Action 3.4.2.1). Population trends will be assessed against information from the database and other sources in an attempt to identify cause and effect.

## Responsibility

QPWS.



### **3.3.2 Education, communication and community action Aims**

To raise the level of community awareness of cassowary conservation issues and engender positive changes in attitude and behaviour by developing and disseminating appropriate information to land managers, habitat neighbours, schools and the wider community.

To actively involve the community in the recovery effort.

#### **Justification**

The major threats to the long-term survival of the southern cassowary originate from human activities. Voluntary retention of habitat on private lands, rehabilitation and ongoing protection and management of key corridors, responsible dog control, and sensitive driving behaviour are positive actions required of the wider community in order to reduce threatening processes.

Information material and education programs are not well developed for this species. Access to appropriate information and advice is critical if the level of awareness and community support for the conservation of this species is to increase.

Whilst the bulk of community involvement is volunteered freely, some support funding is required for on-ground works including habitat rehabilitation workshops and education initiatives.

#### **Methods**

'Living with cassowaries' brochures will be printed. Existing brochures including the 'Cassowaries in the Wet Tropics World Heritage Area' (developed by the Cassowary Advisory Group) and 'The Cassowary in Queensland' (QPWS) will be used. Brochures will be reviewed and if necessary amended prior to reprinting. These brochures will be circulated by shire councils, cassowary conservation groups and QPWS staff to habitat owners, neighbours, visitors and the general public.

Interpretive signage will be installed at key visitor nodes within the Wet Tropics. Appropriate advisory signs will be installed at potential conflict locations e.g. Etty Bay and South Mission Beach caravan parks. Wildlife Parks with cassowaries are currently displaying cassowary interpretive signs.

The print and electronic media will be used to present information on cassowary issues and cassowary conservation. Cassowary education modules will be developed for use in primary and secondary schools. Education materials and activities will be based on contemporary Education Department curriculum. Documentaries and publications on cassowaries will be encouraged and supported.

Cassowary conservation groups will be supported. Habitat rehabilitation projects will rely heavily on the involvement of volunteers from local communities.

#### **Responsibility**

QPWS, Wet Tropics Management Authority, cassowary conservation groups.

### **3.3.3 Indigenous community involvement Aims**

To ensure that Aboriginal communities are involved in all aspects of the cassowary recovery effort.

#### **Justification**

In an Aboriginal cultural context, *caring for country* is an integral part of their relationship with the natural environment. While profoundly important it nevertheless is often taken for granted in the context of responding to specific environmental management needs. It is important to understand that the history and responsibility of Aboriginal communities to their traditional lands and the inhabitants of those lands are very different than is the case for non-indigenous communities (Bentrupperbaumer and Reser 2000). Aboriginal people are known to have close traditional links to the cassowary (Crome and Moore 1990), and the nature and quality of these links are likely to vary between communities. Unfortunately, in the Australian context both the historical and contemporary relationships between different Aboriginal communities and cassowaries are not well known, or at least not well documented.

Issues relating to co-management arrangements of protected areas, native title rights, traditional hunting, cassowary research and monitoring, and cassowary habitat management require close and meaningful consultation with Aboriginal people. Consultation is regarded by many as simply bringing together various interest groups, listening to their expressed issues, concerns and advice and discussing and hopefully addressing particular management issues and perceived problems and conflicts. This however is a simplistic view rarely providing meaningful outcomes (Bentrupperbaumer and Reser 2000). With some exceptions, Aboriginal participation in environmental management has and continues to be "advisory". Any consideration of Aboriginal rights, skills and experience has generally been ignored (Woenne-Green *et al.* 1992).

Recovery plan actions pertaining to Cape York Peninsula and the Wet Tropics bioregion cannot be effectively implemented without the support of Aboriginal communities.

#### **Methods**

Aboriginal communities will be consulted about establishing a preliminary study to:

- develop a clear understanding of, and document the nature of, relationships between Aboriginal communities and cassowaries, and
- emphasise the role and importance of traditional knowledge in the management of this species.

Under the guidance of the above study, the nature and possibilities of Aboriginal participation in cassowary management will be explored and documented through direct consultation with individual communities. Specific strategies will be jointly developed for each community. Endorsement of the recovery plan and of agreements about indigenous involvement will be sought from the relevant indigenous groups.

These elements require an understanding of the protocols associated with Aboriginal community consultation processes, and a professional commitment to facilitating and providing resources for the process of consultation and Aboriginal involvement in cassowary management. Issues relating to intellectual and cultural property rights and recording and presentation of information must be negotiated with the traditional owners in each community.

#### **Responsibility**

QPWS.

### 3.3.4 Recovery co-ordination

#### Aims

To ensure progress in recovery plan implementation is coordinated effectively and reviewed regularly by people with appropriate expertise, community standing and concern for conservation of the species.

#### Justification

A Cassowary Scientific Advisory Group (Appendix 2) and a Cassowary (community) Advisory Group (Appendix 3) were in existence prior to the development of this plan. These groups assisted QPWS with the development of the plan and are prepared to participate in reviewing its implementation. Creation of a separate recovery team is not seen as a priority in the short-term. The absence or poor level of representation by the Department of Natural Resources, local government, and key industry groups on the existing advisory groups needs addressing.

A cassowary project officer was employed in early 2000 by QPWS to coordinate the development and implementation of the recovery plan. This position is considered critical for managing the actions identified in the plan.

#### Methods

The implementation of this recovery plan will be monitored and reviewed by the Scientific Advisory Group, and the Cassowary Advisory Group with additional input from the Department of Natural Resources, local government, key industry groups, Aboriginal interest groups and other community groups. If the existing arrangement is found not to provide an effective interactive forum between all parties, the need for a recovery team will be reviewed.

Communication will be facilitated through the dissemination of meeting minutes, reports and other relevant information to Advisory Group members and other involved groups and individuals.

Reporting will be provided during the period covered by this recovery plan through the dissemination of meeting minutes, reports and other relevant information to relevant agencies including those providing funding. Co-ordination of this reporting will be the responsibility of the cassowary project officer employed by QPWS.

The recovery plan will be revised periodically to reflect recovery activity details and priorities. It is expected that the plan will require annual revision, especially in the initial phases.

#### Responsibility

QPWS and the advisory groups.

### 3.4 Improving knowledge

#### 3.4.1 Population assessment techniques

##### Aims

To develop and implement repeatable survey and monitoring techniques to more accurately assess and monitor the status of cassowary populations.

##### Justification

There are inherent inaccuracies in the way that cassowary population estimates have traditionally been derived. Population estimates have been derived from density estimates based on various field methods. There has been no consistency in methodology used to arrive at density estimates, and no consistency in criteria or methods used to relate density estimates to population estimates.

Crome and Moore (1988) developed an index of activity to reflect likely densities (low, low-moderate, moderate-high, high) based on sightings, vocalisations, and signs including droppings. Moore (1999) adopted a similar methodology with greater emphasis on individual identification derived through direct sighting supported by footprint measurement when available. Bentrupperbaumer (1998) relied on extensive direct observation and individual bird identification in defining home range and density.

As direct encounter with cassowaries during wide scale field surveys is rare, droppings and footprints are the most common signs of a cassowary's presence (Crome and Moore 1988). Cassowary movement and therefore habitat use, is greatly influenced by feeding behaviour (Bentrupperbaumer 1998). Seasonal variation in food supply influences feeding behaviour. Defecation rates also vary greatly based on food type and availability. Bentrupperbaumer (1998) found that dropping detection rate was not significantly correlated with the number of different individuals in her study site at Kennedy Bay. Westcott (1999) also found no significant relationship between the amount of sign encountered and the number of cassowaries known to be using the trails in his study site at Wooroonooran National Park.

Probability of sign detection is influenced by a range of factors including field expertise, rate of sign decay, ease of sign production (e.g. footprint in soft earth), and habitat complexity. The amount of sign detected on trails compared to in forest may be an indication of detectability or level of use by cassowaries. Crome and Moore (1990) found no difference between the amount of sign detected on and off trails in the Mission Beach area. Westcott (1998) found that surveys along trails in Wooroonooran National Park encountered 2.33 times as much sign as did paired forest transects. Westcott (1999) suggests that there may be significant differences in the level of use of trails as a consequence of local conditions, such as level of use by humans, prevalence of trails and how clogged with vegetation they are relative to the surrounding forest.

Further refinement of traditional methods, or the development of new methods, of estimating populations is needed to accurately assess the status of cassowaries, to monitor population trends and to assess the effectiveness of recovery actions.

##### Methods

Genetic techniques to identify individual cassowaries. This project will develop DNA amplification techniques to use on sloughed intestinal cells collected in scats to identify individual cassowaries. If successful the technique will allow management agencies with the assistance of community groups to sample populations and estimate population size, based on standard mark-recapture statistical methods. There is potential for this work to provide information on recruitment trends and sex ratios.

This project is part funded by the CSIRO (Rainforest CRC), the Cassowary Advisory Group and QPWS; specifically the development of the techniques for individual recognition and extracting DNA from cassowary dung.

##### Remote monitoring techniques

This project will involve the purchase and use of camera-trap equipment for trialing as a remote survey and monitoring technique. The project will be based on the Cape York (northern) population as part of a broader survey and monitoring program involving the relevant indigenous communities. Results from this trial may be applied as an alternative survey technique throughout the species' range.

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### **Refine existing techniques**

Survey methods based on individual identification and sign will be further developed to allow repetition and assessment of spatial and temporal trends. Evaluation of new methods against previous methods may lead to improved characterisation of and reduction of their associated errors.

### **3.4.2 Population trends and effects of different threats**

#### **3.4.2.1 Distribution and incident data storage and management**

##### **Aims**

- To store distribution and incident data in a well-managed database.
- To ensure that data relating to the distribution, management and conservation of cassowaries is readily available to those people and organisations that can contribute to their recovery.

##### **Justification**

Cassowary sighting, incident and post mortem reports have been collected and stored at several locations in a range of formats for a number of years. No single database currently exists to capture new spatial and social data. No single database exists that allows any level of analysis to be undertaken.

A comprehensive data base linked to GIS is required to monitor distribution and threats and to store information on cassowary management actions. This database will provide the platform for monitoring the effectiveness of recovery plan actions.

##### **Methods**

QPWS will develop the database linked to GIS with the assistance of the Wet Tropics Management Authority, CAG and the Cassowary Scientific Advisory Group. Historical records will be incorporated into the data base. New forms will be developed to ensure that future sighting, identification, incident and post mortem data collected is compatible with the database. Some of the data may be collected at the QPWS district level and by community cassowary conservation action groups. The database should be readily available for all potential users. Locational (sightings) data will be compatible with the QPWS Wildnet program.

##### **Responsibility**

QPWS will have primary responsibility for managing the cassowary database. The close involvement of the Wet Tropics Management Authority and community cassowary conservation action groups will be required in the development of the database and ongoing data collection.

#### **3.4.2.2 Mortality analysis**

##### **Determining the fate of sub-adult cassowaries**

##### **Aims**

To better understand dispersal, survival and recruitment of young cassowaries.

##### **Justification**

It is essential for the long-term management of cassowaries that recruitment rates and dispersal patterns of young in the wild are understood. Incidental observations suggest that cassowaries are continuing to breed but that most young birds die prior to recruitment to the adult population. The longevity of adult cassowaries is believed to be as high as 40 years in the wild. Opportunities for recruitment may be limited in a stable undisturbed population, but may be significant where mortality is higher, e.g. where there is mortality due to road kills.

A sound understanding of mortality and recruitment is essential for population modeling.

### **Methods**

A technician will be employed to investigate the importance of different mortality factors in sub-adult cassowaries. Radio telemetry and visual tracking will be used. Adult populations in areas of high mortality (e.g. Mission Beach roads) will be monitored. This situation may provide an opportunity to record subsequent use of the available home range. The work of Moore and Moore (1998) and C4 (ongoing) provides a strong basis for this aspect of the study. The information gained will help determine ways to improve the survival of sub-adult cassowaries and to identify key areas for habitat corridors that will allow for the dispersal of sub-adults.

### **Responsibility**

QPWS.

### **Study of mortality factors**

##### **Aims**

- To better understand the lesser known and suspected causes of cassowary mortality.
- To quantify the impact of various mortality causes.
- To highlight existing and potential causes of mortality and monitoring and management actions to ameliorate those causes if necessary.

##### **Justification**

There is a need to review the lesser known and suspected causes of cassowary mortality (for example pigs, disease, hunting) to determine whether any of these factors warrant further investigation.

The direct and indirect impact of feral pigs on cassowary populations is poorly known. Previous feral pig studies by Mitchell (1993, 2000) have identified potential effects. Further work is necessary, particularly as the level of impact may significantly affect population viability modelling.

##### **Methods**

Data on known mortality will be collected, added to the cassowary database and analysed. Whenever possible, postmortem will be conducted to ascertain cause of death, and record other data including state of health and presence of parasites or disease. DNA samples will also be collected during postmortem. A specific study will be instigated based on postmortem and pathology reports and literature review.

Future research on feral pigs in the Wet Tropics will include investigations on direct and indirect impact of mortality on cassowary populations.

##### **Responsibility**

QPWS.

#### **3.4.3 The relationship between the cassowary and its habitat.**

##### **Aims**

To better understand the use of habitat by cassowaries and the effects of forest ecology on cassowary distribution and behaviour.

##### **Justification**

Forest phenology and plant species diversity significantly affect cassowary populations. A knowledge of temporal (e.g. seasonal) and spatial (e.g. different habitats) trends in food availability will greatly aid in identifying priority habitat for conservation and in managing threats, e.g. seasonal access to a food source across a road. Such information includes knowledge of the value of different habitat types to local populations and the management regimes required to maintain them.

## Methods

The Scientific Advisory Group and QPWS will encourage research focused on cassowary habitat through existing and emerging research activities.

## Responsibility

QPWS, Cassowary Scientific Advisory Group, Rainforest CRC, CSIRO TFRC.

## 4. Guide for decision-makers

### 4.1 Commonwealth jurisdiction

The Wet Tropics World Heritage Area protects 45 percent of the Wet Tropics bioregion. A significant proportion of the cassowary habitat within the bioregion is within the World Heritage area.

The cassowary is listed as an endangered species under Schedule 1 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. Section 4.3 of this recovery plan (*Management prescriptions*), provides a guide to activities likely to have a significant impact on the species.

### 4.2 Other planning constraints

A range of planning mechanisms provide guidance for cassowary habitat management. Local, state and Commonwealth government planning mechanisms have a statutory basis and may place certain constraints on the development of cassowary habitat.

Activities affecting cassowary habitat within the Wet Tropics World Heritage Area may require approval under the *Wet Tropics Management Plan 1998*. Works such as road construction and upgrading or tree clearing are subject to a permit under the Plan.

Regional vegetation management plans, under the *Vegetation Management Act 1999*, have the capacity to protect declared areas of high nature conservation value from clearing. All endangered regional ecosystems are now protected from broadscale clearing. The Mahogany Glider Conservation Plan, when enacted (currently in draft form), will place development constraints over areas declared as critical habitat for that species. Some of this habitat is utilised by cassowaries.

Strategic Plans:

- FNQ Regional Planning Project,
- individual Strategic Plans for the Atherton, Cairns, Cardwell, Douglas, Eacham, Johnstone, Herberton and Mareeba Shires,
- Cape York Peninsula Land Use Strategy,
- regional Coastal Management Plans:
- Cape York Peninsula,
- Wet Tropical Coast,
- Cardwell / Hinchinbrook.

Statutory plans:

- *Wet Tropics Management Plan 1998*,
- draft *Nature Conservation (Mahogany Glider) Conservation Plan 1999*.

### 4.3 Management prescriptions

#### State Lands

Management of cassowaries and cassowary habitat on state forests will be subject to the DNR Species Management Profile for the southern cassowary. All endangered and of concern regional ecosystems are protected from broadscale clearing on state lands.

Management of cassowary habitat and roads through cassowary habitat on dedicated road reserves will be subject to the MOU (action 3.1.4). Management of cassowary habitat on other State Lands will be subject to the MOU and relevant planning policies.

Management of cassowary habitat on protected areas will be subject to the *Nature Conservation Act 1992*.

Management of cassowary habitat on land within the Wet Tropics World Heritage Area will be subject to the *Wet Tropics Management Plan 1998*.

Activities likely to affect cassowary populations

The following activities are likely to significantly affect cassowary populations:

1. Clearing of habitat and removal of fruit forming plant species.
2. Fragmentation of habitat resulting in travel of cassowaries over exposed land and across roads.
3. Road construction and road upgrading resulting in habitat fragmentation, loss of feed trees and exposure to vehicles or increase in vehicle speed.
4. Residential development resulting in loss of habitat, habitat fragmentation and exposure to fringe effects including dog attack and hand feeding.
5. Recreation area development resulting in loss of feed trees and exposure to hand feeding and subsequent conflict with visitors.
6. Supplement (artificial) feeding resulting in reliance on human support, association of humans and vehicles as source of food leading to human attack or vehicle strike, loss of health due to poor dietary content, maintenance of unsustainable localised population numbers.
7. Fire management regimes which lead to habitat degradation and reduced variety of habitat types within mosaics.

Development proposals and management programs should be assessed with due regard for the potential impact of the above activities on local cassowary populations.

## 5. Other opportunities to assist implementation

### 5.1 Funding sources

The costs associated with the implementation of this plan are summarised in the Implementation Schedule. Implementation of actions identified in this plan will be subject to obtaining a significant amount of funding. The plan relies heavily upon volunteer support, principally derived from the cassowary conservation groups, supportive landholders and enthusiastic individuals. Management of cassowary habitat on protected areas, state forests and other state lands is the responsibility of the respective state government agencies. Costs associated with managing these areas are not identified under this plan.

It is envisaged that funding for education, research and monitoring, and habitat rehabilitation actions will be sourced from state and Commonwealth budgets. Corporate and private investment in the recovery process will be facilitated in part through the Wet Tropics Rainforest Foundation. Foundation trust funds could be directed toward on-ground rescue activities and land acquisition (rollover fund). Other nature conservation trust funds could be accessed to cover specific actions such as education or research components.

## 5.2 Incentives for landholder involvement

Shire councils offer a rate deferral scheme linked to voluntary conservation agreements. These schemes offer the landholder reduced rates for conserved habitat and negotiated bonus development rights.

Under new Commonwealth tax regulations (*Taxation Laws Amendment Bill No. 8*), landowners are now eligible to claim tax deductions for land set aside for conservation purposes. Reduced land values and loss of income can now be offset as a tax deduction spread over five years.

Areas protected under a voluntary conservation agreement (VCA) prepared pursuant to the *Nature Conservation Act 1992* are declared as Nature Refuges, a class of protected area. These agreements are binding on title. The secure protection of conservation values is often incentive enough for supportive landowners considering property succession or sale. These VCA's could be linked to Shire rate deferral initiatives.

## 5.3 Community involvement

Three community based cassowary conservation groups were in existence prior to the preparation of this plan. This high profile species has always attracted considerable community interest and support. Formal groups and dedicated individuals will continue to be supported in their endeavours to protect this endangered species. Wherever possible, local communities will be encouraged to participate in research and monitoring actions and habitat rehabilitation works. School students and their families will become involved through the education modules (action 3.3.2). Broad community representation on the Cassowary Advisory Group (CAG) or subsequent recovery team, will provide further opportunities for community linkages.

## 6. Implementation schedule

Action	Priority	Costs					Total cost
		2001	2002	2003	2004	2005	
<b>3.1</b>	<b>Protect and restore habitat</b>						
3.1.1	Identify areas for protection	1	15,000	15,000			\$30,000
3.1.2	Linkage restoration	3	70,000	70,000	70,000	70,000	\$350,000
3.1.3	Incentives for protection on private land	1	50,000	50,000	50,000	50,000	\$250,000
3.1.4	MOU-state government agencies	3	15,000				\$15,000
<b>3.2</b>	<b>Reduce other threats</b>						
3.2.1	Vehicles/roads	2	5,000	5,000	5,000	5,000	\$25,000
3.2.2	Dog control	2	5,000	5,000	5,000	5,000	\$25,000
3.2.3	Pig control	3					Nil from this program
3.2.4	Rescue program	3	5,000	5,000	5,000	5,000	\$25,000
<b>3.3</b>	<b>Protect important populations</b>						
3.3.1	Cassowary population monitoring	1		45,000	45,000		\$90,000
3.3.2	Education, communication /community action	1	25,000	15,000	15,000	15,000	\$85,000
3.3.3	Aboriginal community involvement	2	50,000	12,500	12,500	12,500	\$100,000
3.3.4	Recovery co-ordination	1	8,000	8,000	8,000	8,000	\$40,000
<b>3.4</b>	<b>Improving knowledge</b>						
3.4.1	Population assessment techniques	1	70,000	30,000			\$100,000
3.4.2	Population trends & effects of different threats						
3.4.2.1	Distribution and incident data storage and management	3	5,000	5,000	5,000	5,000	\$25,000
3.4.2.2	Mortality/recruitment analysis	2	45,000	45,000			\$90,000
3.4.3	Relationship between the cassowary and its habitat	3					Nil from this program
<b>TOTAL COST (over 5 year period)</b>							<b>\$1,250,000</b>

Priority categories 1, 2 and 3 (in terms of significance to the recovery process) Note: all actions are considered important. Costs include salary and operating support for a QPWS Cassowary Project Officer. Volunteer time generated through community involvement and landowner labour and equipment contributions are not costed.

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## 7. Monitoring, reporting and review

- **Implementation of this plan is the responsibility of QPWS.**
- The recovery plan will be reviewed on an annual basis by QPWS Northern Region-Biodiversity Planning Group.
- Plan actions and outcomes will be reviewed by QPWS with the assistance of the Cassowary Scientific Advisory Group and Cassowary Advisory Group. Ongoing monitoring of actions will occur throughout the life of this plan. Actions will be modified or expanded if required.
- Discrete research or monitoring projects will result in the production of a formal report or scientific paper. Peer review will be sought for research reports. Scientific papers will be published in relevant journals.
- Reports detailing outcomes and expenditure against objectives and actions will be prepared for external grants as required.
- A formal review of this plan will commence in July 2004. QPWS will conduct this review with the assistance of the Cassowary Scientific Advisory Group, the Cassowary Advisory Group and other key agencies and individuals.
- A new recovery plan will be finalised by mid December 2005, and will be enacted in 2006.

## 8. Acknowledgements

Sincere thanks to members of the Cassowary Scientific Advisory Group and the Cassowary Advisory Group, the Wet Tropics Management Authority, wildlife consultant Les Moore, staff from the Environmental Protection Agency-Biodiversity Planning Group (Cairns), and staff from the Queensland Parks and Wildlife Service, Cairns, Atherton and Brisbane offices, for assisting in developing and editing this plan.

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## Appendix 1

### Other threatened species and Regional Ecosystems that will benefit from recovery actions.

The list of individual species is not exhaustive and focuses on the Wet Tropics bioregion where this plan proposes actions to protect remnant habitat at risk. Plants have not been listed. In excess of 100 rare and threatened species occur in the vegetation communities utilised by cassowaries.

Common Name	Scientific Name	Conservation Status	
		NC(W)R <sup>1</sup>	EPBC <sup>2</sup>
<b>Fauna</b>			
Apollo jewel butterfly	<i>Hypochrysops apollo apollo</i>	E	NL
Australian hedge blue butterfly	<i>Undara tenella tenella</i>	V	
Australian beak butterfly	<i>Libythea geoffroy nicevillei</i>	V	NL
Brood frog	<i>Cophixalus infacetus</i>	R	NL
Australian lacelid	<i>Nyctimystes dayi</i>	E	E
Common mist-frog	<i>Litoria rheocola</i>	E	E
Waterfall frog	<i>Litoria nannotus</i>	E	E
Crimson finch	<i>Neochmia phaeton</i>	V	NL
Grey goshawk	<i>Accipiter novaehollandiae</i>	R	
White-rumped swiftlet	<i>Collocalia spodiopygius</i>	R	
Rufous owl	<i>Ninox rufa queenslandica</i>	V	NL
Double-eyed fig-parrot	<i>Cyclopsitta diophthalma marshalli</i>	R	NL
Atherton antechinus	<i>Antechinus godmani</i>	R	
Lemuroid ringtail possum	<i>Hemibelideus lemuroides</i>	R	
Herbert River ringtail possum	<i>Pseudochirulus herbertensis</i>	R	
Green ringtail possum	<i>Pseudochirops archeri</i>	R	
Northern bettong	<i>Bettongia tropica</i>	E	E
Spotted-tail quoll	<i>Dasyurus maculatus gracilis</i>	E	E
Mahogany glider	<i>Petaurus gracilis</i>	E	E
Yellow-bellied glider	<i>Petaurus australis</i>	V	V
Diadem horseshoe bat	<i>Hipposideros diadema</i>	R	NL
Golden-tipped bat	<i>Kerivoula papuensis</i>	R	NL

Regional ecosystems <sup>3</sup>	Description	Status
RE 7.1.3	Bulkuru <i>Elaeocharis dulcis</i> swamp on poorly drained acid peats	Of Concern
RE 7.2.1	Mesophyll rainforest on coastal beach sands	Endangered
RE 7.2.2	Notophyll rainforest with acacia emergents on coastal beach sands	Endangered
RE 7.2.4	Open forest and woodland on old stranded dune ridges on sands	Of Concern
RE 7.3.1	Sedgeland + grassland freshwater swamp on coastal lowlands	Endangered
RE 7.3.3	Alexandra palm <i>Archontophoenix alexandrae</i> on poorly drained lowlands	Endangered
RE 7.3.4	Fan palm <i>Licuala ramsayi</i> swamp rainforest on poorly drained lowlands	Endangered
RE 7.3.5	Swamp paperbark open forest on very wet and poorly-drained lowlands	Of Concern
RE 7.3.6	Swamp paperbark and rainforest complex on very wet and poorly-drained lowlands	Endangered
RE 7.3.7	Coastal floodplain forest red gum/melaleuca open forest complex on moist to very wet poorly-drained lowlands	Endangered
RE 7.3.10	Complex mesophyll rainforest on well drained fertile lowland alluvials	Endangered
RE 7.3.12	Forest redgum woodland on very wet and poorly-drained lowland alluvial soils	Endangered
RE 7.3.13	<i>Corymbia nesophila</i> woodland on well drained lowland gravelly alluvial soils	Endangered
RE 7.3.22	Complex mesophyll riparian rainforest on well drained alluvial levees	Endangered
RE 7.3.23	Semi-deciduous notophyll riparian rainforest on well drained alluvial levees	Of Concern
RE 7.3.24	Red tea tree <i>Melaleuca dealbata</i> riparian open forest on lowland alluvia	Endangered
RE 7.3.25	<i>Melaleuca</i> , eucalypt and notophyll rainforest spp. riparian forest	Endangered
RE 7.3.27	Eucalypt and swamp mahogany riparian forest	Of Concern
RE 7.3.28	Herbfield and shrubland of river sandbars and river beds	Endangered
RE 7.8.1	Complex mesophyll rainforest on very wet well drained basalt lowlands	Of Concern
RE 7.8.2	Complex mesophyll rainforest on very wet basalt uplands	Endangered
RE 7.8.3	Complex notophyll rainforest on moist basalt lowlands, foothills and uplands	Endangered
RE 7.8.4	Complex notophyll rainforest on cloudy wet basalt uplands and highlands	Of Concern
RE 7.8.6	Semi-deciduous mesophyll rainforest on moist basalt foothills	Endangered
RE 7.11.8	Notophyll rainforest with acacia emergents on moist metamorphic lowlands and foothills	Endangered
RE 7.12.12	Notophyll rainforest with acacia emergents on granite lowlands and foothills	Endangered

<sup>1</sup> Nature Conservation (Wildlife) Regulation 1994

<sup>2</sup> Environmental Protection and Biodiversity Conservation Act 1999

E = Endangered; V = Vulnerable; R = Rare; NL = Not Listed (the EPBC Act has no Rare category)

<sup>3</sup> Sattler and Williams 1999.



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## Appendix 2

### Cassowary Scientific Advisory Group Membership:

Name	Organisation	Section
Dr Joan Bentrupperbaumer	JCU Cairns	Psychology & Sociology
Dr Brad Congdon	JCU Cairns	Tropical Biology
Dr Alison Cottrell	JCU Townsville	Social Sciences
Dr Will Edwards	JCU Cairns	Tropical Biology
Dr Graham Harrington (Chairperson)	Birds Australia	President
Dr David Westcott	CSIRO Atherton	Wildlife Ecology
Dr John Winter	Consultant ecologist	
Keith Smith (Facilitator)	QPWS Atherton	Cassowary Project Officer

## Appendix 3

### Cassowary Advisory Group Membership:

Name	Organisation
George Mansford	Chairperson
Jax Bergersen	Kuranda Enviro Care Inc
Mary Ritchie	Community for Coastal and Cassowary Conservation (C4)
Alan Curtis	Daintree Rainforest Environment Centre
Michael Frankcombe	Main Roads Department
Keith Smith	QPWS
Terry Carmichael	Queensland Wildlife Parks Association
Des Lee	Wet Tropics Management Authority
Steve Russell	Community representative
Graham Harrington	Birds Australia and Cassowary Scientific Advisory Group
Michael Morta	Girringun Elders and Reference Group Aboriginal Corporation
Hilton Noble	Bama Wabu

