APPENDIX 13: SPECIES SPECIFIC METHODOLOGY

MEMO

To:	Department of Climate Change, Energy, the Environment and Water
From:	Litoria Consulting
Date:	27/09/23
Re:	EPBC 2021/9112 – Modified Habitat Quality Assessment methods

1 INTRODUCTION

The following document proposes species-specific Modified Habitat Quality Assessment (MHQA) methods for assessment of habitat quality for the Grey-headed Flying-fox (GHFF) at impact and offset sites for EPBC 2021/9112. This assessment has been conducted following the Guide to Terrestrial Habitat Quality version 1.2, 2017[1] (State of Queensland 2017).

Habitat quality at an impact or offset matter area is determined based on an assessment of the following attributes (State of Queensland 2017):

Site condition + Site context + Species stocking rate = Habitat quality score

The default MHQA spreadsheet is generalised so it may be applied to a number of species. It is most suitable for terrestrial fauna. For the GHFF, we have undertaken modifications to suit the following unique species characteristics which are listed in the EPBC Administrative Guidelines on Significance, the National Recovery Plan (NRP) and the Species Profile and Threats Database (Department of the Environment and Heritage 2003, Department of Climate Change Energy the Environment and Water 2022):

[1] Guide to Determining Terrestrial Habitat Quality (2017).

- The GHFF is considered one population due to high genetic exchange and mobility across a unified range,
- The species is exclusively aerial and arboreal,
- Mobility and population dynamics are not influenced by terrestrial factors such as dispersal barriers and fragmentation,
- The GHFF rests, socialises and bears young in roosts (or camps) and only leave for foraging activity,
- Increasing the availability of winter foraging resources is crucial to species recovery objectives,
- Population numbers and roost locations are well understood and counted in an annual census, and
- The GHFF can travel very large distances in a single day to forage and return to roost (average of 10-40km, however outliers of 150km have been recorded).

The following document outlines the modifications of the MHQA assessment undertaken by Litoria for the GHFF. This document is for review and in-principal agreement of the species-specific changes to the MQHA tool with the Department of Climate Change, Energy, the Environment and Water (the Department). We have integrated advice from the Department received on 14/10/2022 in regard to the MQHA requiring:

- A balanced suite of metrics which capture both site and local-scale attributes,
- Attributes that can be applied at any location without site-specific bias,
- Attributes drawn from habitat preferences & threats identified in Statutory Documents,
- Re-weighting or removal of MHQA metrics which are not deemed relevant to the GHFF's viability,
- Supplementary metrics specific to the needs of GHFF, including the availability and timing of flowering (such as winter-spring flowering resources),
- On-ground measures that can be aligned to management actions,
- Consideration of the upper-average foraging range of the species (up to 40km), and
- Re-weighting of measures and sections (condition, context and SSR) to reflect the influence on GHFF viability.

The following sections summarise the default and proposed approaches under the MHQA tool. Where methods have not been changed, they have been extracted directly from the MHQA tool and the Guide to Determining Terrestrial Habitat Quality (Version 1.2, April 2017) (State of Queensland 2017). Methods are displayed as the default (old) and proposed (new) measures of habitat quality. For each measure which we have removed, changed or chosen an indicator for, justifications have been provided.

The report contains the following sections:

- Justification of the overall weightings of site condition, site context, and species stocking rate for the habitat quality score,

- A detailed explanation of the measures, weightings and scoring methods of the suite of measures that comprise site condition, site context and species stocking rate, including justification for all decisions, and
- Finally, a summary of the modifications is provided.

2 OVERALL WEIGHTINGS

The overall weighting for the species-specific methods has been adjusted to suit the importance of the categories as they relate to GHFF:

1. Site condition,
2. Site context, and
3. Species stocking rate.

The following sections provide an overview of the proposed weighting approach and reasoning behind the proposed changes. Changes have been guided by:

- The unique species characteristics which are listed in the EPBC Administrative Guidelines on Significance, the National Recovery Plan (NRP) and the Species Profile and Threats Database (listed above) and
- Integrated advice from the Department received on 14/10/2022 in regard to the MQHA (Refer Appendix 1 of this methodology for official guidance material).

2.1 SITE CONDITION

Site condition measures the characteristics of the vegetation community compared to an undisturbed community of the same type, with a focus on those characteristics that support the recovery of the species (State of Queensland 2017). Hence site condition in this case represents quality and availability of food and foraging habitat for the GHFF.

Site condition is critical to the GHFF as food tree productivity, reliability and seasonal continuity are the central component of species persistence (State of Queensland 2017). Site condition in this method prioritises availability of winter foraging habitat which is both a key threat and a key recovery target in the National Recovery Plan (State of Queensland 2017). Site condition can be improved via on-ground management. Parameters which measure the effect of management actions provide clear line-of-sight between actions and habitat quality uplift – helping to ensure a conservation gain can be achieved at the offset site. As such, a score of 4/10 is considered appropriate. Default and proposed weightings are indicated in Table 1.

2.2 SITE CONTEXT

The surrounding landscape and adjacent land uses can directly influence the quality and security of habitat through edge effects, environmental buffering, or threatening processes (Fischer and Lindenmayer 2007). Habitat with limited threats and a complementary environmental setting (such as highly vegetated surroundings) is more likely to be successful than more isolated patches which are located far from roost sites and/or subject to greater threatening processes.

There are no proposed changes to the weighting for Site Context. The GHFF is highly mobile and can fly between patches of vegetation or even individual trees within an otherwise fragmented landscape. Physical connectedness, including corridors, patch size and context are less important for highly mobile species such as GHFF than other terrestrial arboreal or ground-dwelling specialists. Notwithstanding, site context remains an important part of assessing both impacts and any habitat offset, as it is also a proxy for threatening processes and to ensure that any offset provides a complimentary environmental setting. As such, a category weighting of 3/10 is considered appropriate. Default and proposed weightings are indicated in Table 1.

2.3 SPECIES STOCKING RATE

A suitable offset must demonstrate that the species occurs in the area and the site can support the reproduction and continued existence of species. Species stocking rate measures the capacity of a site to support a species. Species stocking rate is measured from field survey data, available modelling and current species records.

The proposed changes to the weighting of species stocking rate are justified on the basis that almost all habitat area in the distribution of the species is foraging habitat. This is due to the wide-ranging habit of the species and that most of the population is highly concentrated in roosts for resting, socialisation, breeding and gestation. Therefore, the majority of GHFF habitat is unable to support key stocking measures such as breeding, dispersal, genetic exchange, etc. unless – in rare cases – a roost is present on the site (which would be of critical importance). However, species stocking rate is still important to demonstrate that the species occurs in the area and the site can support the continued existence of species. As such, a category weighting of 3/10 is considered appropriate. Default and proposed weightings can be found in Table 1.

TABLE 1: DEFAULT AND PROPOSED WEIGHTINGS.

Category	Default weighting	Proposed weighting
Site condition	3/10	4/10
Site context	3/10	3/10
Species stocking rate	4/10	3/10

3 HABITAT QUALITY ATTRIBUTES

The following section contains details of scoring and weighting methodologies for habitat quality attributes including:

- Site condition,
- Site context, and
- Species stocking rate.

3.1 SITE CONDITION

Site condition refers to the condition of vegetation on the site. Traditionally this is a measure of BioCondition attributes (modified by the Department), quality and availability of food and foraging habitat, and quality and availability of shelter. Foraging habitat is the critical driver of GHFF recovery plans (Department of Agriculture Water and the Environment 2021) and is therefore the focus of site condition for the GHFF specific methodology. The selected approach measures food tree productivity, reliability and seasonal continuity of available food sources within strata.

Literature review was key to establishing the site condition assessment method and informed selection of the following indicators:

- Modified BioCondition score (unchanged from the method provided by the Department),
- Blossoming tree productivity and reliability in tree strata (i.e., T1, T2 and T3),
- Fruiting species density (in strata in which they occur), and
- Seasonal continuity of available food (particularly during annual shortages).

Table 2 contains site condition default and proposed measures and weightings.

TABLE 2: SITE CONDITION DEFAULT AND PROPOSED MEASURES (GREEN INDICATES CHANGE).

Default			Proposed		
Measure		**Score**	**Measure**		**Score**
Recruitment of woody perennial species in EDL	5		Recruitment of woody perennial species in EDL	5	
Native plant species richness – trees	5		Native plant species richness - trees	5	
Native plant species richness – shrubs	5		Native plant species richness - shrubs	5	
Native plant species richness – grasses	5		Native plant species richness – grasses	5	
Native plant species richness – forbs	5		Native plant species richness - forbs	5	
Tree canopy height (average of emergent, canopy, sub-canopy)	5		Tree canopy height (average of emergent, canopy, sub-canopy)	5	
Tree canopy cover (average of emergent, canopy, sub-canopy)	5	80	Tree canopy cover (average of emergent, canopy, sub-canopy)	5	10
Shrub canopy cover	5		Shrub canopy cover	5	
Native grass cover	5		Native grass cover	5	
Organic litter	5		Organic litter	5	
Large trees (Eucalypt plus Non-eucalypt)	15		Large trees (Eucalypt plus Non-eucalypt)	15	
Coarse woody debris	5		Coarse woody debris	5	
Non-native plant cover	10		Non-native plant cover	10	
Quality and availability of food and foraging habitat (applicable strata)			Blossoming productivity and reliability – Canopy (T1) strata	40	
			Blossoming productivity and reliability – Sub-canopy (T2) strata	10	40
			Blossoming productivity and reliability – Sub-canopy (T3) strata	10	
		10	Fruiting tree availability – Canopy (T1) strata	10	
			Fruiting tree availability – Sub-canopy (T2) strata	5	
			Fruiting tree availability – Sub-canopy (T3) strata	5	20
			Fruiting tree availability – Shrub (S1) strata	5	
			Seasonal reliability of foraging habitat		30
Quality and availability of shelter		10	Not applicable to foraging habitat		-
Total score		**100**	**Total score**		**100**
Overall weighting		**3/10**	**Overall weighting**		**4/10**

3.1.1 BIO-CONDITION SCORE

BioCondition has been designed to measure a range of site-scale attributes, however, not all attributes are relevant to the GHFF. As such, the score has been reduced from a score out of 80 to a score out of 10, as more appropriate measures of foraging habitat quality have been assessed, and the majority of measures in BioCondition are irrelevant to foraging habitat quality.

Nevertheless, BioCondition score has been included in the assessment as it represents the maturity, integrity and ecological value of a site. Sites with high BioCondition scores are usually part of resilient and healthy ecosystems that are resistant to threats and disturbances. High BioCondition scores increase the likelihood that the site will contribute to foraging food tree productivity and reliability in the long-term scope of threatened species management.

The BioCondition methodology has not been changed from the default. Refer to the BioCondition assessment method (Eyre, Kelly et al. 2015), and the additional guidance documents on the modifications provided by the Department.

3.1.2 QUALITY AND AVAILABILITY OF FOOD AND FORAGING HABITAT

As the offset proposal is for foraging habitat, this measure has been significantly raised from a score out of 10, to a score comprised of several different measures of food tree productivity, reliability and annual continuity that is scored 90/100. This has been weighted highly as the offset is for foraging habitat for a wide ranging exclusively aerial species.

Blossoming Tree Productivity and Reliability (Density weighted flower scores)

Blossoming tree productivity and reliability measures the value of habitat with a function of food tree density and the relative value of food trees for the GHFF as they occur in the habitat. The value of trees was assessed utilising the document *Ranking the Feeding Habits of Grey Headed Flying Foxes for Conservation Management* (Eby & Law 2008). It ranks food trees for the GHFF with a score between 0 and 1, where scores closest to 1 are the most productive and reliable food trees for the GHFF, where:

- **Productivity** is a function of abundance, which measures nectar proliferation; and spatial synchrony, which is the likelihood that individual trees of the same species flower at the same time over large areas, and
- **Reliability** is a function of annual reliability, which measure the number of years flowering events occur for any given species; and variation in flowering intensity (i.e., average percent of tree canopy in flower).

Blossoming tree productivity is measured in canopy and sub-canopy strata to differentiate the relative importance of the canopy to the sub-canopy. GHFF are canopy feeding frugivores and nectivores primarily, and usually (not always) prefer closed canopy forests at

least 5 m high in forests with upper, mid and understorey layers present (Council 2016, Department of Agriculture Water and the Environment 2021). Differentiation between the mid and upper story is particularly important for the GHFF in summer when they utilise the sub-canopy to manage heat stress while feeding (Council 2016). The strata has been scored accordingly for seasonal preferences (i.e., the sub canopy is more important than the canopy in summer, i.e., for a quarter of the year and hence receives a quarter of the canopy score. Refer Table 2 for differential scoring of strata).

Heights of strata are compared to the Regional Ecosystem (RE) technical description of the dominant RE in the assessment unit. Therefore, the assessment can measure fruiting tree productivity and reliability within the context of the strata, i.e., it can differentiate between regrowth and mature forest, mature forest being more resourceful for the GHFF. Only trees that are known food trees for the GHFF are counted towards blossoming tree productivity and reliability scores, other non-food trees are not assessed. Refer to Appendix 2 of this methodology for the draft technical descriptions of all of the REs that are relevant to the impact and offset sites.

To demonstrate the approach, we have utilised RE 12.9-10.2 as an example. Habitat value has been measured as a function of flower score and tree density. Where scores in a range were provided for a single tree by Eby & Law (2008), the average score of the range was used in the assessment (applied score), as shown in Table 3 below. Note that food trees are only counted towards scores if:

- The tree is expected to exist in the Regional Ecosystem, or
- The tree has grown naturally in the area without human intervention.

TABLE 3: FLOWER SCORES (IN LITERATURE AND APPLIED TO THE ASSESSMENT) FOR REGIONAL ECOSYSTEM 12.9-10.2 ARRANGED IN ORDER (PRIORITY).

Food Tree Species (RE 12.9-10.2)	Flower score (literature)	Flower Score (applied)
Corymbia intermedia	0.86	0.86
Corymbia citriodora	0.65	0.65
Eucalyptus tereticornis	0.37-0.88	0.63
Eucalyptus crebra	NA[2]	0.56
Eucalyptus siderophloia	0.54	0.54
Eucalyptus moluccana	0.35-0.65	0.50

[2] *Eucalyptus crebra* is a known flowering food tree listed in the National Recovery Plan however was not included in the paper, therefore, it has been assigned the average score of all assessed food trees in the paper.

Food Tree Species (RE 12.9-10.2)	Flower score (literature)	Flower Score (applied)
Eucalyptus melanophloia	0.45-0.54	0.50
Lophostemon confertus	0.46	0.46
Eucalyptus acmenoides	0.43	0.43
Corymbia tessellaris	0.4	0.40
Eucalyptus major	0.37	0.37
Eucalyptus longirostrata	0.37	0.37
Angophora leiocarpa	0.35	0.35
Eucalyptus propinqua	0.34	0.34

Flower scores are assessed by food tree density per hectare (ha). For impact and offset sites, stem density was counted in BioCondition assessment transects and extrapolated to a per-hectare count.

To create a benchmark, stem density was estimated from the Regional Ecosystem description, utilising known information. Benchmark stem density *(sd)* was calculated per stratum using the following formula, where:

- *c* = average crown cover for the strata (all trees),
- *s* = crown cover average for individual tree species[3], and
- *d* = average stem density for the strata.

$$sd = \frac{d}{c} \times s$$

The logic behind the formula is to proportionally allocate the total stem density across different tree species based on their relative crown cover contributions. Dividing the average cover by the average stem density represents the average stem density per metre of crown cover. Multiplying this value by *s,* the crown cover average for an individual tree species, then provides the stem density specifically for that species. Thereby, the calculation provides relative stem density between trees based on proportional estimates derived from species cover.

This approach has been taken as a best-on offer estimate of species-specific stem density utilising publicly available data from the RE description. Species-specific tree density is not

[3] The Regional Ecosystem technical description species cover is the average across site where that species is present i.e., transects where the tree did not appear will not count towards the average species cover score. Trees with cover scores of less than 1 i.e., 0 were assigned 1 such that the calculation does not exclude trees that are present in low densities.

recorded in publicly available databases or information sources. Due to this, the assessment of relative stem density is based on a few caveats. Namely, the method assumes relative crown cover is an approximate representation of proportion, i.e., a species with double the crown cover would, on average, have twice the number of stems. Also, the benchmark does not account for the fact that not all species at their average proportions when occurring could fit in a single transect when all are co-located.

When assessing field data for impact and offset sites, benchmark stem densities for each tree species, and actual stem density for each tree species (per stratum) in transects (calculated in the field), are then multiplied by flower scores to attain a density-weighted flower score for each stratum. Thereby, the density of each tree is weighted according to its productivity and reliability as a foraging resource. Density-weighted flower scores for all food tree species that occur in the habitat were added to attain a blossoming tree productivity and reliability score for each stratum. Blossoming tree productivity and reliability, i.e., strata blossom scores were calculated where:

- *n* = number of trees in the strata,
- *sd* = benchmark stem density or actual stem density estimates, and
- *fs* = flower score for the tree.

$$\sum_{i=1}^{n}(sd \times fs)$$

Strata habitat scores are calculated as a percentage of the benchmark score and then weighted in accordance with the scores in Table 2. Refer to Table 4 below for an example of the benchmark flower score density for the canopy strata of RE 12.9-10.2, and the resulting score for the canopy of a transect on the offset site. Scores for all strata are then added in accordance with the scores in Table 2 to contribute to the overall site context score.

TABLE 4: THE BENCHMARK AND TRANSECT SITE SCORE FOR THE CANOPY STRATA OF RE 12.9-10.2 (HEIGHT >18M, TOTAL AVERAGE COVER 54M).

Tree species (RE 12.9-10.2)	Flower score	Benchmark		Offset (remnant) transect	
		Stem density (estimate)	Flower score density	Stem density (estimate)	Flower score density
Corymbia intermedia	0.86	11.1	9.6	N/A	N/A
Corymbia citriodora	0.65	65.6	42.7	112	72.8
Eucalyptus tereticornis	0.63	13.6	8.6	N/A	N/A
Eucalyptus crebra	0.56	31.2	17.5	2	1.1
Eucalyptus siderophloia	0.54	23.1	12.5	N/A	N/A
Eucalyptus moluccana	0.5	46.0	23.0	N/A	N/A

Tree species (RE 12.9-10.2)	Flower score	Benchmark		Offset (remnant) transect	
		Stem density (estimate)	Flower score density	Stem density (estimate)	Flower score density
Eucalyptus melanophloia	0.5	6.1	3.0	N/A	N/A
Lophostemon confertus	0.46	N/A	N/A	N/A	N/A
Eucalyptus acmenoides	0.43	24.7	10.6	N/A	N/A
Corymbia tessellaris	0.4	19.2	7.7	N/A	N/A
Eucalyptus longirostrata	0.37	6.1	2.2	N/A	N/A
Eucalyptus major	0.37	2.0	0.7	N/A	N/A
Angophora leiocarpa	0.35	40.7	14.3	N/A	N/A
Eucalyptus propinqua	0.34	2.0	0.7	N/A	N/A
		Benchmark	**153.0**	**Total**	**73.9**
				Percent (%) of benchmark	**48.30**
				Score (out of 40)	**19.32**

Fruiting Species Availability

Fruit species availability is measured utilising the same method as blossoming tree productivity and reliability (see previous section) with some differences. The paper *Ranking the Feeding Habits of Grey Headed Flying Foxes for Conservation Management* (Eby & Law 2008) does not identify scores for fruiting species, rather, the paper lists known fruiting species in the diet of the GHFF. As such, stem density has been measured on its own for fruiting species.

Fruiting species have been measured in all strata in which they occur (T1, T2, T3 and Shrub) for the RE being measured (Department of Agriculture Water and the Environment 2021)). Fruiting species consist of species from roughly 30 families (Eby 2008). Canopy fruiting species have been ranked higher than other strata due to the GHFF's feeding preferences and the likelihood for canopy fruiting species to provide more food biomass. However, not all REs contain fruiting species listed in all strata (T1, T2, T3 and Shrub). Therefore, if an RE does not list a fruiting species in a stratum, the score for that strata should be removed from the total and the new total score should be weighted accordingly in calculations.

To demonstrate the approach, we have utilised the T2 strata of RE 12.9-10.2 as an example (Refer to Table 5). Fruiting trees found in RE 12.9-10.2 include *Alphitonia excelsa,* which is listed in in T1, T2, T3 and Shrub strata, with increasing frequency towards lower strata. Scores for all strata are added in accordance with the scores in Table 2 to contribute to the overall site context score.

TABLE 5: EXAMPLE SCORING OF FRUITING SPECIES IN SUB CANOPY STRATA.

Strata	Fruit tree	Benchmark stem density estimate (per ha)	Offset site transect stem density estimate (per ha)
T2 Sub-canopy (10-17m)	*Alphitonia excelsa*	15	6
		Percent (%) of benchmark	**40**
		Score (out of 5)	**2**

Seasonal Continuity

To ensure year-round availability of flowering resources, the focus is on assessing the duration and timing of flowering periods of food tree species. Trees productive in winter and spring are prioritised and given twice the score (1.0) compared to those that bloom in summer (0.5). This is due to the relative scarcity of resources in colder months.

It's important to note that a tree's potential flowering window doesn't always translate to actual food production. The real duration of flowering can be shorter; there is no guarantee trees will flower consistently every year. This unpredictability underlines the significance of maximising flowering opportunities.

Increasing tree species richness is incentivised as the greater the variety of trees, the higher the chances of having some trees in bloom at any given time. This diversity ensures a more consistent and spread-out availability of resources throughout the year. As for strata differentiation and tree volume considerations, these factors have already been accounted for in the blossoming productivity and reliability score, hence seasonal availability has been measured based on occurrence in transects.

The benchmark score has been established by measuring maximal seasonal availability that is possible within the constraints of species listed in the regional ecosystem. Flowering windows of tree species was taken from the paper *Ranking the Feeding Habits of Grey Headed Flying Foxes for Conservation Management* (Eby & Law 2008). The paper lists flowering phenology of species contributing nectar and pollen to the diet of Grey-headed flying foxes assessed across the range of the animals[4]. Flowering windows are compilations from all regions in the study. The total weighted sum of flowering windows for the regional ecosystem is compared

[4] The paper assessed all blossom trees except *Eucalyptus crebra.* The paper also did not assess fruit trees, such as *Alphitonia excelsa*. The flowering phenology of these species has been established by research of literature, such as EUCLID. (2023). "Narrow-leaved red ironbark, Ironbark, Narrow-leaved ironbark." 2023, from https://apps.lucidcentral.org/euclid/text/entities/eucalyptus_crebra.htm?zoom_highlight=crebra.

with the actual species within transects to determine the seasonal availability as compared to the potential seasonal availability that could be achieved in the transects.

To attain a score for the transect, multiply the number of months in flower (per species) by the weighting score attributed to the season. Sum the values for each species to yield a seasonal continuity score for the transect. Please note that:

- Blossoming trees can only be counted towards score if they persist in strata of sub-canopy height or taller, as juvenile trees do not blossom/fruit, and
- Fruiting species can contribute to scores if they are of fruiting maturity in the strata (i.e., *Alphitonia excelsa* can be counted from the shrub layer).

Refer to Table 6 for the benchmark seasonal continuity for RE 12.9-10.2, and Table 7 for example scoring from an offset site transect.

TABLE 6: BENCHMARK SEASONAL CONTINUITY OF FORAGING RESOURCES.

Season	Summer (0.5)			Autumn (0.5)			Winter (1)			Spring (1)			Score
Trees / months	D	J	F	M	A	M	J	J	A	S	O	N	
Alphitonia excelsa									1	1	1		3
Corymbia intermedia	0.5	0.5	0.5	0.5									2
Corymbia citriodora subsp. variegata	0.5	0.5	0.5	0.5	0.5	0.5	1	1			1	1	7
Eucalyptus tereticornis	0.5	0.5	0.5	0.5			1	1	1	1	1	1	8
*Eucalyptus crebra**	0.5	0.5		0.5	0.5	0.5	1	1	1	1	1	1	8.5
Eucalyptus siderophloia	0.5										1	1	2.5
Eucalyptus moluccana			0.5	0.5									1
Eucalyptus melanophloia	0.5	0.5					1	1			1	1	5
Lophostemon confertus	0.5	0.5									1	1	3
Eucalyptus acmenoides	0.5	0.5									1	1	3
Eucalyptus tessellaris	0.5	0.5	0.5	0.5									2
Eucalyptus longirostrata	0.5	0.5	0.5	0.5									2
Eucalyptus major	0.5	0.5	0.5	0.5									2
Angophora leiocarpa	0.5	0.5									1	1	3
Eucalyptus propinqua	0.5	0.5	0.5	0.5									2
												Total	54

TABLE 7: EXAMPLE OF SEASONAL CONTINUITY SCORING OF FORAGING RESOURCES FROM TRANSECT DATA.

Season	Summer (0.5)			Autumn (0.5)			Winter (1)			Spring (1)			Score
Trees / months	D	J	F	M	A	M	J	J	A	S	O	N	
Alphitonia excelsa									1	1	1		3
Corymbia citriodora subsp. variegata	0.5	0.5	0.5	0.5	0.5	0.5	1	1			1	1	7
Eucalyptus tereticornis	0.5	0.5	0.5	0.5			1	1	1	1	1	1	8
*Eucalyptus crebra**	0.5	0.5		0.5	0.5	0.5	1	1	1	1	1	1	8.5
Eucalyptus moluccana			0.5	0.5									1
Eucalyptus melanophloia	0.5	0.5					1	1			1	1	5
												Total	**32.5**
												Percent of benchmark (%)	**60**
												Score (30)	**18**

3.2 SITE CONTEXT

Site context refers to the configuration and location of the habitat and whether the characteristic of the surrounding landscape places the habitat in a favourable or unfavourable context. Context is important to the GHFF due to the species' daily foraging dispersal characteristics and reliance on a broad range of foraging habitat. However, not all aspects of site context are relevant to GHFF. For example, habitat fragmentation and physical barriers between patches are not relevant to a highly mobile, exclusively aerial species and have been removed.

The total score has been increased from a score out of 56 to a score out of 100 so that all categories can be allocated a score out of 1 – providing a common denominator in the absence of interval-scaled measurement. However, in relative terms, the weighting for each measure remains the same as the default. Most total scores have been simply doubled to reflect the original weighting of measures. Where possible, we have maintained the original scoring tables from the methods described in the modified BioCondition assessment, i.e., the Guide to Determining Terrestrial Habitat Quality (State of Queensland 2017). Site condition is comprised of the measures laid out below in Table 6.

TABLE 8: SITE CONTEXT DEFAULT AND PROPOSED MEASURES (GREEN INDICATES CHANGE).

Default		Proposed	
Measure	**Score**	**Measure**	**Score**
Size of patch	10	Size of patch	30
Connectedness	5	-	-
Context	5	Context	10
Ecological corridors	6	Ecological corridors	10
Role of site location to species overall population in the state	5	-	-
Threats to the species	15	Power line density	30
Species mobility capacity	10	Number of roosts used by GHFF in 20km of site	20
Total score	**56**	**Total score**	**100**
Overall weighting	**3/10**	**Overall weighting**	**3/10**

3.2.1 SIZE OF PATCH

The method for measuring size of patch has not been altered from the method in the Guide to Determining Terrestrial Habitat Quality (State of Queensland 2017). Patch size is the area of vegetation being assessed, including any directly connecting remnant vegetation. Size of patch can influence the quality of habitat through edge effects, habitat security, carrying capacity, and proximity of anthropogenic disturbance (such as vehicles, light and noise).

Size of patch was originally weighed 10/56. This has been raised to a weighting of 30/100. This has been increased due to the importance of the abovementioned factors, and to compensate for the removal of *connectedness* (Item 2 below). Scoring will be conducted as per the Guide to Terrestrial Habitat Quality (State of Queensland 2017), and will then be scaled to a score out of 30 points, as shown below in Table 9.

TABLE 9: SIZE OF PATCH SCORING TABLE.

Size of patch		
Measure	Original score	Adjusted score
<5 ha	0	0
5-25 ha	2	6
26-100 ha	5	15
101-200 ha	7	21

>200 ha	10	30

3.2.2 CONNECTEDNESS

Connectedness was removed because it relates to the capacity for species to disperse through the landscape between suitable patches of habitat as described in the Guide to Determining Terrestrial Habitat Quality (State of Queensland 2017). This is not relevant for the GHFF which is a long-ranged flighted species that is not inhibited by fragmentation within the immediate vicinity of the site.

3.2.3 CONTEXT

Context will be measured using a method similar to the modified BioCondition assessment by assessing the volume of remnant vegetation in the vicinity of the site, measured within a 20km buffer of the site according to standard EPBC project assessments. This measurement provides an indication of the extent of urbanisation and/or agricultural activity on a landscape scale and therefore the presence or absence of anthropogenic disturbance (such as light pollution) which is known to influence GHFF during dispersal to and from feeding sites (Ecosure Pty Ltd 2021). Habitat surrounded by a high volume of remnant vegetation is also less likely to be cleared. Surrounding landscapes also provide an indication the extent of alternative remnant foraging opportunities in the locality of the site.

Context was originally weighted 5/56. This has been raised to a weighting of 10/100 points to maintain consistency with the original weighting. Scoring will be measured using the original method from the Guide to Determining Terrestrial Habitat Quality (State of Queensland 2017) and will be scale to a score out of 10, as shown below in Table 8.

TABLE 10: CONTEXT SCORING METHOD TABLE.

Context		
Measure	Original score	Adjusted score
<25% remnant	0	0
>25% - <50% remnant	2	4
>50% - <75% remnant	4	8
>75% remnant	5	10

3.2.4 ECOLOGICAL CORRIDORS

The method for measuring ecological corridors[5] has not been altered from the method in the Guide to Determining Terrestrial Habitat Quality (State of Queensland 2017). The This is due to evidence that GHFF display a preference for roosting within the vicinity of waterway corridors, and because environmental corridors are less likely to be cleared or fragmented, and therefore offer the species better protections.

Ecological corridors was originally weighted 6/56. This has been raised to a weighting of 10/100 to maintain consistency with the original weighting. Scoring will be measured using the original method from the Guide to Determining Terrestrial Habitat quality (State of Queensland 2017) and will then be scale to a score out of 20, as shown below in Table 9.

TABLE 11: ECOLOGICAL CORRDIORS SCORING TABLE.

Context		
Measure	Original score	Adjusted score
Not within	0	0
Sharing a common boundary	4	5
Within (whole or part)	6	10

3.2.5 ROLE OF SITE LOCATION TO SPECIES OVERALL POPULATION IN THE STATE

Role of site location to species overall population was removed. There are limited measures of the relationship between the foraging habitat location and the overall GHFF population. To avoid repetition, the relationship between the site and the population is more relevant in Species Stocking Rate (3.3). The relationship between the site *location* and the overall population is less relevant due to the fact that the GHFF is considered one fluid and highly mobile population across the entire distribution of the species.

3.2.6 THREATS TO THE SPECIES: POWER LINE DENSITY

Overhead power lines are a significant threat to GHFF. Power line density on the site measures direct risk of electrocution or entanglement however also acts as a proxy measurement for the density of rural and urban areas and the prevalence of edge effects,

[5] An 'ecological corridor' is represented as any 'Riparian' or 'Terrestrial' feature within the Qld state-wide corridor buffers GIS layer derived from Qld Biodiversity Planning Assessments and Statewide Conservation Corridor information (data link).

fauna unfriendly infrastructure, and anthropogenic disturbances (light, noise and dust) within and surrounding the site. Threats to the species was originally weighted 10/56. This has been raised to a weighting of 20/100 to maintain consistency with the original weighting.

Overhead powerline density has been measured as the total line distance of all mapped overhead electrical infrastructure per square kilometre (m/km^2). The data has been gathered from a GIS link to Qld geospatial information[6]. Spatial data from all electricity suppliers in Queensland was analysed to generate a one square kilometre grid of overhead powerline density. Data can then be separated into quantiles to provide a discrete density of the overhead infrastructure for any location.

Scores were inversely proportional to the density of overhead powerlines – cells with a score of 30 had very low powerline density (in the bottom 20%); whereas cells in the 80th – 100th percentile received a score of 0 due to the extremely high density of overhead powerlines.

TABLE 12: POWER LINE DENSITY SCORING TABLE.

Power line density (quantile breaks)	
Measure	Score
0-20th quantile	30
20-40th quantile	23
40-60th quantile	15
60-80th quantile	8
80-100th quantile	0

3.2.7 SPECIES MOBILITY CAPACITY: NUMBER OF ROOSTS USED BY GHFF IN 20KM OF SITE

Mobility capacity for a species of regular unobstructed dispersal is thought to be best measures by the availability of roost sites, because roosts are required for rest each day. Roost count also indicates potential site usage, and the number of individuals that may rely on the site for foraging. Number of roosts used by GHFF in 20km of the site is measured by all roosts used permanently or intermittently in a 20km buffer of the site boundary within the past five (5) years (since 2017).

[6] https://data.gov.au

The data was extracted from the National Flying-fox Monitoring Viewer[7] (Australian Government 2022). The viewer allows users to explore Flying-fox camps and the numbers of each species counted in camps over time. This information spans the data gathered from November 2012 to present using the CSIRO's monitoring methodology for gathering information on the status of the national Grey-headed Flying-fox population and population trend (David A. Westcott and Cameron S. Fletcher 2011).

Species mobility was originally weighted 10/56. This has been raised to a weighting of 20/100 to maintain consistency with the original weighting. The five-year observation limit lowered the importance of roosts used very rarely or not used by the species in the last half decade due to shifting annual preferences, land use, climate change and natural stochasticity. This ensures our observations target important roosts and is not misled by roosts that are unoccupied by the GHFF most of the time.

There is a wide variety of roost density across the species distribution. If there is a higher count of GHFF roosts in the landscape, the site is more likely to be utilised. A high density can infer that the species prefers the area for one reason or another. Within the GHFF's coastal range, population density shifts due to a combination of several favourable conditions, primarily, the presence of foraging resources and microclimate preferences (Brown 2011).

The GHFF is highly mobile and most commonly disperses 15-20km. Hence, 20km has been selected as the maximum distance as this the most common i.e., most comfortable dispersal range. Seven (7) or more roosts has been selected as a maximum where a preference for the location for roosting is evident as observed from the National Flying-fox Monitoring Viewer. Scoring has been evenly spaced within this measurement.

TABLE 13: ROOST AVAILABILITY SCORING TABLE.

Roost availability in 20km	
Measure	Score
7+	20
5-6	15
3-4	10
1-2	5
0	0

[7] National Flying-fox monitoring viewer

3.3 SPECIES STOCKING RATE

The capacity of the site to "stock" species (for breeding, dispersal, etc) is less important to a wide-ranging aerial species such as GHFF which uses the site solely for foraging. Instead, species stocking rate has been adapted to determine if the GHFF occurs in the area and if the site is important for supporting the continued existence of the species.

The total score of species stocking rate has been increased from a score out of 70 to a score out of 100 so that all categories can be allocated a score out of 1 – providing a common denominator in the absence of interval-scaled measurement. Where possible, we have maintained the original scoring tables from the methods described in the modified BioCondition assessment, i.e., the Guide to Determining Terrestrial Habitat Quality (State of Queensland 2017).

TABLE 14: SPECIES STOCKING RATE DEFAULT AND PROPOSED MEASURED (GREEN INDICATES CHANGE).

Default		Proposed	
Measure	**Score**		**Score**
Usage of the site (not habitat, dispersal, foraging, breeding)	15	Usage of the site (not habitat, summer foraging, winter foraging)	35
Approximate density	30	The site not mapped, partially or wholly mapped under maxent high habitat suitability model (remnant or non-remnant)	25
Role/importance of population/site • Breeding source • Dispersal source • Necessary for genetic diversity • Near the limit of the species range	15	Is the site near the limit of the species range	15
		Nationally significant roost proximity	25
Total score	**70**	**Total score**	**100**
Overall weighting	**4/10**	**Overall weighting**	**3/10**

3.3.1 USAGE OF THE SITE

Only small changes to this measure have been proposed to suit habitat usage characteristics for the GHFF. Modifications include the removal of dispersal and breeding habitat measures from the original scoring table in the Modified Habitat Quality Assessment tool. This is because all habitat within the species range is potentially dispersal habitat. In addition, breeding habitat was removed because breeding habitat is restricted to roost locations which

is not assessed by this offset proposal. Scoring will be measured out of 35 due to the importance of winter/spring foraging habitat (Department of Agriculture Water and the Environment 2021).

TABLE 15: USAGE OF THE SITE.

Species usage of the site (habitat type & evidenced usage)	
Measure	Score
Winter and/or spring foraging habitat	35
Foraging habitat	20
Not habitat	0

3.3.2 HABITAT SUITABILITY MODEL

The intended measure, i.e., role and density of populations *on the site* are not relevant when assessing foraging habitat for GHFF. As roost sites are not being considered, there is no occupancy to measure apart from intermittent visitation for foraging.

Consequently, an alternative approach using the Qld government's predictive habitat mapping Maxent[8] model for the GHFF (based on location, vegetation, microclimates, topography, etc.) has been utilised. This model predicts the location of high-quality pre-clearing GHFF habitat. If the site is within this mapped extent, it is likely to be able to support the species currently or potentially (after habitat improvement) (Queensland Herbarium 2022). Where the model intersects with remnant vegetation, this indicates quality habitat. Where the model intersects with non-remnant vegetation, this indicates lower quality or potential habitat (Queensland Herbarium 2022).

Habitat suitability mapping has replaced approximate density of species on the site. Approximate density of species on the site was originally weighted 30/70. The measure has been replaced with a measure of habitat suitability which is been slightly reduced to a weighting of 25/100 because the replacement measure is not as important as the original (which cannot be measured).

[8] Maximum entropy modelling of species' geographic distributions.

TABLE 16: HABITAT SUITABILITY SCORING TABLE.

High habitat suitability in part or whole of site	
Measure	Score
Site mapped (remnant vegetation)	25
Site mapped (non-remnant)	10
Not mapped	0

3.3.3 ROLE/IMPORTANCE OF SITE: LIMIT OF THE SPECIES RANGE

Maintenance of the population range improves species viability. This score has been ranked out of 10 as opposed to the default 15 due to the fact that this default measure has been accompanied by NSR proximity. This measure has been selected from the Species Stocking Rate supplementary table because it was the only measure that could be applied to foraging habitat.

We applied the national distribution map on the to identify whether a site is in or near the limit of the species range. The map is contained in the Species Profile and Threats (SPRAT) document database and is the standard federal distribution mapping for EPBC assessments (Department of Climate Change Energy the Environment and Water 2022). Mapped locations where species or species habitat *may* occur is considered at the limit of the species range. This measure was originally weighted 15/70, however, has been weighted at 15/100 to remain appropriately ranked against other measures.

TABLE 17: RANGE LIMIT SCORING TABLE.

Range limit	
Measure	Score
Within range limit	15
Inside main range	0

3.3.4 ROLE/IMPORTANCE OF SITE: NATIONALLY SIGNIFICANT ROOST PROXIMITY

NSR proximity will be utilised to assess the importance of the site to the species overall population, i.e., the site potentially supports an important population or a much larger proportion of the population than other areas in the species distribution.

Proximity of the NSR has been scored according to the range of average foraging distances (0-40km) with emphasis on the most common or most comfortable dispersal for the species

(0-20km). The closer the roost to the habitat, the more easily and more likely individuals will forage at the site from the NSR. This measure was originally weighted 15/70. It has been updated to 25/100 to maintain general consistency with the original weighting.

TABLE 18: NATIONALLY SIGNIFICANT ROOST PROXIMITY SCORING TABLE.

Nationally Significant Roost proximity	
Measure	Score
Within 10km	25
Within 11-20km	18
Within 21-40km	10
Outside 40km	0

5 SUMMARY

The proposed methods are designed to respond to the unique species characteristics which are listed in the EPBC Administrative Guidelines on Significance, the National Recovery Plan (NRP) and the Species Profile and Threats Database (Department of the Environment and Heritage 2003, Department of Climate Change Energy the Environment and Water 2022). The proposed method incorporates a balanced suite of metrics which capture both site and local-scale attributes and also attributes that can be applied at any location without site-specific bias. The key additions to the base method include:

- Quantifying volume of foraging habitat,
- Measuring power line density in the vicinity of the site,
- Assessing number of roosts and proximity to Nationally Significant Roosts within the vicinity of the site,
- Measuring factors inside a 20-40km buffer of the site,
- Utilising predictive species modelling.

The additions were made to reflect species-specific attributes that were not captured by the generic method including:

- Threats to the species,
- Habitat preferences,
- Quality and availability of foraging habitat, and
- Site proximity to population sources.

The following aspects of the original method were removed:

- Shelter (roosting habitat),
- Understory and shrub cover,
- Leaf litter and coarse woody debris,
- Approximate density of species on site,
- Connectedness, and
- Importance of site location to the population.

These measures were removed because they have either have no impact on foraging habitat, were inappropriate for an exclusively aerial and arboreal species or to avoid duplication.

The proposed adjustments ensures the assessment retains '*like for like*' i.e., ensuring the offset can meet or exceed protection of the same habitat values. Therefore, the methods meet key recovery priority actions including maintaining the extent and viability of foraging habitat for the Grey-headed Flying-fox that is productive during winter and spring and creating or rehabilitating habitat away from people and areas unsuitable for development due to potential conflicts (Department of Agriculture Water and the Environment 2021).

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APPENDIX 1: DEPARTMENT GUIDANCE

SPECIES HABITAT and TEC QUALITY – EPBC offsets and the DEHP (2017) Guide

Weighting of the 3 habitat quality components

- **Species habitat:** site context/site condition/species stocking rate - 30%/30%/40%
- **TEC:** site context/site condition - 30%/70% (species stocking rate for TECs would focus on key indicator species which is covered under the site condition assessment and the TEC condition thresholds)

Accompanying worksheet to enter habitat assessment data and information

There is an Excel document which has a worksheet/template for entering in habitat quality raw data, scores (based on scoring matrices below) and the Benchmark vegetation attributes for the Regional Ecosystems. It is recommended that this document is used in conjunction with the worksheet.

SITE CONTEXT – Importance of a site in terms of its position in the landscape

The following metrics from the DEHP (2017) Guide to Determining Terrestrial Habitat Quality (DEHP Guide) are used to calculate the Site Context component of habitat quality:

1 Size of Patch*	**Score**	**0**	**2**	**5**	**7**	**10**
	Description	<5ha	5–25ha	26–100ha	101–200ha	>200ha
2 Connectedness*	Score	0	2	4		5
	Description	0–10%	>10%–<50%	50–75%		>75% or >500ha
3 Context*	Score	0	2	4		5
	Description	<10% remnant	>10–30% remnant	>30–75% remnant		>75% remnant

5 Ecological corridors	Score	0	4	6
	Description	Not within	Sharing a common boundary	Within (whole or part)

5 Role of site location to species overall population in the state	Score	1	4	5
	Description	Not or unlikely to be critical to species' survival	Likely to be critical to species' survival	Critical to species survival

1 Threats to species	**Score**	**1**	**7**	**15**
	Description	High threat level (i.e. likely to result in death, irreversible damage)	Moderate threat level	Low threat level (i.e. likely to survive)

* **4 Species mobility capacity**	Score	1	4	7	10
	Description	Severely restricted (76–100% reduction)	Highly restricted (51–75% reduction)	Moderately restricted (26–50% reduction)	Minor restriction (0–25% reduction)

*Species mobility capacity is not relevant to plants or TECs.

These variables are measured during each habitat quality assessment, regardless of whether the site is in a state-classified fragmented or intact bioregion.

The first three variables (patch size, connectedness, context) are to be calculated with consideration of all potentially suitable habitat (not just remnant vegetation). When calculating context, the following buffer sizes are to be used around the site for each species/TEC (based on dispersal and home ranges, with a maximum of 30 km):

- TECs and plants – 1 km
- Koala, Greater Glider – 20 km
- South-eastern Long-eared Bat – 10 km
- Painted Honeyeater, Australian Painted Snipe – 30 km
- Squatter Pigeon – 20 km
- Dunmall's Snake, Yakka Skink, Ornamental Snake – 5 km
- Collared Delma – 1 km

The more subjective variables such as 'threats to the species' and 'species mobility capacity' need to be justified by the proponent/approval holder and evidenced with scientifically robust information applicable to the site.

Site Context final scoring

For plants and TECs – Site Context is a score out of 46 which is then be converted into a score suitable for the EPBC Offsets calculator. For example, a threatened flora species (Site Context score has 30% weighting [3 out of 10]) attaining a raw score of 33 for Site Context would then be converted into a score out of 3; (33/46) x 3 = 2.15

For fauna species – when calculating Site Context for threatened fauna, it is a score out of 56 as the 'species mobility capacity' is included.

SITE CONDITION – Condition of a site in relation to the ecological requirements of a threatened species or ecological community

1 Recruitment of woody perennial species in EDL*	**Score**	**0**	**3**	**5**
	Benchmark	<20%	>20–75%	>75%
2 Native plant species richness—trees	Score	2.5	3	5
	Benchmark	<25%	>25–90%	>90%
3 Native plant species richness—shrubs	Score	2.5	3	5
	Benchmark	<25%	>25–90%	>90%
4 Native plant species richness—grasses	Score	2.5	3	5
	Benchmark	<25%	>25–90%	>90%

5 Native plant species richness - forbs	Score	2.5	3		5
	Benchmark	<25%	>25–90%		>90%
6 Tree canopy Height	Score	0	3		5
	Benchmark	<25%	>25–70%		>70%
7 Tree canopy cover	Score	0	2	3	5
	Benchmark	<10%	>10%–<50%	>200%	>50%–<200%
8 Shrub canopy cover	Score	0	3		5
	Benchmark	<10%	≥10%–<50% or >200%		>50%–<200%
9 Native perennial grass cover	Score	0	1	3	5
	Benchmark	<10%	>10–50%	>50–90%	>90%
10 Organic litter	Score	0	3		5
	Benchmark	<10%	≥10%–<50% or >200%		>50%–<200%
11 Large trees	Score	0	5	10	15
	Benchmark	0%	0–50%	>50–100%	>100%
12 Coarse woody debris	Score	0	2		5
	Benchmark	<10%	<50% or >200%		>50% or <200%
13 Non-native plant cover[6]	Score	0	3	5	10
	% of weed cover	>50%	>25–50%	>5–25%	<5%

*Ecologically dominant layer

- Please note for condition scoring there are errors in Table 2 of the Queensland Guidelines for attributes 2, 3, 4 and 5, and correct score values are found in the Qld Bio condition Guidelines as highlighted in the table below.

Table 1: BioCondition Guideline (page 22).

Attribute	***Guide to Determining Terrestrial Habitat***	***BioCondition Guideline***
Native plant species – trees	<25% benchmark = 2.5 ≥25% to 90% of benchmark = 3 ≥90% of benchmark = 5	<25% benchmark = 0 ≥25% to 90% of benchmark = 2.5 ≥90% of benchmark = 5
Native plant species – shrubs	<25% benchmark = 2.5 ≥25% to 90% of benchmark = 3 ≥90% of benchmark = 5	<25% benchmark = 0 ≥25% to 90% of benchmark = 2.5 ≥90% of benchmark = 5
Native plant species – grasses	<25% benchmark = 2.5 ≥25% to 90% of benchmark = 3 ≥90% of benchmark = 5	<25% benchmark = 0 ≥25% to 90% of benchmark = 2.5 ≥90% of benchmark = 5
Native plant species – forbs	<25% benchmark = 2.5 ≥25% to 90% of benchmark = 3 ≥90% of benchmark = 5	<25% benchmark = 0 ≥25% to 90% of benchmark = 2.5 ≥90% of benchmark = 5

* **2 Quality and availability of food and foraging habitat**	Score	1	5	10
	Description	Poor	Moderate	High
3 Quality and availability of shelter	Score	1	5	10
	Description	Poor	Moderate	High

* Quality and availability of food/foraging habitat and shelter are not relevant to plants or TECs.

Site Condition final scoring

For TECs – Only Table 2 of the DEHP Guide (guide for site condition scoring sheet) would be used to calculate a score out of 80, which would then be converted into a score suitable for the EPBC Offsets calculator. Site Condition score has 70% weighting (7 out of 10). Eg. A score of 66 out of 80 would be converted to a score out of 7; (66/80) x 7 = 5.8.

For threatened flora species – Only Table 2 of the DEHP Guide (guide for site condition scoring sheet) would be used to calculate a score out of 80, which would then be converted into a score suitable for the EPBC Offsets calculator. Site Condition score has 30% weighting (3 out of 10). Eg. A score of 66 out of 80 would be converted to a score out of 3; (66/80) x 3 = 2.5.

For threatened fauna species, Site Condition would be a score out of 100 which would then be converted into a score suitable for the EPBC Offsets calculator. Site Condition score has 30% weighting (3 out of 10). Eg. A score of 72 out of 100 would be converted to a score out of 3; (72/100) x 3 = 2.16.

SPECIES STOCKING RATE – Usage and/or density of a species at a particular site

For threatened species – potential approaches; to be refined

Below is a scoring matrix for species stocking rate (out of 4) to contribute to 40% of the overall habitat quality score. Please note that comprehensive best-practice targeted surveys are required to inform and calculate species stocking rate. Also, evidence of the species' presence includes indirect observations such as scats, tracks, scratches, etc.

Targeted surveys to determine stocking rates should be undertaken using best-practice methods aimed at maximising detectability. This includes appropriate survey timing and search effort, preferentially over numerous monitoring periods. If surveys were not undertaken in accordance with best-practice methods (eg. koala transects in an area likely to support low density population) then the Department would assume conservative values calculating the proposed offset.

Presence detected on or adjacent to site (neighbouring property with connecting habitat)	Score	0		10	
		No		Yes	
Species usage of the site (habitat type)	Score	0	5	10	15
		Not habitat	Dispersal	Foraging	Breeding
Approximate density (per ha)	Score	0	10	20	30
		0%			
	Score	0	5	10	15

Role/importance of species population on site*	(Total from supplementary table below)	0	5 - 15	20 - 35	40 - 45

* The score for Role/importance of species population on site is calculated using the table below

For a species, an important population is one that is necessary for a species' long-term survival and recovery (DoEE Significant Impact Guidelines). This may include populations identified as such in recovery plans, and/or that are:

- Key source populations for breeding or dispersal
- Populations that are necessary for maintaining genetic diversity, and/or
- Populations that are near the limit of the species range.

The following supplementary scoring matrix will require species distribution mapping, such as available on Wylie (internal use only), Atlas of Living Australia and/or WildNet.

Key source population for breeding	Score	0	10
		No	Yes
Key source population for dispersal	Score	0	5
		No	Yes
Necessary for maintaining genetic diversity	Score	0	15
		No	Yes
Near the limit of the species range	Score	0	15
		No	Yes

Performance Targets & Completion Criteria

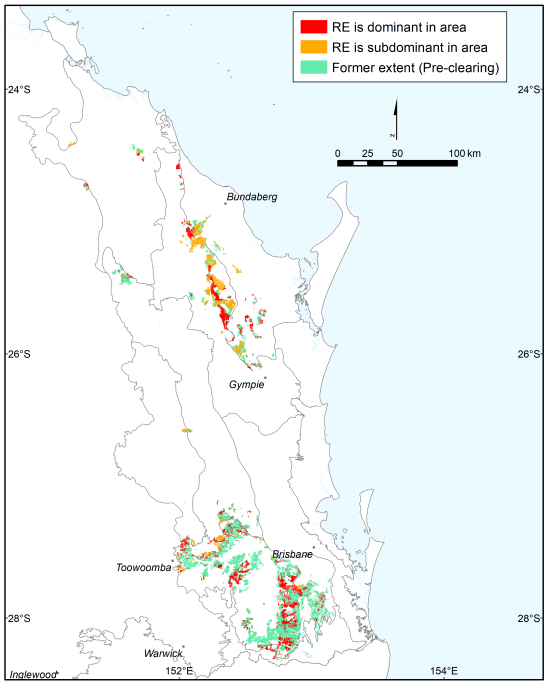
Performance targets and completion criteria need to be specific and measurable. As such the ranges for scoring site condition in accordance with the DEHP Guide are not stringent enough to be performance targets or completion criteria. A possible way to define performance targets and/or completion criteria relating to relevant vegetation and habitat attributes.

For an offset area, as an example, the overarching completion criteria would be to achieve the proposed future quality score. This score out of 10 would need to be broken down into the 3 core components: Site Condition, Site Context and Species Stocking Rate (SSR). It is then recommended that more specific completion criteria are provided for each core component.

Completion criteria for Site Condition should relate to measure/s of relevant habitat features and selected variables of the vegetation condition/structure assessment that are most important to the species/TEC and in line with Benchmark standards for the associated RE. For example, completion criteria for Squatter Pigeon habitat in RE 11.4.9 could include native perennial grass cover of 20%, tree canopy cover of 25%, 0% weed cover, native shrub cover of 5%, etc.

APPENDIX 2: RE TECHNICAL DESCRIPTIONS

12.9-10.2: Corymbia citriodora subsp. variegata +/- Eucalyptus crebra open forest on sedimentary rocks



Mapping data	**Pre-clearing area** = 220,350.1 ha; **Remnant area 2021** = 86,307.4 ha; **Remnant percent remaining in 2021** = 39.2 %
Species richness	total: 289 (44 sites); woody: 79 (40 sites); ground: 181 (18 sites); average spp./site: 33.9, standard deviation: 12.5 (18 sites)
Basal area	average/site: 15.1 m^2/ha; range: 6.0 - 30.0 m^2/ha; std. deviation: 5.1; (40 sites)
Ecological dominant layer (EDL) height	stratum: tree 1; average/site: 23.07m; range: 18.00 - 33.00m; (44 sites)
Ecological dominant layer (EDL) Crown Cover	stratum: tree 1; average: 54.3%; range: 25.0 - 87.0%; (44 sites)
Structural formation	Open Forest: 61.4 %; Woodland: 34.1 %; Tall Closed Forest: 2.3 %; Closed Forest: 2.3 %; (44 sites)
Representative site(s)	2032, 2037, 2040, 2047, 2161, 2168, 2202, 2209, 2288, 2338, 2478, 2481, 2790, 2794, 3014, 3083, 3169, 3173, 3287, 3436, 3468, 3474, 3476, 3477, 3489, 3566, 3570, 3571, 3574, 3575, 3576, 3863, 3867, 6235, 6633, 7719, 12988, 13997, 13998, 14748, 15670, 15780, 16214, 16401

Stratum: Tree 1 (EDL)

Height: average: 23.07m; range: 18.00 - 33.00m; (44 sites)
Crown Cover: average: 54.3%; range: 25.0 - 87.0%; (44 sites)
Stem Count: average: 110 stems/ha; range: 40 - 180 stems/ha; std. deviation: 99.0 stems/ha; (2 sites)
Basal area: average: 12.8 m^2/ha; range: 6.0 - 30.0 m^2/ha; std. deviation: 4.7 m^2/ha; (40 sites)

Species list(frequency(%), average cover(%)):

Most frequent species (up to 6):

Corymbia citriodora subsp. variegata (100.0, 32.4), *Eucalyptus crebra* (77.3, 15.4), *Eucalyptus acmenoides* (22.7, 12.2), *Eucalyptus tereticornis* (22.7, 6.7), *Eucalyptus siderophloia* (20.5, 11.4), *Angophora leiocarpa* (15.9, 20.1)

Additional species:

Corymbia tessellaris (15.9, 9.5), *Eucalyptus moluccana* (9.1, 22.7), *Corymbia intermedia* (9.1, 5.5), *Eucalyptus exserta* (6.8, 8.0), *Eucalyptus melanophloia* (4.5, 3.0), *Allocasuarina torulosa* (4.5, 0.0), *Eucalyptus propinqua* (4.5, 0.0), *Corymbia trachyphloia subsp. trachyphloia* (2.3, 8.0), *Eucalyptus longirostrata* (2.3, 3.0), *Acacia melanoxylon* (2.3, 0.0), *Alphitonia excelsa* (2.3, 0.0), *Alstonia constricta* (2.3, 0.0), *Brachychiton populneus* (2.3, 0.0), *Brachychiton populneus subsp. populneus* (2.3, 0.0), *Eucalyptus major* (2.3,

Species list: Frequency (percent of total sites) and cover (average of species cover across sites where that species is present). Ordered by decreasing frequency. Naturalised species have an asterisk (*) after the name. indet. after listed name if indeterminate species or genus.

0.0), *Flindersia australis* (2.3, 0.0)

Stratum: Tree 2

Height: average: 13.03m; range: 9.00 - 17.00m; (38 sites)
Crown Cover: average: 19.9%; range: 1.0 - 76.0%; (38 sites)
Stem Count: average: 130 stems/ha; range: 40 - 220 stems/ha; std. deviation: 127.3 stems/ha; (2 sites)
Basal area: average: 3.5 m^2/ha; range: 1.0 - 10.0 m^2/ha; std. deviation: 2.3 m^2/ha; (19 sites)

Species list(frequency(%), average cover(%)):

Most frequent species (up to 6):

Corymbia citriodora subsp. variegata (72.7, 9.1), *Eucalyptus crebra* (47.7, 7.0), *Acacia disparrima subsp. disparrima* (13.6, 14.8), *Eucalyptus acmenoides* (13.6, 10.4), *Angophora leiocarpa* (13.6, 3.8), *Alphitonia excelsa* (11.4, 2.3)

Additional species:

Corymbia tessellaris (9.1, 6.4), *Eucalyptus exserta* (9.1, 4.0), *Eucalyptus tereticornis* (9.1, 3.9), *Eucalyptus siderophloia* (9.1, 3.1), *Lophostemon confertus* (6.8, 10.7), *Allocasuarina torulosa* (6.8, 6.8), *Eucalyptus major* (6.8, 6.5), *Corymbia intermedia* (6.8, 3.8), *Eucalyptus moluccana* (6.8, 3.3), *Allocasuarina littoralis* (2.3, 14.0), *Eucalyptus melanophloia* (2.3, 4.0), *Petalostigma pubescens* (2.3, 4.0), *Acacia maidenii* (2.3, 0.0), *Alstonia constricta* (2.3, 0.0), *Notelaea longifolia* (2.3, 0.0), *Psydrax odorata* (2.3, 0.0)

Stratum: Tree 3

Height: average: 7.63m; range: 5.00 - 10.00m; (15 sites)
Crown Cover: average: 11.7%; range: 0.7 - 35.0%; (15 sites)
Stem Count: average: 40 stems/ha; range: 40 - 40 stems/ha; std. deviation: 0.0 stems/ha; (1 site)
Basal area: average: 1.0 m^2/ha; range: 1.0 - 1.0 m^2/ha; std. deviation: 0.0 m^2/ha; (1 site)

Species list(frequency(%), average cover(%)):

Most frequent species (up to 6):

Corymbia citriodora subsp. variegata (29.5, 5.2), *Eucalyptus crebra* (15.9, 5.3), *Eucalyptus acmenoides* (9.1, 3.8), *Eucalyptus siderophloia* (6.8, 4.5), *Angophora leiocarpa* (4.5, 5.0), *Allocasuarina luehmannii* (2.3, 13.0)

Additional species:

Allocasuarina torulosa (2.3, 10.0), *Acacia glaucocarpa* (2.3, 8.0), *Eucalyptus major* (2.3, 7.0), *Corymbia trachyphloia subsp. trachyphloia* (2.3, 3.0), *Corymbia tessellaris* (2.3, 1.0), *Eucalyptus tereticornis* (2.3, 0.2), *Alphitonia excelsa* (2.3, 0.0), *Celastrus subspicata* (2.3, 0.0)

Stratum: Shrub 1

Height: average: 2.33m; range: 1.00 - 5.00m; (38 sites)
Crown Cover: average: 17.9%; range: 0.5 - 58.0%; (38 sites)
Stem Count: average: 170 stems/ha; range: 120 - 220 stems/ha; std. deviation: 70.7 stems/ha; (2 sites)
Basal area: average: 2.4 m^2/ha; range: 1.0 - 5.0 m^2/ha; std. deviation: 1.6 m^2/ha; (9 sites)

Species list(frequency(%), average cover(%)):

Most frequent species (up to 6):

Acacia leiocalyx subsp. leiocalyx (36.4, 6.4), *Acacia disparrima subsp. disparrima* (34.1, 4.9), *Corymbia citriodora subsp. variegata* (34.1, 2.3), *Alphitonia excelsa* (31.8, 7.5), *Lantana camara** (29.5, 8.0), *Eucalyptus crebra* (18.2, 3.3)

Additional species:

Jacksonia scoparia (18.2, 2.0), *Breynia oblongifolia* (11.4, 1.5), *Angophora leiocarpa* (9.1, 5.0), *Acacia maidenii* (9.1, 2.8), *Pultenaea euchila* (9.1, 1.3), *Acacia fimbriata* (6.8, 11.3), *Acacia falcata* (6.8, 9.2), *Alstonia constricta* (6.8, 5.5), *Corymbia tessellaris* (6.8, 3.0), *Acacia glaucocarpa* (6.8, 2.7), *Allocasuarina torulosa* (6.8, 2.7), *Myoporum acuminatum* (6.8, 1.2), *Eucalyptus tereticornis* (6.8, 1.0), *Choretrum candollei* (6.8, 0.5), *Eremophila debilis* (6.8, 0.0), *Lophostemon confertus* (4.5, 13.0), *Allocasuarina littoralis* (4.5, 10.5), *Lophostemon suaveolens* (4.5, 9.0), *Acacia melanoxylon* (4.5, 6.0), *Psydrax odorata forma buxifolia* (4.5, 4.0), *Eucalyptus exserta* (4.5, 3.0), *Exocarpos cupressiformis* (4.5, 3.0), *Pittosporum angustifolium* (4.5, 2.0), *Eucalyptus siderophloia* (4.5, 1.0), *Denhamia cunninghamii* (4.5, 0.5), *Trema tomentosa* (4.5, 0.0), *Daviesia filipes* (2.3, 15.0), *Acacia complanata* (2.3, 12.0), *Acacia amblygona* (2.3, 8.0), *Acacia irrorata subsp. irrorata* (2.3, 8.0), *Indigofera australis* (2.3, 8.0), *Xanthorrhoea johnsonii* (2.3, 8.0), *Brachychiton rupestris* (2.3, 7.0), *Alectryon diversifolius* (2.3, 5.0), *Astrotricha latifolia* (2.3, 5.0), *Citrus australis* (2.3, 5.0), *Eucalyptus moluccana*

Species list: Frequency (percent of total sites) and cover (average of species cover across sites where that species is present). Ordered by decreasing frequency. Naturalised species have an asterisk (*) after the name. indet. after listed name if indeterminate species or genus.

(2.3, 4.0), *Eucalyptus major* (2.3, 2.0), *Hovea lorata* (2.3, 2.0), *Acacia loroloba* (2.3, 1.0), *Brachychiton populneus* (2.3, 1.0), *Erythrina vespertilio* (2.3, 1.0), *Phyllota* (2.3, 1.0), *Pultenaea villosa* (2.3, 0.5), *Acacia concurrens* (2.3, 0.0), *Acacia decora* (2.3, 0.0), *Acacia implexa* (2.3, 0.0), *Acacia neriifolia* (2.3, 0.0), *Acrotriche aggregata* (2.3, 0.0), *Corymbia intermedia* (2.3, 0.0), *Cupaniopsis parvifolia* (2.3, 0.0), *Daviesia ulicifolia* (2.3, 0.0), *Daviesia ulicifolia subsp. stenophylla* (2.3, 0.0), *Flindersia australis* (2.3, 0.0), *Gomphocarpus physocarpus** (2.3, 0.0), *Indigofera australis subsp. australis* (2.3, 0.0), *Opuntia tomentosa** (2.3, 0.0), *Persoonia sericea* (2.3, 0.0), *Psydrax odorata* (2.3, 0.0), *Solanum ellipticum* (2.3, 0.0), *Solanum seaforthianum** (2.3, 0.0), *Swainsona galegifolia* (2.3, 0.0), *Wikstroemia indica* (2.3, 0.0)

Stratum: Shrub 2

Height: average: 1.20m; range: 1.20 - 1.20m; (1 site)
Crown Cover: average: 3.0%; range: 3.0 - 3.0%; (1 site)
Stem Count: No data available.
Basal area: No data available.

Species list(frequency(%), average cover(%)):

Most frequent species (up to 6):

Macrozamia mountperriensis (2.3, 3.0),

Additional species:

Stratum: Ground

Height: average: 0.56m; range: 0.15 - 0.85m; (18 sites)
Projective foliage cover (PFC): average: 47.6%; range: 6.0 - 90.0%; (18 sites)

Species list(frequency(%), average cover(%)):

Grass - perennial:

Most frequent species (up to 6):

Themeda triandra (77.8, 17.0), *Cymbopogon refractus* (72.2, 15.2), *Panicum effusum* (50.0, 2.5), *Heteropogon contortus* (44.4, 15.5), *Entolasia stricta* (38.9, 10.0), *Eragrostis brownii* (38.9, 0.0)

Additional species:

Aristida vagans (33.3, 0.8), *Digitaria parviflora* (33.3, 2.0), *Imperata cylindrica* (33.3, 15.6), *Eremochloa bimaculata* (16.7, 0.0), *Melinis repens** (16.7, 17.0), *Aristida benthamii var. benthamii* (11.1, 7.0), *Aristida calycina* (11.1, 25.5), *Capillipedium spicigerum* (11.1, 0.0), *Chloris divaricata* (11.1, 40.0), *Chrysopogon sylvaticus* (11.1, 14.0), *Digitaria didactyla** (11.1, 0.0), *Oplismenus aemulus* (11.1, 0.0), *Sporobolus creber* (11.1, 0.0), *Alloteropsis semialata* (5.6, 0.0), *Aristida* (5.6, 0.0), *Aristida caput-medusae* (5.6, 28.0), *Aristida gracilipes* (5.6, 16.0), *Aristida muricata* (5.6, 0.0), *Aristida queenslandica var. dissimilis* (5.6, 0.0), *Aristida queenslandica var. queenslandica* (5.6, 0.0), *Aristida ramosa* (5.6, 0.0), *Bothriochloa decipiens* (5.6, 0.0), *Bothriochloa decipiens var. decipiens* (5.6, 0.0), *Cenchrus caliculatus* (5.6, 1.0), *Chloris gayana** (5.6, 0.0), *Chloris ventricosa* (5.6, 0.0), *Dichanthium sericeum* (5.6, 0.0), *Eragrostis lacunaria* (5.6, 0.0), *Eragrostis leptostachya* (5.6, 0.0), *Eragrostis sororia* (5.6, 0.0), *Eragrostis tenuifolia** (5.6, 0.0), *Megathyrsus maximus** (5.6, 16.0), *Megathyrsus maximus var. maximus** (5.6, 0.0), *Panicum decompositum* (5.6, 0.0), *Paspalidium caespitosum* (5.6, 0.0), *Paspalidium constrictum* (5.6, 0.0), *Paspalidium criniforme* (5.6, 0.0), *Paspalidium disjunctum* (5.6, 0.0), *Paspalidium distans* (5.6, 0.0), *Sarga leiocladum* (5.6, 0.0)

Grass - annual/biennial:

Not present

Forbs & other:

Most frequent species (up to 6):

Eustrephus latifolius (66.7, 0.5), *Desmodium rhytidophyllum* (55.6, 1.0), *Dianella revoluta* (50.0, 1.8), *Glycine tabacina* (50.0, 4.0), *Lobelia purpurascens* (50.0, 0.0), *Cyanthillium cinereum* (44.4, 0.8)

Additional species:

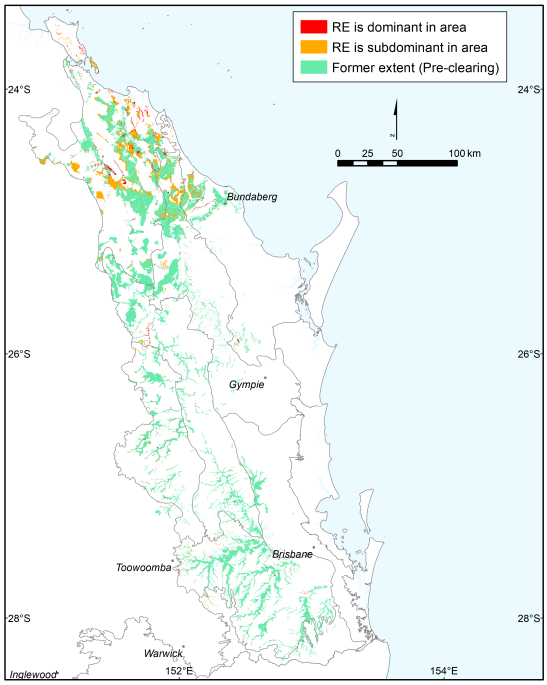
Brunoniella australis (38.9, 0.8), *Lomandra multiflora subsp. multiflora* (38.9, 3.8), *Hardenbergia violacea* (33.3, 2.0), *Lantana camara** (33.3, 1.0), *Lantana montevidensis** (33.3, 14.0), *Laxmannia gracilis* (27.8, 0.5), *Lomandra longifolia* (27.8, 4.8), *Peripleura hispidula var. hispidula* (27.8, 0.0), *Achyranthes aspera* (22.2, 4.0), *Bidens pilosa** (22.2, 1.0), *Cheilanthes sieberi* (22.2, 0.0), *Cyperus gracilis* (22.2, 1.5), *Desmodium varians* (22.2, 3.0), *Dianella caerulea* (22.2, 2.5), *Eremophila debilis* (22.2, 0.0), *Galactia tenuiflora* (22.2, 0.0), *Desmodium brachypodum* (16.7, 0.0), *Fimbristylis dichotoma* (16.7, 0.0), *Opuntia stricta** (16.7, 0.0), *Parsonsia straminea* (16.7, 0.0), *Passiflora subpeltata** (16.7, 14.5), *Phyllanthus virgatus* (16.7, 0.0), *Scleria mackaviensis* (16.7, 0.0), *Sida cordifolia** (16.7,

Species list: Frequency (percent of total sites) and cover (average of species cover across sites where that species is present). Ordered by decreasing frequency. Naturalised species have an asterisk (*) after the name. indet. after listed name if indeterminate species or genus.

0.0), *Sida hackettiana* (16.7, 0.0), *Alphitonia excelsa* (11.1, 0.0), *Chrysocephalum apiculatum* (11.1, 0.0), *Clematicissus opaca* (11.1, 0.0), *Coleus australis* (11.1, 2.0), *Crotalaria montana* (11.1, 0.0), *Cyperus aggregatus** (11.1, 0.0), *Desmodium gunnii* (11.1, 5.0), *Dianella* (11.1, 0.0), *Glycine* (11.1, 0.0), *Glycine tomentella* (11.1, 1.0), *Gomphocarpus physocarpus** (11.1, 0.0), *Goodenia rotundifolia* (11.1, 0.0), *Grewia latifolia* (11.1, 0.0), *Mentha satureioides* (11.1, 0.0), *Murdannia graminea* (11.1, 0.0), *Opuntia* (11.1, 0.0), *Opuntia tomentosa** (11.1, 0.0), *Passiflora suberosa** (11.1, 1.0), *Pycnosorus chrysanthus* (11.1, 0.0), *Rostellularia adscendens subsp. adscendens* (11.1, 0.0), *Sigesbeckia* (11.1, 0.0), *Sigesbeckia orientalis* (11.1, 0.0), *Zornia dyctiocarpa var. dyctiocarpa* (11.1, 0.0), *Abildgaardia ovata* (5.6, 0.0), *Abutilon oxycarpum var. oxycarpum* (5.6, 0.0), *Acacia leiocalyx subsp. leiocalyx* (5.6, 0.0), *Apowollastonia spilanthoides* (5.6, 0.0), *Asparagus africanus** (5.6, 0.0), *Asperula conferta* (5.6, 0.0), *Asplenium* (5.6, 0.0), *Bidens bipinnata** (5.6, 0.0), *Brunonia australis* (5.6, 0.0), *Bryophyllum delagoense** (5.6, 0.0), *Calotis dentex* (5.6, 0.0), *Carex breviculmis* (5.6, 0.0), *Cassytha filiformis* (5.6, 0.0), *Cassytha pubescens* (5.6, 0.0), *Cheilanthes* (5.6, 0.0), *Cheilanthes sieberi subsp. sieberi* (5.6, 0.0), *Cheilanthes tenuifolia* (5.6, 0.0), *Cirsium vulgare** (5.6, 0.0), *Commelina diffusa* (5.6, 0.0), *Crotalaria montana var. angustifolia* (5.6, 0.0), *Cymbidium canaliculatum* (5.6, 0.0), *Cyperus cyperoides* (5.6, 0.0), *Cyperus javanicus* (5.6, 0.0), *Desmodium uncinatum** (5.6, 0.0), *Dianella caerulea var. vannata* (5.6, 0.0), *Dianella rara* (5.6, 0.0), *Dichondra repens* (5.6, 2.0), *Echium* (5.6, 0.0), *Einadia hastata* (5.6, 0.0), *Erigeron bonariensis** (5.6, 0.0), *Erigeron pusillus** (5.6, 0.0), *Evolvulus alsinoides* (5.6, 0.0), *Exocarpos cupressiformis* (5.6, 2.0), *Gahnia aspera* (5.6, 0.0), *Galactia tenuiflora var. lucida* (5.6, 0.0), *Glycine clandestina* (5.6, 0.0), *Glycine cyrtoloba* (5.6, 0.0), *Goodenia delicata* (5.6, 0.0), *Goodenia hederacea* (5.6, 0.5), *Goodenia mystrophylla* (5.6, 0.0), *Goodenia paradoxa* (5.6, 0.0), *Gymnostachys anceps* (5.6, 0.0), *Hibbertia linearis* (5.6, 0.0), *Hovea acutifolia* (5.6, 0.0), *Hydrocotyle laxiflora* (5.6, 0.0), *Iphigenia indica* (5.6, 0.0), *Jasminum didymum* (5.6, 0.0), *Jasminum didymum subsp. lineare* (5.6, 0.0), *Leichhardtia rostrata* (5.6, 0.0), *Lepidosperma laterale* (5.6, 2.0), *Lepidosperma laterale var. laterale** (5.6, 0.0), *Lespedeza juncea subsp. sericea* (5.6, 0.0), *Liliaceae* (5.6, 0.0), *Lissanthe strigosa subsp. subulata* (5.6, 2.0), *Lomandra confertifolia subsp. pallida* (5.6, 0.5), *Lomandra filiformis* (5.6, 0.0), *Malvastrum americanum var. americanum** (5.6, 0.0), *Marsdenia* (5.6, 0.0), *Monotoca scoparia* (5.6, 0.0), *Myoporum acuminatum* (5.6, 0.0), *Oxalis corniculata** (5.6, 0.0), *Ozothamnus diosmifolius* (5.6, 0.0), *Parsonsia eucalyptophylla* (5.6, 0.0), *Passiflora foetida** (5.6, 0.0), *Picris angustifolia subsp. carolorum-henricorum* (5.6, 0.0), *Pigea enneasperma* (5.6, 0.0), *Pigea stellarioides* (5.6, 0.0), *Podolepis neglecta* (5.6, 0.0), *Pomax umbellata* (5.6, 0.0), *Pultenaea villosa* (5.6, 1.0), *Rhodanthe anthemoides* (5.6, 0.0), *Rhynchosia minima var. minima* (5.6, 0.0), *Scleria sphacelata* (5.6, 0.0), *Sida rhombifolia** (5.6, 0.0), *Smilax australis* (5.6, 0.0), *Solanum nemophilum* (5.6, 0.5), *Solanum stelligerum* (5.6, 0.0), *Stephania japonica* (5.6, 0.0), *Styphelia sieberi* (5.6, 0.0), *Vincetoxicum ovatum* (5.6, 0.5), *Wahlenbergia gracilis* (5.6, 0.0)

Species list: Frequency (percent of total sites) and cover (average of species cover across sites where that species is present). Ordered by decreasing frequency. Naturalised species have an asterisk (*) after the name. indet. after listed name if indeterminate species or genus.

12.3.3: Eucalyptus tereticornis woodland on Quaternary alluvium



Mapping data	**Pre-clearing area** = 419,267.8 ha; **Remnant area 2023** = 36,822.8 ha; **Remnant percent remaining in 2023** = 8.8 %
Species richness	total: 351 (24 sites); woody: 87 (21 sites); ground: 277 (15 sites); average spp./site: 50.9, standard deviation: 17.5 (15 sites)
Basal area	average/site: 19.8 m^2/ha; range: 8.0 - 34.0 m^2/ha; std. deviation: 8.9; (24 sites)
Ecological dominant layer (EDL) height	stratum: tree 1; average/site: 23.40m; range: 17.00 - 33.00m; (24 sites)
Ecological dominant layer (EDL) Crown Cover	stratum: tree 1; average: 36.2%; range: 12.0 - 66.0%; (24 sites)
Structural formation	Woodland: 66.7 %; Open Forest: 20.8 %; Open Woodland: 8.3 %; Tall Woodland: 4.2 %; (24 sites)
Representative site(s)	1870, 1925, 2192, 2196, 2200, 2585, 2848, 2943, 3168, 3353, 3358, 3415, 3573, 3676, 3823, 3824, 3833, 3877, 3907, 8677, 11055, 11910, 14719, 14962

Stratum: Tree 1 (EDL)

Height: average: 23.40m; range: 17.00 - 33.00m; (24 sites)
Crown Cover: average: 36.2%; range: 12.0 - 66.0%; (24 sites)
Stem Count: average: 260 stems/ha; range: 40 - 560 stems/ha; std. deviation: 199.2 stems/ha; (10 sites)
Basal area: average: 15.4 m^2/ha; range: 1.0 - 32.0 m^2/ha; std. deviation: 8.7 m^2/ha; (24 sites)

Species list(frequency(%), average cover(%)):

Most frequent species (up to 6):

Eucalyptus tereticornis (100.0, 20.0), *Lophostemon suaveolens* (45.8, 18.1), *Corymbia intermedia* (41.7, 8.5), *Eucalyptus crebra* (29.2, 6.3), *Angophora subvelutina* (16.7, 9.5), *Casuarina cunninghamiana subsp. cunninghamiana* (12.5, 0.0)

Additional species:

Eucalyptus exserta (8.3, 11.0), *Corymbia tessellaris* (8.3, 5.0), *Eucalyptus moluccana* (8.3, 0.5), *Eucalyptus melanophloia* (4.2, 9.0), *Corymbia citriodora* (4.2, 5.0), *Angophora floribunda* (4.2, 2.0), *Acacia disparrima subsp. disparrima* (4.2, 1.0), *Corymbia clarksoniana* (4.2, 1.0), *Araucaria cunninghamii var. cunninghamii* (4.2, 0.0), *Eucalyptus melanoleuca* (4.2, 0.0)

Species list: Frequency (percent of total sites) and cover (average of species cover across sites where that species is present). Ordered by decreasing frequency. Naturalised species have an asterisk (*) after the name. indet. after listed name if indeterminate species or genus.

Stratum: Tree 2

Height: average: 11.52m; range: 6.00 - 19.00m; (23 sites)
Crown Cover: average: 12.5%; range: 0.5 - 35.0%; (21 sites)
Stem Count: average: 243 stems/ha; range: 30 - 700 stems/ha; std. deviation: 242.5 stems/ha; (7 sites)
Basal area: average: 6.5 m^2/ha; range: 1.0 - 19.0 m^2/ha; std. deviation: 5.5 m^2/ha; (15 sites)

Species list(frequency(%), average cover(%)):

Most frequent species (up to 6):

Eucalyptus tereticornis (41.7, 11.1), *Angophora subvelutina* (29.2, 8.1), *Lophostemon suaveolens* (20.8, 10.4), *Eucalyptus crebra* (20.8, 2.0), *Corymbia tessellaris* (16.7, 1.7), *Acacia disparrima subsp. disparrima* (12.5, 3.0)

Additional species:

Allocasuarina torulosa (12.5, 2.8), *Eucalyptus melanophloia* (8.3, 4.0), *Melaleuca nervosa* (8.3, 3.0), *Banksia integrifolia* (8.3, 1.0), *Corymbia clarksoniana* (8.3, 1.0), *Pleiogynium timorense* (8.3, 0.5), *Cryptocarya triplinervis* (4.2, 20.0), *Banksia integrifolia subsp. compar* (4.2, 5.0), *Allocasuarina luehmannii* (4.2, 2.0), *Casuarina cunninghamiana subsp. cunninghamiana* (4.2, 1.0), *Corymbia intermedia* (4.2, 1.0), *Planchonia careya* (4.2, 1.0), *Diospyros fasciculosa* (4.2, 0.0), *Diospyros geminata* (4.2, 0.0), *Ficus* (4.2, 0.0), *Flindersia australis* (4.2, 0.0), *Melaleuca fluviatilis* (4.2, 0.0), *Melia azedarach* (4.2, 0.0)

Stratum: Tree 3

Height: average: 6.92m; range: 4.50 - 11.00m; (12 sites)
Crown Cover: average: 7.0%; range: 0.5 - 20.0%; (11 sites)
Stem Count: average: 120 stems/ha; range: 20 - 180 stems/ha; std. deviation: 87.2 stems/ha; (4 sites)
Basal area: average: 1.3 m^2/ha; range: 1.0 - 2.0 m^2/ha; std. deviation: 0.5 m^2/ha; (4 sites)

Species list(frequency(%), average cover(%)):

Most frequent species (up to 6):

Lophostemon suaveolens (12.5, 6.5), *Angophora subvelutina* (12.5, 3.5), *Eucalyptus tereticornis* (12.5, 2.8), *Melaleuca nervosa* (12.5, 1.3), *Acacia disparrima subsp. disparrima* (8.3, 1.0), *Eucalyptus crebra* (8.3, 0.0)

Additional species:

Smilax australis (4.2, 20.0), *Petalostigma pubescens* (4.2, 10.0), *Allocasuarina luehmannii* (4.2, 4.0), *Alphitonia excelsa* (4.2, 2.0), *Corymbia tessellaris* (4.2, 2.0), *Corymbia clarksoniana* (4.2, 1.0), *Mallotus philippensis* (4.2, 0.3), *Drypetes deplanchei* (4.2, 0.2), *Corymbia intermedia* (4.2, 0.0), *Eucalyptus melanophloia* (4.2, 0.0), *Ficus opposita* (4.2, 0.0), *Geijera salicifolia* (4.2, 0.0)

Stratum: Shrub 1

Height: average: 2.75m; range: 2.00 - 5.00m; (22 sites)
Crown Cover: average: 7.1%; range: 0.0 - 25.0%; (20 sites)
Stem Count: average: 312 stems/ha; range: 100 - 960 stems/ha; std. deviation: 370.0 stems/ha; (5 sites)
Basal area: average: 1.0 m^2/ha; range: 1.0 - 1.0 m^2/ha; std. deviation: 0.0 m^2/ha; (3 sites)

Species list(frequency(%), average cover(%)):

Most frequent species (up to 6):

Acacia disparrima subsp. disparrima (45.8, 4.1), *Lantana camara** (33.3, 3.0), *Acacia maidenii* (20.8, 1.8), *Alphitonia excelsa* (20.8, 1.6), *Acacia leiocalyx subsp. leiocalyx* (12.5, 6.5), *Lophostemon suaveolens* (12.5, 6.2)

Additional species:

Breynia oblongifolia (12.5, 0.2), *Glochidion ferdinandi* (8.3, 15.0), *Jacksonia scoparia* (8.3, 3.0), *Planchonia careya* (8.3, 3.0), *Angophora subvelutina* (8.3, 0.0), *Corymbia intermedia* (8.3, 0.0), *Corymbia tessellaris* (8.3, 0.0), *Glochidion lobocarpum* (8.3, 0.0), *Maclura cochinchinensis* (8.3, 0.0), *Timonius timon var. timon* (4.2, 20.0), *Acacia concurrens* (4.2, 4.5), *Acacia blakei subsp. blakei* (4.2, 3.0), *Eucalyptus tereticornis* (4.2, 3.0), *Melaleuca trichostachya* (4.2, 3.0), *Banksia integrifolia* (4.2, 1.0), *Melaleuca nervosa* (4.2, 1.0), *Banksia integrifolia subsp. compar* (4.2, 0.2), *Jagera pseudorhus var. pseudorhus* (4.2, 0.2), *Persoonia amaliae* (4.2, 0.2), *Petalostigma pubescens* (4.2, 0.2), *Acacia glaucocarpa* (4.2, 0.0), *Acacia salicina* (4.2, 0.0), *Acronychia oblongifolia* (4.2, 0.0), *Ailanthus triphysa* (4.2, 0.0), *Alpinia caerulea* (4.2, 0.0), *Aphananthe philippinensis* (4.2, 0.0), *Arytera divaricata* (4.2, 0.0), *Capparis canescens* (4.2, 0.0), *Choretrum candollei* (4.2, 0.0), *Cryptocarya obovata* (4.2, 0.0), *Cymbidium suave* (4.2, 0.0), *Drypetes deplanchei* (4.2, 0.0), *Elattostachys xylocarpa* (4.2, 0.0), *Eucalyptus acmenoides* (4.2, 0.0), *Ficus opposita* (4.2, 0.0), *Flindersia schottiana* (4.2, 0.0), *Geijera salicifolia* (4.2, 0.0), *Glochidion sumatranum* (4.2, 0.0), *Jasminum didymum subsp. lineare* (4.2, 0.0), *Legnephora moorei* (4.2, 0.0), *Livistona australis* (4.2, 0.0), *Lomandra longifolia* (4.2, 0.0), *Macaranga tanarius* (4.2, 0.0), *Mallotus discolor* (4.2, 0.0), *Melodorum leichhardtii* (4.2, 0.0), *Mischocarpus anodontus* (4.2, 0.0), *Myrsine howittiana* (4.2, 0.0), *Pleogyne australis* (4.2, 0.0),

Species list: Frequency (percent of total sites) and cover (average of species cover across sites where that species is present). Ordered by decreasing frequency. Naturalised species have an asterisk (*) after the name. indet. after listed name if indeterminate species or genus.

Psydrax lamprophylla (4.2, 0.0), *Psydrax odorata* (4.2, 0.0), *Sterculia quadrifida* (4.2, 0.0), *Toona ciliata* (4.2, 0.0), *Trema tomentosa* (4.2, 0.0), *Turraea pubescens* (4.2, 0.0), *Vitex melicopea* (4.2, 0.0)

Stratum: Shrub 2

Height: average: 0.93m; range: 0.50 - 2.00m; (7 sites)
Crown Cover: average: 3.2%; range: 0.2 - 10.0%; (5 sites)
Stem Count: No data available.
Basal area: No data available.

Species list(frequency(%), average cover(%)):

Most frequent species (up to 6):

Melaleuca nervosa (8.3, 2.5), *Breynia oblongifolia* (4.2, 10.0), *Acacia glaucocarpa* (4.2, 1.0), *Grewia latifolia* (4.2, 0.2), *Rubus moluccanus* (4.2, 0.0), *Sida cordifolia** (4.2, 0.0)

Additional species:

*Tagetes minuta** (4.2, 0.0)

Stratum: Ground

Height: average: 0.57m; range: 0.40 - 0.80m; (15 sites)
Projective foliage cover (PFC): average: 59.2%; range: 8.7 - 92.0%; (15 sites)

Species list(frequency(%), average cover(%)):

Grass - perennial:

Most frequent species (up to 6):

Imperata cylindrica (66.7, 14.0), *Cymbopogon refractus* (60.0, 9.6), *Digitaria parviflora* (40.0, 3.0), *Heteropogon contortus* (40.0, 5.8), *Panicum effusum* (40.0, 12.5), *Eragrostis brownii* (33.3, 30.0)

Additional species:

Eremochloa bimaculata (33.3, 29.2), *Themeda triandra* (33.3, 35.3), *Arundinella nepalensis* (26.7, 10.2), *Bothriochloa decipiens var. decipiens* (26.7, 5.0), *Eragrostis spartinoides* (26.7, 1.0), *Melinis repens** (26.7, 6.0), *Sporobolus elongatus* (26.7, 0.0), *Alloteropsis semialata* (20.0, 10.5), *Bothriochloa decipiens* (20.0, 2.5), *Digitaria didactyla** (20.0, 8.8), *Digitaria ramularis* (20.0, 9.0), *Hyparrhenia filipendula* (20.0, 0.0), *Microlaena stipoides var. stipoides* (20.0, 6.5), *Oplismenus aemulus* (20.0, 16.5), *Paspalidium distans* (20.0, 1.0), *Paspalidium gausum* (20.0, 3.0), *Paspalum scrobiculatum* (20.0, 0.0), *Aristida gracilipes* (13.3, 6.0), *Aristida personata* (13.3, 1.0) , *Capillipedium parviflorum* (13.3, 19.0), *Capillipedium spicigerum* (13.3, 30.0), *Cenchrus caliculatus* (13.3, 0.0), *Chloris gayana** (13.3, 12.5), *Chrysopogon fallax* (13.3, 0.0), *Eragrostis curvula** (13.3, 0.0), *Eragrostis lacunaria* (13.3, 1.0), *Ottochloa gracillima* (13.3, 0.0), *Panicum simile* (13.3, 4.5), *Sarga leiocladum* (13.3, 23.0), *Sporobolus creber* (13.3, 0.0), *Aristida* (6.7, 0.0), *Aristida benthamii var. benthamii* (6.7, 2.0), *Aristida calycina* (6.7, 4.0), *Aristida lazaridis* (6.7, 0.0), *Aristida queenslandica var. dissimilis* (6.7, 1.0), *Aristida queenslandica var. queenslandica* (6.7, 1.0), *Aristida warburgii* (6.7, 0.0), *Chloris divaricata* (6.7, 0.0), *Chloris ventricosa* (6.7, 0.0), *Chrysopogon sylvaticus* (6.7, 1.0), *Dichanthium sericeum* (6.7, 0.0), *Digitaria brownii* (6.7, 5.0), *Enneapogon polyphyllus* (6.7, 4.0), *Entolasia stricta* (6.7, 0.0), *Eragrostis leptocarpa* (6.7, 8.0), *Eragrostis pubescens* (6.7, 0.0), *Eragrostis sororia* (6.7, 0.0), *Eriachne triseta* (6.7, 10.0), *Panicum queenslandicum* (6.7, 0.0), *Paspalidium criniforme* (6.7, 0.0), *Paspalum dilatatum** (6.7, 1.0), *Poa labillardierei var. labillardierei* (6.7, 20.0), *Setaria pumila subsp. pumila** (6.7, 1.0), *Setaria pumila subsp. subtesselata** (6.7, 0.0), *Sporobolus laxus* (6.7, 0.0), *Sporobolus pyramidalis** (6.7, 5.0), *Stolonochloa pygmaea* (6.7, 20.0)

Grass - annual/biennial:

Most frequent species (up to 6):

Urochloa foliosa (13.3, 0.0), *Urochloa subquadripara** (13.3, 0.0),

Additional species:

Forbs & other:

Most frequent species (up to 6):

Cyanthillium cinereum (66.7, 0.0), *Eustrephus latifolius* (60.0, 0.0), *Desmodium rhytidophyllum* (53.3, 0.0), *Fimbristylis dichotoma* (53.3, 5.0), *Chrysocephalum apiculatum* (46.7, 3.0), *Lomandra longifolia* (46.7, 1.7)

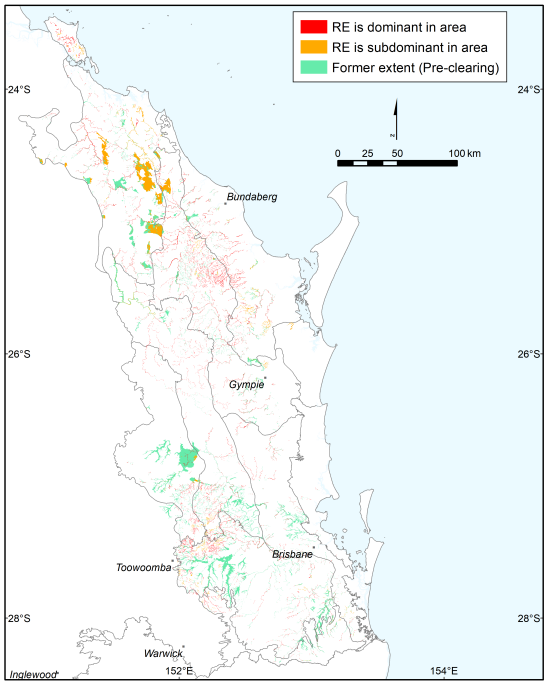
Additional species:

Species list: Frequency (percent of total sites) and cover (average of species cover across sites where that species is present). Ordered by decreasing frequency. Naturalised species have an asterisk (*) after the name. indet. after listed name if indeterminate species or genus.

Phyllanthus virgatus (46.7, 0.0), *Alphitonia excelsa* (40.0, 0.0), *Bidens pilosa** (40.0, 0.0), *Brunoniella australis* (40.0, 0.0), *Cyperus gracilis* (40.0, 5.5), *Emilia sonchifolia** (40.0, 0.5), *Flemingia parviflora* (40.0, 0.0), *Lobelia purpurascens* (40.0, 1.0), *Pigea stellarioides* (40.0, 0.0), *Breynia oblongifolia* (33.3, 0.0), *Cheilanthes sieberi* (33.3, 0.0), *Desmodium varians* (33.3, 0.0), *Mentha satureioides* (33.3, 1.0), *Acacia disparrima subsp. disparrima* (26.7, 0.0), *Commelina diffusa* (26.7, 0.5), *Crotalaria montana* (26.7, 0.0), *Desmodium brachypodum* (26.7, 0.0), *Desmodium gunnii* (26.7, 0.0), *Dianella caerulea* (26.7, 0.0), *Dichondra repens* (26.7, 2.0), *Eremophila debilis* (26.7, 0.0), *Galactia tenuiflora* (26.7, 0.0), *Pteridium esculentum* (26.7, 30.0), *Scleria mackaviensis* (26.7, 0.0), *Sida hackettiana* (26.7, 0.0), *Sida rhombifolia** (26.7, 0.0), *Spermacoce brachystema* (26.7, 0.0), *Commelina lanceolata* (20.0, 0.0), *Cyperus cyperoides* (20.0, 0.0), *Cyperus fulvus* (20.0, 0.0), *Desmodium triflorum** (20.0, 0.0), *Dianella revoluta* (20.0, 1.0), *Glycine clandestina* (20.0, 0.0), *Glycine clandestina var. clandestina* (20.0, 0.0), *Glycine tabacina* (20.0, 0.0), *Glycine tomentella* (20.0, 0.0), *Gomphocarpus physocarpus** (20.0, 0.0), *Hardenbergia violacea* (20.0, 0.0), *Hydrocotyle laxiflora* (20.0, 0.0), *Iphigenia indica* (20.0, 0.0), *Lantana camara** (20.0, 0.0), *Lomandra multiflora subsp. multiflora* (20.0, 0.0), *Murdannia graminea* (20.0, 0.0), *Opuntia stricta** (20.0, 0.0), *Oxalis corniculata** (20.0, 0.0), *Rhynchosia minima* (20.0, 0.0), *Rubus moluccanus* (20.0, 0.0), *Rubus parvifolius* (20.0, 0.0), *Tricoryne elatior* (20.0, 0.0), *Wahlenbergia gracilis* (20.0, 0.0), *Zornia dyctiocarpa var. dyctiocarpa* (20.0, 0.0), *Abildgaardia ovata* (13.3, 0.0), *Acacia leiocalyx subsp. leiocalyx* (13.3, 0.0), *Acacia maidenii* (13.3, 0.0), *Ajuga australis* (13.3, 0.0), *Anisomeles* (13.3, 0.0), *Causonis clematidea* (13.3, 0.0), *Centella asiatica* (13.3, 0.5), *Clematicissus opaca* (13.3, 0.0), *Crotalaria pallida var. obovata** (13.3, 0.0), *Cyperus leiocaulon* (13.3, 0.0), *Denhamia bilocularis* (13.3, 0.0), *Desmodium gangeticum* (13.3, 0.0), *Dianella longifolia* (13.3, 0.0), *Erigeron canadensis** (13.3, 0.0), *Evolvulus alsinoides* (13.3, 0.0), *Exocarpos cupressiformis* (13.3, 0.0), *Geodorum densiflorum* (13.3, 0.0), *Glossocardia bidens* (13.3, 0.0), *Glycine clandestina var. sericea* (13.3, 0.0), *Gomphocarpus fruticosus** (13.3, 0.0), *Jasminum didymum subsp. racemosum* (13.3, 0.0), *Juncus continuus* (13.3, 0.0), *Lespedeza juncea subsp. sericea* (13.3, 0.0), *Lomandra confertifolia subsp. pallida* (13.3, 0.0), *Lomandra filiformis* (13.3, 0.0), *Opercularia diphylla* (13.3, 0.0), *Passiflora suberosa** (13.3, 0.0), *Pimelea neoanglica* (13.3, 0.0), *Polymeria calycina* (13.3, 0.0), *Pomax umbellata* (13.3, 3.0), *Pterocaulon* (13.3, 0.0), *Pycnospora lutescens* (13.3, 0.0), *Richardia brasiliensis** (13.3, 0.0), *Sida cordifolia** (13.3, 0.0), *Sigesbeckia orientalis* (13.3, 0.5), *Solanum nemophilum* (13.3, 0.0), *Solanum stelligerum* (13.3, 0.0), *Sphaeromorphaea* (13.3, 0.0), *Verbena litoralis** (13.3, 0.0), *Veronica plebeia* (13.3, 0.0), *Vittadinia dissecta var. hirta* (13.3, 0.0), *Acacia fimbriata* (6.7, 0.0), *Acacia glaucocarpa* (6.7, 0.0), *Acacia irrorata subsp. irrorata* (6.7, 0.0), *Adiantum hispidulum* (6.7, 0.0), *Ageratum houstonianum** (6.7, 0.5), *Alternanthera nana* (6.7, 0.0), *Araujia sericifera** (6.7, 0.0), *Aristolochia pubera* (6.7, 0.0), *Artanema fimbriatum* (6.7, 0.0), *Asparagus africanus** (6.7, 0.0), *Bacopa* (6.7, 0.0), *Brunoniella acaulis* (6.7, 0.0), *Calotis cuneata* (6.7, 1.0), *Calotis cuneifolia* (6.7, 0.0), *Calotis dentex* (6.7, 2.0), *Capparis arborea* (6.7, 0.0), *Cassinia laevis subsp. rosmarinifolia* (6.7, 0.0), *Centratherum riparium* (6.7, 1.0), *Chamaecrista mimosoides* (6.7, 0.0), *Chamaecrista nomame var. nomame* (6.7, 0.0), *Cheilanthes tenuifolia* (6.7, 0.0), *Cirsium vulgare** (6.7, 0.0), *Clematis glycinoides* (6.7, 0.0), *Coleus australis* (6.7, 0.0), *Corymbia clarksoniana* (6.7, 0.0), *Corymbia intermedia* (6.7, 0.0), *Crotalaria incana** (6.7, 0.0), *Crotalaria juncea** (6.7, 0.0), *Crotalaria lanceolata subsp. lanceolata** (6.7, 0.0), *Crotalaria medicaginea* (6.7, 0.0), *Crotalaria mitchellii subsp. mitchellii* (6.7, 0.0), *Crotalaria novae-hollandiae* (6.7, 0.0), *Cullen tenax* (6.7, 0.0), *Cyclophyllum coprosmoides var. coprosmoides* (6.7, 0.0), *Cyperus brevifolius** (6.7, 0.0), *Cyperus difformis* (6.7, 0.0), *Cyperus enervis* (6.7, 1.0), *Cyperus sanguinolentus* (6.7, 0.0), *Cyperus subulatus* (6.7, 0.0), *Dianella* (6.7, 0.0), *Dianella brevipedunculata* (6.7, 0.0), *Dianella longifolia var. longifolia* (6.7, 0.0), *Dianella rara* (6.7, 0.0), *Diplocyclos palmatus subsp. palmatus* (6.7, 0.0), *Drosera* (6.7, 0.0), *Embelia australiana* (6.7, 0.0), *Eremophila* (6.7, 0.0), *Erigeron sumatrensis** (6.7, 0.0), *Eucalyptus melanophloia* (6.7, 0.0), *Eucalyptus tereticornis* (6.7, 0.0), *Euphorbia* (6.7, 0.0), *Euphorbia hyssopifolia** (6.7, 1.0), *Ficus opposita* (6.7, 0.0), *Geitonoplesium cymosum* (6.7, 0.0), *Gomphrena celosioides** (6.7, 0.0), *Goodenia bellidifolia subsp. argentea* (6.7, 0.0), *Goodenia glabra* (6.7, 0.0), *Goodenia mystrophylla* (6.7, 0.0), *Gymnostachys anceps* (6.7, 0.0), *Haloragis heterophylla* (6.7, 0.0), *Hibbertia linearis var. obtusifolia* (6.7, 0.0), *Indigofera hirsuta* (6.7, 0.0), *Indigofera linifolia* (6.7, 0.0), *Indigofera linnaei* (6.7, 0.0), *Ipomoea plebeia* (6.7, 0.0), *Jacksonia scoparia* (6.7, 0.0), *Jasminum simplicifolium subsp. australiense* (6.7, 0.0), *Juncus polyanthemus* (6.7, 0.5), *Lagenophora sublyrata* (6.7, 0.0), *Lantana montevidensis** (6.7, 3.0), *Livistona decora* (6.7, 0.0), *Lomandra hystrix* (6.7, 0.0), *Lophostemon suaveolens* (6.7, 0.0), *Malvastrum americanum var. americanum** (6.7, 0.0), *Mecardonia procumbens** (6.7, 0.0), *Melaleuca viridiflora var. viridiflora* (6.7, 0.0), *Melodinus australis* (6.7, 0.0), *Micromelum minutum* (6.7, 0.0), *Myrsine variabilis* (6.7, 0.0), *Ophioglossum reticulatum* (6.7, 0.0), *Oxalis* (6.7, 0.0), *Oxalis chnoodes* (6.7, 0.0), *Passiflora aurantia* (6.7, 0.0), *Passiflora aurantia var. aurantia* (6.7, 0.0), *Physalis* (6.7, 0.0), *Pimelea linifolia* (6.7, 0.0), *Pittosporum viscidum* (6.7, 0.0), *Planchonia careya* (6.7, 0.0), *Plantago debilis* (6.7, 0.0), *Polygala triflora* (6.7, 0.0), *Psydrax odorata* (6.7, 0.0), *Psydrax odorata forma buxifolia* (6.7, 0.0), *Rostellularia adscendens* (6.7, 0.0), *Scolopia braunii* (6.7, 0.0), *Sida* (6.7, 0.0), *Siphonodon australis* (6.7, 0.0), *Solanum americanum** (6.7, 0.0), *Stackhousia viminea* (6.7, 0.0), *Sterculia quadrifida* (6.7, 0.0), *Stylosanthes* (6.7, 0.0), *Styphelia trichostyla* (6.7, 0.0), *Tagetes minuta** (6.7, 0.0), *Triumfetta rhomboidea** (6.7, 0.0), *Vachellia bidwillii* (6.7, 0.0), *Verbena bonariensis** (6.7, 0.0), *Verbena rigida** (6.7, 0.0), *Veronica persica** (6.7, 0.0), *Vigna lanceolata var. lanceolata* (6.7, 0.0), *Vigna radiata var. sublobata* (6.7, 0.0), *Vigna vexillata* (6.7, 0.0), *Vincetoxicum ovatum* (6.7, 0.0), *Wahlenbergia* (6.7, 0.0), *Zornia muriculata* (6.7, 0.0), *Zornia muriculata subsp. angustata* (6.7, 0.0)

Species list: Frequency (percent of total sites) and cover (average of species cover across sites where that species is present). Ordered by decreasing frequency. Naturalised species have an asterisk (*) after the name. indet. after listed name if indeterminate species or genus.

12.3.7: Eucalyptus tereticornis, Casuarina cunninghamiana subsp. cunninghamiana +/- Melaleuca spp. fringing woodland



Mapping data	**Pre-clearing area** = 117,113.3 ha; **Remnant area 2023** = 62,930.4 ha; **Remnant percent remaining in 2023** = 53.7 %
Species richness	total: 353 (21 sites); woody: 122 (21 sites); ground: 272 (12 sites); average spp./site: 57.0, standard deviation: 21.6 (12 sites)
Basal area	average/site: 17.6 m^2/ha; range: 2.2 - 39.0 m^2/ha; std. deviation: 8.7; (17 sites)
Ecological dominant layer (EDL) height	stratum: tree 1; average/site: 21.71m; range: 15.00 - 28.00m; (21 sites)
Ecological dominant layer (EDL) Crown Cover	stratum: tree 1; average: 31.5%; range: 12.0 - 75.0%; (21 sites)
Structural formation	Woodland: 57.1 %; Open Woodland: 28.6 %; Open Forest: 14.3 %; (21 sites)
Representative site(s)	2099, 2188, 2590, 2629, 2694, 2696, 2919, 3188, 3335, 3540, 3545, 3860, 3878, 3925, 3947, 3950, 4480, 6665, 12061, 14717, 17866

Stratum: Emergent

Height: average: 32.33m; range: 28.00 - 35.00m; (3 sites)
Crown Cover: average: 4.2%; range: 2.5 - 5.0%; (3 sites)
Stem Count: No data available.
Basal area: average: 2.7 m^2/ha; range: 1.0 - 5.0 m^2/ha; std. deviation: 2.0 m^2/ha; (3 sites)

Species list(frequency(%), average cover(%)):

Most frequent species (up to 6):

Eucalyptus tereticornis (9.5, 5.0), *Corymbia intermedia* (4.8, 2.5),

Additional species:

Species list: Frequency (percent of total sites) and cover (average of species cover across sites where that species is present). Ordered by decreasing frequency. Naturalised species have an asterisk (*) after the name. indet. after listed name if indeterminate species or genus.

Stratum: Tree 1 (EDL)

Height: average: 21.71m; range: 15.00 - 28.00m; (21 sites)
Crown Cover: average: 31.5%; range: 12.0 - 75.0%; (21 sites)
Stem Count: average: 197 stems/ha; range: 40 - 380 stems/ha; std. deviation: 112.0 stems/ha; (6 sites)
Basal area: average: 10.6 m^2/ha; range: 2.0 - 19.0 m^2/ha; std. deviation: 5.5 m^2/ha; (16 sites)

Species list(frequency(%), average cover(%)):

Most frequent species (up to 6):

Casuarina cunninghamiana subsp. cunninghamiana (81.0, 18.6), *Eucalyptus tereticornis* (71.4, 10.4), *Lophostemon suaveolens* (14.3, 28.7), *Waterhousea floribunda* (14.3, 19.3), *Melaleuca fluviatilis* (14.3, 10.0), *Corymbia intermedia* (14.3, 5.3)

Additional species:

Corymbia tessellaris (14.3, 2.0), *Melaleuca bracteata* (4.8, 28.0), *Melaleuca linariifolia* (4.8, 15.0), *Melaleuca viminalis* (4.8, 12.0), *Angophora subvelutina* (4.8, 10.0), *Grevillea robusta* (4.8, 5.0), *Corymbia citriodora subsp. variegata* (4.8, 1.0), *Didymocheton gaudichaudianus* (4.8, 1.0), *Elaeocarpus grandis* (4.8, 1.0), *Eucalyptus acmenoides* (4.8, 0.0), *Eucalyptus crebra* (4.8, 0.0), *Euroschinus falcatus var. falcatus* (4.8, 0.0), *Ficus rubiginosa* (4.8, 0.0), *Mallotus philippensis* (4.8, 0.0)

Stratum: Tree 2

Height: average: 11.67m; range: 6.00 - 16.00m; (18 sites)
Crown Cover: average: 23.2%; range: 1.3 - 65.0%; (18 sites)
Stem Count: average: 193 stems/ha; range: 60 - 340 stems/ha; std. deviation: 105.6 stems/ha; (6 sites)
Basal area: average: 6.2 m^2/ha; range: 1.0 - 20.0 m^2/ha; std. deviation: 6.6 m^2/ha; (12 sites)

Species list(frequency(%), average cover(%)):

Most frequent species (up to 6):

Casuarina cunninghamiana subsp. cunninghamiana (33.3, 11.9), *Aphananthe philippinensis* (28.6, 10.6), *Waterhousea floribunda* (23.8, 19.4), *Melaleuca viminalis* (23.8, 4.0), *Eucalyptus tereticornis* (19.0, 3.2), *Cryptocarya triplinervis* (19.0, 2.9)

Additional species:

Melaleuca bracteata (14.3, 12.0), *Lophostemon suaveolens* (14.3, 7.5), *Corymbia intermedia* (14.3, 3.4), *Syzygium australe* (14.3, 1.7) , *Melia azedarach* (14.3, 0.9), *Acacia disparrima subsp. disparrima* (9.5, 3.5), *Corymbia tessellaris* (9.5, 1.0), *Macaranga tanarius* (9.5, 0.5), *Nauclea orientalis* (9.5, 0.4), *Melaleuca fluviatilis* (4.8, 25.0), *Castanospermum australe* (4.8, 8.0), *Elaeocarpus obovatus* (4.8, 3.0), *Ficus virens var. virens* (4.8, 3.0), *Drypetes deplanchei* (4.8, 2.0), *Maclura cochinchinensis* (4.8, 2.0), *Melaleuca nervosa* (4.8, 2.0), *Angophora subvelutina* (4.8, 1.0), *Cryptocarya triplinervis var. triplinervis* (4.8, 1.0), *Elaeocarpus grandis* (4.8, 1.0), *Ficus racemosa var. racemosa* (4.8, 1.0), *Mallotus discolor* (4.8, 1.0), *Notelaea microcarpa* (4.8, 1.0), *Diospyros australis* (4.8, 0.5), *Eucalyptus crebra* (4.8, 0.5), *Euroschinus falcatus var. falcatus* (4.8, 0.5), *Ficus adenosperma* (4.8, 0.5), *Mallotus philippensis* (4.8, 0.5), *Geijera salicifolia* (4.8, 0.3), *Diospyros fasciculosa* (4.8, 0.2), *Alphitonia excelsa* (4.8, 0.0), *Angophora floribunda* (4.8, 0.0), *Brachychiton acerifolius* (4.8, 0.0), *Diplatia furcata* (4.8, 0.0), *Lophostemon confertus* (4.8, 0.0), *Platycerium superbum* (4.8, 0.0), *Pleiogynium timorense* (4.8, 0.0)

Stratum: Tree 3

Height: average: 6.67m; range: 5.00 - 8.00m; (9 sites)
Crown Cover: average: 15.4%; range: 3.0 - 35.0%; (9 sites)
Stem Count: average: 87 stems/ha; range: 20 - 200 stems/ha; std. deviation: 98.7 stems/ha; (3 sites)
Basal area: average: 5.5 m^2/ha; range: 1.1 - 13.0 m^2/ha; std. deviation: 5.2 m^2/ha; (4 sites)

Species list(frequency(%), average cover(%)):

Most frequent species (up to 6):

Melaleuca viminalis (23.8, 10.8), *Melaleuca bracteata* (9.5, 11.0), *Casuarina cunninghamiana subsp. cunninghamiana* (9.5, 8.0), *Acacia disparrima subsp. disparrima* (9.5, 4.0), *Mallotus philippensis* (9.5, 1.0), *Pleiogynium timorense* (9.5, 1.0)

Additional species:

Cupaniopsis anacardioides (9.5, 0.3), *Aphananthe philippinensis* (4.8, 11.0), *Castanospermum australe* (4.8, 6.0), *Waterhousea floribunda* (4.8, 5.0), *Cryptocarya triplinervis* (4.8, 3.0), *Drypetes deplanchei* (4.8, 2.0), *Alphitonia excelsa* (4.8, 1.0), *Cryptocarya triplinervis var. triplinervis* (4.8, 1.0), *Ficus adenosperma* (4.8, 1.0), *Mallotus discolor* (4.8, 1.0), *Acacia fasciculifera* (4.8, 0.5), *Acacia maidenii* (4.8, 0.5), *Cryptocarya obovata* (4.8, 0.5), *Diospyros australis* (4.8, 0.5), *Elattostachys xylocarpa* (4.8, 0.5), *Lophostemon suaveolens* (4.8, 0.5), *Notelaea microcarpa* (4.8, 0.5), *Siphonodon australis* (4.8, 0.5), *Baloghia inophylla* (4.8, 0.3), *Ficus racemosa var. racemosa* (4.8, 0.3), *Harpullia pendula* (4.8, 0.2), *Hymenosporum flavum* (4.8, 0.2), *Alectryon tomentosus* (4.8, 0.0), *Arytera divaricata* (4.8, 0.0), *Bridelia leichhardtii* (4.8, 0.0), *Dockrillia bowmanii* (4.8, 0.0), *Ficus rubiginosa* (4.8, 0.0), *Flagellaria indica* (4.8,

0.0), *Jagera pseudorhus var. pseudorhus* (4.8, 0.0), *Legnephora moorei* (4.8, 0.0), *Melaleuca linariifolia* (4.8, 0.0), *Melia azedarach* (4.8, 0.0), *Streblus brunonianus* (4.8, 0.0)

Stratum: Shrub 1

Height: average: 2.40m; range: 2.00 - 3.50m; (21 sites)
Crown Cover: average: 13.6%; range: 0.0 - 40.0%; (21 sites)
Stem Count: average: 252 stems/ha; range: 20 - 420 stems/ha; std. deviation: 160.4 stems/ha; (5 sites)
Basal area: average: 4.0 m^2/ha; range: 1.0 - 12.0 m^2/ha; std. deviation: 4.1 m^2/ha; (6 sites)

Species list(frequency(%), average cover(%)):

Most frequent species (up to 6):

*Lantana camara** (57.1, 5.3), *Acacia disparrima subsp. disparrima* (42.9, 1.1), *Melaleuca viminalis* (38.1, 8.8), *Maclura cochinchinensis* (33.3, 4.0), *Aphananthe philippinensis* (23.8, 6.6), *Mallotus philippensis* (23.8, 1.2)

Additional species:

Breynia oblongifolia (19.0, 1.0), *Alchornea ilicifolia* (14.3, 10.0), *Waterhousea floribunda* (14.3, 3.5), *Drypetes deplanchei* (14.3, 3.0), *Streblus brunonianus* (14.3, 1.0), *Glochidion ferdinandi* (14.3, 0.2), *Melaleuca trichostachya* (9.5, 8.5), *Melaleuca bracteata* (9.5, 7.8), *Ficus coronata* (9.5, 5.0), *Lophostemon suaveolens* (9.5, 1.5), *Syzygium australe* (9.5, 1.0), *Alphitonia excelsa* (9.5, 0.6), *Diospyros australis* (9.5, 0.5), *Glochidion lobocarpum* (9.5, 0.3), *Diospyros geminata* (9.5, 0.2), *Ficus fraseri* (9.5, 0.2), *Huberantha nitidissima* (9.5, 0.2), *Polyscias elegans* (9.5, 0.2), *Alstonia constricta* (9.5, 0.0), *Austrosteenisia blackii* (9.5, 0.0), *Ficus opposita* (9.5, 0.0), *Melia azedarach* (9.5, 0.0), *Pittosporum tinifolium* (9.5, 0.0), *Senna septemtrionalis** (9.5, 0.0), *Trema tomentosa* (9.5, 0.0), *Urena lobata** (9.5, 0.0), *Alchornea thozetiana* (4.8, 20.0), *Castanospermum australe* (4.8, 8.0), *Casuarina cunninghamiana subsp. cunninghamiana* (4.8, 6.0), *Jasminum simplicifolium subsp. australiense* (4.8, 3.0), *Passiflora subpeltata** (4.8, 2.0), *Angophora subvelutina* (4.8, 1.0), *Eucalyptus tereticornis* (4.8, 1.0), *Toona ciliata* (4.8, 1.0), *Acronychia laevis* (4.8, 0.5), *Euroschinus falcatus var. falcatus* (4.8, 0.5), *Harpullia pendula* (4.8, 0.5), *Macaranga tanarius* (4.8, 0.5), *Neolitsea australiensis* (4.8, 0.5), *Scolopia braunii* (4.8, 0.5), *Xanthium* (4.8, 0.5), *Myrsine variabilis* (4.8, 0.4), *Pipturus argenteus* (4.8, 0.4), *Cordyline petiolaris* (4.8, 0.2), *Elaeodendron australe* (4.8, 0.2), *Hymenosporum flavum* (4.8, 0.2), *Olea paniculata* (4.8, 0.2), *Timonius timon var. timon* (4.8, 0.2), *Abutilon auritum* (4.8, 0.0), *Acacia maidenii* (4.8, 0.0), *Alectryon tomentosus* (4.8, 0.0), *Argemone mexicana** (4.8, 0.0), *Callicarpa pedunculata* (4.8, 0.0), *Capparis canescens* (4.8, 0.0), *Causonis clematidea* (4.8, 0.0), *Cryptocarya triplinervis* (4.8, 0.0), *Cupaniopsis anacardioides* (4.8, 0.0), *Cupaniopsis parvifolia* (4.8, 0.0), *Denhamia celastroides* (4.8, 0.0), *Diplatia furcata* (4.8, 0.0), *Dockrillia bowmanii* (4.8, 0.0), *Elaeocarpus obovatus* (4.8, 0.0), *Excoecaria dallachyana* (4.8, 0.0), *Flagellaria indica* (4.8, 0.0), *Geijera salicifolia* (4.8, 0.0), *Geitonoplesium cymosum* (4.8, 0.0), *Malaisia scandens subsp. scandens* (4.8, 0.0), *Mallotus claoxyloides* (4.8, 0.0), *Melodinus australis* (4.8, 0.0), *Opuntia tomentosa** (4.8, 0.0), *Parsonsia straminea* (4.8, 0.0), *Passiflora suberosa** (4.8, 0.0), *Phyllanthus microcladus* (4.8, 0.0), *Plantago debilis* (4.8, 0.0), *Pleiogynium timorense* (4.8, 0.0), *Psydrax odorata* (4.8, 0.0), *Sannantha* (4.8, 0.0), *Smilax australis* (4.8, 0.0), *Solanum torvum** (4.8, 0.0), *Tinospora smilacina* (4.8, 0.0), *Triumfetta rhomboidea** (4.8, 0.0), *Wikstroemia indica* (4.8, 0.0)

Stratum: Ground

Height: average: 0.53m; range: 0.20 - 0.80m; (12 sites)
Projective foliage cover (PFC): average: 35.1%; range: 7.2 - 90.0%; (12 sites)

Species list(frequency(%), average cover(%)):

Grass - perennial:

Most frequent species (up to 6):

Oplismenus aemulus (75.0, 13.6), *Bothriochloa decipiens var. decipiens* (58.3, 5.7), *Digitaria didactyla** (33.3, 26.5), *Heteropogon contortus* (33.3, 2.7), *Axonopus compressus** (25.0, 3.0), *Cenchrus purpurascens* (25.0, 3.1)

Additional species:

Ottochloa nodosa (25.0, 2.8), *Paspalidium distans* (25.0, 0.0), *Aristida personata* (16.7, 0.0), *Cymbopogon refractus* (16.7, 0.0), *Eragrostis spartinoides* (16.7, 0.0), *Eragrostis tenuifolia** (16.7, 0.0), *Imperata cylindrica* (16.7, 2.0), *Microlaena stipoides var. stipoides* (16.7, 0.0), *Paspalum scrobiculatum* (16.7, 0.0), *Sporobolus elongatus* (16.7, 0.0), *Sporobolus laxus* (16.7, 0.0), *Aristida vagans* (8.3, 0.0), *Arundinella nepalensis* (8.3, 1.0), *Axonopus fissifolius** (8.3, 2.0), *Bothriochloa decipiens var. cloncurrensis* (8.3, 0.0) , *Capillipedium spicigerum* (8.3, 0.0), *Chrysopogon oliganthus* (8.3, 1.0), *Cynodon dactylon var. dactylon** (8.3, 0.0), *Dactyloctenium aegyptium** (8.3, 0.0), *Dichanthium tenue* (8.3, 0.0), *Digitaria* (8.3, 0.0), *Digitaria eriantha** (8.3, 0.0), *Digitaria parviflora* (8.3, 0.0), *Digitaria ramularis* (8.3, 2.0), *Digitaria violascens** (8.3, 2.0), *Echinopogon nutans var. nutans* (8.3, 0.0), *Entolasia stricta* (8.3, 0.0), *Eragrostis brownii* (8.3, 15.0), *Eragrostis curvula** (8.3, 0.2), *Leersia hexandra* (8.3, 0.0), *Megathyrsus maximus** (8.3, 3.0), *Megathyrsus maximus var. maximus** (8.3, 1.0), *Melinis repens** (8.3, 0.0), *Microlaena stipoides* (8.3, 2.0), *Oplismenus imbecillis* (8.3, 1.0), *Ottochloa gracillima* (8.3, 3.0), *Paspalum dilatatum** (8.3, 0.0), *Paspalum notatum** (8.3, 0.0), *Sacciolepis indica* (8.3, 0.0), *Sarga plumosum* (8.3, 0.0), *Sorghum* (8.3, 0.0), *Sporobolus creber* (8.3, 0.0), *Stolonochloa pygmaea* (8.3, 20.0)

Species list: Frequency (percent of total sites) and cover (average of species cover across sites where that species is present). Ordered by decreasing frequency. Naturalised species have an asterisk (*) after the name. indet. after listed name if indeterminate species or genus.

Grass - annual/biennial:

Most frequent species (up to 6):

*Eleusine indica** (16.7, 10.0), *Digitaria ciliaris** (8.3, 0.0), *Echinochloa colona** (8.3, 0.0),

Additional species:

Forbs & other:

Most frequent species (up to 6):

*Emilia sonchifolia** (75.0, 0.0), *Bidens pilosa** (66.7, 0.0), *Cyanthillium cinereum* (66.7, 0.0), *Oxalis corniculata** (66.7, 1.0), *Eustrephus latifolius* (58.3, 0.0), *Sida rhombifolia** (58.3, 1.5)

Additional species:

Sigesbeckia orientalis (58.3, 0.0), *Asclepias curassavica** (50.0, 0.0), *Breynia oblongifolia* (50.0, 0.0), *Cyperus gracilis* (50.0, 1.3), *Malvastrum coromandelianum subsp. coromandelianum** (50.0, 0.5), *Richardia brasiliensis** (50.0, 0.0), *Stephania japonica* (50.0, 0.0), *Adiantum hispidulum* (41.7, 0.0), *Ageratum houstonianum** (41.7, 0.6), *Commelina diffusa* (41.7, 9.0), *Euphorbia hirta** (41.7, 0.0), *Scleria mackaviensis* (41.7, 0.0), *Sida cordifolia** (41.7, 0.0), *Cissus antarctica** (33.3, 0.0), *Cyclospermum leptophyllum** (33.3, 0.0), *Lantana camara** (33.3, 0.0), *Macroptilium atropurpureum** (33.3, 0.0), *Acacia disparrima subsp. disparrima* (25.0, 0.0), *Alchornea ilicifolia* (25.0, 0.0), *Centella asiatica* (25.0, 0.0), *Cyperus trinervis* (25.0, 0.0), *Geitonoplesium cymosum* (25.0, 0.0), *Lobelia purpurascens* (25.0, 0.0), *Lomandra longifolia* (25.0, 5.5), *Mallotus philippensis* (25.0, 0.0), *Parsonsia straminea* (25.0, 0.0), *Phyllanthus virgatus* (25.0, 0.0), *Plantago debilis* (25.0, 0.0), *Salvia coccinea** (25.0, 0.0), *Senna septemtrionalis** (25.0, 0.0), *Sida hackettiana* (25.0, 0.0), *Solanum seaforthianum** (25.0, 0.0), *Achyranthes aspera* (16.7, 0.0), *Alstonia constricta* (16.7, 0.0), *Angophora subvelutina* (16.7, 0.0), *Aphananthe philippinensis* (16.7, 0.0), *Araujia sericifera** (16.7, 0.0), *Aristolochia elegans** (16.7, 0.0), *Austrosteenisia blackii* (16.7, 0.0), *Brunoniella australis* (16.7, 0.0), *Casuarina cunninghamiana subsp. cunninghamiana* (16.7, 0.0), *Christella dentata* (16.7, 0.0), *Cirsium vulgare** (16.7, 0.0), *Clematis glycinoides* (16.7, 0.0), *Crotalaria* (16.7, 0.0), *Dichondra repens* (16.7, 0.0), *Dysphania ambrosioides** (16.7, 0.0), *Eclipta prostrata** (16.7, 0.0), *Erigeron sumatrensis** (16.7, 0.0), *Ficus opposita* (16.7, 0.0), *Galactia tenuiflora* (16.7, 0.0), *Geodorum densiflorum* (16.7, 0.0), *Glycine clandestina var. clandestina* (16.7, 0.0) , *Gomphocarpus physocarpus** (16.7, 0.0), *Grevillea robusta* (16.7, 0.0), *Jasminum didymum subsp. didymum* (16.7, 0.0), *Mecardonia procumbens** (16.7, 0.0), *Melaleuca linariifolia* (16.7, 0.0), *Melaleuca viminalis* (16.7, 0.0), *Melia azedarach* (16.7, 0.0), *Murraya paniculata 'Exotica'** (16.7, 0.0), *Nyssanthes diffusa* (16.7, 0.0), *Pandorea pandorana* (16.7, 0.0), *Passiflora suberosa** (16.7, 0.0), *Persicaria hydropiper* (16.7, 0.0), *Polymeria calycina* (16.7, 0.0), *Pseuderanthemum variabile* (16.7, 0.0), *Pteridium esculentum* (16.7, 1.0), *Rhynchosia minima* (16.7, 0.0), *Smilax australis* (16.7, 0.0), *Stellaria media** (16.7, 0.0), *Tridax procumbens** (16.7, 1.0), *Xanthium occidentale** (16.7, 0.0), *Zornia dyctiocarpa var. dyctiocarpa* (16.7, 0.0), *Acalypha nemorum* (8.3, 0.0), *Acronychia laevis* (8.3, 0.0), *Adiantum aethiopicum* (8.3, 0.0), *Adiantum formosum* (8.3, 0.0), *Ajuga australis* (8.3, 0.0), *Alchornea thozetiana* (8.3, 0.0), *Alocasia brisbanensis* (8.3, 0.0), *Alphitonia excelsa* (8.3, 0.0), *Alpinia caerulea* (8.3, 0.2), *Alternanthera angustifolia* (8.3, 0.0), *Alternanthera nana* (8.3, 0.0), *Alyxia ruscifolia* (8.3, 0.0), *Amaranthus spinosus** (8.3, 0.0), *Araucaria bidwillii* (8.3, 0.0), *Aristolochia pubera* (8.3, 0.0), *Azolla pinnata* (8.3, 0.0), *Bidens bipinnata** (8.3, 0.0), *Blechnum neohollandicum* (8.3, 0.0), *Boerhavia dominii* (8.3, 0.0), *Bridelia leichhardtii* (8.3, 0.0), *Cassytha pubescens* (8.3, 0.0), *Causonis clematidea* (8.3, 0.0), *Centipeda minima* (8.3, 0.0), *Chamaecrista mimosoides* (8.3, 0.0), *Cheilanthes distans* (8.3, 0.0), *Cheilanthes sieberi* (8.3, 0.0), *Christella hispidula* (8.3, 0.0), *Clematicissus opaca* (8.3, 0.0), *Coleus australis* (8.3, 0.0), *Crassocephalum crepidioides** (8.3, 0.0), *Crotalaria spectabilis** (8.3, 0.0), *Cryptocarya triplinervis var. triplinervis* (8.3, 0.0), *Cupaniopsis anacardioides* (8.3, 0.0), *Cupaniopsis parvifolia* (8.3, 0.0), *Cyperus bowmanni* (8.3, 0.0), *Cyperus brevifolius** (8.3, 0.0), *Cyperus difformis* (8.3, 0.0), *Cyperus distans* (8.3, 0.0), *Cyperus fulvus* (8.3, 0.0), *Cyperus javanicus* (8.3, 1.0), *Cyperus polystachyos* (8.3, 0.0), *Denhamia disperma* (8.3, 0.0), *Desmodium rhytidophyllum* (8.3, 0.0), *Dianella* (8.3, 0.2), *Dioscorea transversa* (8.3, 0.0), *Diospyros geminata* (8.3, 0.0), *Dolichandra unguis-cati** (8.3, 5.0), *Drymaria cordata** (8.3, 0.0), *Drypetes deplanchei* (8.3, 0.0), *Elaeagnus triflora* (8.3, 0.0), *Elaeodendron australe* (8.3, 0.0), *Elattostachys nervosa* (8.3, 0.0), *Erythrina vespertilio* (8.3, 0.0), *Eucalyptus tereticornis* (8.3, 0.0), *Euphorbia bifida* (8.3, 0.0), *Euroschinus falcatus var. falcatus* (8.3, 0.0), *Ficus coronata* (8.3, 0.0), *Ficus fraseri* (8.3, 0.0), *Ficus rubiginosa* (8.3, 0.0), *Fimbristylis dichotoma* (8.3, 0.0), *Flemingia parviflora* (8.3, 0.0), *Galinsoga parviflora** (8.3, 8.0), *Gamochaeta antillana** (8.3, 0.0), *Geijera salicifolia* (8.3, 0.0), *Glochidion ferdinandi* (8.3, 0.0), *Glycine tabacina* (8.3, 0.0), *Glycine tomentella* (8.3, 0.0), *Gnaphalium polycaulon** (8.3, 0.0), *Gomphrena* (8.3, 0.0), *Gymnanthera oblonga* (8.3, 0.0), *Heliotropium amplexicaule** (8.3, 0.0), *Hippocratea barbata* (8.3, 0.0), *Hydrocotyle acutiloba* (8.3, 0.0), *Hydrocotyle peduncularis* (8.3, 0.0), *Hypochaeris albiflora** (8.3, 0.0), *Ipomoea cairica** (8.3, 0.0), *Jagera pseudorhus* (8.3, 0.0), *Jasminum didymum subsp. racemosum* (8.3, 0.0), *Jasminum simplicifolium subsp. australiense* (8.3, 0.0) , *Juncus polyanthemus* (8.3, 0.0), *Lantana montevidensis** (8.3, 0.0), *Legnephora moorei* (8.3, 0.0), *Lepidium* (8.3, 0.0), *Lepidium virginicum** (8.3, 0.0), *Lomandra hystrix* (8.3, 10.0), *Lophostemon suaveolens* (8.3, 0.0), *Ludwigia* (8.3, 0.0), *Ludwigia octovalvis* (8.3, 0.0), *Maclura cochinchinensis* (8.3, 0.0), *Malvastrum americanum var. americanum** (8.3, 0.0), *Melaleuca bracteata* (8.3, 0.0), *Melodorum leichhardtii* (8.3, 0.0), *Mezoneuron scortechinii* (8.3, 0.0), *Mitrasacme paludosa* (8.3, 0.0), *Neolitsea australiensis* (8.3, 0.0), *Opuntia tomentosa** (8.3, 0.0), *Oxalis* (8.3, 0.0), *Parsonsia eucalyptophylla* (8.3, 0.0), *Passiflora* (8.3, 0.0), *Passiflora subpeltata** (8.3, 0.0), *Pavetta australiensis var. australiensis* (8.3, 0.0), *Phyllanthus sp. (Bulburin P.I.Forster+ PIF16034)* (8.3, 0.0), *Physalis* (8.3, 0.0), *Pigea stellarioides* (8.3, 0.0), *Pleiogynium timorense* (8.3, 0.0), *Polymeria pusilla* (8.3, 0.0), *Portulaca oleracea** (8.3, 0.0), *Portulaca pilosa** (8.3, 0.0), *Psychotria loniceroides* (8.3, 0.0), *Pycnospora lutescens* (8.3, 0.0), *Rivina humilis** (8.3, 0.0), *Rostellularia adscendens* (8.3, 0.0), *Rubus parvifolius* (8.3, 0.0), *Rubus probus* (8.3, 0.0), *Salvia verbenaca** (8.3, 0.0), *Scleria brownii* (8.3, 0.0),

Species list: Frequency (percent of total sites) and cover (average of species cover across sites where that species is present). Ordered by decreasing frequency. Naturalised species have an asterisk (*) after the name. indet. after listed name if indeterminate species or genus.

Senna barclayana (8.3, 0.0), *Senna pendula var. glabrata** (8.3, 0.0), *Sida corrugata* (8.3, 0.0), *Solanum americanum** (8.3, 0.0), *Solanum mauritianum** (8.3, 0.0), *Solanum nigrum** (8.3, 0.0), *Sonchus oleraceus** (8.3, 0.0), *Sphagneticola trilobata** (8.3, 0.0), *Stachytarpheta jamaicensis** (8.3, 0.0), *Sterculia quadrifida* (8.3, 0.0), *Streblus brunonianus* (8.3, 0.0), *Syagrus romanzoffiana** (8.3, 0.0), *Synedrellopsis grisebachii** (8.3, 0.0), *Syzygium australe* (8.3, 0.0), *Tagetes minuta** (8.3, 0.0), *Tephrosia* (8.3, 0.0), *Thunbergia alata** (8.3, 0.0), *Tradescantia fluminensis** (8.3, 68.0), *Trema tomentosa* (8.3, 0.0), *Urtica incisa* (8.3, 0.0), *Wahlenbergia gracilis* (8.3, 0.0), *Waterhousea floribunda* (8.3, 0.0), *Xanthium* (8.3, 1.0), *Youngia japonica* (8.3, 0.0)

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