Donato Environmental Services
ABN: 68083 254 015
Mobile: 0417 819 196
Int'l mobile: +61 417 819 196
Email: ddonato@rbe.net.au
Phone: +61 8 8344 9726
Fax +61 8 8269 4025

Spring Survey of Diamond Firetail (*Stagonopleura guttata*) at the Kanmantoo Copper Project, South Australia

Report to:
Hillgrove Resources Ltd
December 2008

REPORT

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Contents

Introduction

Kanmantoo is an open cut copper and gold mine located in the Mt Lofty Ranges, 55 kilometres southeast of Adelaide in South Australia [1]. Kanmantoo ore body was first mined in 1846 and ore extraction continued intermittently over the next century. Production ceased in 1976 [1]. In 2004 Hillgrove acquired a mining lease that covers the former mine workings at Kanmantoo [1]. Mining activities have commenced and in 2005 garnet mineralisation was also discovered at the Kanmantoo mine to depths of 120 metres and extending one kilometre wide and five kilometres long [1]. Production of approximately 19 000 tonnes of copper concentrate and 6 000 ounces of gold per annum is targeted to commence late 2009, early 2010 [2].

Surrounded by farmland and a few small rivers, the mine is approximately 4 kilometres northwest of Callington. The land use at the mining lease area (MLA) has varied since first mined, with some level of sheep grazing and evidence of timber extraction. The current lease has remnant native vegetation that represents to some degree the remnant vegetation types that existed in the eastern slopes of the Mt Lofty Ranges. The surrounding land is extensively cleared for sheep grazing and cropping, with minimal remnant vegetation. There is some revegetation, with native species mainly along paddock boundaries. As a consequence of the extant of remnant vegetation on the MLA, native fauna that was formerly more widespread can be found there. The Diamond Firetail (*Stagonopleura guttata*) is one such species found on the MLA that was once widespread [3] in South Australia but has declined in both range and abundance [4-6].

Scope of works

Tasks

Donato Environmental Service (DES) was approached by Catherine Davis to conduct a spring survey of Diamond Firetail on the Kanmantoo Copper Project mining lease.

Objectives

Assess the presence and distribution of the Diamond Firetail on and around the Kanmantoo Copper Project mining lease. Also gain some level of ecological understanding of the species from field observations and produce the findings in a technical report.

Ecology of Diamond Firetail

Status, distribution and abundance

The Diamond Firetail's status has declined to near threatened, as recognised by the Commonwealth Government [7] and globally by the IUCN [8]. It is classified as vulnerable in South Australia [9]. Its decline is attributed to vegetation clearance, habitat alteration, competition with introduced species, weed invasion, trapping for the bird cage industry and urbanisation [5, 10, 11].

The species is endemic to southeastern Australia, with a distribution from southeast Queensland to Eyre Peninsula, South Australia [5] (Appendix 1). Diamond Firetail numbers have decreased within its recorded range, particularly in Victoria and South Australia [12, 13], which includes areas such as the Mt Lofty Ranges [12]. Regional distribution of the Diamond Firetail shows a presence near Kanmantoo [14] (Appendix 1) and it is known to occur on the MLA. Many remaining populations are likely to be isolated [10] and subpopulations are all likely to be isolated within Eyre Peninsula, Flinders Ranges and Mt Lofty Ranges [13]. As a result of the declining populations, conservation management in South Australia has recommended re-introduction to large rehabilitated areas of the Mt Lofty Ranges [13].

Although mainly sedentary, short-range migration can occur in parts of Victoria [15] (less than 200 kilometres) and South Australia, however the species is mainly resident or sedentary [5]. Local movements have been recorded as birds search widely for food in autumn, outside of the breeding season [5]. Contrary to this, Griffioen and Clarke (2002) have found strong evidence that indicates no movement [16].

Habitat and breeding ecology

The habitat of the species is recorded to be predominantly woodlands [5, 17] and shrublands [11, 17, 18], open forest and lightly timbered habitats, such as farmland [17] with remnant trees or grasslands with scattered trees [5]. The woodlands and forests are often eucalyptus-dominated vegetation structures with open or sparse, occasionally dense, grassy or heath understorey [5, 11]. These consist of eucalyptus species such as red, yellow, spotted and manna gum; stringy and iron barks; species such as Moreton Bay ash [5]; and Kangaroo grass. It is also often found in mallee forest dominated by casuarinas [5, 11]. The Diamond Firetail is also found in vegetation around lakes and watercourses [5, 18] and in modified habitats such as orchards, gardens and parks [5], and near settlements [5, 18].

Nests are usually situated in a fork located in the foliage of shrubs, crown of saplings, amongst mistletoe [19] of tall trees [6] and less often in the foliage of tall trees [5]. Nests are often in Eucalypts [6] and prickly shrubs such as acacias or hakeas [5]. McGuire (2007) [6] found nests in *Banksia speciosa* and *Allocasuarina verticillata*. Diamond Firetails are also known to nest in the base

of stick nests of other species [18, 20]. Ford (1908) [20] found that in one eucalypt tree there were five separate nests, three of those were Diamond Firetails, one of these built directly under a White-fronted Heron's nest while the heron was sitting in the nest [20]. Likewise, Boehm (1957) [18] found that some built under the nests of the Brown Falcon, *Falco berigora*. Nests from previous years, not necessarily those of Diamond Firetail, are also sometimes refurbished [6]. There have been observations that old nests from other species have been used [3]. Nests can, at times, be conspicuous and the height of location is usually between 2.5 to 6 metres [5, 6].

The nest is bottle-shaped, sometimes a spherical nest with an entrance tunnel [5, 6]. A roosting chamber that is not used for laying eggs is also built [19]. The nests are constructed from green grass and incorporate various other materials, both organic (wiry plant stems, rootlets, leaves, twigs and mistletoe [21]) and inorganic (ribbons or wool) [5]. The interior is often lined with soft grass, feathers, bark, wool, hair or flowers [5]. The entrance and or exterior can occasionally be adorned with flowers woven into the nest [5, 6]. The nest is built entirely from the inside with the frame built first, the walls gradually getting thicker, then the entrance. The interior is always completed last [5]. Both sexes build the nest, sometimes only one bird is involved [5]. When two birds construct the nest, one is the collector the other the constructor [5].

The care during incubation and of nestlings is shared by both sexes. It starts after the second egg is laid and lasts 12 to15 days [22]. This care continues up to when the young leaves the nest at 24 to 25 days old [22]. Clutch size is usually between 4 and 9 pale white eggs [22]. These are typically between 13 and 18 millimetres in length [6].

Food and foraging behaviour

The Diamond Firetail forages mostly on the ground among low vegetation [5, 23] often in areas dominated by grasses [23]. The foraging method is usually 'gleaning' where the bird moves along the substrate and takes seed from its surface [23]. Several birds at a time are known to perch on overhanging seed heads to way them down and strip the seeds from the plant [24]. Foraging is usually in flocks of 5 to 40 birds [15], sometimes of mixed species [5, 24]. Records show that in some cases winter flocks can be 300 or more [5]. Diamond Firetails are predominantly granivorous [23], with the diet at one site in South Australia consisting mainly of seeds of native and introduced grasses such as *Digitaria* spp., *Danthonia* spp., *Poa annua*, *Stipa tenuifolia*, wild oats *Avena fatua, Hordeum hystrix,* pussy tails *Lagurus ovatus, Holcus lantus,* and *Phalaris spp.* in summer and autumn. In winter and spring they were recorded eating seeds of fat hen *Chenopodium album*, *Erodium crinitum* and at times *Poa annua* [5, 12] [12]. Green foliage and herbage can also make up part of the diet, either when seed is in short supply, for example in winter when seed has mostly sprouted, or during summer when surface water for drinking is in short supply and eating green foliage increases water intake in the diet [12].

In the South Australian Mt Lofty Ranges Diamond Firetails have been known to travel at least 2 kilometres to permanent water bodies for drinking in the summer [12]. They can survive for short periods by obtaining their water through green vegetation [5, 12]. The bird immerses its bill in water and drinks by sucking, making only slight movements of the throat [5].

Existing vegetation communities within the MLA

Remnant vegetation comprises around 26% (113 hectares) of the 436 hectares MLA area [25]. Eight vegetation communities are present within the MLA, of which two dominate:

- *Eucalyptus odorata* low woodland (54.1 hectares); and
- *Lomandra effusa* ± *Heliochrysum leucopsideumopen* tussock grassland (23.3 hectares) [25].

The other six vegetation communities are:

- *Austrostipa sp.* open tussock grassland.(17 hectares);
- *Acacia pycnantha* low woodland (11.2 hectares);
- *E. gracilis* ± *E. oleosa* open mallee (4 hectares);
- *Allocasuarina verticillata* ± *Callitris gracilis* ± *Lomandra effusa* low woodland (1.8 hectares);
- *E. leucoxylon ssp. Leucoxylon* ± *Lomandra effusa* open woodland (1.3 hectares); and
- *Callitris gracilis* low woodland (0.2 hectares) [25].

The remaining areas of the MLA consist of land disturbed by previous mining activities (103 hectares) and cleared pastures used for high-intensity sheep grazing operations (221 hectares) [25]. Scattered trees are located across these areas. The condition of the vegetation communities varies according to previous use and disturbance however some is considered high quality [25].

Methodology

To achieve the stated objectives, DES:

- conducted three morning surveys, deliberately targeting Diamond Firetail by call and sight and recording GPS location, number, age, vegetation community or habitat and behaviour;
- attempted to conduct surveys on calm (or low wind) sunny days to facilitate detection of the species;
- reviewed aerial photographs and identified vegetation and habitat types that are likely to attract the species;
- reviewed any existing fauna data collected on the site and surrounds;
- accessed SA Museum and Birds Australia Birdata to identify locations of the species documented nearby the MLA;
- presented findings as a technical report; and
- performed all duties in a safe and professional manner.

A total of 29 ornithological area surveys were conducted between the hours of 8:00 and 12:00 on 13, 17 and 18 November 2008. Each survey comprised of searching (sight and aural detection) for the birds in a 100 by 100 metre area for a period of 10 minutes. All species detected were recorded and, in the case of Diamond Firetail, the number, age and behaviour was recorded. The location of each survey was recorded on GPS and graphically displayed on Google Earth Plus™. Survey locations were initially determined by experience and likelihood of finding Diamond Firetail, thereafter survey locations were more widespread over the Kanmantoo Copper Project mining lease.

Each survey location was photographed (see Appendix 2) from the GPS marked location.

Nomenclature and recommended English names follow Christidis and Boles (2008) [26].

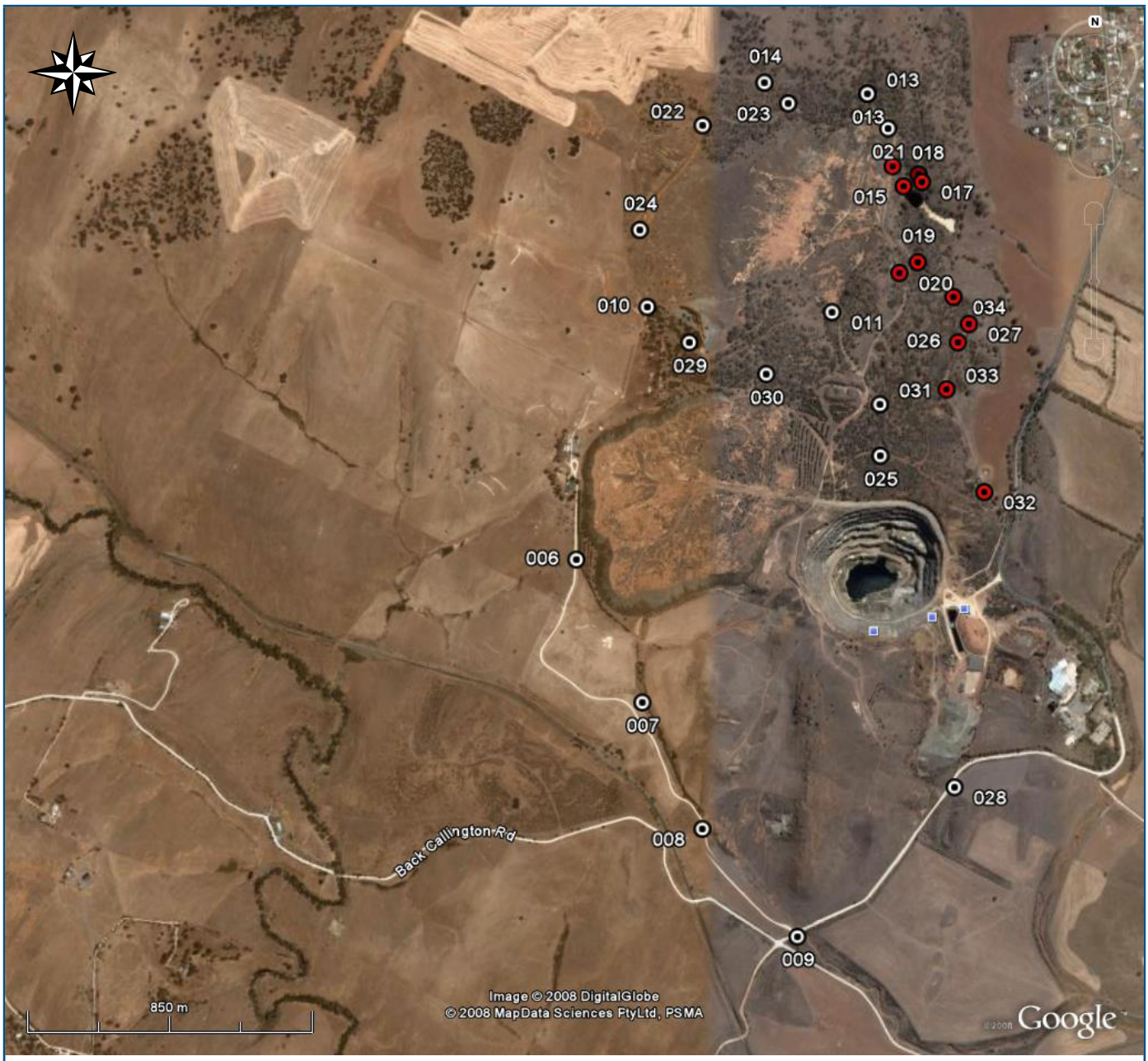
Results

A total of 38 Diamond Firetail records were collected during ten surveys, and an additional six individuals were observed while travelling between survey sites. Between one and eight individuals were counted in quadrats where they were present. All individuals observed were in adult plumage.

Diamond Firetails were not randomly distributed across the Kanmantoo Copper Project area, with all observations occurring in the *Allocasuarina* and *Acacia*-dominated communities on the eastern edge. Within these vegetative communities the species was recorded during all ten surveys and it was reasonably common. Diamond Firetails have a strong affiliation with *Allocasuarina*, often in the presence of dead timber (fallen and standing) and often use are the mid-storey shrub layer. The species prefers to perch on dead timber.

Three Diamond Firetail nests were discovered, one containing three eggs and two being constructed. All nests were in densely foliaged *Allocasuarina verticulata*. The breeding season appears to have just commenced as two nests were under construction and one nest had an incomplete clutch. This is further illustrated by the observation of males in courtship display, calling with long strands of grass held in their bill from high exposed branches.

A total of 41 bird species were detected on the mining lease during the 29 surveys (Appendix 3). Breeding activity was observed in ten species (including Diamond Firetail). Two additional species, Tawny Frogmouth *Podargus strigoides* and Horsfield's Bronze Cuckoo *Chrysococcyx basalis,* were detected while travelling between surveys. A full list of survey results is provided in Appendix 3.



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Surveys where Diamond Firetails were detected.

Surveys where Diamond Firetails were not detected.

Figure 1. Diamond Firetail numbered survey site locations. The survey numbers are marked adjacent to the marker.

Discussion

The Diamond Firetail occupies a large range across southeastern Australia and occupies a wide range of vegetation types. However within this survey of the Kanmantoo Copper Project MLA it appears to be restricted to *Allocasuarina* or *Acacia*-dominated communities despite larger areas of *Eucalyptus*-dominated communities being present, some of which are considered to be in quite good condition [25]. This habitat selection may be related to breeding requirements such as presence of suitable nesting sites. The use of dense *Allocasuarina* foliage for nesting is consistent with the literature [5, 6] and it appears to be preferred by Diamond Firetails for nesting at this site, however other tree species may also have been used.

Diamond Firetails are primarily seed eaters although some green foliage may be eaten at certain times of the year and invertebrates are reportedly taken especially during the breeding season when young are being raised [5, 12]. Consequently Diamond Firetails are strongly associated with a good level of grass cover and a substrate that allows seeds to be located [27]. Many of the introduced grass species identified as food plants for Diamond Firetails are common in the Adelaide Hills and wild oats *Avena fatua* is an abundant species in the MLA [25].

One study in the Mt Lofty Ranges found that this species is negatively related to the presence of dead timber and leaf litter [12, 27]. This is largely attributed to the shape of their beak, making it difficult to forage among such substrates for fallen seeds [27]. Other sources however suggest that during breeding season, Diamond Firetails prefer to forage among dead timber for invertebrates, as their need for protein is higher at this stage [12 27]. Large woody debris such as logs and fallen trees are used for perching and probably for other reasons, such as surveying the surrounding area [27], and they were observed perching on dead timber during this study.

The effects of seasonality on presence within the MLA and habitat use is currently unknown for this site however the species is likely to be more widespread across the project area post-breeding. Photographs of survey sites (Appendix 2) show that a good covering of grass is present in many of the survey sites including some of the Eucalyptus-dominated sites. Habitats dominated by *Allocasuarina* or Acacia only constitute 13 hectares or 11.5% of the remaining remnant vegetation within the MLA. Diamond Firetails are likely to use any areas where a good covering of grass occurs and leaf litter or fallen timber is not too dense, regardless of the canopy species.

Nationally, threats to the species have been identified as habitat fragmentation, sheep grazing and land clearance [4]. It is beyond the scope of this work to identify any risks to the viability of the species by proposed mining activities and current land management at the Kanmantoo Copper Project.

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Appendices:

1: National and regional distribution of the Diamond Firetail

2: The vegetation structure of each Diamond Firetail survey site

3: Results of Diamond Firetail spring survey at the Kanmantoo Copper Project, South Australia

APPENDICES

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Appendix 1: National and regional distribution of the Diamond Firetail

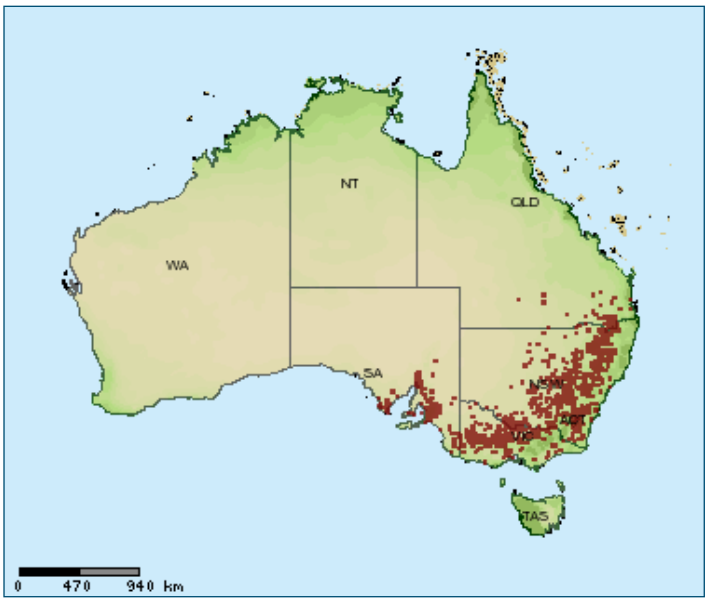

Figure 1: National distribution of the Diamond Firetail

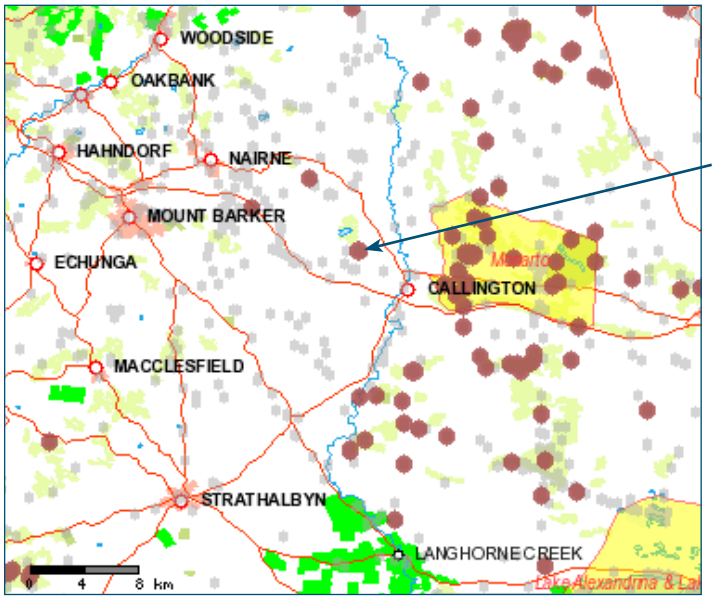

Figure 2: Regional distribution of the Diamond Firetail. The brown dots represent Diamond Firetails; the yellow areas are important bird areas.

Source: Birds Australia Birdata., Diamond Firetail Distribution Atlas no. 652. 2008.

APPENDIX 1

Appendix 2: The vegetation structure of each Diamond Firetail survey site

Diamond Firetails were only found in sites with Allocasuarina and Acacia as dominant canopy species. The following are photographs of these communities.

Figure 1: Survey area 15

Figure 2: Survey area 16

APPENDIX 2

Figure 3: Survey area 17

Figure 4: Survey area 20

Figure 5: Survey area 19

Figure 6: Survey area 26

Figure 7: Survey area 18

Figure 8: Survey area 27

Figure 9: Survey area 33

Figure 10: Survey area 34

The following are photographs of sites with Eucalyptus species as the dominant canopy species.

Figure 11: Survey area 6

Figure 12: Survey area 7

Figure 13: Survey area 8

Figure 14: Survey area 9

Figure 15: Survey area 10

Figure 16: Survey area 11

Figure 17: Survey area 13

Figure 18: Survey area 14

Figure 19: Survey area 21

Figure 20: Survey area 22

Figure 21: Survey area 23

Figure 22: Survey area 24

Figure 23: Survey area 25

Figure 24: Survey area 28

Figure 25: Survey area 29

Figure 26: Survey area 30

Figure 27: Survey area 31

Figure 28: Survey area 32

Appendix 3: Results of Diamond Firetail spring survey at the Kanmantoo Copper Project, South Australia

The following table is a list of species found at each survey site. It includes the number of Diamond Firetails at each site observed and whether breeding activity was observed. The table includes the corresponding figure number for the photographs of each survey site in Appendix 2. The symbols in the following tables are as follows: B = breeding; X = present; 2 (for example) = the number observed.

Table 1: Bird species present and the number of Diamond Firetails recorded for each survey site. Observations of breeding activity are indicated (B).

Vegetation Community	***Acacia pycnantha*** low woodland or ***Allocasuarina verticillata* ± *Callitris gracilis* ± *Lomandra effusa*** low woodland										***Eucalyptus odorata*** low woodland or ***E. gracilis* ± *E. oleosa*** open mallee																	
Species/Survey Number	15	16	17	18	19	20	26	27	33	34	6	7	8	9	10	11	13	14	21	22	23	24	25	28	29	30	31	32
Figure Number in Appendix 2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Brown Goshawk						X																						
Nankeen Kestrel						X						X																
Brown Falcon									X							X			X									
Peregrine Falcon					X																							
Crested Pigeon													X															
Galah						X				X				X			X	X			X			X				
Purple-crowned Lorikeet																												
Musk Lorikeet		X	X		X	X		X	X								X		X					X				
Crimson Rosella		X	X			X	X	X	X		X				B	X		X	X	X	X				X			
Red-rumped Parrot		X	X			X				X								X			X						X	
Elegant Parrot						B				X																		
Rainbow Bee-eater					X	X													X									
Brown Treecreeper		X	X	X	X			X	X	X																	X	
Weebill															X	X	X		X	X					B		X	X
Yellow-rumped Thornbill																					X		X		X		X	X
Yellow Thornbill																					B							B
Southern Whiteface				X			X	X																				
Striated Pardalote	X	X			X	X			X	X	X					X	X	X	X	X	X		X		X	X	X	
Singing Honeyeater					X					X	X	X	X	X	X	X						X		X	X			
White-plumed Honeyeater		X	X		X	X	X	X	X	X	X	X										X						

continued

Vegetation Community	***Acacia pycnantha*** low woodland or ***Allocasuarina verticillata* ± *Callitris gracilis* ± *Lomandra effusa*** low woodland										***Eucalyptus odorata*** low woodland or ***E. gracilis* ± *E. oleosa*** open mallee																		
Species/Survey Number	15	16	17	18	19	20	26	27	33	34	6	7	8	9	10	11	13	14	21	22	23	24	25	28	29	30	31	32
Figure Number in Appendix 2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Brown-headed Honeyeater							X																					
New Holland Honeyeater												X		X										X				
Red Wattledbird									X															X				
Varied Sitella	B																											
Black-faced Cuckoo-shrike					X				X	X						X												
Rufous Whistler	X			X			X												X				X		X		X	X
Grey Shrike-thrush	X	X	X							X	X		X	X	X		X				X						X	
Dusky Woodswallow			X	X	X	X				X												X						
Australian Magpie			X						X		X	B		X	X	B	X	X	X	X	X	X	X	X				X
Corvid										X					X					X		X			X			
Willie Wagtail					X			X		X	X	X	X		X				X						X	X		
Magpie Lark		X	X																									
White-winged Chough	X	X					X			X						X			X	X								
Red-capped Robin				X																	B		X			B	X	
Eurasian Skylark														X								B						
Brown Songlark					X							X			X					X		X						
Welcome Swallow										X	X	X		X										X	X			
Fairy Martin										X		X	X	X														
Common Starling									X						X			X				X			B	X		
Diamond Firetail	1	1	2	1 B	1	8 B	12	4	4	2																		
House Sparrow													X															

APPENDIX 3