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FOCUSED VISION consulting

Great Northern Highway Bindoon Bypass Project
Additional survey area February 2018

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1 Introduction

As part of environmental impact assessment and planning for the proposed bypass of Bindoon by the Great Northern Highway, Bamford Consulting Ecologists (BCE) has undertaken extensive environmental assessments (Bancroft *et al.* 2017, 2018). These have included surveys along broad alignment options to assess values for threatened black-cockatoo species. The surveys have focussed on scoring the foraging value of vegetation and locating and assigning a rank to potential nest-trees. Potential nest-trees are defined broadly by their diameter at breast height (DBH) as per guidance from the Commonwealth Department of the Environment and Energy (DEE), while trees are further ranked using a system developed by BCE. A rank of 1 is assigned to a known nest tree (birds seen using a hollow), down to a rank of 5 (tree with required DBH but clearly no suitable hollows). Trees of rank 1, 2 and 3 are of most interest as they are known or likely to support breeding.

Extensive potential nest-tree surveys were completed in late 2017 and reported on by Bancroft *et al*. (2018). Additional surveys on several properties south-west of Bindoon were requested in early 2018 to provide some contextual information on the density of potential nest trees close to the proposed bypass. This report provides a brief summary of the work undertaken and the observations made.

2 Study Areas and Methods

2.1 Study area

Two study parcels, collectively the 'study area', as shown in Figure 1, were investigated. The study area falls across four properties as listed in Table 1 (also indicated in Figure 1).

Table 1. Properties accessed as part of the additional (February 2018) potential nest-tree surveys.

Landowner Name	Address	Land ID
FAZARI HOLDINGS PTY LTD	Lot 18 (No: 5077) GREAT NORTHERN HWY CHITTERING	3786660
ODELON PTY LTD	Lot 9001	4067095
ODELON PTY LTD	Lot 104 (No: 257) BRENNAN RD BINDOON	1712311
MAROUCHTCHAK MIKHAIL, MAROUCHTCHAK IAROSLAVA	Lot 1 (No: 537) TEATREE RD BINDOON	3375697

2.2 Survey date and personnel

The additional surveys were conducted on the 20th and 21st of February 2018 by:

- Brenden Metcalf *BSc (Environmental Science), Hons (Biology)*;
- Peter Smith *AssDipAg*;
- Sarah Smith *BSc (Biology);*
- Katherine Chuk *BSc (Zoology), Hons (Zoology)*;
- Tim Gamblin *BSc (Zoology), CertEnvMngmt*;
- Barry Shepherd *BSc (Environmental Biology), Hons (Environmental Biology), PhD (Ecology)*;
- Pang Yong Kai *MSc (Zoology)*;
- Elspeth Meikle *BSc (Environmental Biology)*; and
- Eliza-Joyce Mellersh *BSc (Wildlife Management)*.

Data analysis, GIS management and report preparation were by:

- Dr Mike Bamford *BSc (Biol.), Hons (Biol.), PhD (Biol.)*; and
- Dr Wes Bancroft *BSc (Zool./Microbiol.), Hons (Zool.), PhD (Zool.)*.

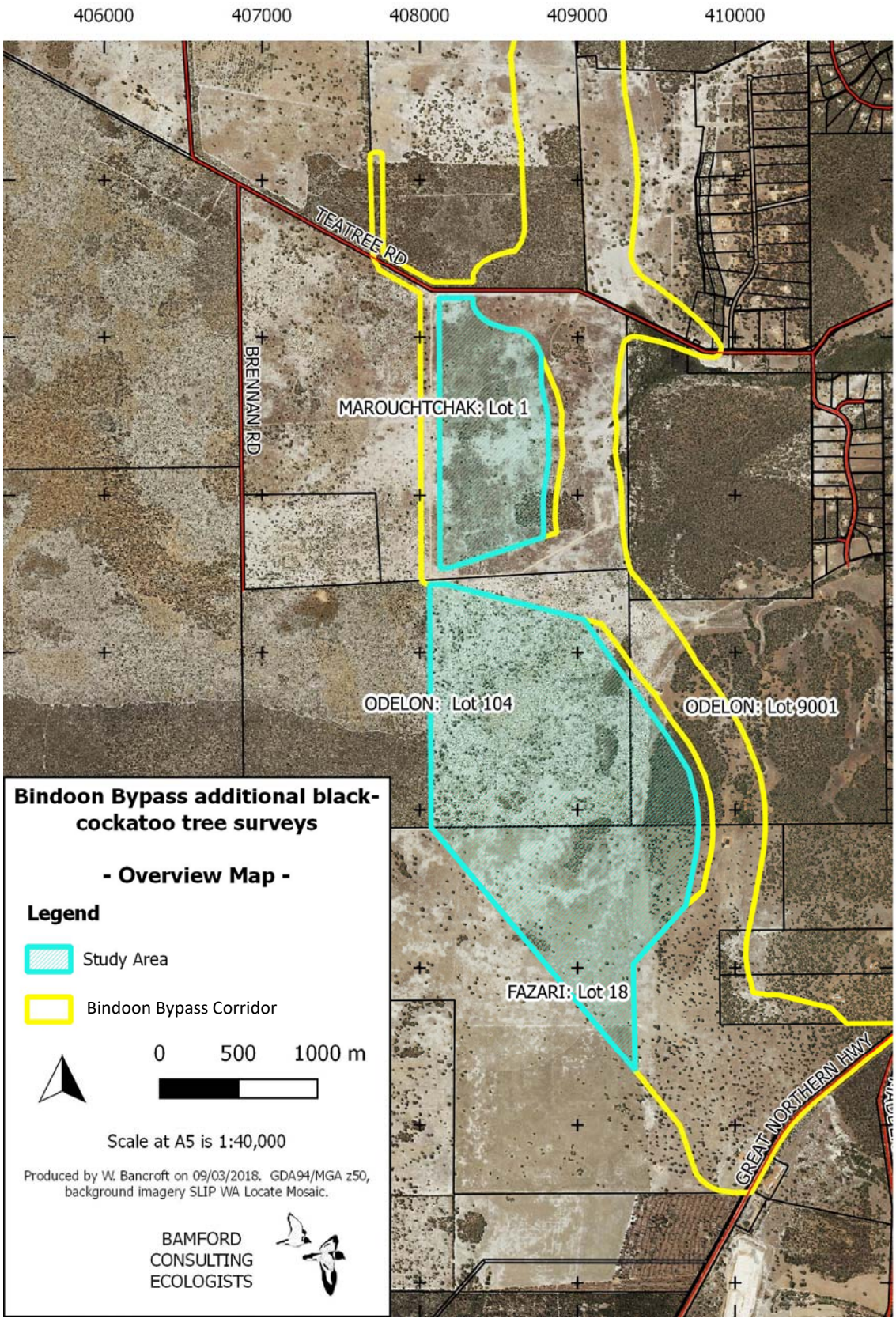

Figure 1. Study area location.

2.3 Black-cockatoo breeding habitat

The aim of the breeding surveys was to record all potential hollow-bearing trees (suitable for black-cockatoo nesting) within the study areas. Within the study areas, the following information was recorded for every suitable tree[1] (predominantly Jarrah, *Eucalyptus marginata*; Marri, *Corymbia calophylla*) with a DBH equal to or greater than 500 mm:

- tree location;
- tree species;
- life status;
- DBH; and
- nest-tree rank: trees were assessed (from the ground) for the potential presence/quality of nest-hollows and allocated a nesting rank (developed by BCE) as described in Table 2.

Table 2. Ranking system for the assessment of potential nest-trees for black-cockatoos.

As per DoEE (2018a, c) guidance, a potential nest-tree is any tree with a diameter at breast height >500 mm (or >300 mm for *Eucalyptus salmonophloia* and *E. wandoo*).

Rank	Description of tree and hollows/activity
1	Active nest observed; adult (or immature) bird seen entering or emerging from hollow.
2	Hollow of suitable size and angle (i.e. near-vertical) visible with chew marks around entrance.
3	Potentially suitable hollow visible but no chew marks present; or potentially suitable hollow present (as suggested by structure of tree, such as large, vertical trunk broken off at a height of >10m).
4	Tree with large hollows or broken branches that might contain large hollows but hollows or potential hollows are not vertical or near-vertical; thus a tree with or likely to have hollows of sufficient size but not to have hollows of the angle preferred by black-cockatoos.
5	Tree lacking large hollows or broken branches that might have large hollows; a tree with more or less intact branches and a spreading crown.
x	Where a hollow that is (otherwise) potentially suitable for black-cockatoo nesting has been colonised by feral Honey Bees (*Apis mellifera*), and therefore rendered unusable, the nest-tree rank is preceded by 'x' (e.g. x2, x3, x4).

BCE has also developed a tree measurement protocol, based on Commonwealth guidelines, and this is outlined in Appendix 1.

2.4 Black-cockatoo foraging signs

Black-cockatoo foraging signs were recorded in conjunction with the breeding tree surveys (see Section 2.3). When observed, the location, tree species and approximate age of the foraging evidence were recorded. Black-cockatoo foraging evidence may persist for some months or years after the foraging event. There is currently no published evidence documenting the deterioration process of forage. Factors that help to establish the time since foraging include: the colour of nuts/foliage, the

[1] the draft revised EPBC Act referral guidelines (DEE 2017) stress that any tree species may provide suitable hollows.

degree of weathering or decay of debris, the presence of small fragments of nut debris, the position/compression of the foraging debris relative to surrounding vegetation and leaf litter, and the strength of the eucalypt smell emitted. Despite the absence of empirical data, four categories of foraging activity were recognised, based on the time since foraging:

(i) Active – where birds were observed in the act of foraging;

(ii) Recent – foraging signs (e.g. chewed nuts or vegetation) were 'fresh' (i.e. foraging was likely to have occurred within days to weeks). Recent foraging signs were typically green and/or with very little sign of weathering. Approximately less than four weeks old;

(iii) Intermediate – foraging was likely to have occurred within weeks to months previously. Approximately one to six months old; and

(iv) Old – foraging was likely to have occurred months to years previously. Approximately more than six months old.

2.5 Mapping

Low resolution maps have been provided within the body this report. Higher resolution maps can be supplied if required. Separate (digital) GIS files have also been supplied.

3 Results and Discussion

3.1 Breeding

A total of 616 'potential nest-trees' that met the hollow-bearing criteria of DotE (2018a, c) and DEE (2017) was recorded from the 421 hectare study area. These comprised at least four species, as shown in Table 3. Two species accounted for almost 87% of trees: Jarrah and Marri (c. 47% and 39% of all potential nest-trees, respectively, as shown in Table 3). The assessment data (species, life status, DBH and nest-tree rank) for all trees are provided in Addendum A1.

The numbers of potential nest-trees of each species recorded in each ranking category are shown in Table 3, and the locations of these trees are mapped in Figure 2. The majority (c. 71%) of potential nest-trees surveyed in the study did not have hollow entrances suited to black-cockatoos that were observable from ground level. No active nests were located (probably reflecting the time of year of the survey) and four trees (c 0.6% of all potential nest-trees, see Table 3) had evidence of hollow-entrance chewing by black-cockatoos and, therefore, are highly likely to have been used for breeding recently. A further 77 trees (c. 12.5%, see Table 3) had potential black-cockatoo nesting hollows (but no sign of recent use).

The potential black-cockatoo-suitable hollows in two trees (0.32% of all potential nest-trees) had been colonised by feral Honey Bees and, thus, rendered the trees unusable for breeding at the time of the survey. The numbers of these trees in each species in each ranking category are presented in Table 3.

Of the 616 potential nest-trees, 539 (87.5%) were live trees.

3.1.1 Comparison to previous data

The proportions of each nest-tree rank in the 421 ha study area (reported here) were very similar to those observed in the 3118 ha study area for the greater Bindoon Bypass Corridor (Bancroft *et al.* 2018). The 'additional' area (this study) had very similar proportions of ranks 1 and 2 trees, an additional 2.5% more rank 3 trees, an additional 2% more rank 4 trees and c. 5% less rank 5 trees. With respect to the provision of potential nest sites, the additional survey areas reported on here are of equivalent value to the overall Bindoon Bypass Corridor.

The species composition of the study area (reported here), however, differed to the Bindoon Bypass Corridor of Bancroft *et al*. (2018). Jarrah and Coastal Blackbutt were overrepresented in the additional study area, and Wandoo (E. wandoo) was absent. This is likely to reflect the localised vegetation and substrate associations (in a c. 5 km by c. 1.6 km study area) when compared to the broader region (a c. 35 km by 16 km referral area).

3.2 Foraging signs

There was one record of foraging evidence from black-cockatoos in the study area: old foraging signs from Forest-Red-tailed Black-Cockatoos on Jarrah (409425 E, 6520923 N).

3.3 Direct records

No black-cockatoos were seen or heard within the study area during the breeding tree surveys.

Table 3. The number of potential nest-trees of each species in each nest-tree rank category in the additional study area.

Parentheses indicate the number of trees in that category that were unsuitable for use because of bee hives.
Jarrah = *Eucalyptus marginata*; Marri = *Corymbia calophylla*; Coastal Blackbutt = *E. todtiana*.

Category		Number of Trees				TOTAL	Percentage (of Grand Total)
		Jarrah	Marri	Coastal Blackbutt	Unidentified eucalypt		
1	Active nest.	-	-	-	-	0	0.00
2	Potential hollow with chew-marks.	1	2	1	-	4	0.65
3	Potential hollow, no chew marks.	28	19	30 (1)	-	77 (1)	12.50
4	Potential hollow, unsuitable orientation.	45 (1)	26	29	-	100 (1)	16.23
5	Sufficient DBH, no observable hollows.	218	194	19	4	435	70.62
	TOTAL:	292 (1)	241	79 (1)	4	**616** (2)	100.00
	Percentage (of Grand Total)	47.40	39.12	12.82	0.65	100.00	

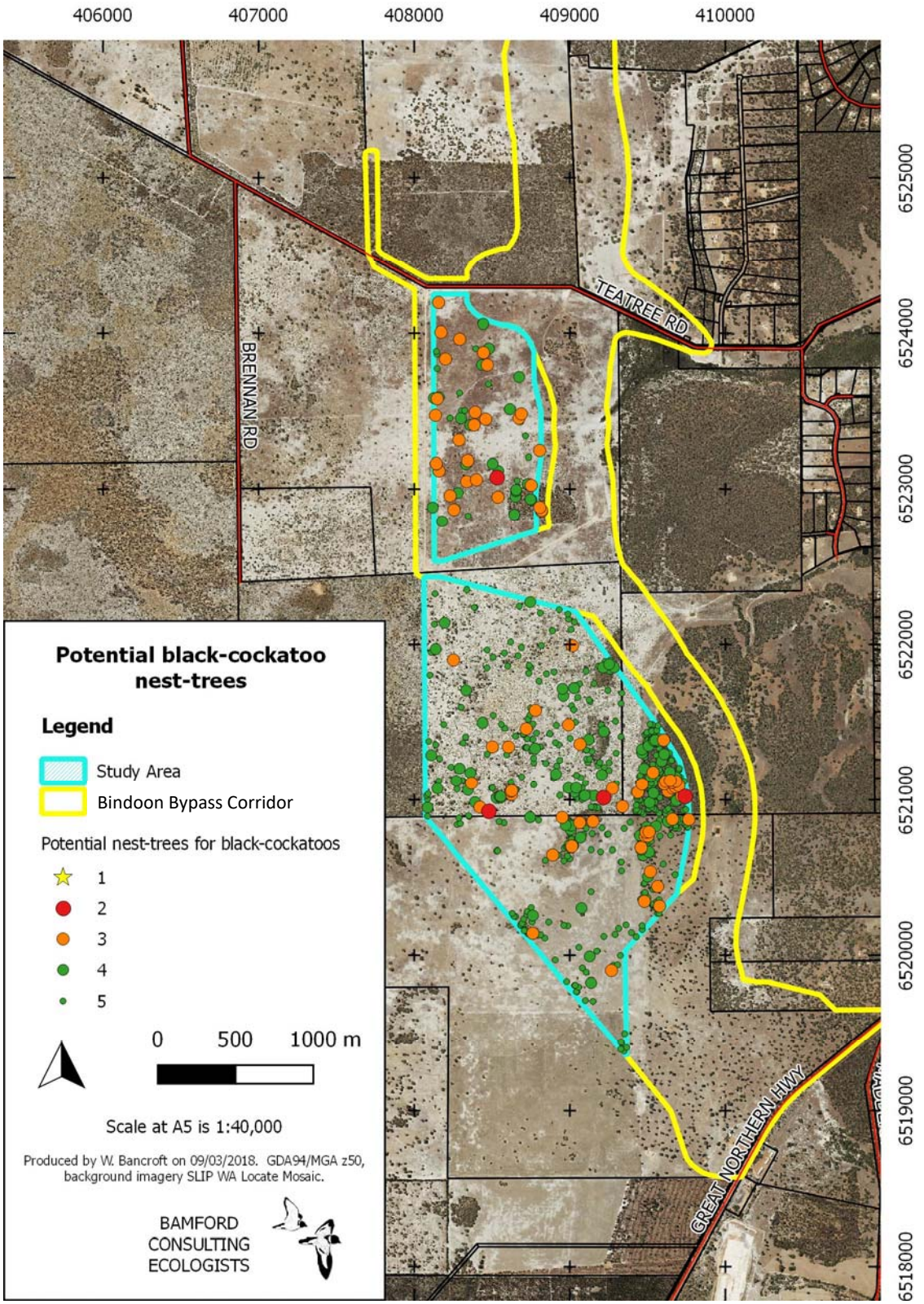

Figure 2. Location of potential nest-trees within the study area, as classified according to nest-tree rank.

4 References

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5 Appendices

Appendix 1. Bamford Consulting Ecologists black-cockatoo nesting-tree assessment protocol.

Bamford Consulting Ecologists base black-cockatoo nesting-tree assessments on Federal guidelines (DEE 2017; DotE 2018a, b, c) but also refer to the following when undertaking field surveys.

Measuring DBH

While black-cockatoos generally nest towards the crown of a tree, the diameter of a tree at breast-height (DBH) can be indicative of the likelihood of hollow-formation in the upper trunk and can be used in the assessment of the 'value' of a tree to breeding black-cockatoos. A DBH threshold of 500 mm (or 300 mm for Wandoo, *Eucalyptus wandoo*, and Salmon Gum, *E. salmonophloia*) is commonly used to delineate 'potential' nest-trees (DotE 2018a, b, c), however the tree has to be *functionally capable of supporting a nest hollow* and there are several exceptions where trees that meet a strict DBH threshold are excluded (e.g. those with low-forking into narrow-diameter trunks, or those that have been hollowed-out and 'opened' by fire). Thus some discretion needs to be used when assessing trees.

The international standard for 'breast height' is 1.3 m (James and Shugart Jr 1970).

Only occasionally are trees close to perfectly cylindrical. As such, wherever possible, DBH should be 'representative' of the tree. In cases where the tree is approximately oval in cross-section, BCE measures the diameter of the shorter axis. Note that other methods such as circumference, or the quadratic average of the long and short axes are used in some applications, but logistic constraints generally require a more pragmatic approach. DBH should be reflective of the trunk above the nesting threshold (see below). Where a tree spreads at the base along one axis, the axis that best represents the trunk above is chosen for measurement.

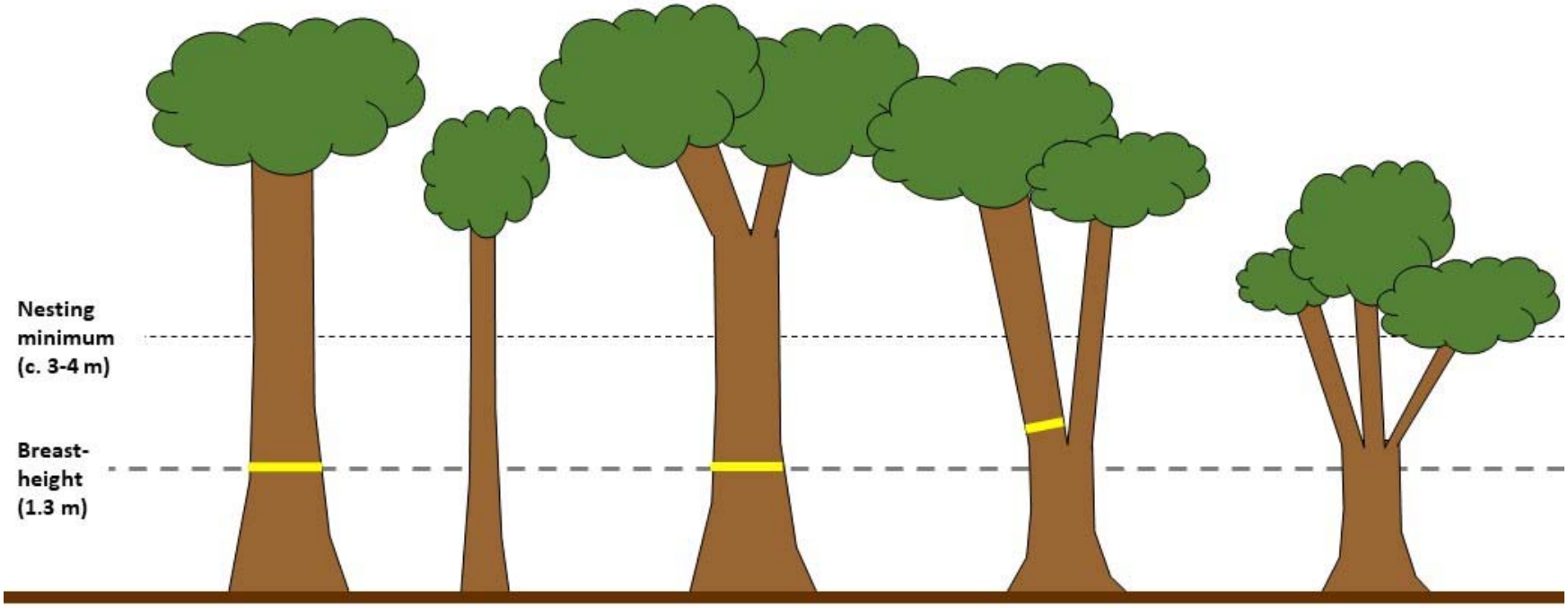
Nest height minima

For Carnaby's Black-Cockatoo, the minimum height of known nests is c. 3 m (Saunders 1979)[2]. For Forest Red-tailed Black-Cockatoo, the minimum height of a known nest is 6.5 m (Johnstone *et al.* 2013). Thus, a 3-4 m threshold seems a pragmatic "general" one to use for the purposes of field surveys where both species are likely and multiple tree species are under consideration.

Tree forms

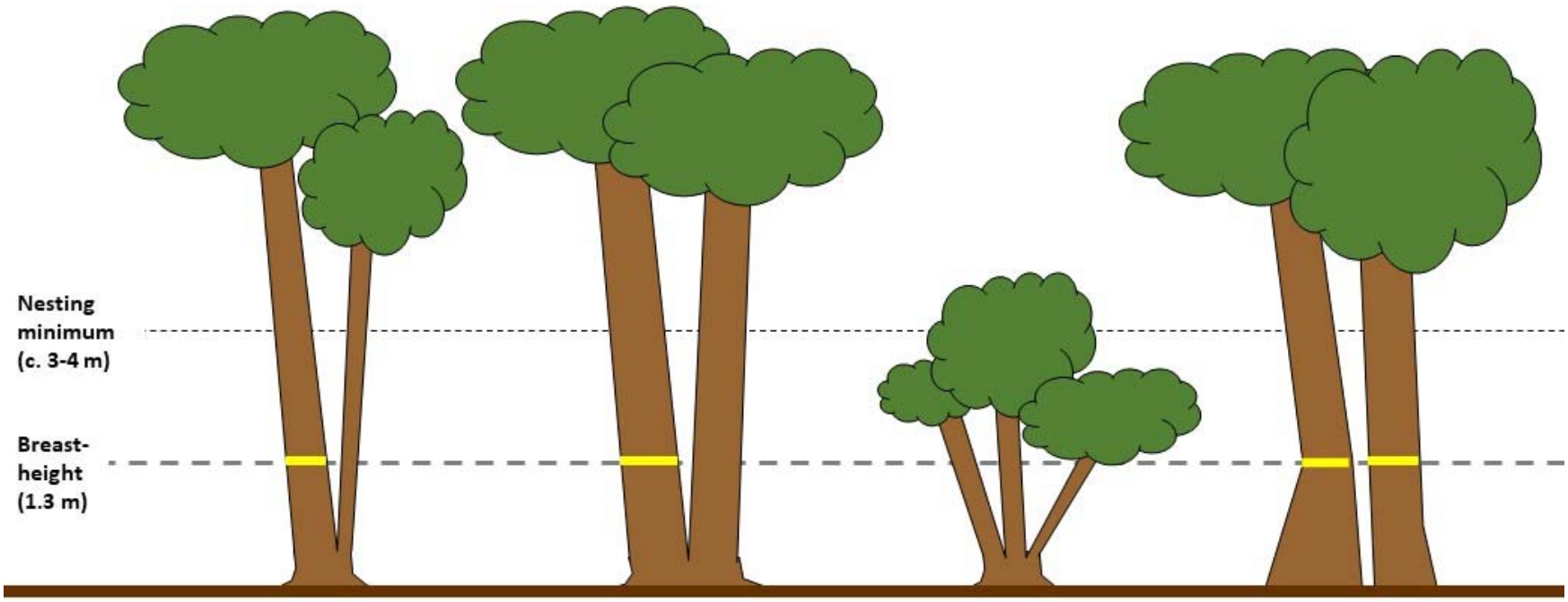
Quite obviously, trees have a range of forms and growth-habits. These can occasionally affect black-cockatoo nesting-tree surveys. As such, the following table has been developed (with reference to the information above) to guide tree assessment.

[2] Although nests as low as 2 m (in Wandoo or Salmon Gum) were recorded, 95% of nests were above 3 m.



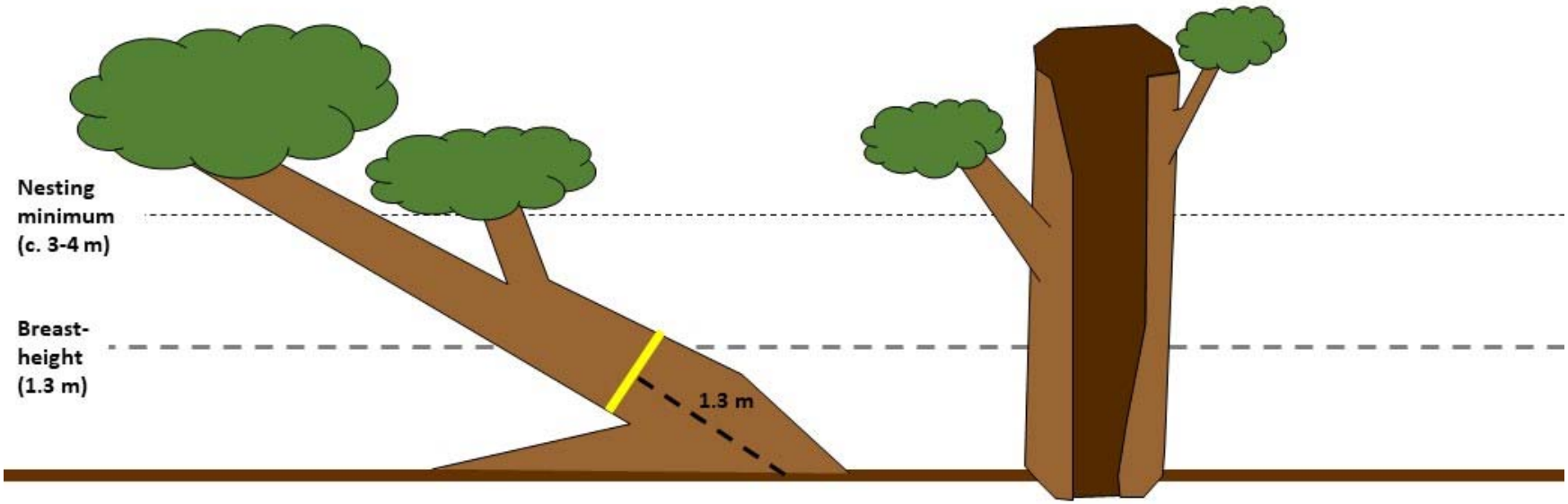
Tree Description:	Straight trunk. DBH > 500 mm*.	Straight trunk. DBH < 500 mm*.	Trunk forks above 3 m. DBH > 500 mm*.	Trunk forks between 1.3 m & 3 m. Diameter of at least one trunk above fork > c. 500 mm*.	Trunk forks between 1.3 m & 3 m. DBH > 500 mm* but no trunks above fork have diameter > c. 500 mm*.
Actions:	Measure DBH. Record species, life status and score for hollows. Waypoint tree.	Do not record.	Measure DBH. Record species, life status and score for hollows. Waypoint tree.	Measure/estimate diameter of widest trunk above fork. Note number of trunks. Record species, life status and score for hollows. Waypoint tree.	Do not record.

* Or 300 mm DBH for Wandoo, Salmon Gum.



Tree Description:	Trunk forks below 1.3 m. Diameter of <u>one</u> trunk above fork > 500 mm*.	Trunk forks below 1.3 m. Diameter of <u>multiple</u> trunks above fork > 500 mm*.	Trunk forks below 1.3 m. DBH of all trunks < 500 mm*.	Two <u>separate</u> trees in very close proximity. Both with DBH > 500 mm.
Actions:	Measure DBH of relevant trunk above fork. Note number of trunks. Record species, life status and score for hollows. Waypoint tree.	Measure DBH of <u>widest</u> trunk above fork. Note number of trunks. Record species, life status and score for hollows. Waypoint tree.	Do not record.	For <u>both</u> trees... Measure DBH. Record species, life status and score for hollows. Waypoint <u>each</u> tree (i.e. 2 separate records).

* Or 300 mm DBH for Wandoo, Salmon Gum.



Tree Description:	Trunk leans dramatically. Diameter > 500 mm* at 1.3m from centre of tree base.	Trunk has been burnt out internally to create an open half-pipe shape (no potential nesting sites). DBH > 500 mm*.
Actions:	Measure diameter at 1.3 m from the central base point, along the midline of the tree. Record species, life status and score for hollows. Waypoint tree.	Do not record.

* Or 300 mm DBH for Wandoo, Salmon Gum.