Survey of Grey Grasswrens *Amytornis barbatus barbatus* on *Narriearra – Caryapundy Swamp National Park*

Report to the Saving Our Species Program
of the NSW Department of Planning and Environment;
Biodiversity and Conservation Division

April/May 2022

J.W. Hardy

On behalf of the Australian Bird Study Association Inc.

ABSA
Australian Bird Study Association Inc

Report to the Saving Our Species Program of the NSW Department of Planning and Environment; Biodiversity and Conservation Division,

on the trapping and radio-tracking of Grey Grasswrens *(Amytornis barbatus barbatus)* at *Narriearra – Caryapundy Swamp National Park* in north-western NSW in 2022

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BACKGROUND INFORMATION

A bird banding study of the Bulloorine subspecies of the Grey Grasswren *Amytornis barbatus barbatu*s in south-western Queensland, approximately 70 kilometres north of Tibooburra, had been initiated in 1985. That study was abandoned in the year 2000 following the severe degradation of the study site by the overgrazing of beef cattle; ring-barking of Lignum *Duma florulenta* shoots by rabbits *Ocyctolagus cuniculus* and by feral pigs *Sus scrofa* rooting up large clumps of lignum (Hardy 2002). However, with the encouragement of local National Parks and Wildlife Service (NPWS) staff to move the study to the remnant NSW population and with the support and hospitality of Bill O'Connor, the then owner of *Narriearra,* a beef-grazing property north-east of Tibooburra, the study of the species recommenced.

Male Grey Grasswren with radio-transmitter fitted to the bird's back. (Photo: Richard Allen)

A paper concerning the first ten years of the banding study on *Narriearra* suggested, *inter alia*, options for the future management of the threatened Grey Grasswren in NSW (Hardy, 2010). The suggested monitoring of habitat was taken up by the NSW NPWS and from 2014 three contracts were issued under the Saving Our Species Program of the Office of the Environment and Heritage to the Australian Bird Study Association Inc. (ABSA) to expand the banding study of the birds to include mapping and monitoring of their habitat. Following the field work, three reports to the Saving Our Species Program were submitted by the ABSA in Farrell *et al.* in 2014, 2015 and 2019 to meet the requirements of contracts to undertake research on Grey Grasswrens and their habitat on *Narriearra.* The property was acquired by the NPWS in mid-2020 and named *Narriearra-Caryapundy Swamp National Park.*

A fourth contractual agreement was issued to the ABSA in January 2022 to carry out a further radio-tracking project to establish foraging territories and habitat utilisation of the threatened Grey Grasswrens on *Narriearra-Caryapundy Swamp National Par*k. The primary objective was to continue radio-tracking in a high rainfall and improved condition habitat (*La Nina* climatic period) for comparison with the results of the previous work that had been carried out during drought (*El Nino* period) (as published in Farrell *et al* 2018 and reported in Farrell *et al* 2019). This report is to fulfil the requirements conferred by the January 2022 contract.

INTRODUCTION

The operational plan for this trip was to hopefully capture and radio-track up to 10 Grey Grasswren over at least five monitoring areas. It was proposed to monitor the movements of the tagged birds and the habitat occupied by them at least once during the morning and again in the afternoon of every day of the planned four-week period proposed for the study. During the period of this study seven Grey Grasswrens were captured, banded and transmitters were placed on them. Unfortunately, the study period was severely impacted by high wind conditions that made mist-net trapping impractical on some days and flying a drone to undertake aerial photography of foraging areas impossible. The greatest obstacle for the successful completion of the 2022 research objectives was the access difficulties caused by frequent rainfall. Indeed, heavy rainfall had the effect of flooding much of the primary habitat and access to carry out monitoring of the transmitter-tagged birds was severely hampered by flooding and boggy management tracks.

It had been planned to undertake radio-tracking from 18 April until 13 May 2022. The actual period that the research team was on *Narriearra-Caryapundy Swamp National Park* was from 17 April until we unfortunately had to abandon our research and departed the NP on 6 May. We had remained in the study area during several bouts of heavy rain to the end of April, but we were advised by satellite phone on 30 April of impending heavy rain returning on 8 May and we were advised to leave the park to avoid being trapped for possibly several weeks. We subsequently decided to reduce the planned research period from four to three weeks. Although several of the transmitters fitted to birds were still broadcasting on 6 May, with the assistance of two NPWS officers, we abandoned the research efforts and left the NP.

SITE DESCRIPTION

A site description for the study area on *Narriearra Station*, now *Narriearra-Cayapundy Swamp National Park* was presented in the ABSA's 2019 report to the Saving Our Species Program (Farrell *et al*. 2019), so we have not repeated it here.

TRAPPING AND RADIO-TRACKING

Over the period of three weeks the team was able to access only three (Barton's Crossing, Bob's Hole Tank West and Bullagree Tank) of the planned five or more trapping areas (which would have included known grasswren habitat near Barton's Tank and Adelaide Gate). The three sites where trapping was undertaken and are shown in Figure 1.

A male Grey Grasswren being extracted from a mist net. (Photo: Greg Little)

A male Grey Grasswren captured in 2022. (Photo: Greg Little)

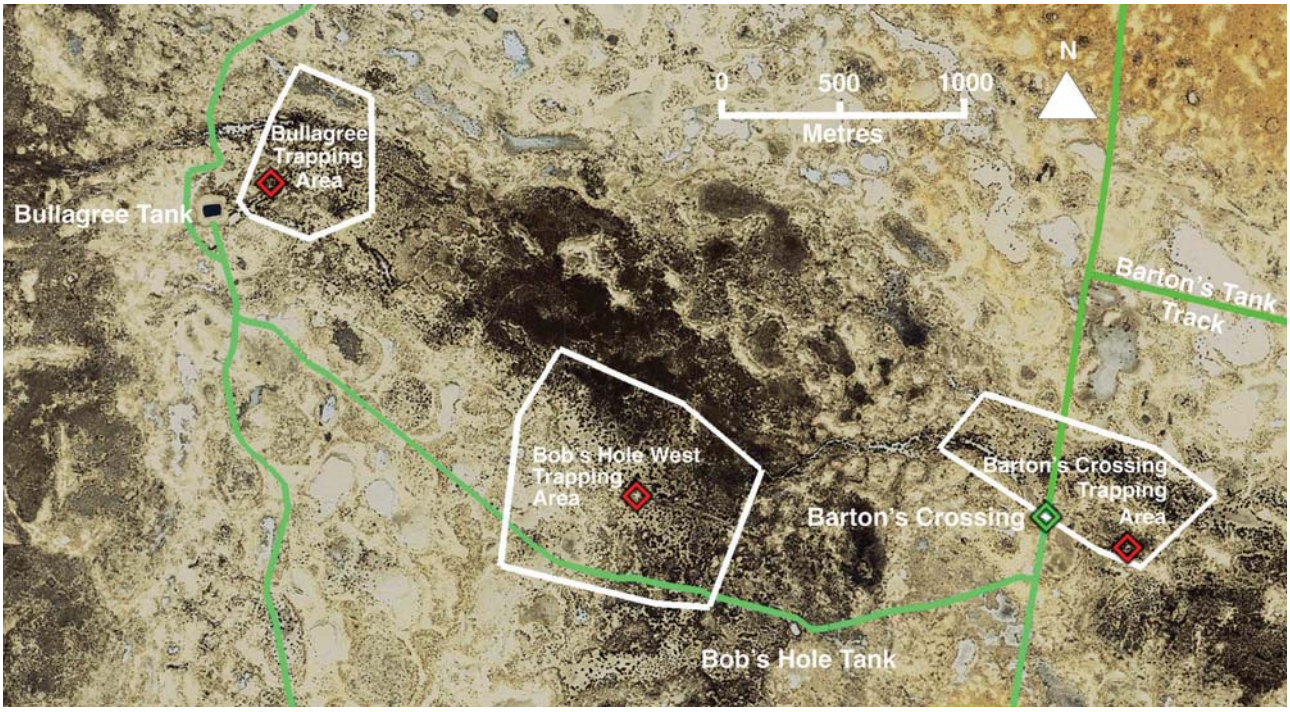


Figure 1. *Three mist-net trapping areas used from 18 to 29 April 2022. Red diamond icons indicate the locations at which Grey Grasswrens were captured on 18 April (four birds at Barton's Crossing trapping area), 22 April (one bird at Bob's Hole West trapping area) and on 29 April (two birds at Bullagree Tank trapping area.*

Image courtesy Google Earth

The triangulated latitude and longitude co-ordinates of the origin point for each transmitter signal detected for each of the seven birds is shown in Tables 1 to 7. The meaning of the text notes in the Tables are as follows:

- "not detected" – despite repeated attempts, from different receiver positions, to pick up transmitter signals we could not detect any transmissions;
- "no tracking done" – no tracking attempt was made on that day which had been set-aside as a rest day;
- "rain", or "heavy rain" – to protect radio telemetry equipment, no attempt was made to radio- track;
- "flooded tracks" – access to sites for the purpose of radio-tracking was prevented by flooded or impassable management tracks, so tracking may have been attempted, but was abandoned.

The capture site (red diamond icon), release site (red circle icon) and co-ordinate positions for each received radio-transmission (coloured circle icon) are shown in Figures 2 to 7. A graphical representation of the direction and pattern of movement between recorded transmission points are shown in the Figures by a white line. A unbroken line connects points which were recorded at consecutive recording events (am / pm, or days) and broken lines indicate that the position points were not consecutive recording events. Also note that the lines connecting recorded positions of the birds do not represent direct flight lines between those points.

Radio-tracking. (Photo: Rebecca Jacobs)

Barton's Crossing Trapping Area:

Twenty-three mist nets with a total length of 303 metres were erected among clumps of lignum, with interspersed Saltbush (*Atriplex nummularia*) and Swamp Canegrass (*Eragrostis australasica*), in the vicinity of Barton's Crossing on 18 & 19 April 2022 (Fig 1). On 18 April all twenty-three nets had been erected and were open by 9 am and closed at around noon, but reopened for two hours in the late afternoon. On 19 April eighteen nets were opened by 7:30 and closed by 11:30 am, but the other five nets were removed without being opened.

We have not included the precise location co-ordinates for all of the mist nets erected because we believe that is irrelevant to the report. We have, however, described the vegetation within which the nets were erected. Table 1 lists the precise location of the mist net in which the four Grey Grasswrens were captured. These comprised two adult females, an adult male and an immature which were all banded and fitted with radio transmitters. After they were banded and had transmitters fitted all four birds were released together at 9:30 am.

Tables 1 – 4 and Figures 2 - 5 depict the recorded positions and basic direction and patterns of movement recorded for each of these four birds. Birds 1, 2 and 3 appeared to stay together, or in near proximity for most of the 18 days that they were tracked (see Figs 2, 3 and 4). Bird 4, the adult male of the group, however, appears to have separated from the three birds that he was caught with (Fig. 5). Because of weather and habitat conditions we did not attempt to detect birds at night roost sites.

Mist net in mixed lignum and saltbush in which Grey Gasswrens 1-4 were captured. (Photo: Rebecca Jacobs)

Bird 1 – The first Grey Grasswren captured, an adult female, was banded, a radio-transmitter fitted and released at 9:30 am with the three birds that it was capture with on 18 April 2022. The radio-telemetry monitoring of Bird 1 is shown in Table 1 and its recorded movement over 18 days is graphically represented in Figure 2.

Bird 1 could not be located in the afternoon of 18/4, the morning and afternoon of 19/04, or during the morning of 20 April. Attempts to locate the bird on these four occasions were made from several receiver locations spread over several hundred metres and well within the transmitter's broadcast range. The foraging range obtained from subsequent recorded signals suggest that the bird mostly occupied a range within a radius of about 300 metres (Fig. 1), so failure to pick up a signal from the transmitter was unlikely to have been an out-of-range issue, but rather a signal interruption caused by the bird being in a depression, or in very dense habitat, which had prevented a direct line-of-sight for a signal between the transmitter and the receiver.

Grey Grasswrens 1, 2, 3 and 4 all caught together and photographed immediately before they were released together. The aerial of the radio-transmitters can be seen protruding from the backs of the birds.

(Photo: Rebecca Jacobs)

The position of Bird 1 was not recorded on 26 April, or on several other occasions thereafter, because heavy rain, or access problems caused by the rain, curtailed the use of radio telemetry equipment. Fig. 2 shows, by numbered circle icons, the positions recorded for the bird on those occasions that a radio signal was received (Table 1). Where the bird may have been during the days that a signal was not obtained is not known. The lines connecting the consecutive recorded positions in Fig. 2 are therefore simply a graphical illustration of the basic direction and distance that the bird moved from one recorded position to the next recorded position.

It appears that Bird 1 mainly foraged in lignum or a mixture of lignum and saltbush over an area of 40 to 50 hectares. However, location 13 is entirely saltbush habitat and position 14 (Fig. 2) is mostly a canegrass habitat.

Table 1

Bird 1 – Co-ordinates of tracking record points.

Record	Date	Time	Latitude S	Longitude E
Captured	18/04/2022	am	29° 05' 21.30"	142° 36' 52.4"
Released	18/04/2022	am	29° 05' 17.50"	142° 36' 43.7"
	18/04/2022	pm	not detected	
	19/04/2022	am/pm	not detected	
	20/04/2022	pm	not detected	
1	20/04/2022	pm	29° 05' 18.87"	142° 36' 48.44"
2	2104/2022	am	29° 05' 18.40"	142° 36' 44.40"
3	21/04/2022	am	29° 05' 18.97"	142° 36' 55.89"
4	21/04/2022	am	29° 05' 21.62"	142° 36' 55.54"
5	21/04/2022	pm	29° 05' 19.03"	142° 36' 57.18"
6	22/04/2022	am	29° 05' 19.75"	142° 36' 54.15"
7	22/04/2022	am	29° 05' 18.75"	142° 36' 54.78"
8	22/04/2022	pm	29° 05' 17.43"	142° 36' 51.24"
9	22/04/2022	pm	29° 05' 17.54"	142° 36' 49.91"
	23/04/2022	am/pm	no tracking done	
10	24/04/2022	am	29° 05' 11.07"	142° 36' 56.62"
11	25/04/2022	am	29° 05' 21.28"	142° 36' 45.38"
12	25/04/2022	am	29° 05' 12.53"	142° 36' 46.93"
13	25/04/2022	pm	29° 05' 6.61"	142° 37' 14.00"
	26-27/04/2022	am/pm	heavy rain	no tracking
14	28/04/2022	am	29° 05' 25.35"	142° 36' 54.09"
	28/04/2022	pm	rain	no tracking
	29/04/2022	am	rain	no tracking
15	29/04/2022	pm	29° 05' 19.28"	142° 36' 49.38"
	30-31/04/2022	am/pm	heavy rain	no tracking
	01-3/05/2022	am/pm	flooded tracks	no tracking
	04/05/2022	am	flooded tracks	no tracking
16	04/05/2022	pm	29° 05' 21.69"	142° 36' 52.36"
17	04/05/2022	pm	29° 05' 22.85"	142° 36' 51.03"
	05/05/2022	am	no tracking done	
18	05/05/2022	pm	29° 05' 18.75"	142° 36' 47.28"

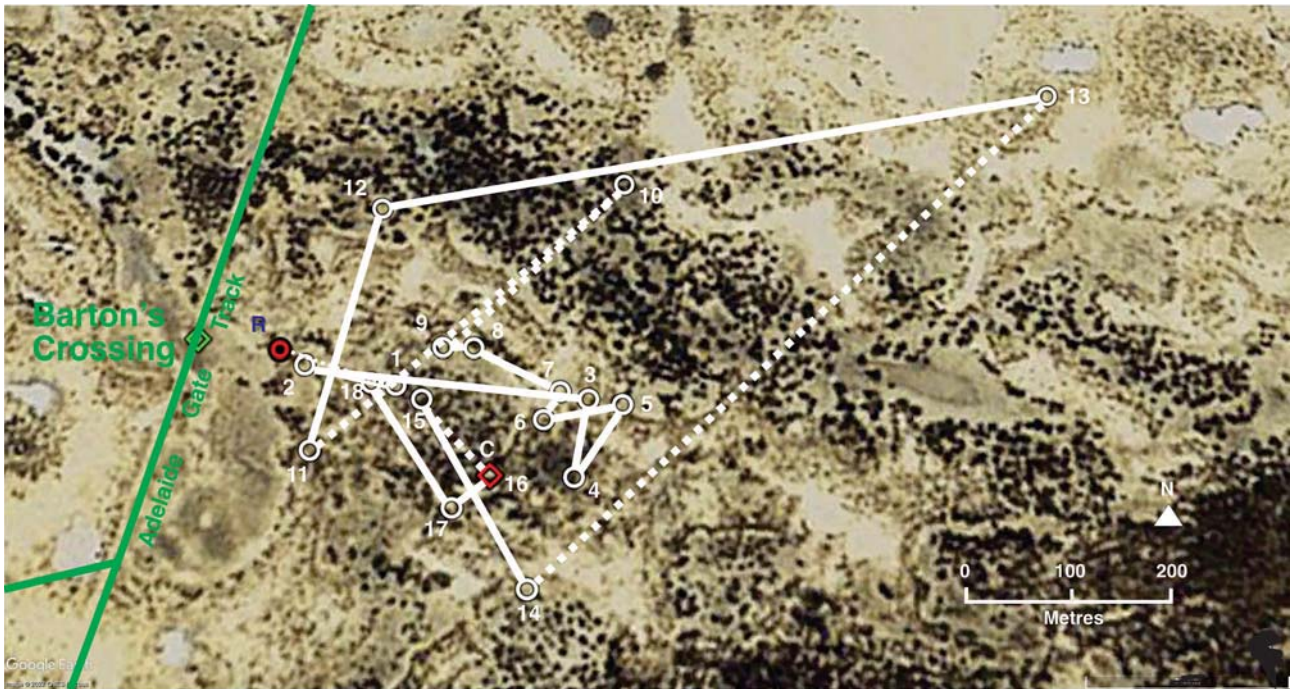


Figure 2 – *Bird 1 pattern of movements over a period of 18 days. Unbroken lines connecting transmission recorded positions provide a graphical representation of movement direction on consecutive days, whereas broken lines show direction of movement on non-consecutive record days (Table 1). The red diamond icon was the capture site and the red circle icon was the release site. The lines connecting recorded positions of the bird do not represent direct flight lines between those points.*

Image courtesy of Google Earth

Female Grey Grasswren with radio transmitter. (Photo: Judy Little)

Bird 2 – an immature (sex unknown) was, banded, a radio-transmitter fitted and released at approximately 9:30 am on 18 April 2022. The radio-telemetry monitoring of Bird 2 is shown in Table 2 and its recorded movement are graphically represented in Figure 3.

A transmitter signal could not be detected on the afternoon of 18 April or in the afternoon of the following day, probably because of interrupted line-of sight between the transmitter and receiver as described for Bird 1. Bird 2 appears to have stayed in the same general foraging area of about 40 to 50 hectares as Birds 1 & 3. The habitat between recorded points 13 & 14 and 14 and 15 (Fig 3) is a fairly even mixture of saltbush and patchy lignum and the most southerly points 16 and 19 (Fig 3) has a high proportion of canegrass with patchy lignum.

Table 2

Bird 2 – Location of tracking record co-ordinates.

Record	Date	Time	Latitude S	Longitude E
Captured	18/04/2022	am	29° 05' 21.30"	142° 36' 52.4"
Released	18/04/2022	am	29° 05' 17.50"	142° 36' 43.7"
	18/04/2022	pm	not detected	
1	19/04/2022	am	29° 05' 18.19"	142° 36' 42.99"
	19/04/2022	pm	not detected	
2	20/04/2022	am	29° 05' 17.82"	142° 36' 49.59"
3	20/04/2022	pm	29° 05' 19.18"	142° 36' 49.34"
4	21/04/2022	am	29° 05' 18.40"	142° 36' 44.40"
5	21/04/2022	am	29° 05' 18.52"	142° 36' 53.85"
6	21/04/2022	pm	29° 05' 20.59"	142° 36' 52.14"
7	22/04/2022	am	29° 05' 17.44"	142° 36' 51.61"
8	22/04/2022	am	29° 05' 18.20"	142° 36' 48.27"
9	22/04/2022	pm	29° 05' 17.76"	142° 36' 49.94"
10	22/04/2022	pm	29° 05' 19.75"	142° 36' 49.07"
	23/04/2022	am/pm	no tracking done	
11	24/04/2022	am	29° 05' 21.68"	142° 36' 55.27"
12	24/04/2022	am	29° 05' 21.56"	142° 36' 50.62"
13	25/04/2022	am	29° 05' 18.91"	142° 36' 46.61"
14	25/04/2022	pm	29° 05' 13.21"	142° 36' 47.26"
15	25/04/2022	pm	29° 05' 18.35"	142° 36' 49.26"
	26-27/04/2022	am/pm	heavy rain	no tracking
16	28/04/2022	am	29° 05' 24.75"	142° 36' 53.21”
	28/04/2022	pm	rain	no tracking
	29/04/2022	am	rain	no tracking
17	29/04/2022	pm	29° 05' 16.47"	142° 36' 52.03”
	30-31/04/2022	am/pm	heavy rain	no tracking
	01-03/05/2022	am/pm	flooded tracks	no tracking
	04/05/2022	am	flooded tracks	no tracking
18	04/05/2022	pm	29° 05' 19.27"	142° 36' 52.32"
19	04/05/2022	pm	29° 05' 23.56"	142° 36' 49.52"
	05/05/2022	am	No tracking done	
20	05/05/2022	pm	29° 05' 18.52"	142° 36' 46.76"

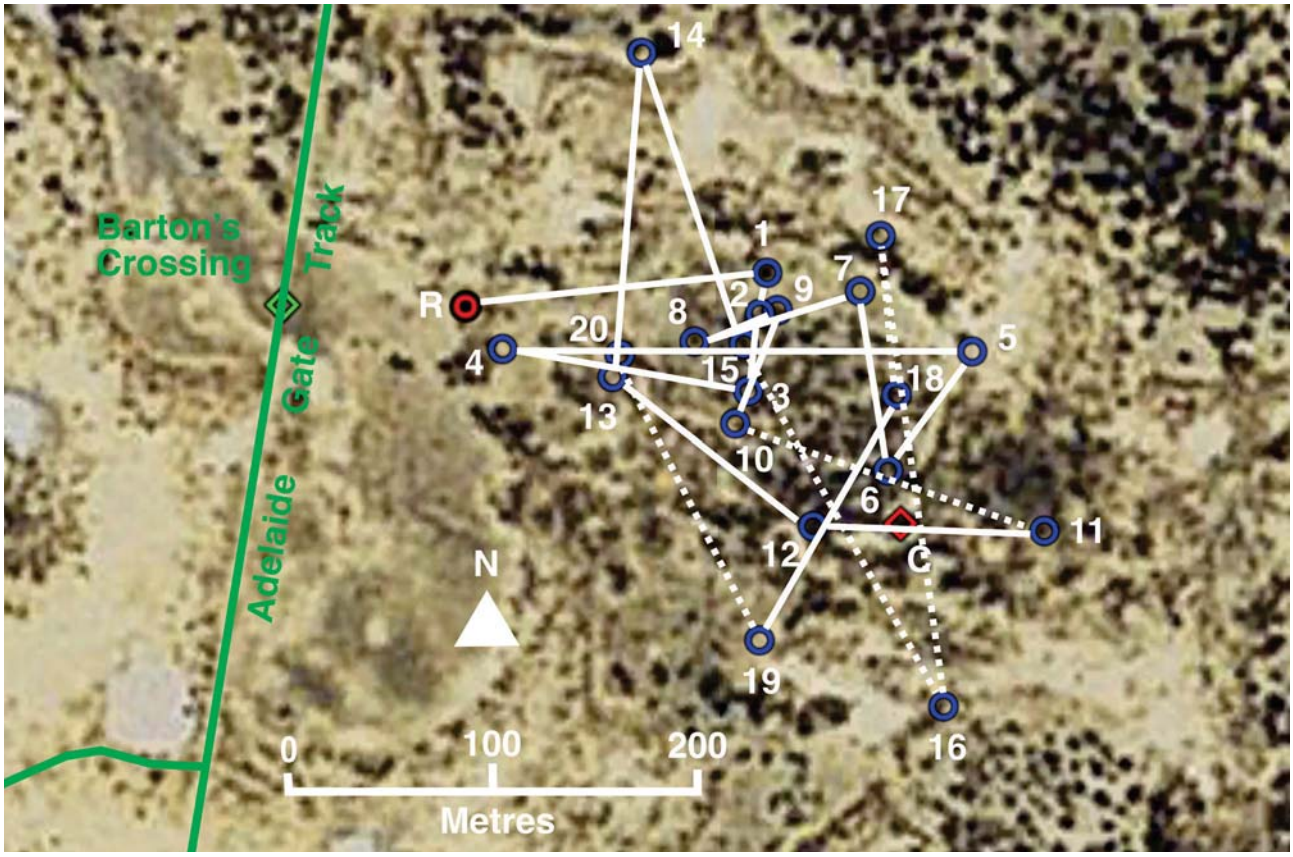


Figure 3 – *Bird 2 pattern of movements over a period of 18 days. Unbroken lines connecting transmission recorded positions provide a graphical representation of movement direction on consecutive days, whereas broken lines show direction of movement on non-consecutive record days (Table 2). The red diamond icon was the capture site and the red circle icon was the release site. The lines connecting recorded positions of the bird do not represent direct flight lines between those points.*

Image courtesy of Google Earth

Bird 3 – an adult female was captured, banded, a radio-transmitter fitted and released at approximately 9:30 am on 18 April 2022. The radio-telemetry monitoring of Bird 3 is shown in Table 3 and its recorded movement are graphically represented in Figure 4.

It appears from the radio telemetry records locations that this bird was mostly within the same foraging area to the east of Barton's Crossing as Birds 1 and 2. However, on at least one occasion this bird did venture south-west of Barton's Crossing to an area of mainly scattered saltbush habitat. Nevertheless, the telemetry records suggest that Bird 3 stayed in close proximity to Birds 1 & 2 in the 40 – 50 hectare mixture of lignum and saltbush habitat for most of the 18 days that it was tracked.

Similar to the results for other birds, it could not be detected, despite repeated attempts on three occasions (see Table 3).

Table 3

Bird 3 – Location of tracking record co-ordinates.

Record	Date	Time	Latitude S	Longitude E
Captured	18/04/2022	am	29° 05' 21.30"	142° 36' 52.40"
Released	18/04/2022	am	29° 05' 17.50"	142° 36' 43.70"
1	18/04/2020	pm	29° 05' 20.95"	142° 36' 42.36"
2	19/04/2022	am	29° 04' 48.21"	142° 36' 54.08"
3	19/04/2022	am	29° 05' 09.21"	142° 36' 51.29"
4	19/04/2022	pm	29° 05' 20.56"	142° 36' 45.10"
	20/04/2022	am	not detected	
5	20/04/2022	pm	29° 05' 20.10"	142° 36' 50.13"
6	21/04/2022	am	29° 05' 22.69"	142° 36' 39.62"
7	21/04/2022	am	29° 05' 21.06"	142° 36' 56.10"
8	21/04/2022	pm	29° 05' 21.42"	142° 36' 52.50"
9	22/04/2022	am	29° 05' 20.12"	142° 36' 55.61"
10	22/04/2022	am	29° 05' 20.16"	142° 36' 45.16"
11	22/04/2022	pm	29° 05' 18.93"	142° 36' 48.15"
12	22/04/2022	pm	29° 05' 21.30"	142° 36' 49.23"
	23/04/2022	am/pm	no tracking done	
13	24/04/2022	am	29° 05' 15.20"	142° 36' 47.14"
	24/04/2022	pm	not detected	
14	25/04/2022	am	29° 05' 18.35"	142° 36' 46.89"
15	25/04/2022	pm	29° 05' 12.89"	142° 36' 47.09"
	26-27/04/2022	am/pm	heavy rain	no tracking
	28/04/2022	am	not detected	
	28/04/2022	pm	rain	no tracking
	29/04/2022	am	rain	no tracking
16	29/04/2022	pm	29° 05’ 12.75"	142° 36' 49.69"
	30-31/04/2022	am/pm	heavy rain	no tracking
	01-03/05/2022	am/pm	flooded tracks	no tracking
	04/05/2022	am	flooded tracks	no tracking
17	04/05/2022	pm	29° 05' 19.05"	142° 36' 46.71"
18	04/05/2022	pm	29° 05' 17.71"	142° 36' 45.53"
	05/05/2022	am	no tracking done	
19	05/05/2022	pm	29° 05' 11.57"	142° 36' 48.91"
20	05/05/2022	pm	29° 05' 12.42"	142° 36' 48.83"

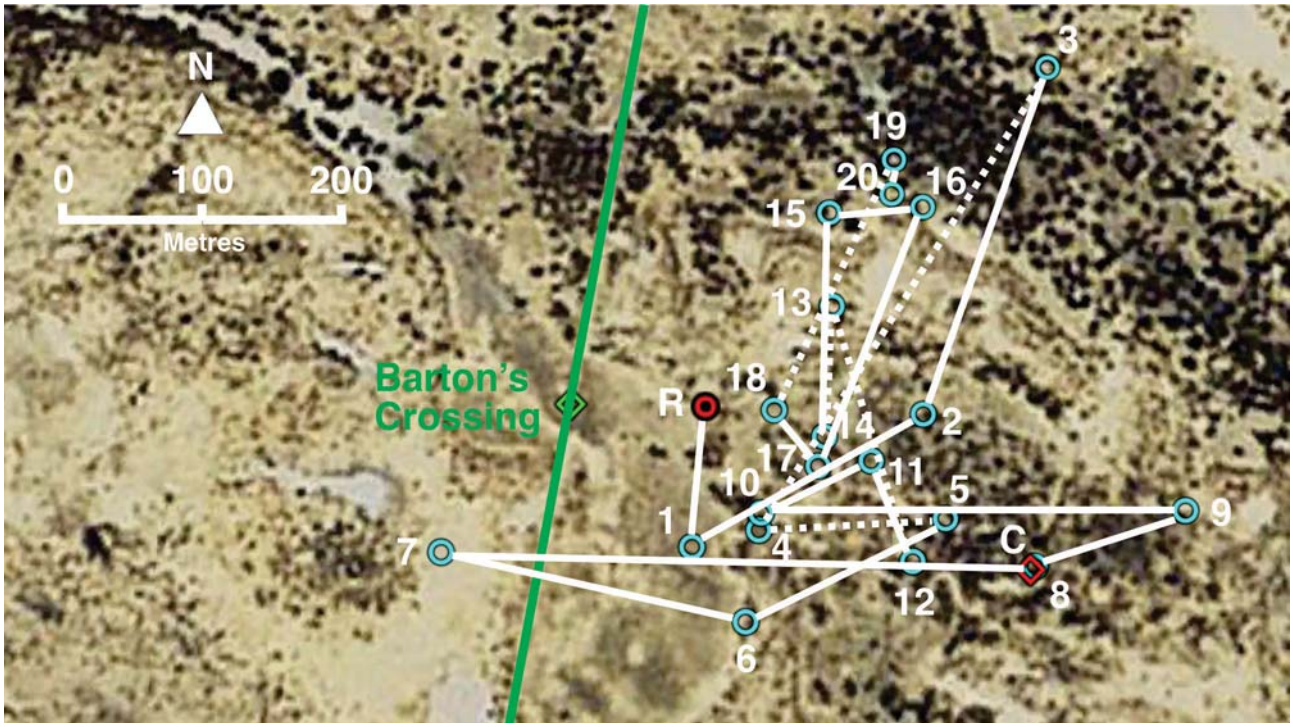


Figure 4 – *Bird 3 pattern of movements over a period of 17 days. Unbroken lines connecting transmission recorded positions provide a graphical representation of movement direction on consecutive days, whereas broken lines show direction of movement on non-consecutive record days (Table 3). The red diamond icon was the capture sit and the red circle icon was the release site. The lines connecting recorded positions of the bird do not represent direct flight lines between those points.*

Image courtesy of Google Earth

Bird 4 – an adult male was banded, a radio-transmitter fitted and released at approximately 9:30 am on 18 April 2022. The radio-telemetry monitoring of Bird 4 is shown in Table 4 and its recorded movement are graphically represented in Figure 5.

Although this grasswren was captured at the same time and in the same net as Birds 1, 2 and 3, it appears from the radio telemetry records that it did not stay with those three birds, or within their foraging range for much of the 18 days that monitoring was attempted (Fig. 5). Also, this bird could not be detected on numerous occasions when the other birds within its original foraging group were detected. Bird 4 also moved about 1km north of its release site into purely saltbush habitat immediately following its release, but returned to the vicinity if its capture in mixed lignum and saltbush habitat the following day. Seven days after its release Bird 4 was detected in dense lignum to the north- west of Bob's Hole Tank over 1.5 km west of its capture site. It was not detected at all after 25 April despite several attempts to pick up the transmitter signal over a very wide area, so it is suggested that Bird 4's transmitter failed after seven days.

Table 4

Bird 4 – Location of tracking record co-ordinates.

Record	Date	Time	Latitude S	Longitude E
Captured	18/04/2022	am	29° 05' 21.30"	142° 36' 52.40"
Released	18/04/2022	am	29° 05' 17.50"	142° 36' 43.70"
	18/04/2020	pm	not detected	
1	19/04/2022	am	29° 04' 50.19"	142° 36' 52.59"
2	19/04/2022	am	29° 05' 01.88"	142° 37' 00.18"
3	19/04/2022	pm	29° 05' 17.68"	142° 36' 49.24"
	20/04/2022	am	not detected	
4	20/04/2022	pm	29° 05' 18.22"	142° 36' 55.96"
5	21/04/2022	am	29° 05' 21.38"	142° 36' 56.33"
6	21/04/2022	pm	29° 05' 22.39"	142° 36' 56.15"
	22/04/2022	am/pm	not detected	
	23/04/2022	am/pm	no tracking done	
7	24/04/2022	am	29° 05' 36.06"	142° 36' 57.46"
8	24/04/2022	pm	29° 05' 23.88"	142° 35' 54.44"
9	25/04/2022	am	29° 05' 22.42"	142° 35' 59.07"
	25/04/2022	pm	not detected	
	26-28/04/2022	am/pm	heavy rain	no tracking
	29/04/2022	am	not detected	
	29//04/2022	pm	rain	no tracking
	30-31/04/2022	am/pm	heavy rain	no tracking
	01-04/05/2022	am/pm	rain/flooding	no tracking
	05/05/2022	am	no tracking done	
	05/05/2022	pm	not detected	

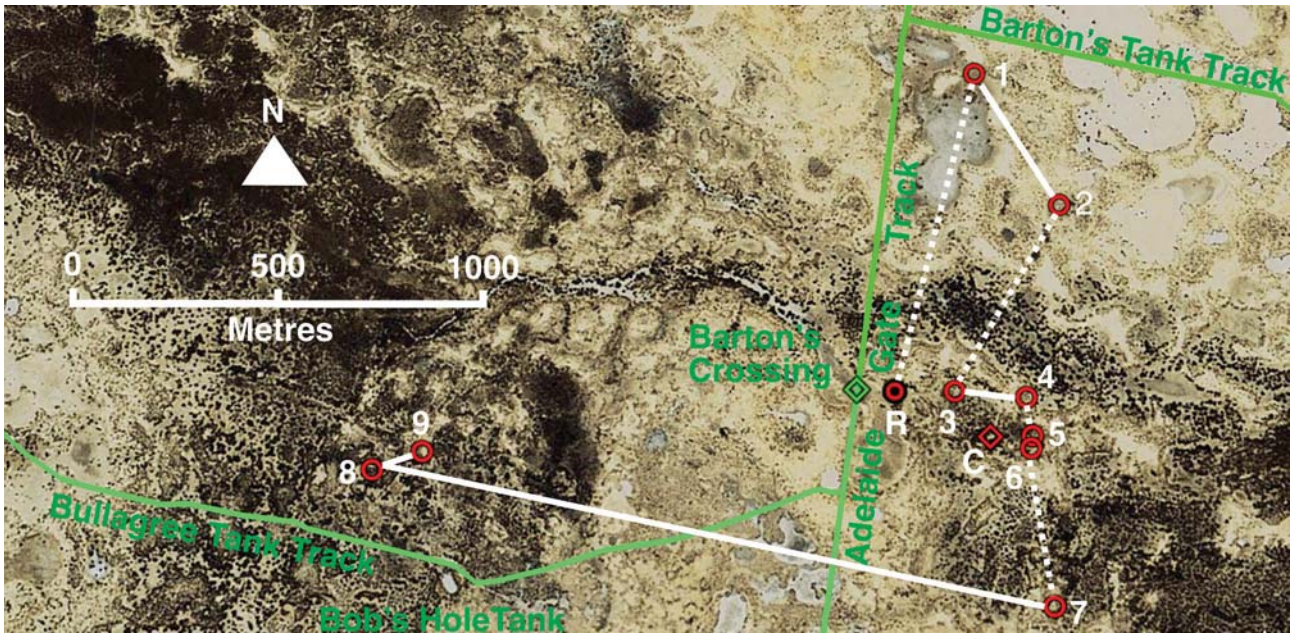


Figure 5 – *Bird 4 pattern of movements over a period of 18 days. Unbroken lines connecting transmission recorded positions provide a graphical representation of movement direction on consecutive days, whereas broken lines show direction of movement on non-consecutive record days (Table 4). The lines connecting recorded positions of the bird do not represent direct flight lines between those points.*

Image courtesy of Google Earth

Bob's Hole Tank Trapping Area:

Forty-one mist nets with a total length of 513 metres were erected to the west and north-west of Bob's Hole Tank from the afternoon of 20 April to 22 April 2022 in habitat comprised mainly of lignum with small amounts of interspersed saltbush and canegrass (see Fig 1). Several Grey Grasswrens had been captured in this area in previous years, but during these five days of intensive trapping effort only one grasswren was captured, though several Grey Grasswrens were sighted within the netted area over the period that we trapped in this area.

Most nets had been erected at this trapping area on the afternoon of 19 April but were not opened until the following morning. On 20 & 21April all nets were opened by 7:30 am and closed around midday to be reopened for about 2 ½ hours in the late afternoon. On 21 and 22 April several nets were relocated to other areas within the trapping area. We have not provided co-ordinates of all net lanes used at this trapping area as we believe that such information is irrelevant to the report. The co-ordinates of the net in which Bird 5 was captured is shown in Table 5.

Bird 5 – as this grasswren became known, was an adult male captured, banded and fitted with a radio transmitter at approximately 8:30 am on 22 April. The radio-telemetry monitoring of Bird 5 is shown in Table 5 and its recorded movement are graphically represented in Figure 6.

This bird was tracked, or attempts were made to track it, over a period of 15 days. Bird 5 could not be located on three occasions despite numerous attempts from different receiver locations. This bird was captured in very tall, dense lignum and stayed in that type of habitat for at least the first four days, so interruption to transmission signals was probably caused by the habitat.

Table 5

Bird 5 – Location of tracking record points.

Record	Date	Time	Latitude S	Longitude E
Captured	22/04/2022	am	29° 05' 27.72"	142° 35' 44.40"
Released	22/04/2022	am	29° 05' 27.72"	142° 35' 44.40"
1	22//04/2020	am	29° 05' 18,17"	142° 35' 50.10"
2	22//04/2020	am	29° 05' 19.32"	142° 35' 41.15"
2	22//04/2020	pm	29° 05' 16.68"	142° 35' 49.41"
	23//04/2020	am/pm	no tracking done	
	24/04/2022	am	not detected	
4	24/04/2022	pm	29° 05' 03.46"	142° 35' 55.00"
5	25/04/2022	am	29° 05' 22.07"	142° 35' 34.34"
	25/04/2022	pm	not detected	
	26-28/04/2022	am/pm	heavy rain	no tracking
	29/04/2022	am	not detected	
	29//04/2022	pm	rain	no tracking
	30-31/04/2022	am/pm	heavy rain	no tracking
	01-04/05/2022	am/pm	flooded tracks	no tracking
6	05/05/2022	am	29° 05' 09.40"	142° 36' 38.21"
7	05/05/2022	pm	29° 05' 08.60"	142° 36' 46.50"
8	06/05/2020	am	29° 05' 08.38"	142° 3' 46.50"

Heavy rainfall over the period 26 to 31 April and flooded tracks from 1 to 5 May prevented attempts to monitor this bird except for the morning of 29 April when a transmission could not be picked up, though the bird on this occasion may have been out of range of the receiver. On 5 and 6 May the bird was detected north of Barton's Crossing, over 1500 metres north-east of its previous transmission point (see Fig 6). This movement was similar in distance travelled by Bird 4, another adult male, and the bird had left tall, dense lignum to occupy an area of scattered lignum and saltbush habitat.

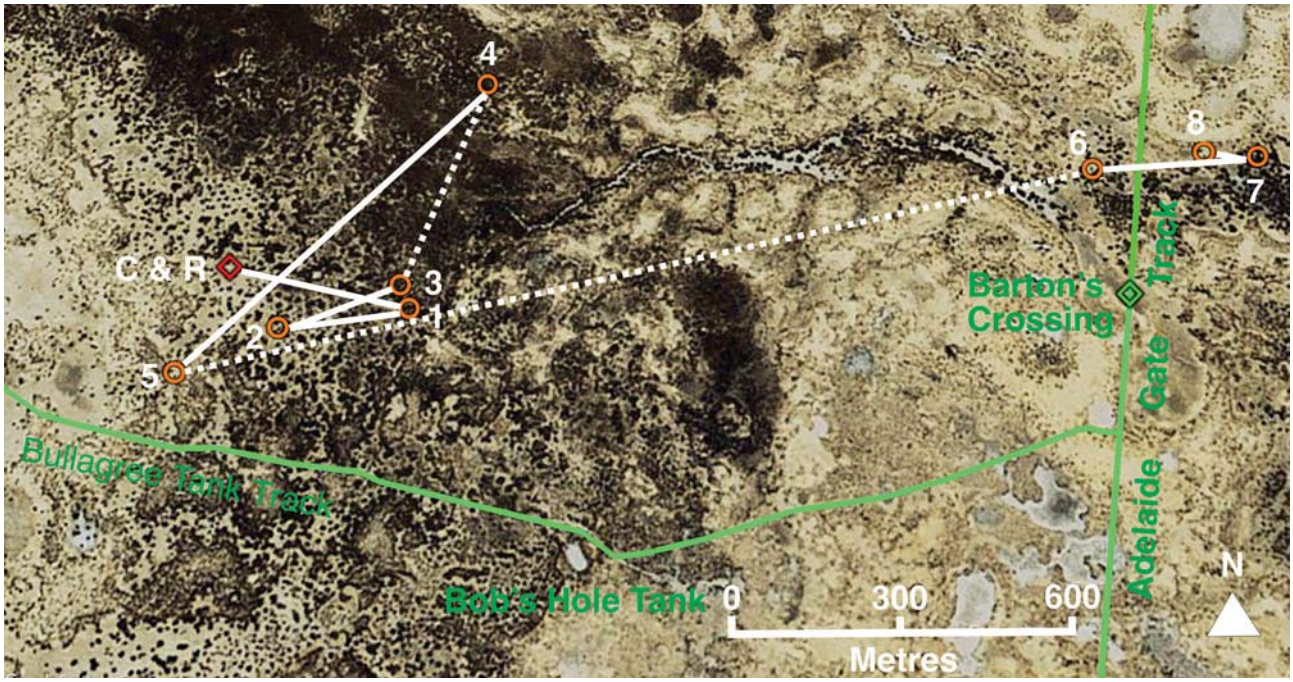


Figure 6 – *Bird 5 pattern of movements over a period of 17 days. Unbroken lines connecting transmission recorded positions provide a graphical representation of movement direction on consecutive days, whereas broken lines show direction of movement on non-consecutive record days (Table 1). The lines connecting recorded positions of the bird do not represent direct flight lines between those points.*

Image courtesy of Google Earth

Bullagree Tank Trapping Area:

Twenty mist nets with a total length of 240 metres were erected to the east and north-east of Bullagree Tank on 29 April to sample habitat comprised mainly of lignum with small amounts of interspersed saltbush (see Figure 1). All nets were opened by 8:30 am and closed around midday. Nets reopened around 2:00 pm and all removed in late afternoon with impending rain storms.

Birds 6 & 7 – Two Grey Grasswrens, both adult males, were captured in the same net at approximately 9:30 am on 29 April. Both birds (Birds 6 & 7) were banded and released with radio-transmitters within 30 minutes of capture.

Soon after release of these two birds the study area experienced three days of intense rain storms which left the property management tracks that are used for access to radio-telemetry monitoring areas either flooded or untrafficable because of boggy conditions. Both birds were subsequently detected near the release site on 2 May (see Tables 6 & 7 and Figure 7), but they could not be located thereafter despite extensive receiver searches over a wide radius from the release site. As a consequence, the research team did not gather enough data on these two birds to include them in the calculation of foraging territory requirements or population size.

Table 6

Bird 6 – Location of tracking record points.

Record	Date	Time	Latitude S	Longitude E
Captured	29/04/2022	am	29° 04' 36.48"	142° 34' 40.38"
Released	29/04/2022	am	29° 04' 33.70"	142° 34' 34.80"
	29//04/2022	pm	rain	no tracking
	30-31//04/2022	am/pm	heavy rain	no tracking
	01/05/2022	am/pm	flooded tracks	no tracking
1	02/05/2022	am	29° 04' 35.49"	142° 34' 34.28"
2	02/05/2022	pm	29° 04' 37.06"	142° 34' 34.39"
	03-05/05/2022	am/pm	not detected	

Table 7

Bird 7 – Location of tracking record points.

Record	Date	Time	Latitude S	Longitude E
Captured	29/04/2022	am	29° 04' 36.48"	142° 34' 40.38"
Released	29/04/2022	am	29° 04' 33.70"	142° 34' 34.80"
	29//04/2022	pm	rain	no tracking
	30-31//04/2022	am/pm	heavy rain	no tracking
	01/05/2022	am/pm	flooded tracks	no tracking
	02/05/2022	am	not detected	
1	02/05/2022	pm	29° 04' 34.48"	142° 34' 47.02"
	03-05/05/2022	am/pm	not detected	

Trying to find Birds 6 & 7 by radio-tracking at Bullagree Tank. (Photo: Richard Allen)

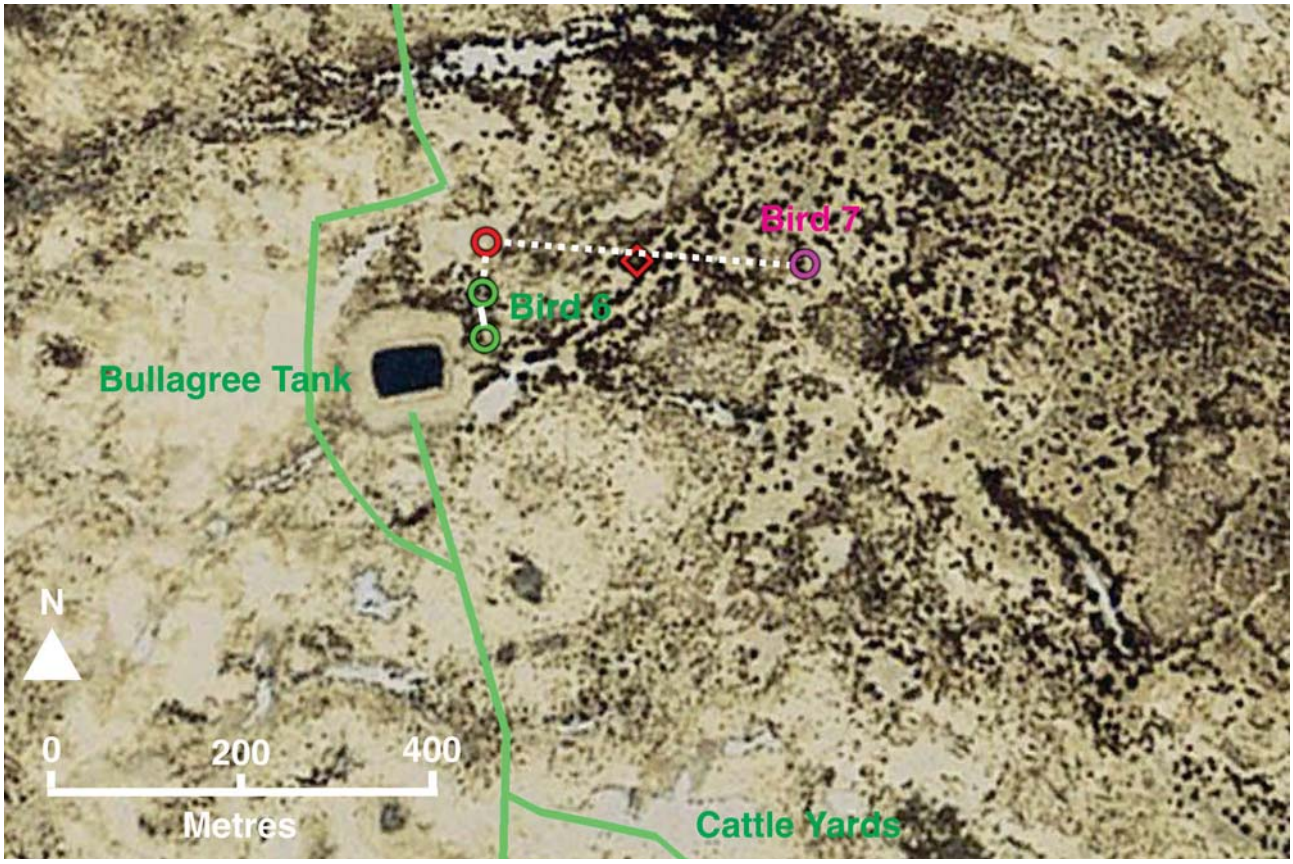


Figure 7 – *Birds 6 & 7 pattern of movements before contact was lost. Unbroken lines connecting transmission recorded positions provide a graphical representation of movement direction on consecutive days, whereas broken lines show direction of movement on non-consecutive record days (Tables 6 & 7). The lines connecting recorded positions of the birds do not represent direct flight lines between those points.*

Image courtesy of Google Earth

BIRD SPECIES OBSERVED AND CAPTURED

Since research on the Grey Grasswrens on *Narriearra Station* commenced in the year 2000, 158 bird species have been observed, but all habitat was not extensively searched by the research team. The list of species observed by the team, which is included in an Appendix to this report, will undoubtedly be added to from NPWS records and from other observers in the future.

The bird banding authority issued by the Australian Bird and Bat Banding Scheme and the licence issued by NSW NPWS authorized the capture and banding of the target Grey Grasswrens and the banding of all species of birds captured in the study areas. Fifty-two species of bird were captured and banded over the course of the 22 year study. A list and the number of each species banded is also included in the Appendix.

The Appendix also contains a number of photographs of birds, reptiles and shield shrimp observed and/or captured an during the study.

VEGETATION

A comprehensive outline of the plant species and vegetation communities within the Grey Grasswren foraging areas that we have studied was compiled from photographs taken from a drone and was included in our 2019 report (Farrell *et al.* 2019). However, for clarity with the present study, we have included a vegetation map with an overlay of the calculated principal foraging ranges of Bird 1 – 5 in Figure 10.

Flying drone to map Grey Grasswren habitat. (Photo: Rebecca Jacobs)

The present study could not add to the previous findings so far as mapping "*optimal*" and "*suitable"* habitat is concerned. However, we noted that there have been significant changes, with respect to vegetation height and density, over the past three years throughout the "*suitable*" grasswren habitat which would have improved their capacity to support a transient, if not resident, population.

Most of the cattle had been removed from *Narriearra*, or had died during the drought, prior to the acquisition of the property by NPWS in June 2020. It was very apparent to the 2022 research team that there had been substantial revegetation and growth in all native plant communities across the new National Park which had in previous years been severely impacted by overgrazing. The unprecedented number of invertebrates and bird life in 2022 was testament to the revitalized habitats.

It is appreciated that the *La Nina* climatic conditions, which brought about an end to the drought after 2019, and continued though this research period, has played an important role in the vegetative growth spurt across the national park and a dramatic increase in the availability of invertebrate prey for birds, but the absence of cattle and the reduction in grazing pressure within grasswren habitat must also be recognized and acknowledged.

Lignum in all areas visited had significant new shoots and new lignum plants had emerged across all of the claypans. In all canegrass communities that we viewed we also noted substantial changes in density and height. The most obvious of example of this was in the Caryapundy Swamp outflow channel north of *Teurika* homestead where the original type specimens of the Grey Grasswren were collected in 1967. In 2019 the canegrass in this channel was little more than overgrazed stubble, but only three years later it is more than a metre in height. Saltbush and samphire communities are also important foraging habitat for Grey Grasswrens, but as far as we are aware they were not severely impacted by grazing cattle. The regeneration that we noted in these areas is probably best attributed to prevailing climatic conditions.

We expect that within a few years of continued productive climatic conditions and natural regeneration of previously overgrazed former Grey Grasswren habitat, we will witness a return of grasswrens to the whole of the former range of the species on *Narriearra-Caryapundy Swamp National Park*.

FORAGING TERRITORY AND GREY GRASSWREN POPULATION

In our 2019 report (Farrell *et al.* 2019) the research team calculated that, in the drought (*El Nino* climatic period) conditions prevailing at that time, the mean foraging territory for a pair of Grey Grasswrens was 57 ha. Also, it was calculated that the "optimal" area of habitat on *Narriearra Station* was 3191 ha which equated to 56 foraging territories and a conservative estimate of 112 birds in the study area. At the same time the total suitable habitat was calculated as 5449 ha and it could conservatively support 191 individuals.

Over the period of this study we captured and fitted radio transmitters to seven birds, but the weather conditions prevailing over late April and the first half of May seriously impacted the team's ability to trap birds and complete the planned period of radio-tracking. Nevertheless, the results that we did obtain have allowed us to reliably estimate territories revealed by radio-tracking Birds 1 - 5 as illustrated in Figure 8. In the case of Bird 5, however, we suggest that other grasswrens observed (but not captured in the proximity of Bird 5's estimated primary foraging territory), were probably part of the Bird 5's resident foraging flock, we therefore included them in the Bird 5 Territory estimate of about 50 ha (blue polygon in Fig. 8).

Grasswrens 1, 2, 3 and 4 were all captured at the same time and at the same site. All four were subsequently released from exactly the same location. However, they initially dispersed in different directions, but subsequently returned to vicinity of their capture site. Over the period in which they were tracked they mostly stayed within the same general locality and primarily lignum habitat. Allowing for time lag in recording each bird from at least two receiver points to triangulate the source of each transmission recorded, radio-tracking records suggest that, on at least some occasions, these four birds were very close to each other, or together in a foraging flock. Whether the four individual birds subsequently rejoined the birds that they had been captured with, or whether they may have joined others that had not been captured is irrelevant (see Figs. 2, 3, 4 & 5) because all four birds, for much of the tracking period, shared the same foraging territory and they may have been together.

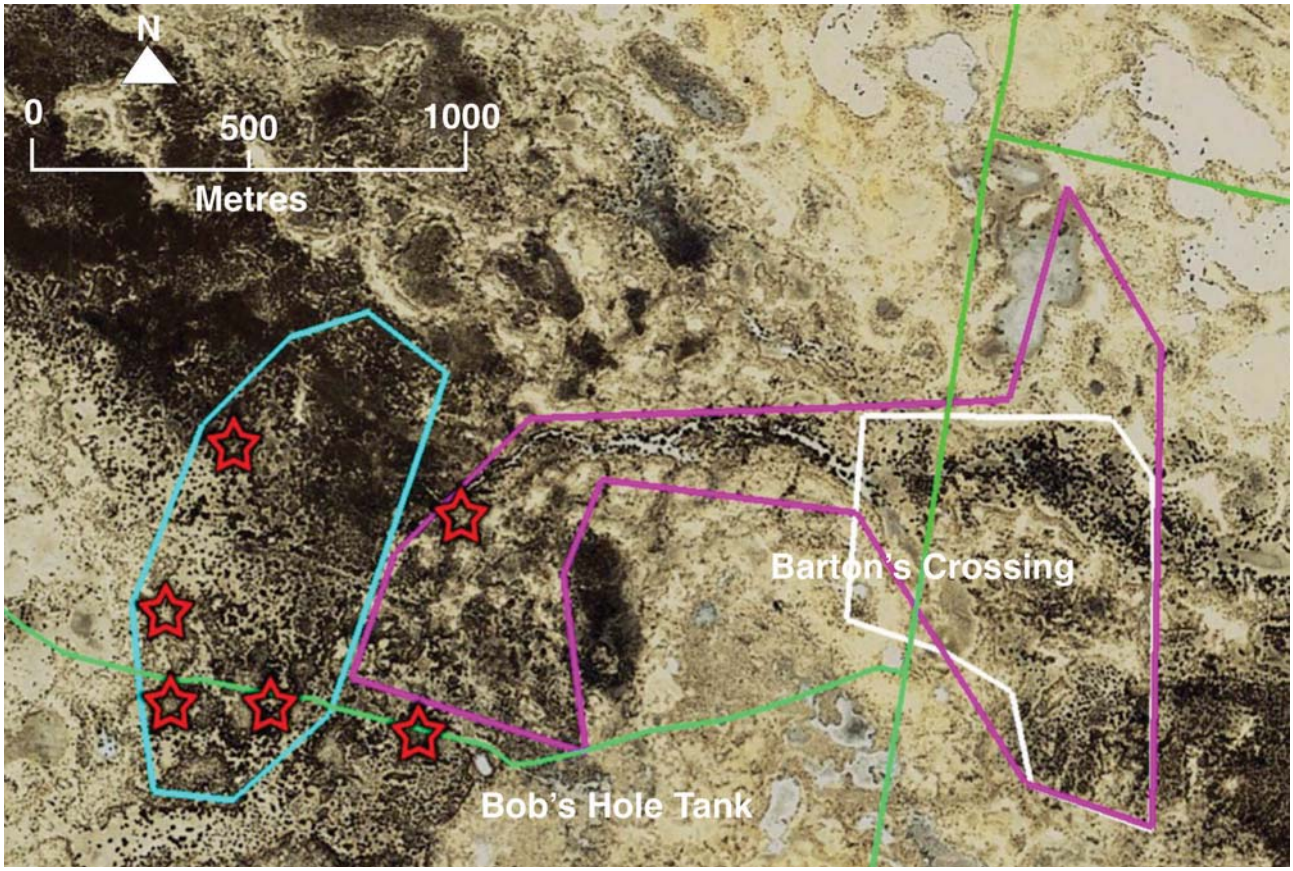


Figure 8 – *Estimated foraging ranges for five Grey Grasswrens (Birds 1 – 5) radio-tracked in the vicinity of Barton's Crossing and Bob's Hole Tank. The white polygon delineates the estimated range of Birds 1-3, mauve polygon Bird 4 and blue polygon Bird 5 with probable feeding flock partners observed in the nearby vicinity (six Grey Grasswren observation positions shown by red stars).*

Image courtesy of Google Earth

It is interesting to note that the two birds which appeared to leave their primary foraging territory by over a kilometre (Bird 4 – see Fig. 5 and Bird 5 – see Fig. 6) were both adult males, but the significance of this is not known. We have therefore excluded these departures from the primary foraging area in our calculations.

For the purposes of estimating foraging territory and the Grey Grasswren population on *Narriearra – Cayapundy Swamp National Park* in 2022 we believe that we can best rely on the data obtained from the four birds (Birds 1 – 4) captured in the Barton's Crossing trapping area on 18 April. By leaving out the most distant telemetry points recorded and plotted for each of these four birds we have mapped the area shared by all four birds for most of the period over which they were monitored. This area of approximately 23.5 ha is shown by the white polygon at Barton's Crossing.

There may have been more than the four Grey Grasswrens in the foraging flock at Barton's Crossing trapping area that avoided being captured and from our observation in the vicinity of the foraging range of Bird 5 (Fig 8), we conservatively estimate that a typical feeding flock of Grey Grasswrens, in prime condition *optimal* habitat, comprises four birds.

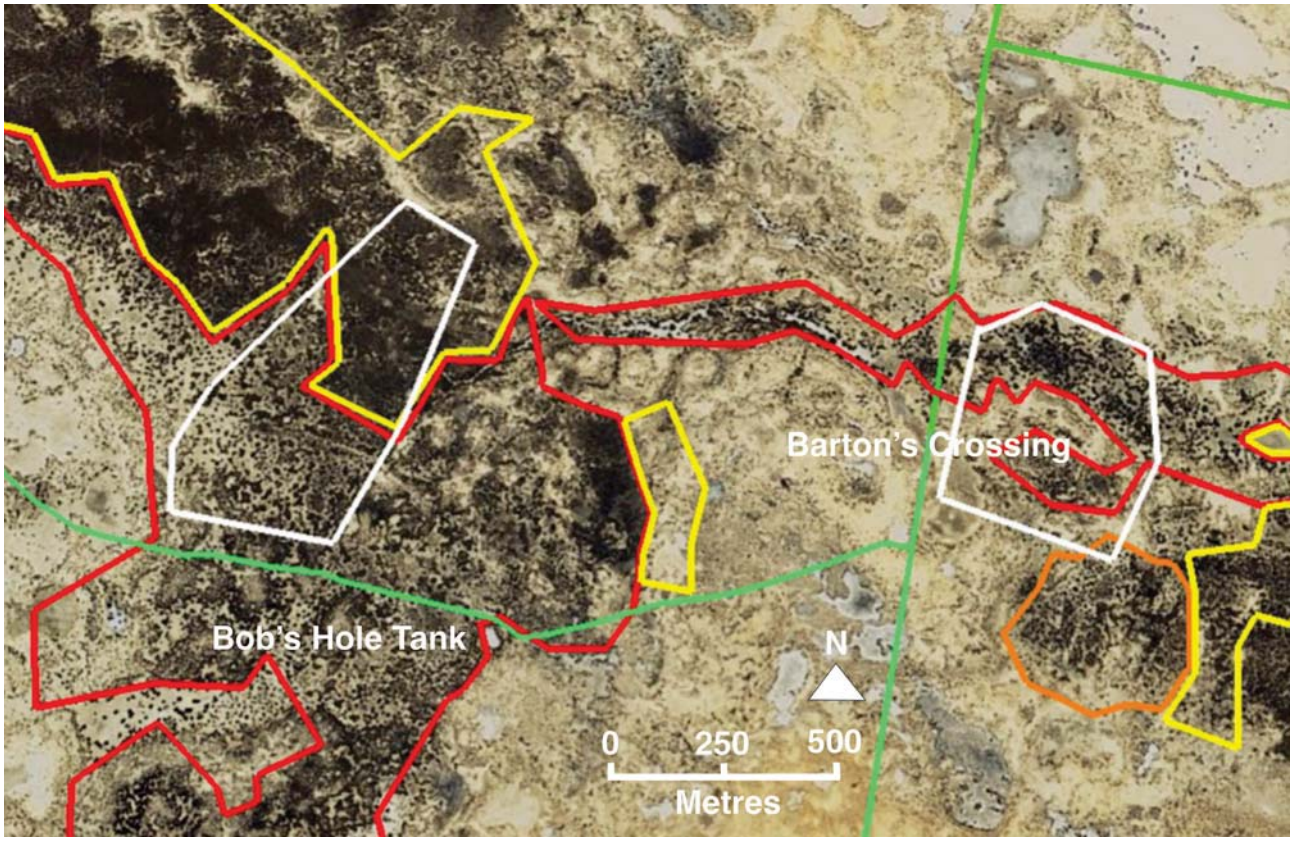


Figure 9 – *Vegetation community map of the 2022 study area – (white polygons – Birds 1 – 4 (at Barton's Crossing) shared foraging ranges of birds and Bird 5 (n-w of Bob's Hole Tank) estimated primary foraging range (excluding observed nearby grasswrens); red outline – lignum community; yellow outline – lignum, canegrass & saltbush community; orange outline – canegrass community).*

Image courtesy of Google Earth

In calculating the present population we recognise that the period of severe drought ended in 2019 and cattle are no longer a major threat to the optimal grasswren habitat. However, we also accept that Grey grasswrens breed in July / August and there have been only two grasswren breeding seasons over the past two years and there is very little information on Grey Grasswren fecundity. It is thought that, like all grasswren species, a pair usually raise only two fledglings in a breeding season. At the very most, the overall population may have tripled, but with natural mortality that is unlikely. Also, there has not been sufficient time, since the end of drought conditions and the removal of cattle, for regenerative processes to significantly expand suitable habitat.

By utilising the same calculation criteria as was contained in our 2019 report (Farrell et al, 2019) and assuming what was assessed in 2019 as *suitable* habitat is now regenerating to the extent that it may be approaching *optimal* status, we suggest that the area of very good habitat for Grey Grasswrens would now equate to at least 200 foraging territories. Given that the population of Grey Grasswrens has not yet had sufficient time to recover to its probable pre-drought level and to disperse to fully utilize the available habitat, we conservatively estimate the present population would be at least 300 and possibly as high as 500 across the whole of the presently available habitat on *Narriearra-Caryapundy Swamp National Park*.

The 2022 known, suspected, historic and future range of Grey Grasswrens on *Narriearra Caryapundy Swamp National Park* is shown in Figure 10.

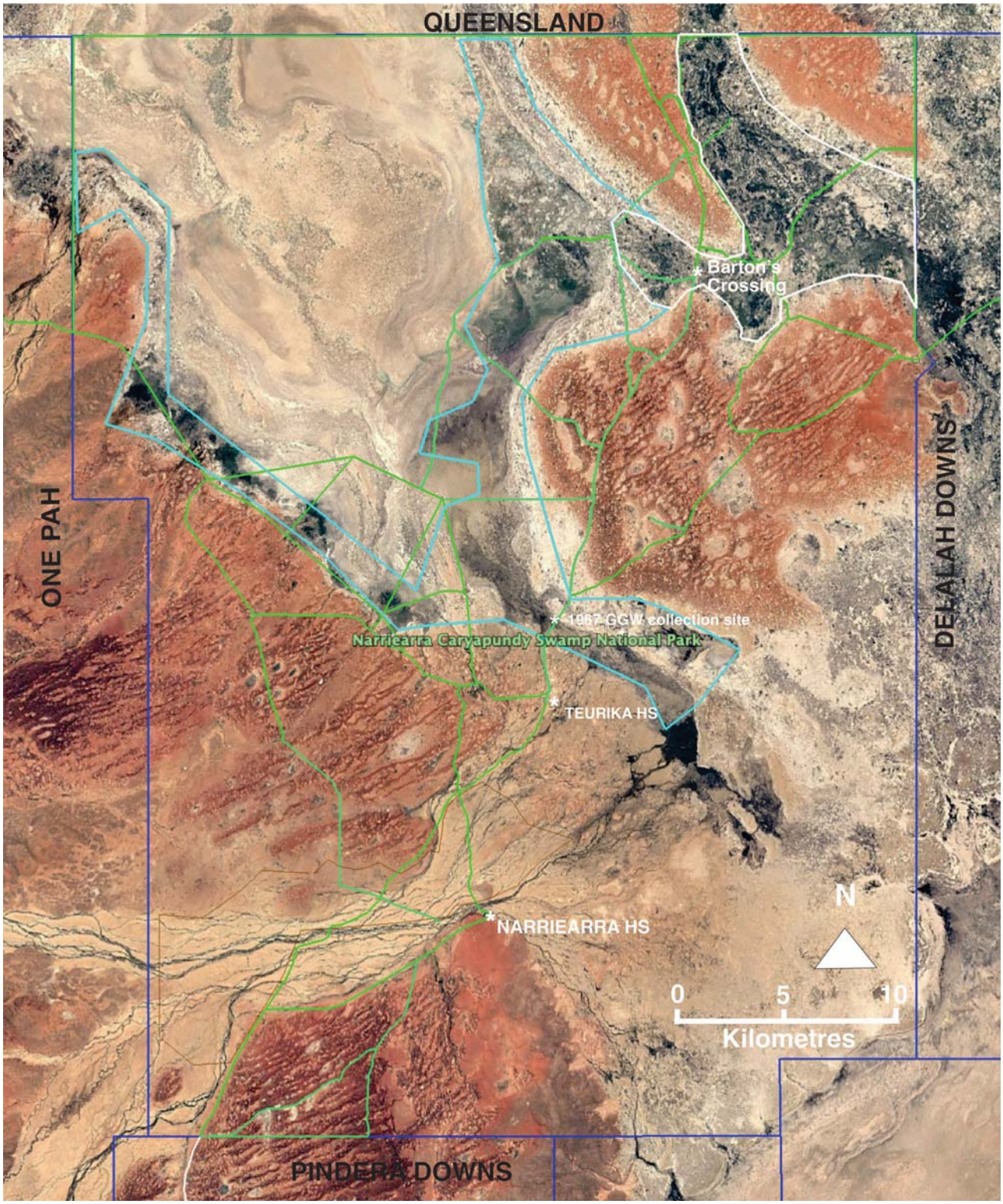


Figure 10 – *Grey Grasswren range within Narriearra-Caryapundy Swamp National Park–* ***white polygon*** *- 2022 known and suspected range;* ***light blue polygon*** *- historic and predicted future range. Green lines are existing property management tracks.*

Image courtesy of Google Earth

CONCLUSION AND RECOMMENDATIONS

The regeneration of all vegetation communities and associations throughout *Narriearra-Caryapundy Swamp National Park* since the end of the drought and the removal of most of the cattle, has been very encouraging. We expect that if present climatic conditions were to continue it would possibly take another five or so years for the regeneration of the lignum, saltbush, canegrass and samphire associations to return to the vegetative coverage that existed in the 1960's when the first Grey Grasswrens were found on the property.

We estimate that the present population of Grey Grasswrens on *Narriearra-Caryapundy Swamp National Park* is presently around 300 but could be double that if the whole of the presently available habitat is occupied. When regeneration of habitat post removal off all cattle replicates the 1960s vegetative cover, the Grey Grasswren population could reasonably be expected to reach a sustainable level of several thousand birds in boom years.

Garnett and Baker (2020) listed the conservation status of the Bulloo Grey Grasswren *A. b. barbatus* as "Near Threatened". That assessment was based on the range of the subspecies being primarily in the Bulloo River catchment of south-western Queensland. Now that 90 percent, or more of the optimal habitat in NSW is protected and will be managed within the conservation reserve system, we believe that the NSW population is now secure.

The Australian Bird Study Association's Grey Grasswren research team is of the opinion that intensive research, such as radio-tracking, of the Grey Grasswren is no longer necessary, nor justified. However, we do recommend:

- observational monitoring, using call playback, should continue to be undertaken on a regular basis to gain knowledge of expansion from the present range of the Grey Grasswren to its historic range – this will include habitat that was destroyed by cattle grazing over the past five decades and by fire in recent years;
- transects be established for future of the population monitoring by observation and call playback;
- all remaining cattle be removed;
- regular culling of feral pigs, goats and horses continue;
- regular baiting continue for rabbits, wild dogs (feral and dingo), foxes and cats.

ACKNOWLEDGEMENTS

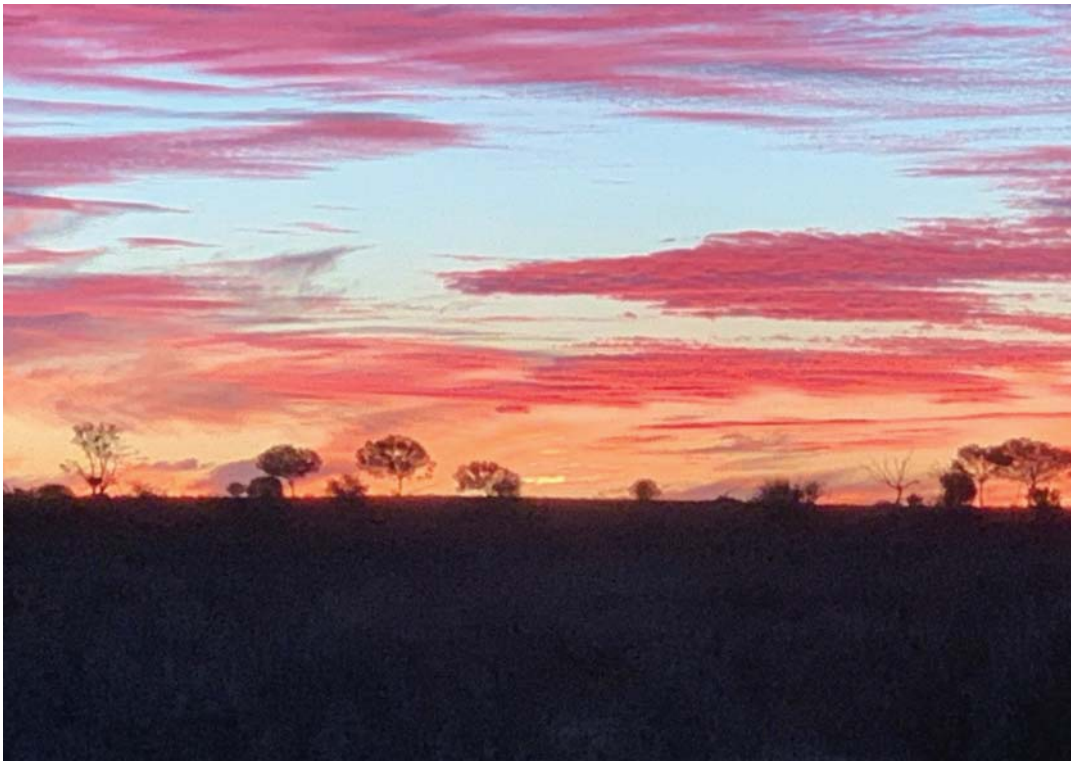
I particularly acknowledge the contribution made to the Grey Grasswren study by Dr. John Farrell who proposed and initiated the expansion of the banding study of the birds and the mapping and monitoring of their habitat, to also undertake radio-tracking of the birds and the drone photography of their foraging habitat. I also acknowledge the assistance provided in the 2022 study by Rebecca Jacobs, Rudy Jacobs, Richard Allen, Wendy Holland, Judy Little, Greg Little, Darryl McKay, Genevieve Kyi, Ros Farrell, Heather Parsons and Phillip Brown. Our appreciation is given to Jamie Hayman from the Wild Dog Destruction Board for allowing access to the dingo fence maintenance track. After being warned of the forecast of more heavy rain and abandoning our research efforts, we extend our thanks NSW NPWS officers Dan Hough and Adam Watson for providing assistance and escorting the team over the wet and boggy tracks on the NP back to Tibooburra. Finally, a special thanks to Phil Bell, Darren Shelly and Jaymie Norris of NSW NPWS for encouragement and support for the study over the past nine years.

A PERSONAL NOTE FROM THE AUTHOR

And so ends my Grey Grasswren journey which began with a bird watcher's coach trip in 1984. I never expected that I would see the reservation of *Narriearra* as a National Park and the habitat security attained for this beautiful threatened bird. It is the realization of my greatest hopes to see these outcomes. I again thank all of those people who assisted in the study of the birds over the past 38 years.

Jeff Hardy with the last Grey Grasswren captured in 2022.

(Photo: Judy Little)



Sunset on Narriearra – Caryapundy Swamp National Park May 2022 (Photo: Jeff Hardy)

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Appendix 1

ABSA RESEARCH TEAM – BIRD CHECKLIST
NARRIEARRA - CARYAPUNDY SWAMP NATIONAL PARK
(Observed and Banded – Pre 2022 and April / May 2022)

Species Number	Common Name	Scientific Name	Pre 2022		April / May 2022		
			Observed	Number banded	Observed	Number banded	Number retrap
1	Emu	*Dromaius novaehollandiae*	●		●		
213	Pink-eared Duck	*Malacorhynchus membranaceus*	●		●		
203	Black Swan	*Cygnus atratus*	●		●		
215	Hardhead	*Aythya australis*	●		●		
212	Australasian Shoveler	*Anas rhynchotis*	●		●		
208	Pacific Black Duck	*Anas superciliosa*	●		●		
211	Grey Teal	*Anas gracilis*	●		●		
9	Stubble Quail	*Coturnix pectoralis*	●		●		
61	Australasian Grebe	*Tachybaptus novaehollandiae*	●		●		
62	Hoary-headed Grebe	*Poliocephalus poliocephalus*	●		●		
35	Common Bronzewing	*Phaps chalcoptera*	●				
36	Flock Bronzewing	*Phaps histrionica*	●		●		
43	Crested Pigeon	*Ocyphaps lophotes*	●	2	●		
31	Diamond Dove	*Geopelia cuneata*	●	11	●	8	
30	Peaceful Dove	*Geopelia striata*	●	2			
342	Horsfield's Bronze-Cuckoo	*Chalcites basalis*	●	9	●		
341	Black-eared Cuckoo	*Chalcites osculans*	●	1	●		
338	Fan-tailed Cuckoo	*Cacomantis flabelliformis*	●				
337	Pallid Cuckoo	*Heteroscenes pallidus*	●	1	●		
176	Australian Bustard	*Ardeotis australis*	●		●		
313	Tawny Frogmouth	*Podargus strigoides*	●				
330	White-throated Nightjar	*Eurostopodus mystacalis*	●		●		
317	Australian Owlet-nightjar	*Aegotheles cristatus*	●				
46	Buff-banded Rail	*Hypotaenidia philippensis*			●		
55	Black-tailed Native-hen	*Tribonyx ventralis*	●	3	●		
59	Eurasian Coot	*Fulica atra*	●		●		
177	Brolga	*Antigone rubicunda*	●				
148	Red-necked Avocet	*Recurvirostra novaehollandiae*			●		
146	Pied Stilt	*Himantopus leucocephalus*	●		●		
144	Black-fronted Dotterel	*Elseyornis melanops*	●	11	●		
135	Banded Lapwing	*Vanellus tricolor*	●		●		
133	Masked Lapwing	*Vanellus miles novaehollandiae*			●		
132	Red-kneed Dotterel	*Erythrogonys cinctus*	●	3	●		
145	Inland Dotterel	*Charadrius australis*	●		●		
163	Sharp-tailed Sandpiper	*Calidris acuminata*	●				
161	Curlew Sandpiper	*Calidris ferruginea*	●				
157	Common Sandpiper	*Actitis hypoleucos*	●				
158	Common Greenshank	*Tringa nebularia*	●				
159	Marsh Sandpiper	*Tringa stagnatilis*	●		●		
18	Little Button-quail	*Turnix velox*	●	1	●	1	
173	Australian Pratincole	*Stiltia isabella*	●				
122	Caspian Tern	*Hydroprogne caspia*	●				
8794	Australian Gull-billed Tern	*Gelochelidon macrotarsa*	●				
110	Whiskered Tern	*Chlidonias hybrida*	●		●		
106	Australian Pelican	*Pelecanus conspicillatus*	●		●		
192	Nankeen Night-Heron	*Nycticorax caledonicus*	●				
977	Cattle Egret	*Bubulcus ibis*	●				
189	White-necked Heron	*Ardea pacifica*	●		●		
187	Great Egret	*Ardea alba*	●				
188	White-faced Heron	*Egretta novaehollandiae*	●		●		
179	Australian White Ibis	*Threskiornis moluccus*	●				

Appendix 1 ***(continued)***

Species Number	Common Name	Scientific Name	Pre 2022		April / May 2022		
			Observed	Number banded	Observed	Number banded	Number retrap
180	Straw-necked Ibis	*Threskiornis spinicollis*			●		
182	Yellow-billed Spoonbill	*Platalea flavipes*	●				
181	Royal Spoonbill	*Platalea regia*	●				
178	Glossy Ibis	*Plegadis falcinellus*	●				
100	Little Pied Cormorant	*Little Pied Cormorant*	●				
96	Great Cormorant	*Phalacrocorax carbo*	●				
97	Little Black Cormorant	*Phalacrocorax sulcirostris*	●				
232	Black-shouldered Kite	*Elanus axillaris*	●		●		
233	Letter-winged Kite	*Elanus scriptus*			●		
231	Black-breasted Buzzard	*Hamirostra melanosternon*	●				
224	Wedge-tailed Eagle	*Aquila audax*	●		●		
225	Little Eagle	*Hieraaetus morphnoides*	●		●		
219	Swamp Harrier	*Circus approximans*	●		●		
218	Spotted Harrier	*Circus assimilis*	●		●		
221	Brown Goshawk	*Accipiter fasciatus*	●		●		
222	Collared Sparrowhawk	*Accipiter cirrocephalus*	●		●		
228	Whistling Kite	*Haliastur sphenurus*	●		●		
229	Black Kite	*Milvus migrans*	●		●		
249	Barn Owl	*Tyto alba*	●		●		
242	Southern Boobook	*Ninox boobook*	●		●		
329	Rainbow Bee-eater	*Merops ornatus*	●	3			
325	Red-backed Kingfisher	*Todiramphus pyrrhopygius*	●		●		
240	Nankeen Kestrel	*Falco cenchroides*	●		●		
235	Australian Hobby	*Falco longipennis*	●		●		
239	Brown Falcon	*Falco berigora*	●		●		
236	Grey Falcon	*Falco hypoleucos*			●		
238	Black Falcon	*Falco subniger*	●		●		
237	Peregrine Falcon	*Falco peregrinus*	●		●		
274	Cockatiel	*Nymphicus hollandicus*	●		●		
273	Galah	*Eolophus roseicapillus*	●		●		
270	Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	●				
271	Little Corella	*Cacatua sanguinea*	●		●		
280	Red-winged Parrot	*Aprosmictus erythropterus*	●				
297	Blue Bonnet	*Northiella haematogaster*	●	3	●		
296	Mulga Parrot	*Psephotellus varius*	●	1	●		
294	Australian (Mallee) Ringneck	*Barnardius zonarius barnardi*	●				
304	Bourke's Parrot	*Neopsephotus bourkii*	●	18	●		
306	Blue-winged Parrot	*Neophema chrysostoma*	●	2	●		
310	Budgerigar	*Melopsittacus undulatus*	●	5	●	20	
555	Brown Treecreeper	*Climacteris picumnus*	●				
537	Purple-backed Fairy-wren	*Malurus assimilis*	●	138	●	15	
535	White-winged Fairy-wren	*Malurus leucopterus*	●	124	●	58	
871	Grey Grasswren	*Amytornis barbatus barbatus*	●	51	●	7	
589	Black Honeyeater	*Sugomel niger*	●	7	●		
598	Painted Honeyeater	*Grantiella picta*	●	1	●		
597	Brown Honeyeater	*Lichmera indistincta*	●	3			
602	Pied Honeyeater	*Certhionyx variegatus*	●	30	●		
452	Gibberbird	*Ashbyia lovensis*	●				
449	Crimson Chat	*Epthianura tricolor*	●	20	●	1	
450	Orange Chat	*Epthianura aurifrons*	●	19	●		
448	White-fronted Chat	*Epthianura albifrons*	●		●		
640	Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*	●	9	●		
608	Singing Honeyeater	*Lichenostomus virescens*	●	65	●	3	
625	White-plumed Honeyeater	*Ptilotula penicillata leilavalensis*	●	42	●		

Appendix 1 ***(continued)***

Species Number	Common Name	Scientific Name	Pre 2022		April / May 2022		
			Observed	Number banded	Observed	Number banded	Number retrap
594	White-fronted Honeyeater	*Purnella albifrons*	●	3	●		
635	Yellow-throated Miner	*Manorina flavigula*	●	13	●		
570	Red-browed Pardalote	*Pardalotus rubricatus*	●		●		
976	Striated Pardalote	*Pardalotus striatus*	●		●		
465	Weebill	*Smicrornis brevirostris*	●				
497	Redthroat	*Pyrrholaemus brunneus*	●	128	●	21	2
466	Southern Whiteface	*Aphelocephala leucopsis*	●	60	●		
476	Inland Thornbill	*Acanthiza apicalis*	●				
481	Chestnut-rumped Thornbill	*Acanthiza uropygialis*	●	8	●		
445	White-browed Babbler	*Pomatostomus superciliosus*	●				
446	Chestnut-crowned Babbler	*Pomatostomus ruficeps*	●	13	●		
423	Ground Cuckoo-shrike	*Coracina maxima*	●				
424	Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	●	3	●		
425	White-bellied Cuckoo-shrike	*Coracina papuensis*	●		●		
430	White-winged Triller	*Lalage tricolor*	●	6	●		
401	Rufous Whistler	*Pachycephala rufiventris*	●	4	●		
408	Grey Shrike-thrush	*Colluricincla harmonica*	●				
419	Crested Bellbird	*Oreoica gutturalis*	●				
866	Chirruping Wedgebill	*Psophodes cristatus*	●	17	●	4	
705	Australian Magpie	*Cracticus tibicen*	●		●		
700	Pied Butcherbird	*Cracticus nigrogularis*	●		●		
702	Grey Butcherbird	*Cracticus torquatus*	●		●		
544	Masked Woodswallow	*Artamus personatus*	●		●		
545	White-browed Woodswallow	*Artamus superciliosus*	●		●		
546	Black-faced Woodswallow	*Artamus cinereus*	●	19	●	1	
543	White-breasted Woodswallow	*Artamus leucorynchus*	●	1	●		
364	Willie Wagtail	*Rhipidura leucophrys*	●	13	●	1	
361	Grey Fantail	*Rhipidura fuliginosa*	●	2			
692	Torresian Crow	*Corvus orru*	●				
691	Little Crow	*Corvus bennetti*	●				
954	Little Raven	*Corvus mellori*	●		●		
930	Australian Raven	*Corvus coronoides*	●		●		
728	Restless Flycatcher	*Myiagra inquieta*	●				
415	Magpie-lark	*Grallina cyanoleuca*	●	5	●		
693	White-winged Chough	*Corcoraax melanorhamphos*	●				
675	Apostlebird	*Struthidea cinerea*	●	2	●		
381	Red-capped Robin	*Petroica goodenovii*	●	69	●	5	
377	Jacky Winter	*Microeca fascinans*	●		●		
385	Hooded Robin	*Melanodryas cucullata*	●				
564	Mistletoebird	*Dicaeum hirundinaceum*	●	1	●		
653	Zebra Finch	*Taeniopygia guttata*	●	224	●	21	
995	House Sparrow	*Passer domesticus*	●				
647	Australasian Pipit	*Anthus novaeseelandiae*	●		●		
648	Horsfield's Bushlark	*Mirafra javanica*			●		
508	Brown Songlark	*Cincloramphus cruralis*			●		
509	Rufous Songlark	*Cincloramphus mathewsi*	●	1	●		
522	Little Grassbird	*Poodytes gramineus*	●	32	●		
524	Australian Reed-Warbler	*Acrocephalus australis*	●	5	●	2	
358	White-backed Swallow	*Cheramoeca leucosterna*	●	1	●		
360	Fairy Martin	*Petrochelidon ariel*	●		●		
359	Tree Martin	*Petrochelidon nigricans*	●		●		
357	Welcome Swallow	*Hirundo neoxena*	●	1	●		
999	Common Starling	*Sturnus vulgaris*	●				

Appendix 2

A FEW BIRDS CAPTURED AND/OR OBSERVED

Blue-winged Parrot

Budgerigar (F)

Bourke's Parrot (F)

Painted Honeyeater (F)

White-plumed Honeyeater
(feeding while in the hand)

Redthroat (M)

Pied Honeyeater (F)

Pied Honeyeater (M)

Black-faced Woodswallow

(Photos: Richard Allen)

Appendix 2 ***(continued)***

A FEW BIRDS CAPTURED AND/OR OBSERVED

Purple-backed Fairywren (M)

Purple-backed Fairywren (F)

Zebra Finch (M)

Chirruping Wedgebill

Orange Chat (M)

Horsfield's Bronze-Cuckoo

Pallid Cuckoo

Crimson Chat (F)

White-winged Fairywren (M)

Flock Pigeons

(Photos: Richard Allen)

Appendix 3
A FEW REPTILES AND A SHIELD SHRIMP

Strap-snouted Brown Snake *Pseudonaja aspidorhyncha* (Photo: Richard Allen)

Eastern Brown Snake *Pseudonaja textilis* (Photo: Richard Allen)

Central Netted Dragon *Ctenophorus nuchalis* (Photo: Jeff Hardy)

Shield Shrimp *Triops australiensis* (Photo: Richard Allen)