

# **BORE TRACK NORTH**

## **Mammals, Birds, Vegetation Survey 2013**

*A project undertaken by the Friends of the Innamincka Reserves,  
funded by the Natural Resources Management (SA)*



*The Bore Track North, Innamincka Regional Reserve*

# **REPORT ON THE BORE TRACK NORTH MAMMALS, BIRDS, VEGETATION SURVEY 2013**

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# **REPORT ON THE BORE TRACK NORTH MAMMALS, BIRDS, VEGETATION SURVEY 2013**

## **INTRODUCTION**

### **A. PROJECT VOLUNTEERS**

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### **B. BACKGROUND**

The Bore Track North extends from Nappa Merrie Road south to Bollards Lagoon Station boundary. While average rainfall is low (177 mm per annum) the Innamincka area is in a region of maximum rainfall variability for Australia (Appendix III). In 2010 this area experienced extreme rainfall in terms of scale and intensity. The rainfall event came to an abrupt end and has been closer to average since then. The NRM Grant presented the FOIR with a unique research opportunity to study what happens to the nomadic terrestrial bird species, mammals and vegetation of the Bore Track as the weather returns to 'normal' following a time of ecological boom.

### **C. APPROACH**

A series of long-distance transects were set up across the Bore Track North to study the impacts of the recent climatic convulsion on the breeding, distribution and abundance of terrestrial bird species, mammals and vegetation. Because the Bore Track North experiences strong climatic variation from wet to dry conditions, superimposing an extreme rainfall event on to this base data provides a unique opportunity to study dynamic climate drivers of species' distributions and abundance. Transects covering differing vegetation types were sampled along an 80 km length of the Bore Track North, providing invaluable base-line data for assessing future changes. Nine census stops using sub-transects of 500 m perpendicular to the main route every 10 km were undertaken. There was flexibility to design transect routes that spanned the most diverse landscape conditions.

### **D. OBJECTIVES**

- 1) To collect data systematically for bird, mammal and plant species, at a series of transects spanning 80 km in total. 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 present these results quickly to provide the base data for ongoing research.
- 4) To use these data to facilitate further monitoring of the change in population diversity and abundance as the conditions change to drier or wetter.

### **E. PROGRAMME OF RESEARCH**

Surveys were conducted on August 12th-14th 2013.

## METHODS – BORE TRACK NORTH SURVEY

### 1. Survey overview and terminology

The Bore Track North was surveyed over 4 days using the method described below, travelling an average of 30 km per day along the Track, with census stops every 10 km. The survey method was adapted from methodology used by Rob Clemens and Richard Fuller (School of Biological Sciences, University of Queensland) for similar surveys in outback SA. Accommodation was at Burke's camp ground, 30 km from the Bore Track North. All necessary provisions and equipment, plus contingency supplies in case of breakdowns or other emergencies were arranged beforehand.

#### Key terminology:

A **census stop** is one of the points placed at 10 km intervals along the Bore Track North. The census stop forms a central point for conducting surveys in the surrounding habitat. The locations of all census stops were provided as GPS waypoints. If the exact location of the waypoint proved to be inaccessible, then the point was established along the Bore Track North road that was closest to the waypoint location.

A **survey point** is the location of a point survey within the census stop transect.

### 2. A typical day

A typical day commenced at first light, 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 finished at around 11am-noon, when bird activity began to decline noticeably. After a break during the heat of the day, a third census stop was surveyed late in the afternoon when bird activity had increased again.

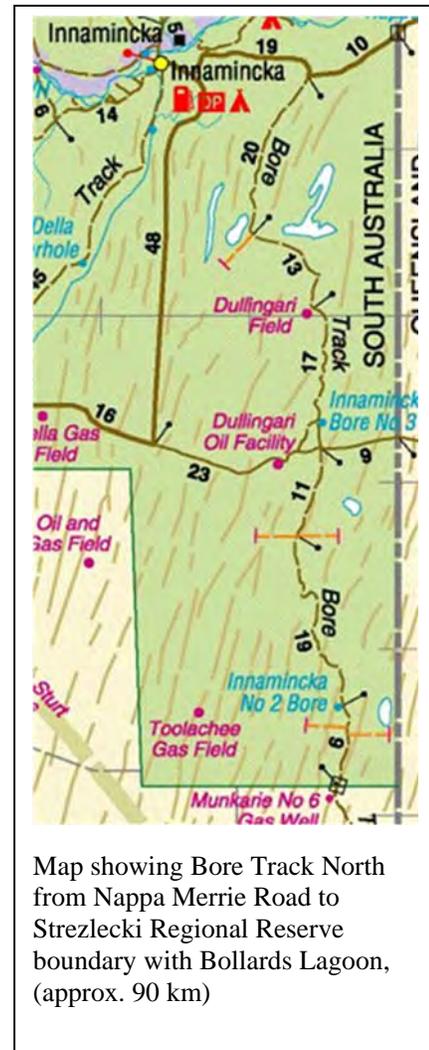
### 3. Communication

The team maintained contact using vehicle and hand-held UHF radio. Hand-held UHF units were used by teams conducting line transects and survey points. Channel 14 was used for all radio communication.

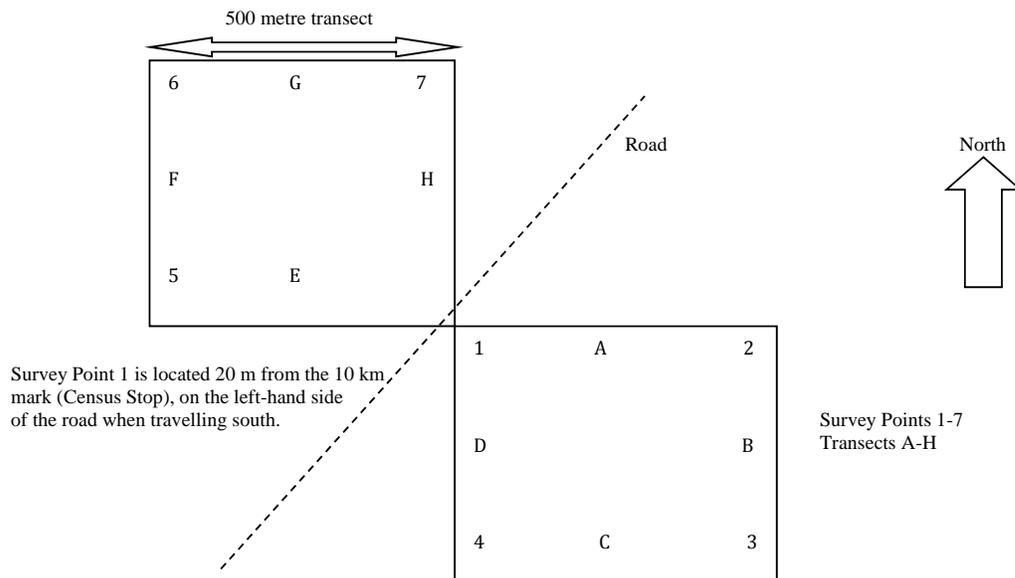
### 4. Survey work at each census stop

The following protocol was adopted for the baseline survey and should be followed as closely as possible in future repeat surveys. For the baseline survey there were 6 members, so 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 hazard indicator (eg 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 – this is survey point 1 (see diagram below). Erect Star Dropper and attach yellow cap. Write



identifying detail on the Star Dropper, e.g. FOIR Survey 2013, Census Stop 1. Write GPS location, weather details and habitat details in the Survey Booklet. Conduct a 5-minute survey at this point (see method below under 5. Survey Point count method).



Survey Point 1 is located 20 m from the 10 km mark (Census Stop), on the left-hand side of the road when travelling south.

(b) Using a GPS to guide you, walk east for 500 m, conducting the line transect method as you go (see method below under 6. *Line Transect method*). The easiest way to keep track of distance is to use the GPS set to navigate to the next survey 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. If your route has to deviate around obstacles etc, return to the transect once the obstacle has been passed.

(c) At 500 m from Survey point 1, mark the location in the GPS and conduct a 5-minute point count – this is Survey point 2. Continue in this fashion following the scheme in the diagram until 7 point surveys and 8 line transects have been completed. Where there is more than one surveyor, it will be more efficient to separate and take half of the survey each.

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

### *5. Survey Point count method*

(i) Make sure the survey point is marked in your GPS. Write the co-ordinates onto the survey sheet to ensure they are not lost. Note down the dominant habitat type in the area surrounding the survey point. Choose from gibber, grassland, dunes, shrub-land, lignum, woodland, wetland. Take a photo of the survey sheet just prior to the habitat photos so that it is always clear which survey point the following photos belong to. Take representative photographs of the habitat e.g. to the right and left of the survey point.



(ii) Note and photograph any mammal tracks, sighting of mammals and GPS the exact point where tracks are sighted.

(iii) Stand at the survey point, and look intensively for birds for 5 minutes. For each group of birds or individual seen, note down (a) the species, (b) the number of birds in the group, (c) whether the birds were perched or flying, and (d) whether you heard and/or saw the birds.

(iv) Pay close attention as you walk toward the survey point to commence your survey – if you disturb any birds from near the survey point, include them in your survey.

(v) There is no maximum distance for recording birds – every bird you detect should be noted. Birds can be aged/sexed where possible. Any signs of breeding or feeding should also be recorded.

### *6. Line Transect method.*

(i) Note down the dominant habitat through which the transect passes. Choose from gibber, grassland, dunes, shrubland, lignum, woodland, wetland. Take representative photographs of the habitat. You might want to take a photo of the survey sheet just prior to the habitat photo just so it is always clear which transect the photo belongs to.

(ii) Note and photograph any mammal tracks and sighting of mammals. A GPS reading for any significant sightings could be recorded.

(iii) Walk slowly along the transect line, looking and listening for birds. For each individual or group of birds seen, note down (a) the species, (b) the number of birds in the group, (c) whether the birds were perched or flying, and (d) whether you heard and/or saw the birds.

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

(v) 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.

#### 7. *While driving between census stops*

(i) Any birds seen while driving between census stops should be noted along with the number of individuals.

(ii) A count of all mammals that are seen should be recorded including dingoes, kangaroos, pigs, feral cats, rabbits and cattle.

(iii) Stop at any wetlands that are visible from the road, and do a count of any water-birds visible. Be sure to GPS the location from which you do the survey, and take a photo of the wetland.

(iv) 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 Quailthrush crossed the road". However, such incidental stops should not jeopardise the aim of completing the Bore Track North survey.

(v) Make a note of any items left on or near the track such as, tyres, garbage or equipment.

#### 8. *Obstructions*

In the event of getting stuck due to road closures, surveying can continue in the local area that is open until the main route is open again. Flexible decision-making is needed in the field, for example, a variation on the main route might be needed.

#### Equipment list:

- EPIRB (if you have one) or Satellite phone (if you have one)
- Hand-held UHF radio for staying in contact while surveying (*to be carried on your person at all times when out of the car, along with at least one set of spare batteries*)
- GPS for each person (*to be carried on your person at all times when out of the car, along with at least one set of spare batteries*)
- Compass (*to be carried on your person at all times when out of the car*)
- Plenty of spare batteries
- Lots of pencils
- Plenty of survey sheets and a clip board and a notebook
- Watch for telling the time (or use GPS clock)
- Digital camera with large memory card
- Car chargers for the various pieces of electronic equipment / rechargeable batteries.

## RESULTS

A total of nine census stops were established in the Innamincka Regional Reserve along the length of the Bore Track. The exact location of the census stops and the co-ordinates for the survey points are given in Appendix I.

### BIRD SURVEY DATA

DATE	CENSUS STOP	SPECIES	S/H	F/P	No.	GPS	
11/08/2013	1	Australian Raven	S	F	6	54J 0490012 6928492	
		Corvid	S	F	7		
		Australian Pipit	S	F/P	2		
		Australian Magpie	S	P	1		
		Spiny Cheeked Honeyeater	H		1		
		Black faced Woodswallow	S	F/P	14		
		Willie Wagtail	S	F/P	4		
		Brown Falcon	S	P	2		
		Crested Pigeon	S	F/P	1		
		Little Corella	S	F	4		
		Galah	S	F	30		
		Nankeen Kestrel	S	F	2		
		Singing Honeyeater	H	P	1		
		Zebra Finch	S	P	41		
		Yellow Throated Miner	S	F	2		
		Little Crow	S	F	5		
		BETWEEN CENSUS STOPS 1 - 2					
		Budgerigar	S/H	F	20		
		Cockatiel	S/H	F	8		
12/08/2013	2	Zebra Finch	S/H	F/P	282	54J 0484731 6920321	
		Willie Wagtail	S/H	F/P	7		
		White-backed Swallow	S	F	1		
		Crested Pigeon	S/H	F/P	11		
		Fairy Wren	H		2		
		Black faced Woodswallow	S	P	8		
		Peaceful Dove	S/H	F/P	2		
		Cockatiel	S	F	35		
		Spiny Cheeked Honeyeater	H		1		
		Fairy Wren	H				
		Raptor	S	F	1		
		Australian Magpie	S	F	1		
		Fairy Wren White Winged	S	F/P	5		
		Diamond Dove	S	F/P	3		
		Australian Raven	S	F/P	1		
		Chestnut Crowned Babbler	S	F	4		
		Corvid	S	F	1		
		Chirruping Wedgebill	H	P	3		
		Australian Pipit	S	P	2		
		Brown Falcon	S	F	2		
		BETWEEN CENSUS STOPS 2 - 3					
		Nankeen Kestrel	S	F	1		
		Cinnamon Quail Thrush	S	F/P	1		
		Galah	S	F	25		

<b>BIRD SURVEY DATA (Cont.)</b>						
DATE	CENSUS STOP	SPECIES	S/H	F/P	No.	GPS
12/08/2013	3	Nankeen Kestrel	S	F	2	54J 0484143 6911271
		Australian Raven	S	F	4	
		Woodswallow ?	S	F	1	
		Cinnamon Quail Thrush	S	F	1	
		BETWEEN CENSUS STOPS 3-4				
		Cinnamon Quail Thrush	S	F/P	1	
		Willie Wagtail	S	F/P	1	
		Masked Woodswallow	S	F/P	2	
		Gibber bird	S	F/P	2	
		Spiny Cheeked Honeyeater	S/H	F/P	1	
		Singing Honeyeater	S/H	F/P	1	
12/08/2013	4	Chirruping Wedgebill	H		3	54J 0490809 6905990
		Singing Honeyeater	H		5	
		Wedgetail Eagle	S/H	F	4	
		Zebra Finch	S/H	F	24	
		Singing Honeyeater	S	F	13	
		Masked Woodswallow	S	F/P	4	
		Budgerigar	S/H	F/P	168	
		Black faced Woodswallow	S	F/P	2	
		White winged Fairy Wren	S	P	3	
		Australian Raven	S	P	2	
		Crested Pigeon	S/H	F	2	
		Galah	S	F	105	
		Willie Wagtail	S/H	P	1	
		White-backed Swallow	S	F	2	
		Little Crow	H		1	
13/08/2013	5	Brown Songlark	S/H	F/P	10	54J 0491798 6897070
		Zebra Finch	S/H	P	3	
		Australian Raven	H		5	
		Singing Honeyeater	S/H	F/P	15	
		Willie Wagtail	S/H	F/P	1	
		Black faced Woodswallow	S	F/P	6	
		Nankeen Kestrel	S	F/P	3	
		Fairy Wren ?	H			
		White winged Fairy Wren	S	P	6	
		Corvid	S	F	1	
		Little Crow	S	F	1	
		Black shouldered Kite	S	P	1	
		Brown Falcon	S	P	1	
		White-backed Swallow	S	F	2	
		BETWEEN CENSUS STOPS 5-6				
		White winged Fairy Wren	S	P	2	
13/08/2013	6	Corvid	S	P	4	54J 0491640 6887512
		Little Crow	SH	F/P	14	
		Black faced Woodswallow	S	F	10	
		White winged Fairy Wren	S/H	F/P	10	
		Zebra Finch	S/H	F/P	90	
		Singing Honeyeater	S/H	F/P	18	
		Willie Wagtail	S	F/P	6	
		Brown Songlark	S/H	F/P	2	
		Budgerigar	S/H	F/P	2	
		Spiny Cheeked Honeyeater	H		1	
		White backed Swallow	S	F	1	
		Woodswallow ?	S	F	3	
		Chirruping Wedgebill	S/H	P	2	
		Variegated Fairy Wren	S/H	F/P	3	
		Australian Pipit	S	F	1	
		Crested Pigeon	S	P	1	
		Nankeen Kestrel	S	F	1	
		BETWEEN CENSUS STOPS 6-7				
		Australian Pipit	S	F/P	2	

<b>BIRD SURVEY DATA (Cont.)</b>						
DATE	CENSUS STOP	SPECIES	S/H	F/P	No.	GPS
13/08/2013	9	Zebra Finch	S/H	P	6	54J 0491529 6865273
		Fairy Wren ?	S/H	F/P	6	Note Census Stops do
		Masked Woodswallow	S/H	F/P	2	not follow consecutively
		White winged Fairy Wren	S/H	P	5	at this point.
		Corvids	S	F	1	
		Crested Pigeon	S/H	F	2	
		Little Crow	S	F	2	
		Nankeen Kestrel	S	P	5	
		Singing Honeyeater	H	P	1	
		White backed Swallow	S	F	2	
	BETWEEN	CENSUS STOPS 9-8				
		Nankeen Kestrel	S	F	1	
		Little Crow	S	F	3	
14/08/2013	8	Flock Bronzewing	S/H	F/P	4	54J 0489726 6871570
		Button Quail (little ?)	S	F/P	1	
		Chirruping Wedgebill	H	P	2	
		Black faced Woodswallow	S/H	F/P	4	The distance between
		Willie Wagtail	S/H	P	5	Census Stops 8 and 7 is
		Singing Honeyeater	H	P	4	7.3 km. Distance between
		Little Crow	S/H	P	1	all other Census Stops
		Crested Pigeon	S/H	P	2	is 10 km.
		Galah	S/H	F/P	8	
		Zebra Finch	S	F/P	30	
		White winged Fairy Wren	S/H	F/P	15	
		Diamond Dove	S/H	F/P	3	
		Nankeen Kestrel	S	F/P	2	
		White winged Triller	S	P	1	
	BETWEEN	CENSUS STOPS 8-7				
		Nankeen Kestrel	S	F	2	
		Magpie Lark	S/H	F/P	1	13/08/2013
		Australian Pipit	S	F/P	1	13/08/2013
		Wedgetail Eagle	S	F	1	
		Corvid	S/H	F	1	
		Flock Bronzewing	S/H	F/P	3	
	7	Nankeen Kestrel	S	F/P	8	54J 0489092 6878100
		Zebra Finch	S/H	F/P	8	
		Australian Pipit	S/H	F/P	2	
		Corvid	S	F	1	
		Willie Wagtail	S/H	F/P	3	
		Wedgetail Eagle	S	F	3	
		Little Crow	S	F	7	
		Black faced Woodswallow	S	F	2	
		Singing Honeyeater	S/H	F/P	7	
		Corvid	S	P	2	
		White winged Fairy Wren	S/H	P	2	

## DISCUSSION

### A. HABITATS

The Bore Track crosses a variety of arid zone habitats. Much of the area is dominated by the long north-south running dune system of the northern Strzelecki Desert. These dunes generally rise about 5 – 10m above the inter-dune swales. Many of the swales form ephemeral wetlands which fill with water following heavy rains although there are also extensive areas of low tussock grassland between the dunes.

The dunes themselves support scattered low shrubs (mainly *Croatalaria* sp and *Senna* sp) and scattered Whitewood trees. In some areas there are scattered trees (*Corymbia terminalis*, Desert Bloodwood or *Tjulta*) and *Acacia* species. In many areas there are patches of Cane Grass and on the dunes although the extent of these grasses has been significantly reduced by recent fires. There is some evidence of recovery, i.e., small tussocks but it will take a number of years without fires for these grasslands to fully recover. The loss of these grasslands may account for the absence of small birds dependent on this habitat such as grasswrens and whiteface.

About halfway along the section of the track between the Nappa Merrie Rd and Dullingari the track crosses a higher area of gibber plain. This area is largely devoid of vegetation although some grasses and small shrubs may be found along ephemeral water courses and where water runoff has caused some soil to accumulate.

There are also areas where there are larger water courses. These run from the higher areas and terminate in some of the lower inter-dune wetlands. The banks of these streams support small trees and shrubs, mainly *Acacias* and *Sennas*.

An area of unburnt dune shrublands partly covered by Census Stop 9 showed greater diversity than shrublands on other parts of the dune system. This area included Hop Bushes (*Dodonea* sp), *Grevillea* sp, *Eremophila* spp, as well as *Senna* spp and *Acacia* spp. There were also extensive patches of old and other grasses as well as many herbaceous species. This was potentially the most productive habitat for birds that was encountered during the survey.

The larger wetland areas support extensive areas of *Lignum* (*Mhuelenbeckia* sp) and Cane Grass. When these wetlands flood they will be capable of supporting significant populations of wetland birds.

Photographs of habitats and flora are given in Appendix II.

Census stop	Topography	Vegetation types		No. of bird species
1	Dune/Swale	<i>Acacia</i> spp, , Cane Grass	Low tussock grassland, scattered trees	16
2	Dune	<i>Hakea</i> , , tussock grass		19
3	Gibber Plain	Sparse tussock grassland	Occasional low shrubs	4
4	Dune/Swale	Tussock grassland		15
5	Dune/Swale	Tussock grassland	Whitewood trees	13
6	Dune/Swale	Tussock grassland	Whitewood	17

7	Dune/Swale	Tussock grassland		11
8	Dune/Swale	Tussock grassland	Open shrubland	14
9	Dune/Swale	Tussock grassland	Dune shrubland	10

## B. FLORA

Overall the appearance of the vegetation showed signs of rainfall earlier in the year, but by August much of the vegetation was drying out, particularly the Desert Rattlepod (*Croatalaria eremaea*) on the dunes and some of the grasses on the drier clay pans and where the sand had run off over calcrete. However there was the occasional burst of colour from the herbaceous flowering annuals, such as *Ptilotus* and *Swainsona* species on the dunes or lower in the swales.

To review the flora present along the Bore Track, the vegetation is divided up into height categories and their general distribution and relative occurrence is described. Photographs of flora at the different census stops, transects and survey points are given in Appendix II.

### Small Trees

Whitewood (*Atalaya hemi-glauca*) was the most common and widely distributed tree along the Bore Track. However its distribution ranged from the most frequent at the northern end to the occasional tree at the southern end. Clumps of Mulga (*Acacia aneura*) and Coolabah (*Eucalyptus coolabah*) were found along some of the ephemeral creekbeds midway along the track. The occasional Emu apple (*Owenia acidula*) and Beefwood (*Grevillea striata*) were also scattered along the track on the dunes.

### Large Shrubs

The most common and widely distributed large shrub, particularly on the plains and lower swales was Needlewood (*Hakea leucoptera*), a plant which suckers and regenerates quickly after fire. This was closely followed by *Senna* sp., particularly (*Senna pleurocarpa*) and (*Senna artemesoides*) the latter occurring mainly along the southern half of the track. Hop bush (*Dodonea viscosa* ssp *angustissima*) became very common from the 70 – 90 km section. The most common *Acacia* on the dunes and throughout was (*Acacia ligulata*). Three *Scaevola* species were seen generally around the southern end of the track; the most common being *Scaevola spiniscens*. At around 80km distance several new species were seen on the undulating terrain including *Melaleuca bracteatum*, *Grevillea stenobotrya*, *Hakea divaricarta*, *Eremophila longifolia* and *Eremophila duttoni*.

### Small Shrubs

*Croatalaria* sp. *C. cunninghamii* and particularly *C. eremaea* were the most widely distributed small shrub on the dunes and were especially dominant at the northern and southern ends. Others included some Cane grass (*Eragrostis australasica*), Cattlebush (*Trichodesma zeylanicum*), *Lechenaultia divaricarta* and *Pterocaulon* sp. In the ephemeral wetland areas *Lignum* (*Muehlenbeckia cunninghamii*) and Nitre goosefoot (*Chenopodium nitrariaceum*) were present.

### Small Herbaceous Plants

*Ptilotus* sp. *P. polystachyus* and *P. obovatus* were most prevalent on the dunes throughout the track. Over the southern half of the track several members of the Asteraceae family were in flower including *Helipterum floribundum* and *Helichrysum apiculatum* as well as *Swainsona*, *Tephrosia*, *Trachymene*, *Calandrinia* and *Goodenia* species. The *Chenopodiaceae* family were well represented especially in the Southern half including *Salsola kali*, *Enchalaena tomentosa*, Cannonball (*Dissocarpus paradoxus*), *Maireana*, *Sclerolaena* and *Atriplex* species.

## Grasses

Tussock grasses of various kinds were the most abundant type of vegetation along the Bore Track. They covered the gentler dune slopes, swales, clay and sand plains as well as gibber. Some of these included *Triodia* sp., Mitchell grasses (*Astrebla* sp.), *Aristida* sp. and possibly Fairy grass (*Sporobolus caroli*). However there were many more (see photographs in Appendix II).

## C. BIRDS

A total of 33 bird species were identified on the surveys with an additional 2 species (Gibberbird and Magpie Lark) seen when driving between survey points. The species found were mainly granivores (Cockatoos, finches and pigeons) or insectivores (Willie Wagtails, woodswallows and fairy-wrens). The three species of honeyeater recorded are also insectivorous when nectar resources are not available. Three species of raptor were recorded, all in low numbers. There were also generalists such as the corvids.

The maximum number of species seen at any census stop was 19 (census stop 2, close to the northern end of the track) with 372 individual birds recorded.

In contrast the minimum number at any census stop was 4 species and 8 individuals. This census stop was on gibber plain where there are large areas of bare ground, relatively few tussocks and almost no woody plants.

Overall there was an average of 13.2 species and 136.1 individual birds found across the surveys however, if the survey that was carried out on the gibber plain site is excluded the average number of species rises to 14.4 with 152 individuals.

The most numerous species were those species that tend to form large flocks. Zebra finches were found at all sites except census stop 3 (gibber plain) and were present in greatest numbers with a total of 484 birds recorded. Their largest count was 282 on census stop 2 however, the counts ranged from 3 to 282.

The next most numerous birds were Budgerigar (190 birds over 3 sites, max count 168) and Galah (168 birds over 4 sites, max count 105).

Passerines that were regularly found include Willie Wagtail, Singing Honeyeater and Black-faced Woodswallow. While not found at every site, these birds were a regular occurrence wherever there were low trees or shrubs which provided perching sites, food and shelter. Unidentified woodswallows at census stop 3 (gibber plain) and census stop 6 were most likely black-faced woodswallows.

Australian corvids can be difficult to identify unless they are calling. There are two common corvids in this region, namely Australian Raven and Little Crow. Where it was not possible to make a positive identification of these species they were recorded generically as 'Corvid'.

There were two species of fairy-wren encountered during the survey. This is another situation where female, immature and non-breeding birds may be difficult to identify. At four census stops fairy-wrens were heard calling or seen fleetingly but were unable to be positively identified.

There were no emus recorded during the survey although their presence was noted on four transects where footprints or scats were seen. These were mainly south of Moomba – Epsilon Road.

Some of the survey transects crossed ephemeral wetland that had obviously held water during the floods of 2010-2011. Under these conditions they would potentially hold populations of wetland species such as ducks, herons, stilts and plovers.

The range of species and the varied habitats that they support indicates that this area is important for arid zone birds and, when conditions are favorable, will be used by wetland species.

<b>Birds recorded at census stops along Bore Track North</b>						
Species	No. of census stops where present	Total	Min. count	Max. count	Average when present	Average for all stops (9)
Black-shouldered kite	1	1	1	1	1	0.11
Wedge-tailed Eagle	2	7	3	4	3.5	0.78
Brown falcon	3	5	1	2	1.67	0.56
Nankeen Kestrel	7	23	1	8	3.29	2.56
Little Button-quail	1	1	1	1	1	0.11
Crested Pigeon	6	19	1	11	3.17	2.11
Flock Bronzewing	1	4	4	4	4	0.44
Diamond Dove	2	6	3	3	3	0.67
Peaceful Dove	1	2	2	2	2	0.22
Little Corella	1	4	4	4	4	0.44
Galah	3	143	8	105	47.67	15.89
Cockatiel	1	35	35	35	35	3.89
Budgerigar	2	170	2	168	85	18.89
Variegated Fairy-wren	1	3	3	3	3	0.33
White-winged fairy-wren	7	46	2	15	6.57	5.11
Yellow-throated Miner	1	2	2	2	2	0.22
Spiny-cheeked Honeyeater	3	3	1	1	1	0.33
Singing Honeyeater	8	64	1	18	8	7.11
Chestnut-crowned babbler	1	4	4	4	4	0.44
Chirruping Wedgebill	4	10	2	3	2.5	1.11
Cinnamon Quail-thrush	1	1	1	1	1	0.11
Willie Wagtail	7	27	1	7	3.37	3.00
Black-faced Woodswallow	7	46	2	14	6.57	5.11
Masked Woodswallow	2	6	2	4	3	0.67
White-winged Triller	1	1	1	1	1	0.11
Australian Raven	5	18	1	6	3.60	2.00
Little Crow	7	31	1	14	4.43	3.44
Unidentified Corvid	7	17	1	7	2.43	1.89
Australian Magpie	2	2	1	1	1.00	0.22
Australian pipit	4	7	1	2	1.75	0.78
Brown Songlark	2	12	2	10	6	1.33
White-backed Swallow	5	8	1	2	2.67	0.89
Zebra Finch	8	484	3	282	60.50	53.78
Total species - 33						

## **D. MAMMALS**

Few mammals were seen during the surveys. Mammal presence was mainly indicated by the presence of tracks, scats or burrows. A limited amount of overnight camera trapping was attempted during the survey but did not detect any mammals.

The majority of mammal signs related to the presence of domestic and feral animals. These are a major threat to these ecosystems.

### **Cattle:**

This area is subject to grazing by Bollards Lagoon Station. Cattle were seen at several points along the way and were present at two of the census stops. Cattle with calves at foot were present at census stop 1. Tracks and dung were present at 5 census stops. All cattle that were seen were within a short distance of water points.

### **Feral Horse:**

No horses were seen during the survey but stallion territory marking dung piles were seen at census stop 2 and dung was also seen at census stop 9.

### **Rabbits:**

Rabbits are common in this area. A total of six rabbits were seen at two census stops. Rabbit scats and warrens were found on 5 of the 9 census stops. Most rabbit activity was in the section north of the Moomba – Epsilon Road.

### **Fox:**

Fox scats were recorded at census stop 1.

### **Cat:**

Possible cat prints seen and photographed at census stop 5.

### **Dingo:**

Dingo tracks were recorded on transects at five census stops.

### **Kangaroo (various species):**

No kangaroos were seen during the survey. Kangaroo tracks were recorded at census stops 5 and 9.

### **Other mammals:**

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

## **E. REPTILES AND AMPHIBIANS**

A frog was heard in a channel at Census stop 1 but not identified.

No reptiles were recorded during the survey although some people had fleeting glimpses of small lizards but were unable to record any details.

## **F. INVERTEBRATES**

Locusts observed at several census stops. These are a native species which can, at times, reach plague proportions. Given that this area is within the natural range of this species and that the vegetation is still predominantly indigenous plants this species is seen as being part of the natural ecosystem and not a threat.

## **G. THREATS AND POTENTIAL IMPACTING FACTORS NOTED**

### **1. Soil Erosion**

This is a major threat for the entire region. The major causes of accelerated soil erosion are addressed in the following points.

#### **2. Weeds**

- a. Buffel grass.** One large infestation was found at GPS Point 54J 0491262 6906497. This was spread for approx 500m along both sides of the creek and spreading out onto surrounding flats. Census stop 4.
- b. *Acacia farnesiana*.** This invasive species is already present within the Innamincka Reserve near Policeman's Tank and is common in the Cooper Ck Catchment in south-west Queensland. It can be spread by the movement of vehicles and machinery. This species should be on our 'watch list' during future surveys.

#### **3. Feral animals**

##### **a. Horses**

Feral horses occur in low numbers across the region with their presence confirmed by the presence of territory marking dung piles. These can aggravate problems caused by over-grazing by other animals and contribute to the erosion of fragile soils.

##### **b. Rabbits**

Rabbits and rabbit traces (burrows, tracks, pellet mounds, etc) were present at most census stops. These are the most serious feral animal. Burrows and grazing by rabbits is a major contributor to erosion.

##### **c. Cats**

Feral cats were not seen during their survey but some possible cat tracks were seen. Cats were frequently observed in surrounding areas during the days around the survey. Anecdotal evidence points to high numbers of feral cats in the arid zones of northern South Australia and adjacent areas of Queensland and New South Wales, e.g. online discussion by the birding community on Birding-Aus. Feral cats are a major threat to small mammals, birds and reptiles.

### **4. Mining, grazing and tourism development**

#### **a. Rubbish**

Rubbish such as cans, bottles, discarded machinery and oil drums, plastic bags and used toilet paper was found at and between all census stops. A sustained education campaign for all people visiting the area is required to combat this issue before it gets worse.

#### **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. 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 that cut through sand dunes open the dunes to accelerated erosion. Roads across wetlands result in deep ruts which have further impacts on the water regime.

### **c. Cattle Grazing**

The entire area traversed by the Bore Track is subject to cattle grazing. There is evidence of soil erosion and loss of vegetation caused by cattle grazing at several points along the survey route. These are mainly areas within a few hundred metres 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. 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. 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 adjacent to the Cooper Floodplain and will inevitably be affected by any significant changes to the water regime in Cooper Creek. Current plans to increase irrigation in the Queensland section of the Cooper Catchment represent a threat to this area. It is the northern end of the Bore Track (Census stop 1) which is most likely to suffer impacts.

## **CONCLUSIONS**

A survey method has been established which can 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 a large 80 km span of the Bore Track.

Baseline data have been collected following the ecological boom that occurred in 2010. Threats and potential impacting factors on the ecological value and biodiversity of the region have been identified. 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 3 years.

Consideration should be given to establishing additional surveys in other parts of the reserve which are also subject to significant changes e.g. along the Coongie Road and the Cordillo Downs Road.

## APPENDIX I – LOCATION OF CENSUS STOPS

### A. CENSUS STOP AND SURVEY POINT COORDINATES

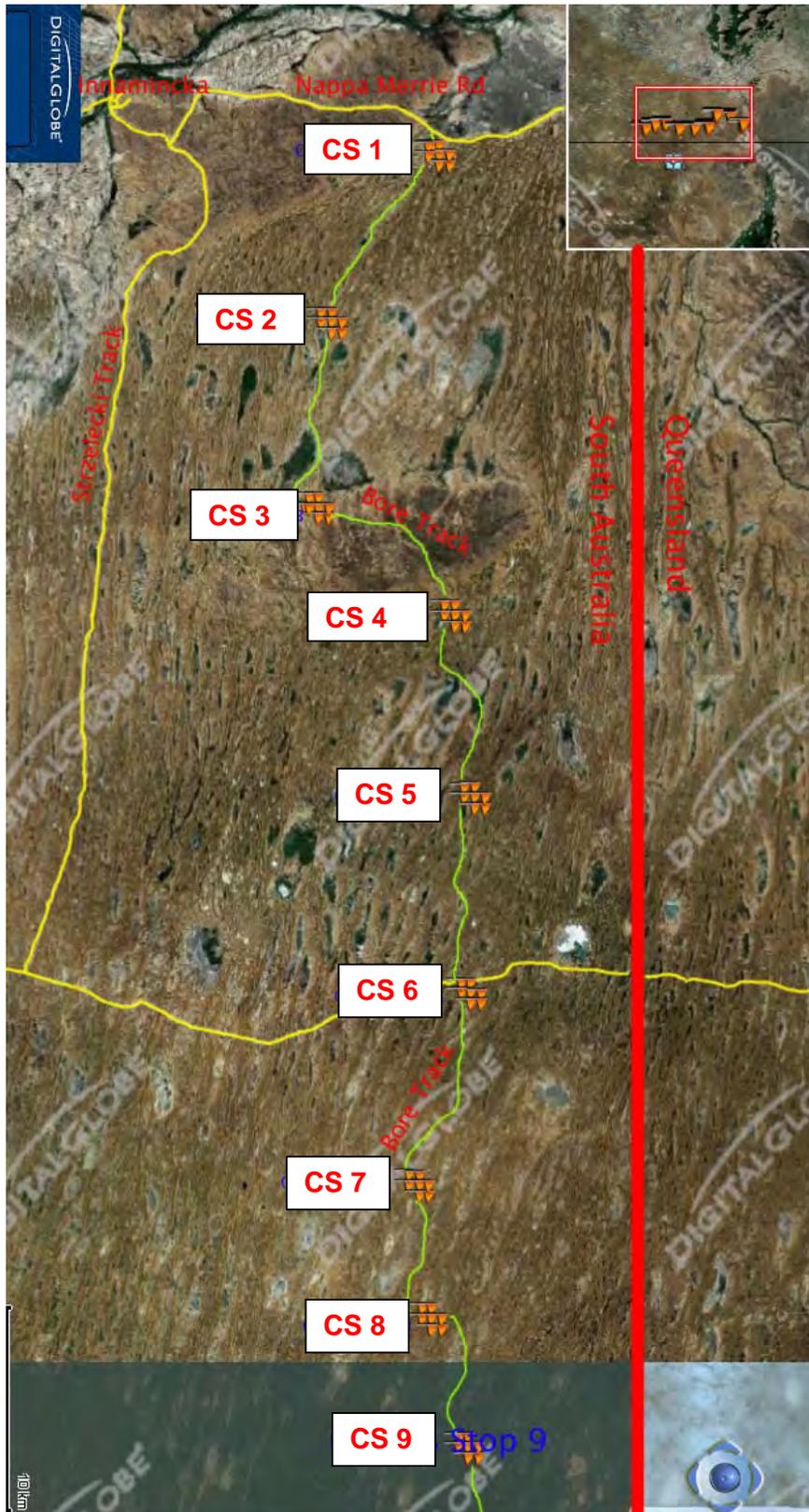
The following table lists all co-ordinates for each census stop. The co-ordinate system used is UTM. The Census Stops are also shown on the following Map.

Census Stop	Survey Point	AMG zone	Easting	Northing
1	1	54J	0490012	6928492
	2		0490012	6928987
	3		0489503*	6928969*
	4		0489503*	6928492*
	5		0490400	6928373
	6		0490399	6927878
	7		0489902	6927874
2	1	54J	0484731	6920321
	2		0484733	6920814
	3		0484228	6920814
	4		0484215	6920322
	5		0485116	6920139
	6		0485116	6919642
	7		0484731	6919647
3	1	54J	0484143	6911271
	2		0484135	6911779
	3		0483666	6911782
	4		0483666*	6911271*
	5		0484520	6911095
	6		0484516	6910597
	7		0484017	6910596
4	1	54J	0490809	6905990
	2		0490823	6906491
	3		0490319	6906495
	4		0490326	6905997
	5		0491195	6905818
	6		0491199	6905319
	7		0490700	6905312
5	1	54J	0491798	6897070
	2		0491809	6897572
	3		0491302	6897567
	4		0491299	6897074
	5		0492178	6896894
	6		0492178	6896397
	7		0491680	6896400

6	1	54J	0491640	6887512
	2		0491641	6888015
	3		0491142	6888014
	4		0491142	6887515
Census Stop	Survey Point	AMG zone	Easting	Northing
	5		0492020	6887327
	6		0492026	6886831
	7		0491523	6886832
7	1	54J	0489092	6878100
	2		0489095	6878593
	3		0488591	6878596
	4		0488590	6878101
	5		0489474	6877923
	6		0489468	6877424
	7		0488969	6877426
8	1	54J	0489726	6871570
	2		0489724	6872062
	3		0489223	6872070
	4		0489225	6871568
	5		0490100	6871393
	6		0490104	6870896
	7		0489596	6870903
9	1	54J	0491529	6865273
	2		0491533	6865765
	3		0491036	6865770
	4		0491033	6865272
	5		0491912	6865095
	6		0491911	6864598
	7		0491411	6864594

\* Estimated values

Map showing Census Stop locations along the Bore Track North



## APPENDIX II - PHOTOGRAPHIC AND HABITAT RECORDS

Original photographs are available from FOIR for analysis if required.

**Census stop 1** 11-08-2013. Commenced 4.00pm.

Slight Breeze 28 CS 4° C, full sun, clear sky.

Number of observers: 6

HABITAT:- Dunes, Grassland, Trees, Acacia, Triodia, Cane Grass

Survey point 1	Right: 	Left: 		
	Habitat:	Habitat:		
Transect A				
	Tracks:	Tracks:	Tracks:	Tracks:
Survey point 2	Right: Nil photo	Left: Nil photo		
	Dune with small trees, croatalaria			
Transect B				
	Tracks:	Tracks:	Scaevola sp.	Scaevola sp.
				
	Rabbit warren	Habitat:		
Survey point 3				
	Dune tussock with small shrubs			
Transect C				
	Goodenia sp.	Goodenia sp.	Grasses; Ptilotus polystachyus	Swainsona sp.

				
	Swainsona sp.	Desert rattlepod	Ptilotus obovatus	Ptilotus obovatus
				
	Habitat	Scats and tracks		
Survey point 4				
	Habitat:	Habitat:		
Transect D				
	Habitat:	Sandhill Acacia		
Transect H				
	Habitat:	Habitat:	Habitat:	
Survey point 7	Right: 	Left: 		
	Habitat:	Habitat:		
Transect G				
	Habitat:	Habitat:	Ant nest	
				
	Mammal tracks	Mammal tracks	Mammal tracks	

Survey point 6	Right: 	Left: 		
	Frog heard in the channel; rabbit seen in this area.	Whitewood		
Transect F				
	Habitat:	Habitat:		
Survey point 5	Right: 	Left: 		
	Habitat:	Habitat:	Habitat:	
Transect E				
	Habitat:	Habitat:	Soil degradation evident as a result of cattle traffic.	

**Census stop 2** 12-08-2013 Commenced 7.45am

Fine sunny morning, gentle 10-20 knot s/w breeze

Number of observers: 6

HABITAT:- Dunes, Hakea, , Tussock Grass

Survey point 1	Right: 	Left: 		
	Habitat:	Habitat:		
Transect A				
	Tracks:	Tracks:	Tracks:	
Survey point 2	Right: 	Left: 		
	Dune with bloodwood, small trees			
Transect B				
	Rabbit warren	Poached egg daisy		
Survey point 3	Right: 	Left: 		
	Dune tussock grassland			
Transect C				
	Zebra finches			
Survey point 4	Right: 	Left: 		
	Tussock grassland swale	Hakea leucoptera		

Transect D				
	Fresh feral horse droppings			
Transect H				
			Tussock grass, Dunes, Whitewood trees (no photographs)	
Survey point 7	Right: 	Left: 		
	Dune, Tussock Grass, Senna, Sandhill Wattle			
Transect G	 Poached egg daisy	 Triodia	 Sandhill wattle	
				
Survey point 6	Right: 	Left: 		
	Habitat:	Habitat:	Habitat:	Tracks:
Transect F				
	Tracks:	Tracks:	Tracks:	Tracks:
				
	Tracks:	Desert Rattlepod	Habitat:	

Survey point 5	Right: 	Left: 		
	Habitat:	Desert Rattlepod	Habitat:	
Transect E		Wide swale, Whitewood, tussock grass		
	Whitewood			

**Census stop 3** 12-08-2013 Commenced 10.15am

Wind 20 knots S/WE 30 ° C, clear sky.

Number of observers: 6

HABITAT:- Gibber, Tussock grass.

Survey point 1	Right: 	Left: 		
	Habitat:	Habitat:		
Transect A	No photo			
	Gibber, tussock grass			
Survey point 2	Right: 	Left: 		
	Gibber plain	Gibber plain		
Transect B	No photo			
Survey point 3	Right: 	Left: 		
	Gibber plain	Gibber plain		
Transect C				
	Gibber plain	Gibber stone		
Survey point 4	Right: 	Left: 		
	Gibber plain	Gibber plain		

Transect D				
	Gibber stone			
Transect H				
	Tussock grass and Gibber			
Survey point 7	Right: 	Left: 		
	Tussock grass	Tussock grass		
Transect G	Tussock grass thinly spread with Whitewood, Rattlepod and a dune (no photo)			
	Horse hoof prints seen in this area and a glass beer bottle			
Survey point 6	Right: 	Left: 		
	Tussock grass	Tussock grass		
Transect F				
	Tussock grass, sparse Whitewood			
Survey point 5	Right: 	Left: 		
	Gibber, Tussock grass. Creek line 250m away, some trees in flower.			
Transect E				
	Paper daisy			

**Census stop 4** 12-08-2013 Commenced 3.42pm  
Slight Breeze 30 ° C, sunshine, clear sky.

Number of observers: 6

Habitat: Tussock, Grassland and Dunes.

Census Stop 4 Marker is not clearly visible from the road due to plant growth.

Survey point 1	Right: 	Left: 		
	Habitat:	Habitat:		
Transect A	No photo			
Survey point 2	Right: 	Left: 		
	Dune, tussock grassland			
Transect B				
	Whitewood	Whitewood	Tracks	
Survey point 3	Right: 	Left: 		
	Habitat:	Habitat:		
Transect C	No photo			
Survey point 4	Right: 	Left: 		
	Dune crest, tussock grass			
Transect D	No photo			

Transect H				
	Sour Plum Tree (or Emu Apple)		Scaevola spinescens	Pterocaulon sp.
		Grasshoppers heard all along this transect. There was also a disused rabbit warren and numerous lizard holes.		
	Grevillea (Beef Wood)			
Survey point 7	Right: 	Left: 		
	Tussock grass and Gibber			
Transect G				
	Tussock grass, some Gibber, Dunes, Senna, Rattlepod,			
Survey point 6	Right: 	Left: 		
	Tussock grass, flowering Corymbia			
Transect F	Flowering Mulga and Tussock grass (no photographs) (evidence of disused rabbit warren)			
Survey point 5	Right: 	Left: 		
	Tussock grass, Dunes, Sandhill Wattle		Rabbit warren	Whitewood
Transect E				
	White-wood, sand dune, tussock grass, Rattle Pod		Tracks:	Tracks:
		(NOTE:- a 44 Gallon Drum on the left side of the track, 30 metres off the road between Census Stop 4 and 5)		
	Ptilotus obovatus			

**Census stop 5** 13-08-2013 Commenced 7.42am

Very slight breeze 5 knots S/East. Bright Sun

Number of observers: 6

HABITAT:- Tussock grass, Whitewood Trees.

Survey point 1	Right: 	Left: 		
	Habitat:	Habitat:		
Transect A				
	Tracks:	Tracks:		
Survey point 2	Right: 	Left: 		
	Triodia and tussock grass			
Transect B				
	Trachymene sp.	Paper daisy	Paper daisy	Scaevola spinescens
				
	Scaevola spinescens	Senna pleurocarpa	Senna pleurocarpa	Acacia ligulata
Survey point 3	Right: 	Left: 		
	Tussock grassland, scattered small trees			
Transect C				
	Croatalaria cunninghamii		Tracks:	Pterocaulon sp.

				
	Pterocaulon sp.	Habitat:		
Survey point 4	Right: 	Left: 		
	Tussock grassland			
Transect D				
	Pterocaulon sp.		Maireana sp.	
				
	Frankenia sp.		Tracks:	Skull ?dingo
				
	Tracks:	Paper daisy		
Transect H				
	Grevillea in pod	Prints possibly cat	Prints possibly cat	Rabbit warren
	Tussock grass, Dune, Rattlepod, Whitewood			
Survey point 7	Right: 	Left: 		
	Habitat:	Habitat:		
Transect G				
	Habitat:	Sand plain between dunes and claypan to right	Evidence of previous rabbit infestation	Ant nest
	Tussock grass, Dune, Whitewood, Hakea leucoptera,			

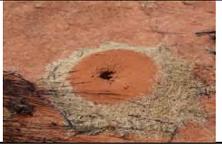
Survey point 6	Right: 	Left: 		
	Habitat:	Habitat:		
Transect F				
	Tracks:	Tracks ?cat	Tracks:	Tracks:
	Tussock grass, Beefwood, Grevillea stricta, Hop Bush (no pictures)			
Survey point 5	Right: 	Left: 		
	Tussock grass and Whitewood			
Transect E				
	Tracks ?cat	Sandhill Wattle	Sandhill Wattle	Tracks ?cat
	Tussock grass, White-wood, Dune, Sandhill wattle (no photographs)			
	Between Census Stop 5 and Census Stop 6 it was evident that this area had not been burnt recently. Earlier survey points showed burnt areas and regrowth.			

**Census stop 6**      13-08-2013    Commenced 9.57am  
 Breeze 5-10 knots, S-SE, Bright Sunlight, 18-20°.

Number of observers: 6

HABITAT:- Tussock grass, Whitewood.

Survey point 1	Right: 	Left: 		
	Habitat:	Habitat:		
Transect A				
	Tracks:			
Survey point 2	Right: 	Left: 		
	Tussock, Hakea sp.	Hakea sp.		
Transect B				
	Eremophila sp.			
Survey point 3	Right: 	Left: 		
	Dune, shrubland			
Transect C				
	Paper daisy		Maireana sp.	
				
	Hakea sp.			
Survey point 4	Right:	Left:		

				
	Tussock grassland, sparse shrubs			
Transect D				
	Saltbush		Locust	
Transect H	Tussock grass, Bare earth (no photographs)			
Survey point 7	Right: 	Left: 		
	Tussock grass			
Transect G				
	Large rabbit warren, old	Growth along dune	Trachymene sp. (Wild parsnip)	
	Tussock grass, Dune, Rattlepod, Bare earth (photographs not taken)			
				
	Wild parsnip. Evidence of old fire	Ant nest		
Survey point 6	Right: 	Left: 		
	Tussock grass, Bare earth (evidence of old fire)			
Transect F				
	Poached egg daisy	Poached egg daisy. Evidence of burning	Evidence of fire	
	Tussock grass, Bare earth, Dune, Rattlepod (no photographs)			

Survey point 5	Right: 	Left: 		
	Bare earth, Tussock grass	Hakea leucoptera		
Transect E				
	Tussock grass, Bare earth, Sand flat, White-wood			
	Locusts were plentiful in this area, good feeding for insectivorous birds.			

**Census stop 7**

**The distance between Census Stop 8 and Census Stop 7 is 7.3 km in length rather than 10 km.**

**Census Stop 8 was surveyed before Census Stop 7.**

CENSUS STOP 7 14-08-2013 Commenced 10.06am

Cloudy, light stratus, 80% cover. Breeze N/W 5 knots.

Number of observers: 6

HABITAT:- Tussock grass.

Survey point 1	Right: 	Left: 		
	Habitat:	Habitat:		
Transect A				
	Ptilotus sp., paper daisy		Grassland	Scats:
				
	Paper daisy	Habitat:	Tracks:	Tracks:
Survey point 2	Right: 	Left: 		
	Dune tussock grassland			
Transect B				
	Locust	Lesser wanderer	Tracks:	Tracks:
				
	Poached egg daisy, Triodia	Habitat:	Burnt Triodia	Calandrinia sp.

Survey point 3	Right: 	Left: 		
	Tussock grassland			
Transect C				
	Psoralea patens		Trichodesma zeylanicum (cattlebush)	
				
	Hibiscus sp.	Scats		
Survey point 4	Right: 	Left: 		
	Tussock grassland			
Transect D				
	Indigophera sp.	Triodia	Ptilotus polystachyus	Croatalaria cunninghamii
Transect H	Tussock grass, Cross road, Fairy grass, Dune, (fresh evidence of cattle at this point)			
Survey point 7	Right: 	Left: 		
	Edge of dune, some tussock grass			
Transect G				
	Dune, tussock grass, Rattlepod, Poached egg daisy, Bare earth			Ptilotus polystachyus
Survey point 6	Right: 	Left: 		
	Burnt trees, low grass, swale between dunes			

Transect F	Dune, Triodia, Tussock grass	NOTES: Cattle seen over the dune. There was a cross road on the dune.		
Survey point 5	Right: 	Left: 		Just off Dune. Some Triodia, Tussock grass
	Habitat:	Habitat:	Nankeen kestrel	
Transect E	Dune, Tussock grass, Triodia, small amount of Rattlepod and one Whitewood			
	A clay pan was off the dune and there was a significant amount of cow manure			
		Scat – kangaroo?		

**The distance between Census Stop 8 and Census Stop 7 is 7.3ks in length rather than 10.**

**Census Stop 8 was surveyed before Census Stop 7.**

**Census stop 8** 14-08-2013 Commenced 7.51am  
 Fine, mild. 8/10<sup>th</sup> Cloud Strata Cumulus. Wind 0-5 knots.

Number of observers: 6

HABITAT:- Tussock grass, Senna, Dune rise.

Survey point 1	Right: 	Left: 		
	Habitat:	Habitat:		
Transect A				
	Sclerolaena bicornis	Grassland	Scats	
				
		Senna sp.	Maireana sp.	Reptile burrow
Survey point 2	Right: 	Left: 		
	Tussock with Senna sp., Eremophila sp., Hakea sp.			
Transect B				
	Tracks:	Ptilotus polystachyus	Hakea sp.	
				
	Acacia and melaleuca sp.	Melaleuca uncinata	Euphorbia tannensis	

Survey point 3	Right: 	Left: 		
	Dune slope, unburnt , Dodonea, Grevillea, Senna			
Transect C				
	Swainsona sp.	Dune	Swainsona sp.	Calotis sp.
				
	Ephemeral wetland	Goodenia sp.	Dune	Poached egg daisy
Survey point 4	Right: 	Left: 		
	Swale - tussock			
Transect D				
	Brassicaceae sp.		Ptilotus spp.	
Transect H	Tussock grass, Dune, Senna, Triodia, Rattlepod on Dune crest			
				
	Tracks:	Ptilotus obovatus	Small rodent burrow	
				
	Old markers	Dog prints		
Survey point 7	Right: 	Left: 		
	Tussock grass, Bare earth, Hakea leucoptera, Blue bush, Maireana sp.			

Transect G				
	Maireana campanulata	Habitat:	Evidence of horse and cattle hooves	Bird prints when earth was wet. Swamp vegetation, Lignum
	Roadway, patches of bare earth up to dune, Tussock grass, Triodia, Senna			
Survey point 6	Right: 	Left: 		
	Tussock grass, Senna on side of dune, Triodia			
Transect F				
	Tracks:	Tracks:	Evidence of cattle	Seed Burst Helichrysum sp. (Paper daisy)
	Side of dune, Tussock grass, Triodia, Wattle, Hop bush			
Survey point 5	Right: 	Left: 		
	Tussock grass			
Transect E				
	Fairy grass	Tracks:	Ant hole	Road crossing
	Fairy grass, Senna, Tussock grass, some Triodia, Emu bush, Mulga, Hop bush			
	Many grasshoppers heard throughout this Census Point.			

CENSUS STOPS WERE NOT DONE IN ORDER AT THIS POINT.  
 CENSUS STOP 9 DONE BEFORE CENSUS STOP 8 AND CENSUS STOP 7.

**Census stop 9** 13-08-2013 Commenced 3.58pm  
 Fine. 0-5 knot breeze. Sunny

Number of observers: 6

HABITAT:- Tussock Grass, Dune.

Survey point 1	Right: 	Left: 		
	Habitat:	Habitat:	Wild parsnip	
Transect A				
	Trachymene sp. (Wild parsnip)		Euphorbia tannensis	
				
	Tracks:	Tracks:		
Survey point 2	Right: 	Left: 		
	Dune, tussock grass, sparse Senna			
Transect B				
	Tracks:	Tracks:	Dune with grasses	Swainsona sp.
				
	Paper daisy			
Survey point 3	Right: 	Left: 		
	Tussock grassland			

Transect C				
	Tracks:	Tracks:	Wild parsnip	Lesser wanderer
Survey point 4	Right: 	Left: 		
	Grassland, grevillea, acacia, dodonea			
Transect D				
	Tracks:	Tracks:	Tracks:	Senecio gregorii
Transect H				
	Nature's bowls	Daisy		
	Dune, Tussock grass, Rattlepod, Senna.			
	NOTES:-aluminium can with bullet holes near this point, along with evidence of cattle, not recent, perhaps a couple of months ago. Horse manure, not recent.			
Survey point 7	Right: 	Left: 		
	Dune, Tussock grass, Triodia			
Transect G	Tussock grass, dune, small amount of Triodia with no sign of recent burning. (No photographs taken). Grasshoppers heard. Poached egg daisy. Grevillea.			
Survey point 6	Right: 	Left: 		
	Hop bush, Tussock grass, Triodia on top of dune			
Transect F				
	Emu print	Eremophila sp. (Emu bush)		Emu print
	Triodia, Tussock grass, Emu bush, Desert Wattle on top of dune			

				
	Wattle Blossom ?	Tracks:		
Survey point 5	Right: 	Left: 		
	Triodia, Tussock grass on top of Dune			
Transect E				
	Tussock grass, Dune, Rattlepod, some Triodia			
	Evidence of cattle	NOTES:- Cattle between Survey points 8 and 9, 30 head, mixture of bulls, cows and calves at foot.		

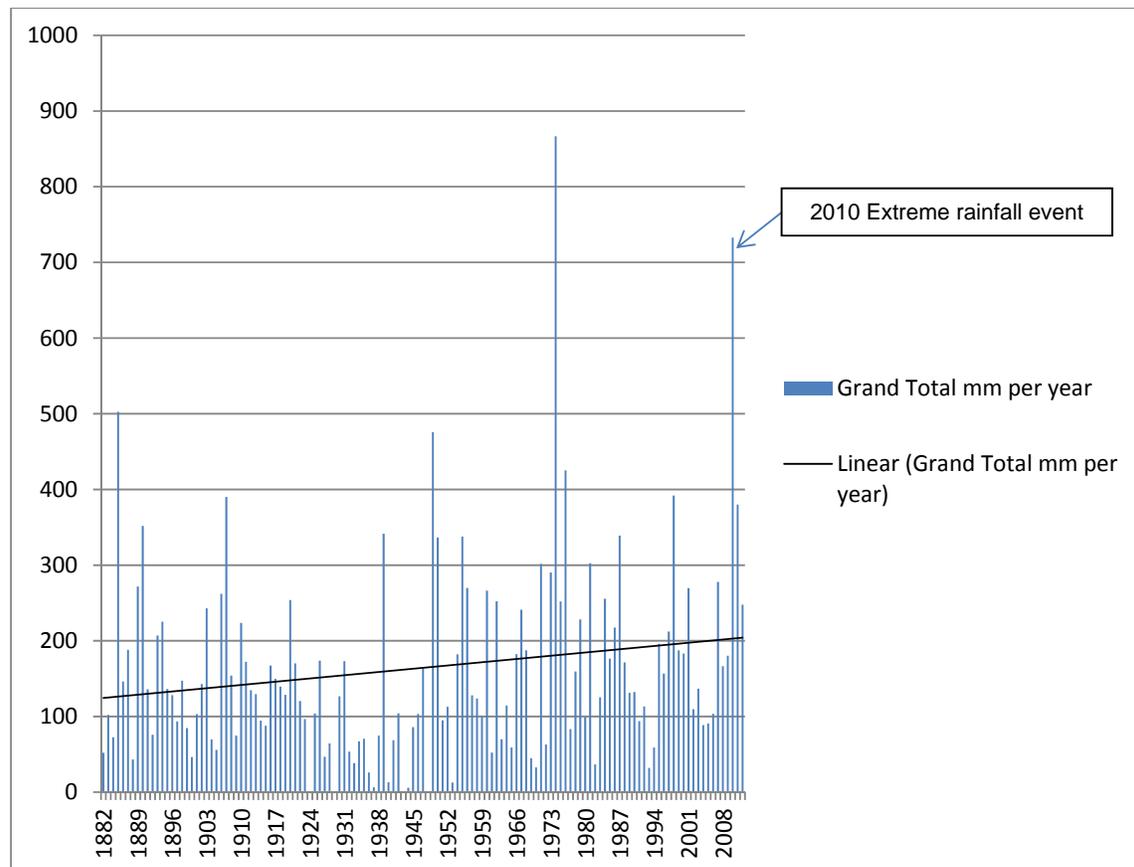
### APPENDIX III – CLIMATE

The area surveyed falls within the arid zone of north-east South Australia.

The closest weather station to the Bore Track is Bureau of Meteorology station number 17028 at Innamincka Station. The rainfall record for this station goes back to 1882.

The significant change indicated by the rainfall figures is that there has been an increase in rainfall in this area over the period for which there are records (Fig. 1). This trend is present in spite of the extreme variability in rainfall from year to year and month to month.

Data for other climatic factors are not readily available for this area.



**Fig.1 Innamincka Station rainfall grand total per year and trend**

Annual rainfall is extremely variable but has shown an upward trend over the last 130 years.

Source: Bureau of Meteorology.