BioCondition Report: Griffith University Gold Coast Campus

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Griffith University Gold Coast Campus

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1 Introduction

1.1 Background

Natura Pacific was commissioned by Griffith University, to carry out a BioCondition Assessment covering Griffith University's Gold Coast Campus, specifically areas of remnant Regional Ecosystem (RE) vegetation within Lot 7 on SP266767 (forming the northern part of the campus, divided by Smith Street), and Lot 29 on SP248334 (forming the southern part of the campus) (Figure 1). Remnant RE vegetation is defined as those indigenous vegetation communities native to the area prior to European settlement and clearing. The Queensland Herbarium and legislatively, the Queensland Government *Vegetation Management Act 1999* (VMA), provide context and regulation of remnant RE vegetation in Queensland through the RE vegetation classification system. Clearing is regulated in accordance with the level of conservation significance of the vegetation communities identified under this system (ranging from 'No Concern at Present' to 'Of Concern' to 'Endangered'). Remnant vegetation of both woody and non-woody predominant stratum (ecologically-dominant layer – EDL) is defined by the State of Queensland within the 'Methodology for surveying and mapping regional ecosystems and vegetation communities in Queensland: Version 6.0' (Neldner *et al*., 2022), as:

> ***Woody dominated vegetation:*** *woody vegetation is vegetation for which the predominant stratum is composed mainly of woody vegetation such as trees or shrubs. The Herbarium assesses and maps woody dominated vegetation as remnant if it meets the definition used in the Vegetation Management Act 1999, which is: 'vegetation, part of which forms the predominant canopy of the vegetation -*
> *(a) covering more than 50% of the undisturbed predominant canopy; and*
> *(b) averaging more than 70% of the vegetation's undisturbed height; and*
> *(c) composed of species characteristic of the vegetation's undisturbed predominant canopy.*
>
> ***Non-woody dominated vegetation:*** *non-woody vegetation is vegetation in which the predominant stratum is composed of grasses and / or other non-woody vegetation. Defining remnant status in non-woody dominated vegetation, such as grasslands, on the characteristics of the height and cover of the canopy—that is, the grasses and forbs—is not practical. The dominant layer in these vegetation types is highly variable according to seasonal conditions and can be rapidly modified using grazing, fire, or mechanical mowing. In addition, variations in the composition and condition of the non-woody vegetation may not be readily and consistently recognised from Landsat TM imagery. Therefore, the Herbarium assesses and maps non-woody dominated vegetation as remnant if it meets the definition of areas of non-woody dominated vegetation that can be mapped as remnant under the Vegetation Management Act 1999 – 'an area of vegetation that:*
> *(a) has not been cultivated for 15 years*
> *(b) contains native species normally found in the regional ecosystem*
> *(c) is not dominated by non-native perennial species.*
>
> ***Regrowth vegetation:*** *the Vegetation Management Act 1999 in Queensland also recognizes High Value Regrowth (HVR) which is currently defined as native vegetation regrowth greater than 15 years old. HVR is mapped as Category C on the regulated vegetation map produced by the Department of Resources.*

Many of the remnant REs today found around Griffith University's Gold Coast Campus were once present on a much larger scale throughout the City of Gold Coast but land-clearing for agriculture, urban development and transport infrastructure has meant many of these REs are now listed as threatened not just within the local context, but across Queensland as a whole. Indeed, two (2) of the original REs present within the campus as remnants, are listed as 'Endangered' pursuant to the VMA. This loss of native vegetation across the local area, and more widely, has in recent years become a focus of the Queensland Government and Local Government Areas (LGAs) to instigate restoration projects in the most accurate way, reflective of the area's pre-clearing nature to help rehabilitate native vegetation. In this way, native biodiversity can be supported and encouraged to return to areas

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where it has been lost or has diminished, and long-term impacts of human development on climatic change can, to some degree, be offset.

1.2 Objectives

This report has been developed in accordance with the Gold Coast City Plan (Version 9.0, current as of 2021). Our methods of assessment are in alignment with the BioCondition and RE Benchmark Protocols as laid out in Eyre *et al*. 2015 and Neldner, *et al*., 2022. Overall, this document provides advice on the current biological state of Griffith University's Gold Coast Campus remnant REs and recommendations for their continued and improved management. The report contains the following key objectives:

- Provision of a full BioCondition assessment of Griffith University's Gold Coast Campus remnant REs utilising a two (2) representative BioCondition monitoring plots (GC1 and GC2) within 1 of the extant remnant REs (RE 12.11.23, forming the majority of the Campus' native vegetation), as set out through pers. comm. with Prof. Catherine Pickering.

- BioCondition assessment will focus on all required elements of the plot's structure, composition and function with benchmarking of achieving the intended target Regional Ecosystem (RE) condition measured against the appropriate scientific protocols set out by Eyre *et al*. 2015 and the Queensland Herbarium's RE Benchmarks (Figure 2).

- Provide standardised BioCondition data and scoring for the plots as a representation of the general condition of the Campus' remnant REs as a whole.

- Use the results of the BioCondition assessment to determine management recommendations for the Campus' remnant REs. This will have a strong focus on the whole of site resilience, natural regeneration, weed management and progress towards both restoration and climate change (carbon sequestration) targets.

- Assistance provided for Griffith University to implement these informed management recommendations.

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Figure 1 Location of remnant Regional Ecosystems (REs) within Griffith University's Gold Coast Campus (REs 12.11.23, 12.11.27 (both 'Endangered' and 12.3.5, 'No Concern at Present') showing 2 x BioCondition monitoring transects (GC1 and GC2) bisecting the main RE 12.11.23 that forms the majority of the campus' native vegetation.

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2 Context

Natura Pacific understand that Griffith University's Gold Coast Campus is a combined area of around 59.8 ha zoned under the City Plan as Innovation and Community Facilities. The land's primary function is for education. The land contains important landscapes and ecological values including the predominance of the 'Endangered' RE 12.11.23 "*Eucalyptus pilularis* open forest on coastal metamorphics and interbedded volcanics". This RE covers approximately 25.3 ha of the Campus (approximately 42% of the total area). A secondary 'Endangered' RE 12.11.27 "*Eucalyptus racemosa* subsp. *racemosa* and/or *E. seeana* and *Corymbia intermedia* woodland on metamorphics +/- interbedded volcanics" is also present in a much smaller area (1.2 ha) (Queensland Government, 2020a). Finally, the 'No Concern at Present' RE 12.3.5 "*Melaleuca quinquenervia* open forest on coastal alluvium" is also present, but only covers around 2.7 ha of the Campus.

Due to the predominance of RE 12.11.23, its status as 'Endangered' pursuant to the VMA and its large remnant sizes, this was the sole RE chosen to be measured in line with the methods of Eyre *et al*., 2015, and in pers. comm. with Prof. Catherine Pickering. The comprehensive BioCondition attribute benchmarks for this RE (the goals towards rehabilitation efforts for any natural vegetation in Queensland should be managed) are presented in Figure 2 and form the basis for comparison of results presented in this report (see Section 4). Figure 3 presents the Queensland Herbarium's Technical Description for RE 12.11.23 which serve to provide extra detail on typical species composition and structure.

The Campus is primarily bordered by private allotments containing residential dwellings on the southern side and to the north, west and east, by linear transport infrastructure. There is limited connectivity to neighbouring extant native vegetation in all directions except to the west (where some connectivity exists to Parkwood Family Park), and the Campus' native vegetation is therefore highly fragmented.

The site contains important mapped 'Core Koala Habitat Areas' for the 'Endangered' Koala (*Phascolarctos cinereus*) pursuant to the Queensland Government *Nature Conservation Act 1992*, and as defined by the updated Queensland Government *Nature Conservation (Koala) Conservation Plan 2017* and set out in its South East Queensland Koala Conservation Strategy (2020-2025) (Queensland Government, 2020b). This koala habitat area covers all of the remnant RE vegetation present, totaling 29.2 ha, or around 49% of the whole Campus.

This current BioCondition Assessment undertaken by Natura Pacific comprises the first assessment of condition of this important remnant RE vegetation at Griffith University's Gold Coast Campus. This assessment provides results to report on the condition of the Campus' native vegetation to the University's management committee, with important connections to the institutions climate change targets and future management of campus biodiversity.

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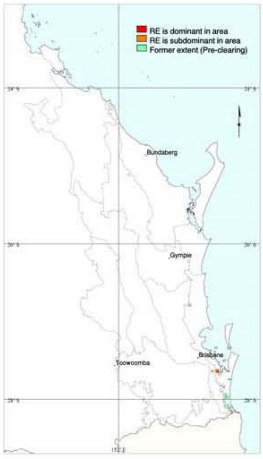
BioCondition benchmark for regional ecosystem condition assessment

Southeast Queensland **Regional ecosystem: 12.11.23**

Eucalyptus pilularis open-forest on coastal metamorphics and interbedded volcanics



David Jinks

BioCondition attribute			Benchmark
Recruitment of dominant canopy species (%):			100
Native plant species richness:		Tree:	16
		Shrub:	11
		Grass:	4
		Forbs and other:	18
Trees:	Tree canopy	Tree canopy median height (m):	31
		Tree canopy cover (%):	50
	Tree sub-canopy	Tree sub-canopy median height (m):	10
		Tree sub-canopy cover (%):	11
	Large trees	Large eucalypt tree dbh threshold (cm):	47
		Number of large eucalypt trees per hectare:	28
		Large non-eucalypt tree dbh threshold (cm):	27
		Number of large non-eucalypt trees per hectare:	2
	Typical tree species: Eucalyptus pilularis (blackbutt), Eucalyptus tindaliae (Queensland white stringybark), Corymbia intermedia (pink bloodwood)		
Shrubs:		Native shrub cover (%):	18
	Typical shrub species: Allocasuarina littoralis (woolly oak), Lophostemon confertus (brush box)		
Ground cover (%):		Native perennial grass cover (%):	6
		Organic litter cover (%):	56
	Typical ground cover species: Themeda triandra (kangaroo grass), Entolasia stricta (wiry panic), Imperata cylindrica (blady grass)		
Coarse woody debris	Total length (m) of debris ≥ 10cm diameter and ≥0.5m in length per hectare:		480
Non-native plant cover			0
	Typical non-native species: Lantana camara^, Senna pendula var. glabrata^ (Easter cassia)		

Selected typical species are those that characterize the ecosystem, community or stratum at reference sites. Up to five frequently occurring species for each stratum are selected. Users should refer to the regional ecosystem description database (REDD) and/or the technical description for more complete lists of characteristic species. Only the most frequently used common name is given. Other common names may be used in other regions. Declared pest species in Queensland are designated (^).

30/11/2012

Figure 2 BioCondition Benchmark for RE 12.11.23 from the Queensland Herbarium for use in BioCondition assessments and in guiding restoration of REs

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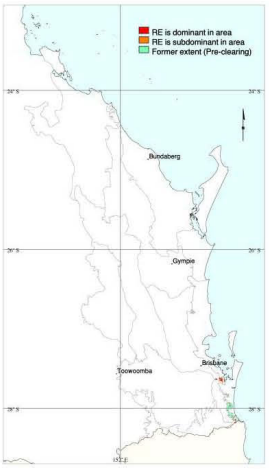
Technical Description Regional ecosystem: **12.11.23**

Eucalyptus pilularis open-forest on coastal metamorphics and interbedded volcanics



Pre-clearing area (ha), remnant area (ha) and per cent remaining: 9,302 1,793 19%

Species recorded: Total: 140; woody: 36; ground: 117; Avg. spp./site: 44.7; std dev.: 13.7, 6 site(s)

Basal area: Avg./site: 24.0 m²/ha, range: 15.0 - 37 m²/ha, std. deviation: 8 m²/ha, 6 site(s)

Structural formation: Woodland: 33%; open-forest: 33%; tall open-woodland: 17%; tall open-forest: 17%, 6 site(s)

Representative sites: 19760, 19761, 19837, 19842, 19873, 19913.

Stratum: **T1**

Height avg. = 26.8m, range 24-30m, 6 sites

Crown cover avg. = 37.8%, range 12.0-65.0%, 6 sites

Stem density/ha avg. = 264, range 80-480, 5 sites

Dominant species (relative cover, frequency): Eucalyptus pilularis (47, 100%), Eucalyptus microcorys (24, 33%), Eucalyptus tindaliae (22, 67%), Corymbia intermedia (17, 83%), Angophora woodsiana (16, 33%)

Frequent species (cover, frequency): Eucalyptus pilularis (13, 100%), Corymbia intermedia (7, 83%), Eucalyptus tindaliae (10, 67%), Angophora woodsiana (5, 33%), Corymbia gummifera (1, 33%), Eucalyptus microcorys (16, 33%), Eucalyptus resinifera (6, 33%), Lophostemon confertus (5, 33%), Eucalyptus propinqua (3, 17%), Eucalyptus siderophloia (2, 17%), Syncarpia glomulifera (8, 17%)

Stratum: **T2**

Height avg. = 10.2m, range 8-14m, 6 sites

Crown cover avg. = 11.0%, range 3.0-30.0%, 6 sites

Stem density/ha avg. = 900, range 240-2400, 6 sites

Dominant species (relative cover, frequency): Angophora woodsiana (72, 33%), Allocasuarina littoralis (44, 33%), Lophostemon confertus (31, 67%), Corymbia intermedia (23, 67%), Eucalyptus resinifera (17, 33%)

Frequent species (cover, frequency): Corymbia intermedia (2, 67%), Lophostemon confertus (6, 67%), Acacia disparrima subsp. disparrima (1, 33%), Allocasuarina littoralis (5, 33%), Angophora woodsiana (3, 33%), Eucalyptus pilularis (33%), Eucalyptus resinifera (5, 33%), Allocasuarina torulosa (3, 17%), Alphitonia excelsa (17%), Eucalyptus carnea (2, 17%), Eucalyptus microcorys (2, 17%), Eucalyptus propinqua (17%), Eucalyptus tindaliae (17%), Syncarpia glomulifera (17%)

Dominant species: Relative cover (mean of cover of species / total cover of all species in that stratum for all values > zero) and frequency (percent of total sites) ordered by decreasing relative abundance. Up to five most dominant species with frequency > 20% listed for each stratum.

Frequent species: Cover (mean of all values > zero) and frequency (percent of total sites) of all species occurring in more than 5% of sites ordered by decreasing frequency. Ground layer species are listed as either graminoid or forb.

Naturalised species have an asterisk (*) after the name. indet. after listed name = indeterminate species or genus

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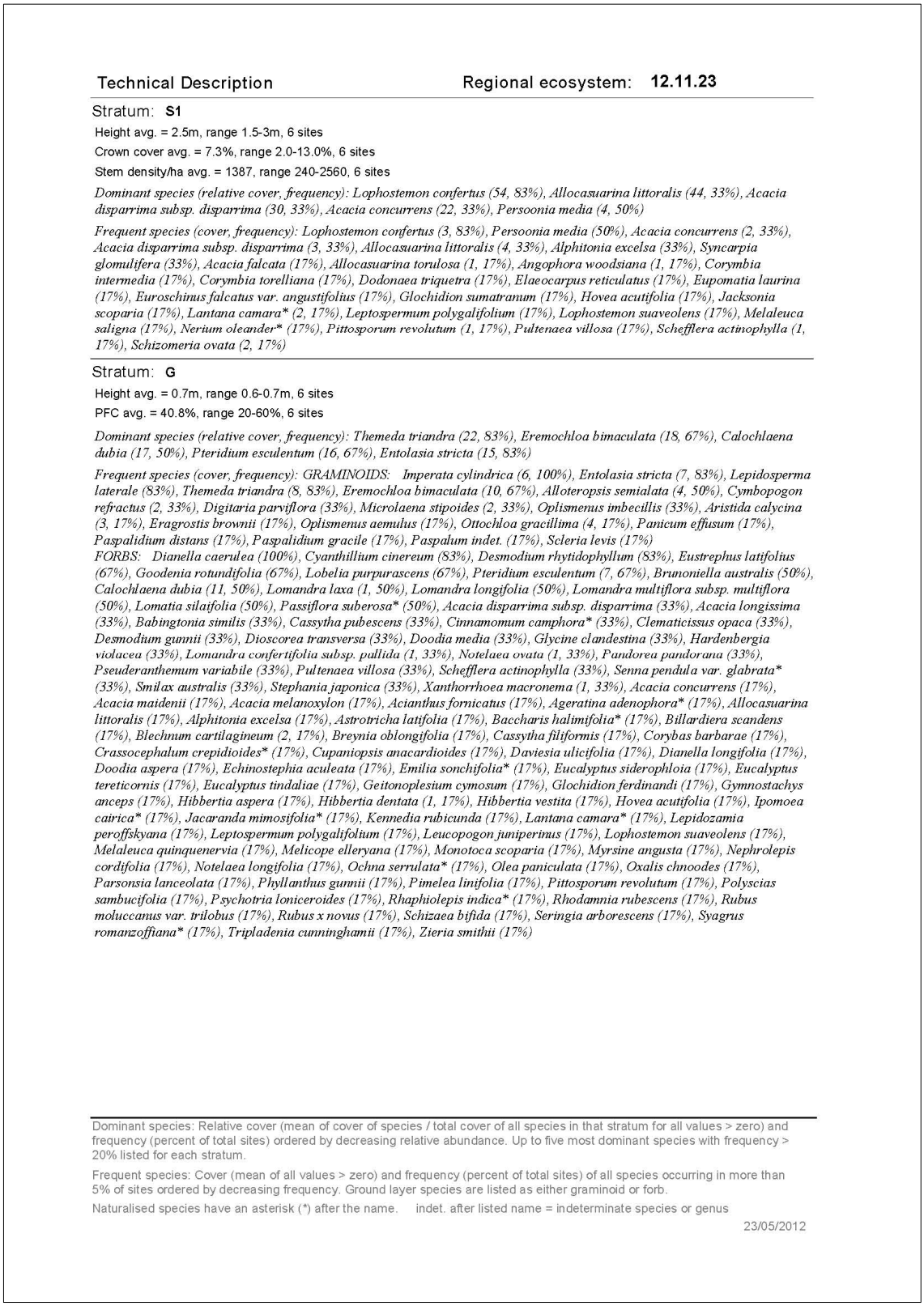

Technical Description Regional ecosystem: **12.11.23**

Stratum: **S1**

Height avg. = 2.5m, range 1.5-3m, 6 sites

Crown cover avg. = 7.3%, range 2.0-13.0%, 6 sites

Stem density/ha avg. = 1387, range 240-2560, 6 sites

Dominant species (relative cover, frequency): Lophostemon confertus (54, 83%), Allocasuarina littoralis (44, 33%), Acacia disparrima subsp. disparrima (30, 33%), Acacia concurrens (22, 33%), Persoonia media (4, 50%)

Frequent species (cover, frequency): Lophostemon confertus (3, 83%), Persoonia media (50%), Acacia concurrens (2, 33%), Acacia disparrima subsp. disparrima (3, 33%), Allocasuarina littoralis (4, 33%), Alphitonia excelsa (33%), Syncarpia glomulifera (33%), Acacia falcata (17%), Allocasuarina torulosa (1, 17%), Angophora woodsiana (1, 17%), Corymbia intermedia (17%), Corymbia torelliana (17%), Dodonaea triquetra (17%), Elaeocarpus reticulatus (17%), Eupomatia laurina (17%), Euroschinus falcatus var. angustifolius (17%), Glochidion sumatranum (17%), Hovea acutifolia (17%), Jacksonia scoparia (17%), Lantana camara (2, 17%), Leptospermum polygalifolium (17%), Lophostemon suaveolens (17%), Melaleuca saligna (17%), Nerium oleander* (17%), Pittosporum revolutum (1, 17%), Pultenaea villosa (17%), Schefflera actinophylla (1, 17%), Schizomeria ovata (2, 17%)*

Stratum: **G**

Height avg. = 0.7m, range 0.6-0.7m, 6 sites

PFC avg. = 40.8%, range 20-60%, 6 sites

Dominant species (relative cover, frequency): Themeda triandra (22, 83%), Eremochloa bimaculata (18, 67%), Calochlaena dubia (17, 50%), Pteridium esculentum (16, 67%), Entolasia stricta (15, 83%)

Frequent species (cover, frequency): GRAMINOIDS: Imperata cylindrica (6, 100%), Entolasia stricta (7, 83%), Lepidosperma laterale (83%), Themeda triandra (8, 83%), Eremochloa bimaculata (10, 67%), Alloteropsis semialata (4, 50%), Cymbopogon refractus (2, 33%), Digitaria parviflora (33%), Microlaena stipoides (2, 33%), Oplismenus imbecillis (33%), Aristida calycina (3, 17%), Eragrostis brownii (17%), Oplismenus aemulus (17%), Ottochloa gracillima (4, 17%), Panicum effusum (17%), Paspalidium distans (17%), Paspalidium gracile (17%), Paspalum indet. (17%), Scleria levis (17%)
FORBS: Dianella caerulea (100%), Cyanthillium cinereum (83%), Desmodium rhytidophyllum (83%), Eustrephus latifolius (67%), Goodenia rotundifolia (67%), Lobelia purpurascens (67%), Pteridium esculentum (7, 67%), Brunoniella australis (50%), Calochlaena dubia (11, 50%), Lomandra laxa (1, 50%), Lomandra longifolia (50%), Lomandra multiflora subsp. multiflora (50%), Lomatia silaifolia (50%), Passiflora suberosa (50%), Acacia disparrima subsp. disparrima (33%), Acacia longissima (33%), Babingtonia similis (33%), Cassytha pubescens (33%), Cinnamomum camphora* (33%), Clematicissus opaca (33%), Desmodium gunnii (33%), Dioscorea transversa (33%), Doodia media (33%), Glycine clandestina (33%), Hardenbergia violacea (33%), Lomandra confertifolia subsp. pallida (1, 33%), Notelaea ovata (1, 33%), Pandorea pandorana (33%), Pseuderanthemum variabile (33%), Pultenaea villosa (33%), Schefflera actinophylla (33%), Senna pendula var. glabrata* (33%), Smilax australis (33%), Stephania japonica (33%), Xanthorrhoea macronema (1, 33%), Acacia concurrens (17%), Acacia maidenii (17%), Acacia melanoxylon (17%), Acianthus fornicatus (17%), Ageratina adenophora* (17%), Allocasuarina littoralis (17%), Alphitonia excelsa (17%), Astrotricha latifolia (17%), Baccharis halimifolia* (17%), Billardiera scandens (17%), Blechnum cartilagineum (2, 17%), Breynia oblongifolia (17%), Cassytha filiformis (17%), Corybas barbarae (17%), Crassocephalum crepidioides* (17%), Cupaniopsis anacardioides (17%), Daviesia ulicifolia (17%), Dianella longifolia (17%), Doodia aspera (17%), Echinostephia aculeata (17%), Emilia sonchifolia* (17%), Eucalyptus siderophloia (17%), Eucalyptus tereticornis (17%), Eucalyptus tindaliae (17%), Geitonoplesium cymosum (17%), Glochidion ferdinandi (17%), Gymnostachys anceps (17%), Hibbertia aspera (17%), Hibbertia dentata (1, 17%), Hibbertia vestita (17%), Hovea acutifolia (17%), Ipomoea cairica* (17%), Jacaranda mimosifolia* (17%), Kennedia rubicunda (17%), Lantana camara* (17%), Lepidozamia peroffskyana (17%), Leptospermum polygalifolium (17%), Leucopogon juniperinus (17%), Lophostemon suaveolens (17%), Melaleuca quinquenervia (17%), Melicope elleryana (17%), Monotoca scoparia (17%), Myrsine angusta (17%), Nephrolepis cordifolia (17%), Notelaea longifolia (17%), Ochna serrulata* (17%), Olea paniculata (17%), Oxalis chnoodes (17%), Parsonsia lanceolata (17%), Phyllanthus gunnii (17%), Pimelea linifolia (17%), Pittosporum revolutum (17%), Polyscias sambucifolia (17%), Psychotria loniceroides (17%), Rhaphiolepis indica* (17%), Rhodamnia rubescens (17%), Rubus moluccanus var. trilobus (17%), Rubus x novus (17%), Schizaea bifida (17%), Seringia arborescens (17%), Syagrus romanzoffiana* (17%), Tripladenia cunninghamii (17%), Zieria smithii (17%)*

Dominant species: Relative cover (mean of cover of species / total cover of all species in that stratum for all values > zero) and frequency (percent of total sites) ordered by decreasing relative abundance. Up to five most dominant species with frequency > 20% listed for each stratum.

Frequent species: Cover (mean of all values > zero) and frequency (percent of total sites) of all species occurring in more than 5% of sites ordered by decreasing frequency. Ground layer species are listed as either graminoid or forb.

Naturalised species have an asterisk (*) after the name. indet. after listed name = indeterminate species or genus

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Figure 3 Detailed technical description for RE 12.11.23 from the Queensland Herbarium for use in BioCondition assessments and in guiding restoration of REs

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3 Methodology

3.1 Transect locations

The study involved assessment of landscape and context-condition attributes (measured from aerial mapping) and site-specific attributes, measured using two (2) representative transects of 100 m length x 50 m width area within target RE 12.11.23. Only this RE was selected for monitoring due to its large size and predominance across the Campus. Other REs (12.11.27 and 1.3.5) were too small to reliably obtain condition data for without the interference of edge effects (Eyre *et al*., 2015). The transect area, depicted in Figure 4, is the design prescribed by Eyre *et al* (2015) for long-term BioCondition monitoring. The plot area informs the management recommendations to be applied to the Campus' native vegetation components, aiming for improving RE benchmark condition (Table 1). The monitoring locations are relatively homogenous assessment units defined by the broad target RE and broad condition state. A summary of the transect design including length and current status of vegetation within the units under the *Vegetation Management Act 1999* is listed in Table 1.

The transects are wholly contained within native vegetation characteristic of the target RE.

Table 1 Description of transects

Site ID	Plot Origin (Latitude, Longitude)		Length (m)	Remnant Regional Ecosystem	Pre-Clearing Regional Ecosystem	Queensland *Vegetation Management Act 1999* Status
GC1	-27.96899	153.379302	100	12.11.23	12.11.23	Endangered
GC2	-27.972683	153.378303	100	12.11.23	12.11.23	Endangered

3.2 Management outcomes and monitoring intervals

In typical BioCondition examples, a focus area is to be managed and restored until it reaches key management outcomes, which are long term aims that will likely take greater than 10 years to be achieved and are guided by discrete Queensland Herbarium benchmarks relating to the target RE. The aim of this work is to inform long-term management and potential restoration works for the Campus' native vegetation as per the benchmarks in Figure 2.

3.3 Monitoring methodology

3.3.1 Landscape and context-condition monitoring

Utilising the methods provided in Eyre et al., 2015, the landscape and context-condition of the site was assessed using Queensland Globe (https://qldglobe.information.qld.gov.au/) and Google Maps (https://www.google.com/maps).

The location of the landscape assessment is shown in Figure 5.

The location of the two (2) 100 m x 50 m plots, seeks to represent and target:

- a relatively continuous and representative subset of landscapes and aspects of the RE
- a comprehensive perspective of regeneration

3.3.2 Photo point monitoring

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In this study, site photos were taken using the Theodolite application (Samsung version) for each transect at the mid-point (50 m) looking north, south, east and west (Appendix 1).

3.3.3 Transect and quadrat monitoring

Quantitative monitoring at the sites occurred within the fixed plot only and quadrats encompassed by the plot to collect data on the structure, composition and function of the ecosystem and associated vegetative components.

As adapted from Eyre *et al*. (2015), the study area (100 m centreline transect) the 100 m transect line was indicated by the placement of wooden stakes at 0 m and 100 m. Marking out 50 m to the left-hand side of the transect line formed the larger assessment area of 100 x 50 m. The assessment of thirteen site-based attributes was then conducted inside five assessment areas within the 100 x 50 m site, as shown in Figure 4, and summarised as follows:

1. 100 x 50 m area: assessed for number of large trees, recruitment of canopy species, tree canopy height and native tree species richness.

2. 100 m transect: assessment of tree canopy cover and native shrub canopy cover.

3. 100 x 5 m sub-plot, centred from the 0 m point to the 100 m point along the centre transect, and encompassing 5 m to the left-hand side of the transect: assessed for non-native plant cover and native plant species richness of shrubs, grass, and non-grass species. This is adapted from Neldner *et al*. (2015) and equates to the CORVEG standard plot area used by the Queensland Herbarium.

4. 100 x 10 m sub-plot, extending from the 0 m point to the 100 m point along the transect, and encompassing 10 m to the left-hand side of the transect: assessed for coarse woody debris.

5. Five 1 x 1 m quadrats, starting at the 0 m point and located on the left-hand side of the centreline, 20 m apart along the 100 m transect: assessed for native grass cover and organic litter (an average value is derived over the five quadrats).

3.3.4 Site BioCondition Score determination

The BioCondition Score for each Transect was calculated as per the equations referred to in Eyre *et al*. (2015):

$$BC = \frac{a + b + c + d + e + f + g + h + i + j + \text{either } (k + l + m) \text{ or } (n)}{Y + Z}$$

Where:

a-n = attributes a to n (See Table 3). Where a-j = 'site-based attributes' and k-n = 'landscape attributes'

Y = maximum site-based score that can be obtained for site-based attributes (a–j) that are relevant to the RE being assessed e.g., in a wooded ecosystem Y = 80, and in a grassland Y = 30

Z = maximum site score that can be obtained for landscape attributes (k–m in fragmented landscapes or n in intact landscapes) (Z = 20).

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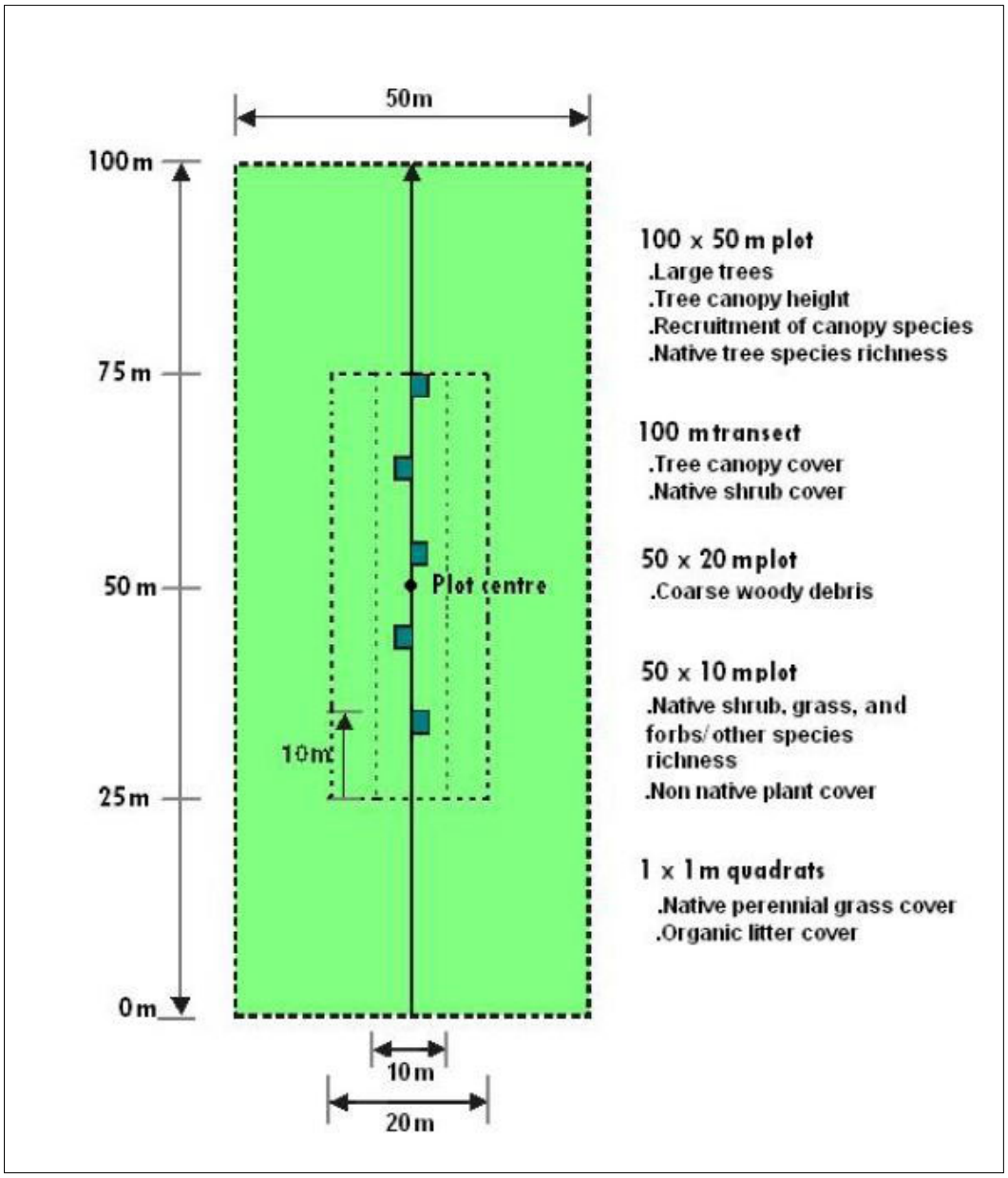

Figure 4 Layout of the BioCondition plot as per Eyre *et al*. (2015)

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Figure 5 Location of the landscape and context-condition assessment over the top of Griffith University's Gold Coast Campus with the BioCondition transects at the centre and the white circle indicating the outer ring of a 1km radius from this centre-point, as per Eyre *et al*. (2015). Source: Queensland Globe, 2023

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4 Results (key results in bold)

Results for the BioCondition assessment undertaken within the offset site at Griffith University's Gold Coast Campus remnant RE vegetation are reported as per the BioCondition methodology and reporting guidelines of Eyre *et al*. (2015) and split between a) landscape and overall ecological condition contexts (whole of site level), and b) site-specific attributes (transect level). Overall, for whole of site level results, **both transect GC1 and GC2 had BioCondition scores of 8 (out of a maximum 20),** while for transect level results, **GC1 had a BioCondition score of 68.5, and GC2 had a BioCondition score of 66 (both out of a maximum 80) (Table 2).**

Regarding landscape and context condition results, the maximum BioCondition score was not met for any of the attributes, indicating **overall low BioCondition for the overall landscape and large-scale functional context of the remnant REs at Griffith University's Gold Coast Campus**. Specifically, for both GC1 and GC2, the highest-scoring attribute was for context (BioCondition Score = 4) due to the measured vegetations' local proximity to some other extant native vegetation patches. The **lowest-scoring attributes were for the size of patch (GC1 – 2, but GC2 – 0) with both being relatively small in area (15.5 ha and 2.9 ha, respectively) and the connectivity of the patch to adjacent native vegetation (2).**

Regarding site-specific results, the maximum BioCondition score was met for most attributes for each site indicating an overall high BioCondition scoring for these attributes. Specifically, **for both GC1 and GC2, the maximum BioCondition score was met for 10 of the site-based attributes** considered in this study. These results are depicted graphically in radar graphs (Figures 6 and 7), where the outermost edge of the graph indicates the maximum benchmark score. The 10 best ranking attributes (Table 3) included: canopy tree height (5), sub-canopy tree height (5), median tree height (5), shrub layer cover (5), tree species richness (5), shrub species richness (5), grass species richness (5), non-native plant cover (10), native perennial grass cover (5) and litter cover (5). When comparing these results with the BioCondition benchmarks for RE 12.11.23 (Figure 2), this indicates that the transects sampled are **highly consistent with structural averages** for remnant sub-canopy and shrub strata, with **structure of the ground-layer components also of high consistency showing good amounts of leaf-litter and native cover**. Similarly, these results also show **moderate consistency with compositional averages noting remnant shrub and native grass species diversity were both high and that non-native cover (weeds) were low.** RE 12.11.23-aligned species recorded in the canopy and sub-canopy strata included *Eucalyptus pilularis, Eucalyptus tinadaliae, Eucalyptus microcorys, Corymbia intermedia*, *Angophora leiocarpa, Lophostemon confertus* and *Acacia leiocalyx*.

The site-specific attributes that showed low BioCondition scoring included: total number of large trees (average score of 10), recruitment of the ecologically-dominant layer (13), average tree cover (4), coarse woody debris (2), tree species richness (GC1 – 5, but GC2 – 2.5) and forbs and other species richness (2.5). These results are depicted graphically in radar graphs (Figures 6 and 7), where the outermost edge of the graph indicates the maximum benchmark score. When comparing these results with the BioCondition benchmarks for RE 12.11.23 (Figure 2), we see that the transects sampled, while highly consistent with structural averages for remnant sub-canopy and shrub strata, did show **below average numbers of large trees, moderate recruitment notably for sub-canopy trees and low amounts of coarse woody debris throughout**. Similarly, while the majority of parameters show moderate consistency with compositional averages, they did **underperform for tree species richness and forb species richness**, noting the diversity of native species in these groups were both relatively low.

When all of these attributes, their associated scoring and their comparisons against the BioCondition benchmarks are taken into account, a **total combined BioCondition score for GC1 is 76.5, and for GC2 is 72, averaging for the whole area as 74.3** (Table 2) which is an overall Moderate score.

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Overall, the BioCondition scoring presented indicates that management should **focus on supporting the maturation of large trees characteristic of the RE, the emergence of higher forb species richness in the ground layer and the accumulation of coarse woody debris. At a landscape scale, but much harder to achieve, improved connectivity of the University's native vegetation remnants to surrounding contextual remnants is desirable for ameliorating not only BioCondition, but also improving local biodiversity and combatting climate change impacts.**

Table 2 Baseline overall BioCondition (BC) Scores for Transects GC1 – GC2 as per results for the current monitoring round

Transect #	RE type	Site score (S_c) (out of 80)	Landscape Score (L_c) (out of 20)	Total BC Score (out of 100)
GC1	12.11.23	**68.5**	**8**	**76.5**
GC2	12.11.23	**66**	**8**	**74**
Average score for Gold Coast Campus		**67.3**	**8**	**75.3**
Trend		**TBC***	**TBC***	**TBC***

Overall BioCondition Rank for Gold Coast Campus	
** Very High (> 90)	
High (80 – 90)	
Moderate (70 – 80)	✓
Low (60 – 70)	
Very Low (< 60)	

* Indicates improvement in score since baseline assessment. NB overall trend symbols include a +/- 5% percentile around the average score. Trends and baseline results will be entered upon repeated survey of the sites.
** Note ranking is weighted for remnant vegetation and is therefore more conservative than for actively regenerating areas of native vegetation such as offset projects or rehabilitation sites.

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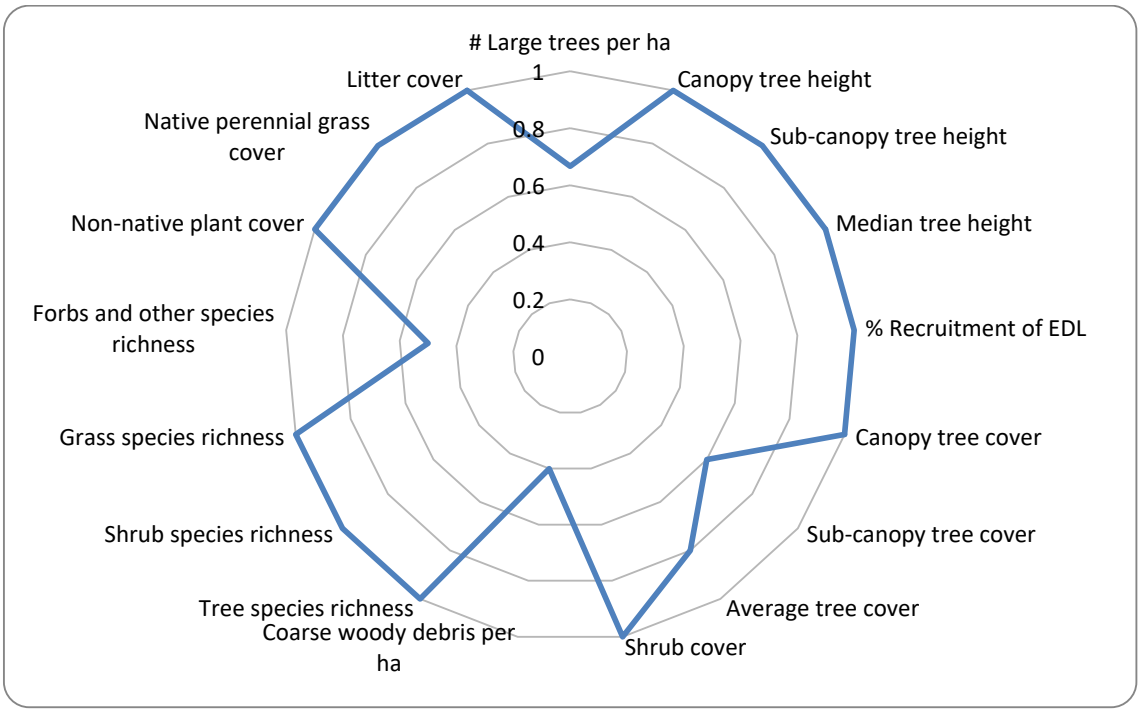

Figure 6 Radar graph depicting the BioCondition Score for Transect GC1 within the RE 12.11.23 of Griffith University's Gold Coast Campus, relative to maximum benchmark scoring for this RE for each of the measurable attributes surveyed as per Eyre *et al*. 2015.

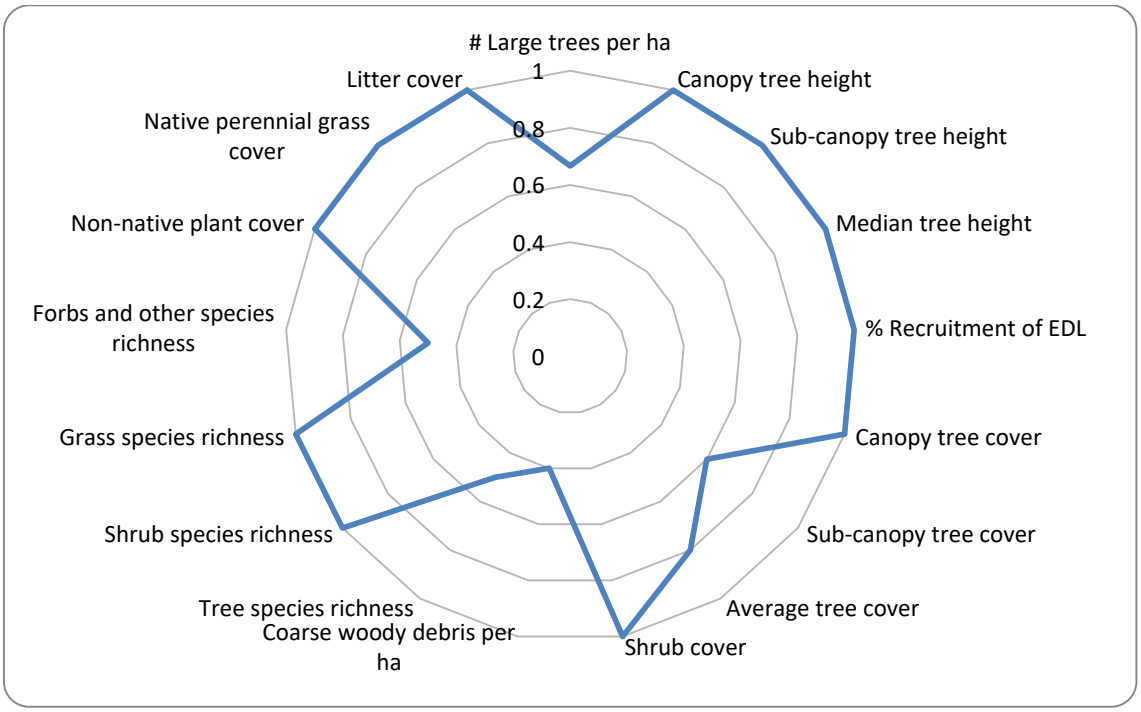

Figure 7 Radar graph depicting the BioCondition Score for Transect GC2 within the RE 12.11.23 of Griffith University's Gold Coast Campus, relative to maximum benchmark scoring for this RE for each of the measurable attributes surveyed as per Eyre *et al*. 2015.

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Table 3 Current BioCondition (BC) Scores for Griffith University Gold Coast BioCondition transects assessed in the current monitoring round. See section 3.3.3 for explanation of attribute numbering for calculations

Scale	Attribute	Maximum Benchmark Scoring	Transect GC1	Transect GC2
Site-based scale	a) # Large trees per ha (DBH >49cm)	15	10	10
	b) Canopy tree height	5	5	5
	b) Sub-canopy tree height	5	5	5
	b) Median tree height	5	5	5
	c) % Recruitment of EDL*	5	5	5
	Canopy tree cover	5	5	5
	Sub-canopy tree cover	5	3	3
	d) Average tree cover	5	4	4
	e) Shrub layer cover	5	5	5
	f) Coarse woody debris per ha	5	2	2
	g) Tree species richness	5	5	2.5
	g) Shrub species richness	5	5	5
	g) Grass species richness	5	5	5
	g) Forbs and other species richness	5	2.5	2.5
	h) Non-native plant cover	10	10	10
	i) Native perennial grass cover	5	5	5
	j) Litter cover	5	5	5
	Condition Total (sum a-j)	**80 (Y)**	**68.5**	**66**
Landscape scale	k) Size of patch	10	2	0
	l) Connectivity	5	2	2
	m) Context	5	4	4
	Context Total (sum k-m)	**20 (Z)**	**8**	**6**
Overall Site Total		**100 (Y+Z)**	**76.5**	**72**

* EDL = ecologically dominant layer

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5 Management recommendations

The results presented in this report are considered to adequately reflect the moderate level of disturbance that the remnant RE vegetation at Griffith University's Gold Coast campus, and its immediate surrounds, have experienced over the previous 100 years. Previously, land-clearing for the campus itself, along with surrounding urbanisation resulted in low landscape context-condition scoring, while continued management of the remnants for bushfire concerns, along with illegal trail formation and recreational use, may continue to affect site-based scoring.

Some important management considerations that would reflect the outcomes of this report, and help to realign the trajectory of the remnant RE vegetation (notably 12.11.23) at Griffith University's Gold Coast Campus could include:

- **sympathetic bushfire management (especially the retention of singular large canopy trees which hold significant amounts of otherwise-atmospheric carbon)**
- **allowance of natural recruitment regimes (i.e. reducing under-scrubbing)**
- **assisted natural regeneration through weed control measures that promote native forb cover, and**
- **possible supplementary planting of rapid-growing RE-aligned natives**

Activating some, or all, of these considerations into an active adaptive management regime for the Campus will continue to improve ecological condition and will likely result in higher BioCondition scoring in future monitoring rounds. These approaches may also improve resilience to continued anthropogenic change that is likely to occur within this highly urbanised area. Weed incursion from surrounding residential housing, climate change and continued development constraints and aspirations for the University itself, are all likely to pose an ongoing challenge to the BioCondition of the important natural vegetation remaining.

Below we outline some more detailed considerations in the future planning of active adaptive management for the remnant RE vegetation at Griffith University's Gold Coast Campus.

5.1 Planning

5.1.1 Preliminaries

Any ongoing management at the Campus must regard the results and recommendations of this BioCondition report to understand and suitably direct any proposed management works. Before any further restoration or management work commences, it is recommended that the proponent is to organise a pre-start meeting between any rehabilitation contractor and the University's landscape and planning management team to establish and clarify scope of works and identify any issues.

5.1.2 Rubbish removal

Prior to any continued rehabilitation work commencing, removal of all unwanted materials within the remnant vegetation is to be undertaken. Rubbish removal is to include all material that can be safely carried. Larger items such as heavy concrete, berms/jumps for informal trail-bike users, or metalwork that needs to be carried individually may need be stockpiled at the edge of the work area for vehicle collection and disposal. Things like car bodies, car / machinery parts, household waste and rock rubble might be notifiable for assessment for machine or other removal methods.

5.1.3 Water restrictions

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When water restrictions apply, no potable water is to be used for rehabilitation works.

5.1.4 Access and safety

Any rehabilitation contractor is to maintain safe access through the site at all times and must ensure any sub-contractors or workers are fully protected at all times and aware of risks to workplace health and safety. An approved SWMS and Risk assessment must be observed and signed by all sub-contractors entering the site, prior to or upon arrival before works commence.

5.1.5 Services

It is any rehabilitation contractor's responsibility to confirm with authorities the location of all underground services prior to commencement of any rehabilitation works that may involve excavation or groundwork. Additionally, the contractor is responsible for the repair of any damage to services without delay or cost. Before You Dig Australia is a good place to start when researching possible service-works conflicts.

5.2 Standards

Works are to be carried out in accordance with relevant Griffith University policy, findings of the Biodiversity Working Group (pers. comm. Prof. Catherine Pickering), Australian and Industry Standards, Queensland Government *Nature Conservation (Koala) Conservation Plan 2017,* as well as the requirements of the Gold Coast City Plan.

5.2.1 Site inspections

Inspections by the proponent will be carried out to an agreed programme throughout implementation of the works.

5.3 Sympathetic bushfire management

Given the BioCondition scoring was comparatively low-moderate for tree species richness, number of large trees and coarse woody debris at both sites measured within the RE 12.11.23 remnants at the Campus, it is advisable that management practises aim to improve these attributes. Options for this could include more sympathetic bushfire management practises whereby large trees, recruiting tree cohorts (succession) and fallen woody debris are left to mature as they would in a completely natural ecosystem. These components of forest ecosystems are often among the most significant in terms of biodiversity, habitat heterogeneity (the provision of multiple, diverse habitats for different ecological niches) and greenhouse gas sequestration (Van Galen *et al*., 2019, Birdsey *et al*., 2023, Mildrexler *et al*., 2023).

Given the University's climate action commitments and 2029 net zero emissions goal (see https://www.griffith.edu.au/sustainability/climate-action), it is pertinent to suggest that bushfire management measures take into account the significant importance of these forest attributes, prior to any destructive or clearance actions, and that critical, hierarchical cost-benefit analyses are performed prior to conducting any whole-scale removal of such features from the Campus' remnant REs.

The University also has a strong stance on maintaining campus biodiversity as an important and marketable asset of its image. This is communicated both in its Biodiversity Conservation Plan 2022-2025, and online (see https://www.griffith.edu.au/griffith-sciences/school-environment-science/griffith-biodiversity). Biodiversity in Australia is intrinsically linked to bushfire regimen, such that regular, low intensity burning is important for many ecosystems (Queensland Government 2022c). However, the

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season, scale, and frequency (acronym SSF) of burning is vital if ecosystems are to be managed in a way that reduces catastrophic bushfires on humans, but promotes biodiversity structure, composition, and function (Burrows *et al*., 2021, Queensland Government 2022c). For example, many detritivores (insects, fungi, molluscs) that inhabit Australian ecosystems are extremely fire-sensitive (Sands, 2018) and these taxa are among the most important for the continued function of many natural ecosystems (Hines and Eisenhauer, 2021). Numerous studies note that where bushfire management is required, a 'micro-mosaic patch burning' or 'small-scale fuel-load removal' technique is required to not destroy important fauna and flora, especially those that perform critical roles such as detritivores and pollinators (Sands and Hosking, 2005; New, 2010). Recommendations relating to the season, scale, and frequency (SSF) of burning include autumn and early winter burns (in Australia), limiting the area to be burnt or modified to half of any given habitat type (not REs, but habitats within REs) at any one time (Sands, 2018), and the frequency matching what is recommended for each RE in Queensland (Queensland Government 2020a). Such micro-mosaic patch burning or fuel-load removal could maintain habitat quality as well as reduce risks of catastrophic bushfires (Queensland Government 2022c).

5.4 Assisted natural regeneration and weed control to support native ground-layer

To continue to improve the BioCondition score for site-based attributes and overall, it is important and therefore highly recommended to maintain regular (minimum 6-monthly) weed removal and weed treatment. This should be primarily concentrated to prescriptive removal along edges of native remnants, with reactive spot management within the core footprint upon closer inspection during maintenance days.

All hand removed weed / invasive exotic species should be removed from the site and disposed of at an appropriate Council green waste facility. Where possible, the spread of seeds within the site should be minimised by containing removed exotic vegetation in rubbish bags or other appropriate storage containers.

5.4.1 Manual and machine-based weed control

The feasibility of manual control methods as a preferred control activity should be assessed against machine-based operations as a secondary preference. While the use of heavy machinery (e.g. dozers, slashers) can result in fast and effective primary weed control, it is in direct opposition to assisted and passive rehabilitation methods and the required extensive propagation, maintenance and monitoring of the ecosystems that comprises this site, post-use. It can also cause degradation of existing native plants of all sizes, compaction of soil, scraping away of topsoil and seed banks, destruction of habitat and damage to root and soil profiles.

It is suggested that only hand-based manual weed control is used for this site, in the form of appropriate methods outlined in Table 4. Where hand removal is not possible, general guidelines for use of herbicides is provided below.

5.4.2 General guidelines for herbicide usage

- Weed removal methods must not pose a threat to existing species diversity.
- Herbicide application should be by targeted-use only.
- Always consult product labels and manufacturers recommendations.
- All "Spray" treatments infer thorough wetting of the target foliage to the point of run-off.

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- It is recommended to add spray adjuvant, when possible, to improve adhesion to and penetration of herbicide spray into the target species. Adjuvants should not be allowed to come into contact with natural water bodies when either mixing or spraying herbicide.

- “Inject” infers industry standard treatment for large woody weeds in environmental areas.

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Table 4 General weed control guidelines and management

Growth Form	Removal Techniques
Woody Stems e.g. Lantana, Camphor Laurel	Manual 1. Small plants can be removed by hand using Soft Weed methodology. Exposure of rootstock to air is necessary to ensure full eradication. Failure to remove ALL of roots will result in regrowth. Herbicide *Up to 10 cm basal diameter* 1. Apply the cut, scrape and paint method using appropriate herbicide to minimise erosion. 2. Lop into 50 cm pieces, leaving these on the ground to act as mulch. 3. Regrowth of woody weeds shall be spot sprayed. *Greater than 10 cm basal diameter and inaccessible sites* • Stem Injection 1. Use stem injection method - at tree base drill holes at a 45 degree angle into the sapwood at 5 cm intervals. 2. Inject herbicide into holes immediately before the plant cells close and translocation of herbicide ceases. • Fill or Chip 1. Cut into the sapwood with a chisel or axe. 2. Fill cut with herbicide immediately with appropriate herbicide 3. Repeat the process at 5 cm intervals around the tree. Note: * For *Cinamomum camphora* cuts must overlap with no gaps in order to kill the hardwood. * Plants to be treated with herbicide should be healthy and actively growing. * Deciduous plants should be treated in Spring and Autumn when leaves are fully formed. * Multi-stemmed plants require injection below the lowest branch or treat each stem individually.
Bulbs, Corms or Tubers e.g. Watsonia	Manual 1. Dig down next to the stem until the bulb or tuber is reached. 2. Remove plant and carefully bag the bulb or tuber. Herbicide 1. Remove any seed or fruit and place in bag. 2. With an herbicide applicator, apply to the stems and leaves using brush-off.
Soft Stems (no underground reproductive parts) e.g. Blue Billy-goat Weed, Lantana seedlings	Manual 1. Gently remove any seeds or fruits and carefully place into a bag. 2. Grasp stem at ground level. Rock plant backwards and forwards to loosen roots and pull out gently. 3. Tap the roots to dislodge soil. Herbicide 1. Directly apply to suitable species. 2. Should only be used where plants are actively growing.
Underground Reproductive Structures - Taproots	Manual 1. Gently remove and bag seeds or fruit. 2. Loosen soil around taproot with suitable implement. 3. Grasp stem at ground level and gently pull out plant. 4. Tap the roots to dislodge soil. * Not suitable for *Sida rhombifolia* or *Ochna serrulata* and many others - use with caution.

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Growth Form	Removal Techniques
Vines, Runners and Scramblers	Manual 1. Locate a runner; gently pull it along the ground. Roll the runners up for easy removal. Continue doing this until all the runners have been rolled up. Small fibrous roots growing from the runners can be cut with a knife. 2. Locate the main root system whilst removing the runners. Remove it manually. 3. Do not leave any bits of stem or large roots, as these may re-shoot. 4. Bag or compost the runners/roots and any other reproductive parts. Herbicide 1. With a knife, scrape 15 to 30 cm of the stem to reach the layer below the bark/outer layer. A maximum of half the stem diameter should be scraped. Large stems (>1 cm) will require two scrapes opposite each other. 2. Immediately apply herbicide along the length of the scrape. 3. Vines can be left hanging in trees after treatment.
Rhizomes e.g. Asparagus Fern	Manual 1. Remove and bag stems with seeds and fruit. 2. Grasp the leaves or stems together so that the base of the plant is visible. 3. Insert a knife at an angle close to the crown and cut through all the roots around the crown. 4. All vegetative materials shall be left in situ.
IMPORTANT NOTES	• Hand removal is recommended where possible and practical except where it may lead to soil destabilisation along creeks and drainage lines. • Non-herbicide removal should be used where possible adjacent to native species to minimise damage. Suitable methods including digging, crowning or hand pulling. • Where herbicide application is required: 1. broad-scale application is not permitted within drainage lines 2. appropriate herbicide is to be used within 30 m of water bodies as it is identified as more “frog friendly” than other herbicides 3. quantities of herbicide need to be controlled and all care be taken to prevent runoff or excess use 4. always read the lab to ensure the herbicide is used safely and no certificate is required for use 5. herbicides use should be undertaken during periods of weed growth or as per manufactures specifications • Herbicide use is not permitted 1. during windy periods 2. prior to rain forecast or 6 hours after rain 3. broadly / recklessly in areas where native vegetation dominants • If in doubt whether plants are weed or native, confirmation prior to conducting weed removal is required e.g. from Environmental Weed Guide (free from GCCC), Department of Natural Resources Pest Fact Sheets and Common Weeds of Northern NSW Rainforest (The Big Scrub Rainforest Landcare Group, 1998).

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5.5 Planting to support improved species richness in the ground layer

Given the comparatively low scoring of native forbs species richness, it would be pertinent to undertake some supplementary planting of RE-aligned ground cover species where possible. Recommended species include *Gahnia aspera, Alloteropsis semialata, Lomandra longifolia, L. multiflora* and *Desmodium rhytidifolium*. Additional species that are characteristic of the RE as per the Technical Description (see Figure 3), may also be considered for approval.

5.5.1 General planting specifications

In preparing planting areas, the following conditions should be adhered to:

- All revegetation work should be carried out by, or under the guidance of, an experienced and qualified person with knowledge of local and exotic species identification.
- Plants used for revegetation must be set out in a formal Rehabilitation Management Plan (planting palette) or as per the RE Technical Description in Figure 3 of this report.
- A minimum advised density of 1 ground cover species (grass or forb) per 1 m^2 is advised for planting efforts. All plants are to be of local provenance, where practical.
- Planting should consider site suitability for natural regeneration and must not be conducted in such a way as to cause damage to naturally regenerating plants.
- Planting should consider the existing vegetation composition, for example, in areas with good canopy cover but degraded lower strata, shrub species would do well to form the predominant part of any revegetation planting. In some instances, woody weeds may be retained to shade out other weeds and allow a native ground cover to establish. These species should be removed once native species are established.
- Tubestock and 140 mm pots should be used wherever possible, although flexibility remains to use larger pot sizes. For all shrub planting, supply and install a minimum 75 mm premium organic mulch (to AS4454) with main components being screened forest mulch, prior to planting.
- Plants are to be watered thoroughly immediately after planting, and thereafter as required. Watering is recommended at least 3 times per week for a period of 6 weeks following planting however this should be determined by the rehabilitation contractor based on weather and site conditions. Creation of a concave hollow around the base of each plant will aid water infiltration.
- Planting should be carried out during suitable weather conditions to minimise the risk of loss of newly establishing plants through drought or by erosion.
- All areas cleared of weed infestations are to be revegetated and mulched immediately following weed removal with a diverse mix of species, particularly ground cover, but can include understorey and canopy native species where indicated.

5.5.2 Plant set-out and stock

- All plant stock to be verified by the restoration contractor / proponent for stock quality and size and set out prior to planting.

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- Substitutions (e.g., alternative species) are not to be made without prior approval.

- When setting out of mass planted areas (where not detailed):
  - plants to be set out in swathes of single species of large numbers of plants
  - swathes to be set out in naturalistic elongated forms / shapes
  - swathes of species to be prearranged to provide contrast in size, shape, and form

- Discuss and verify on-site, a sample section of planting set out prior to contractor proceeding to set out and completing planting.

Mixed native ground cover species (grasses and forbs) are to be planted at a density of 1 per 1 m^2 in areas devoid of existing vegetation, or as infill planting within areas of existing vegetation to achieve a combined density of 1 per 1 m^2 (see Figure 8). A distance of 1 per 4 m^2 is to be retained for any future planting of trees and shrubs.

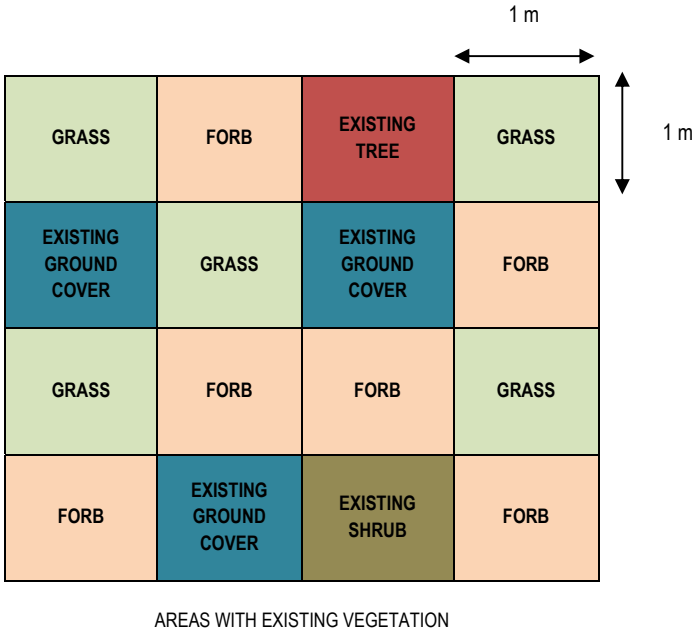

Figure 8 Example plant spacing and density

For larger tubestock or in 140 mm pots, planting is to be undertaken according to the following procedure:

1. Prepare hole twice the depth and twice the diameter of the root ball.

2. Break up sides and base of hole to a minimum depth of 100 mm.

3. Incorporate soil conditioner "terracottem" supplier "agriturf", or similar, to 50% topsoil 50% organic compost prior to installation.

4. Supply and install backfill in planting hole with 50% imported organic topsoil 50% organic compost mix with added soil conditioner

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5. Absolute minimum final density (combined planted tubestock + existing) of 1 ground cover / 1 m^2.

6. Supply and place plants in holes according to location on planting plans (or as directed), plant schedule or associated details.

7. Water in plants thoroughly immediately following planting.

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6 Five-year scope of works

6.1 Monitoring and compliance reporting

It is recommended that each 12 months, following the conduct of this BioCondition Assessment (this report) as a baseline, that an independent monitoring audit is to be actioned, to determine condition progress of the site. Ongoing monitoring and maintenance periods need to focus on determining if the site requires any supplementary planting, altered management regimes, and the overall success and survivability of assisted natural regeneration efforts. The site is also to be assessed for weed incursion, with management undertaken following the guidelines in this plan where necessary. Then every 2-3 years, it is recommended that the same BioCondition assessment is conducted as presented here.

6.2 Timeline

The following table (Table 6) outlines suggested actions required to succeed in rehabilitating the site to the desired BioCondition through improvements in benchmark condition over time.

6.3 Threats to ongoing management

The potential for weed encroachment to occur along the boundaries of the site may impact on management aims and outcomes. The ecological condition of surrounding primarily residential or urban land is unknown yet expected to be of poor BioCondition and a source of propagules of exotic species (both flora and fauna) that can cause threats to native vegetation. The potential encroachment of weeds from surrounding areas should be observed through spots checks, with reactive management in between reporting periods, where required.

Ongoing bushfire management techniques that do not act sympathetically to the high ecological and climate change value attributed to diverse forests, large trees and coarse woody debris, are a threat to ongoing management and improvement of the BioCondition of these areas. It is suggested that critical, hierarchical cost-benefit analyses are performed prior to conducting any removal of such features from the Campus' remnant REs.

Littering, informal trail-use and vandalism is likely to continue to pose a threat, however this is now less coming with the construction of a perimeter fence.

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Table 5 Timeline of actions required to improve BioCondition over the next 5 years

Action	Maintenance Phase
	Next 5 Years
Weed removal (herbicide) and monitoring	6-MONTHLY Spot spraying / hand removal and mulching where required to aid in all weed species removal throughout natural RE remnants. Allow for successional recruitment of EDL-woody plants such as canopy species to develop unhindered (sympathetic bushfire management).
Planting	BASELINE AND FOLLOW-UP 12-MONTHLY Supplementary planting only where necessary as infill, following baseline reporting and top-up where required at 12-monthly intervals.
Photo-monitoring	6-MONTHLY Photograph condition of BioCondition transects as per all 6 photo-transect location points recommended in Eyre *et al* (2015). Keep record with BioCondition reports.
BioCondition Assessment	BI OR TRI-ANNUALLY In conjunction with photo-monitoring and utilising the same BioCondition assessment methodology and scoring as per this report, carry out repeated survey using same Transect locations as per geo-referenced version of Figure 1.

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8 Appendices

Appendix 1 - Photo-point images

Transect GC1 (RE 12.11.23)	
	
Photo 1: At the 50 m mid-point looking North	Photo 2: At the 50 m mid-point looking South
	
Photo 3: At the 50 m mid-point looking East	Photo 4: At the 50 m mid-point looking West
	
Photo 5: Start post	Photo 6: End post

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Transcect GC2 (RE 12.11.23)	
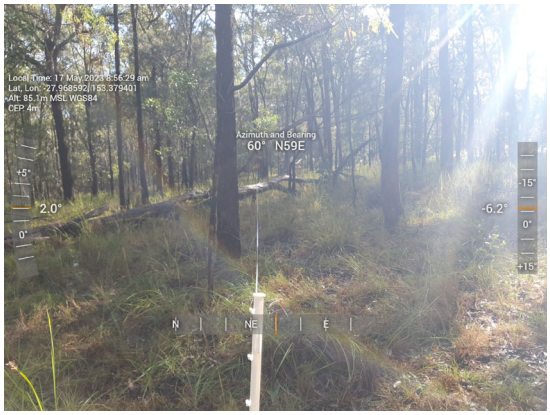	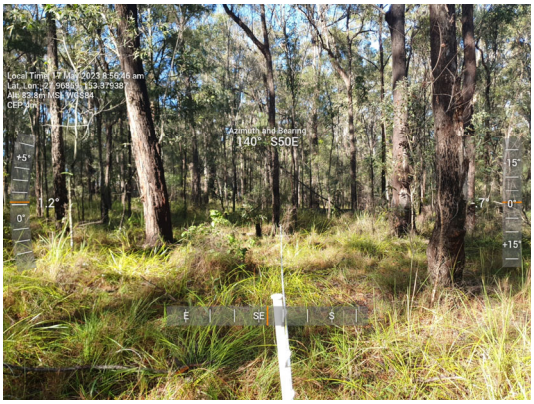
Photo 1: At the 50 m mid-point looking North	Photo 2: At the 50 m mid-point looking South
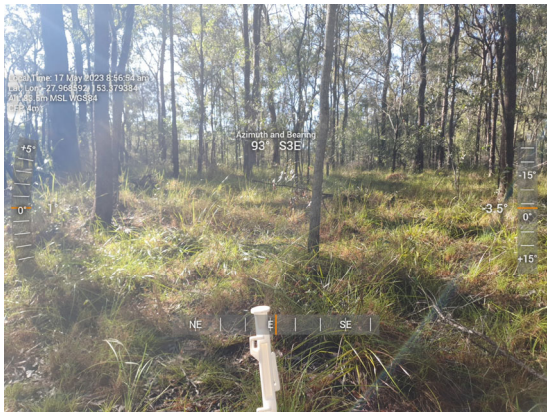	
Photo 3: At the 50 m mid-point looking East	Photo 4: At the 50 m mid-point looking West
	
Photo 5: Start post	Photo 6: End post

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