PILLIGA EAST STATE FOREST KOALA SURVEY

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Project Summary: This report presents the findings of a one-day Koala survey conducted with a professional detection dog in June 2016 in Pilliga East State Forest, New South Wales, Australia.

Document preparation and distribution history

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Signed on behalf of OWAD Environment

Olivia Woosnam
Director
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Pilliga East State Forest Koala survey

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1.0 BACKGROUND AND PURPOSE OF THIS REPORT

OWAD Environment was engaged by Western Woodlands Alliance (WWA) to conduct a one-day survey of Koala *Phascolarctos cinereus* in Pilliga East State Forest, New South Wales, using Taz the professional Koala scat detection dog.

The purpose of this study was to gain an initial understanding of current presence/absence of Koalas across the areas assessed, based on presence/absence of the marsupial's characteristic scats (faecal pellets).

This report presents the findings of this study.

2.0 STUDY AREA

The Pilliga East State Forest is located in Narrabri Shire Council local government, New South Wales. It is situated 30km south of Narrabri and 60km northwest of Gunnedah (see **Figure 1**). The State Forest is approximately 1,350km^2 in size. At its widest, it is 70km East to West and 40km North to South.

3.0 METHODOLOGY

Koala presence/absence was inferred based on the presence/absence of the marsupial's characteristic scats. In order to (1) maximise the chances of detecting scats, (2) minimise bias and (3) assess a maximum amount of surface area, the field survey was conducted with the help of a professional Koala scat detection dog.

3.1 Selection of search areas

Prior to field survey, OWAD Environment discussed with local ecologist David Paull to determine where to concentrate the search effort. David had previously conducted Koala surveys through the region, and it was decided he would accompany OWAD Environment to take the study team to areas with the best chance of finding Koala presence. These areas included areas where Koala presence had been found in the past, or areas traditionally viewed as holding good Koala habitat values.

The objective was to conduct a maximum amount of searches in one day. As a result, search areas would have to be close to tracks accessible by car. Fortunately the Pilliga East State Forest has numerous 4WD access tracks throughout.

3.2 Field assessment

The field assessment was conducted by Olivia Woosnam (Senior Koala Ecologist), Alex Dudkowski (Field Ecologist) and Taz the professional detection dog on 7 June 2016. David Paull and Tania Marshall accompanied the study team for most of the day.

The study team used a handheld GPS (model Garmin GPSMap 78) to record the locations surveyed and the coordinates of any scats found.

This field assessment was conducted under OWAD Environment's Animal Ethics Permit № TRIM 15/2129 (NSW Department of Primary Industries), Scientific Licence № SL101634 (NSW Parks & Wildlife Service) and Research Permit № HF54587 (NSW Forestry Corporation).

Taz is a 4 year old English Springer Spaniel trained to detect and indicate on Koala scats. Taz was professionally trained by conservation dog expert Steve Austin. Olivia is the primary handler of Taz; Alex is her second handler. Both Alex and Olivia have received professional training and obtained certification to handle Taz.

Taz works off leash and starts searching when prompted by the handler. At each survey location, a search consisted in the detection dog scanning the ground layer for scats, as well as above the ground for any scats that may be stuck in branches/in bark along tree trunks/or actual Koalas in trees. (Note: when Taz indicates on Koalas, she is actually indicating on the scent of fresh faecal matter attached to the Koala's fur). Each search is timed and consists in the detection dog actively searching for 5 minutes. Where Koala scats are found, the time of the find is recorded and the timer is paused while the study team records details; the timer is resumed when the search resumes.

Taz searches non-discriminatorily at each location; she is not directed to any specific trees or tree species. On occasions she may be recalled by the handler e.g. if humans observe potential Koala scratch marks on a tree not assessed by the dog yet; or for safety reasons e.g. if approaching traffic or if going out of direct sight.

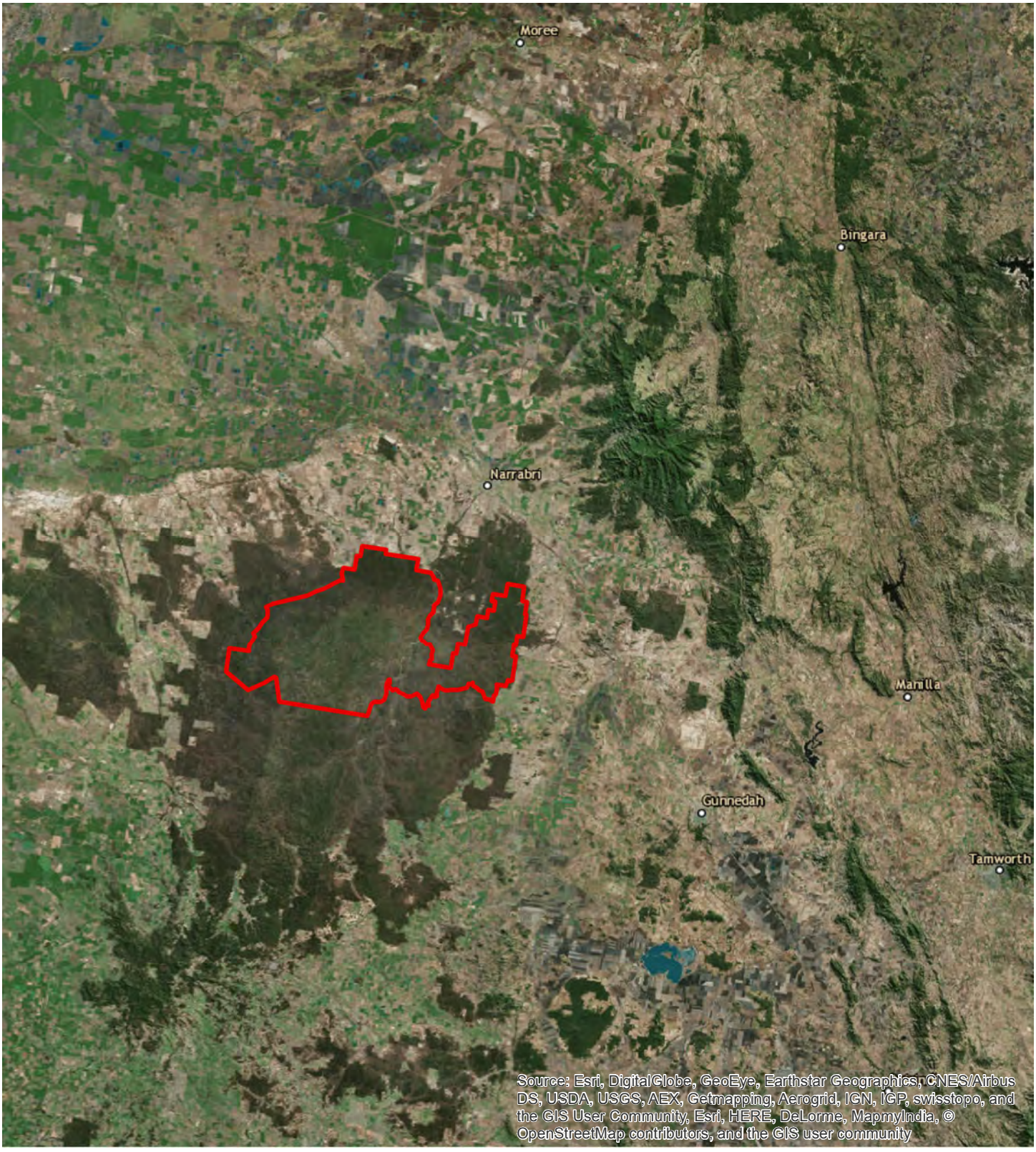
When Taz indicates on Koala scats, the study team retrieves and collects all or a representative sample of the scats for later photography, and records the GPS coordinates and any other relevant information. Where found under tree canopies, the tree species under which the scats are found are also recorded.

Please note:

- Taz also indicates on pap. Even though pap is not faecal matter *per se*, it has the same scent signature as scat and as a result Taz also indicates on it; and
- Even though Taz is capable of detecting the scent of Koala scats/pap long after these have decomposed, Taz is trained to ignore 'residue scent' (that is, odour that is so faint that the scat/pap has long decomposed and lost all physical integrity). This threshold does vary between locations depending on a number of factors (local weather conditions, insect predation, soil type, activity of microorganisms, etc.).

3.3 Data entry and analysis

At the completion of fieldwork, the data recorded was downloaded from the GPS and converted to ArcGIS format. Handwritten fieldwork notes were entered electronically and photos of all scats and pap collected were taken.



0 30 60 120 Kilometers

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LEGEND

Pilliga East State Forest

FIGURE 1
STUDY AREA LOCATION

Pilliga East State Forest
Koala survey

OWAD ENVIRONMENT

4.0 STUDY RESULTS

4.1 Search effort

A total of 24 survey locations were searched with the detection dog.

The detection dog actively searched for a total time of 120 minutes. In total, over 18 km of transect were searched by the dog.

On the day of survey, there was a sustained light breeze (estimated 5-10km/h). In such conditions, the dog would have been perceiving scents from approximately 30-40 meters away travelling with the breeze.

4.2 Results

Koalas are confirmed to be present in the Pilliga East State Forest. The dog indicated and Koala scats were found at one site; and the dog indicated but the study team was unable to recover/retrieve scats at a second location.

Figure 2 shows the location of all areas surveyed, and the survey results.

4.2.1 Koala presence confirmed

Koala scats were found at one survey location (№ 19). These scats were relatively old (estimated 9+ months old). Even though only a few scats were found, the two intact ones appear to be of sufficiently different size class to assume that they likely originate from two distinct individuals. Given that they appear to be of the same age class, they could possibly originate from a female with joey. Alternatively, they could originate from a mature male chasing a mature female for reproduction. See **Plate 1** for a photography of the scats. Note, there was little to no leaf litter or ground vegetation at that location: it was mostly compacted bare ground. These scats were found in a vegetation community best described as Narrow-leaved Ironbark *(Eucalyptus crebra)* open forest, with Sheoak (*Allocasuarina* spp.) understorey. **Plate 2** is a photography of the habitat where the scats were found, with the exact location marked.

Plate 1: Scats found at survey location № 19

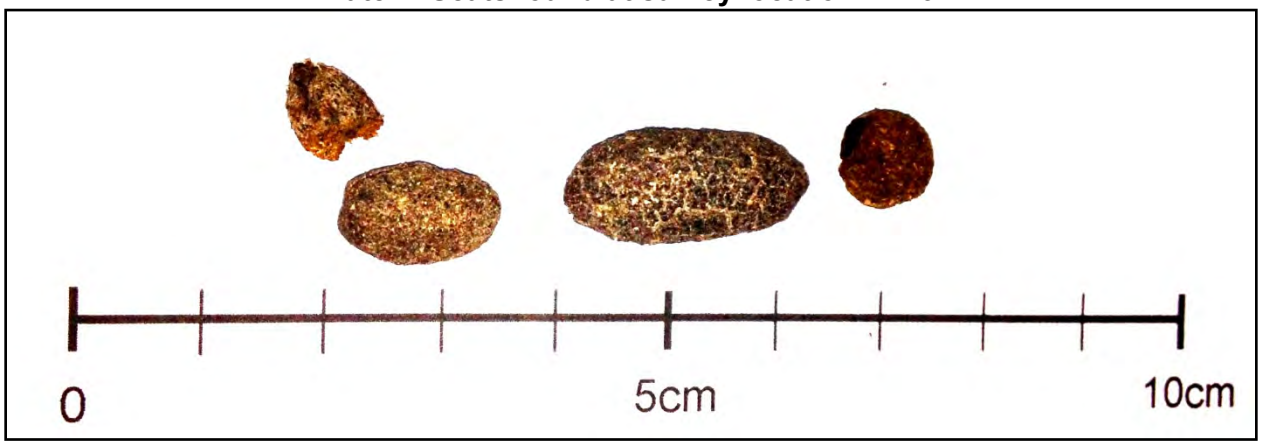
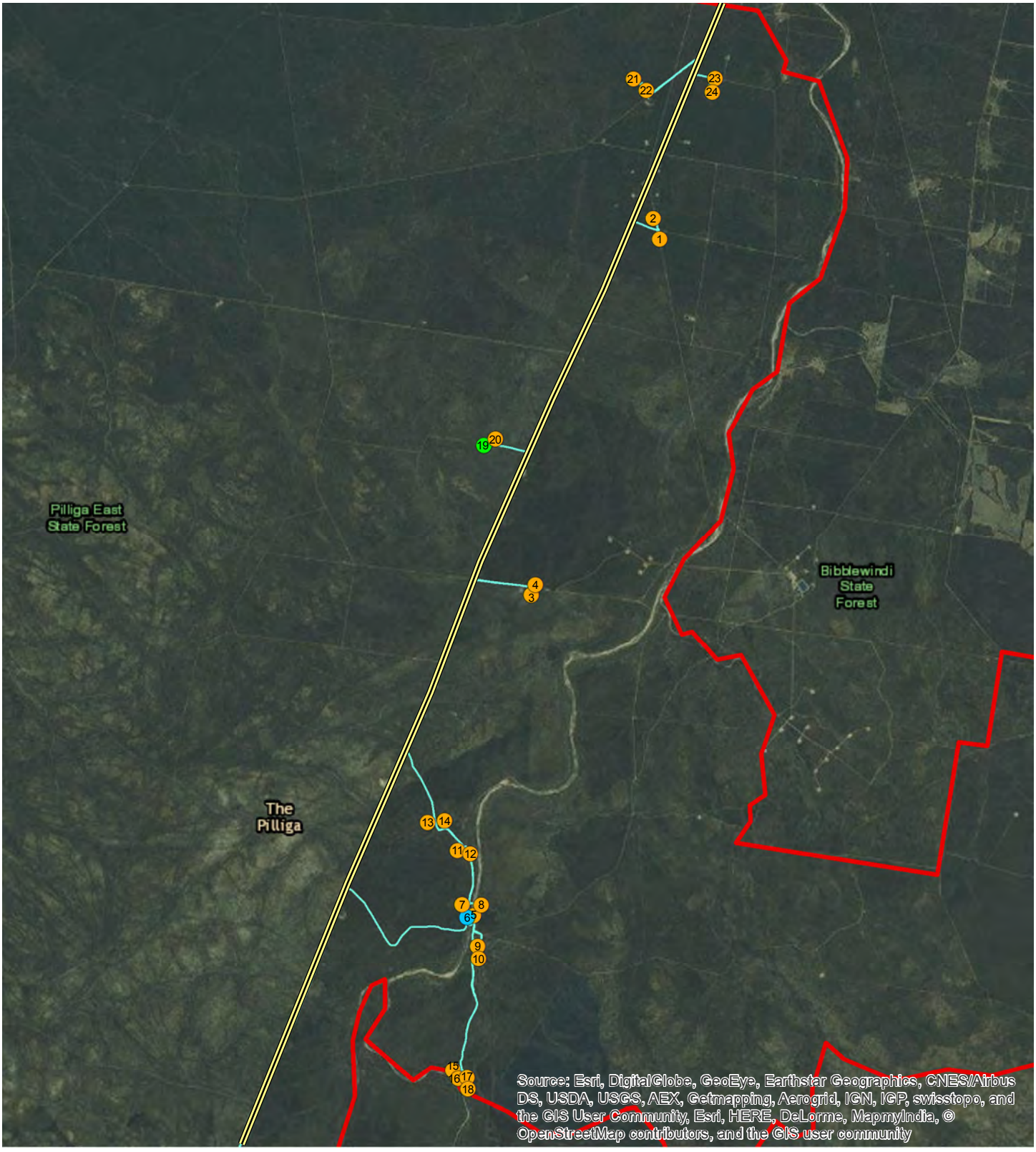


Plate 2: Habitat where Koala scats were found (with exact location shown)

4.2.2 Likely Koala presence

At site № 6 (see **Figure 2**), the detection dog repeatedly indicated on a very precise spot at the base of a large Eucalypt along an intermittent creek (Bohena Creek). Unfortunately the study team was unable to recover a Koala scat. Unlike survey location № 19 where the scats were found on very hard bare ground, at site № 6 where the dog indicated there was a soft layer of rich top soil. There was a significant amount of decaying debris at the base of that tree; it is most likely that there was still sufficient scent for the dog to indicate, yet the scats had already lost their physical integrity / or only fragments remained that humans were unable to distinguish from other organic matter. A relevant limiting factor in this instance is that there had been three significant rain events in the weeks preceding the survey. One event on 2-3 May (total 20mm), a second one 27 May 2016 (total 20mm), and third event just a few days prior to survey (on 2-3-4 June 2016) totaling 50mm. Given the location where the dog indicated, the soil and organic matter would have retained moisture therefore it is very likely that the recent rains precipitated the physical disintegration of the scats.

In the absence of being able to retrieve scats or fragments thereof, the study team is unable to estimate the date of the Koala visitation. However it expected that it would date less than 2 years prior to survey. Of note, David Paull informed the study team that Koala presence had been confirmed in the general area approximately 10km south of site №6, approximately 2-3 years prior (in 2013/2014).



0 2.5 5 10 Kilometers

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Pilliga East State Forest

Newell Highway

Fieldwork Tracks

Survey locations and results:

- No Koala presence detected (and survey location number)
- Koala presence confirmed (and survey location number)
- Likely Koala presence (and survey location number)

FIGURE 2
SURVEY RESULTS

Pilliga East State Forest
Koala survey

OWAD ENVIRONMENT

5.0 STUDY LIMITATIONS

As with any faecal pellet survey, the two major limitations of this study are pellet detectability and inferring absence.

5.1 Pellet detectability

The use of a purpose-trained professional detection dog greatly minimises the risk of not detecting scats when they are in fact present. Taz the dog used for this survey has been extensively trained by a professional scent detection dog specialist for several years; and then extensively and continuously trained and tested by OWAD Environment. In recent trials conducted specifically to test her detection abilities in varying groundcover complexities, Taz was found to have a 100% detection rate. That is, in every single instance she was able to detect at least one Koala scat within 5 minutes when there were known scats present within 100 metres or more. Vegetation structure and groundcover complexity do not affect her detection abilities.

Even though Taz is capable of detecting the scent of Koala scats long after these have decomposed, OWAD Environment takes the approach to always retrieve at least one scat. As a result, scats must have sufficient physical integrity to be recovered. The rate at which pellets decay can vary significantly between areas due to factors such as varying ground layer structure, composition, moisture, sunlight, local weather events and invertebrate activity (Rhodes *et al.* 2011, Cristescu 2011, Witt and Pahl 1995). As a result, in some instances Koala scats may lose integrity within a few months, and in other places scats as old as a year or more can be recovered.

Taz is trained to ignore residue scent and technically should not indicate on scats that are so old that they have lost their physical integrity. In the rare occasions where she does indicate on scats that have lost all physical integrity to be recovered, she is made to search further until the study team finds at least one scat with sufficient integrity. In this study, there was one instance where the dog indicated yet the study team was unable to retrieve a scat with sufficient integrity (survey location № 6, see **Figure 2**).

5.2 Inferring absence

While for the purpose of this study recovering a single Koala scat is an absolute finding, failure to detect Koala scats in an area is not necessarily conclusive. That is, absence of evidence is not evidence of absence. While the risk of 'false negative' was minimised as far as possible, failure to detect Koala scats may suggest either of the following:

- Koalas are not present in the area (i.e. true absence);
- Koalas occur in the area, however scats were not detected because:
  - No scats were deposited in the areas sampled (Koalas can pass through an area without defecating);
  - There were scats in the vicinity, however these were outside of the properties the subject of this study. The fact that no scats were found at survey locations № 15, 16, 17 and 18 (see **Figure 2**) does not mean that there were no scats to the south outside of the State Forest boundaries;

- Scats were deposited in the past at the sites sampled, but were too decomposed for the dog to indicate (whether residue odour perceivable by the dog but below the threshold for indication, or so old that even residue odour has disappeared). There is potential for this to have occurred in this study;
- The dog indicated on a scat, but it was too decayed to have sufficient physical integrity for humans to locate and collect it. This instance did occur at survey location № 6 (see **Figure 2**);
- Scats were deposited at the sites sampled, but were dispersed or obscured by exceptional physical disturbance and the dog could not locate the scats themselves as the scent was dispersed (e.g. significant surface water flow resulting in the dog indicating on a large area rather than a precise location). This instance was not observed to have occurred in this study.

Finally, it must be noted that as with any scat-based survey, the absence of scats at time survey does not negate the possibility of the target animal visiting the site and depositing scats in the future.

In this study, the risks of false negative were minimised by:

1) The geographical spread of areas searched across the study area: the search locations were spread over 8 different locations;
2) Using Taz the professional detection dog, who is significantly more efficient at detecting scats than humans alone[1]; and
3) The timing of this survey: conducted during the drier months with general lower ambient humidity.

5.3 Data interpretation

This study provides an indication on Koala presence/absence only in the areas surveyed as part of this study. Where no Koala scats have been found, if necessary/relevant it is recommended to consult other sources of information in order to determine whether Koalas may in fact be present in those areas.

At location № 19, scats were found in a patch of Narrow-leaved Ironbark *(E. crebra*). This is only an indicator that a Koala/or Koalas was/were in that area when it/they defecated. It must be noted that roost trees are not necessarily a valid indicator of Koala diet (Cristescu *et al*. 2011). Indeed, there isn't necessarily any correlation between the location of Koala scats/which trees they are found under, and that individual animal's diet. The only valid indicator of a Koala's diet is to analyse scats in a specialised laboratory.

[1] In scientific trials conducted in 2015 (to be published), on average Taz & Olivia found scats in 357% more instances than humans alone searching for Koala scats at the same sites.
When analysing results across easy, medium and hard groundcover complexities, Taz & Olivia found scats:
- in 84% more instances in easy groundcover complexities e.g. very open forest with very little to no ground vegetation or leaf litter, or mown parkland setting;
- in 1,100% more instances in medium groundcover complexities e.g. patchy grass cover, some leaf/bark litter/branch debris, small sparse shrubs; and
- in infinitely more instances in hard groundcover complexities e.g. thick tall grass, dense shrubs, thick leaf/bark litter/ branch debris (Taz found scats at 9 of 15 sites; humans did not find any scats at any of those 15 sites).

5.4 False negative due to sampling

When the study area is too large to sample in its entirety, the study team has to resort to sampling. There is a strong negative correlation between false negative rate and survey effort: the more limited/restricted the search effort, the higher the risk of false negative.

In this study, the study team sampled a large area (Pilliga East State Forest) over only one day, hence the false negative due to sampling is considered to be very high. Indeed only a minuscule fraction of the Pilliga East State Forest was sampled, therefore extrapolation of this study's results to the State Forest as a whole would not be deemed scientifically valid in any way.

6.0 CONCLUSION AND RECOMMENDATIONS

This report provides a baseline of current Koala presence/absence across the areas surveyed as part of this study.

The study team confirms the presence of Koalas in Pilliga East State Forest

A total of 24 locations were surveyed. Koala presence was confirmed at one location, and Koala presence is considered likely at a second location (see **section 4.2** for further detail). This equates to Koala presence confirmed or likely at 8% of location sampled.

Unfortunately, no assessment of 'activity levels', movement patterns or habitat preferences is possible due to the very limited survey effort.

Although at the majority of sites sampled there was no indication of Koala presence, in this study the potential for false negative due to sampling is considered to be extremely high (very limited search effort for a very large area).

OWAD Environment has on many occasions surveyed areas as large as or even larger than Pilliga East State Forest but with more intensive search effort. It is not uncommon for the study team to find very little to no evidence of Koala presence for whole days at a time, yet overall find Koala presence at 30% or more of sites sampled. So the findings of this study are not necessarily representative: with a more intense search effort, Koala presence may be found at more than the current 8% of locations sampled.

Where a more detailed understanding may be required or desirable, it is recommended to conduct a more extensive survey. Such survey should target all habitat types represented in the landscape. Indeed in OWAD Environment's extensive experience conducting Koala surveys, the detection dog regularly finds Koala scats in areas not traditionally viewed or thought of as Koala habitat. If additional surveys are envisaged, Western Woodlands Alliance could also consider Koala scat analysis. OWAD Environment partners with Federation University (Victoria) who is able to do DNA profiling from scats (gender, relatedness of Koalas sampled, gene flow, population structure) as well as determine presence/absence of *Chlamydia* (and strain) and of Koala Retrovirus. Scats for such analyses do have to be in sufficient physical condition and hence relatively fresh (up to 2 weeks old). Additionally, if local tree leaves are sampled and sent with scats, Federation University may also be able to determine diet. For diet analysis the scats can be up to several weeks old.

7.0 REFERENCES

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