

Ord-East Kimberley Expansion Project - Weaber Plain Development Area

Gouldian Finch Non Breeding Population and Habitat Assessment (2015)

Prepared for
Ord-East Kimberley Expansion Project
Department of Regional Development

By Save The Gouldian Fund

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Save The Gouldian Fund
361 Martinsville Road,
NSW 2265

Web: www.savethegouldian.net
Tel: 0431 746 276
Email: sarah.pryke@anu.edu.au



Summary

As part of the requirement for State approval under the *Environment Protection and Biodiversity Conservation Act 1999*, an assessment and regular monitoring of the endangered Gouldian finch (*Erythrura gouldiae*) is required during the operation of the Ord River Irrigation Area Weaber Plain Development Project in Kimberley, Western Australia. This report details the findings from 1) surveys of non-breeding Gouldian finches and vegetation assessment of their associated feeding habitats during the non-breeding season (September 2014 – December 2014), and 2) wet season vegetation surveys of Gouldian finch feeding grasses (November 2014 – March 2015).

In accordance with the EPBC Act (6AIV) and GFMP (3-4, 3-5, 3-6, 3-9) conditions, this work specifically provides:

- 1) *Gouldian finch counts of the non-breeding population.*
- 2) *An assessment of vegetation condition in areas identified as key Gouldian Finch habitat within the Buffer Area and immediate surrounding reserves.* This includes monitoring the temporal and spatial availability of grasses, as well as the impacts of fire and grazing on Gouldian finch feeding grasses.
- 2) *Annual monitoring of the phenology and productivity of wet season feeding habitat, and assessment of their use by Gouldian Finches.*

Key results included:

- 1) A total of 29 Gouldian finches were located feeding (in both the breeding and Buffer areas); this is the highest number of birds to be recorded since land clearing commenced.
- 2) Substantial reduction in grazing pressure (almost absent) in Gouldian finch breeding areas, feeding areas and in the general Buffer Area compared to previous years.
- 3) Potential feeding grasses were present in all habitats, and in higher proportions than in the previous 5 years. Gouldian finch habitats were dominated by *Sorghum spp.* and *Triodia spp.*, both of which are favoured feeding grasses.
- 4) Phenology surveys showed that *Sorghum spp.*, *Triodia spp.* and *Alloteropsis semialata* were flowering and/or seeding during the late wet season, and in greater numbers than in previous years, thus providing a vital food base for the finches.

This work provides the required annual data for (1) long-term monitoring of breeding Gouldian finches within the Weaber Plain Development Project, and (2) the conditions detailed in the EPBC Act and GFMP, as well as important on-going and baseline data to ensure appropriate management of the endangered Gouldian finch.

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1 Introduction

As a requirement for State approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), Gouldian finch (*Erythrura gouldiae*) populations and their associated habitats (breeding and feeding areas) need to be regularly surveyed during the construction and operation of the Ord River Irrigation Area (ORIA) Weaber Plain Development Project (the Project) in the eastern Kimberley, Western Australia. This is to ensure appropriate management of the endangered Gouldian finch and its habitat before, during and after completion of the development. The Gouldian finch is currently listed as *Endangered and Migratory* under the *Environment Protection and Biodiversity Conservation Act 1999* and listed as “rare or likely to become extinct” under the *Wildlife Conservation Act 1950*.

Because of the status of the Gouldian finch, the current survey sets out to build the baseline groundwork and guidelines for the maintenance of sustainable populations of Gouldian finches in the Project area.

1.1 Gouldian Finch Distribution

The Gouldian finch is an obligate granivorous bird that lives only in the northern savanna region of Australia. Formerly ranging from Cape York Peninsula in Queensland, through the northern half of the Northern Territory, to the Kimberley region in Western Australia, Gouldian finches were once believed to be amongst the most common finches of the region (O'Malley 2006). However, within the last century (and 50 years in particular), Gouldian finch populations have undergone population declines and a contraction of their range. The species is now recorded reliably at only a few sites within the Northern Territory, Western Australia and Queensland. A large known and important Gouldian finch population is located in the Wyndham area, about 100 km west of the Weaber Plain Development Project area. Current national Gouldian finch estimates suggest a population of less than 2500 individuals with no more than 250 birds (and frequently much less) where sub-populations occur (O'Malley 2006).

1.2 General Habitat

Gouldian finches currently utilise only a small percentage of the range they formerly occupied (O'Malley 2006), and it is likely that most habitats currently used are not optimal (Brazill-Boast and Pryke 2011). Also, due to special dietary needs (detailed in 1.3.1) and temporal and geographical variability of feeding grasses, preferred Gouldian finch habitat varies between the dry (breeding) season (ca. January - June), and non-breeding seasons (ca. July - January).

1.2.1 Breeding Habitat

Known breeding habitat for Gouldian finches includes rocky hills with hollow-bearing *Eucalyptus* (e.g. *Eucalyptus brevifolia*, *E. tintinnans*) and *Corymbia* species (e.g. *Corymbia dichromophloia*). Gouldian finches have very specific nesting requirements and require robust and deep hollows with small diameters (Tidemann et al. 1992a; Brazill-Boast et al. 2010). Birds often rely on feeding habitat located within or immediately adjacent to breeding habitats (Brazill-Boast and Pryke 2011), however they will move up to 5 km (or potentially further) to find suitable feeding grounds. Key species of grass utilised during the breeding season, are annual spear grass or native Sorghum (e.g. *Sorghum stipoides*, *S. intrans*, *S. plumosum*) and Spinifex (e.g. *Triodia bitextura*; *T. acutispicula*; *T. bynoei*; *T. schinzii*) (Dostine et al. 2001).

1.2.2 Non-breeding Habitat

Because of limited seed availability following a breeding season (July-January), Gouldian finches usually move away from their breeding habitats and form mixed species flocks, moving over lowland granite soil areas feeding on a range of annual and perennial grasses species. Key species of grass during this period includes kangaroo grass (*Themeda triandra*), cockatoo grass (*Alloteropsis semialata*), giant spear grass (*Heteropogon triticeus*), golden beard grass (*Chrysopogon fallax*), white grass (*Sehima nervosum*), ricegrass (*Xerochloa laniflora*), and Spinifex species (*Triodia spp.*).

1.3 Key Threats

Several processes have been attributed to Gouldian finch declines (Tidemann 1996), including excessive trapping for aviculture (Franklin et al. 1999), infestation with airsac mite (Tidemann et al. 1992b), low survivorship (Woinarski and Tidemann 1992), inappropriate fire patterns (Dostine et al. 2001), mining activities (Garnett and Crowley 2000) and pastoral intensification (Franklin 1999; Franklin et al. 2005). However, the National Species Recovery Plan for the Gouldian finch specifically highlights that “habitat change through landscape destruction and inappropriate fire regimes are the factors most likely contributing to on-going declines or absence of recovery”. Habitat destruction through landscape clearing and inappropriate fire management alters seed diversity, directly affecting foraging ecology and survival (Dostine et al. 2001), and also affects the availability and production of tree cavities, directly affecting breeding ecology and local recruitment (Brazill-Boast et al. 2010; Brazill-Boast et al. 2011).

The Ord Phase Two Expansion Project requires large areas of land clearing for irrigated agricultural land and the addition of infrastructure for secondary roads, irrigation, flood protection and drainage. Approximately 9260 ha vegetation for farms and infrastructure will be cleared, including approximately 8205 ha for farmland. As required by the State Approval of the Project, on the ranges and rocky slopes surrounding and within the proposed Development Area, a designated Buffer Area of approximately 11, 470 ha of native vegetation is set aside to protect watercourses and surrounding conservation reserves, and help offset disturbance in the Development Area.

1.3.1 Food Availability

Both *Alloteropsis* and *Triodia* species, which are critical Gouldian finch wet season grass species, are highly vulnerable to anthropogenic habitat changes such as land clearing, grazing, and inappropriate fire regimes (O’Malley 2006). *Triodia* is highly flammable and particularly sensitive to repeated, late season wildfires, while *Alloteropsis* is susceptible to pastoralism and suffers reduced seed production for years after even moderate grazing pressure (Crowley and Garnett 2001).

Over the course of the tropical dry season, the availability of the Gouldian finch preferred grass seeds on the soil surface are steadily reduced by wind, rainfall run-off, fire, germination, and consumption and the birds typically move from their breeding habitats to low-lying areas to feed on wet-season seeding grasses (feeding on a variety of annual

and perennial grasses that produce seed at the appropriate times, in order to bridge this bottleneck in food supply (Dostine et al. 2001)). Therefore, the low-lying feeding areas and proposed Buffer Areas are critical for sustaining wet season grass productivity, and hence populations of non-breeding birds.

1.4 Weaber Plain Development Area and Gouldian Finches

Areas of breeding and non-breeding Gouldian finch habitat exist within the Weaber Plain Development Area, the Pincombe Range Conservation Area and Point Springs Nature Reserve, as well as within the Buffer Area to be established for the Weaber Plain Development Project.

The Gouldian finch has earlier been recorded within the Ord-East Expansion Area. A preliminary survey during the non-breeding season of 2010 identified the presence of suitable breeding habitat (Pryke 2010). Additional in-depth surveys during the breeding season of 2011 (March-June) located 5 distinct breeding populations all of which were located within these habitats. During breeding surveys, Gouldian finches have also been sighted feeding on *Sarga* species within the breeding habitats.

Gouldian finches have also been located within the Weaber Plain Development Area during the non-breeding season. In August 2010, birds were observed during general bird surveys (by Animal Plants Minerals). Furthermore, during in-depth surveys in 2011, birds were located in both the Buffer Area and the Development Area (Save The Gouldian Fund, 2011b). In contrast, in 2012, during the initial land-clearing phase, no Gouldian finches were sighted in either the Buffer or Development Areas (Save The Gouldian Fund 2013). However, in the last round of surveys (since land clearing has been completed), 14 Gouldian finches were sighted in the Buffer Areas during the late dry season surveys (Save The Gouldian Fund 2014).

In response to the presence of Gouldian finches in the area, the Gouldian Finch Management Plan (GFMP) has been developed (Strategen 2011). The purpose of the GFMP is to ensure the protection of the endangered Gouldian finch by preserving and maintaining habitat and ensuring the retention of vegetation corridors linking feeding areas across the Project.

1.5 Purpose of the Current Survey

To ensure protection and aid in the sustainable management of Gouldian finch populations within the Weaber Plain Development Area, the presence, distribution and relative numbers of Gouldian finches, as well as the quality and availability of their habitat and feeding grounds needs to be regularly monitored and assessed.

There are a number of potential impacts arising from the proposed project that need to be assessed during on-going monitoring. In the Development Area, the primary impacts will be clearing of potential feeding habitat and the removal of feeding grasses (replaced with uninhabitable agricultural land). In the Buffer Area, the primary impacts are wildfire control and cattle grazing (both remove favourable feeding grasses required by Gouldian finches). Indeed, late season fire and heavy grazing pressures is likely to be the primary reason for the absence of Gouldian finches during the 2012 dry season bird surveys (Save The Gouldian Fund 2012).

In response to the requirements for State approval under the EPBC Act and the GFMP this work aims to specifically address:

(A) GFMP Monitoring Regime (Table 3, Item 6):

Undertake Gouldian Finch counts within the Buffer Area and immediate surrounding reserves.

(B) EPBC Act (Condition 6AIV) and GFMP Monitoring Regime (Table 3, Item 4, 5):

Annual monitoring of the phenology and productivity of wet season feeding habitat, and assessment of their use by Gouldian Finches.

(C) GFMP Monitoring Regime (Table 3, Item 9):

Undertake assessment of vegetation condition in areas identified as key Gouldian Finch habitat within the Buffer Area and immediate surrounding reserves.

2 Methods

2.1 Study Site

The Weaber Plain Development Area and Buffer Area of the Ord-East Expansion Project is situated within the East Kimberley region of Western Australia. The area is located 30 km north-east of Kununurra on the Weaber Plains Road and approximately 100 km east of Wyndham. Gouldian finch associated habitat surveys were conducted in areas that have previously been identified as potential feeding (non-breeding) habitats, and in feeding areas within and adjacent to the breeding areas (Pryke 2010b; Save The Gouldian Fund 2011b), as well as in the Buffer Area (within the designated development area).

2.2 Gouldian Finch Survey Method

The Gouldian finch surveys were carried out during September 2014. Counting birds at isolated and restricted waterholes during the late dry season is the commonly used method to monitor Gouldian finch populations. However, because of the widespread and continuous availability of ground water in the Weaber Plain Development Area (through the extensive canals), birds are highly dispersed in the landscape. Therefore, standardised transect-plots (Roberts and Schnell 2006) were used to estimate the number and distribution of birds.

Transects were undertaken between 5:30 and 9:30am to coincide with the period of peak feeding activity. Following guidelines by the IUCN, and recommendations for surveying rare or cryptic species (Joseph and Possingham 2008), the 20 minute 2-ha count method was used (Roberts and Schnell 2006). This method provides resolution at a relatively fine scale and still enables a large number of grids to be appropriately surveyed in the time frame. For each chosen 2-ha plot, the perimeter of the area was walked, and then parallel lines 20m apart are walked inside the area, recording all birds observed during this time.

2.3 Gouldian Finch Counts in Breeding Areas

Breeding habitat has been identified from previous monitoring of breeding Gouldian finches (Pryke 2011). These areas consists of areas situated on gently sloping and rocky

hills, and are dominated by open woodland (Brazill-Boast et al. 2010; Brazill-Boast and Pryke 2011). For each of the 5 breeding habitats, a number of 2-ha sample grids were placed over the breeding habitats (at least 100 m apart), such that at least 50% of the breeding habitat was sampled. In total, 31 2-ha plots were surveyed within the 5 breeding habitats and adjoining feeding habitats.

2.4 Gouldian Finch Counts in Non-breeding Areas

A total of 45 2-ha plots were sampled in the potential feeding areas and the general Buffer area. Because the current vegetation mapping of the area is incomplete, the location of feeding grasses potentially utilised by Gouldian finches is unknown. Although some feeding areas have previously been located (e.g. Folly Rock), most of the regional habitat types identified for the area host at least one potential feeding grass (e.g. habitat types: C21, D10, D26, H3; from the ORIA – Weaber Plain Development Project Environmental Impact Statement (EIS) (Strategen 2011)). Therefore, Gouldian finches may potentially be located throughout the Weaber Plain Development Area. As a result, 2-ha sample grids were chosen across the landscape, ensuring that each habitat type was included, and thus no specific habitat was favoured for assessment that may lead to a bias in population numbers.

2.5 Feeding Activity and Critical Feeding Grasses

During each survey, the activity of the bird is recorded. In particular, when birds are sighted feeding, the species of grass is recorded to identify the critical grass species used in the area. In addition, grass phenology is assessed and seed samples are collected to infer availability, condition and viability of feeding grasses in breeding and feeding areas, as well as in the general Buffer area (see 2.7 for more detailed methods).

2.6 Feeding Grasses Transect Site Selection

Within the Buffer Area (both adjacent and within the designated Development Area), 41 50 x 50 meter square vegetation transects have been aligned to best represent the grass species present in known Gouldian finch feeding and breeding areas, as well as in the general Buffer Area (Table 1). This design is a variation of the Woinarski et al. (2010) quadrant, generally used for biodiversity surveys. These survey plots (50 x 50 metre

squares) are placed at a minimum of 100 metres apart (i.e. areas of different sizes have different numbers of transects). In addition, the location of transects takes into account altitude differences in the area and ensures that transect surveying encompasses spatial/geographical differences in grass species ecology.

Table 1. Areas and number of surveyed vegetation transects (breeding area numbers).

Area	Number of transects
1 (breeding area with adjoining feeding areas)	4
2 (breeding area with adjoining feeding areas)	4
3 (breeding area with adjoining feeding areas)	3
4 (breeding area with adjoining feeding areas)	4
5 (breeding area with adjoining feeding areas)	6
Feeding Areas (all situated in the Buffer area)	14
Buffer Area corridors (within Development Area)	6

Although in the EPBC requirements, item 6A, condition IV states that the phenology and availability of grasses needs to be monitored during the wet season, these proposed surveys are undertaken during both wet and dry seasons. This is to be able to fully assess the availability and phenology (e.g. flowering times and seeding) of the different grass species in both the non-breeding and breeding stages, and assess grass quality in relation to current and future management regimes (e.g. fire and cattle management).

2.6.1 Grass Survey Transect Alignment

The start of the vegetation transect was marked with an individually numbered aluminium picket and marked with GPS coordinates. A 50-metre tape was placed in a straight line from the start point/picket and GPS coordinates were taken at the end of the 50-metre transect (again marked with a picket), and transect orientation noted (Figure 1). A photo was taken from the start point of all transects along the direction/orientation of each transect. For each transect, three 1 x 1 metre squares (located at (0 – 1 metre), (25 –

26 metre) and (49 – 50 metre)) were intensively surveyed for more detailed phenology assessment of individual grasses (2.6.2).

2.6.2 Phenology Assessment of Critical Grasses

Focusing on the line directly under the 50 meter tape, a measurement (in cm) is taken of the area occupied by any of the critical grass species for Gouldian finches: *Sarga* species, *Trioda* species (spinifex), *Chrysopogon fallax* (golden beard grass), *Alloteropsis semialata* (cockatoo grass), *Themeda triandra* (kangaroo grass), *Heteropogon triticeus* (giant spear grass), *Panicum decompositum* (native millet), *Xerochloa laniflora* (rice grass), and *Sehima nervosa* (white grass). At the completion of the 50-metre transect, measurements were totalled and converted into a percentage value. Within the 50-metre x 50-metre survey plot, grasses were individually marked to assess grass phenology over time (e.g. flowering, seeding).

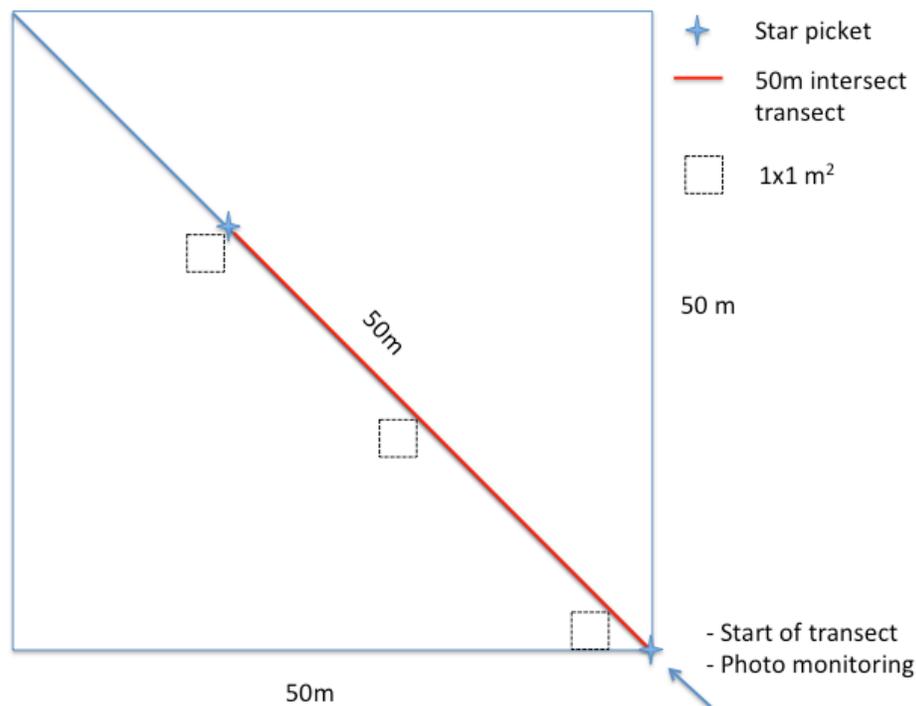


Figure 1. Schematic of the outlay of the 50 x 50 metre grass survey transect, depicting start and end of transect, orientation of photo monitoring and position of 1 x 1 meter squares.

2.6.3 Scoring of Additional Indicators Affecting Critical Grasses

In addition to grass quality and quantity, evidence of fire (i.e. burnt areas) and cattle damage (i.e. grazing, trampling) was scored. Scoring is measured by its direct effect on the availability and distribution of critical feeding grasses (none, patchy, low, moderate, high and extreme) in the 50 x 50 meter quadrant.

3 Results

3.1 Non-breeding Gouldian Finches

A total of 31 2-ha plots were surveyed in the previously established Gouldian finch breeding areas and adjoining feeding areas. An additional 45 2-ha plots were surveyed in other potential Gouldian finch feeding areas throughout the designated Buffer area. In total, 29 Gouldian finches were located/observed during the total 76 2-ha plot surveys where all located birds were found within the breeding areas. Table 2 shows a comparison of the number and distribution of Gouldian finches over the last four years.

Table 2. Comparison of the number of observed non-breeding Gouldian finches between 2011, 2012, 2013 and 2014 surveys.

Area	Number of surveys				Number of Gouldian finches			
	2011	2012	2013	2014	2011	2012	2013	2014
Breeding habitat	45	45	31	31	4	0	14	21
Buffer Area	44	52	45	45	61	0	0	8
Development Area	40	n/a	n/a	n/a	8	n/a	n/a	n/a
Total	129	97	76	76	73	0	14	29

* Note that no surveys were conducted in the Development Area after 2011 because land clearing had commenced in these areas and there was no suitable habitat.

3.2 Gouldian finch Survival and Resightings

None of the Gouldian finches observed during the 2014 non-breeding survey were previously banded.

3.3 Critical Feeding Grasses and Fire and Cattle Damage

A total of 34 vegetation surveys (transects located throughout the breeding, feeding and general Buffer area) were performed to infer availability and phenology of critical feeding grasses.

No fires (or fire damage) were recorded in any of the surveyed areas between September 2014 and March 2015.

There was limited cattle and grazing damage. Table 3 shows the proportion (%) of vegetation transects displaying different levels of grazing damages during the surveys. Only low and patchy grazing damage were observed (no 'extreme' or 'high' grazing pressures were located in any of the surveys and habitats).

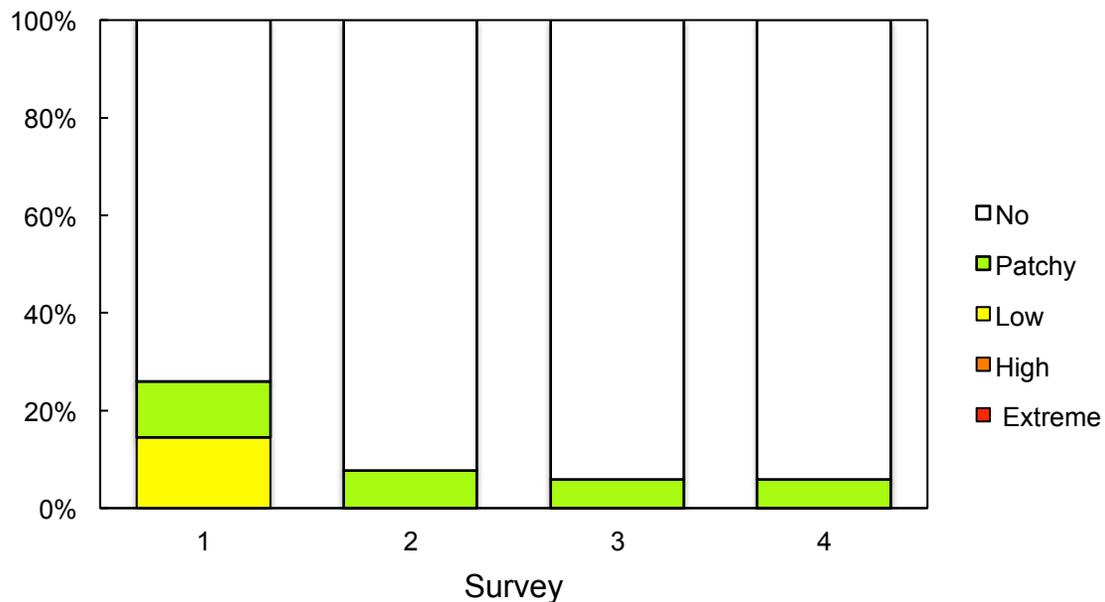


Figure 2. Percentage of vegetation transects showing the intensity of grazing damage observed at the different survey times (1 = September; 2 = November; 3 = January; 4 = March).

The severity of grazing pressure has substantially decreased compared to previous surveys (Table 3). Although cattle are occasionally sighted and there is limited evidence of grazing is present, the number of cattle is substantially lower than recorded in previous years.

Table 3. Comparison of vegetation transects showing grazing damage observed during 2014-2015 surveys (average %).

Score	2012-2013	2013-2014	2014-2015
None	4.9	56.2	83.5
Low	18.3	5.4	3,1
Patchy	12.2	36.9	13,1
High	18.3	1.5	0
Extreme	46.3	0	0

3.4 Availability and Presence of Feeding Grasses

Vegetation surveys in October and December 2014 (Table 4) showed that sorghum (e.g. *Sarga* spp.) were the prevalent feeding grasses available (60-66%) followed by spinifex (e.g. *Triodia* spp.), kangaroo grass (*Themeda triandra*), spear grass (*Heteropogon triticeus*), golden beard grass (*Chrysopogon fallax*), cockatoo grass (*Alloteropsis semialata*) and native millet (*Panicum decompositum*). These grasses comprise seven out of the nine commonly used seeding grasses used by the Gouldian finches in the eastern Kimberley.

Table 4. Available feeding grasses used by Gouldian finches in vegetation transects during late wet season surveys.

Year 2014 Critical Feeding Grasses	Vegetation cover (m)		% Critical Feeding Grasses Available	
	October	December	October	December
<i>Sorghum spp.</i>	318.3	253.2	73.2	58.6
<i>Triodia spp.</i>	90.9	129.3	14.3	26.3
<i>Themeda triandra</i>	15.4	1.4	1.8	1.5
<i>Alloteropsis semialata</i>	25.4	9.3	4.3	2.5
<i>Heteropogon triticeus</i>	18.4	34.2	1.2	1.4
<i>Panicum decompositum</i>	9.8	2.9	1.1	8.8
<i>Chrysopogon fallax</i>	45.3	18.3	4.1	0.9

3.5 Phenology of Feeding Grasses

No grasses were flowering or seeding during the October and December surveys. However, at the time of survey 3 (January 2015), 83% of surveyed transects had flowering grasses, and in 21% of these transects grasses were producing seeds. During the fourth survey (March 2015), 33% of the surveyed transects had flowering grasses, and in 21% of transects these grasses were producing seeds. Table 5 details the phenology of the critical grass species observed in the vegetation transects during the wet season 2015.

Table 5. Percentage (%) of flowering and seeding grass species observed between January and March 2015

Critical Feeding Grasses	% Flowering		% Seeding	
	January	March	January	March
<i>Sorghum/Sarga spp.</i>	64.4	13.2	69.3	89.3
<i>Triodia spp.</i>	29.5	24.3	9.3	58.7
<i>Themeda triandra</i>	9.7	4.6	0	0
<i>Alloteropsis semialata</i>	28.4	19.5	5.9	15.4
<i>Heteropogon triticeus</i>	13.2	11.2	0	9.3
<i>Panicum decompositum</i>	11.3	0	0	0
<i>Chrysopogon fallax</i>	8.4	1.3	0	14.3

4 Discussion and Implications

As part of the Gouldian Finch Management Plan (Strategen 2012) and as a requirement for State approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), regular assessments of Gouldian finch populations and their associated habitats (breeding and feeding areas) are to be carried out during the construction and operation of the Ord River Irrigation Area Weaber Plain Development Project in the Eastern Kimberly. This report covers the results of the 2014 survey of the presence and distribution of non-breeding Gouldian finches, as well as the early wet season habitat assessment (2014-2015). In concurrence with these conditions, this report summarises data for the wet season vegetation surveys, which specifically monitored the presence, condition and phenology of wet season feeding habitat and the critical feeding grasses used by Gouldian finches.

4.1 Population Size of Non-breeding Gouldian finches

A total of 76 2-ha plots were surveyed during September and December 2014. During the transect surveys, 29 Gouldian finches were observed. Twenty-one birds were sighted in the breeding areas, and 8 in the general Buffer Areas.

Although Gouldian finches were sighted in breeding habitats in the early wet season of 2014, these habitats are rarely able to provide suitable feeding grasses for Gouldian finches year-round, and thus it is not uncommon for birds to be absent from breeding areas during the wet season (see section 1.3.1 above). After the depletion of critical dry season grass seeds, such as Sorghum, the birds typically move from their breeding habitats to low-lying areas (e.g. previously established feeding areas and the Buffer Area within the designated Development Area) to feed on wet season seeding grasses. Therefore, the low-lying feeding areas and proposed Buffer Areas are critical for sustaining wet season grass productivity, and thus populations of nonbreeding birds. The presence of Gouldian finches in these low-lying areas in late 2014 suggests that the birds are utilizing these valuable Buffer Areas.

During the previous 2012 non-breeding surveys (Save The Gouldian Fund 2012), no Gouldian finches were observed during any transect surveys, nor opportunistically, in any of the areas, using the exact same monitoring methods. Although Gouldian finch populations do naturally fluctuate between years and areas, it is likely that the

combination of increased activity (due to construction and land clearing), together with high grazing pressures and wildfire damages, contributed to the absence of Gouldian finches in 2012.

During the 2013 and 2014 non-breeding surveys, disturbance was substantially reduced. The Main Compound 2 was dismantled (positioned opposite Gouldian finch breeding area 2 and 3, and associated feeding areas), and the area has subsequently experienced reduced disturbances, noise and dust. Furthermore, cattle pressures and wildfire have substantially been reduced and controlled, which has promoted many more seeding grasses (see 4.1), and thus the likely the return of Gouldian finches to the areas.

4.1 Assessment of Critical Wet Season Feeding Grasses

In contrast to previous years (e.g. 2012-2013, where there was substantial fire damage and extreme cattle damage), the current 2013-2014 surveys reported no evidence of fire damages in any areas and, although a few cattle were sighted in some areas, their numbers were severely reduced and grazing damage was substantially reduced from previous years. Indeed, there was no evidence of ‘extreme’ or ‘high’ grazing pressures (unlike previous years).

Surveys during 2014-2015 wet season showed that *Sarga* spp. and *Triodia* spp. were the most abundant feeding grasses present in the Gouldian finch breeding and feeding habitats. Furthermore, another 5 grasses (including the grazing-sensitive *Alloteropsis*) used by Gouldian finches were observed in higher proportions in 2014-2015 than during the previous 2013-2014 vegetation surveys. Detailed phenology assessments of the Gouldian finch feeding grasses revealed that *Sorghum* spp. and *Triodia* spp. were the most prominent grass species observed flowering and seeding in the areas. In contrast, the grazing-sensitive *Alloteropsis semialata* and *Heteropogon triticeus* were much less common, and few of these plants were observed seeding.

4.3 Survival of Gouldian Finch Populations

From mark-recapture data collected over the last five years in the eastern Kimberley, the Gouldian finch is considered to be a largely annual species, with only a small proportion (< 8%) of breeding adults surviving to breed the following season. It is thought that a combination of food shortages during the early wet season (O'Malley 2006), deleterious

genetic incompatibilities (Pryke and Griffith 2009) and high stress associated with reproduction (such as finding compatible mates, competing for nest hollows and food shortages; Pryke et al. 2007; Brazill-Boast et al. 2010; Brazill-Boast et al. 2011; Pryke et al. 2012) are the main reasons for their short lifespan.

In the current survey, 29 Gouldian finches were recorded (19 adults and 10 juveniles) all within the breeding and Buffer Areas. Although this is less than the number recorded prior to development (73 in 2011), this is the highest number of Gouldian finches to be recorded since land clearing started. This increased re-occurrence of Gouldian finches in the area is likely due to the reduced grazing pressure and wildfire occurrence, and subsequent healthy grass phenology.

4.4 Implications and Future Management

The Gouldian Finch Management Plan (Strategen 2011) details strategies aiming to protect the populations of Gouldian finches and their associated habitats during development of the Ord River Irrigation Area - Weaber Plain Development Project. Prominent in the Gouldian Finch Management Plan is the implementation of a fire management plan (aimed at reducing the incidence of late season wildfires), and removal of cattle in the Project area to prevent extreme grazing pressures. In addition, the Gouldian Finch Management Plan aims to protect Gouldian finch populations by preserving and maintaining habitat by ensuring the retention of corridors linking feeding areas across the Project.

The work from this survey (assessing non-breeding populations and critical feeding grass availability and phenology) highlights the importance of implementing the Gouldian Finch Management Plan together with the Fire Management Plan and the Buffer Management Plan. Removing cattle, as stated in the Buffer Management Plan (Strategen 2011), together with the Fire Management Plan (Strategen 2011), has substantially increased the availability and productivity of the Gouldian finch seeding grasses, and Gouldian finches have also returned to the area. The GFMP aims to protect Gouldian finch populations by preserving and maintaining habitat (reduce grazing pressure and incidences of wild fires) and ensuring the retention of corridors linking feeding areas across the Project. Future surveys will be able to assess the relative success of wildfire control and cattle management in protected areas in relation to increased disturbance with the commencement of agricultural activity.

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