

# **WESTERN GROUND PARROT**

## **INTERIM RECOVERY PLAN**

**1996 to 1999**

by

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June 1997

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## FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM) Policy Statements Nos 44 and 50.

Where urgency and/or lack of information mean that a full Recovery Plan can not be prepared, IRPs outline the recovery actions required urgently to address those threatening processes most affecting the ongoing survival and begin the recovery process of threatened taxa or ecological communities.

CALM is committed to ensuring that Critically Endangered taxa are conserved, through the preparation and implementation of Recovery Plans or Interim Recovery Plans and ensuring that conservation action commences as soon as possible and always within one year of endorsement of that rank by the Minister.

This IRP was approved by the Director of Nature Conservation on 7 May 1997. Approved IRPs are subject to modification as dictated by new findings, changes in status of the taxon or ecological community and the completion of recovery actions. The provision of funds identified in this Interim Recovery Plan is dependent on budgetary and other constraints affecting CALM, as well as the need to address other priorities.

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Information in this IRP was accurate at December 31, 1996.

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## SUMMARY

**Species:** *Pezoporus wallicus flaviventris* **Western Ground Parrot**

**Order:** Psittaciformes **Family:** Psittacidae

**CALM Region:** South Coast (and possibly also Southern Forest)

**CALM Districts:** Albany, Esperance (and possibly also Walpole and Pemberton Districts, Southern Forest Region)

**Recovery Team:** South Coast Threatened Birds Recovery Team: Kelly Gillen (Chair), John Blyth, Allan Burbidge, Andrew Burbidge, Peter Cale, Alan Danks, Shapelle McNee, Bruce Male, Brenda Newbey and Graeme Smith.

**Current Status:** Critically Endangered (CALM Scientific Ranking Panel, 1995)

**Habitat Requirements and Limiting Factors:** low coastal and near coastal heathlands, unburnt for at least 15 years in some areas (depending on source population); requirements poorly understood in other areas

**IRP Objectives:** The long-term objective is to increase the probability of survival of the Western Ground Parrot. Over the time frame of this three year plan, specific objectives are to (a) improve the protection of known populations and any new ones that become known during the term of this plan, (b) obtain more accurate estimates of population size, distribution and trends, so that the effectiveness of management actions can be assessed, (c) improve understanding of habitat requirements, particularly with respect to fire regime, and (d) produce a formal recovery plan.

**Recovery Criteria:**

The criteria for success are (in priority order):

- (a) establishment of a monitoring program, (b) a measured increase in population size or increasing area occupied by those populations being monitored, (c) discovery of previously unknown populations, (d) production and application of fire management guidelines for each known population, (e) the application of an on-going predator control (fox baiting) program in monitored populations in Fitzgerald River National Park and Waychincup National Park and (f) the production of an approved Recovery Plan.

The program will be considered to have failed if:

- (a) there is a measured decrease in overall population size or decrease in area occupied by those populations being monitored, or (b) adequate data cannot be/have not been collected to allow a confident assessment of population trend or area occupied.

- Recovery Actions:**
1. Fire management
  2. Predator control
  3. Dieback hygiene
  4. Vesting in the NPNCA of land in Manypeaks area
  5. Documentation of known populations and monitoring of trends in population size/boundaries
  6. Survey of areas possibly suitable for Western Ground Parrots
  7. Taking birds for captive breeding or translocation
  8. Production of an approved Recovery Plan

**Estimated Cost of Actions:** Cost of the above actions depends to a large degree on the amount of volunteer resources that can be accessed and how many new populations are found. The minimum cost over three years will be \$108 855 (including salaries and overheads) but this includes significant extra volunteer input.

## BACKGROUND

### Description, Taxonomy and Status

The Ground Parrot (*Pezoporus wallicus* Kerr) is a cryptic, ground-dwelling parrot, endemic to Australia and having a fragmented distribution in coastal south-eastern and south-western parts of the continent. It is a medium sized, slim parrot with a long, strongly gradated tail comprising narrow, pointed feathers (Forshaw 1973, 1981). The wings are short and rounded. The tarsi are long and the claws extremely long and only slightly curved. Sexual dimorphism is absent. Adults are generally rich green, strongly mottled with black and yellow. Feathers on the upper surface show black shaft streaking. Adults have a red frontal band. Three adult birds caught in Fitzgerald River National Park weighed 105-110 g with wing length 135-145 mm (Burbidge *et al.* 1989).

North (1911) was the first to distinguish the Western Australian populations of *P. wallicus* as different from those in eastern Australia, describing the western birds as *P. flaviventris*. He based this view on differences in plumage, with the western birds having broken barring on the under surface and a yellow (rather than greenish yellow) lower breast and abdomen. Mathews (1912) reduced *flaviventris* to subspecific level, describing it as "... not too well differentiated when South Australian specimens are considered." This situation has persisted, despite the view of some authors that the subspecies are poorly differentiated (Ford 1969; Forshaw 1981). No genetic investigations have been made on subspecific variation in this species and the morphometric investigations are based on few specimens and show little difference between the populations (Ford 1969; Forshaw 1981). On the other hand, there are some habitat differences, and possibly behavioural differences between eastern and western birds (Burbidge *et al.* 1989).

The Ground Parrot has often been considered the sole member of the genus *Pezoporus* and part of a relict group including two other monotypic genera: *Geopsittacus* (Night Parrot) from Australia and *Strigops* (Kakapo) from New Zealand (e.g. Mathews 1917; Condon 1975; Forshaw 1981). It has also been thought to be related to *Melopsittacus* (Budgerigar) (Forshaw 1973). However, Serventy (1953) considered *Pezoporus wallicus* and *Geopsittacus occidentalis* as members of the same genus as did Ford (1969), who considered the major differences between the two species to be simply a result of adaptations to their different environments. Recent DNA work (Leeton *et al.* 1994) is consistent with this latter view, suggesting that the Ground Parrot and Night Parrot are closely related, congeneric, and more closely related to *Neophema* than *Strigops*.

King (1979) considered *P. wallicus wallicus* as vulnerable to extinction and *P. w. flaviventris* as endangered. Since then, work on eastern Australian populations has shown that numbers of *P. w. wallicus* in Tasmania are high (Bryant 1991), and Garnett (1992a, 1992b) no longer considers this subspecies as threatened, but classified *P. w. flaviventris* as endangered. On Garnett's (1992b) list of priorities of threatened birds of Australia and its territories, *P. w. flaviventris* was listed at number 13.

However, recent reappraisals of the available data (Cale and Burbidge 1993; CALM Scientific Ranking Panel, 1995) found that the status of *P. w. flaviventris* is critically endangered. According to the most recent IUCN criteria (IUCN Species Survival Commission 1994) the taxon is Critically Endangered on the basis of Criterion C, ie the total population is less than 2500 individuals with a severely fragmented distribution (no population in excess of 250 individuals), and declining due to losses brought about through wildfire. In addition, the known area of occupancy is only about 10 km<sup>2</sup>, and so the taxon may also meet Criterion B.

## Distribution

### *Historical*

At the time of European colonisation, the Western Ground Parrot was distributed in coastal areas from Cape Arid, west along the south coast and north possibly to the Dongara-Watheroo area of Western Australia (Watkins 1985).

It was first collected by John Gilbert near Perth in the 1840s (Ford 1969). The only other records from the west coast are nestlings in the Gould collection at the British Museum, recorded as taken from Wanyun Hills (Wongan Hills) and an adult from the Swan River collected by Dr. R.B. Sharpe (Salvadori 1891). Leake (1962) commented briefly about this species being a visitor to the eastern wheatbelt, where it fed in the vicinity of granite hills, but was not seen there after 1892. Several second hand reports from sandplain country between Dongara and Watheroo up to the 1890s when the area was burnt out, were recorded by Ashby (1921). Ford (1969) noted second hand reports of this species being found in stunted heath in laterite hills between Jurien Bay and Badgingarra during the 1890s and 1900s. In addition, Gilbert recorded a name for this species from Aborigines resident to the north of Perth, as well as one from Aborigines resident in the Perth area (Gould 1865, Whittell 1951).

On the south coast the species was found by George Masters to be plentiful at King George Sound during the 1860s, where he collected several specimens (Ford 1969). A specimen was collected at Torbay by T.P. Draper in 1906 (Western Australian Museum). Whitlock (1914) recorded the species breeding in the Denmark area during the spring of 1912 and 1913, but information from local residents at the time suggested that it had declined in abundance (Whitlock 1914). S.W. Jackson saw one individual that he attempted but failed to collect, near Bow River (approximately 40 km west of Denmark) in October of 1912 (Whittell 1952). Baggs (1953) also recorded the species at Bow River during December of 1952. Other records were made in the Augusta area, at Torbay, and in William Bay National Park (Watkins 1985). The last definite record west of Albany was at Torbay by A.R. Main who recorded the species there until 1983 (Watkins 1985).

To the east of Albany only one locality was recorded until the 1960s. This was on the eastern most extension of the Mt Manypeaks range, where Mr. C. Allen received feathers of this species from fishermen who had shot several birds during the 1940s and where they considered it common (Ford 1969). Since the 1960s there have been reports from Two Peoples Bay, Cheyne Beach, and Cape Riche (Watkins 1985). In 1965 Garstone (1977) recorded the species from the Cape Arid area and Mr. K. Newbey recorded it from the Fitzgerald River area (Watkins 1985). These two records extended the known range approximately 450 km to the east.

### *Current*

Knowledge of the presence of Ground Parrots in an area is determined mainly by listening for their calls and by flushing parrots (Watkins 1985; McFarland 1989; Bryant 1991); difficulties in obtaining positive data are discussed by Cale and Burbidge (1993). Practicalities make it difficult to determine if Ground Parrots are *absent* from an area; the following account is based on known definite records (Figure 1).

Watkins (1985) conducted an extensive survey along the western and southern coasts of Western Australia from Cervantes to Cape Arid National Park and found Western Ground Parrots in only two areas, the Fitzgerald River National Park and the Cape Arid National Park. Further studies (Burbidge *et al.* 1989, 1990) suggested that Western Ground Parrots were restricted to five subpopulations in the northern part of Fitzgerald River National Park and one population in Cape Arid National Park (Watkins & Burbidge 1992) (Fig. 1).





A number of recent records have also come from the Mt Manypeaks area (Anon. 1993a, 1993b, 1994, A. Danks unpubl., D. Wilson pers. comm., L. Whisson pers. comm.). These have all been from low heathlands on the lower slopes of the Manypeaks complex in an area visited only briefly by Watkins (1985). Taken together, these records suggest that there is also a significant population inhabiting this area.

Following post-natal dispersal, Ground Parrots can occur away from known populations, sometimes in sub-optimal habitat, particularly in autumn (Meredith *et al.* 1984). Recent reports from Woolbernup Hill and near West Mt Barren, Fitzgerald River National Park (S. McNee pers. comm. 1994; N. Brown *et al.* pers. comm. 1996) and at Upper Kalgan (P. Collins pers. comm.) are probably in this category. Reports from the western side of Cape Arid National Park (M. Paxman pers. comm. 1994) may also represent dispersing birds, although the vegetation and geomorphic setting in this area is similar to that occupied in the northern parts of Fitzgerald River National Park. In any case, these sites should be re-surveyed to determine whether any of them actually represent permanent or semi-permanent populations, as opposed to being sites occupied only by itinerant birds.

### **Number, Size and Trend of Populations**

Cale and Burbidge (1993) discussed the considerable difficulties in obtaining useful census data for Ground Parrots and summarised that available for *P. w. wallicus* at the time of writing. There are two basic methods, one based on calls and the other on flushing birds.

The listening method requires a number of observers to listen for calls during the two calling periods (before sunrise and after sunset). Numbers and locations can then be estimated by knowing the exact location of each observer, the time at which each call was heard, and the use of a triangulation procedure. Cale and Burbidge (1993) discuss the considerable difficulties with this technique. Provided listening conditions are good and the survey is carried out at an appropriate time of year, it is believed that the method is fairly reliable for determining the area occupied. Numbers can be estimated with much less confidence. Some workers (Bryant 1991; Baker and Whelan 1996) have used this technique with one observer, without triangulation, but with an estimate of area censused, corrected for listening conditions (wind, rain). However, the correction factors used to date are coarse and qualitative. In any case, conditions in Western Australian sites are different from those in the east (less rain but probably more wind) and correction factors should be determined for local conditions and stated explicitly.

Alternatively, birds can be flushed using a line of observers walking through the heath. Western Australian populations of Ground Parrots appear to be at a density which is an order of magnitude lower than those in eastern Australia (Watkins and Burbidge 1992) and this means that very few birds are flushed this way in western populations. It is therefore not a very efficient technique under Western Australian conditions. Nevertheless, if observers are available, it can be used to supplement data obtained by listening for calls.

Due to the low numbers of birds and the exploratory nature of investigations to date, existing data for Western Australian populations are probably inadequate for monitoring purposes except at a coarse level. In the first year of this IRP, therefore, emphasis should be given to determining the level of survey needed to provide base line data adequate for meaningful monitoring. This will also provide better population estimates.

Watkins and Burbidge (1992) estimated the total population of Western Ground Parrots to be 378 birds. This estimate was determined using an estimate of the density at one site ("Short Road", Fitzgerald River National Park) and extrapolating to all known subpopulations, on the basis of the extent of suitable habitat associated with each. The estimate of population density for the Short Road sub-population was 1-2 birds/40 ha, which is an order of magnitude lower than the densities found in eastern Australian populations (Watkins & Burbidge 1992). Only three of the six known

subpopulations were estimated to have greater than 50 birds (Watkins & Burbidge 1992). These population estimates are preliminary, because the true boundaries of the five subpopulations were not known and the estimates based on data from the post-breeding period, when densities would be expected to be higher than prior to breeding.

**Table 1: Estimate of Western Ground Parrot population size in 1990 (from Watkins and Burbidge 1992).**

Site	Area of vegetation (ha)	Proportion suitable	Population estimate
<i>Fitzgerald River NP</i>			
Hamersley Drive	2 900	.75	145
Short Road	1 000	1.00	67
Fitzgerald Track	2 400	.25	40
Drummond Track	5 300	.10	35
Moir Track	50	1.00	3
Other	2 000	?10	?13
Sub-total			303
<i>Cape Arid NP</i>			
Poison Creek Road	1 100	1.00	75
Sub-total			75
<b>Total population estimate</b>			<b>378</b>

Since this estimate was made, there have been two significant developments. First, most of the Fitzgerald Track area was burnt in October 1994. The effect on the Western Ground Parrot population is unknown, but the total estimate could be reduced by 40 birds. Second, the Mt Manypeaks area has been recognised as supporting an extant population. The area of suitable habitat here is unknown but could be in excess of 1500 ha and might therefore support about 100 birds.

In summary, Western Ground Parrots are known to exist in three areas (Fitzgerald River National Park, Cape Arid National Park and the Mt Manypeaks area), with the total number of birds probably being less than 500. Population trends are unknown for any of these areas.

The extremely low total population size and fragmented distribution indicate that the taxon is Critically Endangered (IUCN Species Survival Commission 1994).

### Habitat

The vegetation types used by Ground Parrots can be broadly characterised as sedgeland, temperate shrub heaths, temperate graminoid heaths or sub-tropical graminoid heaths (Meredith 1984). All have medium to high species richness except sedgelands that are frequently dominated by a single species, and all are similar structurally being low with dense vegetation cover (Table 2). However, all Western Ground Parrot sites show much higher plant species richness than any of the eastern Australian sites where *P. w. wallicus* has been studied (Burbidge *et al.* 1989). Sites currently used by the Western Ground Parrot receive considerably lower rainfall than any of the eastern Australian sites (Table 2), but areas west of Albany known to have been used by Western Ground Parrots in the past have a rainfall (900-ca. 1300 mm) comparable to many sites used by *P. w. wallicus* in eastern Australia.

**Table 2: Comparison of the climate (including mean annual rainfall) and vegetation communities used by Ground Parrots in different States of Australia (from Cale and Burbidge 1993).**

State	Vegetation Type	Climate	Structure	Reference
Queensland	Graminoid heaths	Sub-tropical; 1420 mm	0.5-2 m high >70% cover	McFarland 1989
Tasmania	Buttongrass moorlands	Temperate; 1600-2800 mm	0.3-2.5 m high 30-90% cover	Bryant 1991
Victoria	Coastal heaths and sedgeland	Temperate; 800-1200 mm	0.6-1 m high >70% cover	Meredith <i>et al.</i> 1984
Western Australia	Heaths	Temperate; 400-500 mm	<0.5 m high >50% cover	Burbidge <i>et al.</i> 1989, unpubl.

### Biology and Ecology

Little is known about the breeding biology of the Ground Parrot, and most work that has been done concerns the eastern *P. w. wallicus*. The major study has been that by McFarland (1988; 1989; 1991a,b,c,d) in Queensland, with other studies having been made in New South Wales (Jordan 1984, 1987, 1989; Barren Grounds Bird Observatory, unpublished), Victoria (Meredith & Isles 1980; Meredith *et al.* 1984) and Tasmania (Bryant 1991, 1992).

The breeding season of *P. w. wallicus* varies geographically, beginning earlier in northern latitudes (eggs: Queensland, July-November; NSW-Victoria, September-November; Tasmania, October-January) (McFarland 1988). However, the breeding season of the Western Ground Parrot is not known clearly. Whitlock (1914) found a nest with three eggs in late November 1913 and one with two young chicks (a few days old) in late October 1912, both east of Irwin Inlet, near Denmark. In contrast, Burbidge *et al.* (1989) found that, in 1988, juvenile birds were common by late October in Fitzgerald River National Park. Based on the estimated age of these juveniles, they suggested that the breeding season commenced at their study site in mid-late winter (June-August). These differences suggest that either (1) the breeding season in Western Australia varies from year to year, or (2) the records by Whitlock represent replacement or second clutches (Burbidge *et al.* 1989), or (3) the breeding season in Western Australia varies geographically (perhaps in response to patterns of rainfall). The second possibility is consistent with the fact that Whitlock only searched for nests during spring and so could not have found nests earlier (Whitlock 1914). McFarland (1991b) found no evidence of double clutching in Queensland, but he did observe two cases of females re-nesting after abandoning earlier nests.

The clutch size of the Eastern Ground Parrot varies from two to six eggs with the majority having three or four (McFarland 1988). Clutch size is consistent throughout eastern populations, except for Tasmanian birds having a higher mean clutch size. The data for Western Australia are limited to the two nests found by Whitlock (1914), which were a brood of two and a clutch of three.

In eastern Australia Ground Parrot eggs have an incubation period of 21-24 days and are incubated only by the female, which is fed by the male during this period. Chicks are continuously brooded by the female for the first four days after hatching and during the night for a further two days, and are capable of running by 18 days, though they usually remain in the nest for 24 days (range 18-28 days). After fledging juveniles remain near the nest for at least three weeks, but once they are capable of flying they follow the adults (McFarland 1991b). No data on the chronology of breeding are available for *P. w. flaviventris*.

Estimates of fledging success from Victoria (56%; Meredith & Isles 1980) and Queensland (57%; McFarland 1991b) are similar and show that less than two thirds of eggs produced fledged young.

Meredith and Isles (1980) found that one third of eggs were infertile in Victoria, but the level of infertility was lower (19%) in Queensland (McFarland 1991b). Predation and desertion caused the loss of 15% of eggs in Queensland and just under 10% of chicks died in the nest, all being the youngest and smallest members of the brood (McFarland 1991b). The mean fledging success in Queensland was  $1.9 \pm 0.3$  fledglings per nest (McFarland 1991b). No data are available on the recruitment rate of juveniles. No aspects of the breeding success of *P. w. flaviventris* have been investigated.

In Victoria, the pattern of observations on Ground Parrots in non-breeding areas suggests that post-natal dispersal occurs during February to August (Meredith *et al.* 1984). These observations were in sub-optimal habitats like non-diverse *Juncus* sedgeland and alpine heaths, up to 220 km from the nearest known breeding areas (Meredith *et al.* 1984). Changes in the density of Ground Parrots in autumn and spring in Queensland and Tasmanian populations are considered to be the result of the autumn dispersal of juveniles and the spring movements of adults and sub-adults searching for breeding vacancies (McFarland 1991c; Bryant 1991). In Queensland these density peaks correspond to peaks in seed availability in most heaths (McFarland 1991c). Based on the failure to recapture banded chicks after four months of age, McFarland (1991d) argued that juveniles either have a high rate of mortality or have dispersed from the natal area by this time. However, this is based on a sample size of only 35 banded chicks of which only eight were recaptured during the first two months.

Little is known about dispersal in Western Australia, but Burbidge *et al.* (1989) found a 75% drop in the number of birds flushed/day between October-November and January-February. They suggested that this reflected the movement of juveniles out of the study area during this period. Movements of 2-3 km were observed in several radio-tracked young birds, in the second week of December (Burbidge *et al.* 1989).

Outside the Fitzgerald River, Cape Arid and Waychinicup National Parks, most of the recent records (after 1970) of Western Ground Parrots were made between October and February, suggesting the possibility that these birds may be dispersing individuals. Exceptions were those by M. Silberstein in William Bay National Park during June 1973, W. Okell in the Augusta area in mid-September 1980 and the records by A. Main at Torbay from 1971-1983 (Watkins 1985).

In Queensland, McFarland (1991b) found nests only in the dry heath microhabitat identified in his study area, but these nest sites differed little from the surrounding vegetation with respect to structure and floristics. Nests were always under dense clumps of vegetation dominated by three plant species (*Empodisma minor*, *Xanthorrhoea fulva* and *Banksia oblongifolia*), but these were not obviously different from other clumps in the heathland (McFarland 1991b). Nests were built on the ground in a dome cavity usually in a sward of *E. minor*, or in a clump of *X. fulva* and/or *B. oblongifolia*. The nest consisted of a scrape in the ground lined with sedge and rush leaves (McFarland 1991b). The nests of *P. w. flaviventris* found by Whitlock (1914) at Wilson's Inlet were both found under clumps of what he described as a prickly "dwarf" *Hakea* sp., and his brief description of their structure is consistent with the description by McFarland (1991b) for Queensland nests.

The Ground Parrot is a granivore, but shows little specialisation in seed preference (McFarland 1991a). In Queensland a total of 40 species of seed were found to be eaten, of which 34 species were identified at least to family. Nineteen were dicotyledonous species (Fabaceae, 6 species and Epacridaceae, 4 species) and 15 were monocotyledonous species (mostly Cyperaceae, 7 species and Restionaceae, 5 species). These 40 species represented 34% of the plant species found in the study area. The seeds taken were restricted in size to 0.6-7 mm in diameter and excluded all seeds that were enclosed in a hard woody fruit (*Petrophile*, *Banksia*, *Leptospermum* and *Hakea* spp.) (McFarland 1991a).

In Victoria 15 species of plant were identified as important food sources (Meredith *et al.* 1984). Of these, eight species belonged to the families Cyperaceae and Restionaceae. In some sedgeland (*Baumea juncea* sedgeland and *Leptocarpus tenax* sedgeland) the dominant species was considered the only available seed source.

In Western Australia seven species of plant have been identified as food sources for Ground Parrots, based on observations and feeding evidence at sites where birds were flushed. These species were found in at least 30% and usually in more than 50% of vegetation quadrats (Burbidge *et al.* 1989). Green fruits still on the plants were being eaten from most of these species (Burbidge *et al.* 1989) and the somewhat succulent leaves of *Daviesia pachyphylla* were also observed being eaten (Newbey *et al.* 1983). These very limited observations suggest that Ground Parrots in Western Australia may be using more green fruit and vegetable material than birds in the east (Burbidge *et al.* 1989); this may reflect the drier nature of the currently used habitats in Western Australia.

### **Threatening Processes**

Two major factors have been implicated in the decline of Western Ground Parrots: clearing for agriculture and the imposition of unsuitable fire regimes (Watkins & Burbidge 1992; Garnett 1992a, 1992b). Two other factors - predation by introduced predators and the changes in the vegetation brought about through dieback disease caused by root-rot pathogens (*Phytophthora* spp.) - have been considered as potential threats to the survival of the Western Ground Parrot (Watkins & Burbidge 1992; Garnett 1992a, 1992b). Clearing for agriculture is no longer a serious threatening process for the Western Ground Parrot because all known populations occur on Crown land, and most populations are in conservation reserves.

#### *Response to fire*

Investigation of the post-fire age of vegetation used by Ground Parrots suggests that the preferred fire age differs in different vegetation types (Meredith *et al.* 1984) and geographically (Meredith *et al.* 1984; Watkins 1985; Jordan 1987; McFarland 1989; Burbidge *et al.* 1989; Bryant 1991, 1992). In Queensland, McFarland (1989) found that Ground Parrot densities were highest in vegetation with a post-fire age of 5-8 years and that densities were lower in vegetation that had not been burnt for 15 years. He had insufficient data to assess the effect of vegetation older than 15 years on Ground Parrot densities. Jordan (1987) found comparable results at Barren Grounds NSW, with peak Ground Parrot densities occurring in vegetation 5-6 years post-fire and the absence of the species from vegetation older than 12 years post-fire. In Tasmania, Bryant (1991, 1992) found peak densities in vegetation 4-7 years post-fire, but unlike in other areas, vegetation that had not been burnt for more than 30 years still maintained relatively high densities of Ground Parrots.

Meredith *et al.* (1984) found that Ground Parrot density in sedgeland communities in Victoria was not correlated with post-fire age, but in heathland communities it was. The highest densities of Ground Parrots were found in diverse shrub heaths that had a post-fire age of 4-6 years, but no Ground Parrots were found in heaths that had not been burnt for 20 or more years. Graminoid heaths showed a different pattern with the highest densities being found in heaths with a post-fire age of 10-15 years, while in most areas that had not been burnt for 18 or more years, no Ground Parrots were found. They proposed that these observed correlations between Ground Parrot densities and the post-fire age of the vegetation, reflected a response by the Ground Parrot to changes in the density and seed production of sedges (a major component of their diet), after a fire.

The use of the correlation between post-fire age of the vegetation and the density of Ground Parrots in that vegetation has two major problems associated with it. Firstly, correlations do not indicate a cause and effect relationship between the two variables, and for Ground Parrot densities other factors not directly related to post-fire age of the vegetation, such as minor differences in habitat type or the effects of predators may be producing the observed correlations. The second problem is in determining which sites to include in the analysis. If a site has no Ground Parrots in it, it should be included in the analysis only if it is known that historically it supported a population of this species, otherwise it will confound the relationship between post-fire age and other factors. How sites used in the above studies were determined is not clear, so it is not possible to assess the reliability of these observed correlations. These problems are highlighted by the ten year study of Baker and Whelan (1992) who

demonstrated that populations of Ground Parrots at a census site in Barren Grounds Nature Reserve did not decline after seven years post-fire in the way predicted from correlation studies (Jordan 1987).

In Western Australia insufficient work has been done to assess accurately the relationship between post-fire age of vegetation and its use by Ground Parrots. Two observations, however, suggest that the relationship may differ from that suggested for the eastern subspecies. Firstly, birds in the Short Road population at Fitzgerald River National Park, are still present in vegetation that has not been burnt for at least 35 years (Burbidge *et al.* 1989; A.H. Burbidge *et al.* unpublished). Secondly, in the Cape Arid National Park population, birds appear to be restricted to long unburnt areas and only occasionally utilise an adjacent area of habitat that was six years post-fire (Burbidge *et al.* 1989). Burbidge *et al.* (1989) suggested that the possible preference by *P. w. flaviventris* for older vegetation than that used by *P. w. wallicus*, may be due to the slower growth rates of the vegetation in areas used by the parrots in Western Australia, due to a lower rainfall.

Care must be taken in interpreting the current information from Western Australia because it is not known how the current densities of Western Ground Parrots compare with the carrying capacity of Western Australian heaths. The absence of Ground Parrots from some areas may be due to insufficient birds to colonise them, as has been found for the Western Bristlebird at Two Peoples Bay (Smith 1987), rather than some deficiency in the habitat. In the Fitzgerald River National Park, Western Ground Parrots have recolonised an area by six and a half years after an intense wildfire. This shows that they can survive in vegetation this young in this area. However, colonisation was from an immediately adjacent area. Furthermore, it is not known if they breed in vegetation this age but, as it is much more open than the adjacent unburnt area, it might not yet be suitable.

In fire management for Ground Parrots it would seem prudent to follow the model developed for vegetation occupied by the rare birds at Two Peoples Bay, ie total fire exclusion and wildfire suppression in areas occupied by Noisy Scrub-birds and Western Bristlebirds. This has resulted in expansion of populations of these species (in numbers and area occupied) and has provided new information on habitat usage.

#### *Predation*

Mattingley (1918) and Edwards (1924) recorded that the Ground Parrot has a powerful scent that was easily found by dogs, and Mattingley noted that quail shooter's dogs frequently ran down and captured Ground Parrots. This, together with the terrestrial habits of the bird, suggests that the Ground Parrot could be particularly susceptible to predation by foxes and feral cats. They often fly to their night-time roosts (Burbidge *et al.* 1989), thus affording some protection from scent-following predators, but usually walk to the nest (McFarland 1991b), putting them at risk from predators such as foxes which follow scent trails. Although there are records of Ground Parrots being taken by foxes and cats (Mattingley 1918; Fletcher 1927; Jordan 1989), there are no data on the level of predation or its effects on populations. McFarland (1989) did not consider predation to be a major problem for Ground Parrots at densities of predators or parrots normally encountered in Queensland, but stated that they may prevent or slow down the recolonisation of small areas of suitable habitat after fire. No data are available on predation in Western Australia, but due to the very low number of Ground Parrots in this State, the drier and more open habitats utilised and the known effects of foxes on ground-dwelling mammals (eg Kinnear *et al.* 1988), the fox must be considered a potential threat.

#### *Influence of Dieback Disease (Phytophthora spp.)*

Dieback disease caused by introduced *Phytophthora* spp. has been considered a potential threat to Ground Parrot populations (Garnett 1992a, 1992b). Work by Wills (1993) on the effects of *Phytophthora cinnamomi* on heath communities in the Stirling Ranges National Park, indicates that the disease causes changes in plant community structure and composition. In heaths in the Stirling Ranges, *Phytophthora* infections are associated with a general decline in total projective foliage cover, due mainly to the loss of many woody perennials. An increase in the cover of sedges (Cyperaceae and

Restionaceae) may also occur. Changes in floristic composition were also observed, primarily through a decline in woody perennials of the Proteaceae. Such changes could have adverse effects on Western Ground Parrot habitat in some areas. On the other hand, such changes may actually improve the habitat in other areas by e.g. removing large shrubs of *Banksia* spp. and increasing the dominance of sedges with a possible increase in food availability.

Nevertheless, the effects of such vegetation changes on Western Ground Parrots are unknown and cannot be assessed without better information on habitat requirements, diet and population densities, as well as better knowledge of the effects of *Phytophthora* in vegetation types used by Ground Parrots.

### **Existing conservation measures**

Most of the known populations of Western Ground Parrot are in CALM-managed land, ie Fitzgerald River National Park, Cape Arid National Park and Waychinicup National Park. Some of the Cheyne Beach - Waychinicup population is in unvested Crown land adjacent to Waychinicup National Park.

The presence of Ground Parrots constituted a major argument for the addition to Fitzgerald River National Park of approximately 100 000 ha of land on the northern boundary in 1988. This area holds the major known, and the most intensively studied, subpopulations of the Western Ground Parrot (Watkins & Burbidge 1992).

Management of Fitzgerald River National Park is carried out under a management plan (Moore *et al.* 1991) which provides considerable protection for the Ground Parrot through fire protection, dieback control and fox baiting. No specific management guidelines have been proposed for the Western Ground Parrot in the management plan, but the general prescriptions were formulated with conservation of the Ground Parrot as a major objective. For example, the major subpopulations of Ground Parrots in the Fitzgerald River National Park occur in several habitat management cells that are protected by wide, open-edged buffers. Within these cells prescribed burning will occur only after assessment of the risk to rare fauna and attempts will be made to keep wildfires confined to a single cell. Dieback disease caused by *Phytophthora* has been identified as the greatest threat to the Fitzgerald River National Park and management/research prescriptions to reduce the threat of this disease have been implemented. A fox baiting program was initiated in part of the Fitzgerald River National Park, to assess the effects of reducing the numbers of this introduced predator on mammal populations. The Fitzgerald Track sub-population of Western Ground Parrots is within the baited area and some monitoring of this sub-population has occurred. While it was hoped that this would assist in an assessment of the effect of fox baiting on Western Ground Parrots, the situation has been complicated by the fact that most of the area occupied by this sub-population has been burnt in a recent wildfire. Furthermore, the baiting program has now been superseded by the Western Shield program, in which the whole park is being baited for foxes four times per year. This program started in Fitzgerald River National Park in spring 1996.

No management plan exists for Cape Arid National Park, but Interim Guidelines for Management have been produced that identify the area where Western Ground Parrots occur and classifies it as a no planned burn area. These guidelines were written prior to the finding of Ground Parrots in the western part of the park, but it is not yet known whether these western records constitute a permanent population. Under the Western Shield program, baiting for predator control began in Cape Arid National Park in spring 1996.

Interim Guidelines for Management are also in operation for the Waychinicup National Park, but they were written prior to recent findings of Ground Parrots in the area. Waychinicup National Park is managed primarily for the benefit of other threatened species such as the Noisy Scrub-bird, Western Bristlebird and Dibbler, but such management would in most cases be advantageous for Ground Parrots. Fire management is a high priority. Regular ground-based fox baiting has been carried out along boundaries for some time, and in spring 1996, aerial baiting was commenced (including some

areas not part of the CALM-managed estate), with the planned frequency of baiting being four times per year. The interim guidelines are currently being reviewed.

Two research programs on the Western Ground Parrot have been completed (Watkins 1985; Burbidge *et al.* 1989). The first, funded by CALM and carried out by the RAOU, identified two of the three currently known populations of the Western Ground Parrot (Watkins 1985). (The third population, in the Manypeaks area, was not identified until much more recently.) The second project - a joint program between CALM and World Wildlife Fund Australia - provided preliminary information on the habitat preferences and daily movement patterns of Western Ground Parrots (Burbidge *et al.* 1989). In addition to this information the second project found that capturing and radio-tracking Western Ground Parrots was feasible (Burbidge *et al.* 1989). Based on information from both projects Watkins and Burbidge (1992) produced an estimate of the total population numbers for the Western Ground Parrot (see above for details).

A research plan has been prepared (Cale and Burbidge 1993) but to date this has not been funded.

### **Captive breeding**

Captive breeding has been suggested as an option but is not proposed within the life of this interim plan. A few birds have been legally held in captivity, mostly in eastern Australia, but to date, attempts to maintain or breed Ground Parrots in captivity have been *ad hoc* and sporadic. If the known populations are considered sufficiently viable to allow removal of enough birds for a sustainable breeding program or for translocation, the priority should be for translocation.

If it is found that captive breeding is desirable, CALM will seek to co-operate with appropriate agencies and individuals in designing a captive breeding program. If proceeded with, a captive population will be established and maintained in liaison with suitably qualified private aviculturists.

Such a captive breeding program would be designed to be consistent with CALM Policy Statements No 29, "Translocation of threatened flora and fauna"; No. 33, "Conservation of threatened and specially protected fauna in the wild"; No. 44, "Wildlife Management Programs"; and No 50, "Setting priorities for the conservation of Western Australia's threatened flora and fauna". All established protocols as to recording all captive specimens in a stud book, and maintaining genetic diversity to the greatest extent possible, would be followed.

A breeding colony set up by CALM would provide the possibility of releasing birds to approved aviculturists to spread the load of providing enough birds for eventual relocation in the wild, if that was in accordance with an approved translocation proposal or was required under an approved recovery plan.



## **STRATEGY FOR RECOVERY**

The immediate need is to review management needs in terms of protection, particularly from wildfire and predation. This needs to be done for each population on a case by case basis, as well as from an overall perspective.

A better knowledge of distribution, population sizes and boundaries will enable improvements in management actions and allow assessment of the effectiveness of management actions. Current knowledge of distribution is reasonable in general terms, but it would be useful to have better knowledge of population sizes and boundaries in all areas, particularly in the Manypeaks area. There is also a need for on-going survey in areas with potential to support Ground Parrots, and to investigate possible sightings of Ground Parrots reported by CALM staff or the general public.

There is a need to improve our understanding of response to fire. The Cape Arid population appears to be restricted to long unburnt vegetation (15+ years). In the Fitzgerald River National Park, one population has expanded into an area burnt 6.5 years previously, but it is unknown if they breed in this younger vegetation. It is likely that under some circumstances Ground Parrots are able to utilise vegetation burnt more recently than this. It is also likely that response to fire will vary geographically, depending largely on rainfall. A priority in this area is to monitor the Ground Parrot population and the permanent vegetation quadrats in burnt and non-burnt areas at the Short Road site. A further priority is to obtain more accurate data on post-fire ages of vegetation where Ground Parrots are known to occur.

It is assumed that Western Ground Parrots are susceptible to predation by foxes (and possibly feral cats; see above) and therefore that predator control through baiting for foxes will benefit the birds. Predator control is therefore seen as a priority for management. Available evidence (J.A. Friend pers. comm., P. de Tores pers. comm.) suggests that cats may be a less significant problem in the south-west than in more arid parts of the state, but the evidence is not conclusive. Nevertheless, the emphasis at this stage is on fox control because of the known negative effects on prey populations and the availability of an effective control measure. It was hoped that monitoring of some sites in Fitzgerald River National Park (Fitzgerald Track area, Hamersley Drive area) would aid in understanding of the effectiveness of baiting for predator control, but due to unforeseen circumstances (see above) this is now not possible.

Better knowledge of population sizes and boundaries will enable an assessment of the need for translocation. Such an assessment should be done within the life of this IRP. If translocation is contemplated, work will need to be put into locating suitable translocation sites. This information will also enable an informed assessment of whether a captive breeding program might be appropriate, and such an assessment should also be done within the life of this IRP.

## **OBJECTIVES**

The long-term objective is to increase the probability of survival of the Western Ground Parrot. Over the time frame of this three year plan, specific objectives are to

- improve the protection of known populations and any new ones that become known during the term of this plan,
- obtain more accurate estimates of population size, distribution and trends, so that the effectiveness of management actions can be assessed,
- improve understanding of habitat requirements, particularly with respect to fire regimes, and
- produce a recovery plan.

## **CRITERIA**

### **Success**

The criteria for success are (in priority order):

- production and application of fire management guidelines for each known population,
- the application of an on-going predator control (fox baiting) program in populations in Fitzgerald River National Park, Waychinicup National Park and Cape Arid National Park,
- establishment of a monitoring program,
- a measured increase in population size or increasing area occupied by those populations being monitored,
- discovery of previously unknown populations,
- production of an approved Recovery Plan.

### **Failure**

The program will be considered to have failed if:

- there is a measured decrease in overall population size or decrease in area occupied by those populations being monitored, or
- adequate data cannot be/have not been collected to allow a confident assessment of population trend or area occupied.

## **RECOVERY ACTIONS**

The WA South Coast Threatened Birds Recovery Team will co-ordinate the implementation of this IRP and will report annually to CALM's Corporate Executive. The following actions are listed in priority order, with the first (fire management) being essential. In the long term, management will be dependent on adequate information concerning population sizes, distribution at the local level, response to fire, predators and possibly other factors, micro-habitat preferences and population dynamics. Actions in this IRP, however, only address the most basic and pressing issues.

### **1. Fire management**

In Cape Arid National Park, the Western Ground Parrot is only known to be resident in vegetation which is unburnt for at least 15 years. Until recently, this was also thought to be the case in Fitzgerald River National Park. Recent surveys have shown that they are resident in vegetation unburnt for 6.5 years in one part of Fitzgerald River National Park, although this is adjacent to a very long unburnt area, and it is thought unlikely that they breed in the six year old vegetation. In the Waychinicup area, they appear resident in vegetation unburnt for eight years. Nevertheless, it would appear prudent at this stage to maintain a regime of no planned burns and maximum possible protection against wildfire for all known populations. This is likely to be particularly important in Cape Arid National Park and Fitzgerald River National Park, where the rainfall is lower than in the Waychinicup area (and hence the heath regenerates more slowly and is perhaps more prone to wildfires). Where possible, fire exclusion will also be extended to potential Ground Parrot areas, to promote older vegetation ages and better conditions for supporting Ground Parrots in future translocations or self-introductions.

Interim Management Guidelines for Waychinicup National Park are currently being reviewed, and locations of Ground Parrots and information on perceived fire management needs will be incorporated in this process. Not all of the area occupied by Ground Parrots in the Waychinicup area is vested in the National Parks and Nature Conservation Authority (NPNCA) but this issue is addressed in Action 4.

Fire exclusion/no planned burn areas need to be defined for each population. There is also a need to ensure that the requirements of Ground Parrots with respect to management of fire can be met without detriment to other threatened species.

Responsibility: CALM South Coast Region, Recovery Team

Costs:

	FRNP	CANP	WNP
1) planning for each population (1996)	675	675	950
2) on-ground application (per year)	1000	500	1000

Note: salaries (here and below) include 35% salary overheads.

Sources of funds: WATSCU 1996; ESP 1997-1999

Completion date: initial planning to be complete by mid 1997; on ground application on-going for the life of the IRP.

## 2. Predator control

The effect of fox predation is unknown, but, as discussed above, is likely to be important. Monitoring of Western Ground Parrot populations in Fitzgerald River National Park and perhaps in Waychinicup National Park may provide some evidence as to whether there is an increase in numbers of birds following baiting, but is unlikely to provide a conclusive result within the life of this plan. In the interim, the baiting should continue at as many Ground Parrot locations as practicable, particularly in Fitzgerald River and Waychinicup National Parks. An appropriate baiting regime should be defined for each population. In some cases, it may be appropriate to increase the intensity of baiting above the current level, as particular Ground Parrot populations may require better protection than the general level provided under the Western Shield program.

Interim Management Guidelines for Waychinicup National Park are currently being reviewed, and locations of Ground Parrots and information on perceived needs for predator control will be incorporated in this process.

Responsibility: CALM South Coast Region, Recovery Team

Predator control costs in 1996 were met under CALM's Western Shield program. For the Ground Parrot areas, these are approximately as follows (assuming ground and aerial baiting at a cost of 10c/ha four times per year):

Cost:	FRNP	CANP	WNP
-----			
<i>per year</i>			
application	2000	1200	400
salaries	800	800	800
-----			
Total over three years:	8400	6000	3600

Sources of funds: CALM 1996; CALM and Environment Australia's Endangered Species Program (ESP) 1997-99

Completion date: on-going for the life of this IRP

### 3. Dieback Hygiene

Effects on Ground Parrots of dieback due to *Phytophthora* species are unknown, but detrimental effects could occur through reduction of cover or availability of food source species. The conservative course for management is to continue to carry out dieback hygiene precautions, and improve measures where necessary. Management and/or research actions should be avoided at times of high risk.

Responsibility: CALM South Coast Region, Recovery Team

Cost per year:	FRNP	CANP	WNP
-----			
Annual mapping updates, permit system	700	700	700
-----			
Totals over three years	2100	2100	2100

Sources of funds: CALM South Coast Region

Completion date: on-going for the life of this IRP

### 4. Vesting of land in Manypeaks area

Land to the north of Mt Manypeaks where Ground Parrots are known to occur is currently unvested. Under the Regional Management Plan for CALM's South Coast Region (CALM 1992) it was proposed that this area be added to Waychincup National Park. CALM has been involved in negotiations concerning the future vesting of this land but some issues remain to be resolved. Vesting of this area in the National Parks and Nature Conservation Authority (NPNCA) would enable CALM to manage the area more effectively for conservation of the Ground Parrot and other rare birds in the area.

Discovery of Ground Parrots in this area in recent years has added to its already high conservation values and increased the need to complete these negotiations.

Responsibility: CALM South Coast Region

Administrative costs: ca. \$800 (mostly salaries) over the life of the IRP

Sources of funds: CALM South Coast Region

Completion date: mid 1999 (subject to outcome of negotiations)

## **5. Documentation of known populations and monitoring of trends in population size/boundaries**

Effective management relies on knowledge of the number of parrots and/or the area occupied. Assessment of either parameter for a given population can be determined by listening for calls or using an area search method. Both methods require a number of observers at the same time.

Knowledge of trends in area occupied and/or numbers of birds will be used to assess the effectiveness of management actions such as baiting for predators or vegetation management (fire exclusion/control). Some base line data already exist for three areas in Fitzgerald River National Park, but these populations should be re-examined to detect change, and comparable data should be gathered for all other populations. Some of these populations should be selected for further monitoring.

To reduce errors from inclusion of dispersing juveniles, the proposed monitoring would best be carried out in late winter - early spring. However, access to some areas may pose logistic problems at this time of year due to the need to avoid the possible spread of *Phytophthora*. It is therefore recommended that this action be carried out in autumn. In dry winters, it may be possible to gain some supplementary information at that time, but interpretation of trends in numbers and boundaries will need to be done from data gathered at the same season each year.

In the first year, monitoring will be carried out at the Short Road population in Fitzgerald River National Park. This will concentrate on estimating numbers at sample sites within the population, not population boundaries, and will provide information on the amount of survey required to gather such information from other sites. At the same time, tests will be done to quantify better the distance at which different observers can hear Ground Parrot calls under varying conditions. Measurements of wind strength will be made as this is the major factor influencing listening conditions. A minimum of four observers will be needed, so they can be positioned on a square grid pattern which will provide data to concurrently estimate density of calling birds and distances. The feasibility of using tape-recorders to extend the area covered at a given time, or to assist when observers are unavailable, will also be investigated.

After the first year, techniques and correction factors determined can be used, as appropriate, at other sites.

The most efficient way to carry out this action effectively would be through a combination of CALM staff, consultants with particular expertise and RAOU volunteers. In the first year, a minimum of four persons is required for a minimum of 12 nights. It is difficult to estimate what will be required in subsequent years, but it may need at least four persons for a month or more, depending on how many sites are monitored. Determination of population boundaries would require considerably more effort.

Responsibility: Recovery Team

Cost: \$7500 in the first year (salaries, consultancy fees, vehicle usage, field costs) and \$10200 per year thereafter, assuming a very high rate of volunteer input.

Sources of funds:

1996: WATSCU and Science and Information Division.

1997-99: CALM (Science and Information Division, South Coast Region, Southern Forest Region) and ESP.

Completion date: mid 1999

## **6. Survey of areas possibly suitable for Western Ground Parrots**

Cape Arid National Park and Fitzgerald River National Park have been surveyed reasonably well for the presence of Western Ground Parrots, although some areas in Fitzgerald River National Park have not been surveyed well (eg near Hamersley Drive). The Manypeaks/Waychinicup area is poorly surveyed, and there is a need for intensive, systematic surveys in this area, including the areas north of Manypeaks, the western part of Waychinicup and in the Boulder Hill reserve. Some historical sites (eg Bow River area, Torbay) have been inadequately surveyed (only one brief visit by a reputable ornithologist since the survey of Watkins (1985)) and, given the existence of several promising recent reports from near Denmark and near Broke Inlet, the area west of Albany should be given emphasis. In the Denmark area, this is already being done by local CALM staff and volunteers, with assistance from members of the Recovery Team. Some areas, such as Alexander Bay (west of Cape Arid National Park), have not been surveyed for at least a decade.

There also is a need to go back to areas where previously no Ground Parrots were seen, but where fire management may have changed or age of vegetation increased significantly since they were last visited.

Survey of all historical and likely sites would assist in an assessment of potentially suitable translocation sites. Ideally, this would include sites thought previously to be only occupied by dispersing birds (eg near West Mount Barren).

Population boundaries should be mapped and numbers estimated where possible.

CALM staff and volunteers are a source of assistance in this action. For example, recent records from Mt Manypeaks and Cape Arid National Park have come from both sources. This action could be accomplished in one year if funding was available for a consultant (about \$20 000) who would utilise volunteers and assist in the training of CALM field staff, or could be addressed over a number of years at lower cost but with less useful assessment of sites. In either case, local CALM staff could assist with logistics and possibly personnel.

Responsibility: Recovery Team, CALM districts in South Coast Region and Southern Forests Region

**Cost:** \$4320 spent in 1996; \$9250 per year required in 1997-99, plus high volunteer input over this period.

Sources of funds:

1996: WATSCU and Science and Information Division.

1997-99: CALM (Science and Information Division, South Coast Region, Southern Forest Region) and ESP.

Completion date: mid 1999

## **7. Taking birds for captive breeding or translocation**

Captive breeding or translocation are not currently proposed within the life of this interim plan, but will be treated in detail when the formal Recovery Plan is prepared, or beforehand if sufficient data are available. If the known populations are considered sufficiently viable to allow removal of enough birds for a sustainable breeding program or for translocation, the priority should be for translocation. Under exceptional circumstances (the finding of large numbers in a population as well as the finding of an ideal site for translocation) translocation could be considered but such action would need to be consistent with CALM Policy Statement No 29, "Translocation of threatened flora and fauna". Within the term of this IRP, the need for and appropriateness of both translocation and establishing a captive breeding program will be assessed.

Responsibility: CALM (Recovery Team)

Cost: Within the life of this interim plan, no costs separate from those identified above.

Priority: Low at the present time; to be re-assessed at the time of preparation of a full Recovery Plan, or beforehand if available information indicates a need to examine the option of captive breeding or translocation.

Completion date: to be re-assessed at the time of preparation of a full Recovery Plan.

### 8. Recovery Plan

A formal Recovery Plan should be written within the life of this IRP.

Responsibility: Recovery Team

Costs: ca. \$ 1500 (salaries, travel for Recovery Team members to attend meetings).

Sources of funds: CALM, ESP.

Completion date: full recovery plan to be written by mid 1999.

<b>Table 3: Summary of recovery actions, priority, responsibility and completion date.</b>					
Recovery Action	Priority	Responsibility			Completion date
1. Fire management	1	CALM	Sth	Coast	Planning: mid 1997 On ground: on-going
		Region,			
		Recovery Team			
2. Predator control	2	CALM	Sth	Coast	On-going
		Region,			
		Recovery Team			
3. Dieback Hygiene	3	CALM	Sth	Coast	On-going
		Region,			
		Recovery Team			
4. Vesting of land in Manypeaks area	4	CALM	Sth	Coast	Mid-1999 (if possible)
		Region			
5. Documentation of known populations and monitoring of trends in population size/boundaries	5	CALM	Sth	Coast	On-going
		Region,			
		Recovery Team			
6. Survey of areas possibly suitable for Western Ground Parrots	6	CALM	Sth	Coast	mid 1999
		Region,		CALM	
		Southern		Forest	
		Region,		Recovery	
		Team			
7. Taking birds for captive breeding or translocation	7	CALM		(Recovery	Re-assess by mid-1999
		Team)			
8. Writing of a formal Recovery Plan	8	Recovery Team			mid 1999

**Table 4: Summary of costs, identifying sources of funds. The costs assume a high rate of volunteer input for Actions 5 and 6.**

Action	1996	1997		1998		1999		Sub-total for each action(1997-99)
	CALM*	CALM	ESP	CALM	ESP	CALM	ESP	
1. Fire management	4800	-	2500	-	2500	-	2500	7500
2. Predator control	-	800	3600	800	3600	800	3600	13 200
3. Dieback hygiene	700	700	-	700	-	700	-	2100
4. Vesting (Manypeaks area)	270	270	-	270	-	270	-	810
5. Population documentation and monitoring	7500	4900	5300	4900	5300	4900	5300	30 600
6. Survey	4320	6750	2500	6750	2500	6750	2500	27 750
7. Taking birds for captive breeding or translocation	-	-	-	-	-	-	-	-
8. Writing a formal Recovery Plan	-	-	-	-	-	7750	1000	8750
<b>Sub-Totals</b>	17 590	13 420	13 900	13 420	13 900	21 170	14 900	90 710
Corporate overheads (CALM)	3520	5465		5465		7215		18 145
<b>Totals</b>	21 110	1997: \$32 785		1998: \$32 785		1999: \$ 43 285		108 855

(Salaries of permanent officers are calculated as salary plus 35% salary overheads; corporate overheads calculated at 20% and included as part of CALM contribution)

(CALM = WA Dept Conservation and Land Management; ESP = Environment Australia's Endangered Species Program)

\* Much of the funding in 1996 was from AMRAD funds obtained via WATSCU

#### Summary to 1999:

<b>1996</b>	\$s
CALM	21 110
<b>1997-1999</b>	
CALM	66 155
ESP	42 700
<b>Total (1997-99)</b>	<b>108 855</b>



## ACKNOWLEDGMENTS

This IRP draws heavily on the Research Plan for the Western Ground Parrot, Western Whipbird and Western Bristlebird (Cale and Burbidge 1993); thanks are due to Peter Cale for his contribution to discussions concerning Ground Parrot recovery.

Ron Johnstone gave assistance with museum specimens and location records and Andrew Burbidge, Shapelle McNee and Graeme Smith contributed to a number of discussions concerning research and management of Ground Parrots. Drs Stephen Garnett and Peter Mawson provided helpful comments on an earlier version of this document.

## REFERENCES

- Anon. (1993a) Observations. *Western Australian Bird Notes* 67: 2-3.
- Anon. (1993b) Observations. *Western Australian Bird Notes* 68: 2-3.
- Anon. (1994) Observations. *Western Australian Bird Notes* 71: 2-3.
- Ashby, E. (1921) Notes on birds observed in Western Australia from Perth northwards to Geraldton. *Emu* 20: 130-7.
- Baggs, J.W. (1953) Re-discovery of the Ground Parrot at the Bow River. *Western Australian Naturalist* 3: 198.
- Baker, J.R. and Whelan, R.J. (1992) The importance of Ground Parrot fire ecology research at Barren Grounds. Unpubl. report to NSW National Parks and Wildlife Service.
- Baker, J.R. and Whelan, R.J. (1996) The Ground Parrot and Eastern Bristlebird at Jervis bay National Park. Survey and management recommendations. Unpubl. report to ANCA.
- Bryant, S.L. (1991) The Ground Parrot, *Pezoporus wallicus*, in Tasmania: Distribution, density and conservation status. Scientific Report 91/1 (Department of Parks, Wildlife & Heritage, Tasmania).
- Bryant, S.L. (1992) The Ground Parrot and age of vegetation in Tasmania. In: L. Joseph (ed.) *Issues in the Conservation of Parrots in Australasia and Oceania: Challenges to Conservation Biology*. RAOU Report No. 83: 42-45.
- Burbidge, A.H., Watkins, D. and McNee, S. (1989) Project 118: Conservation of the Ground Parrot in Western Australia. Unpublished final report to World Wildlife Fund (Australia).
- Burbidge, A.H., McNee, S., Newbey, B. and Rolfe, J. (1990) Supplementary report on Project 118: Conservation of the Ground Parrot in Western Australia. Unpublished report to World Wildlife Fund (Australia).
- Cale, P. and Burbidge, A.H. (1993) Research Plan for the Western Ground Parrot, Western Whipbird and Western Bristlebird. Unpubl. report to ANPWS Endangered Species Unit.
- CALM (1992) South Coast Region Regional Management Plan 1992-2002. Management Plan No. 24. Department of Conservation and Land Management, Perth..
- CALM Scientific Ranking Panel (1995) Report of the Scientific Ranking Panel for Western Australia's threatened flora and fauna. Unpublished report, CALM.
- Chapman, A. and Newbey, K. (1995) A biological survey of the Fitzgerald area, Western Australia. *CALMScience* Suppl. 3, pp. 1-258.
- Condon, H.T. (1975) *Checklist of the Birds of Australia Part I. Non-Passerines*. (Royal Australasian Ornithologists Union, Melbourne).
- Edwards, H.V. (1924) Notes on the Ground Parrot. *Emu* 24: 35-7.
- Fletcher, J.A. (1927) The *Neophema* parrots. *Emu* 27: 120-21.
- Ford, J. (1969) Distribution and taxonomic notes on some parrots from Western Australia. *South Australian Ornithologist* 25: 99-105.
- Forshaw, J.M. (1973) *Parrots of the World*. (Lansdowne, Melbourne).
- Forshaw, J.M. (1981) *Australian Parrots*. (Second Edition) (Lansdowne, Melbourne).
- Garnett, S. (1992a) *Threatened and Extinct Birds of Australia*. RAOU Report No. 82 (RAOU and ANPWS).
- Garnett, S. (1992b) *The Action Plan for Australian Birds*. (Australian National Parks and Wildlife Service, Canberra).

- Garstone, R. (1977) Observation of a Ground Parrot in the Cape Arid National Park. *Western Australian Naturalist* 13: 206.
- Gould, J. (1865) Handbook to the Birds of Australia. (J. Gould, London).
- IUCN Species Survival Commission (1994) IUCN Red List Categories, as approved by the 40th Meeting of the IUCN Council, Gland, Switzerland. (IUCN, Gland, Switzerland).
- Jordan, R. (1984) The Ground Parrot. Effect of fire on a population. *RAOU Report* No. 11: 28-9.
- Jordan, R. (1987) The Ground Parrot in Barren Grounds Nature Reserve. *RAOU Report* No. 27: 19-23.
- Jordan, R. (1989) The Ground Parrot. Out of the frying pan into the fire. *Geo* 11(1): 83-7.
- King, W.B. (1979) *Red Data Book. Vol. 2: Aves*. (IUCN, Morges, Switzerland).
- Kinnear, J., Onus, M.L. and Bromilow, R.N. (1988) Fox control and rock-wallaby population dynamics. *Australian Wildlife Research* 15: 435-450.
- Leake, B.W. (1962) *Eastern Wheatbelt Wildlife*. (B.W. Leake, Perth).
- Leeton, P. R. J., Christidis, L., Westerman, M. and Boles, W. E. (1994) Molecular phylogenetic relationships of the Night Parrot (*Geopsittacus occidentalis*) and the Ground Parrot (*Pezoporus wallicus*). *Auk* 111: 831-841.
- Mathews, G.M. (1912) Reference List to the Birds of Australia. *Novitates Zool.* 18. (P. 280, cited in Mathews 1917).
- Mathews, G.M. (1917) *The Birds of Australia*. Vol. 6. (G.M. Mathews, London).
- Mattingley, A.H.E. (1918) The Ground Parrot (*Pezoporus formosus*). *Emu* 17: 216-18.
- McFarland, D.C. (1988) Geographical variation in the clutch size and breeding season of the Ground Parrot *Pezoporus wallicus*. *Australian Bird Watcher* 12: 247-50.
- McFarland, D.C. (1989) The Ground Parrot *Pezoporus wallicus wallicus* (Kerr) in Queensland: Habitat biology and conservation. (Division of Conservation, Parks and Wildlife; Department of Environment and Conservation, Queensland).
- McFarland, D.C. (1991a) The biology of the Ground Parrot. I. Microhabitat use, activity cycle and diet. *Wildlife Research* 18: 169-84.
- McFarland, D.C. (1991b) The biology of the Ground Parrot. II. Spacing, calling and breeding behaviour. *Wildlife Research* 18: 185-97.
- McFarland, D.C. (1991c) The biology of the Ground Parrot. III. Distribution and abundance. *Wildlife Research* 18: 199-213.
- McFarland, D.C. (1991d) Flush behaviour, catchability and morphometrics of the Ground Parrot *Pezoporus wallicus* in south-eastern Queensland. *Corella* 15: 143-149.
- Meredith, C.W. (1984) The Ground Parrot *Pezoporus wallicus* (Kerr). *RAOU Conservation Statement* No. 1.
- Meredith, C.W., Gilmore, A.M. and Isles, A.C. (1984) The Ground Parrot (*Pezoporus wallicus* Kerr) in south-eastern Australia: a fire adapted species? *Australian Journal of Ecology* 9: 367-380.
- Meredith, C.W. and Isles, A.C. (1980) A study of the Ground Parrot (*Pezoporus wallicus*) in Victoria. (Publication No. 304, Environmental Studies Division of the Ministry for Conservation, Victoria).
- Moore, S., Cavana, M., Gillen, K., Hart, C., Hopper, S., Orr, K. and Schmidt, W. (1992) Fitzgerald River National Park Management Plan 1991-2001. (Department of Conservation & Land Management, Perth).
- Newbey, K., Newbey, B. and Bradby, K. (1983) Notes on the swamp parrot. *Western Australian Naturalist* 15: 145-6.
- North, A.J. (1901-1914) Nests and eggs of birds found breeding in Australia and Tasmania. *Australian Museum Special Catalogue* No. 1, Vol 3, Part 2.
- Salvadori, T. (1891) *Catalogue of birds in the British Museum. Vol. 20. Catalogue of the Psittaci (Parrots)*. British Museum, London, pp. 596-7.
- Serventy, D.L. (1953) Some speciation problems in Australian birds. *Emu* 53: 131-45.
- Smith, G.T. (1987) Observations on the biology of the Western Bristlebird *Dasyornis longirostris*. *Emu* 87: 111-18.
- Watkins, D. (1985) Report of the RAOU Ground Parrot survey in Western Australia. *RAOU Report* No. 15.

- Watkins, D. and Burbidge, A.H. (1992) Conservation of the Ground Parrot in Western Australia. In. L. Joseph (ed.) *Issues in the conservation of parrots in Australasia and Oceania: Challenges to conservation biology*. RAOU Report No. 83: 46-9.
- Whitlock, F.L. (1914) Notes on the Spotless Crake and Western Ground Parrot. *Emu* 13: 202-5.
- Whittell, H.M. (1951) A review of the work of John Gilbert in Western Australia. Part 4. *Emu* 51: 17-29.
- Whittell, H.M. (1952) The visit of Sydney William Jackson to Western Australia in 1912 in search of the Noisy Scrub-bird. *Western Australian Naturalist* 3: 73-80.
- Wills, R.T. (1993) The ecological impact of *Phytophthora cinnamomi* in the Stirling Range National Park, Western Australia. *Australian Journal of Ecology* 18: 145-159.