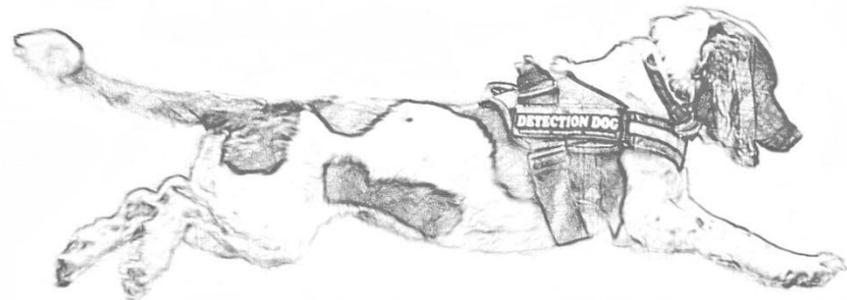




# KOALA SURVEYS IN FOUR NSW STATE FORESTS

Prepared by OWAD Environment

for the NSW Environment Protection Authority



## DOCUMENT CONTROL SHEET

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Client: The NSW Environment Protection Authority

Report Title: Koala surveys in four NSW State Forests

Report Author: Olivia Woosnam

Report Reviewer: Alex Dudkowski

Project Summary: This report presents the findings of Koala faecal pellet surveys conducted with a professional detection dog in October 2015 in four State Forests in New South Wales.

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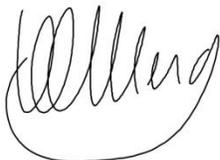
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**Olivia Woosnam**  
**Director**  
Date: 10/11/2015

# Koala surveys in four NSW State Forests

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## 1.0 INTRODUCTION

### 1.1 Background and purpose of this report

OWAD Environment was engaged by the New South Wales (NSW) Environment Protection Authority (EPA) to conduct faecal pellet surveys of Koala *Phascolarctos cinereus* in four State Forests located in the NSW North Coast.

The EPA had previously conducted Koala faecal pellet surveys in these forests between March and June 2015, led by humans only, and engaged OWAD Environment to conduct the searches at the same general locations with Taz a professional Koala scat detection dog.

The purpose of this study was to collect information on Koala presence/absence at each site, as well as to test a method to estimate habitat utilisation using Taz.

This report presents the findings of the study. This report may assist the EPA in the management of Koala habitat across the four State Forests to ensure the long-term resilience of the Koala in those areas.

### 1.2 Study area

The study area includes four State Forests located on the NSW North Coast, namely:

- Royal Camp State Forest;
- Carwong State Forest;
- Clouds Creek State Forest; and
- Maria River State Forest.

**Figure 1** shows the geographical location of the four State Forests that were assessed as part of this study.





Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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**Legend**  
 State Forests

**Figure 1: Location of State Forests assessed**

Koala scat surveys  
 NSW Environment Protection Authority



## 2.0 METHODOLOGY

This study was designed in partnership between the EPA and OWAD Environment.

### 2.1 Site pre-selection

The EPA selected the State Forests to assess, and within each forest selected the sites to be surveyed. These were the same areas that had previously been surveyed by humans between March and June 2015.

The EPA provided the ArcGIS shapefiles of the forest boundaries and of the site locations to OWAD Environment. These were loaded onto OWAD Environment's GPS unit, a handheld GPS model Garmin GPSMap 78.

### 2.2 Field assessment

The field assessment was conducted by Olivia Woosnam (Koala Ecologist), Alex Dudkowski (Field Assistant) and Taz the professional detection dog over 4 days between 12 and 15 October 2015.

Taz is a 4 year old English Springer Spaniel professionally trained by detection dog expert Steve Austin to detect and indicate on Koala scats. Olivia is the primary handler of Taz. Alex is the dog's second handler for H&S purposes. Both Alex and Olivia have received professional training and obtained certification to handle Taz. Throughout this study, Olivia was the sole handler of Taz during searches.

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

The study team physically went to the location of pre-selected sites, or as close as practical. Where reaching the exact location of the pre-selected site was not safe or practical, the study team went as close as possible to the location. Where this was not safe or practical, a site was either moved to a safer location nearby, or cancelled altogether.

Fieldwork tracks and the coordinates of all sites surveyed were recorded using the handheld GPS unit.

Once the location of a site was identified, searching for Koala faecal pellets began. 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.

The search method for this study was as follows:

- A first phase consisted in first determining whether there were any Koala scats at the selected site. A timer was started when the search began.
- If the dog did not detect any Koala scats within 5 minutes, the site was recorded as 'negative' and the survey team moved on to the following site.



- If the dog did find Koala scats (at least one) within 5 minutes, then the timer was paused. The coordinates of the location where the scat(s) was/were found was recorded with the handheld GPS, and the scat was / or samples of the scats were collected. The search was then resumed a few meters away to avoid Taz from indicating again on the same location.
- The timer was paused each time Olivia Woosnam recovered Koala scats; and restarted each time the search resumed. This process was conducted for a total of 10min.

During recent controlled trials conducted by OWAD Environment in partnership with Logan City Council, it was found that a 5mn limit provided an appropriate search effort to determine presence/absence within the vicinity of a search area <sup>1</sup>. The distance from which Taz is able to detect Koala scats varies as a function of breeze and topography, however during these trials there were instances where Taz was able to detect Koala scats located up to 200 meters away, within 5 minutes. Depending on forest density and terrain, Taz can search up to several hundred trees within this 5 minute timeframe.

During this study, the dog searched non discriminatorily at each site; Taz was not directed to any specific trees or tree species.

At each area where Koala scats were found, the survey team collected a representative sample of scats: if there were scats of different sizes, different shapes and/or different age classes, then at least one of each were collected.

The scats were collected in hermetic bags and later photographed (see **Appendix 1**).

Taz was originally trained to detect even the faintest scent of Koala scat. However, this meant that Taz could detect scats that had long decomposed and lost their structural integrity, which OWAD Environment did not desire. Therefore OWAD Environment adjusted her training to ignore residue sent, so that Taz now only indicates on scats that have sufficient integrity to be visually recognised and identified as Koala scats.

### 2.3 Data entry and analysis

At the completion of fieldwork, all data collected was downloaded from the GPS, entered onto ArcGIS mapping system, and photos were taken of all scats collected.

The results were analysed upon completion of fieldwork to determine presence/absence and relative activity of Koalas across the areas assessed as part of this study.

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<sup>1</sup> In 100% of instances where Koala scats were known to be present within 100m or more, Taz found the scats well within 5 minutes regardless of vegetation type or groundlayer complexity. (Study in process of future publication).



### 3.0 STUDY RESULTS

A total of 41 sites were surveyed on 12, 13, 14 and 15 October 2015.

Koala scats were found at 18 of these 41 sites, or 44% of sites.

**Appendix 1** provides photos for each site where Koala scats were found.

The following sections present the findings for each State Forest.

#### 3.1 Clouds Creek State Forest

A total of 13 sites were assessed, with Koala scats found at just 2 sites (or 15%).

**Figure 2** shows the survey sites and results. See **Appendix 1** for photos of the scats collected.

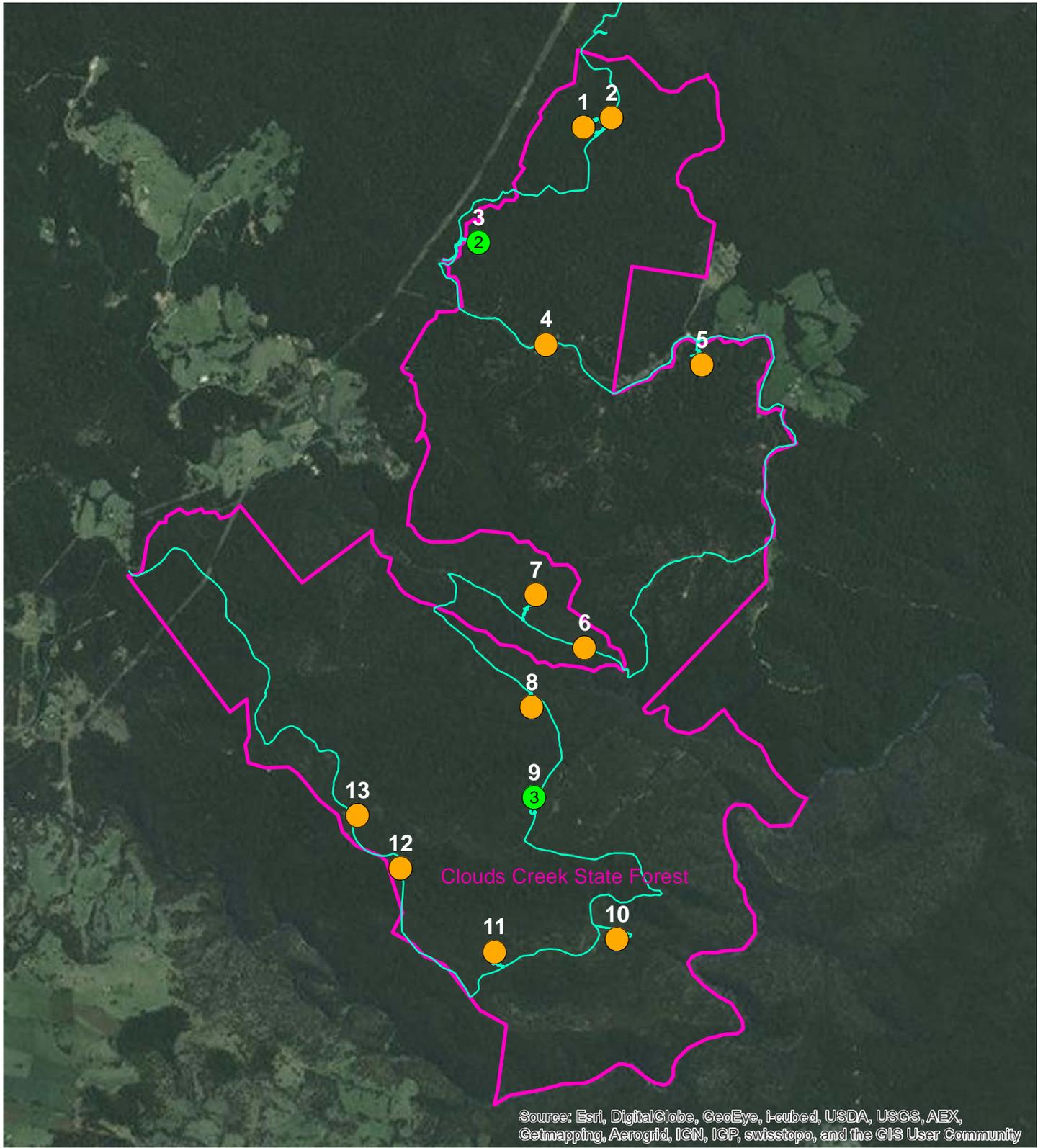
**Table 1** shows the number of 'finds' (how many locations Koala scats were found within the survey site), the timing of these finds (00:00 being search start time, 10:00 being search end time, or 10 minutes), and comments on the scats found.

**Table 1: 'Finds' at Clouds Creek State Forest**

Site Number (refer to Figure 2)	Number of 'finds'	Time	Comments
3	2	00:45 02:50	Only 2 fresh scats, single age class, single shape & size class
9	3	02:12 02:39 02:48	Only a few fresh scats, single age class, but 2 shape & size classes

With scats found at only 2 sites and at just 5 locations in total, it appears Koalas may occur at relatively low density across Clouds Creek State Forest. However, it must be noted that scratch marks were observed sporadically on smooth bark trees at various locations across this State Forest.





Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



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**Legend**

State Forest

Fieldwork tracks

**Survey sites and findings:**

No scats found and site number

Scats found & number of locations where found (with site number)

**Figure 2: Results for Clouds Creek State Forest**

Koala scat surveys  
 NSW Environment Protection Authority



### 3.2 Maria River State Forest

A total of 10 sites were assessed, with Koala scats found at 5 sites (or 50%).

**Figure 3** shows the survey sites and results. See **Appendix 1** for photos of the scats collected.

**Table 2** shows the number of 'finds' (how many locations Koala scats were found at), the timing of these finds (00:00 being search start time, 10:00 being search end time, or 10 minutes), and comments on the scats found.

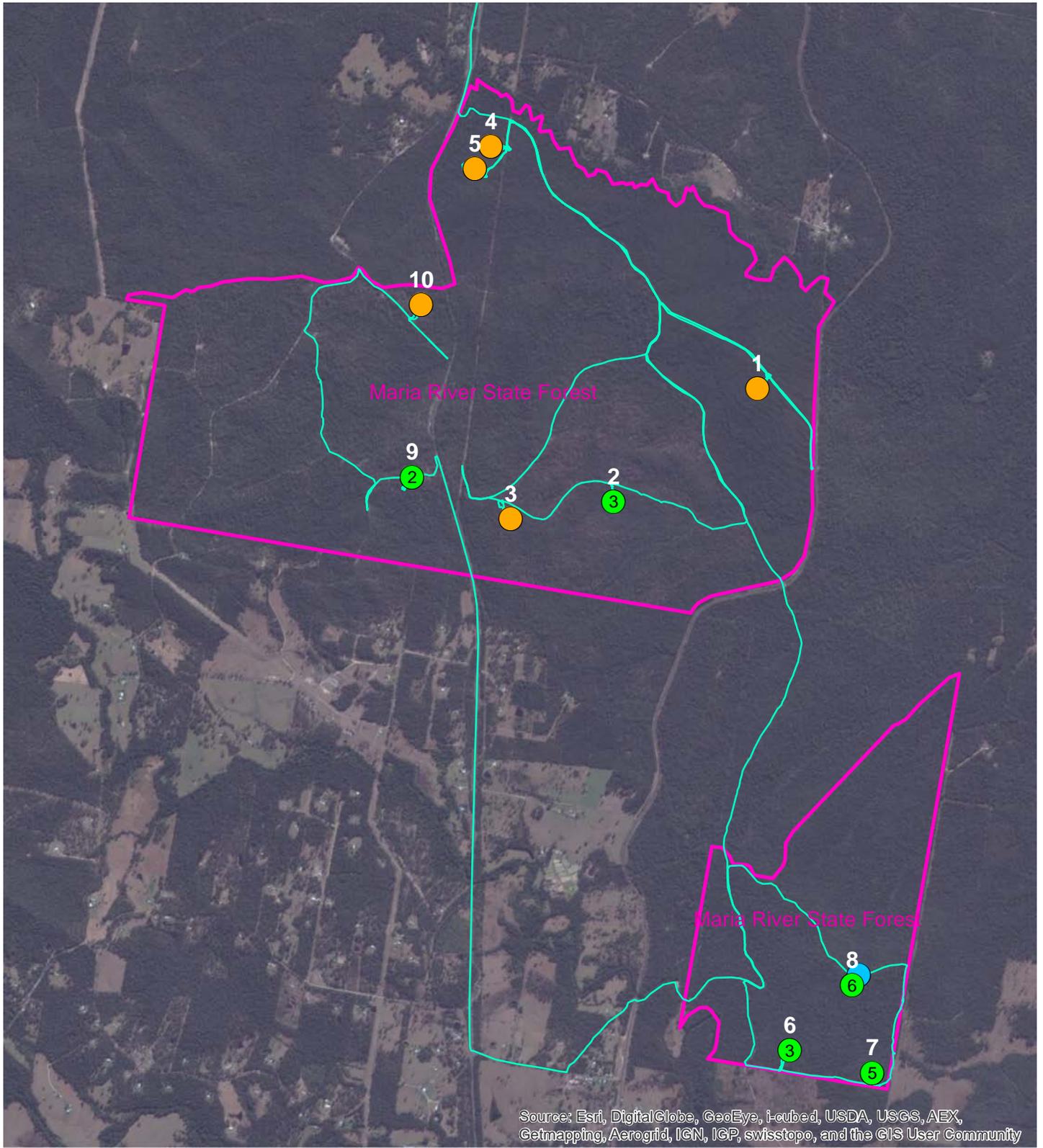
**Table 2: 'Finds' at Maria River State Forest**

Site Number (refer to Figure 3)	Number of 'finds'	Time	Comments
2	3	03:00 03:41 03:48	2 age classes and 2 shape & size classes
6	3	04:12 07:53 09:35	Single age class but 2 shape & size classes
7	5	01:21 03:02 03:41 05:05 05:35	Numerous scats, at least 2 age classes and at least 2 shape & size classes
8	6	03:52 04:38 07:32 08:47 09:03 09:59	Numerous scats, at least 2 age classes and at least 2 shape & size classes
9	2	00:02 04:29	At least 2 age classes and at least 3 shape & size classes

With scats found at 5 sites and at 19 locations in total, it appears Koalas occur at higher density in this State Forest. With scats found at up to 6 locations in a site (site number 8) with scats of multiple age classes, shapes and size classes, this tends to support that there is a significant amount of Koala movement and activity in this forest.

Additionally, Koala scats were also found at one location outside the survey sites (opportunistic find, see **Figure 3**).





Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



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**Legend**

State Forest

Fieldwork tracks

**Survey sites and findings:**

No scats found and site number

Scats found & number of locations where found (with site number)

Opportunistic find

**Figure 2: Results for Maria River State Forest**

Koala scat surveys  
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### 3.3 Royal Camp State Forest

A total of 12 sites were assessed, with Koala scats found at 7 sites (or 58%).

**Figure 4** shows the survey sites and results. See **Appendix 1** for photos of the scats collected.

**Table 3** shows the number of 'finds' (how many locations Koala scats were found at), the timing of these finds (00:00 being search start time, 10:00 being search end time, or 10 minutes), and comments on the scats found.

**Table 3: 'Finds' at Royal Camp State Forest**

Site Number (refer to Figure 4)	Number of 'finds'	Time	Comments
1	4	02:37 05:26 07:46 07:48	At least 2 age classes and at least 2 shape & size classes
2	1	03:52	Single age class and single shape & size class
3	10	02:18 02:43 03:12 04:35 04:37 06:42 06:59 08:19 08:41 09:59	Very numerous scats, several age classes and several shape & size classes
4	2	00:07 04:10	Single age class, but possibly 2 shape & size classes
5	4	01:57 02:09 04:19 08:36	Possibly 2 age classes, and 2 shape & size classes
7	3	04:54 06:12 06:29	Single age class but 2 shape & size classes
11	3	01:57 03:19 06:23	Single age class, but possibly 2 shape & size classes

With scats found at 7 sites and at 27 locations in total, it appears Koalas also occur at relatively high density in this State Forest. Very numerous scats were found at 10 locations at site number 3, including scats of various age classes and various shape & size classes, suggesting that this area is regularly visited by several individuals. These findings tend to support that there is a significant amount of Koala movement and activity across this State Forest.

Additionally, Koala scats were also found at two locations outside the survey sites (opportunistic finds, see **Figure 4**).



### 3.4 Carwong State Forest

A total of 6 sites were assessed, with Koala scats found at 5 sites (or 83%).

**Figure 4** shows the survey sites and results. See **Appendix 1** for photos of the scats collected.

**Table 4** shows the number of 'finds' (how many locations Koala scats were found within the survey site), the timing of these finds (00:00 being search start time, 10:00 being search end time, or 10 minutes), and comments on the scats found.

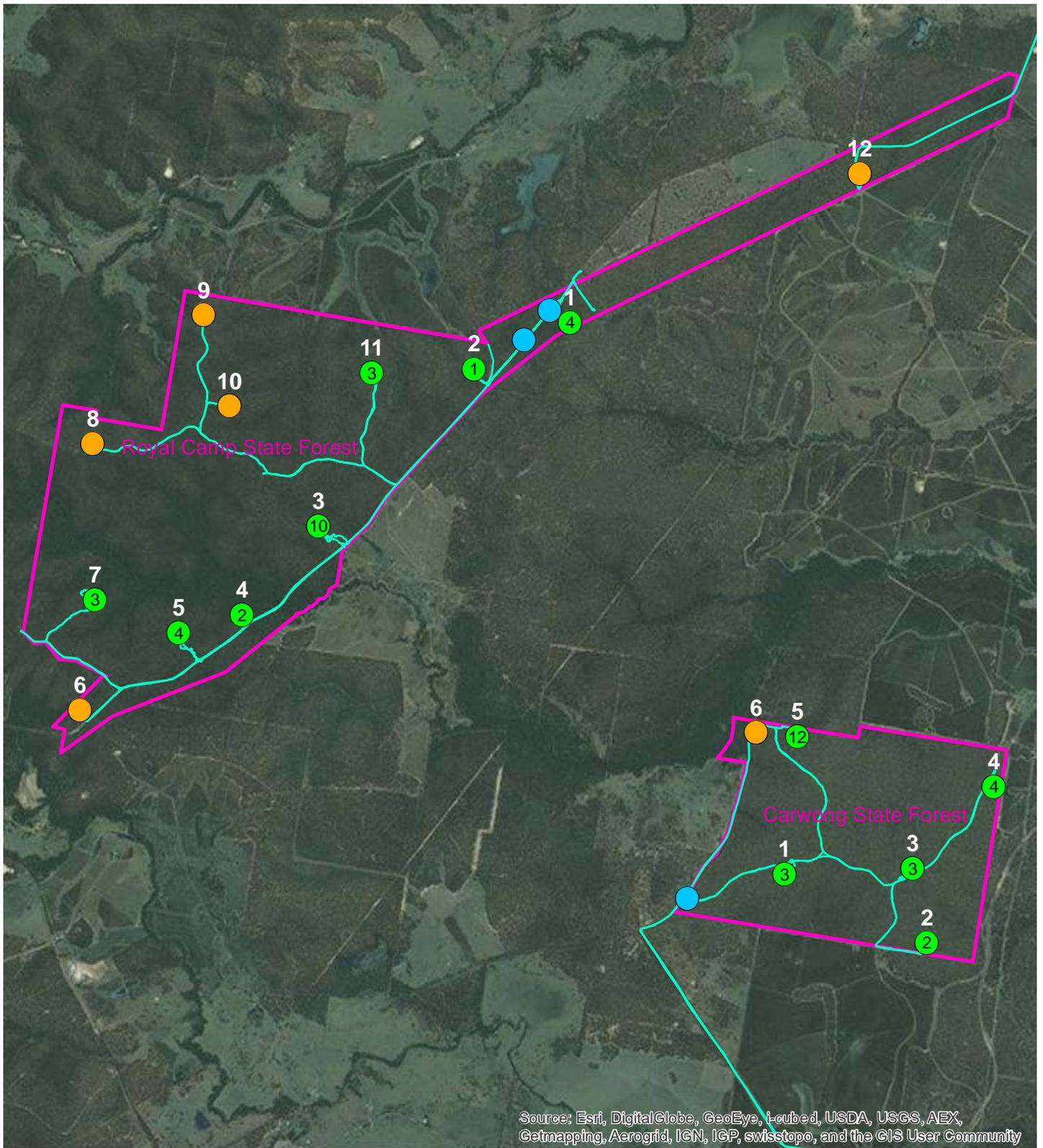
**Table 4: 'Finds' at Carwong State Forest**

Site Number (refer to Figure 4)	Number of 'finds'	Time	Comments
1	3	02:50 03:29 04:29	Single age class, 1 or 2 shape & size classes
2	2	04:37 05:01	Single age class, single shape & size class
3	3	00:13 05:27 08:47	Single age class, but at least 2 shape & size classes
4	4	04:43 06:03 06:31 07:20	2 age classes and at least 2 or 3 shape & size classes
5	12	00:02 00:07 00:48 00:57 01:14 02:18 02:19 03:25 05:44 08:56 09:52 09:59	Numerous scats, several age classes and several shape & size classes

With scats found at 5 of the 6 sites assessed, and at 24 locations in total, it appears that Koalas occur at very high density in this State Forest. Numerous scats were found at 12 locations at site number 5, including scats of various age classes and various shape & size classes, suggesting that this area is regularly visited by several individuals. These findings tend to support that there is a very significant amount of Koala movement and activity across this State Forest.

Additionally, Koala scats were also found at one location outside the survey sites (opportunistic find, see **Figure 4**).





Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



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**Legend**

- State Forest
- Fieldwork tracks

**Survey sites and findings:**

- No scats found and site number
- ③ Scats found & number of locations where found (with site number)
- Opportunistic finds

**Figure 4: Results for Royal Camp State Forest & Carwong State Forest**

Koala scat surveys  
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## 4.0 STUDY LIMITATIONS

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

### 4.1 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 tested and continuously trained 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 when there were known scats present within 100 metres or more from starting point, she was able to detect at least one Koala scat within 5 minutes. Vegetation structure and groundcover complexity do not affect her detection abilities whatsoever.

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 integrity to be confirmed and recovered, hence OWAD Environment adjusted Taz's training to ignore residue scent and to only indicate on scats that have sufficient integrity. The rate at which pellets decay can vary significantly between sites 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 in this study Koala scats may have lost integrity within a few months, and in other sites scats as old as 1 year or more may have been recovered.

### 4.2 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 vicinity of the sites sampled (e.g. 150 meters or so);
  - there were scats in the vicinity, however these were outside of the properties the subject of this study;
  - scats were deposited in the past at the sites sampled, but were too decomposed for the dog to indicate (whether residue odour perceivable by Taz but that she is trained to not indicate on; or scats so old that even residue odour has disappeared);
  - the dog indicated on a scat, but it was too decayed to confirm its origin [*note: this instance did not occur in this survey*];
  - scats were deposited at the sites sampled, but were dispersed or obscured by exceptional physical disturbance [*note: this instance did not occur in this survey*]; or
  - in the context of this specific study, scats were deposited at the sites sampled, but were collected by humans and removed from the environment during the previous surveys conducted in March - June 2015.



Finally, it must be noted that as with any scat-based survey, the absence of scats at the 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 design of the study;
- 2) Appropriate search effort at each site;
- 3) Using Taz the professional detection dog, who is significantly more efficient at detecting Koala scats than humans alone<sup>2</sup>; and
- 4) The timing of this survey – conducted during the drier months with no recent severe weather event (note: there was a small storm the day prior to surveying Clouds Creek State Forest, however it is considered that this storm had no significant impact on results).

### 4.3 Data interpretation

This study provides an indication on Koala presence/absence in the areas surveyed. At sites where Koala scats were found, this study also provides an indication on relative activity, which may be derived from the number of locations Koala scats were found within each site in conjunction with the age, shape & size classes of the scats.

The results of this study may be added to the results of previous surveys of the same areas.

Where no Koala scats were found, it is recommended to consult other sources of information in order to determine whether Koalas may in fact be present in the local landscape.

Tree species under which Koala scats were found were not recorded in this study because:

- 1) Of the risk of tree species misidentification;
- 2) In many instances e.g. when tree canopies interconnect, it is difficult or impossible to determine which tree the Koala would have been sitting in when defecating;
- 3) Taz the detection dog regularly finds Koala scats that are not under the canopy of any tree (e.g. scats deposited by Koala moving on the ground); and
- 4) Roost trees are not a valid indicator of Koala diet (Cristescu *et al.* 2011).

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<sup>2</sup> In the recent scientific trials (to be published), on average Taz & Olivia found scats in 357% more instances than humans alone searching for scats at the same sites. Taz found scats at a total of 32/50 sites; humans at a total of only 7/50 sites.

When looking at results across easy, medium and hard groundcover complexities, Taz 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 (Taz found scats at 11 sites, humans at 6 sites);
- in 1,100% more instances in medium groundcover complexities e.g. patchy grass cover, some leaf/bark litter/branch debris, small sparse shrubs (Taz found scats at 12 sites, humans at 1 site only); 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 sites, humans did not find any scats at any sites).



## 5.0 CONCLUSION AND RECOMMENDATIONS

This study provides a scientific baseline of Koala presence/absence across four State Forests. Koala presence/absence was inferred based on the presence/absence of the marsupial's characteristic scats, using a purpose-trained professional detection dog to detect the scats.

At each site where Koala scats were found, an indication of 'activity' may be derived from the number of location scats were found at within that site, in conjunction with the age, size and shape classes of the scats.

A total of 41 sites were assessed across the four State Forests, with Koala scats found at 18 sites in total (approximately 44%).

The results on this study alone tends to suggest that Koalas occur:

- At relatively low density in Clouds Creek State Forest;
- At higher density in Maria River State Forest and Royal Camp State Forest; and
- At very high density in Carwong State Forest.

It is understood that previous searches were conducted by humans at the same areas a few months prior to this study. It is highly recommended to read the results of the current study in conjunction with and additional to the findings of the previous study. Indeed the previous study was conducted up to 6 months prior; if or where this study did not find Koala scats where the previous study found some, this would highly likely be due to:

- either seasonal variation in Koala visitation, as well as varying faecal pellet decomposition rates; and/or
- humans in the previous survey collected all scats, and no Koala scats were deposited at those areas since; and/or
- humans in the previous study did not collect all scats present, but at the time of this study remaining scats were too decomposed for Taz to indicate (refer to **section 4.1**).

The results of this study may be added to the data used by the NSW Environment Protection Authority to inform Koala habitat management and conservation.

In order to ensure the long term resilience of Koalas across these four State Forests – including habitats that are currently being utilised by Koalas, as well as habitats that are currently not or rarely being utilised due to threatening processes – it is recommended to:

- Conduct a repeat survey at the beginning of the next dry season to confirm Koala presence and activity in the areas where found present during this study, as well as identify any additional areas that Koalas may use at different times of the year;
- Establish permanent monitoring plots to measure the success of conservation or restorations actions, and/or the impact of logging activities;
- Where the EPA may wish to obtain an indication of Koala numbers as well as their health, design and conduct a specific survey with scats collected and sent for analysis. From the scats alone, Federation University is now able to determine the number of Koala individuals these originate from, their gender, and whether these individuals carry KoRV-A or *Chlamydia*.



## 6.0 REFERENCES

**Cristescu, R. (2011).** Fauna recolonisation of mine rehabilitation through the example of arboreal marsupials, with a particular focus on the koala *Phascolarctos cinereus*. PhD thesis. University of new South Wales, Sydney.

**Cristescu, R., Ellis, W., De Villiers, D., Lee, K., Woosnam-Merchez, O., Frere, C., Banks, P., Dique, D., Hodgkison, S., Carrick, H., Carter, D., Smith, P., and Carrick, F. (2011).** North Stradbroke Island: An island ark for Queensland's koala population? *Proceedings of the Royal Society of Queensland* **117**, 309-333.

**Rhodes, J., Lunney, D. Moon, C. Matthews, A. and McAlpine, C. (2011).** The consequences of using indirect signs that decay to determine species' occupancy. *Ecography* **34**: 141-150

**Witt, G.B. and Pahl, L. (1995).** Mulgaland communities of south-west Queensland as habitat for koalas. In M.J. Page and T.S. Beutel (eds). *Ecological research and Management in the Mulgalands - Conference Proceedings*. The University of Queensland, Gatton College, pp. 91-95.

**Woosnam-Merchez, O., Cristescu, R., Dique, D., Ellis, B., Beeton R.J.S., Simmonds, J., and Carrick, F. (2013).** What faecal pellet surveys can and can't reveal about the ecology of koala *Phascolarctos cinereus*. *Australian Zoologist* **36(2)**: 192-200.



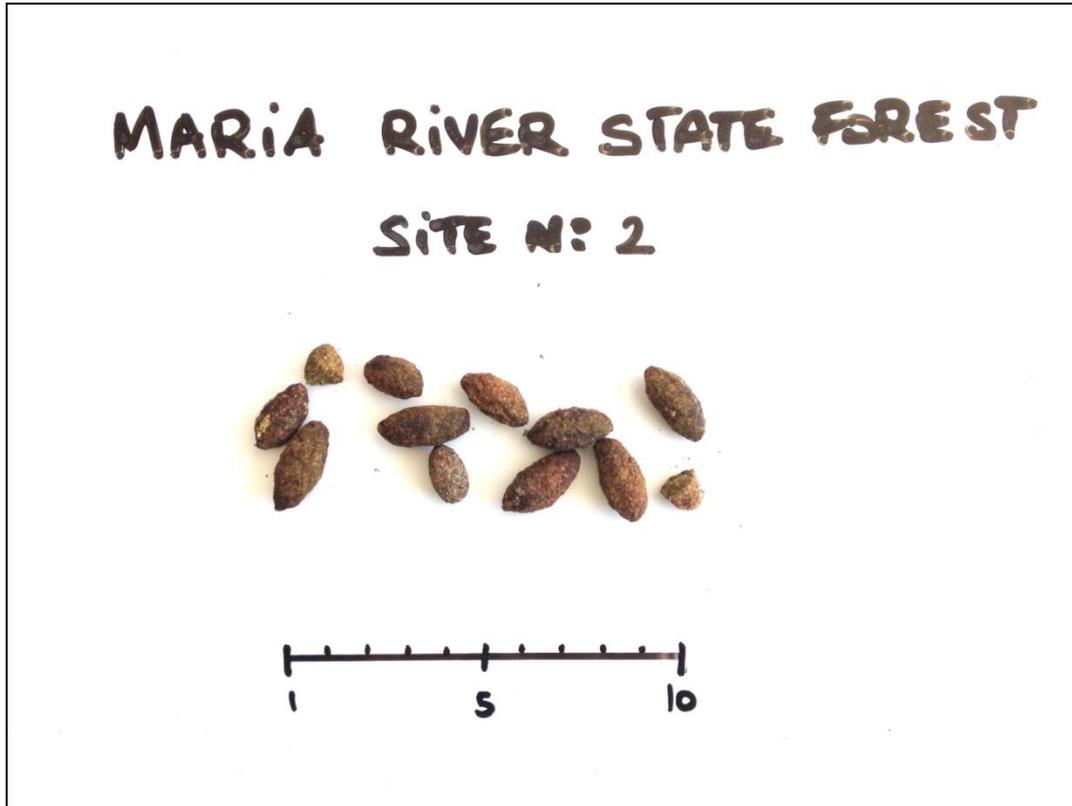
# **APPENDIX 1 PHOTOS & COORDINATES OF KOALA SCATS FOUND**



**CLOUDS CREEK STATE FOREST**



**MARIA RIVER STATE FOREST**

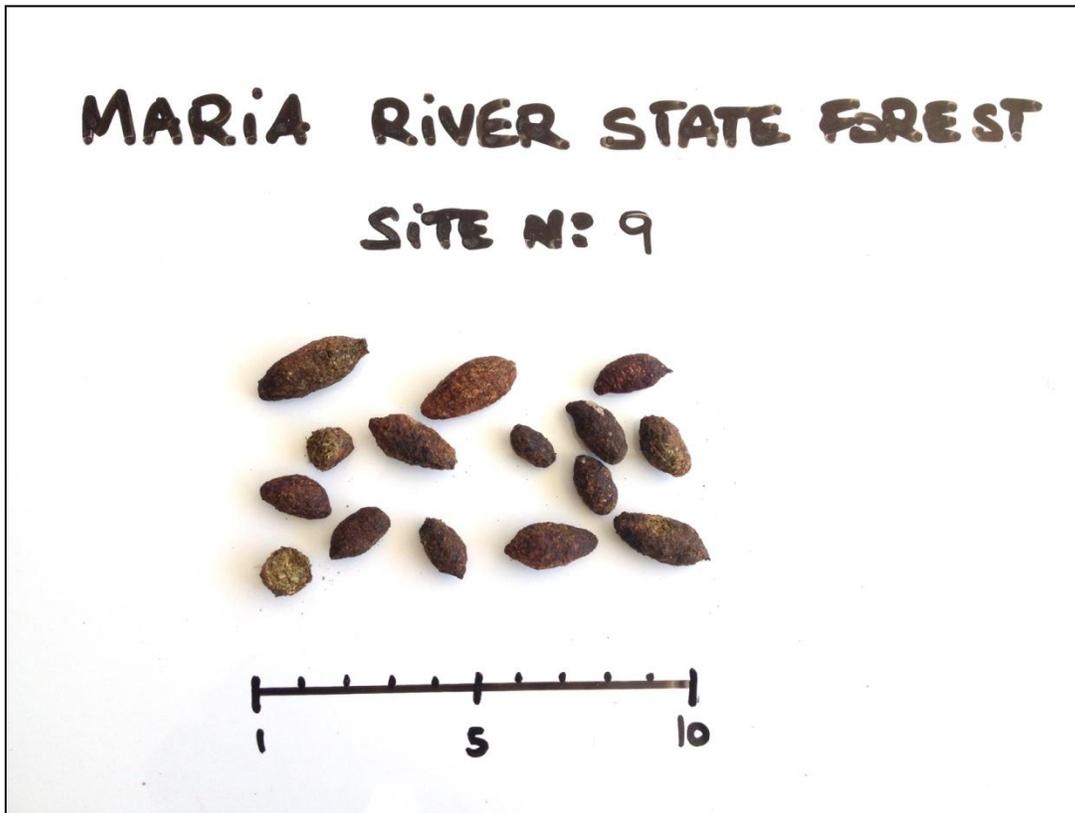


**MARIA RIVER STATE FOREST**  
**SITE N: 7**

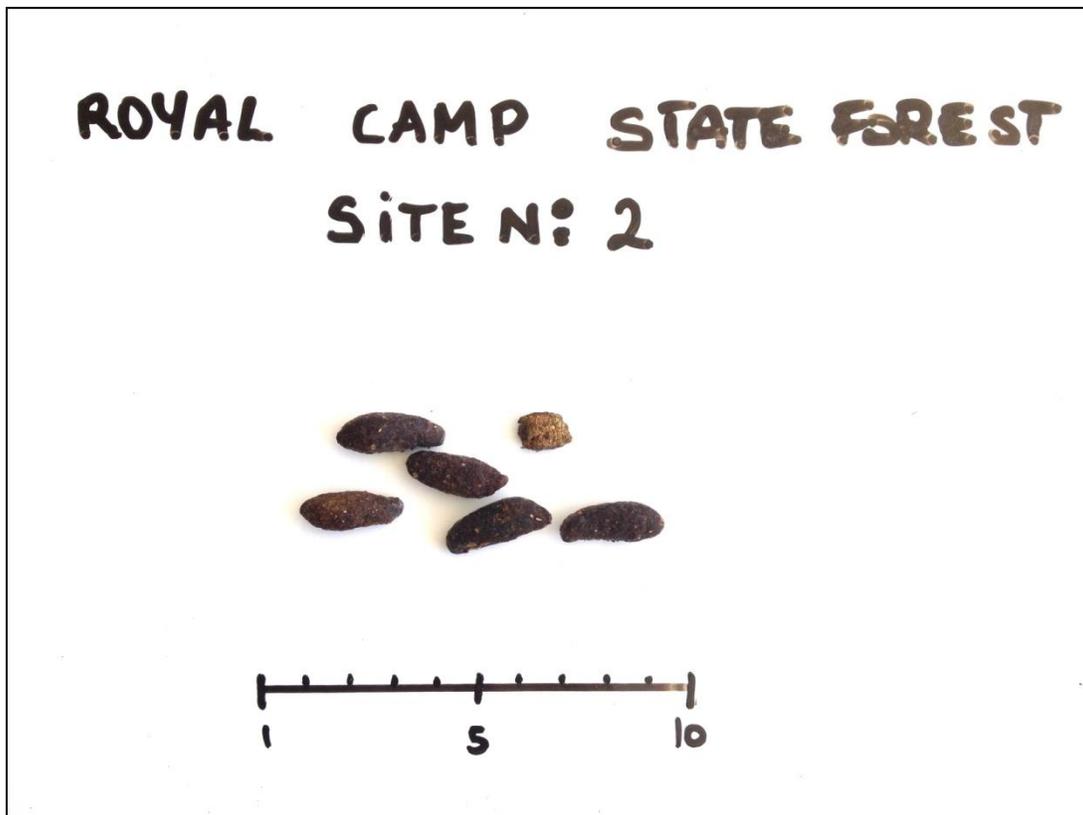
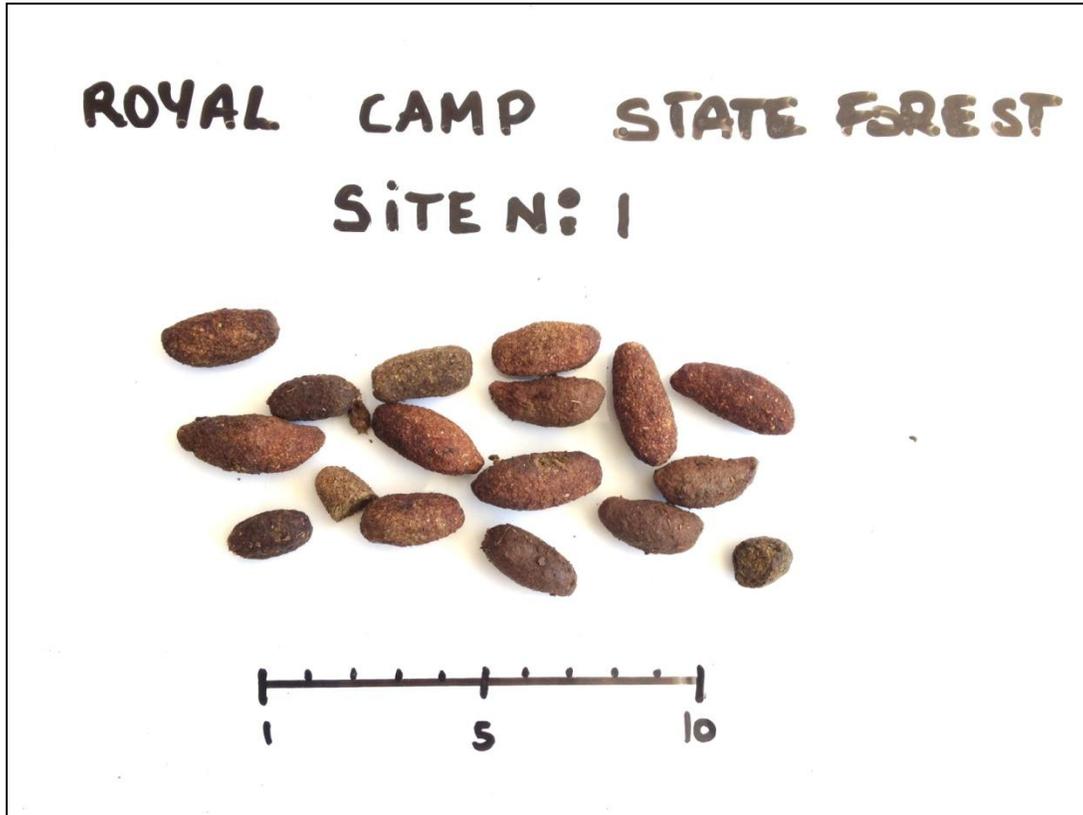


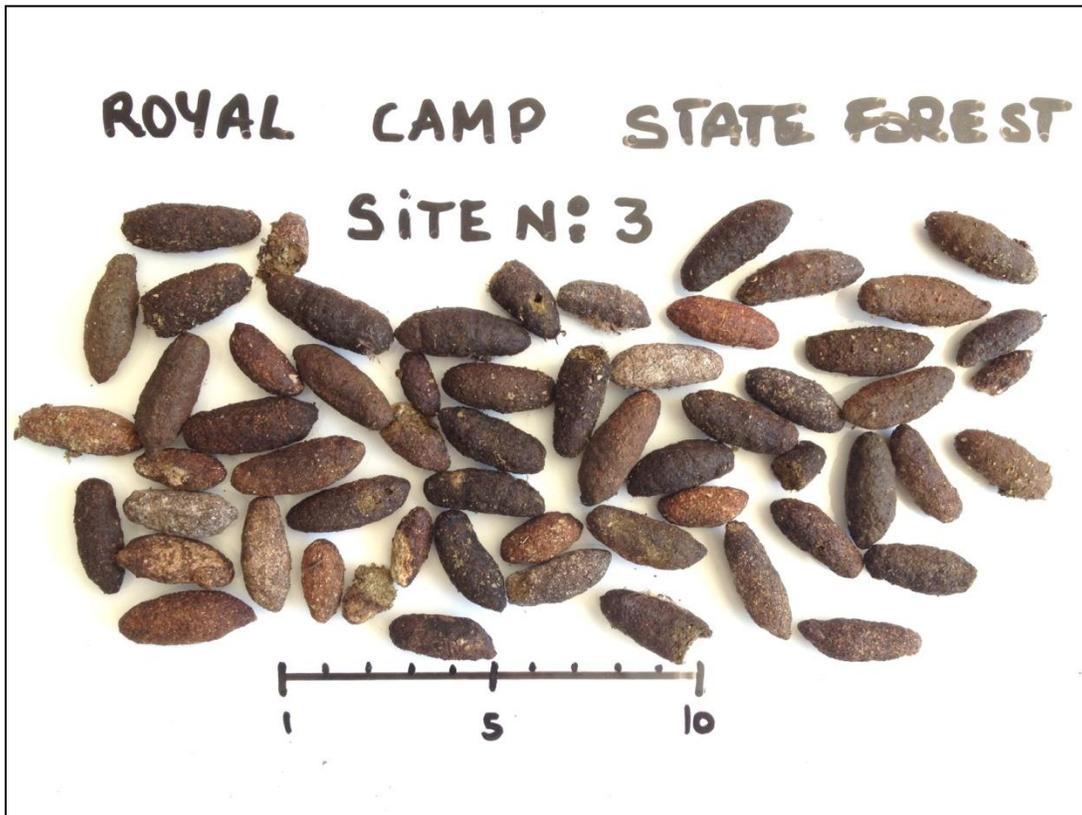
**MARIA RIVER STATE FOREST**  
**SITE N: 8**

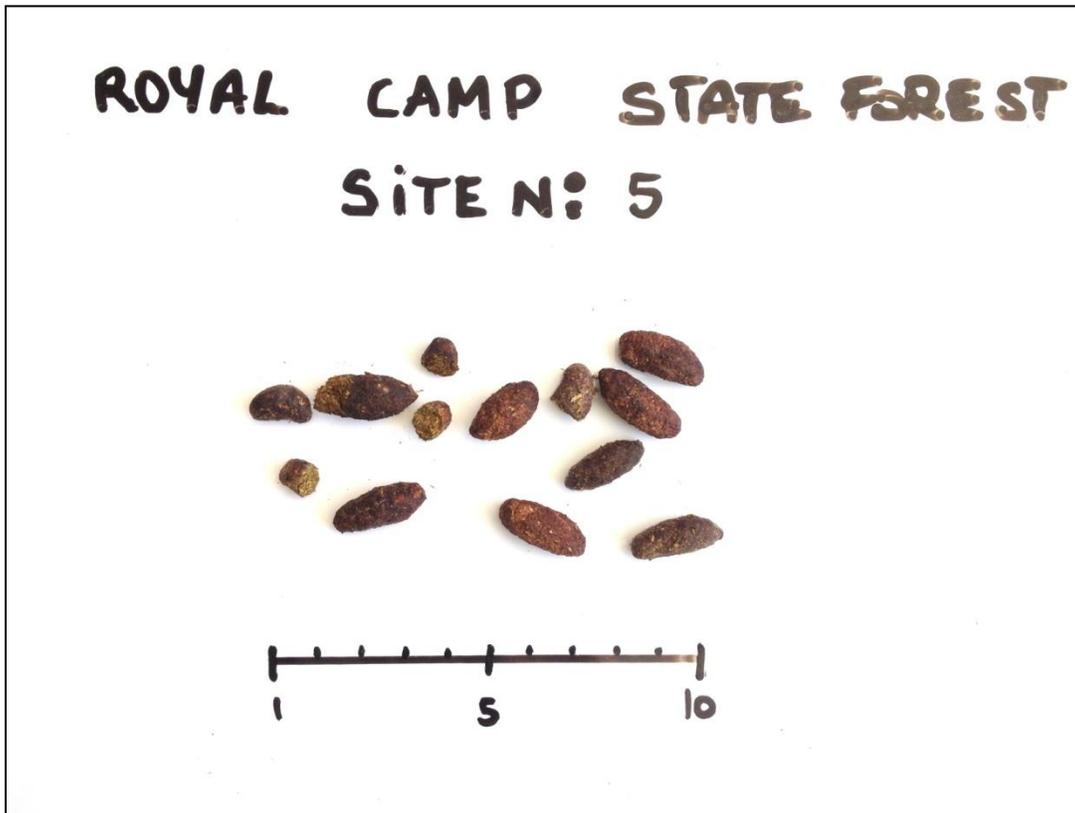


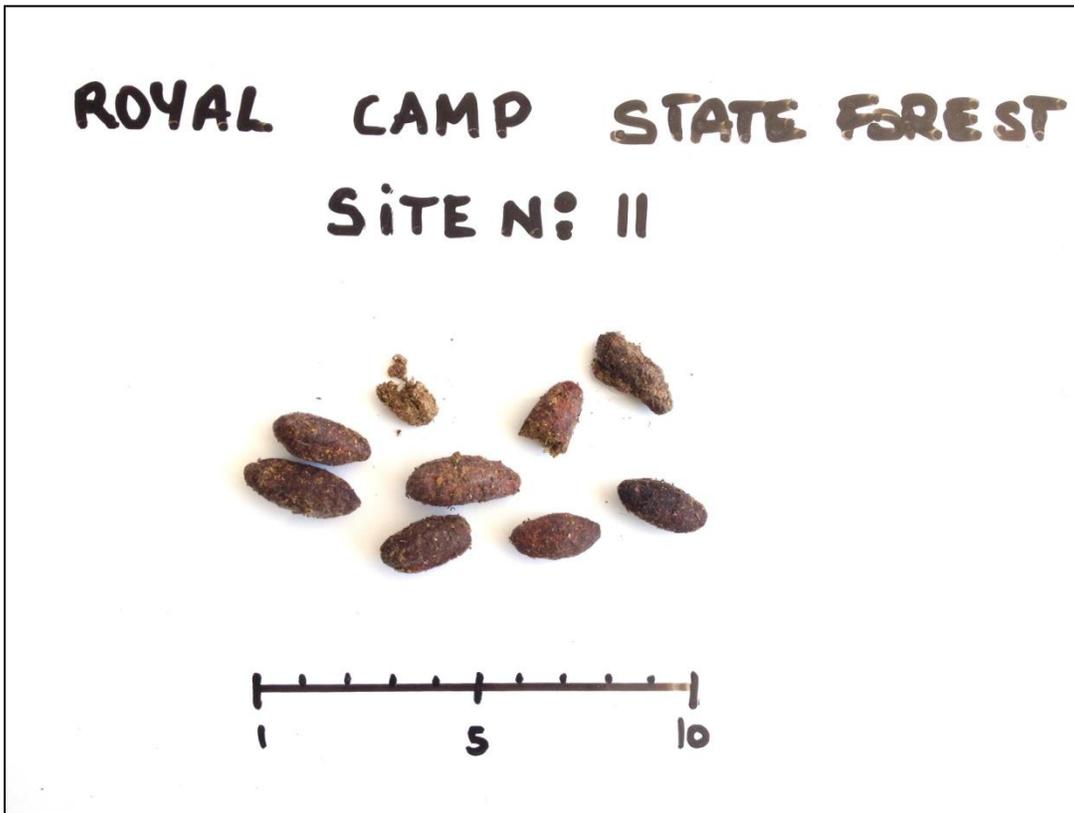


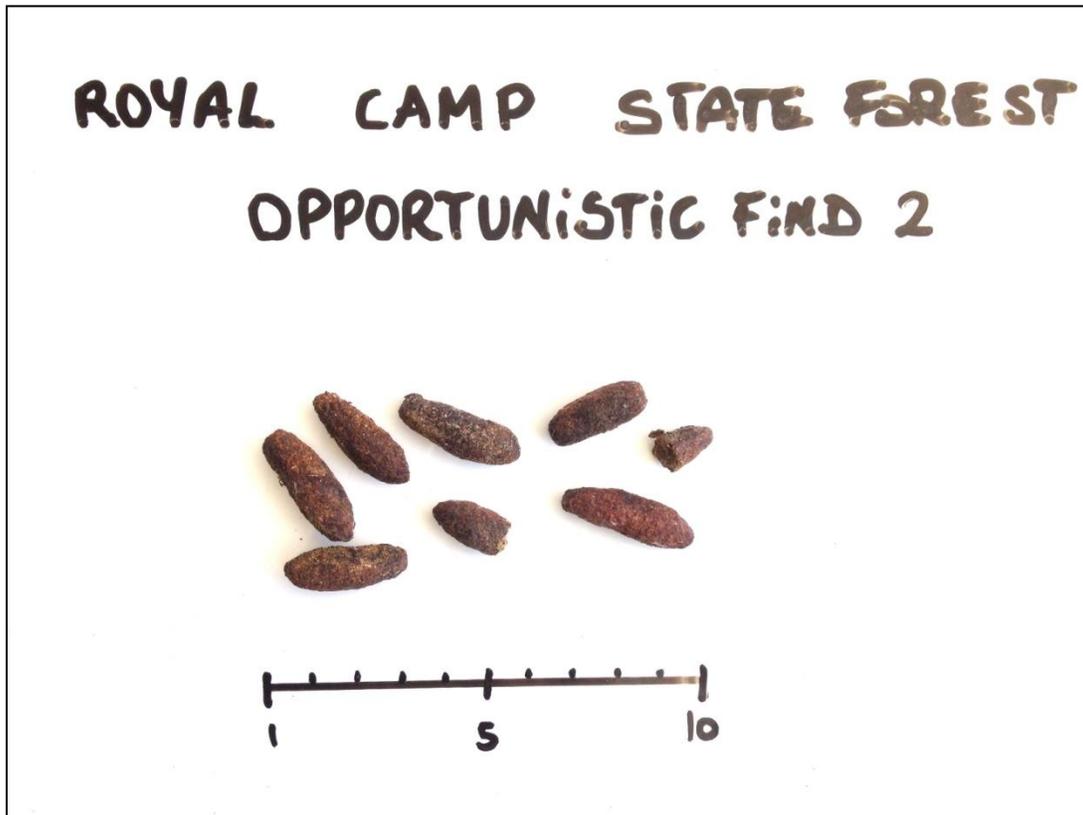
ROYAL CAMP STATE FOREST



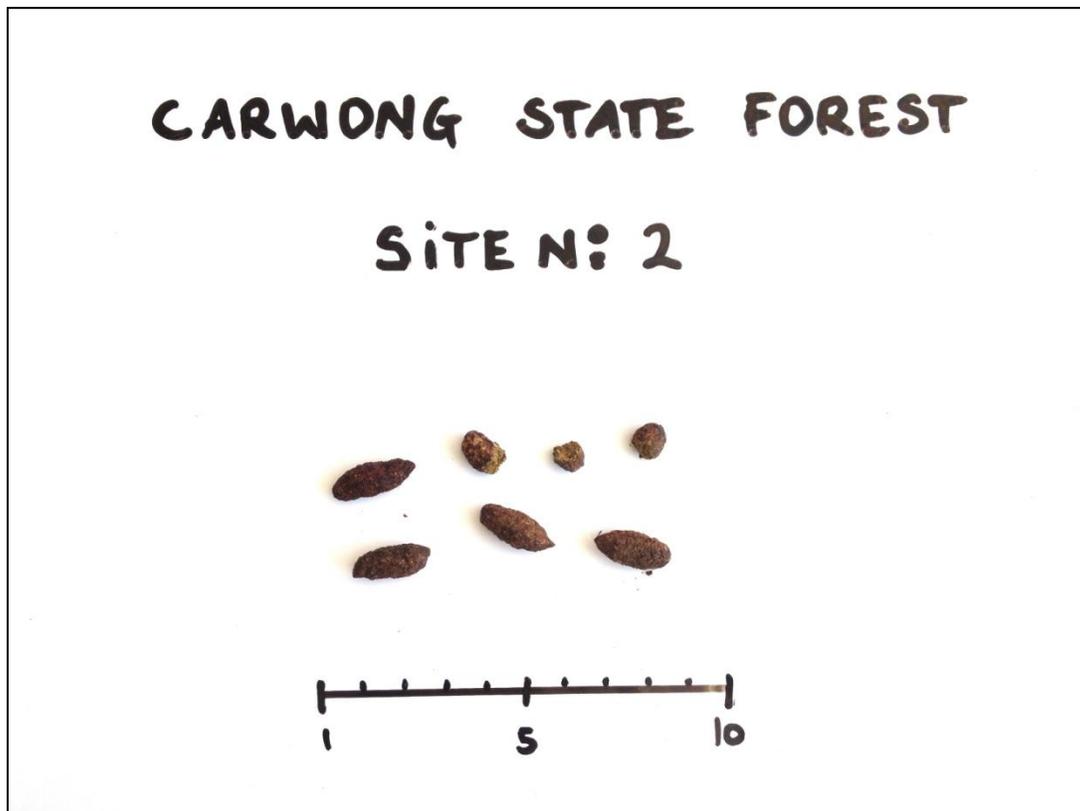
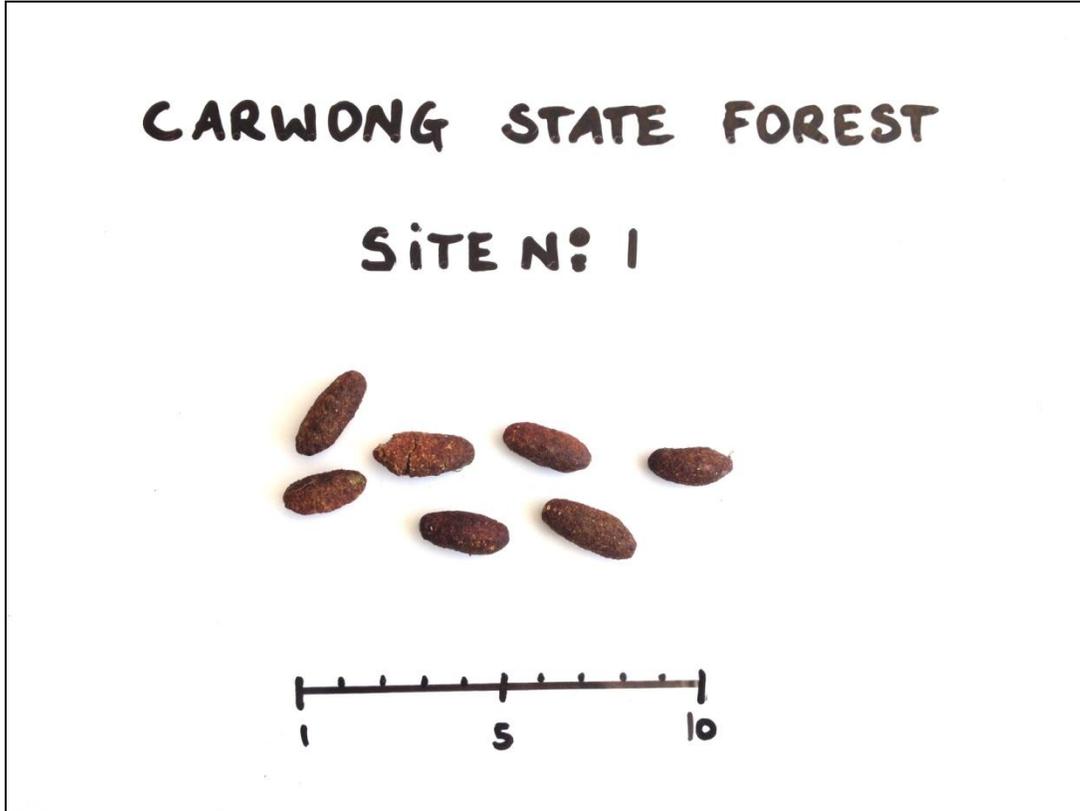








**CARWONG STATE FOREST**



# CARWONG STATE FOREST

## SITE N: 3



# CARWONG STATE FOREST

## SITE N: 4



