# REPORT ON COOLIBAH SURVEY RESULTS- MAY 2011

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**Summary**

A survey of the Coolibah woodland on the Mount Bruce Flats, near Marandoo was undertaken in May 2011, the purpose of which was to ascertain the current health of trees in the Coolibah woodland and to compare this with the data collected in 2008.

A survey of 3 transects covering a total of 2000 m showed the co-dominant height of *E. victrix* within the woodland to be approximately 15 m and crown cover was estimated to be 13.5 %. Tree basal area and stems per hectare within the woodland were estimated at 8 square metres/ ha and 115 stems/ha respectively. There was no field evidence that the extent of Coolibah distribution had changed markedly in recent years. There appears to be an adequate number of trees in the smaller size classes to ensure the regeneration of this woodland.

Very recent and concentrated regeneration of Coolibah less than 30 cm in height was observed in patches along Lines 1 and 2. These were not observed during the 2008 survey and are probably one to two years old, indicating that regeneration of Coolibah is not dependent on flood events.

Results of the survey suggest that, despite a period of below average rainfall, the Coolibah Woodland on the Mt Bruce Flats was in good condition.

**Methods**

Three transects each 10 metres in width and totalling 2000 metres were surveyed within the Coolibah woodland in the Karijini National Park, at Marandoo, on the 24th of May by Mr S Luccitti of RTIO and Mr Batini (consultant to RTIO).

The three transects were selected using Digital Multispectral imagery (DMSI) prepared by SpecTerra Services P/L and were aligned as closely as possible to those established in 2008 (Batini 2008, Figure 1). Each transect was positioned so as to capture the Coolibah Woodland only and therefore transects did not extend into Mulga.

Within 5 metres either side of each transect data were collected on:

- Crown condition of the Coolibah trees (in five Classes, Figure 2, as used by the Department of Environment and Conservation (DEC) and the Wandoo Recovery Group for crown health surveys in wandoo forests),
- Tree size class (using eight size classes, < 50 cm high, 50 cm to 2 m high, >2m but < 10 cm diameter, 10-20cm, 20-30 cm, 30-40cm, 40-50 cm and >50 cm in diameter).

These data were recorded separately for each 50 metre section.

At 50m intervals along each transect, data were collected on:

- Basal area over bark (by Factor 1 gauge),
- Stems per hectare (number of trees within an eight metre radius x 50),
- Top and co-dominant height (estimated using clinometer and tape), and
- Crown cover (estimated using a spherical densiometer).

**Results**

Vegetation within and outside the Coolibah Woodland showed response to 350mm of summer rain, with Spinifex (*Triodia* spp.) and tussock grasses (*Eulalia aurea, Chrysopogon fallax*) in flower, healthy lignum (*Muehlenbeckia florulenta*) and patchy germination of Coolibah within open areas (Figure 3).

A total of 2000 $m^2$ (2 hectares) were surveyed across three transects over a period of 5 hours. 364 Coolibah seedlings and trees were assessed for size class and crown health condition compared to a total of 328 for the 2008 survey.

Data were originally extracted for each of the three lines separately and compared. However the differences between lines were smaller than the differences observed within a line and so the data were pooled and the results are shown below.

The basal area over bark of all live trees > 10 cm in diameter was calculated as 8.3 $m^2$/ha, with a range of between 2 and 19 m2/ha (n = 40). Basal area is a measure of stand density and is the estimated sum of the cross sectional areas, at breast height, of all live stems that are greater than 10 cm in diameter.

Another conventional measure of stand density is the number of live stems per hectare (sph) that are larger than 10 cm in diameter. This was estimated to average 115 stems, with a range from zero to 300 (n = 40). Another estimate was calculated by dividing the total number of live Coolibah trees > 10 cm that were assessed (231) by the area surveyed (2 hectares), also giving a value of 115 sph. A further 66 sph were recorded in size classes less than 10 cm in diameter. Of these, 40 were less than two metres in height and 26 were taller than two metres.

The calculated average crown cover was 13.5 percent, with a very wide range from zero to 36 percent (n = 40). The top height of Coolibah trees observed was calculated as 21 metres (n = 4) and co-dominant height as 15 metres (n =14). Codominant height is the average height of the majority of the trees in the upper crown, whereas top height singles out the tallest trees.

The number of live stems in six size classes ranging from < 10 cm to > 50 cm were as follows: 133, 95, 65, 27, 26 and 18 ( sum =364), with the expected bias towards the smaller sizes, with two-thirds of all stems being smaller than 20 cm in size. Separate analyses of Line 1 and Line 2 show that there was more regeneration on Line 1 (a greater number of saplings < 2m high),a greater number of smaller trees (>2m in height and < 20cm diameter) in Line 2 and similar number of large trees ( > 30 cm diameter) across both transects. Crown health condition ratings were similar for both Line 1 and Line2 ( Figure 4).

There were very few recent deaths in Coolibah, most were old and were probably associated with past wildfire events, as shown by the presence of dry-sides in some trees and dead trees coppicing from the stump. There was no evidence of recent branch dieback or "flagging" however a few small branches had been broken by wind. Minor insect grazing and mistletoe were observed on some trees however no trend was observed and affected trees appeared to be distributed randomly across the woodland. Even where older trees showed some past damage to the crown (resulting from termite damage, lightning strike, wildfire, storm or branch dieback), the replacement crowns were healthy. The crown health assessment showed that the Coolibah trees were healthy at time of survey with 35% of all stems assessed falling within the better health Classes 1 and 2 and only 19% in the poorer health Classes 4 and 5, a ratio of about 1.8 :1. The percentage of trees in each crown health Class 1 to 5 was as follows: 9, 26, 46, 18 and 1 percent.

As expected, the regeneration < 10 cm in size was very healthy, with 61 percent in health Classes 1 and 2. There was no difference in health rating between younger (10-30 cm) and older trees (>40cm).

**Comparison with 2008 data**

The 2011 and 2008 data are comparable for basal area (8.3 and 9), for stems per hectare (115 and 102), for co-dominant height (15m and 15m) and for top height (21m and 21m) even though different observers were used and the three transects did not align perfectly. The diameter class distributions were similar, but with more small, <30 cm regrowth observed in the 2011 survey.

The crown health assessment indicated a small decline in Coolibah tree health. In 2008, 53% of Coolibah were recorded in health Classes 1 and 2 and this had fallen to 34% by 2011. The proportion in Classes 4 and 5 remained similar (19% and 18% respectively). The shift between 2008 and 2011 was from Class 1 and 2 into the middle of the range, Class 3. Though some trees had sparse crowns, the overall impression is that this remains a very healthy stand of Coolibah.

The estimate of crown cover by densiometer also showed a decline, from 20% in 2008 to 13.5% in 2011.

The mulga that were dead in 2008 had not re-sprouted. Those that were unhealthy in 2008, with poor, thin crowns had recovered a little, with slightly denser crowns. No very recent deaths of Mulga were seen.

**Discussion**

The Coolibah Woodland in the Mt Bruce flats at Karijini, as surveyed in May 2011, is a healthy, open woodland of pure Coolibah, with a dense understorey dominated by native grasses with the occasional healthy lignum (*Muehlenbeckia florentula*). The extent of this woodland appears to have remained quite stable over the period 2008 – 2010.

The Coolibahs are "patchily" distributed (as shown by the observed range in basal areas and stems per hectare) with some open areas and others where the trees are clumped closely

together. The size class distribution follows the expected negative exponential curve, with two-thirds of all the stems being less than 20 cms in diameter, or approximately 25-35 years old. Thirty-seven percent of all stems were smaller than 10 cm and are probably younger than 15 years. Very recent and concentrated recruuitment of Coolibah less than 30 cm in height was observed in patches along Line 1. These were not observed during the 2008 survey and as such are likely to be, at the most, one to two years old. The Coolibah Woodland has not flooded in this time and the presence of seedlings of this age suggests recruitment of *E. victrix* within the woodland is not dependent on flood events. In contrast, the larger trees that are around 60 cm in diameter may well be over 150 years of age.

There was evidence of grazing by cattle and at two sites small patches of the weed couch grass (*Cynodon dactylon*) were noted. At least 15 species of bird were seen within the woodland.

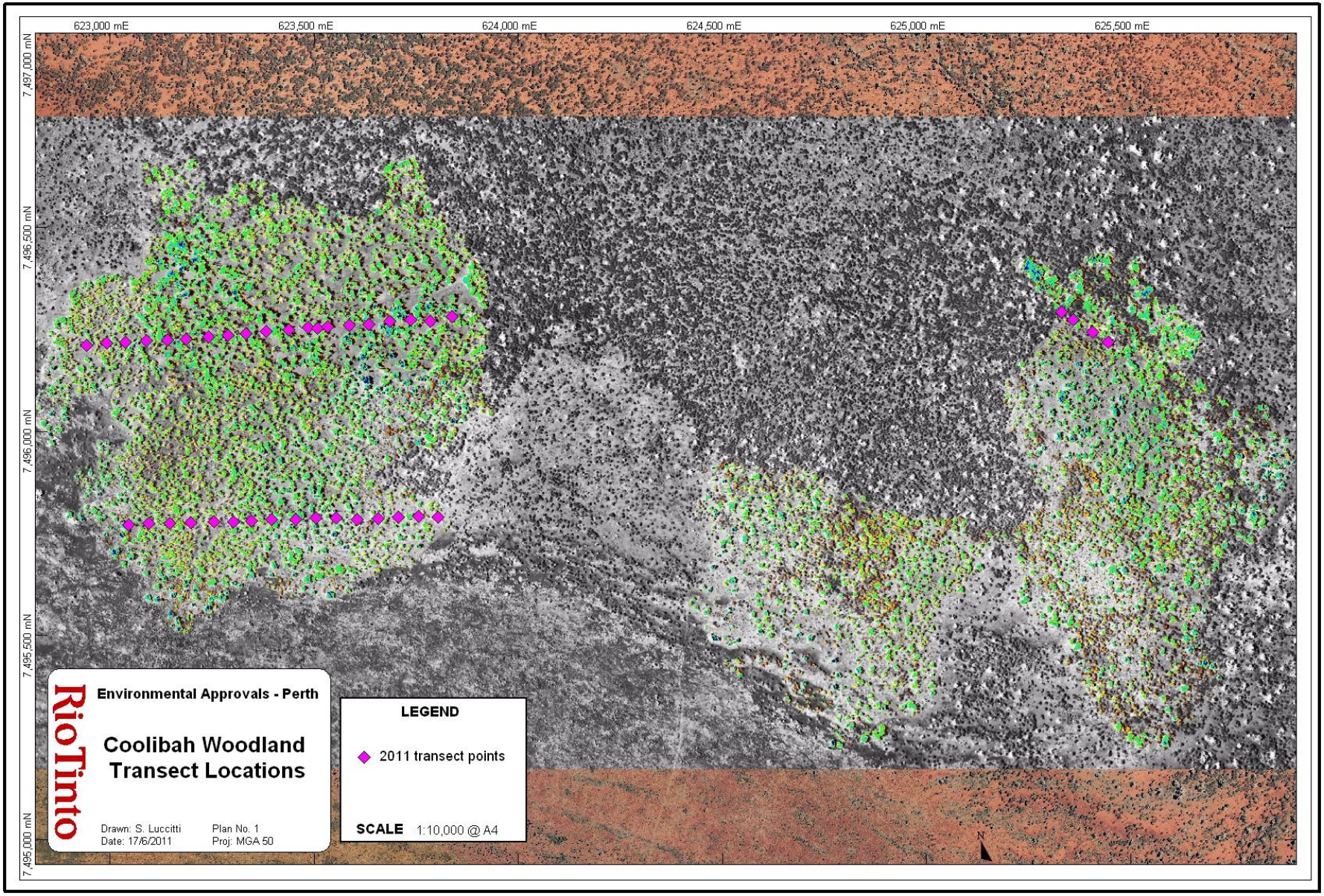
## REFERENCES

Batini F (2008)- Report on Coolibah survey results April 2008. Report to Rio Tinto Iron Ore.
Department of Environment and Conservation (2006). Wandoo Crown Decline. Situation Statement July 2006. Wandoo Recovery Group.

Wandoo Recovery Group (2007)- Surveying wandoo crown decline- a guide for assessors.

## FIGURES

Figure 1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RioTinto
Environmental Approvals - Perth
Coolibah Woodland
Transect Locations
Drawn: S. Luccitti
Date: 17/6/2011
Plan No. 1
Proj: MGA 50
LEGEND
2011 transect points
SCALE 1:10,000 @ A4
N

FIG. 2



## Crown Decline Stages

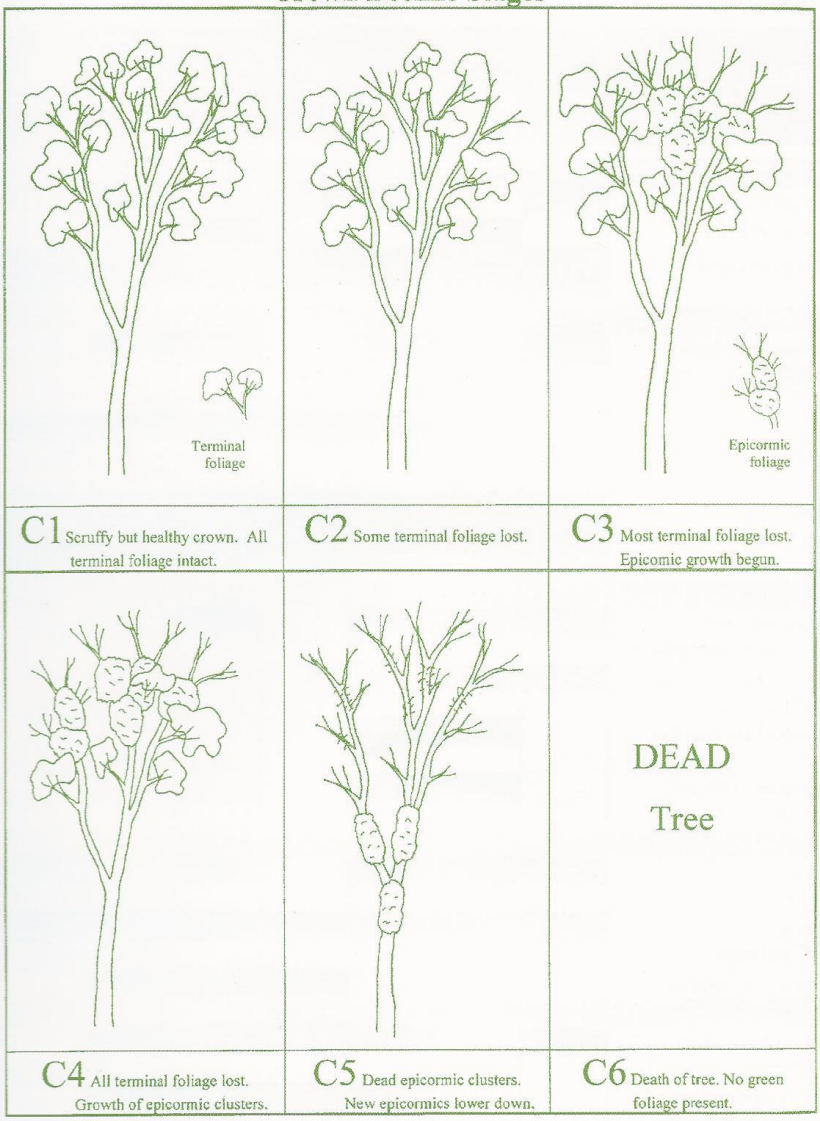

Figure 3: Photographs taken by Samuel Luccitti within Coolibah woodland, May 2011

Clockwise from top left : 1 Excellent crown class 1, 2 Good canopy structure but thin crown Class 3, 3 regeneration of Coolibah and 4 Class 1 crown in foreground and Class 4 in adjacent tree.

Figure 4. Stem distribution, health class 2011 and comparison between 2008-2011