



Greater Bilby Survey: La Grange Project Area

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Department of Biodiversity, Conservation and Attractions

In partnership with:



Progress Report

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1 Introduction

The La Grange region of the south-west Kimberley, Western Australia, has been investigated as an area for agricultural development for pastoralists, horticulturalists and Traditional Owners by the Department of Primary Industries and Regional Development (DPIRD). Through funding from Royalties for Regions, the La Grange Agriculture Opportunities project was established in 2012 and has assessed the potential for expanding irrigated agriculture in the region, including studies on soil, groundwater from the Broome Sandstone aquifer, land tenure, markets and investment opportunities. Through soil and hydrological studies, DPIRD has identified areas in the La Grange project area that are optimal for irrigated agriculture (Department of Agriculture and Food WA (DAFWA) 2016a, DAFWA 2016b).

The La Grange region encompasses a long, linear area extending along the coastline between Broome and Sandfire (Figure 1). Tenure in the La Grange region is mostly pastoral lease, and includes Roebuck Plains, Thangoo, Frazier Downs, Nita Downs, Anna Plains, Wallal and Mandora Stations. Horticultural production is conducted on the Shelamar lease, while Mandora Marsh / Walyarta was transferred to conservation tenure in 2015. Most of the La Grange region occurs in the southern extent of the Dampierland biogeographic region, extending into the Great Sandy Desert bioregion along its eastern margin.

Although both flora and fauna of conservation significance are known to occur in the La Grange region, it also coincides with the area identified nationally as a stronghold for the continued persistence and survival of wild greater bilby (*Macrotis lagotis*) populations. No coordinated systematic surveys or monitoring of bilby populations have occurred in this area, and the status of bilby populations has not been documented. This project consists of two major components: an occupancy survey and an assessment of abundance at selected populations (numbers of animals within populations). This information will enable a model of the distribution of bilby within the La Grange Project Area to be constructed and will deliver outputs that inform and provide context for environmental impact assessment processes. The La Grange Project Area extends from Roebuck Plains Station to Mandora Station - Walyarta Conservation Park.

This survey project is a partnership between the Department of Biodiversity, Conservation and Attractions (DBCA), Traditional Owner Ranger groups and the Western Australian Biodiversity Science Institute. Traditional Owner Ranger groups operating within the La Grange flora survey area are the Karajarri Rangers, Nyangumarta Rangers and Yawuru Country Managers. Head agreements and supporting Fee-for-Service Schedules were developed with these Traditional Owners and their representative bodies. This report documents progress to the end of September 2017.

2 Methods

2.1 Project Aims

This project seeks to enhance knowledge of bilbies in the La Grange area through surveys to determine presence or absence, assessing abundance of bilbies at key populations through analysis of DNA from scats, and development of a distribution model for bilbies in relation to habitat.

The survey results will inform land use planning and sustainable agriculture development in the La Grange area and assist with the assessment of impacts of individual development proposals by setting them in a broader, regional context.

2.2 Planning

Planning and allocation of plots for Ranger groups was undertaken in late May to early June 2017. Bilby occupancy was surveyed using a standard 2 ha sign plot technique (Southgate *et al.* submitted). Numbers of plots were allocated to each Ranger group based on the proportion of Native Title of each group within the project area. The breakdown of plot allocation is shown in Table 1. Initially, a total of 310 sign plots were proposed to be surveyed, stratified across the La Grange Project Area focusing on the Optimised Agriculture Area (Figure 1). Sampling of these plots was to be repeated within two to four months of establishment. Repeat sampling was required to account for imperfect detection (MacKenzie *et al.* 2006). The majority (90% of sign plots) were allocated to the Optimised Agriculture Area and the rest to a 50km buffer. From the occupancy surveys, three active bilby populations were selected to measure abundance of individuals as determined by genotyping of DNA extracted from quantitatively sampled scats (Dziminski and Carpenter 2016; Dziminski and Carpenter 2017).

Table 1. Plots allocated to Ranger groups.

Area	Number of Phase 1 plots (Jun/Jul)	Number of Phase 2 plots (Aug/Sep/Oct)	Total plots	Survey days
Karajarri	206	206	412	69
Nyangumarta	26	26	52	9
Yawuru	34	34	68	11
Shared Country	25	25	50	8
UCL	14	14	28	6
Total	305	305		103

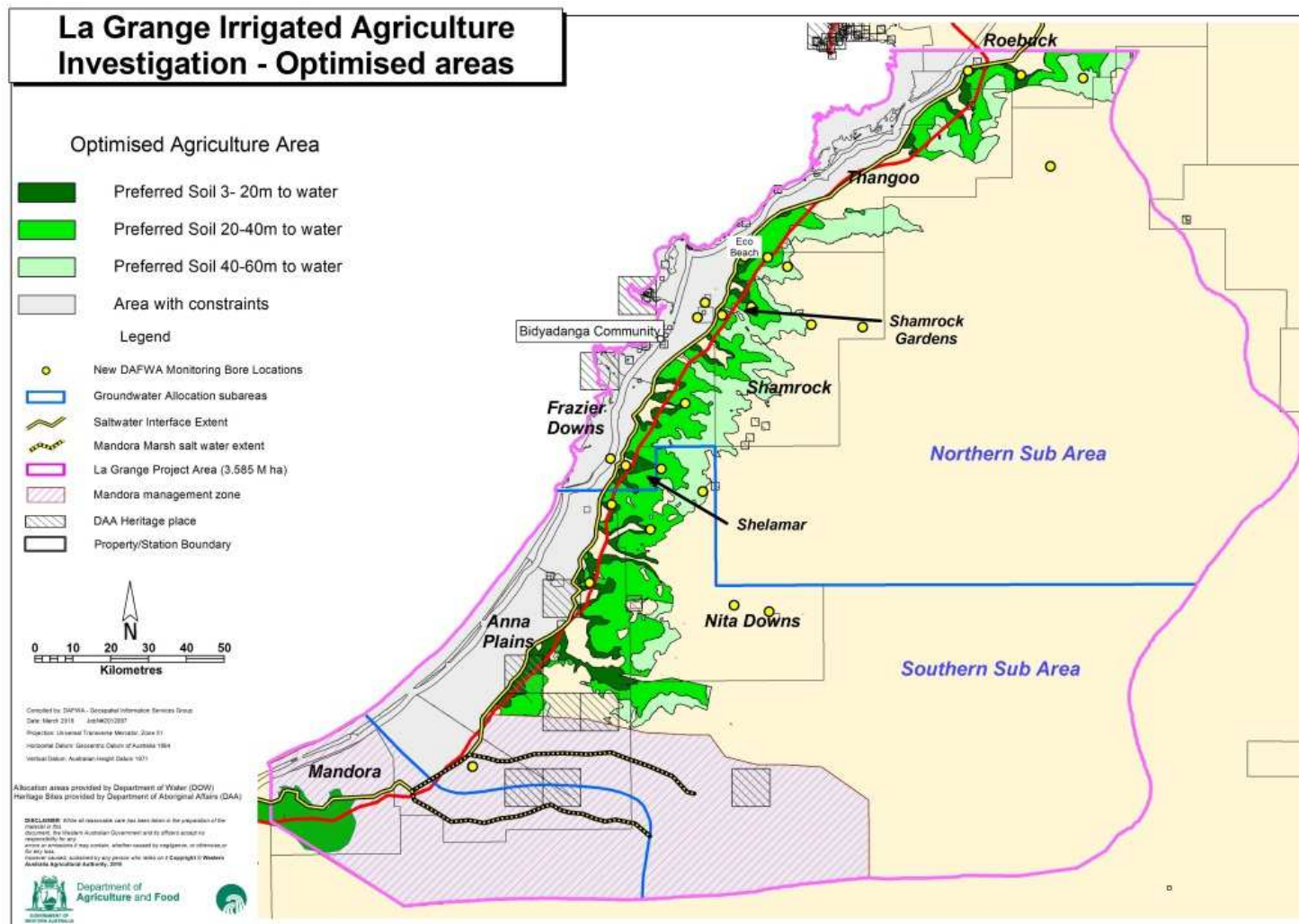


Figure 1. The La Grange Optimal Irrigation Areas, as identified by DPIRD in the La Grange Agriculture Opportunities Project (DAFWA 2016a).

2.3 Training

An information, training and planning workshop was undertaken with Karajarri and Nyangumarta Rangers in Bidyadanga over two days (24-25 May 2017). Yawuru had already received training as part of the Dampier Peninsula Greater Bilby offset project.

Training and revision was provided on:

- Survey techniques
- Identification and verification of animal sign
- Identification of key food resources and plants that are important for bilbies
- Collection and storage of DNA samples
- Digital data capture and management.

Ranger groups were provided with digital devices (tablets) with the required data capture software. Groups were briefed on numbers of plots required to be completed, populations for abundance surveys and project timelines. With guidance from Departmental staff, Ranger groups planned and mapped out proposed plot locations based on their knowledge of country.

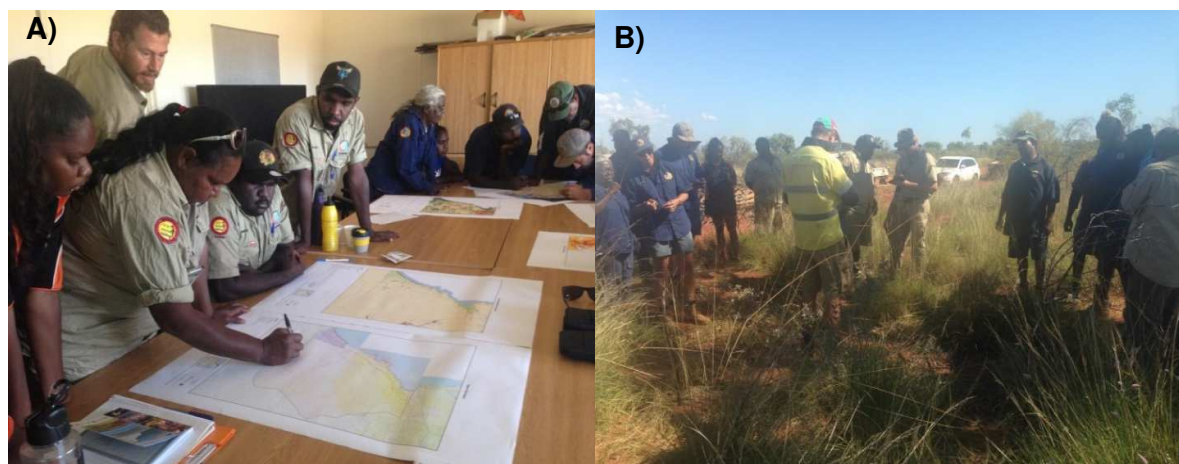


Figure 2. The information, planning and training workshop included: A) planning and coordination sessions with Rangers, and B) field based training in survey and data collection.

2.4 Information for stakeholders

A project information sheet and associated frequently asked questions were prepared and, under a cover letter from the Executive Director, Department of Primary Industries and Regional Development, were distributed to relevant stakeholders in July. Subsequent verbal communication to arrange access was undertaken by the Department of Biodiversity, Conservation and Attractions (DBCA) with all land managers in the La Grange Project Area.

2.5 Land Access

The majority of localities within the Project Area occur on pastoral leases thereby necessitating the need to gain permission to access. Through liaison and negotiation and assistance from the Department of Water and Environmental Regulation, access to most localities was provided, although some restrictions required reconsideration of the design and extent of the survey.

Restricted vehicle access on tracks, particularly to localities east of the Great Northern Highway from the Dampierland into the Great Sandy Desert bioregion, resulted in poor spatial coverage of sign plot surveys in this zone. While some of the tracks are shown on maps, many of these were in poor condition and impassable. This applied to all except one track to the north-east and east of Nita Downs. There was no vehicle access in almost all of the remainder of the eastern areas except for the Dampier Downs Road in the far north-east and an east-west track in Walyarta Conservation Park.

3 Survey results

3.1 Occupancy survey

The first phase of 2 ha sign plot surveys were commenced by Yawuru Country Managers and Karajarri and Nyangumarta Rangers with assistance from DBCA staff in June 2017. The locations of the first phase sign plots are shown in Figure 3.

Data from 277 plot surveys have been collated so far by Ranger groups, with 38 plots containing evidence of bilby occupancy (Figure 4). However, data from the second phase is required to account for imperfect detection before any assessments of occupancy rates are made. Bilby sign was verified on plots from a combination of the presence of tracks, scats, diggings into roots of plants containing root dwelling larvae (RDL) and active burrows (Figure 5) according to the protocol in Southgate *et al.* (submitted).

An amendment was made to the occupancy survey design after completion of the first phase. Approximately 50 plots have been repositioned rather than resurveyed, leaving approximately 260 plots to be resurveyed. These plots were repositioned because of limited access to some locations, unsuitability to detect sign and to ensure independence of sampling units. This will result in increased spatial coverage in the second phase, without compromising the resurvey of existing plots to account for imperfect detection requirements.

The second phase surveys were commenced by Nyangumarta and Karajarri Rangers at the end of July with some assistance from DBCA staff. These will be completed by the mid-October. Yawuru Country Managers are due to complete their second phase surveys on Thangoo Station, Roebuck Plains Station and UCL by early October.

3.2 Other Conservation Significant Fauna

At least 33 other animal taxa were detected on sign plots (Table 2), including feral predators and introduced herbivores, both of which are threats to bilby populations (Woinarski *et al.* 2014; Bradley *et al.* 2015). Mulgara (*Dasyercus* sp.) have likely been detected in the La Grange Project Area (Table 2). While evidence of burrows, scats and tracks were found, the presence of this species is yet to be confirmed with deployment of remote cameras. The mainland spectacled hare-wallaby (*Lagorchestes conspicillatus leichhardtii*) was also detected in the La Grange Project Area (Figure 3; Figure 6). This species is listed as P3 Priority Fauna in Western Australia.

Table 2. Animal taxa detected on sign plots.

Animal	Frequency of observations
Feral predators	
Cat	130
Fox	16
Introduced herbivores	
Camel	32
Cow	236
Horse	3
Mammals	
Bilby	38
Dingo	75
Echidna	1
Hopping mouse	70
Mulgara/Ampurta	8
Macropods	
Agile Wallaby	77
Euro	11
Kangaroo - unknown	40
Northern Nailtail-wallaby	1
Red Kangaroo	19
Spectacled Hare-wallaby	14
Wallaby - unknown	48
Birds	
Bird - unknown	79
Bush Turkey (Bustard)	62
Curlew	6
Emu	1
Quail	34
Reptiles and amphibians	
Bluetongue	4
Frog	5
Goanna - large	86
Great Desert Skink	1
Lizard	123
Sand slider (<i>Lerista</i>)	96
Snake - python	4
Snake	17
Thorny devil	1

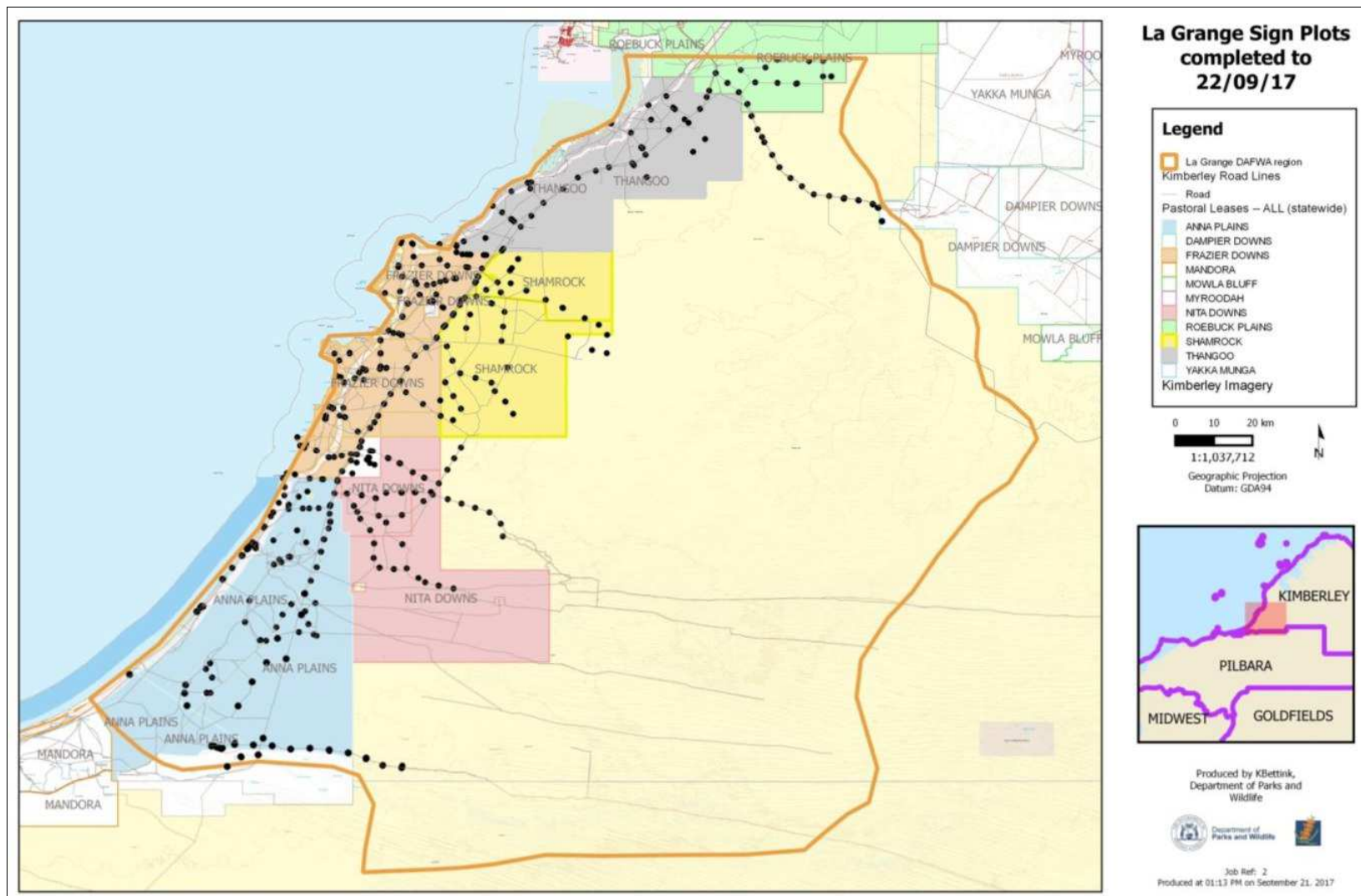


Figure 3. Locations of 2 ha sign plots (●) for the first phase of the bilby occupancy survey in the La Grange Project Area.

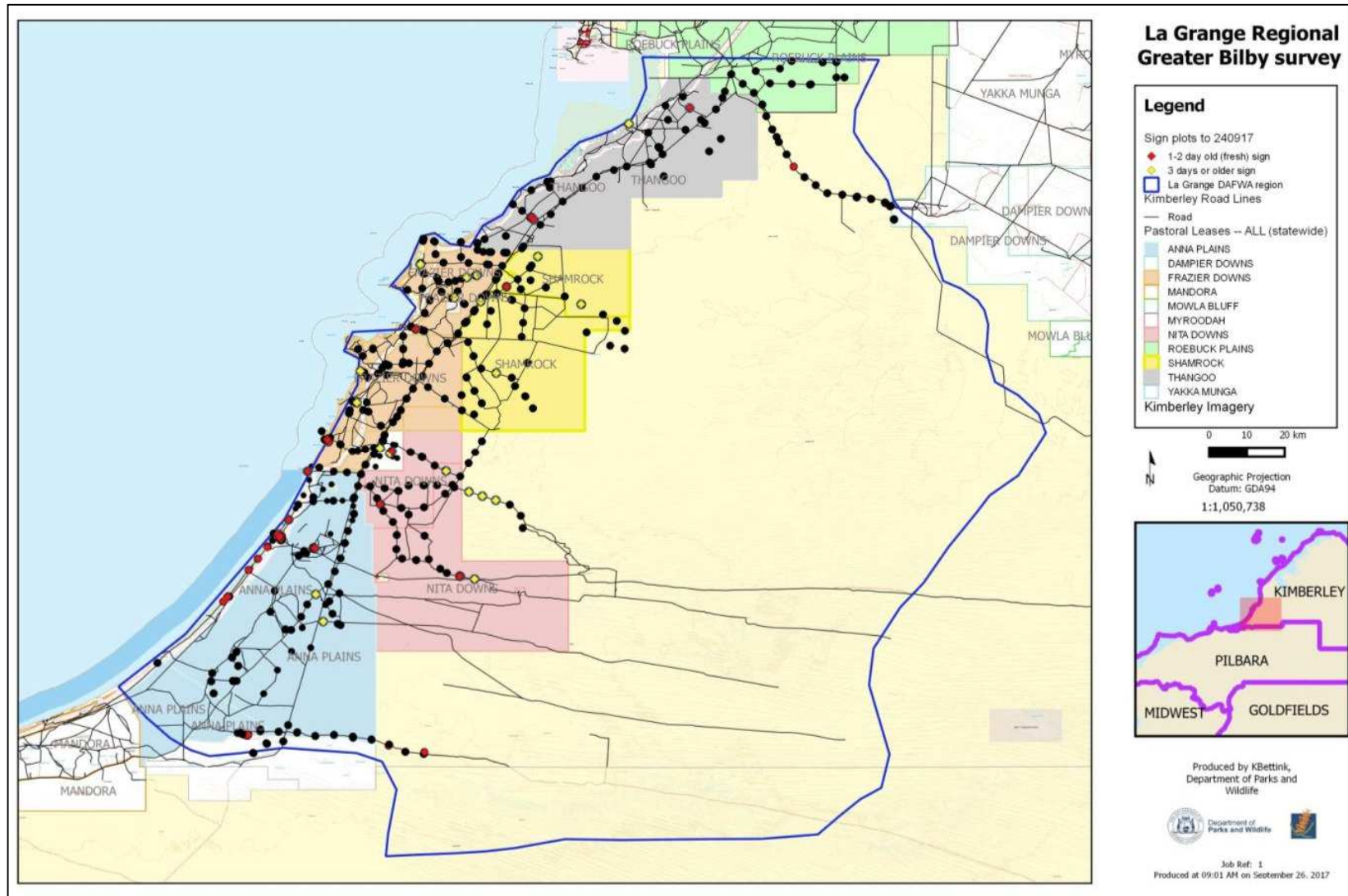


Figure 4. Locations of 2 ha sign plots where fresh (●) and older (○) bilby sign was recorded for the first phase of the bilby occupancy survey in the La Grange Project Area.



Figure 5. Bilby signs: A) scats, B) tracks, C) burrow and D) diggings into roots of plants that contain root-dwelling larvae (RDL).



Figure 6. Scats of three macropod species recorded in one sign plot adjacent to the Great Northern Highway; clockwise from top right: red kangaroo (*Macropus rufus*), spectacled hare-wallaby (*Lagorchestes conspicillatus leichardti*) and agile wallaby (*Macropus agilis*).

3.3 *Abundance surveys*

Three bilby populations identified from the first phase of the occupancy survey were selected to measure abundance of bilbies within these populations (Figure 7). Sites were selected to gain a broad representation of habitats from coastal grassland to a central and eastern site in the La Grange Project Area. All three populations were located on pastoral leases (Anna Plains, Nita Downs and Thangoo Stations).

The technique described in Dziminski and Carpenter (2017) is being used to measure abundance at these populations. The technique involves:

1. Identifying a population and defining the boundaries of occupancy or alternatively defining a portion of a continuous area that is occupied by bilbies.
2. Overlaying transects to evenly sample the defined area.
3. Traversing transects, collecting scat samples and recording positional data (Figure 8 and 9).
4. Extracting DNA, PCR, fragment analysis and genotyping individuals from scat samples.
5. Analysis of spatial and genetic data and abundance.

Remote cameras were deployed for short periods during the abundance fieldwork at the Anna Plains and Nita Downs Stations study sites (see Figures 10 and 11).

Progress of work is outlined in Table 3. Sampling at the Nita Downs Station population was completed in late September. Laboratory analysis of samples from all three abundance study sites has commenced and is ongoing.

Table 3. Details of populations surveyed for abundance.

Population	Habitat	Fieldwork completed by	Number of samples collected
Anna Plains (Figure 1012)	Coastal grassland	Nyangumarta and Karajarri Rangers and DBCA staff (Figure)	242
Thangoo (Figure 13)	Pindan woodland/shrubland	Yawuru Country Managers and DBCA staff	13
Nita Downs	Western desert sandplain	Karajarri Rangers and DBCA staff	70

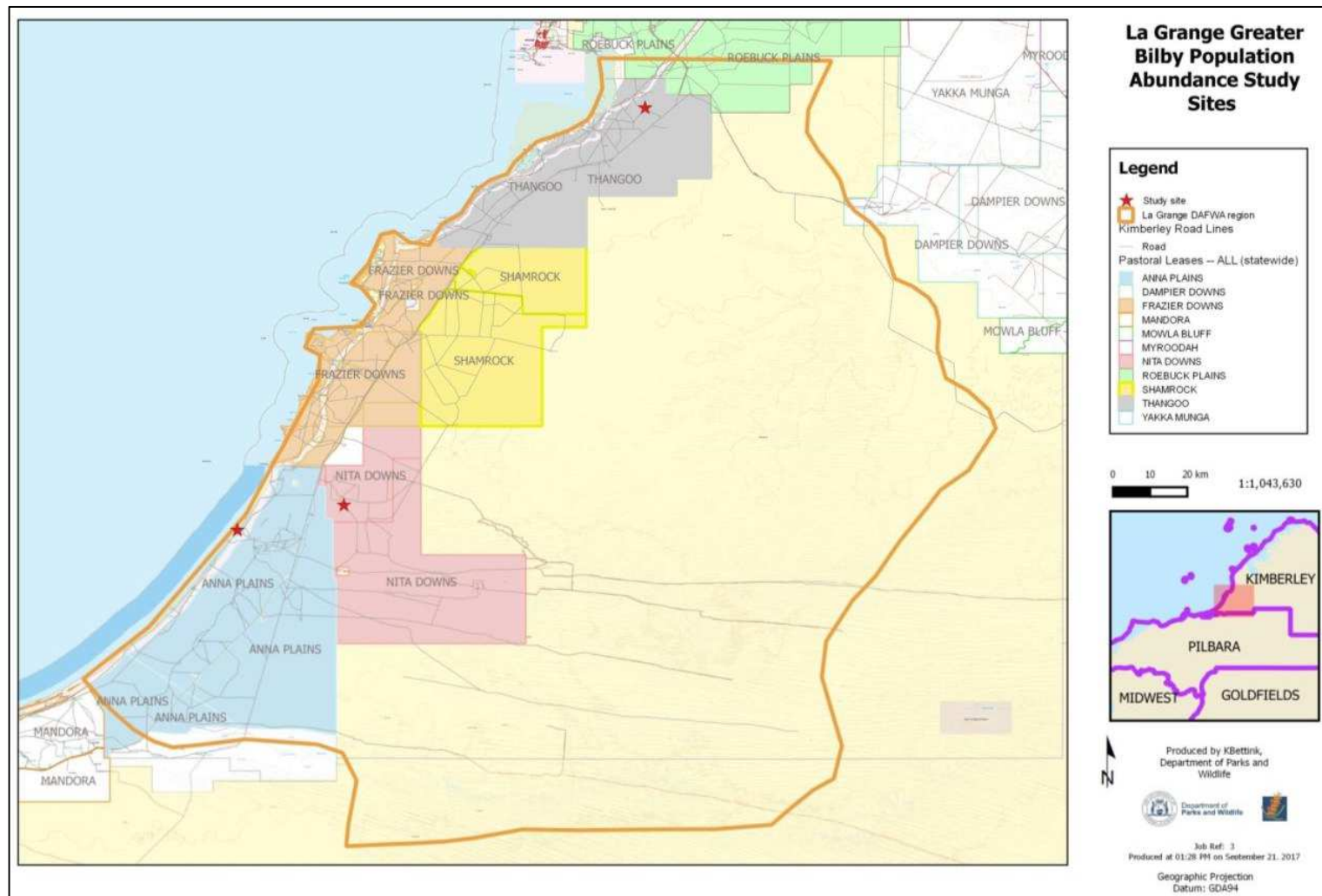


Figure 7. Locations of populations (★) selected for abundance monitoring.



Figure 8. Karajarri and Nyangumarta Rangers and Department of Biodiversity, Conservation and Attractions staff undertaking fieldwork to collect DNA samples for the abundance survey at the Anna Plains Station population.



Figure 9. Yawuru Country Manager Pius Gregory collecting DNA samples for the abundance survey at the Thangoo Station population.



Figure 10. Images of an adult bilby captured on a remote camera at the Anna Plains Station population.



Figure 11. Images of an adult bilby captured on a remote camera at the Nita Downs Station population.

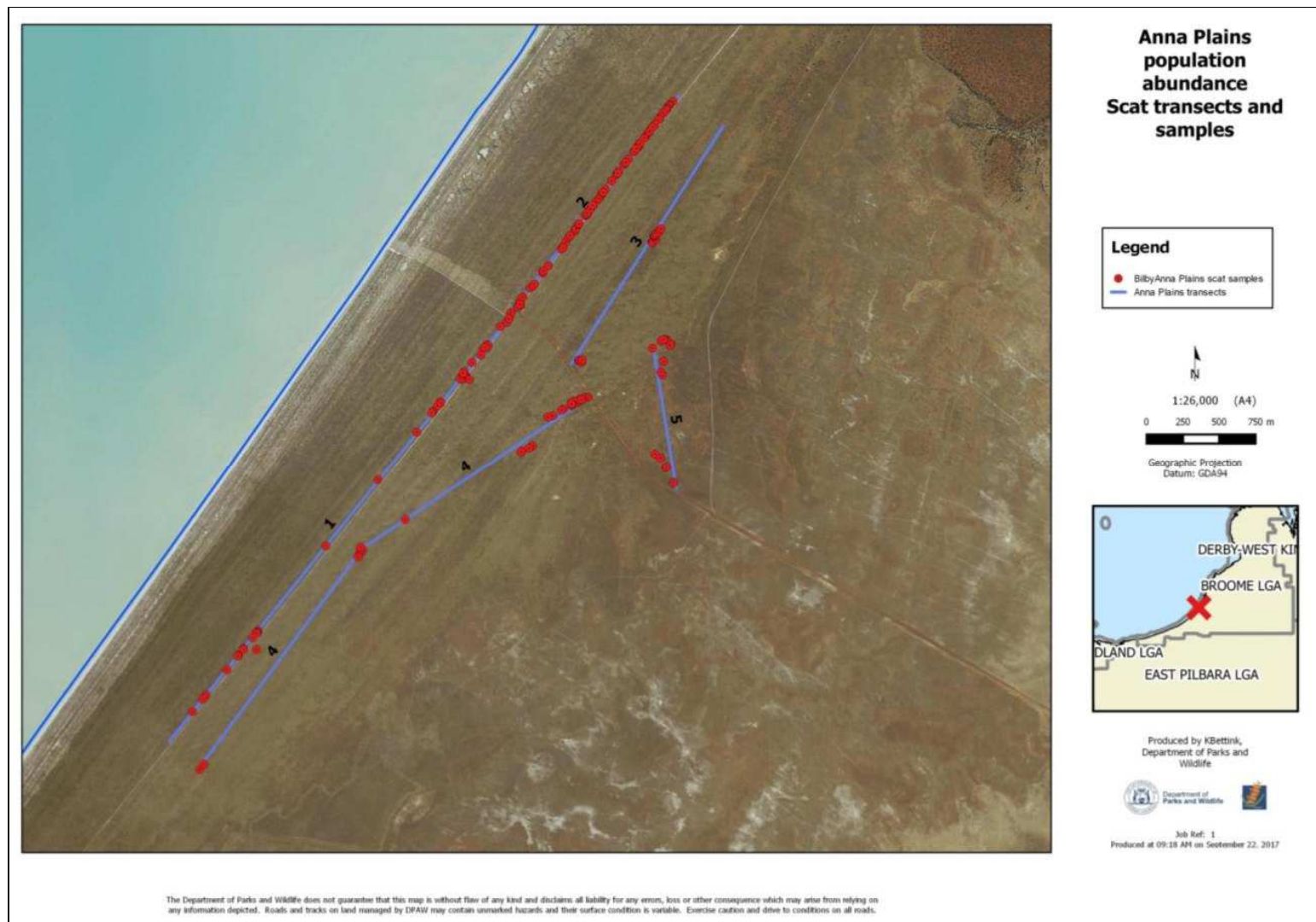


Figure 12. Transects (—) and scat samples (●) collected from the Anna Plains Station population.









Figure 13. Transects (—) and scat samples (●) collected from the Thangoo Station population.

3.4 Documented bilby habitat in the La Grange Project Area

Bilby sign was recorded within several major habitat types in the La Grange Project Area (Table 4). Populations were recorded in variations of pindan woodland and shrubland in areas directly west and east of the Great Northern Highway with root-dwelling larvae (RDL) plants comprising *Acacia eripoda*, *A. monticola*, *A. stellaticeps*, *A. colei* and *Senna notabilis*. Other important food plants observed in these areas included *Solanum* sp. and *Yakirra australiensis*. Previously undocumented habitats within close proximity of the coast consisted of *Whiteochloa airoides* grasslands and *A. bivenosa* shrublands, where a major food source was the native geophyte *Cyperus bulbosus* (bush onion).

Table 4. Major habitat types that bilby presence was recorded in within the La Grange Project Area.

Description	Major floristics and soils	Localities
Pindan shrubland and woodland	Variations of stands of <i>Acacia monticola</i> , <i>A. colei</i> , with/out <i>A. tumida</i> , <i>A. stellaticeps</i> , <i>A. trachycarpa</i> . Occasional <i>Corymbia</i> sp. Understory of <i>Triodia</i> sp, <i>Senna notabilis</i> on red pindan sands.	Central areas east and west of Great Northern Highway
		

Description	Major floristics and soils	Localities
<p>Closed pindan woodland</p>	<p><i>Acacia eriopoda</i> with occasional <i>Gyrocarpus americanus</i> and <i>Gardenia pyriformis</i>, <i>Corymbia</i> sp., <i>Senna notabilis</i>, mixed understory of grasses, herbs and shrubs, <i>Sida</i> sp., <i>Triodia</i> sp., <i>Chrysopogon pallidus</i> on compacted pindan sands.</p> 	<p>Central areas east and west of Great Northern Highway</p>
<p>Coastal <i>Acacia</i> shrubland</p>	<p><i>Acacia bivenosa</i>, <i>Crotalaria cunninghamii</i>, <i>Whiteochloa</i> sp. and <i>Cyperus bulbosus</i> on pink sand with shell fragments.</p>  	<p>Central west Thangoo Station, Anna Plains Station</p>
<p>Coastal grassland</p>	<p><i>Whiteochloa airoides</i>, <i>Acacia bivenosa</i>, <i>Cyperus bulbosus</i>, <i>Pterocaulon</i> sp. and <i>Ptilotus</i> sp. on pallid grey to white sands with coarse shell fragments.</p> 	<p>Adjacent to Eighty Mile Beach Marine Park, Anna Plains Station, southern Frazier Downs Station</p>
<p>Western desert shrub lands and grassland</p>	<p><i>Acacia</i> spp., and <i>Triodia</i> sp.</p> 	<p>Eastern areas of Walyarta Conservation Park, Nita Downs Station</p>

3.4 *Introduced predators*

Introduced predators (feral cat and fox) were recorded in survey plots (Figure 14). Foxes were recorded predominantly west of the Great Northern Highway while feral cats were recorded in high frequency throughout all surveyed areas (Table 2). These introduced predators increase bilby mortality through predation and disease, decreasing bilby abundance and further dissecting/fragmenting sub-populations through local extinctions. Foxes have been implicated as chiefly responsible for the extirpation of bilbies in the southern portion of their former range across Australia (Bradley *et al.* 2015).



Figure 14. Feral cat hunting at a bilby burrow at the Anna Plains Station population. Image captured by remote camera during population abundance field work in August 2017.

4 Ongoing work

The second phase of the occupancy survey (remaining second phase plot surveys that were delayed) is now scheduled to be completed in mid-October. It is also intended to undertake helicopter surveys in eastern / remote areas. Occupancy analysis, molecular laboratory work and analysis for the population abundance survey, and habitat distribution modelling will occur October-December.

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