

COONGIE ROAD

BIRDS, MAMMALS & VEGETATION SURVEY 2014

A project undertaken by the Friends of the Innamincka Reserves



Dune near Coongie Road, Innamincka Regional Reserve

REPORT ON THE COONGIE ROAD BIRDS, MAMMALS & VEGETATION SURVEY 2014

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REPORT ON THE COONGIE ROAD BIRDS, MAMMALS & VEGETATION SURVEY 2014

INTRODUCTION

A. PROJECT COORDINATOR AND FIELD TEAM

Coordinator: Kate Buckley

Team Leaders: Euan Moore, Jenny Rolland, Rose Treilibs, Vern Treilibs

Field Team: Daphne Hards, Sonja Ross, Karen and Geoff Russell, Jen and Len Kenna, Barbara and Peter Bansemer, Fae and Jim Trueman, Jan and Ray Hutchinson

In 2014 this project was carried out as a volunteer activity by members of the Friends of Innamincka Reserves (FOIR). There was no external funding for the project.

B. BACKGROUND

The Coongie Road extends from Innamincka north-west to Malkumba-Coongie Lakes NP via Kudriemitchie. It passes through a range of habitat types from dry grasslands to wetlands. While average rainfall is low (177 mm per annum), the Innamincka area is in a region of maximum rainfall variability for Australia. In 2010 this area experienced extreme rainfall in terms of scale and intensity (732mm in 2010 and 380mm in 2011), resulting in closure of the Coongie Road from 2010-2012. The rainfall event came to an abrupt end in 2012 with only 56.5 mm in 2013 and approx. 35 mm for 2014¹. The FOIR survey provides data for monitoring changes to the nomadic terrestrial bird species, mammals and vegetation as the weather returns to 'normal' following a time of ecological boom. It also enables assessment of the impacts of other environmental changes such as mining and road-making.



The region covered by the transects includes a 123 km stretch of road running between Innamincka and Coongie Lake in a north-westerly direction. The track loosely follows the direction of the braided channels of Cooper Creek leading to Tirrawarra swamp and then gets steadily closer to the north-west branch of the Cooper Creek until it reaches the Kudriemitchie Outstation. The remaining 23 km of track is in the Malkumba-Coongie Lakes National Park and follows the Kudriemitchie Channel quite closely, to within a few hundred metres, until Coongie Lake is reached.

It should be noted that only the track in the National Park is an unformed single vehicle-width track. In the last 1 to 2 years the remainder of the track has become a graded, deepened and widened dirt road, with many additional side roads, affording access to much larger, heavier vehicles used by oil and gas exploration companies.



¹ Commonwealth of Australia, Bureau of Meteorology rainfall figures for station 17121 – Innamincka Hotel

The implications of these road works for this fluid, fragile environment are considerable, particularly following significant rain or flood events.

C. APPROACH

A series of transects were set up along Coongie Road to establish a repeatable survey to monitor the distribution and abundance of bird species, mammals and vegetation with changes in climate and other impacts on the habitat. Transects covering differing vegetation types were sampled along a ~110 km length of Coongie Road, providing base-line data for assessing future changes. Ten census stops using eight sub-transects of 500 m were undertaken at 10 km intervals.

Landscape conditions did not require modification of transect locations or routes during this survey, however this may become necessary if the survey is repeated at a time when some of the flood channels are holding water.

D. OBJECTIVES

- 1) To collect data systematically for bird, mammal and vegetation species, at a series of transects spanning ~110 km in total along the Coongie Road. To relate species occurrence to climatic and environmental variables.
- 2) To put in place a census strategy that can be repeated and potentially expanded in the future to detect the impacts of short- and long-term changes in climate and environment on populations and species.
- 3) To use a survey technique equivalent to a 'fixed-route' survey as specified for the Birdlife Australia Atlas database (Birdata) and to store the data in Birdata and the SA fauna database.
- 4) To provide base data for ongoing research.
- 5) To use these data to facilitate further monitoring of the change in population diversity and abundance as the conditions change to drier or wetter or due to other environmental impacts such as mining, road-making.

E. PROGRAMME OF RESEARCH

Surveys were conducted between July 29 and August 4, 2014.



Cinnamon Quail-thrush occur at low numbers throughout the Innamincka reserves.

METHODS – COONGIE ROAD SURVEY

1. Survey overview and terminology

Coongie Road was surveyed using the method described below, travelling an average of 30-50 km per day along the road, with census stops every 10 km. The survey method is adapted from methodology used by Rob Clemens and Richard Fuller (School of Biological Sciences, University of Queensland) for similar surveys in outback SA. The survey technique is equivalent to a 'fixed-route' survey as specified for the Birdlife Australia Atlas database (Birdata)².

The same survey method was used by FOIR for a survey of the Bore Track in 2013³.

Key terminology:

A **census stop** is one of the points placed at 10 km intervals along Coongie Road. The census stop formed a central point for conducting surveys in the surrounding habitat.

A **corner point** is one of the corners of the transect squares (see diagram below).

2. A typical day

A typical day commenced early in the morning, travelling to the first census stop, surveying for 1.5-2 hours, and then moving to the next census stop for a further survey. Surveying during the middle of the day was avoided due to the heat and often windy conditions. A third survey was completed in the late afternoon.

3. Communication

The team maintained contact using vehicle and hand-held UHF radios.

4. Survey protocol

The following protocol was adopted for the baseline survey and should be followed as closely as possible in future repeat surveys. Where there were sufficient members in the group, half the group took the east survey and the other half the west survey at each census stop.

(a) Upon arriving at a census stop, park the vehicle safely and place a hazard indicator (e.g. witch's hat) behind the cars if deemed necessary. Walk off the road 20 m from the census stop, left of the road when travelling south. Mark this starting location in the GPS (see diagram below). Erect a Star Dropper and attach a yellow cap. Write identifying detail on the Star Dropper, e.g. FOIR Survey 2014, Census Stop 1.

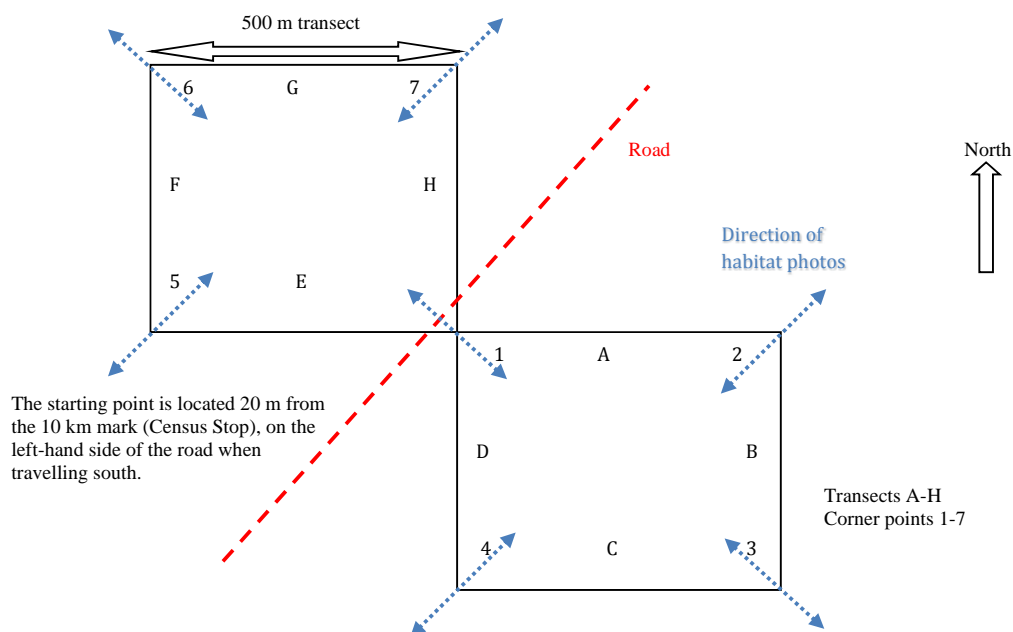
(b) Write the co-ordinates onto the survey sheet to ensure they are not lost and note the dominant habitat type in the area surrounding the starting point (corner point 1). Choose from gibber, grassland, dunes, shrubland, Lignum, woodland, wetland. Record dominant species in the vegetation if known. Record the starting time (24hr clock) and weather conditions (wind direction & approx. speed, approx. temperature). Take a photo of the survey sheet and then representative photographs of the habitat at the starting point, one towards the centre of the north-west square, then 180° towards the centre of the south-east square.

(c) Using a GPS to guide you, walk for 500 m to the next corner point, conducting a line transect survey as you go (see "(f) Line Transect method" below). The easiest way to keep

² For more information about Birdata see: <http://www.birdlife.org.au/projects/atlas-and-birdata>

³ Bore Track North Birds, Mammals and Vegetation Survey 2013, FOIR

track of distance is to use the GPS set to navigate to the next corner point. As each transect line follows grid north/south or east/west, maintaining a constant grid northing or easting, as appropriate, allows the navigator to stay on the transect line. See Appendix IV for more details on using the GPS to navigate. If your route has to deviate around obstacles etc., return to the transect line once the obstacle has been passed.



(d) At 500 m from the starting point mark, i.e. at corner point 2, write the co-ordinates onto the survey sheet, note the time, and take a photo of the survey sheet and then of the habitat to the right (towards the centre of the square) and 180° to the left. Continue in this fashion following the scheme in the diagram until 8 line transects have been completed.

(e) Aim to complete all the survey work for each census stop within 100-120 minutes.

(f) Line Transect method

(i) Walk slowly along the transect line, looking and listening for birds. Pay careful attention for birds that are flushed from ground cover as you approach. For each individual or group of birds seen, note down (a) the species, (b) the number of birds in the group, and (c) whether you heard and and/or saw the birds. Use a separate survey sheet for each 500 m transect. Avoid double counting on adjacent transects.

(ii) If you need to stop to check birds do so, but try to keep a roughly even averaged slow walking pace throughout the transect.

(iii) There is no maximum distance for recording birds – every bird you detect should be noted. Birds should be aged/sexed where possible and any signs of breeding and feeding activity should also be recorded.

(iv) Note down any change in the dominant habitat type through which the transect passes. Choose from gibber, grassland, dunes, shrubland, Lignum, woodland, wetland. Record dominant species in the vegetation if known. Take representative photographs of the habitat.

(v) Note and photograph any mammal tracks or other traces and sightings of mammals. A GPS reading for any significant sightings should be recorded.

(vi) Record any threats or impacting factors noted e.g. soil erosion, weeds (e.g. Buffel Grass, *Acacia farnesiana*, etc.), feral animals, mining, road-making, grazing, fire, water/drainage disturbance, strong wind.

(vii) Record any archaeological sites found along the transect and take a GPS reading.

(g) Incidental surveys while driving between census stops

(i) If you come across a particularly large group of birds, something very rare, or anything in the environment that seems relevant to the aims of the study, stop and do a 5 minute point count, after taking a GPS waypoint. Ensure that you note down why the extra survey has been conducted e.g. "Cinnamon Quail-thrush crossed the road". These qualify as an incidental survey in the Birdlife Australia Atlas database (Birdata).

(ii) Stop at any wetlands that are visible from the road, and do a count of any water-birds visible (2 ha/20 min, 500 m radius or 5 min incidental survey as appropriate). Be sure to GPS the location from which you do the survey, and take a photo of the wetland.

(iii) A count of all mammals (including feral and domestic) that are seen should be recorded.

(iv) Make a note of any items left on or near the road such as, tyres, garbage or equipment and record any threats (as described above).



Recording GPS readings for a corner point

RESULTS AND DISCUSSION

A total of 10 census stops were established at 10 km intervals along the length of Coongie Road between Innamincka and Coongie Lake. Census stops CL9 and CL10 were both within the Malkumba-Coongie Lakes National Park while the remaining census stops were within the Innamincka Regional Reserve. The exact locations of the census stops and co-ordinates for the corner points are given in Appendix I.

A. BIRD SURVEY DATA

Bird surveys were conducted over four days between 29 July 2014 and 4 August 2014. Most surveying was carried out before 12:00 or after 15:00 when conditions were cooler and winds generally not so strong. Details of the bird survey data are given in Appendix II and a summary of each survey is shown in the table below.

Date and start time	Census Stop	Number of species	Number of individuals	Number of waterbird species	Number of waterbirds
29/07/2014 10:10	CL01	9	23	0	0
29/07/2014 14:40	CL02	8	27	0	0
04/08/2014 11:58	CL03	2	4	0	0
04/08/2014 09:28	CL04	9	52	0	0
04/08/2014 10:37	CL05	13	109	1	16
30/07/2014 09:50	CL06	13	104	0	0
30/07/2014 09:25	CL07	24	102	0	0
30/07/2014 15:58	CL08	9	52	0	0
30/07/2014 16:00	CL09	10	122	0	0
31/07/2014 10:15	CL10	32	185	4	6

The overall impression was that bird numbers and biodiversity in general was much poorer than in 2013 when the Bore Track was surveyed. This impression is supported by 500 m Atlas style surveys that were conducted by FOIR volunteers in 2011, 2012 and 2013 and repeated in 2014. These will be reported separately.

The number of species recorded was similar to that recorded during the previous year's survey in grassland habitats along the Bore Track, however the greater amount of woody vegetation and wetlands in the area surveyed in 2014 should have supported much greater numbers and diversity than was found along the Bore Track. In fact the number of individuals was much lower than recorded in 2013.

In all, a total of 45 bird species were recorded across all census stops. This included a mixture of water birds and bush birds. Except for a fly-over of Australian Pelicans, the water birds were confined to census stop CL10 at the north of the series where an anabranch of Cooper Creek touched the south-west corner of the western quadrant of the census stop. Excluding the water birds from the surveys brings the number of species found during surveys to 40.

During the course of the surveys there were seven transects, 10 instances, with 57 birds, where ravens or crows were seen but could not be accurately identified. These were recorded as corvids. The unidentified corvids were birds that were not calling at the time of the

sighting as variations in the call are the surest way of identifying these species. All census stops where corvids were recorded also had records of Australian Raven while three census stops had records of Little Crow. It is most likely that birds recorded as corvids are of one of these species rather than the locally rare Torresian Crow.

There were also two census stops where unidentified martins were recorded. Fairy Martins were recorded at one of these census stops while Tree Martins were recorded at both.

Both unidentified corvids and martins have been excluded from the species count. This does not affect the total number of species for the survey or the number of species per census stop.

The average number of bird species per census stop was 4.5 (4.0 if water birds are excluded).

The number of bird species detected at a census stop ranged from 2 (census stop CL03) to 32 (census stop CL10). If water birds are excluded from census stop CL10 this count drops to 27.

The total number of individual birds recorded was 780 (758 excluding water birds) with 185 (179 excluding water birds) recorded at census stop CL10 but only 4 at census stop CL03.

The low count at census stop CL03 is attributed partly to the high temperature and strong wind on that day along with the timing of the survey which was late morning. This census stop showed the most severe impacts from grazing with a high proportion of bare soil, cattle tracks and disrupted organic crust, when compared to other census stops. It also had the lowest amount of woody vegetation (trees or shrubs) of any of the census stops.

There were very few incidental sightings recorded between census stops. The most notable was of 3 Cinnamon Quail-thrush approximately 2 km south of Kudriemitchie between census stops CL07 and CL08 on the 4th August. There was also a sighting of approximately 200 Galahs feeding on the ground in dry grassy vegetation between census stops CL06 and CL07 on 30th September and again in the same area on 4th August.

There was a general trend of increasing numbers of both species and individuals from south to north. The two most diverse census stops (CL07 and CL010) are both in the northern region of the survey. These census stops also included areas of river channel although these were dry in the case of census stop CL07. This trend of increasing diversity from south-east to north-west corresponded with the changes in grazing intensity which decreased from south-east to north-west. The census stops at the southern end of the survey were all heavily grazed to the extent that there was very little ground vegetation remaining and the predominant surface was bare soil. The heavy grazing had also removed most edible shrubs below browse line.

The most widely encountered species were the Black-faced Woodswallow and Australian Raven each of which occurred in low numbers at nine of the ten census stops. The average rate of occurrence of Black-faced Woodswallows was one bird per kilometer of transect surveyed. For Australian Ravens the rate of reporting was 1.25 birds per kilometer of transect. If the unidentified corvids are allocated to Australian Raven or Little Crow in proportion to their positive sightings this would bring the number of Australian Ravens seen to 102 (third highest for the survey) and the reporting rate up to 2.5 birds per kilometer of transect.

The birds occurring in highest numbers on the transects were Galahs (114 birds at 4 transects) and Tree Martins (104 birds at 4 census stops). If the unidentified martins are assumed to be

Tree Martins the total number of individuals would rise to 108. Both Tree Martins and Galahs tend to be more gregarious, hence the clustering of sightings at just 4 census stops.

Another commonly encountered bird on the transects was the White-plumed Honeyeater which was present in low numbers wherever there were suitable trees available. White-plumed Honeyeaters occurred at 8 census stops with a density at these census stops of 2 birds per kilometer of transect.

Zebra Finches were found at seven census stops however their numbers were much lower than had been encountered in previous years. Most groups consisted of less than ten individuals. Zebra Finches were more frequently encountered and in larger numbers at the more northerly census stops.

Birds recorded at census stops along Coongie Road						
Species	No. of census stops where present	Total	Min. count	Max. count	Average when present	Average for all 10 stops
Emu	1	4	4	4	4	0.4
Australian Shelduck	1	2	2	2	2	0.2
Pacific Black Duck	1	1	1	1	1	0.1
Australian Darter	1	1	1	1	1	0.1
Australian Pelican	2	17	1	16	8.5	1.7
Whistling Kite	7	19	1	8	2.7	1.9
Black Kite	2	3	1	2	1.5	0.3
Wedge-tailed Eagle	4	5	1	2	1.2	0.4
Brown Falcon	1	1	1	1	1	0.1
Nankeen Kestrel	2	3	1	2	1.5	0.3
Caspian Tern	1	1	1	1	1	0.1
Crested Pigeon	5	16	2	4	3.2	1.6
Diamond Dove	1	10	10	10	10	1.0
Peaceful Dove	1	6	6	6	6	0.6
Little Corella	2	6	2	4	3	0.6
Galah	4	114	1	77	28.5	11.4
Australian Ringneck	1	2	2	2	2	0.2
Red-rumped Parrot	1	6	6	6	6	0.6
Red-backed Kingfisher	2	2	1	1	1	0.2
Red-browed Pardalote	2	4	1	3	2	0.4
Variegated Fairywren	3	11	1	5	3.7	1.1
White-winged Fairywren	8	42	1	13	5.2	4.2
Spiny-cheeked Honeyeater	2	3	1	2	1.5	0.3
Black-chinned Honeyeater	1	1	1	1	1	0.1
White-plumed Honeyeater	8	68	5	15	8.5	6.8
Yellow-throated Miner	4	17	2	10	4.2	1.7
Crimson Chat	2	9	4	5	4.5	0.9
Jacky Winter	3	7	1	4	2.3	0.7
Willie Wagtail	7	17	1	6	2.4	1.7
Magpie-Lark	2	4	2	2	2	0.4

Grey Shrikethrush	3	6	1	3	2	0.6
White-winged Triller	1	1	1	1	1	0.1
Black-faced Cuckooshrike	1	1	1	1	1	0.1
Black-faced Woodswallow	9	41	1	9	4.6	4.1
White-breasted Woodswallow	1	2	2	2	2	0.2
White-browed Woodswallow	1	2	2	2	2	0.2
Australian Raven	9	51	1	15	5.7	5.1
Little Crow	3	4	1	2	1.3	0.4
White-backed Swallow	1	2	2	2	2	0.2
Tree Martin	4	104	4	50	26	10.4
Fairy Martin	2	3	1	2	1.5	0.3
Rufous Songlark	1	1	1	1	1	0.1
Mistletoebird	4	2	1	3	2	0.4
Zebra Finch	7	93	1	36	13.3	9.3
Martin	2	4	1	3	2	0.3
Corvid	7	57	2	40	8.1	5.7
Totals	10	780	4	185	78.0	78.0

B. HABITATS

The north-west Branch of the Cooper Creek and its associated channels, some of which contain permanent water, have created a unique environment in an arid landscape. After sufficient rain in the Cooper catchment in north-east Queensland, water will flow north from the main Cooper Creek via the channels into the Coongie Lake system. However it is the local rainfall, timing and magnitude, which determines the greatest biological and vegetative response in the terrestrial environment.

At the time of the survey only 141 mm of rain had been recorded in total for 2013 and 2014 year-to-date, with the most recent rainfall event (approx. 20 mm) falling seven months earlier in the 2013/14 summer. The nature, type and state of the vegetation very much reflected these events. Although a rare event, Coongie Lake dried up earlier in 2014, but has since partially refilled.

Statistically, a great flood which inundates the region except for the very top of the dunes, occurs about once every thirty years. However the most recent of these occurred in 2011-12 creating a 'boom' period. Since then the landscape has been drying out and dependent on the local irregular rainfall.

Overall the land form in this area of the reserve has gentle gradients and low relief. It is dissected by water courses, associated with Cooper Creek, as well as dunes of varying heights up to 5 m. These run in a roughly north-south direction. Much higher dunes are found in the reserve but outside the survey area. The landforms can be divided up into 4 or 5 types, riverine, dunal, dune fields or interdunal complex and flood plain – sand flat or claypan. Although there is much intergrading, each of these landforms carry their particular vegetation complexes and associated habitat. This was reflected in the number and types of birds observed in each (see Table below).

The Coongie Road crosses a variety of these arid zone habitats.

The transects closer to Innamincka tended to include interdunal complexes and flood plains. The interdunal complexes were generally of low relief and sparsely vegetated, generally dominated by Coolibah (*Eucalyptus coolabah*). There were the occasional sightings of large trees/shrubs such as Whitewood (*Atalaya hemiglauc*) and Queensland Bean (*Lysiphyllum gilvum*). The scant remains of some of the summer grasses were still to be seen in the dune fields, mainly in the Malkumba-Coongie Lakes NP, such as some *Aristida sp.* and *Eragrostis sp.*

The flood plains are of variable soil composition and may be clay, sand, or clay with a sand veneer. They contain a sparse low vegetation of variable composition, dominated by ephemeral or short lived perennial species. Typical of these are forbs such as *Sclerolaena sp.* and Native Tobacco (*Nicotiana velutina*). On the sandy flats Lignum (*Muehlenbeckia cunninghamii*) and Golden Goosefoot (*Chenopodium auricomum*) were seen. The claypans were bare. The lower diversity of vegetation both on the dune fields and flood plains correlated with reduced numbers of birds and bird species. The most common sightings were Australian Raven, White-plumed Honeyeater and Black-faced Woodswallow.

More dunes were encountered closer to the lakes. These were also thinly vegetated and contained many dying plants. Dune crests tended to be dominated by Cane Grass (*Zygochloa paradoxa*), with some *Croatalaria sp.* Although this habitat is reputedly critical habitat for the Eyrean Grass Wren, none were seen. The lower dune slopes sometimes had patches of spinifex (*Triodia sp.*) with some isolated sandhill *Acacia sp.*

The riparian or woodland complexes were encountered alongside the Kudriemitchie Channel inside the park closer to the lake, although some woodland complexes occurred at the boundaries of dune fields and flood plain. These are the most floristically complex and contain vegetation at several stratified levels, generating a lot of leaf litter. The channel is fringed with River Red Gums (*E. camaldulensis*) and other large trees and shrubs including Coolibah (*E. coolabah*), and River Cooba (*Acacia stenophylla*). Here the greatest number and variety of woodland birds was also seen.

Coongie Lake is surrounded by dunes lined with coolibah and the freshwater lake edge is lined with grasses, sedges and ephemerals such as *Stemodia florulenta*. At this time the lake was only partially full and the shallower southern end was drying out allowing the surface to become covered in grasses, providing food for several hundred Red-capped Plovers and many other waders. The remaining shallow water in the lake provided a rich food source for large numbers of waterbirds and their attendant raptors and ravens.

Photographs taken from the corner points and along the transects showing the habitats and flora are given in Appendix III.

Census stop	Topography	Vegetation types		No. of bird species
CL01	Flood plain / sand plain	Tussock grassland	Open woodland	9
CL02	Flood plain / sand plain	Open tussock grassland	Open woodland	8
CL03	Sand plain, low dune	Sparse tussock grassland		2
CL04	Flood plain / low dunes	Open woodland / grassland	Hakea shrublands	9
CL05	Dunes / flood plain, creek line	Open shrubs and grassland, some shrubs	Open coolibah woodland, Acacia. Lignum	14
CL06	Flood plain / low dunes	Sparse coolibah woodland	Open grassland and arid woodland	14
CL07	Low dunes / creek line	Open tussock and Cane Grass. Sparse Hakea	Coolibah woodland with Lignum	26
CL08	North-south sand dunes	Grassland (tussock, Cane Grass and Triodia sp.) with scattered shrubs		10
CL09	Flood plain	Lignum with sparse coolibah trees		12
CL10	Sand dunes and creek	Tussock and shrubs on dunes	Glasswort, coolibah woodland and Lignum along creek	32

C. FLORA

At the time of the survey, this arid region was experiencing a typical variable low rainfall period. Consequently most of the annual summer grasses and forbs or short-lived perennials had either died or were rapidly drying out. In the majority of the region where cattle are allowed to graze the limited grasses had been heavily grazed leaving only dark grey stubble, making identification impossible.

Rabbits both inside and outside the park had also browsed the foliage in the areas around their burrows, particularly the softer forbs and regenerating Whitewood and coolibahs.

The remaining perennial trees and shrubs were exhibiting their drought hardy adaptations as the temperatures and evaporation rates increased.

With the exception of the riverine or woodland complexes along the braided channels of the Cooper Creek, most vegetation was open to sparse. The landforms can be roughly divided into four types, each containing their associated vegetation complexes, although there is a lot of overlap or intergrading between them as one area merges into another. Each of these is described below.

The Riverine/Woodland Complex

The riverine vegetation communities bordering the channels are by far the most diverse and complex, exhibiting several floral layers.

Along the Kudriemitchie Channel, a permanent water source, the dominant tree was the River Red Gum (*E.camaldulensis*), also with some Coolibah (*E.coolabah*) and River Cooba (*Acacia stenophylla*). Below this was an understorey of Broughton willow (*Acacia salicina*), Queensland Bean-tree (*Lysiphylum gilvum*) and an occasional Plum Bush (*Santalum lanceolatum*), Wild Orange (*Capparis mitchelli*), or Sour Plum (*Owenia acidula*). Scattered below this were *Eremophila* sp. *E.bignoniflora*, and *E.longifolia*. Still shorter understorey species included *Muehlenbeckia cunninghamii*, *Chenopodium auricomum*, *Atriplex nummularia* and *Enchylaena tomentosa*. The remains of a range of forbs such as *Scleorlaena* sp. (*S. intricata*, *S.bicornis*), *Teucrium racemosum*, *Pterocaulon sphacelatum* and *Nicotiana velutina* and grasses such as *Eragrostis* sp. and *Sporobolus* sp. were also observed. The damp bank adjacent to the waterline was covered in couch (*Cynodon dactylon*).



A similar but less diverse vegetation community occurs on the lakes and their interconnecting channels, with a coolibah riparian woodland. Open to sparse coolibah woodlands are also scattered through the area's floodplain environment often associated with dry lakebeds.

Dunes

The dune crests were thinly vegetated with Cane Grass (*Zygochloa paradoxa*) and some drying *Croatalaria* sp. typically *C. eremaea*, *C. cunninghamii*. Scattered lower down the slopes were spinifex hummocks *Triodia basedowii*, *Acacia ligulata*, *Acacia oswaldi*, *Atriplex velutinella*, *Trichodesma zeylanicum*, *Enchylaena tomentosa* with the very occasional remnant grass tussock (*Aristida* sp.)



Interdune Complex/Dune field

This landform was by far the most common and also sparsely vegetated. Although the dominant tree along the track was often stunted *E. coolabah*, other species such as *Hakea leucoptera* and *Atalaya hemiglauca* were quite prevalent around the mid-section of track. Isolated trees such as *Lysiphylum gilvum*, *Grevilea striata*, *Owenia acidula*, *Santalum lanceolatum* occurred rarely in this landform. Stands of *Acacia* sp.

(*A.victoriae* and *A.tetragonophylla*) were sometimes scattered amongst stands of *Eremophila* sp. (*E. duttonii*, *E. glabra*) and *Senna artemesoides*. Smaller bushes such as *Dodonea viscosa*, *Enchylaena tomentosa*, *Atriplex*



nummalaria, *Lechenaultia divaricata* tended to be scattered along old drainage lines. Forbs such as *Teucrium racemosus*, *Euphorbia tannensis* and *Sclerolaena* sp. including *S. bicornis* and *S. intricata* were sparsely distributed. In the NP where the cattle had not been, patches of remnant summer grasses such as *Enneapogon avanaceus* and *Eragrostis* sp. could still be observed.

Flood plains – Sand flats, claypans

Claypans were generally bare - devoid of vegetation.

Sand flats were covered in varying densities of Lignum (*Muehlenbeckia cunninghamii*) often associated with Queensland Blue Bush (*Chenopodium auricomum*) and possibly Cane Grass *Eragrostis australasica*. A variety of forbs were found on the fringes such as *Sclerolaena* sp., *Crinum flaccidum*, *Teucrium racemosum*, *Enchylaena tomentosa* and *Pterocaulon sphaceolatum*.



On the sand flats immediately adjacent to the dunes which surround Coongie Lake itself, there is a dense covering of *Tecticornia indica* interspersed with *Sclerolaena bicornis*.

Photographs of flora at the different census stops, transects and corner points are given in Appendix III.

D. MAMMALS

Apart from domestic cattle, few mammals were recorded during the survey.

Cattle

The southern part of the survey area (to approx. census stop CL07) had been and was still being heavily grazed by cattle. Groups of cattle were encountered at census stops CL03 and CL05. Extensive cattle tracks and droppings were found at all of census stops CL01-CL07. At these census stops most edible vegetation below browse height for the cattle had been removed or severely browsed, leaving bare ground.

Evidence of cattle was found at census stops CL08 – CL10 but was much lower than for the more southerly census stops. Ground cover at these census stops was much more intact with good ground cover over much of the area.



Cattle pad

Cattle scats and tracks at census stops

CL09 and CL10 were generally old and probably resulted from when cattle entered the national park following the 2010 floods although low numbers of cattle are still present within the park. Inside the park, only small numbers of cattle were seen and evidence of grazing was

patchy. By contrast outside the park all grass had been heavily grazed and the ground was criss-crossed with tracks which break the crust and disturb the underlying soil.

Feral horse

Low level evidence of horses was noted at census stops CL02 and CL07. This comprised of tracks and scats. No horses were seen during the survey or when travelling in the area.

Rabbits

Rabbits and rabbit traces (burrows, tracks, pellet mounds, etc.) were present at most census stops. In the southern and central areas the amount of rabbit activity was lower and warrens were generally smaller than at the northern census stops. Many of the rabbit warrens seen on the southern census stops appeared to be inactive.

The largest warrens were seen at census stop CL10 on the large dunes. The number of active rabbit warrens was much higher in the dunes at the northern census stops, particularly within the national park, than in the southern part of the survey area.

Sites close to active burrows with vegetation such as regenerating Coolibah were heavily browsed.

Fox

No definite evidence of foxes was found.

Cat

No evidence of cats was recorded during the surveys although there were cat sightings at other times during the survey period. These are cryptic animals which are seldom seen in the wild, even when present in high numbers. Local feral cats are presumed to predate on birds, small reptiles and mammals.

Dingo

Dingo scats and tracks were recorded at census stops CL01, CL02 and CL09. Two Dingos were seen at Coongie Lake close to census stop CL10. Dingos are presumed to prey on rabbits, small mammals and reptiles and generally scavenge other food. The two Dingos at Coongie Lake appeared to be feeding on freshwater mussels exposed by the receding water.

Kangaroo (various species)

No kangaroos were seen during the survey. Possible kangaroo scats were recorded at census stop CL06.

Other mammals

Mounds about 0.5 m high and up to 1.5 m diameter were found surrounding the bases of low bushes, mainly Acacias. These mounds had several burrow entrances approx. 50 mm diameter and appeared to be warrens created by small mammals, possibly Long-haired Rats. Most of these burrows appeared to be inactive.



The tracks of small mammals were recorded and photographed along several transects (see photographs in Appendix III). There were also small burrows in the sand dunes which indicated the presence of small mammals, either rodents or marsupials.

E. REPTILES AND AMPHIBIANS

Very few reptiles were seen anywhere and this was probably due to the cool inhospitable winds blowing on most days. A single skink (unidentified) was recorded at census stop CL08. A snake skin (unidentified) was found at census stop CL01. Many Macquarie Tortoises were seen in the creek alongside transect F of census stop CL10.

F. THREATS AND POTENTIAL IMPACTING FACTORS

1. Soil Erosion

The soils in this area lack strong structure and contain very low amounts of organic matter.

Dune-based soils are comprised almost entirely of sand with the surface held by vegetation and a thin organic crust which is easily damaged. Once the crust is broken these soils are susceptible to both wind and water erosion.

The flood plain soils consist of friable silt and clay. These soils crack on drying revealing a weak structure. In many areas there is a moderate to high salt content which prevents the formation of a more robust soil structure. When exposed these soils are susceptible to wind and water erosion.

The impacts of threatening processes described below often manifest as damage to soils and accelerated soil erosion.

2. Weeds

a. Buffel Grass

Known occurrences of Buffel Grass were found at Kudriemitchie on the Cooper Anabranth that feeds Coongie Lake.

Buffel Grass was also found along transect 'A' at census stop CL07.

In this area water is the major way in which Buffel Grass is spread and a search along the river channels in this area should be attempted.

b. *Acacia farnesiana*

This shrub is known within the Innamincka Regional Reserve from locations along the Cordillo Road but was not found during the Coongie Road survey.

3. Feral animals

a. Horses

The surveys found evidence that feral horses are present in the area (tracks and scats, see photographs Appendix III), but currently at low numbers.

b. Rabbits

Rabbits are the most serious feral animal in the area. Burrows and grazing by rabbits are probably the greatest contributor to erosion within the national park.

Rabbits appear to be in direct competition with cattle. The rabbit population is much higher and warrens larger where cattle grazing is lower. At some of the southern census stops almost all vegetation that could be reached by cattle had been removed. This left very little vegetation that would be available for rabbits. In the north where there is very little cattle grazing there is much more vegetation at all levels thus providing more food and above-ground shelter for rabbits.

On the dunes at census stop CL10 there was heavy grazing by rabbits at the base of Cane Grass tussocks.



*Rabbit damage at the base of Cane Grass (*Zygochloa paradoxa*), Malkumba-Coongie Lakes NP*

c. Cats

Feral cat numbers boomed following the wet years of 2010-2011 when there was also a boom in the numbers of small mammals. Since then there has been a crash in the number of small animals and a corresponding reduction in feral cat numbers.

Nevertheless, cats remain an ongoing threat to small native mammals, reptiles and birds.

4. Mining, grazing and tourism development

a. Rubbish

Rubbish was not a major problem in the survey area, but low levels of rubbish were found at most census stops. Some of this, such as bottles and other containers near water courses may have been brought in by floods.

The remains of old fencing materials were found at census stop CL01

When found, small items of rubbish were collected by the volunteers for disposal at the Innamincka tip.

b. Oil drilling and associated roads and pipelines

The area is being crossed by numerous roads and pipelines creating a high density road network. Some of these roads are used by the public but most are closed to public access.

Well drilling sites require the removal of vegetation and leveling of several hectares of land. Often there are deep borrow pits where material has been removed to a depth of several meters associated with drilling sites. There are also cleared and flattened areas of several hectares associated with the location of temporary works camps.



Roads leading to drill sites and other infrastructure are generally bulldozed across the country taking no account of topography or water flow patterns. The same applies to pipelines. Roads and pipelines disrupt natural water flow patterns and ephemeral wetlands which has a major impact on the area's ecology. Roads and pipelines that cut through sand dunes open the dunes to accelerated erosion. While there have been attempts to restore the dunes following these cuttings, the dunes will remain vulnerable until the vegetation and organic surface crust have recovered. Roads across wetlands result in deep ruts which have further impacts on the water regime.

c. Cattle grazing

The entire area traversed by the Coongie Road is subject to cattle grazing. Cattle grazing was heaviest in the southern and central areas. These areas are closest to the Innamincka Station and to various trucking yards and also relatively close to waterholes and bores which provide drinking water for the cattle.

Cattle grazing is less severe in the north and within the boundary of the Malkumba-Coongie Lakes National Park where cattle are officially excluded. There was, however, some evidence of cattle grazing at census stops CL09 and CL10, presumably indicating the presence of animals that entered the park during the 2010-11 floods and have not yet

been removed. Maintenance of fencing to exclude cattle from the national park is essential for the protection of the park.

There is marked evidence of soil erosion and loss of vegetation caused by cattle grazing at most census stops along the southern part of the survey route, especially within range of water points. The tracks caused by cattle break up the fragile soils and can become a focal point for both wind and water erosion. The removal of smaller woody plants and herbs by browsing also has an impact on soils with increased erosion as soil-stabilizing roots and the biological crust break down and stop holding fragile soils.

The impact of grazing animals was particularly apparent at an old yard north of Kudriemitchie. This area was largely fenced off from the surrounding country although the absence of a gate would have allowed limited entry by cattle and large feral animals such as horses. Smaller mammals such as native species and rabbits would not have been impeded by the fence. The difference in vegetation inside (behind the fence) vs outside the fence (see photograph) is stark.



Careful management is required to avoid damage caused by cattle, particularly in drier times.

5. Fire

Fire is a natural part of the ecology of these areas. Grass fires move quickly across the country burning light-weight fuel. Of major importance are the size and frequency of these fires. Too frequent and too extensive fires can have a major impact on the survival of some species. Most plots showed signs of recent wildfires which had resulted in obvious loss of some habitat elements such as Cane Grass and *Triodia* sp. These grasses take years to recover as was indicated by the sparse and small plants in areas that had been burnt in recent years. Other pressures on these habitats are likely to make them less resilient to fire while increased human activity in the area is likely to increase the frequency of fires.

6. Irrigation and water use

This area is part of the Cooper Floodplain and will inevitably be affected by any changes to the water regime in Cooper Creek. Current plans to increase irrigation in the Queensland section of the Cooper Catchment are a major threat to this area.

G - ARCHEOLOGICAL SITES

Middens were observed at census stops CL07 and CL10. These were close to river channels. Middens were seen at access sites along the Cooper Creek and at Coongie Lake. Several large middens were observed near the banks of the Kudriemitchie Channel.



CONCLUSIONS

In 2013 FOIR established a survey method which could be used to monitor the impacts of both short- and long-term changes in environmental conditions on populations of bird, mammal and vegetation species along an 80 km span of the Bore Track. This methodology was used by FOIR volunteers in 2014 to establish fixed transects at 10 km intervals along the Coongie Road (approx. 110km).

Baseline data were collected following the ecological boom that occurred in 2011. The current status of the area is at a post-boom low where few species are flourishing due to lack of rainfall and/or flooding.

In 2014 bird numbers and diversity were much lower than expected. This reflected the very dry conditions with below average rainfall which have prevailed over the previous year and a half. The dry conditions have also intensified the impacts of cattle grazing which has removed much of the lower growing vegetation across much of the survey area.

Threats and potential impacting factors on the ecological value and biodiversity of the region have been identified. The greatest threats to ecological values in this area are introduced species. In particular cattle are having a major impact in areas where grazing is permitted while rabbits are the main threat within the Malkumba-Coongie Lakes National Park. Roads and pipelines used for oil and gas extraction have the potential to cause major disruption to drainage and water flow patterns when the area is next flooded.

The survey data and information provide a valuable resource for development of management plans for the region.

It is recommended that repeat surveys are conducted at least every 5 years.

This survey builds on the survey carried out by FOIR along the Bore Track in 2013. It is suggested that a similar survey be undertaken in 2015 within the Innamincka Regional Reserve, incorporating a section along the Old Strzelecki Track from Innamincka and continuing along the Jump-ups Road from Innamincka Station to Nappa Merrie on the northern side of Cooper Creek.

APPENDIX I – LOCATION OF CENSUS STOPS

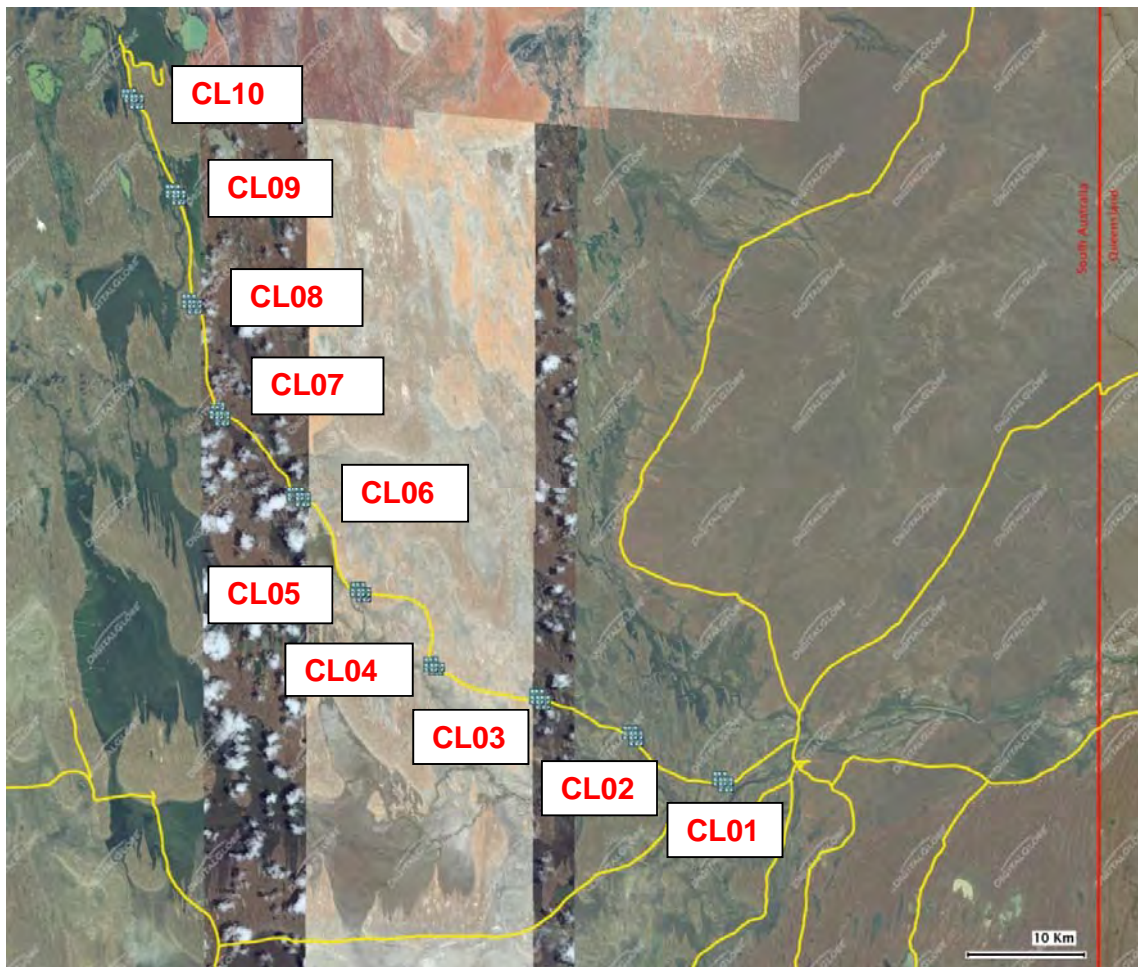
A. CENSUS STOP AND CORNER POINT CO-ORDINATES

The following table lists all co-ordinates for each census stop. The co-ordinate system used is UTM. The census stops are also shown on the following Map.

Census Stop	Corner Point	AMG zone	Easting	Northing
CL01	1	54J	0467629	6929506
	2	54J	0468136	6929506
	3	54J	0468136	6929006
	4	54J	0467629	6929006
	5	54J	0467129	6929504
	6	54J	0467130	6930005
	7	54J	0467630	6930006
CL02	1	54J	0459898	6933418
	2	54J	0460399	6933418
	3	54J	0460399	6932921
	4	54J	0459898	6932921
	5	54J	0459394	6933416
	6	54J	0459399	6933914
	7	54J	0459900	6933916
CL03	1	54J	0452003	6936480
	2	54J	0452507	6936487
	3	54J	0452507	6935981
	4	54J	0452007	6935981
	5	54J	0451506	6936480
	6	54J	0451505	6936978
	7	54J	0452004	6936979
CL04	1	54J	0442784	6939370
	2	54J	0443288	6939370
	3	54J	0443288	6938873
	4	54J	0442788	6938874
	5	54J	0442288	6939368
	6	54J	0442286	6939865
	7	54J	0442787	6939865
CL05	1	54J	0436454	6945757
	2	54J	0436954	6945758
	3	54J	0436953	6945259
	4	54J	0436454	6945258
	5	54J	0435950	6945756
	6	54J	0435974	6946240
	7	54J	0436473	6946242

CL06	1	54J	0431028	6953816
	2	54J	0431530	6953817
	3	54J	0431531	6953319
	4	54J	0431031	6953313
	5	54J	0430531	6953816
	6	54J	0430532	6954317
	7	54J	0431035	6954314
CL07	1	54J	0424294	6960834
	2	54J	0424792	6960834
	3	54J	0424793	6960337
	4	54J	0424292	6960334
	5	54J	0423794	6960834
	6	54J	0423794	6961334
	7	54J	0424294	6961334
CL08	1	54J	0421863	6970289
	2	54J	0422365	6970291
	3	54J	0422364	6969792
	4	54J	0421862	6969794
	5	54J	0421363	6970291
	6	54J	0421357	6970788
	7	54J	0421857	6970793
CL09	1	54J	0420405	6979622
	2	54J	0420905	6979625
	3	54J	0420905	6979126
	4	54J	0420404	6979126
	5	54J	0419902	6979626
	6	54J	0419903	6980126
	7	54J	0420404	6980126
CL10	1	54J	0416753	6987788
	2	54J	0417253	6987793
	3	54J	0417256	6987294
	4	54J	0416756	6987294
	5	54J	0416256	6987788
	6	54J	0416256	6988288
	7	54J	0416753	6988288

Map showing Census Stop locations along the Coongie Road



Source: VantagePoint™/DigitalGlobe™ overlaid with FOIR transect coordinates

APPENDIX II - TRANSECT BIRD DATA

Date and Start time	Census Stop	Species	Heard only	Number	GPS
29/07/2014	CL01	Australian Raven		5	54J 0467629, 6929506
10:10		Corvid		2	
		Red-backed Kingfisher		1	
		Whistling Kite		2	
		White-browed Woodswallow		2	
		White-plumed Honeyeater		5	
		White-winged Fairywren		1	
		Willie Wagtail		2	
		Zebra Finch		3	

29/07/2014	CL02	Black-faced Woodswallow		4	54J 0459898, 6933418
14:40		Crested Pigeon		3	
		Grey Shrike-thrush	H	1	
		Little Corella		2	
		Wedge-tailed Eagle		1	
		White-plumed Honeyeater		9	
		White-winged Fairywren		5	
		Willie Wagtail		2	

04/08/2014	CL03	Australian Raven		2	54J 0452003, 6936480
11:58	CL03	Black-faced Woodswallow		2	

04/08/2014	CL04	Australian Raven		6	54J 0442784, 6939370
09:28		Black Kite		1	
		Black-faced Woodswallow		4	
		Diamond Dove		10	
		Spiny-cheeked Honeyeater		1	
		Tree Martin		8	
		Variegated Fairywren		5	
		White-plumed Honeyeater		16	
		Yellow-throated Miner	H	1	

04/08/2014	CL05	Australian Pelican		16	54J 0436454, 6945757
10:37		Australian Raven		7	
		Corvid		2	
		Australian Ringneck	H	2	
		Black-faced Woodswallow		5	
		Chestnut-rumped Thornbill		2	
		Fairy Martin		2	
		Jacky Winter		4	
		Tree Martin		42	

		Whistling Kite		1	
		Whistling Kite		1	
		White-plumed Honeyeater		5	
		Willie Wagtail		2	
		Zebra Finch		18	

30/07/2014	CL06	Australian Raven		15	54J 0431028, 6953816
09:50		Corvid		40	
		Black Kite		2	
		Black-faced Woodswallow		4	
		Crested Pigeon		4	
		Little Crow		1	
		Nankeen Kestrel		2	
		Red-browed Pardalote		1	
		Wedge-tailed Eagle		1	
		Whistling Kite		2	
		White-plumed Honeyeater		7	
		White-winged Fairywren		13	
		Yellow-throated Miner		10	
		Zebra Finch		2	

30/07/2014	CL07	Australian Raven		7	54J 0424294, 6960834
09:25		Corvid		2	
		Black-faced Woodswallow		9	
		Crested Pigeon		3	
		Crimson Chat		5	
		Emu		4	
		Fairy Martin		1	
		Galah		4	
		Grey Shrike-thrush		3	
		Jacky Winter		1	
		Little Crow	H	1	
		Magpie Lark		2	
		Martin		1	
		Mistletoebird		1	
		Red-backed Kingfisher		1	
		Rufous Songlark		1	
		Spiny-cheeked Honeyeater	H	2	
		Tree Martin		4	
		Wedge-tailed Eagle		1	
		Whistling Kite		1	
		White-breasted Woodswallow		2	
		White-plumed Honeyeater		12	
		White-winged Fairywren		3	
		Willie Wagtail		6	

		Yellow-throated Miner		3	
		Zebra Finch		22	

30/07/2014	CL08	Australian Raven		1	54J 0421863, 6970289
15:58		Corvid		3	
		Black-faced Woodswallow		1	
		Brown Falcon		1	
		Galah		32	
		Nankeen Kestrel		1	
		White-winged Fairywren		9	
		Willie Wagtail		1	
		Yellow-throated Miner		2	
		Zebra Finch		1	

30/07/2014	CL09	Australian Raven	H	1	54J 0420405, 6979622
16:00		Corvid		3	
		Black-faced Woodswallow		6	
		Crested Pigeon		2	
		Galah		77	
		Martin		3	
		Variegated Fairywren		5	
		Whistling Kite		4	
		White-plumed Honeyeater		5	
		White-winged Fairywren		4	
		Willie Wagtail		1	
		Zebra Finch		11	

31/07/2014	CL10	Australian Darter	H	1	54J 0416753, 6987788
10:15		Corvid		5	
		Australian Pelican		1	
		Australian Raven		7	
		Australian Shelduck		2	
		Black-chinned Honeyeater	H	1	
		Black-faced Cuckooshrike		1	
		Black-faced Woodswallow		6	
		Caspian Tern		1	
		Crested Pigeon		4	
		Crimson Chat		4	
		Galah		1	
		Grey Shrike-thrush		2	
		Jacky Winter		2	
		Little Corella		4	
		Little Crow		2	
		Magpie Lark		2	
		Mistletoebird		3	

		Pacific Black Duck		1	
		Peaceful Dove	H	6	
		Red-browed Pardalote		3	
		Red-rumped Parrot		6	
		Tree Martin		50	
		Variegated Fairywren		1	
		Wedge-tailed Eagle		2	
		Whistling Kite		8	
		White-backed Swallow		2	
		White-plumed Honeyeater		10	
		white-winged Fairywren		4	
		White-winged Fairywren		3	
		White-winged Triller		1	
		Willie Wagtail		3	
		Zebra Finch		36	

APPENDIX III - PHOTOGRAPHIC AND HABITAT RECORDS

Original photographs are available from FOIR for analysis if required.

















Census stop 1


















Date: 29-07-2014




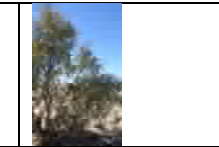










Commenced: 10:10

Number of observers: 6

HABITAT: Tussock grassland, sparse woodland

Corner point 1	Right: 	Left: 		
	Habitat: Claypan, tussock, sparse woodland			
Transect A				
	Tracks: cattle	Habitat	Habitat	<i>Eremophila maculata</i>
				
	Habitat			
Corner point 2	Right: 	Left: 		
	Habitat: Sparse woodland, floodplain, tussock grass			
Transect B				
	Habitat	Fencing wire		
Corner point 3	Right: 	Left: 		
	Habitat: Sparse woodland, floodplain, tussock grass			
Transect C				
	Habitat	Habitat	Scats: cattle	

Corner point 4	Right: 	Left: 		
	Habitat: Sparse woodland, claypan, Lignum			
Transect D	No photos			
Transect E				
	Habitat: Claypan, open tussock grassland			
				
	Tracks: lizard?	<i>Owenia acidula</i>		Tracks: cattle
				
	Grass sp.	<i>Eremophila maculata</i>	<i>Senna artemisioides</i>	
Corner point 5	Right: No photos	Left: No photos		
Transect F				
	Habitat: Claypan, sparse grass, occ. Eremophila and Senna sp.			
				
	<i>Euphorbia sp</i>		Snake skin	
Corner point 6	Right: 	Left: 		
	Habitat: Claypan, sparse tussocks			

Transect G				
	Skull: ? long-haired rat	<i>Centipeda thespidioides?</i>	<i>Centipeda thespidioides?</i>	<i>Eucalyptus coolabah</i>
				
	<i>Gasteromycetes</i> fungus	<i>Acacia victoriae</i>	<i>Acacia victoriae</i>	Small mammal (?long-haired rat) warren under Acacia bush
				
	Skull: ? long-haired rat			
Corner point 7	Right: 	Left: 		
	Habitat: Claypan, sparse tussock			
Transect H				
	Scat: ?dingo	Habitat		













Census stop 2


















Date: 29-07-2014

Commenced: 14:40

Number of observers: 6

Habitat: Mud-flat, sparse open woodland

Corner point 1	Right: 	Left: 		
	Habitat: Claypan, sparse tussock and Coolibah			
Transect A	No photos			
Corner point 2	Right: 	Left: 		
	Habitat: Open sparse woodland, tussock, gibbers, mudflat			
Transect B	No photos			
Corner point 3	Right: 	Left: 		
	Habitat: Open sparse woodland, tussock, gibbers, mudflat			
Transect C	No photos			
Corner point 4	Right: 	Left: 		
	Habitat: Mudplain, tussock, sparse trees			
Transect D	No photos			
Transect E				
	Coolibah sapplings, tussock	Coolibah, Hakea and on dune crest, Cane Grass	<i>Hakea leucoptera</i>	Rabbit droppings, extensive at corner point 5












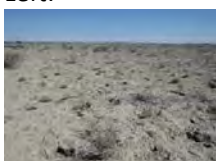
Corner point 5	Right: 	Left: 		
	Habitat: Dune, sparse Cane Grass, tussock, Hakea, Acacia			
Transect F				
	Habitat	<i>Podaxis pistillaris</i> , a fungus	Stone flake	Cattle and horse prints, droppings
Corner point 6	Right: 	Left: 		
	Habitat: River channel, Coolibah, sparse Lignum			
Transect G				
	Coolibah along creek-line	Freshwater crab shell. <i>Paratelphusa leichardti</i> ?	Claypan, sparse tussock	Cushion plants on claypan
				
	<i>Dentella pulvinata</i>			
Corner point 7	Right: 	Left: 		
	Habitat: Flood plain, scattered Coolibah, tussock			
Transect H				
	Coolibah, tussock	<i>Teucrium racemosum</i> , Grey Germander		














Census stop 3 Date: 4-08-2014

Commenced: 11:58

Number of observers: 6

Habitat: Low dune and sand plain, sparse vegetation

Corner point 1	Right: 	Left: 		
	Habitat: Sand dune, sparse saltbush, Hakea			
Transect A				
	<i>Rhodanthe floribunda</i>	<i>Acacia tetragonophylla</i> , Dead Finish		
Corner point 2	Right: 	Left: 		
	Habitat: Sand/claypan, sparse shrubland			
Transect B				
	Habitat	Habitat		
Corner point 3	Right: 	Left: 		
	Habitat: sand plain/claypan, sparse grassland			
Transect C	No Photos			
Corner point 4	Right: 	Left: 		
	Habitat: Sand/claypan, barren (almost)			

Transect D				
	Habitat			
Transect E				
	Cattle pad			
Corner point 5	Right: 	Left: 		
	Habitat: Flood plain, sparse Lignum, scattered Coolibah			
Transect F	No photos			
Corner point 6	Right: 	Left: 		
	Habitat: Flood plain, sparse grasses and Lignum			
Transect G				
	Flood plain rising to dune with sparse Hakea, tussock, Dead Finish	<i>Hakea leucoptera</i>	<i>Ogyris amaryllis</i> , Satin Azure	<i>Amyema miquelii</i> Mistletoe at base of Hakea
Corner point 7	Right: 	Left: 		
	Habitat: Sand plain, sparse Hakea and Whitewood, tussocks (well eaten)			
Transect H				
	Claypan			












Census stop 4



















Date: 4-08-2014

Commenced: 9:28

Number of observers: 6

Habitat: Undulating mudflat/sandflat, sparse woodland

Corner point 1	Right: 	Left: 		
	Habitat: Sparse grass/shrub sand plain			
Transect A				
	Cattle pad	Flood plain		
Corner point 2	Right: 	Left: 		
	Habitat: Low dune to sand plain, dominated by <i>Hakea leucoptera</i>			
Transect B				
	Habitat			
Corner point 3	Right: 	Left: 		
	Habitat: Sand plain, sparse grassland			
Transect C	No photos			
Corner point 4	Right: 	Left: 		
	Habitat: Sand plain, sparse tussock grassland			

Transect D				
	<i>Eremophila maculata</i>			
Transect E				
	Sparse grass/shrub sand plain		Road	Habitat
Corner point 5	Right: 	Left: 		
	Habitat: Undulating low dune – sparse woodland			
Transect F				
	Vegetation change to Beefwood and Sandalwood, understorey Senna sp. (eaten)			
Corner point 6	Right: 	Left: 		
	Habitat: Claypan with thin veneer of sand, sparse grassland			
Transect G				
	<i>Hakea leucoptera</i> dominant			
Corner point 7	Right: 	Left: 		
	Habitat: Claypan with thin veneer of sand, sparse grassland			
Transect H				
	Cattle tracks	<i>Acacia ligulata</i>		











Census stop 5









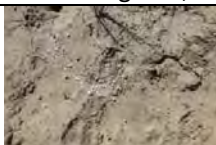




Date: 4-08-2014

Commenced: 10:37

Number of observers: 3

Habitat: Dune, open shrubs - Coolibah, Hakea, Eremophila

Corner point 1	Right: 	Left: 		
	Habitat: Dune, open habitat of Acacia, Eremophila			
Transect A	No photos			
Corner point 2	Right: 	Left: 		
	Habitat: Dune, heavily grazed open woodland (Coolibah, Hakea, Whitewood)			
Transect B	No photos			
Corner point 3	Right: 	Left: 		
	Habitat: Red dune covered in Hakea and some grazed Acacia victoriae			
Transect C				
	<i>Centipeda thespidioides?</i>	Lignum and Coolibah treed area		
Corner point 4	Right: 	Left: 		
	Habitat: Open Coolibah clayflat flood plain with Lignum			
Transect D				
	<i>Eucalyptus coolabah</i>			

Transect E				
	Habitat	Habitat		
Corner point 5	Right: 	Left: 		
	Habitat: Open Coolibah, creek margin with Lignum			
Transect F				
	River channel	<i>Minuria leptophylla?</i>		
Corner point 6	Right: 	Left: 		
	Habitat: Lignum, Coolibah, dry drain channel, occasional Acacia			
Transect G				
	Rabbit droppings	Cattle tracks		
Corner point 7	Right: 	Left: 		
	Habitat: Open habitat with Coolibah, Lignum, tussock			
Transect H				
	Heavy cattle tramping and grazing of shrubs			



















Census stop 6




















Date: 30-07-2014

Commenced: 9:49

Number of observers: 4

Habitat: Sparse open woodland with tussock grass

Corner point 1	Right: 	Left: 		
	Habitat: Sparse open Coolibah woodland, bordered by red dune			
Transect A				
	<i>Senecio gregorii</i>	Habitat	<i>Podaxis pistillaris</i>	
Corner point 2	Right: 	Left: 		
	Habitat: Dune surrounded by sparse woodland			
Transect B				
	<i>Acacia ligulata</i>	<i>Lysiana exocarpi</i>	Cattle bones	
Corner point 3	Right: 	Left: 		
	Habitat: Dune bordered by claypan, sparse Coolibah woodland			
Transect C				
	<i>Dentella pulvinata</i>	Habitat	Habitat	Scats
Corner point 4	Right: 	Left: 		
	Habitat: Flood plain with sparse Coolibah woodland			

Transect D				
	Habitat	<i>Sclerolaena bicornis</i>		
Transect E				
	Habitat	Habitat		
Corner point 5	Right 	Left: 		
	Habitat: Swale between red dunes			
Transect F				
	Ant nest	<i>Lysiphyllum gilvum</i>		
Corner point 6	Right: 	Left: 		
	Habitat: Arid woodland and claypan			
Transect G				
	Habitat	<i>Calotis plumulifera</i>	<i>Acacia tetragonophylla</i>	
Corner point 7	Right: 	Left: 		
	Habitat: Sparse open Coolibah woodland and claypan			
Transect H				
	<i>Eucalyptus coolabah</i>	<i>Lysiana exocarpi</i>	<i>Eremophila longifolia</i>	














Census stop 7






















Date: 30-07-2014






Commenced: 09:25

Number of observers: 3

Habitat: Dune, sparse Hakea, open tussock and daisies

Corner point 1	Right: 	Left: 		
	Habitat: Open tussock, sparse Hakea			
Transect A				
	<i>Rhodanthe moschata</i>	<i>Gnephosis eriocarpa</i>		
Corner point 2	Right: 	Left: 		
	Habitat: Dune, sparse tussock, shrubs, few ephemerals			
Transect B				
	<i>Acacia ligulata</i>	<i>Eremophila macdonnellii</i>	<i>Acacia cambagei</i> , Gidgee	
Corner point 3	Right: 	Left: 		
	Habitat: Coolibah with Lignum			
Transect C	No photos			
Corner point 4	Right: 	Left: 		
	Habitat: Coolibah, Lignum, large Acacia			


















Transect D				
	<i>Acacia salicina</i>			
Transect E				
	<i>Senecio gregorii</i>	Tracks	<i>Sclerolaena bicornis</i>	Cattle on road
				
	<i>Blennodia canescens</i>			
Corner point 5	Right: 	Left: 		
Habitat: Dunes with Coolibah, Cane Grass, tussock grass				
Transect F				
	Dunes with Acacia, Hakea and tussocks		<i>Goodenia cycloptera</i>	Rabbit warren
				
	Beetle	Rabbit warren	Small rodent warren	
Corner point 6	Right: 	Left: 		
Habitat: Dune with Cane Grass, Acacia (small) and tussocks				
Transect G				
	Lizard hole	Dune swale	Tracks: bird?	Tracks: small rodent?




















Corner point 7	Right: 	Left: 		
	Habitat: Dune swale with Whitewood and sparse tussocks			
Transect H				
	Cattle droppings	Shells	Horse droppings	

Census stop 8 Date: 30-07-2014 Commenced: 15:40

Number of observers: 4

Habitat: Sand dune with scattered shrubs and tussock

Corner point 1	Right: 	Left: 		
	Habitat: Sand dune with scattered shrubs and tussock			
Transect A				
	Tracks	Tracks	Tracks	
Corner point 2	Right: 	Left: 		
	Habitat: Sand-dune above claypan, tussock with shrubs, Cane Grass, Triodia			
Transect B				
	Rabbit warren	Moth	Tracks	
Corner point 3	Right: 	Left: 		
	Habitat: Claypan between dunes. Tussock and small bushes			
Transect C				
	Drilling camp and well site to the south		Habitat	
Corner point 4	Right: 	Left: 		
	Habitat: Shallow dune, medium shrubs, tussock, Chenopods			
Transect D	No photos			

Transect E				
	Paw prints	Habitat	Dune	Skink (15 cm)
				
	Rabbit warren			
Corner point 5	Right: 	Left: 		
	Habitat: Sand swale, sparse Acacia and tussock			
Transect F				
	Mound ?mole cricket	Triodia & Cane Grass	<i>Crotalaria eremaea</i>	
Corner point 6	Right: 	Left: 		
	Habitat: Dune, Cane Grass, Crotalaria, tussock, occasional Acacia			
Transect G				
	Habitat	<i>Pterocaulon sphacelatum</i>		
Corner point 7	Right: 	Left: 		
	Habitat: Dune swale with Triodia, occasional Acacia, tussock			
Transect H				
	Tracks: rabbit?			


















Census stop 9

















Date: 30-07-2014

Commenced: 15:45

Number of observers: 4, 6

Habitat: Lignum swamp (dried out) with adjacent dunes

Corner point 1	Right: 	Left: 		
	Habitat: Claypan with moderate to dense Lignum			
Transect A				
	Habitat	Dune vegetation	Rabbit warren	Tracks
				
	Rabbit warren	<i>Zygochloa paradoxa</i> Sandhill Canegrass	Bird tracks	
Corner point 2	Right: 	Left: 		
	Habitat: Sand dune bordering Lignum swamp			
Transect B				
	Kangaroo track	<i>Nicotiana velutina</i>		
Corner point 3	Right: 	Left: 		
	Habitat: Sand dune bordering Lignum swamp			
Transect C				
	<i>Pterocaulon sphacelatum</i>	Rabbit warren		




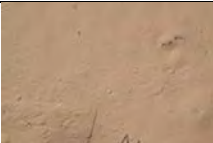





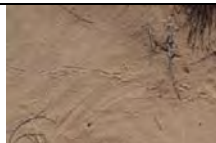





Corner point 4	Right: 	Left: 		
	Habitat: White sand dune bordering claypan			
Transect D	No photos			
Transect E				
	Habitat			
Corner point 5	Right: 	Left: 		
	Habitat: Claypan with Lignum and open Coolibah woodland			
Transect F				
	Habitat		Habitat	
Corner point 6	Right: 	Left: 		
	Habitat: Dense Lignum claypan and scattered Coolibah			
Transect G				
	Habitat	Lignum	<i>Sclerolaena sp.</i>	<i>Atriplex sp.</i>
Corner point 7	Right: 	Left: 		
	Habitat: Dense Lignum in claypan, scattered dead Acacia			
Transect H				
	Habitat			






















Census stop 10 Date: 31-07-2014

Commenced: 9:45

Number of observers: 3

Habitat: Low dune, sparse tussock, scattered Coolibah and samphire

Corner point 1	Right: 	Left: 		
	Habitat: Dune, Coolibah, Acacia and tussocks			
Transect A				
	Rabbit warren	Tracks: lizard?		
Corner point 2	Right: 	Left: 		
	Habitat: Claypan, sparse tussock, scattered Acacia			
Transect B				
	Habitat		<i>Crotalaria cunninghamii</i>	Tracks
Corner point 3	Right: 	Left: 		
	Habitat: Dune-side tussock, Cane Grass and low Acacia			
Transect C	No photos			
Corner point 4	Right: 	Left: 		
	Habitat: Claypan with samphire			
Transect D				
	Habitat			

Transect E				
	Habitat	Habitat	Midden	
				
	Habitat	<i>Acacia tetragonophylla</i>		
Corner point 5	Right: 	Left: 		
	Habitat: Creek edge, River Red Gum, Coolibah			
Transect F				
	Creek edge, River Red Gum, Coolibah		Crab claw	
Corner point 6	Right: 	Left: 		
	Habitat: Coolibah, Whitewood, creek margin, Cane Grass swale			
Transect G				
	<i>Eremophila polyclada</i>		Midden	Rabbit warren
				
	<i>Minuria integerrima</i>			
Corner point 7	Right: 	Left: 		
	Habitat: Cane Grass, samphire swale			
Transect H	No photos			

APPENDIX IV - USING A GPS TO NAVIGATE A TRANSECT

Each survey team needs to have at least one member with a GPS unit and some basic skills in using it. Given that a variety of GPS units will be brought to the survey task by different volunteers, the following guidelines are generic in nature.

Preliminary Skills

Users should come to the task knowing how to:

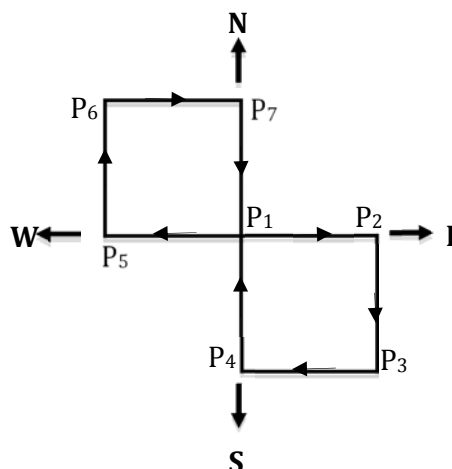
1. set up their GPS units to locate positions using
 - (a) metric units
 - (b) UTM position format
[for the Innamincka area the UTM zone/band is 54 J and the position is given by a 6 or 7 digit **easting** (depending on whether or not the leading zero is shown) and a 7 digit **northing**. E.g. 54 J 0467632 6929509. These numbers may appear on two lines, with the easting on the top line. The “54 J” may or may not be shown]
2. mark and find waypoints
3. show, not necessarily on the same page/screen
 - (a) the easting and northing for the current position
 - (b) the distance from a given waypoint

METHOD

Navigating a Transect

Starting at census stop 1 corner point 1 (P₁ in the diagram) the transect consists of two squares with the 500 m sides oriented along the principal compass directions as shown.

1. Mark P₁ as a waypoint on the GPS unit (e.g. call it waypoint 101)
Record the easting and northing in a notebook (see Table below).
2. Select “Find” or “Go To” waypoint 101 – your unit should tell you that you are already there!
3. Walk in an easterly direction by keeping the northing constant (you may need to adjust it by veering southwards to reduce the northing to the desired value, or by veering northwards to increase the northing to the desired value.)
It is not necessary to be exactly due east of P₁ at all times so it is quite OK to make detours around obstacles such as thorn bushes!
4. While proceeding eastwards, check your distance from P₁ from time to time. When this distance approaches 500 m adjust your position so that your northing is exactly the same as at P₁ and your distance from P₁ is exactly 500 m. Mark this point as P₂ (e.g. waypoint 102) and record the easting and northing in your notebook.
5. Repeat the above process to locate P₃, 500 m south of P₂. This time you will need to keep the easting constant and the northing will decrease as you go.
6. Repeat the above process for each side of the two square transect.



Notes

- Eastings get larger as you move eastwards and smaller as you move westwards.
Northings get larger as you move northwards and smaller as you move southwards.

- A possible format for your record book is shown. Note that eastings and northings are alternatively equal as you move from one point to the next.

Census stop 1 Waypoints

Waypoint	Easting	Northing
101 (P ₁)	a	b
102 (P ₂)	c	b
103 (P ₃)	c	d
104 (P ₄)	a	d
101 (P ₁)	a	b
105 (P ₅)	e	b
106 (P ₆)	e	f
107 (P ₇)	a	f
101 (P ₁)	a	b

- You should also be recording the easting and northings on the survey sheets for the census stop and corner points.
- Maintaining a constant easting or northing is more accurate than trying to follow the compass needle on the GPS which shows your direction of travel but is no use when returning to the transect line after deviating around an obstacle.
- An alternative method is to calculate the end-points of each transect once the starting point is known and enter these as waypoints into your GPS.

Example calculation:

Census Stop 1 Waypoints

Waypoint	Easting	Northing
101 (P ₁)	<i>e</i> 0431028	<i>n</i> 6953816
102 (P ₂)	<i>e</i> +500 0431528	<i>n</i> 6953816
103 (P ₃)	<i>e</i> +500 0431528	<i>n</i> -500 6953316
104 (P ₄)	<i>e</i> 0431028	<i>n</i> -500 6953316
101 (P ₁)	<i>e</i> 0431028	<i>n</i> 6953816
105 (P ₅)	<i>e</i> -500 0430528	<i>n</i> 6953816
106 (P ₆)	<i>e</i> -500 0430528	<i>n</i> +500 6954316
107 (P ₇)	<i>e</i> 0431028	<i>n</i> +500 6954316
101 (P ₁)	<i>e</i> 0431028	<i>n</i> 6953816