

The Ground Parrot, *Pezoporus wallicus* Management Plan



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Cover pictures: The sedgeland component of Ground Parrot habitat at Howe Flat (Hastings 2006), inserts from Meredith (1984); Eastern Ground Parrot (GS Chapman), young Ground Parrots in the nest and nest with eggs (CW Meredith).

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Preface

This report is written as an assessment item for the Wildlife Ecology and Management module, as part of Charles Sturt University's Environment Science (Management) degree. The information contained is based on literature review, and inspired by field observations and discussions on Ground Parrot behaviour and habitat management with local Parks Victoria staff. The information in this report is intended to be useful for any land manager of Ground Parrot habitat.

Summary

Ground Parrots, *Pezoporus wallicus*, are elusive birds that inhabit heathlands and sedgelands on mainland Australia, Bass Straight islands and Tasmania. Their status ranges from Critically Endangered in Western Australia to least concern in Tasmania. They rely on a variety of seeding plants in a dense community to provide food and shelter, which typically results from periodic fires. Determining and implementing appropriate fire regimes for each habitat area is most important for the species' conservation. Predation and competition are not considered threats to the species.

Introduction

Ground Parrots, *Pezoporus wallicus*, are unusual in behaviour, habitat preference and genetically distant from other species. They are adapted specifically to dense heathlands and sedgelands in coastal and near-coastal areas. Loss of habitat, predation and most importantly, changes in fire regimes are considered to have reduced Ground Parrot populations. This report collates existing data for the three known sub-species and proposes general management principles.

Evolution and Taxonomy

Species name

Three subspecies of Ground Parrots are recognised; the Eastern Ground Parrot, *Pezoporus wallicus wallicus* (Kerr 1792), which occurs in eastern mainland Australia, *Pezoporus wallicus leachi* occurs in Tasmania and Bass Straight islands (Garnett and Crowley 2000), and the Western Ground Parrot, *Pezoporus wallicus flaviventris*, of south-west West Australia (Meredith 1984, Garnett and Crowley 2000).

Naming of *P.w.leachi* as a sub-species must have occurred during the late 1990's, as Ground Parrots in Tasmania were referred to as *P.w.wallicus* as recently as 1994 (Bryant 1994) and the name *P.w.leachi* does not appear in any other prior literature. Garnett and Crowley's reference to *P.w.leachi* taxonomy cites the CSIRO's *Zoological Catalogue of Australia. Vol. 37.2.* (Schodde and Mason 1997). *P.w.leachi* has the greatest population numbers and is considered of least concern (Garnett and Crowley 2000).

Pezoporus wallicus wallicus is listed as vulnerable in the 'Action Plan for Australian Birds' (Garnett and Crowley 2000), vulnerable in NSW (DECC NSW 2005), threatened in Victoria (DPC VIC 2000), and *Pezoporus wallicus flaviventris* is Critically Endangered in Western Australia (Barrett 2005, Gibson et al 2007).

The species are classified in the Order *Psittaciforms*, and is in the *Psittacidae* family with parrots, rosellas and lorikeets (Klomp et al 1999). The Night Parrot, *Pezoporus occidentalis* is a separate species not studied in this report.

Description

Ground Parrots are around 300mm long, with a narrow orange frontal band above the beak. Plumage is green with black streaks, barred on the tail. Eyes are a dull yellow and legs are pale grey brown. They breed September to December, in well-hidden nests lined with chewed stalks and leaves, usually at the base of tussock or bush. Eggs number 3 to 4, white, 27 x 21mm. Incubation takes 21 days, and 25 days later young leave the nest and shelter in nearby plants (Frith 1976).

Parrot evolution

The earliest records of birds in Australia are fossilised imprints of feathers from the Early Cretaceous period, 100 – 110 million years ago. Fossils of birds of different skeletal structure to modern birds, of the Enantiornithe sub-class, have been found in Queensland. Between the Cretaceous period and Oligocene epoch evolution of bird species and vegetation communities occurred simultaneously and isolation from other continents,

influenced by climate change as Australia drifted northwards (Boles 2001a). Budgerigars occurred in the Pliocene epoch, 5 million years ago, (Boles 2001a), which are closely related to Ground Parrots (Christidis et al 1991, Boles 2001b). Species that exist today are likely to have existed since at least the Holocene epoch (Boles 2001a).

While lack of fossils leave Palaeontologists uncertain of Australian bird evolution (Boles 2001a), relationships between species can be determined by protein electrophoresis of genetic material (Christidis et al 1991). The technique essentially produces a unique code for each species, and the trick is to interpret this code in a meaningful way. Assumptions are made in order to process algorithms, which lead to production of family trees. Comparing the various results shows that some species, such as Cockatoos, have a strong, definite family group, while Ground Parrots do not have a strong affinity to any other genus. Two possible family trees offered by Christidis (1991) imply that more data is required before the Psittaciformes family tree can be drawn with any certainty. Ground Parrots are grouped with “other conventional members of the Platycercines” (broad-tailed parrots); the Budgerigar, *Melopsittacus*, Red-fronted Parakeet, *Cyanoramphus*, Blue-winged and Bourke's Parrots, *Neophema*.

Distribution and habitat

Ground parrots live in coastal and near-coastal heathlands and sedgeland, where vegetation is typically less than 1m high and more than 70% canopy cover (Bryant 1994, DECC NSW 2005, Klomp et al 1999). Sites where Ground Parrots have been recorded range from Fraser Island, Queensland, scattered NSW coastal sites, including Jervis bay and Nadgee, Victorian coastal heaths, Bass Strait Islands, Tasmanian button-grass plains, and in the Fitzgerald River and Cape Arid National Parks, Western Australia (Barrett 2005, Bryant 1994, Klomp et al 1999, Frith 1976, McFarland 1991c).

Ecological vegetation class 'EVC' names such as heathland, sedgeland and button-grass plain used here are loose terms that include specific communities such as Wet Heathland and Brackish Sedgeland (DSE 2004a) in the East Gippsland Lowlands bio-region (DSE 2004b), Standard and Layered Blanket Moors, and South-western Sedgely in Tasmania (Bryant 1994). These names are used for convenience in describing general locations where Ground Parrots live, although actual habitat usage by birds generally varies seasonally and does not strictly conform to these areas (Kikkawa 1968). A survey of heath and woodland ecotonal use by birds concluded that Ground Parrots are heath specialists (Baker et al 2002), although they make take refuge in heath / forest ecotones (McFarland 1991a).

Vegetation associations

Typical Ground Parrot habitats are heathlands and sedgelands dominated by Cyperaceae and Restionaceae sedges, or diverse array of seed producing heath plants (Meredith 1984). The heathlands and sedgelands occupied by Ground Parrots include species that produce or retain seed all year round, and a variety of plants that produce seed at different times of year to produce a continuous supply (McFarland 1991a).

Western Ground Parrot habitat is more specifically described as “areas relatively high in altitude, distant from rivers, gently sloping to level habitat, with an intermediate cover of vegetation and where there is a mosaic of vegetation ages” (Gibson et al 2007).

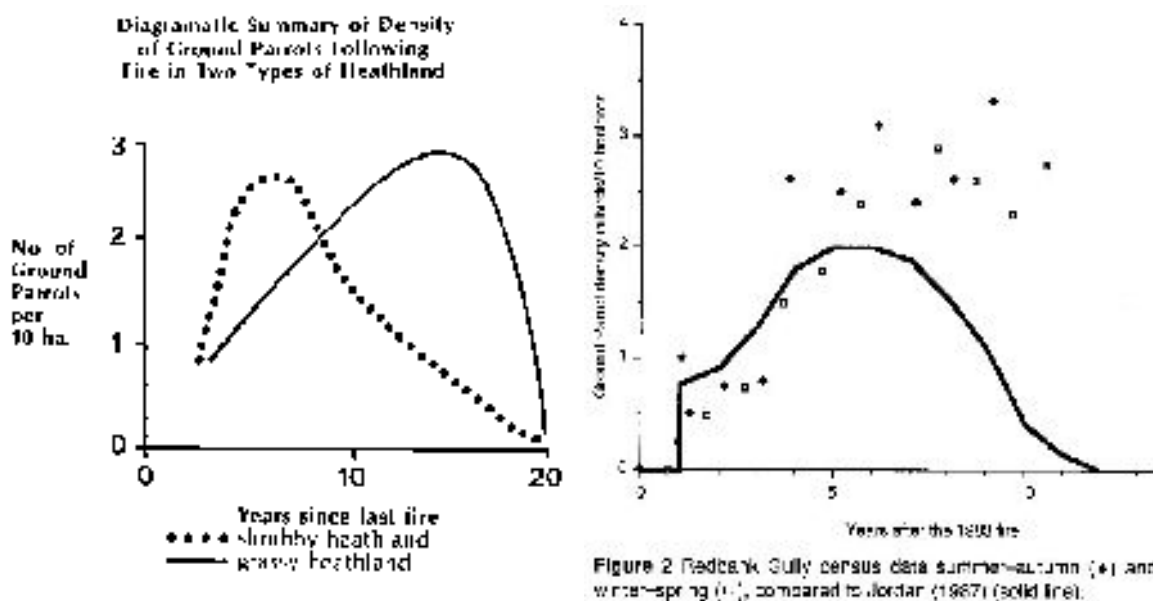
Factors controlling distribution

Small population numbers limit Ground Parrot distribution, rather than availability of suitable habitat (Bryant 1994, Gibson et al 2007). Factors influencing distribution within suitable habitat include predation, fire frequency, disturbance and proximity to re-colonising areas (Bryant 1994).

Disturbance and fire frequency

The heathlands comprising Ground Parrot habitat are prone to recurrent fires (DEWR 2004, Baker and Whelan 1994). This has led to the assumption that “Ground Parrots rely on regular fires to maintain optimum habitat for foraging and breeding” (DNRE undated), a premise contradicted by other sources (such as Gibson et al 2007), and one that is certainly over-simplistic.

Ground Parrot peak density coincides with the heathlands climatic succession; when diversity and seed production is at its highest. The range in suitability depends on seed production after fire, typically 3 years, and lack of productivity at the other extreme, after 20 to 25 years. Absence of fire may also result in change in species composition and community structure to woodland or forest, which is unsuitable habitat (DEWR 2004).



Graph **above left** is reproduced from Meredith (1984), which estimates ground parrot density relative to years after fire in two habitats. This data is speculative and not based on actual surveys. **Above right**, reproduced from Baker and Whelan (1994), plots actual survey data from Barren Grounds, NSW, against another speculative graph. This example shows why surveys and data specific to the site are required to determine if a need for fire exists, rather than relying on general guidelines. All of these graphs describe Eastern Ground Parrot density and habitat, while Western Ground Parrot numbers are recorded as highest in long unburnt patches; over 30 years since last fire (Gibson et al 2007).

Vegetation and soils relationship

All of the records of Ground Parrot habitat are of dense, low vegetation near the coast, however the soils supporting this vegetation varies greatly. The soils are well to poorly drained (Bryant 1994) and can be coarse sand to heavy clay (personal observation). Siliceous sand is often a base for heathlands, from Victoria to Queensland (Cuff 1999, DNRE undated). Heath communities consistently occur on soils low in essential plant nutrient, especially phosphate (Jeffrey 1968) and nitrate (EPA 2007).

Heathlands do not occur on all sites of similar soil and climate; additional factors of wind exposure, salinity, periodic water-logging, periodic drought, and fire regimes also influence vegetation composition and structure (EPA 2007, Bryant 1994).

Food and feeding

When eating, Ground Parrots use their bills to crack and shell seed casings, and their feet to bend stems to bring seed-heads to ground level (McFarland 1991a). Parrots have specialised beaks with grooves that assist in holding and cracking seeds, with a rich supply of tongue sensors to assist food handling. They have much fewer taste receptors than humans, but these are specialised to their environment, for example detecting insect secretions, tannins, salts or sugars (Koutsos et al 2001).

Dietary requirements

Ground Parrots are granivorous (Koutsos et al 2001), feeding on seeds from at least 40 different species, with selection based on availability, accessibility and pragmatic size (McFarland 1991a). Fleshy leaves, green shoots and small invertebrates supplement their diet (Meredith 1976, McFarland 1991a).

Ground Parrots dietary requirements include fresh water, possibly only in temperatures above 20°C, energy, protein, amino acids, vitamins, fatty acids and trace minerals. Parrots generally require at least 40 different nutrients. (Koutsos et al 2001)

The dietary metabolised energy requirements are related to their metabolic rate and energy expenditure, which varies with environmental conditions, life stage and individual genetics. Flight is the most energy expensive activity, minimised by Ground Parrots behaviour of mostly walking on the ground, and only flying short distances. As granivorous birds, they are efficient at obtaining energy from their food, compared to nectarivorous species (Koutsos et al 2001).

Protein requirements are highest when moulting. Reproduction may be timed with seasonal availability of amino acids, as requirements are highest for chicks and egg-laying females (Koutsos et al 2001). Crop contents for chick feeding has included 15 different seeds; the large seeded *Caustis recurvata* and *Cassutha glabella*, plus a variety of Fabaceae and Proteaceae (McFarland 1991b). Vitamin A is required for vision, cellular differentiation, immune function and more. This is sourced from carotenoids in plant matter and retinyl esters in foods of animal origin (Koutsos et al 2001).

Food chain

The precise species occupying Ground Parrot habitat is variable, within local sites and nationally, so construction of a food chain or food web is speculative. In East Gippsland, higher order predators might naturally have included Dingos, *Canis familiaris*, Eastern Brown Snakes, *Pseudonaja textilis*, Red-bellied Black Snake, *Pseuechis porphyriacus*, and Tiger Snakes, *Notechis scutatus*. The list now includes feral Cats, *Felis catus*, and Foxes, *Canis vulpes*. While snakes seem obvious predators, they are not mentioned in any of the references used in this report.

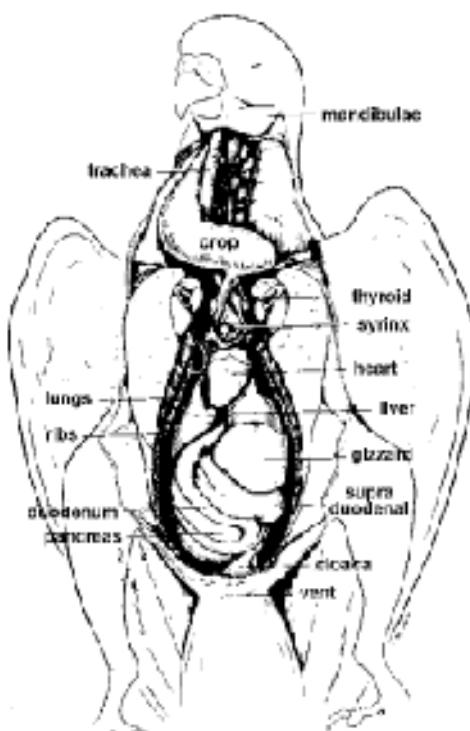
The proximity to forests and oceans means a great number of birds and other species might forage in or pass through Ground Parrot habitat, if not regularly occupy it. For example tracks of Lace Monitor, *Varanus varius*, were seen following a trail through coastal heath, and may have opportunistically taken Ground Parrots eggs, but Monitors prefers forest or woodlands with the refuge of trees to run up (personal observation).

The dense thickets of heath generally provide excellent cover for birds and reptiles hunting insects and other invertebrates, such as centipedes, jewel beetles, spiders, wasps, bees, grasshoppers and ants (Australian Museum 2007). Some known species include Emu Wrens, *Stipiurus malachurus*, Brown Bandicoots, *Isodon obesulus* (Stoddart and Braithwaite 1979), and Bush Rats, *Rattus fuscipes*.

Digestive strategy

Right: Anatomy of a parrot (Pesek 1999).

The crop holds and softens food to aid digestion, and allows regurgitation to feed chicks. Ground Parrot gizzard is likely to be large and muscular with thick lining, to crush and digest hard seeds. The duodenum is on the same medial plane, aiding quick digestion of nectar and pollens. Once foods are broken down and partially emulsified, they pass into the small intestines, whose primary function is enzymatic digestion and nutrient absorption. The pancreas hydrolyses starches, proteins and nucleic acids. (Koutsos et al 2001).



Ecology and management

Ground parrots have declined in abundance and range due to clearing of habitat, predation by introduced animals, and changes to fire regimes (Klomp et al 1999). Fire regimes are critical for maintaining the seed stock and vegetation structure required (DECC 2005a). The habitat requirements of food and shelter appear consistent for all Ground Parrots, although varying vegetation growth rates and response to fire mean that fire management must be site specific (Meredith 1984).

Competition

Inter-species competition

Ground Parrots would compete for seeds with small rodents and ants (McFarland 1991a). In some areas seed-eating rodents are absent, possibly due to the seasonal and unreliable supply (Cockburn 1981 in McFarland 1991a). Ground Parrots may out-compete rodents as they can fly locations where seed are available (McFarland 1991a), which I suggest is also an advantage in escaping predation by snakes.

An additional advantage that Parrots have over Rodents is water conservation, with feathers reducing evaporative loss and the renal-cloacal complex minimising excretory loss (Koutsos et al 2001). Budgerigars can survive without drinking water at all in cool climates, which may also apply to Ground Parrots. Freshwater is scarce in dry heath, with its deep sandy soils, so this factor may explain the increased density of Western Ground Parrots with distance from water (Gibson et al 2007); inversely, Rodents would be more densely populated closer to the stream.

McFarland (1991a) suggests that Ground Parrot's advantage over ants is in taking seed directly from plants, rather than fallen seed, but ants are very capable climbers. The periodic water logging common in wet heaths would eliminate most subterranean ant colonies, limiting this competition.

Ground Parrots are capable of displacing other granivorous birds, such as quails, from patches of seed (McFarland 199b).

Intra-species competition

No aggressive behaviour has been recorded between Ground Parrots. Due to their elusive nature, there have been inadequate behavioural observations to clarify social organisation and systems. There is no evidence to suggest that they maintain exclusive territories. Defending home ranges would be energy expensive, as intruders are not readily visible, and ground parrots do not fly or call during the day (McFarland 1991b).

Ground Parrots calls indicate a social hierarchy, with higher rank providing access to richer seed patches and consequently smaller areas to supply daily requirements. This is supported by the larger range of sub-adults and increased calling rate with increased parrot density, the 'Beau Geste effect' (McFarland 1991b).

Predator – prey dynamics

Ground parrots are susceptible to predation by cats and foxes (Meredith 1984, McLeod 2004). The impact on local populations is considered minimal (Meredith 1984, McFarland 1991c), although is listed as a cause for their population decline (Meredith 1984, Klomp et al 1999). Given their small population sizes and rarity, they are unlikely to affect predator population densities. Psittacine Circoviral Disease, 'PCD', may be a threat (DECC 2005a).

Ground Parrot's requirement for low dense vegetation is considered critical for camouflage (Klomp et al 1999). When disturbed, they abruptly fly a short distance, remain perfectly still, or run through heath faster than most people could pursue (Baker and Whelan 1999).

Ground parrot's prey on some insects and invertebrates (Meredith 1976, McFarland 1991a), but species and details are unknown.

Habitat loss by clearing for agriculture or development by humans is regarded as a cause of Ground Parrot decline (Klomp et al 1999), so humans could be regarded as an indirect predator to the species. Native vegetation clearance controls and the Ground Parrot's conservation status offer some legislative protection, with a loose requirement to implement Action Plans to ensure population recovery. They are not considered threatened by wind turbines.

Behaviour

Ground Parrots feed, roost and breed on the ground, flying short distances when disturbed (Klomp et al 1999). The flight distances are around 160m when leaving the nest in the morning and 220m when returning at dusk (McFarland 1991a). Although once thought to be active at night (Frith 1976), radio tracking instead found that they are most active in the early morning, mid morning and late afternoon, and inactive at night. The remainder of the time is spent walking and foraging (McFarland 1991a).

Males have smaller home ranges than females, and adults utilise a smaller area than sub-juveniles (McFarland 1991a). The specific range varies seasonally, such as from heathland to sedgeland, as the food sources become available (McFarland 1991a).

Despite overlapping home ranges, Ground Parrots tend to be solitary. Inter-bird distance is typically over 100m, and minimum nest spacing is 1 per 10ha. Females incubate eggs, while males provide food for the female and chicks (McFarland 1991b).

The dense heath cover of Ground Parrot habitat has made behavioural observations impossible (McFarlane 1991a, Chan and Mudie 2004). Use of similar calls by birds in one area indicates they are of the same population, while additional or different calls indicate birds of a different population. The variation in calls generally increases with distance between populations. The call heard most often by Ground Parrots has a flute-like whistle tone, rising in a series of sharp, single notes until completion (Chan and Mudie 2004).

Ground Parrots most conspicuous behaviour is their calling at dawn and dusk, which allows population surveys to be conducted. The favoured procedure involves people spaced at 50m intervals, who record the time and direction of any call heard, which can then be triangulated to confirm bird locations (McFarland 1991b, Baker and Whelan 1994).

Management Plan

Ensuring Ground Parrot continuance relies principally on habitat management through monitoring and prescribed burning of habitat. Funding and priority actions exist, as detailed in recovery and threat abatements plans (DECC 2005b, Garnett and Crowley 2000, McLeod 2004).

Monitoring

Ground Parrots rely on a diverse set of seed producing plants and dense cover. Local fire regimes are considered critical to maintaining these habitat elements. Conducting standardised flora surveys, such as 10m square quadrat surveys at locations marked with star pickets, would help monitor change in these elements. A noticeable change in loss of seed production, loss of diversity, loss of density or successional change to forest / woodland would indicate a requirement for a prescribed burn. The frequency of prescribed burns required may vary from 10 year intervals to 30 year intervals, or not at all, so the requirement for flora monitoring frequency may also vary from annually to five yearly intervals.

Monitoring Ground Parrot populations using the above method of listening for calls can provide information about the habitat, as indicated in the graphs above. If repeated surveys clearly indicate a decline in population, as predicted in the bell curves, then a prescribed burn may be required. Conversely if the population remains steady or is increasing, burns are not required. Population surveys would ideally be conducted annually at the same locations. As Ground Parrots are likely to utilise multiple sites within a broad area, depending on fire history and presence of habitat elements, surveying multiple sites in different growth or successional stages would be ideal. Correlating flora survey data and population data would be most useful in understanding the habitat requirements and usage in each area.

Habitat management

A precautionary approach would be to exclude fire from Ground Parrot habitat, unless bird population surveys and vegetation data conclusive prove a population decline due to absence of fire at a location. Evaluating vegetation characteristics to determine the need to conduct a controlled burn, rather than years since previous fire, is supported by Baker and Whelan (1994), who support this by citing Meredith (1984), Burbidge et al (1989) and McFarland (1991).

Ground Parrots move to suitable habitat opportunistically, and therefore a variety of age classes within their habitat area is preferable to the entire habitat burning in a single event (Garnett and Crowley 2000, Gibson et al 2007). The scale of patches to maintain at different age classes is unknown; however, a greater number of smaller patches would maintain a larger area of suitable habitat at any one time. As heaths and sedgeland are dominated by dense, fine fuels, they will be susceptible to wildfire regardless of any imposed burning regime.

Fire management agencies need to be informed of known habitat, with mitigation measures included in fire management plans and operation maps (DECC 2005b). The prime consideration is to ensure the entire habitat is not burnt in one incident, with a mosaic of age classes preferred.

Managing competitors

The Ground Parrot's competitors for food; rodents, ants and other granivorous birds, are not considered an issue in any of the known habitat areas. It is presumed that natural

factors and the Ground Parrots adaptations to the environment provide sufficient competitive advantage.

Potential threats could occur if a plague of pets invaded the habitat, such as mice or locusts. These might have the potential to strip food supply and cause habitat damage, but no incidents have been reported.

Humans could be considered competitors for habitat, given the loss of habitat by humans is a cause of Ground Parrot decline. As the heathland habitat typically occurs on nutrient poor soils, competition for agricultural use should be minimal, and ill-advised, leaving desire for coastal land for development. Native vegetation clearance controls and conservation legislation in place should be adequate to prevent any such developments from being approved. The situation could be assisted by notifying local councils of known Ground Parrot habitats, and provisions in the Environment Protection Biodiversity Conservation Act 1999 (Clth) could be enacted.

Managing predators

Dead individuals, such as any road-kill, need to be collected and analysed for Psittacine Circoviral Disease (DECC 2005b).

Control of foxes through regional programs, such as the Southern Ark Project, ought to include areas surrounding known Ground Parrot habitat. These programs usually involve poison baits, which pose no threat to Ground Parrots.

Control of feral cats is difficult, as they are found in low densities, don't readily eat baits, and are naturally wary. Shooting, baiting and trapping have some effect, but excluding cats from habitat with barrier fencing is considered the most effective control technique (McLeod 2004). Fencing Ground Parrot habitat would be appropriate where there was a small location population restricted to a small habitat area, under direct threat from predatory animals. An example might be remnant heathland near an urban area.

Conclusion

Ground Parrots are extremely well adapted to the environment of dense heathland and sedgeland. Their quiet and elusive nature has made behavioural studies difficult, but McFarland (1991) has notably succeeded in reporting on their calling, breeding and feeding. Their habitat requirements are consistent across all 3 sub-species and in every known area; dense cover and a variety of seeding plants.

The challenge in conserving Ground Parrots is managing their habitat with prescribed burning, the required frequency and scale of which is likely to be different at each location. Monitoring of vegetation and Ground Parrot populations is recommended to determine the need for fire, on a case by case basis.

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