Sunshine Coast COUNCIL

Upper Mooloolah Nature Refuge
Management Plan

2019 - 2029

Your Environment Levy in action

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Images

Cover image: upper Mooloolah River surrounded by tall to very tall notophyll vine forest courtesy of C. Traill from TCL Environmental.

All other images throughout management plan courtesy of C. Traill from TCL Environmental, unless otherwise indicated.

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Contents

Executive summary

Upper Mooloolah Nature Refuge is a council owned and managed environmental reserve—acquired by the former Caloundra City Council in 2001 and further expanded in 2004 with Australian Government National Reserve System (NRS) funding. The reserve contains core habitat and high biodiversity values, adding 45.5 hectares to the region's conservation estate, and protecting a key watershed area of the Mooloolah River catchment

Rising to 417m above sea level, the reserve forms part of a major altitudinal dispersal axis between the Blackall Range and adjacent coastal lowlands (Czechura, 2005).

Most of the site is very steep with a number of gullies, cliff lines, knolls, and scree slopes. The Mooloolah River flows through the reserve, featuring diverse freshwater habitat of waterfalls, large boulder pools, and riffles. The intact forest cover which is in excellent condition across most of the reserve, provides important soil conservation and water quality protection for the Mooloolah catchment.

This reserve offers protection to an area that is part of the 'Core Habitat' associated with the forested upper escarpment of the Mooloolah catchment and contains high biodiversity.

Three different regional ecosystems (RE) are represented within this reserve, including remnant vine forest RE 12.9-10.16 which is listed as "of concern" under the Queensland Vegetation Management act (VMA 2009).

These ecosystems provide important habitat refuge for many native animals which are listed as threatened, declining, and restricted range, vagrant, mobile or migrant including the following recorded in the reserve:

- Richmond birdwing butterfly (*Ornithoptera richmondia*);
- carabid beetle (*Leirodeira violaceum*);
- giant snail (*Hedleyella maconelli*);
- southern day frog (*Taudactylus diurnus*);
- cascade treefrog (*Litoria pearsoniana*);
- giant barred-frog (*Mixophyes iteratus*);
- red goshawk (*Erythrotriorchis radiatus*);
- powerful owl (*Ninox strenua*);
- crested shrike-tit (*Falcunculus frontatus).*

Five plant species listed as 'Vulnerable' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) and Queensland *Nature Conservation Act 1992* (NCA) occur within the reserve:

- three-leaved bosistoa (*Bosistoa transversa*),
- Maroochy nut (*Macadamia ternifolia*),
- Richmond birdwing vine (*Pararistolochia praevenosa*),
- romnalda (*Romnalda strobilacea*)
- red lilly pilly (*Syzygium hodgkinsoniae*).

The Queensland Museum have records from this site for a total of 228 native animal species including 154 bird, 25 mammal, 33 reptile and 16 different frog species. Additional recent fauna surveys have added a credible record of the Coxen's fig parrot (*Cyclopsitta diophthalma coxeni)*, listed as 'Endangered' under both the EPBCA and the NCA.

The management intent for this reserve is to ensure the significant ecological values are protected and enhanced. Therefore, based on the sites high vegetation cover, limited access opportunities, and ecological sensitivities, this environmental reserve is in the management category of "Conservation". Public access is restricted and managed through permits.

This management plan offers a comprehensive assessment of the reserve's ecological, social and economic values and describes management actions that will protect these values in the future. The plan will be reviewed in 5 years and management actions adapted where changes are required. The plan will be re-written after 10 years.

1 Introduction

This management plan supports Sunshine Coast Council's corporate vision "to be Australia's most sustainable region – healthy, smart, and creative".

To achieve this, council's Environment and Liveability Strategy 2017 (ELS), sets the strategic direction for the preservation and enhancement of the natural environment and the liveability of the region—ensuring native plants, animals, and habitats are healthy, resilient and valued by the community. A key policy position to delivering on this outcome is that priority habitat areas are protected, enhanced, connected and responsive to changing environmental conditions. This is supported through the environment levy land acquisition program.

The former Caloundra City Council in partnership with the Australian Government National Reserve System (NRS) purchased the 45.5ha area to create the Upper Mooloolah Nature Refuge (UMNR), protecting a key link in the upper Mooloolah River catchment core habitat area.

The reserve is currently managed by council's Natural Areas Management team.

1.1 Purpose of the management plan

The purpose of this management plan is to describe the reserve's ecological, cultural, social and economic values and express the associated management actions required to maintain or enhance these values.

This management plan provides an adaptive management framework that has been developed under nationally recognised guidelines and principles of protected area management **(Appendix 1)**.

The management plan is subject to a review schedule underpinned by the framework of actions, relevant monitoring and evaluation strategies, and performance indicators described in this plan.

1.2 Management intent

The operational reserve management category for this site in accordance with the ELS environment reserve desired standards of service is "Conservation". Under this category the management intent is to ensure the significant ecological values are protected and enhanced (SCC, 2017c).

Conservation reserves are predominantly covered in remnant vegetation and include threatened or locally significant species that contribute significantly to the Sunshine Coast's valued natural environment. The natural and cultural assets of these reserves are typically highly sensitive to external impacts.

Therefore, public access and any identified secondary purposes are limited in this category of environmental reserves. The site location and topography also restrict access opportunities.

Giant fig tree in tall to very tall complex notophyll vine forest on the basaltic upper slopes of the refuge

2 Description of the reserve

2.1 Location and description

The reserve is located to the east of Maleny on the edge of the Blackall Range, as shown in **Figure 1**. The reserve can be accessed via an unformed road reserve off Glens Road, Balmoral Ridge, where there is limited parking adjacent to private property.

The reserve is comprised of the following two allotments:

- Lot 5 on SP114816 (Lot 5) comprising 19.899ha - council freehold
- Lot 101 on SP165479 (Lot 101) comprising 22.628ha - council freehold

The terrain within the reserve is dominated by steep (10 degrees) to very steep (>50 degrees) slopes, some with minor cliff lines, benches and scree slopes (Thomas, 2011) below ridges extending out from the Blackall Range, rises and knolls.

The ridges are steeply incised by rocky creeks and gullies with waterfalls and creek terraces (Thomas, 2011). The highest point within the reserve is 417m above sea level (ASL) at the top of a ridge and the lowest point is 130m ASL adjacent to the Mooloolah River as it flows north, away from the reserve (Thomas, 2011) **(Appendix 2**, **Figure 5)**.

Figure 1: Location of the Upper Mooloolah Nature Refuge

Catchment and landscape context

The reserve is located at the headwaters of the Mooloolah River catchment and rises to the Maleny plateau at the juncture between four major catchments—Mooloolah, Mary, Stanley and the Pumicestone Passage (refer to **Appendix 2**, **Figure 6**). Several gullies start in the reserve and discharge into the Mooloolah River.

The ELS identifies the reserve as core habitat area with some of the riparian areas identified as connecting habitat areas. The reserve forms part of an identified strategic biodiversity corridor that runs north-south along Balmoral Ridge from Eudlo to Mary Cairncross Scenic Reserve and connecting with the east-west corridor in the upper Stanley River catchment (refer to **Appendix 2**, **Figure 7**).

At its higher point along Balmoral ridge, the reserve meets the edge of the predominantly cleared Maleny plateau. However, only a short distance away—approximately 1km to the south-west—and separated by the Maleny Landsborough Road, is Mary Cairncross Scenic Reserve, which is one of the few remaining remnants of upland old growth rainforest remaining on the Maleny Plateau (refer to **Appendix 2**, **Figure 7**).

More broadly in the landscape—to the south within 1km—another substantial tract of core habitat commences and follows the southern edge of the Blackall Range in a west-south-west direction. This core habitat is in the Stanley River sub-catchment of the Brisbane River catchment.

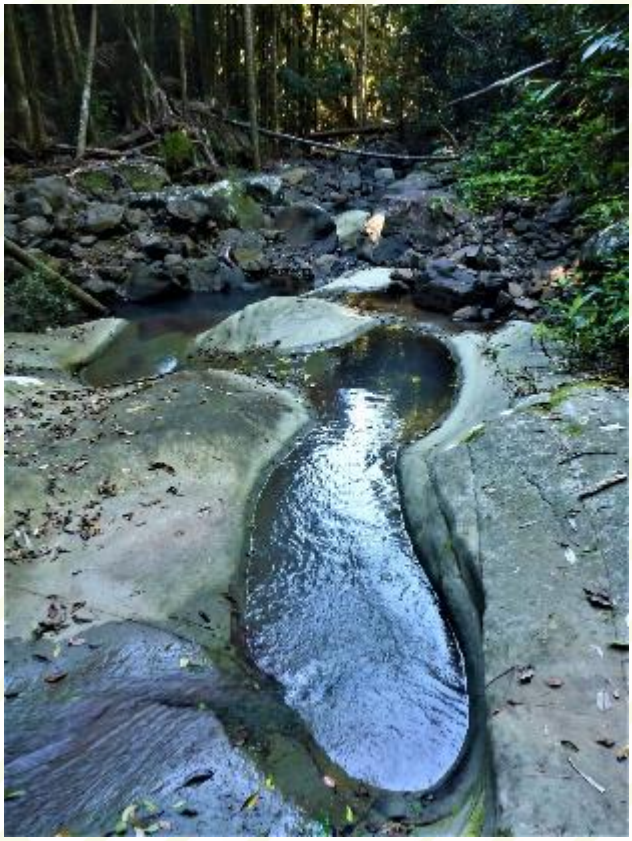
In combination with other council and Queensland Government managed conservation reserves, the site forms a component of a north-south regional corridor identified in the Queensland Government Biodiversity Planning and Assessment Mapping (BPA) for SEQ (Mooloolah to Elgin Vale State Forest Terrestrial Corridor) (QG, 2018c) (refer to **Appendix 2**, **Figure 8**).

Land zones

The reserve is identified under Queensland Government regional ecosystem (RE) mapping (v10) as containing the following two land zones **(Appendix 2**, **Figure 9)**.

- Cainozoic igneous rocks, especially basalt <600m altitude comprising ridges, lower slopes and gullies in the western and southern portions of Lot 5 and 101 (Land Zone 8).
- Remnant tertiary surfaces +/- Cainozoic and Mesozoic sediments comprising lower ridges, slopes and drainage lines in the north-eastern portion of Lot 101 (Land Zone 9-10).

Land Zone 8 (Cainozoic igneous rocks, especially basalt <600m altitude) is the most widespread geological type within the reserve.



Sandstone bed of upper Mooloolah River strewn with basalt boulders, cobbles and pebbles

2.2 Land Use History

Indigenous[1]

Upper Mooloolah Nature Refuge (UMNR) preserves a remnant of the natural habitat of the Maleny/Blackall Range area.

The Blackall Range is part of the traditional country of the Nalbo clan of the Jinibara People. The term nalbo means the resin of the hoop pine (*Araucaria cunninghamii*); jinni means lawyer vine; and bara means people in traditional Jinibara language. By having such names, the clan group was associating itself with the natural vegetation of its traditional country and differentiating itself from those groups living on the coastal plain to the east of the Blackall Ranges.

The UMNR is in close proximity to the important headwaters of Obi Obi Creek.

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These headwaters and tributaries, plus the length of Obi Obi Creek down to the Mary River is *mimburi* to the platypus. The term *mimburi* literally means "a source, a continual flow". By practicing special ceremony in the mimburi area, the health of the platypus population throughout Southeast Queensland is guaranteed, as much as possible, by the human population living in association with it. This is much more than a non-indigenous concept of a national park or a reserve; rather, respect for and consideration of this species is entwined with the Jinibara People through tribal law and custom, and the wellbeing of both are inextricably linked.

Bunya trees which are found within the reserve, fruit each year between December and early February but have copious crops every third year. Small gatherings were held in the years when cropping was less, the large gatherings when the triennial bountiful crop was in season (Jinibara pers comm, 2018). Smaller festivals involving the local Nalbo clan and their near neighbour. For the triennial festival when bountiful crops were available, people travelled

[1] Information provided by Ann Wallin on behalf of Jinibara People Aboriginal Corporation.

from Bundaberg, Wide Bay, Gympie, Bribie Island, Gayndah and Brisbane.

For a history of the Jinibara People after the arrival of non-indigenous settlers, please see the Sunshine Coast Council's website.

Management action

- Consult Jinibara People prior to any works that will cause ground disturbance in a previously undisturbed area.

Early settlement[2]

European settlement on the Blackall Range region commenced in the late 1870's when settlement title conversion from leasehold to freehold was contingent on land clearing "improvement" (Gregory, 1991).

Selective logging of Lot 101 occurred in 1957, 1978 and 1992, targeting hardwood from the two eucalypt forest patches and a few crows ash (*Flindersia australis*) and red cedar (*Toona ciliata*). Most of the large, millable tallowwood (*Eucalyptus microcorys*), blackbutt (*E. pilularis*) and flooded gum (*E. grandis*) were originally extracted by bullock team using a network of snigging tracks up to Glen's road and the steep slopes dominated by rainforest remained largely untouched. In later years dozers were used for tracks and removing the timber trees. Lot 5 has not ever been logged.

Historical axed groove in tree stump at UMNR

Lot 5 was once owned by Mr E. Glenn Laurance, a WWII soldier from the light horse brigade and is understood to have made High Tor available to United States navy sailors during the Second World War for rest and relaxation. Remains of developed tracks through High Tor can be seen today.

In the early 1990's students from the Mooloolah State School would visit the area once a year for a school excursion (A. Yorkston pers. comm., 2018) which involved hiking back down the Mooloolah River to the location of Hell Hole.

Historical steps forming part of a walking track built by WWII soldiers

Historic aerial photography in **Figure 2** below shows vegetation cover changes from 1956, 1997 to 2017.

These photos provide evidence that the reserve has remained consistently forested amid surrounding widespread land clearing, highlighting the importance of this site for providing habitat refuge and preserving remnant vegetation.

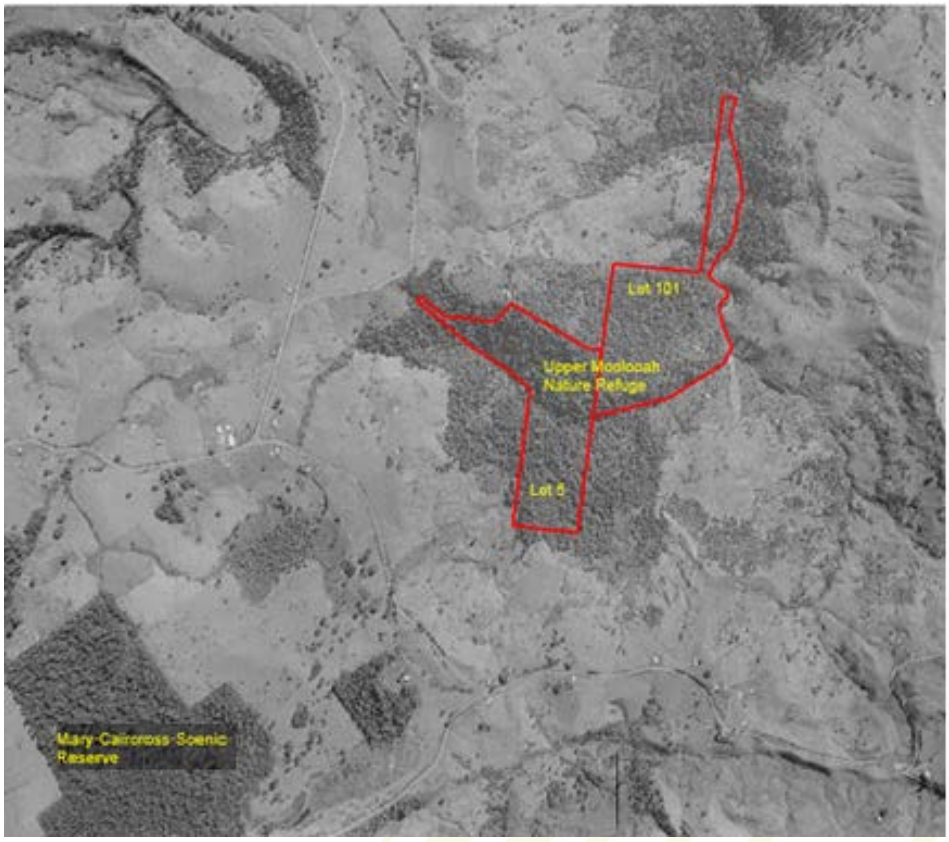
Areas surrounding the reserve, including waterways, were significantly cleared prior to

[2] The information about the early settlement history of the area was obtained through interviews with Mr W Hankinson

1956. However over four decades, up to 1997 the surrounding landscape shows a significant increase in vegetation cover.

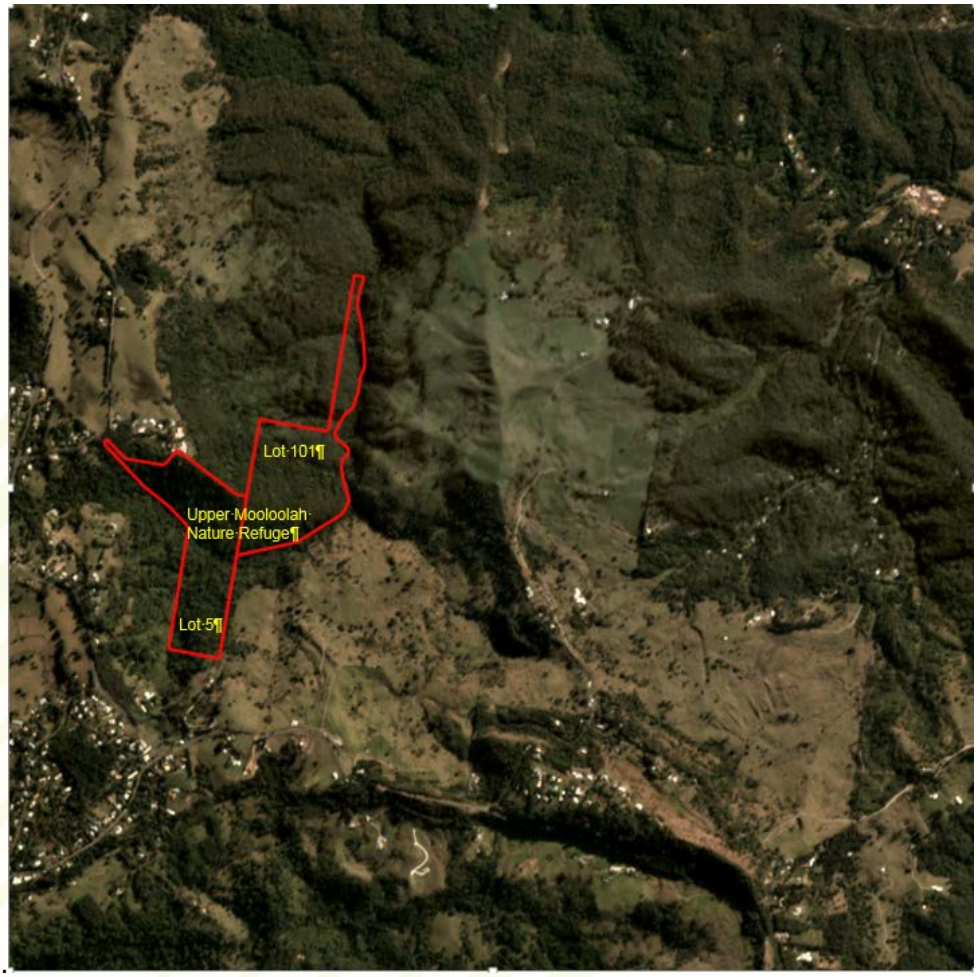
The emergence of conservation land management through landcare and integrated Catchment Management (ICM) have contributed to this increased forest cover, particularly along waterways and gullies. Local community groups such as Barung Landcare, Lake Baroon Catchment Care Group, and Hinterland Bush Links play an important role in fostering these changes.

Figure 2 Aerial image showing land use history between 1956 and 2017 (QG, 2018a)



(a) 1956

(b) 1997



(c) 2017

3 Reserve Planning

3.1 Service level

Reserve planning and annual management actions are guided by council's Environmental Reserves Service Level Framework (ERNMP 2017). The service level is based on scoring matrix criteria which includes reserve size, connectivity, significant species, biodiversity and recreational use.

Under the reserve service level classification this reserve is classified as B1 R3 – Conservation. This is a high biodiversity low recreational opportunity site within the open space category of Conservation

Service level requirements under this classification are listed in **Table 1** and **Table 2.**

Table 1: Planning service level category B1 R3 – "Conservation"

Category	MP	BOA	Flora assessment	Fauna assessment	FMP	RWP
Conservation B1	✓	✓	✓	✓	×	×
Frequency	10 yr	10 yr	10 yr	10 yr	10 yr	5 yr
Current status	Complete 2019	Complete 2010, 2017	Complete 2003, 2011	Complete 2013/13	action	action

MP = [this] Management Plan, BOA = Bushland Operational Assessment (a resilience-based condition assessment to guide management), FMP = Fire Management Plan; RWP = Restoration Works Plan

Table 2: Maintenance service levels

Category	B1
Inspections	Monthly
Weed management	Monthly
Revegetation	As required
Prescribed burning – if required	N/A
Fire trail management drainage/surface maintenance	N/A
Fire trail slashing	N/A
Fuel reduced zones of management	Not required
Tree management	Annual
Urgent & hazardous matter arising	24-48 hours

3.2 Management

The reserve is currently managed by Council's Natural Areas team, guided by this Management Plan and supporting technical documents. In addition to these, the Environmental Reserves Network Management Plan (ERNMP) (2017) provides an overarching management framework to guide priorities and review schedules for management and operational activities

The status and priority for management actions to date are described in **Table 3** below.

Table 3: Status of service level management actions at Upper Mooloolah Nature Refuge (B1 R3)

Management action	Description	Status (priority)*
Condition assessment	Preparation of a resilience-based condition assessment - bushland operational assessment (BOA) to guide management.	BOA completed 2010 (BTE, 2010) & 2017 (Barung Landcare, 2017) (Lot 5 and Lot 101).
Restoration works plan	Preparation of a Regeneration Works Plan (RWP) to guide management.	Commission preparation of a RWP**. (high)**
Weed management	Weed control works underway for weed infestations based on BOA; however, RWP required to ensure weed control works can be monitored against specific RWP actions.	Commission preparation of a RWP and implement in line with service level for this reserve**. (high)**
Assess and manage trails as required	Map existing access/snigging tracks.	Commission mapping**. (med)**
Install access gate and fencing as required	Gate and fencing installed and maintained. Boundary fencing damaged and/or non-existent in some parts providing for cattle access and damage to the reserve (FPE, 2014).	Complete and on-going Undertake condition assessment of boundary fencing to identify repairs/ replacement/new construction requirements, preferably using animal friendly designs. **(high)**
Revegetation	Preparation of a RWP to guide management.	Commission preparation of a RWP. **(high)**
Signage	Environment Levy Reserve signage.	To be installed.
Tenure protection	Protected as a Nature Refuge under a formal conservation agreement between the State of Queensland and Council.	Conservation agreement (dated 2005)
Values assessment	Undertake values assessments for: • Plants • Birds, mammals, reptiles and amphibians (frogs and toads) • Freshwater invertebrates (crustaceans and water insects) • Cultural heritage.	Desktop assessments completed for: • Birds, mammals, reptiles, amphibians (Czechura, 2005) • Cultural heritage (DATSIP, 2018). Site assessments completed for: • Plants (Olsen, 2003; Thomas, 2011) • Mammals, reptiles and frogs (FPE, 2014; FPE, 2015). Commission additional site assessments for: **(low)** • Birds • Freshwater invertebrates • Cultural heritage.
Hazards removed	No hazards identified from existing site assessments.	Not required.

high: 2019/20; med: 2019-2023; review 2023

4 Reserve values

4.1 Ecological values

The reserve protects hinterland regional ecosystems (REs) that have been extensively cleared across the Sunshine Coast.

Natural values of the reserve have been documented through various assessment reports: including the following resources which have been summarised in this management plan:

- Flora surveys (Olsen, 2003; Thomas, 2011)
- Terrestrial fauna survey (FPE, 2014)
- Frog survey (FPE, 2015)
- Vegetation condition assessment - BOA (BTE, 2010; Barung Landcare, 2017)
- Site assessment (Czechura, 2005)

Plant and animal data records are entered into a council database made available to the State Wildnet database.

Vegetation communities

Over 90% of the site is mapped remnant vegetation (**Appendix 2**, **Figure 9**), comprising three different REs. This includes 'Of Concern' (VMA) RE 12.9-10.16, tall to very tall microphyll to notophyll vine forest which covers 18% of the reserve area.

The remainder is non-remnant vegetation classified as 'High Value' regrowth vegetation (refer to **Appendix 2**, **Figure 11**).

.**Table 4: Regional ecosystems of Upper Mooloolah Nature Refuge (DEHP, 2018)**

RE	Status VMA*		Description	Distribution in the reserve
	VM** Class	BD** Status		
12.8.3	LC	NC	Complex notophyll vine forest. Characteristic species include *Argyrodendron trifoliolatum, Olea paniculata, Castanospermum australe, Cryptocarya obovata, Ficus macrophylla forma macrophylla, Syzygium francisii, Diploglottis australis, Pseudoweinmannia lachnocarpa, Podocarpus elatus, Beilschmiedia obtusifolia, Neolitsea dealbata* and *Archontophoenix cunninghamiana*. Occurs on Cainozoic igneous rocks, especially basalt <600m altitude.	Occupies most of the reserve (approx. 32ha or 70%) in the western and southern portion (most of Lot 5 and part of Lot 101)
12.9-10.16	OC	OC	Microphyll to notophyll vine forest +/- *Araucaria cunninghamii*. Characteristic species include *Argyrodendron sp*. (Kin Kin W.D.Francis AQ81198), *Araucaria cunninghamii, Agathis robusta, Backhousia myrtifolia, Cupaniopsis parvifolia, Dendrocnide photinophylla, Rhodosphaera rhodanthema, Flindersia australis, F. xanthoxyla, Drypetes deplanchei, Olea paniculata, Diospyros geminata, Gossia bidwillii, Excoecaria dallachyana* and *Vitex lignum-vitae. Archontophoenix cunninghamiana* often present in gully floors. Occurs on Cainozoic and Mesozoic sediments.	Occupies approx. 8.3ha (18%) in the northern and eastern portion (part of Lot 101)
12.9-10.17d	LC	NC	12.9-10.17d: Open forest generally containing *Eucalyptus siderophloia, E. propinqua or E major, Corymbia intermedia*. Other characteristic species include *Lophostemon confertus, Eucalyptus microcorys* and *E. acmenoides or E. portuensis*. Other species that may be present locally include *Corymbia trachyphloia subsp. trachyphloia, C. citriodora subsp. variegata, E. longirostrata, E. carnea, E. moluccana* and occasional vine forest species. Hills and ranges on Cainozoic and Mesozoic sediments.	Occupies approx. 1.6ha (3.5%) in two patches (part of Lot 101) on ridges and upper slopes between RE 12.8.3 and 12.9-10.16

*VMA = Queensland *Vegetation Management Act 1999*,

**VM Class under the VMA = Least Concern, OC = Of Concern, NC = No Concern

***BD = Biodiversity status is based on an assessment of the condition of remnant vegetation in addition to the criteria to determine the VM Class; BD status is used for a range of planning and management applications.

Ecosystems and habitats

The reserve is located on the edge of a larger 'Core Habitat' area associated with the uncleared upper escarpment of the Mooloolah catchment (**see Appendix 2**, **Figure 7).**

A range of different habitat features are now protected in this reserve including areas of:

- vine forest on black basaltic soil
- vine forest on sedimentary soil
- open forest on sedimentary soil
- rocky gullies
- watercourse with a boulder, cobble, pebble and sand substrate
- many tree and log hollows of different sizes.

At the State level (DES, 2018), the reserve is recognised as having very high aquatic habitat conservation significance (riverine wetlands).

The permanent river with large pools, rocky riffles and intact riparian vegetation are an important habitat feature and provides critical refuge in the upper reaches of the Mooloolah catchment.

Tall to very tall notophyll vine forest fringing the upper Mooloolah River

The reserve is mapped as essential habitat for five threatened species under the *Nature Conservation Act 1992* (NCA), including:

- Coxen's fig parrot (*Cyclopsitta diophthalma coxeni*) – endangered (E)
- Richmond birdwing vine (*Pararistolochia praevenosa*) – near threatened (NT)
- southern corynocarpus (*Corynocarpus rupestris*) – vulnerable (V)
- romnalda (*Romnalda strobilacea*) - V
- bopple nut *Macadamia ternifolia* - V.

A range of endangered, vulnerable and near threatened (EVNT) and locally significant species also found within the reserve, dependent on the site's conserved habitat (refer to Table 5, 6 and 7 below).

Ecosystems provide habitat for plants and animals, and collectively the provision of ecosystem services, including local climate regulation, oxygen production, water purification, pollination, soil formation and nutrient recycling (SCC, 2017a).

Each of these ecosystems also provides a unique habitat for a wide range native species, from the microbial fungi and invertebrates in the soil to the mammals and birds in the forest, and the many aquatic organisms, crustaceans, insects, fish, water rats and platypus, dependent on freshwater streams and rivers.

The interconnectedness of all these elements is critical to maintaining the environmental services they perform as well as the overall sustainability of, not only each ecosystem, but also each species within each ecosystem.

Hence, the protection and long-term effective management of the reserve is vitally important for the preservation of each ecosystem, their inherent values and the services they perform.

Plants

Three hundred and one (301) endemic native plant species in ninety-five (95) families were recorded during the terrestrial plants assessments of the reserve (Olsen, 2003; Thomas, 2011).

Thirty-two (32) exotic species were also recorded within the reserve (Olsen, 2003; Thomas, 2011). All plants recorded from all surveys conducted to date for the reserve are listed in **Appendix 4**

Five (5) threatened species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) and/or the NCA were recorded at the reserve, as listed in **Table 5.**

Five (5) locally significant plant species found in the reserve are listed below in **Table 6**

Tall to very tall ecotone open eucalypt forest within the Upper Mooloolah Nature Refuge

Table 5: EVNT plant species found at Upper Mooloolah Nature Refuge

Scientific name	Family	Common name	Status	
			EPBCA	NCA
Bosistoa transversa	RUTACEAE	three-leaved bosistoa	V	-
Macadamia ternifolia	PROTEACEAE	Maroochy nut	V	V
Pararistolochia praevenosa	ARISTOLOCHIACEAE	Richmond birdwing vine	-	V
Romnalda strobilacea	LAXMANNIACEAE	romnalda	V	V
Syzygium hodgkinsoniae	MYRTACEAE	red lilly pilly	V	V

Notes: V = Vulnerable

Table 6: Locally significant plant species found at Upper Mooloolah Nature Refuge

Scientific name	Family	Common name	Significance
Akania bidwillii	AKANIACEAE	turnip wood	Northern extent of range
Araucaria bidwillii (cultural significance)	ARAUCARIACEAE	bunya pine	Culturally important
Carronia multisepala	MENISPERMACEAE	carronia	Larval host plant for the EPBCA Endangered pink underwing moth (*Phyllodes imperialis smithersi*)
Elatostema stipitatum	URICACEAE	small soft nettle	Uncommon within the Sunshine Coast LGA
Guioa acutifolia	SAPINDACEAE	northern guioa	Southern extent of range

Strap-like leaves of the threatened *Romnalda strobilacea*

Animals

Anecdotal bird records have been collected at this site over the years and are included here; however, it is noted this does not represent the diversity of birds expected to be found here.

A recent fauna survey recorded thirty-three native animal species (not including birds) (FPE, 2014; FPE, 2015).

This included:

- six frogs
- eight ground-dwelling mammals including two species of macropods
- two arboreal mammals
- seven micro bats
- eight reptiles
- one freshwater crayfish

Five exotic species were also recorded within the reserve (FPE, 2014; FPE, 2015). All animals recorded from surveys conducted to date for the reserve are listed in **Appendix 5**.

No threatened mammal, reptile or amphibian species were recorded from the targeted assessments. However fauna survey consultants with relevant expertise (Qld Museum) have reported hearing a pair of Coxen's fig parrot (*Cyclopsitta diophthalma coxeni*), which is listed as 'Endangered' under both the EPBC and the NCA, (FPE, 2014).

Five other significant species were recorded within the reserve, as listed in **Table 7**. This includes core habitat supporting a significant breeding population of Richmond birdwing butterfly; and habitat for the koala (N. Clancy, pers. comm., 2018).

Table 7: EVNT and significant animal species known to occur at Upper Mooloolah Nature Refuge

Common name	Scientific name	Status	
		EPBCA	NCA
Coxen's fig parrot	*Cyclopsitta diophthalma coxeni*	E	E
swamp wallaby*	*Wallabia bicolor*	-	-
rose-shaded skink**	*Saproscincus rosei*	-	-
Conondale spiny crayfish***	*Euastacus hystricosus*	-	-
Richmond birdwing butterfly	*Ornithoptera richmondia*	-	V
koala	*Phascolarctos cinereus*	V	V

Notes: E = Endangered; V – Vulnerable; *swamp wallaby is uncommon within SCC LGA; **rose-shaded skink is uncommon in QLD; Conondale spiny crayfish is Endangered on IUCN Red List.

Previous data records and surveys compiled by the Queensland Museum (Czechura, 2005) for the period between the 1970s and 2005, recorded a total of 228 native vertebrate animal species including: 154 bird; 25 mammal; 33 reptile and 16 amphibian species.

Czechura (2005) states the area provides habitat that supported (and may still support in some cases) a range of significant (threatened, declining species, restricted range, vagrant, mobile or migrant) species, including:

- Richmond birdwing butterfly (*Ornithoptera richmondia*)
- the carabid beetle (*Leirodeira violaceum*)
- the giant snail (*Hedleyella maconelli*)
- spotted-tail quoll (*Dasyurus maculatus maculatus*)
- northern quoll (*Dasyurus hallucatus*)
- southern day frog (*Taudactylus diurnus*)
- southern platypus frog (*Rheobatrachus silus*)
- cascade treefrog (*Litoria pearsoniana*)
- giant barred-frog (*Mixophyes iteratus*)
- red goshawk (*Erythrotriorchis radiatus*)
- powerful owl (*Ninox strenua*)
- crested shrike-tit (*Falcunculus frontatus*).

In addition the reserve offers suitable habitat for the following threatened species, (FPE 2014

- tusked frog (*Adelotus brevis*)
- three-toed snake-tooth skink (*Coeranoscincus reticulatus*)
- long-nosed potoroo (*Potorous tridactylus tridactylus*)
- grey-headed flying fox (*Pteropus poliocephalus*)
- large-eared pied bat (*Chalinolobus dwyeri*)
- koala (*Phascolarctos cinereus*).

Tree hollow nesting sites for arboreal animals and birds

Management actions

- Undertake a bird survey
- Undertake a freshwater invertebrates survey
- Add Plant and animal data records to the state Wildnet database
- Promote partnerships with community groups and the university to assist council with gathering data on the reserve.
- Investigate and promote the use of animal sensitive road design principles and practices on State and local roads to provide safer connectivity between linking habitat patches
- Consider expansion of protected area in surrounding core and connecting habitat in the local area.

4.2 Cultural and social values

Indigenous

Upper Mooloolah Nature Refuge is located within the native title claim area boundary of the Jinibara People.

The Jinibara People made their first native title application in 1998. In November 2012, the Jinibara People were recognised by the Federal Court of Australia as the determined native title holders for their traditional country. Determination is held by the Jinibara People Aboriginal Corporation, the prescribed body corporate for the Jinibara People. Determination recognises a range of rights of the Jinibara People including the maintenance of "sites, objects, places and areas of significance to the native title holders under their traditional laws and customs and protect by lawful means those sites, objects, places and areas from physical harm or desecration". In addition, under the State's *Aboriginal Cultural Heritage Act 2003*, the Jinibara People are the Aboriginal Parties for their traditional country.

A search of the Cultural Heritage Database and Register for Lot 5 and 101 (DATSIP, 2018) advised that at the time of purchase there was no Aboriginal cultural heritage sites or artefacts recorded.

The absence of recorded Aboriginal cultural heritage, however, may simply reflect a lack of cultural heritage surveys in this area.

There are several known Aboriginal cultural heritage sites located in close proximity to the reserve, including nearby burial caves, (Jones 2007); and the site of the Bunya feast at Baroon Pocket.

All significant Aboriginal cultural heritage in Queensland is protected under the *Aboriginal Cultural Heritage Act 2003*, and penalty provisions apply for any unauthorised harm. Under the legislation a person carrying out an activity must take all reasonable and practical measures to ensure the activity does not harm Aboriginal cultural heritage[3].

To assist in meeting this duty of care, there are *Aboriginal Cultural Heritage Act 2003* Duty of Care Guidelines that should be followed. It is a requirement under these guidelines for the relevant Aboriginal party to be consulted prior to any works that will cause ground disturbance in a previously undisturbed area.

Non-indigenous

Historical snig tracks established to haul logged timber from the reserve and remnant logging stumps provide a reminder of early settlement of the Blackall Range by settlers and subsequent land owners. These tracks also provide existing access for management of the reserve and so should be preserved and maintained.

Management action

- Conduct site survey and mapping to identify non-indigenous cultural heritage values, such as snigging tracks, log bridges, axe-marked trees, loading ramps, etc. and assess relevance/ importance for preservation, and to assist with management of the reserve.

Recreation

The reserve has a low recreational score as there is no existing recreational infrastructure on the site and very steep topography. Also

[3] For details refer to the "*Aboriginal Cultural Heritage Act 2003, Duty of Care Guidelines, (2004)*"—available on the Queensland Governments Department of Aboriginal and Torres Strait Islander and Multicultural Affairs (DATSIMA) web page.

current access is very limited and constrained by private property.

Additionally, the reserve provides habitat for significant threatened species that, first and foremost, should be afforded very high protection from disturbance to ensure their continued survival at the reserve and more generally on the Sunshine Coast. Council's strategic planning policy provides for considerable recreational opportunities more broadly across the region as shown in **Appendix 7**.

Restoration

As part of establishment works, contractors have been engaged to undertake weed management, particularly for cats' claw creeper, which is a restricted invasive plant under the *Biosecurity Act 2014* (Bio Act).

Management action

- Prepare a RWP to identify areas for restoration.

Knowledge

The reported presence of Coxen's fig parrot frequenting the reserve prompted an agreement between council and the Queensland Museum to install temporary monitoring equipment to record bird calls.

The temporary equipment has been removed and analysis of the data is now underway.

Local and international partnerships: acoustic survey equipment installed at UMNR to detect endangered Coxen's fig parrot. DES threatened species coordinator Dr Ian Gynther with assistance from local engineers, data technicians and leading acoustic software experts from Japan

Council has an established relationship with the community group Birdlife Sunshine Coast, who conduct bird surveys at council reserves. No bird surveys, however, have been conducted for the reserve.

Council also has an established relationship with Universities for research projects into ecological values. Council welcomes research proposals that will provide additional data and information to inform protection and management of the reserve.

Management action

- Undertake a bird survey.
- Promote partnerships with community groups and the university to assist council with gathering data on the reserve.

4.3 Economic values

Conservation of natural values at the reserve may contribute to the local and broader economy.

In addition, conservation of the reserve's ecosystem values may indirectly contribute to the commercial and recreational fishing industry by improving water quality as it flows through the site.

4.4 Condition of values

The reserve contains relatively intact original vegetation which is representative of the Sunshine Coast hinterland. This is a rare quality that highlights the conservation significance of this site

A condition assessment of the site has found the reserve to be predominantly in good to excellent condition and mostly weed free

Council's Bushland Operational Assessment (BOA) provides a mapping tool to assess the vegetation and habitat condition of a site according to the level of resilience, structural diversity and recruitment. BOAs have been completed at this site in 2010 and again in 2017. See **Figure 3** below.

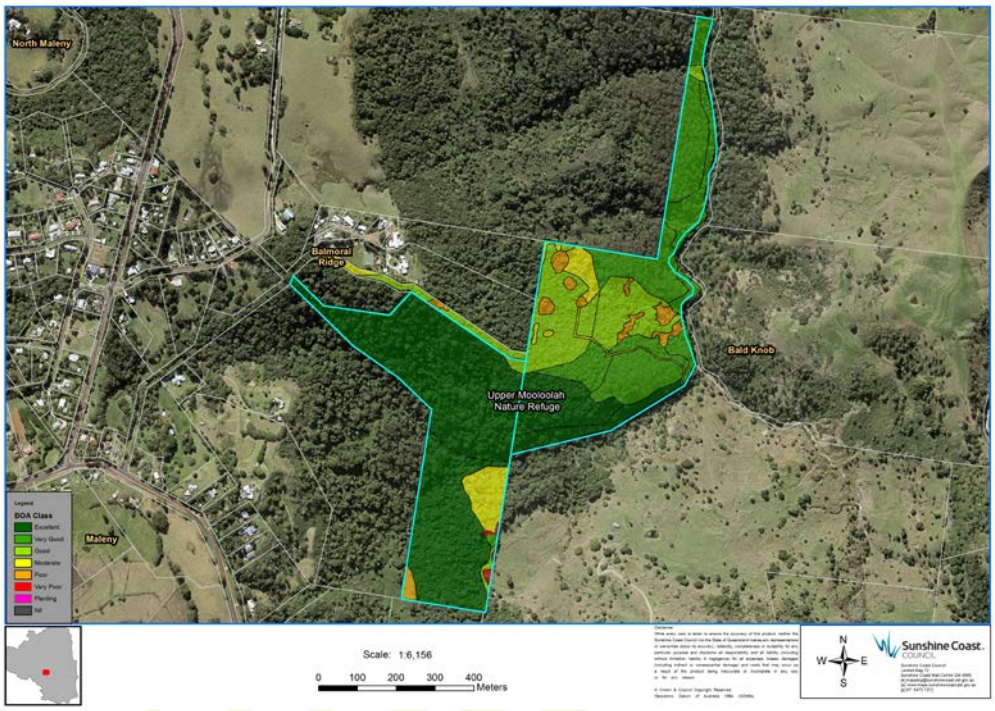
The BOA has shown the areas identified in 'moderate' to 'very poor' condition occupy smaller areas for the most part, and are found where the most amount of historical disturbance has occurred.

Based on the 2010 BOA, initial bush restoration activities primarily involved weed control works, particularly for cat's claw creeper (*Macfadyena unguis-cati*), lantana (*Lantana camara*) and white passionflower (*Passiflora subpeltata*). A

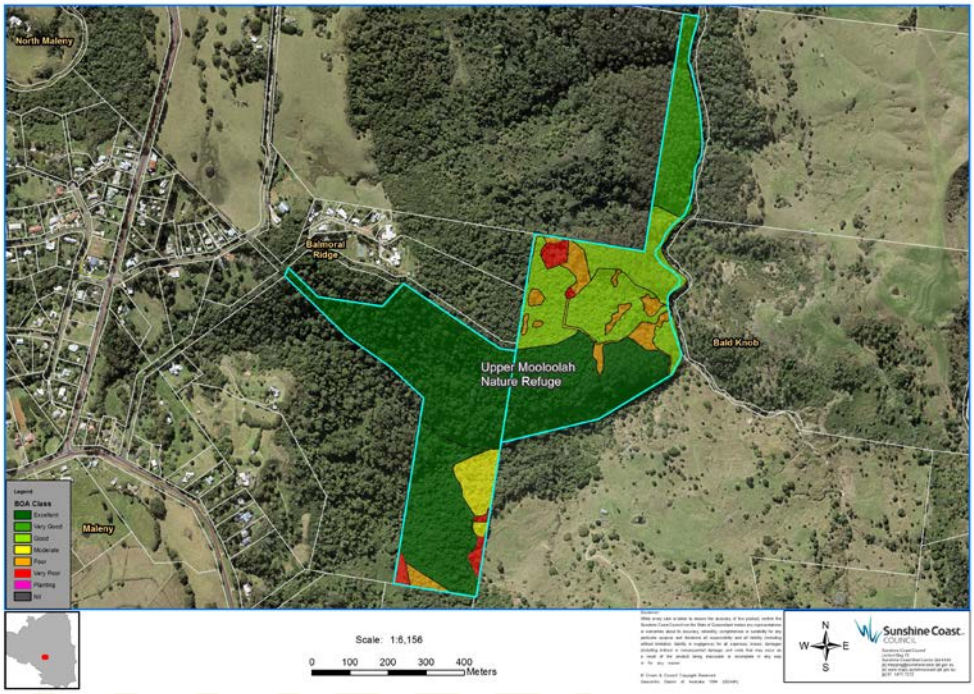
second BOA in 2017 BOA shows where remaining weed problems occur in isolated gullies adjacent to the boundary of the reserve.

The abundance of weeds along boundaries and watercourses indicates that weeds from the surrounding landscape are directly encroaching the reserve and, in some cases, are being transported by water. Partnerships with neighbouring landholders are important for conservation of the reserve's habitat.

Figure 3: Bushland Operational Assessment (BOA)



(a) September 2010



(b) January 2017

Council's Land for Wildlife partners includes nearby properties to this reserve, providing an important habitat restoration and weed removal service that is helping to protect this very unique habitat on the Sunshine Coast.

As the reserve is located at the headwaters of the Mooloolah River catchment, it is expected there are only a few potential sources of pollution, which will mostly affect the riparian vegetation along the river. These include stormwater from impervious surfaces (roads and roofs), on-site sewage systems and any cattle grazing / farming inputs such as fertiliser, herbicides, pesticides and effluent that may be carried by stormwater runoff or in groundwaters, or by spray drift.

Management action

- Undertake a BOA every five years to determine changes in vegetation condition and to measure success of restoration works
- Undertake a freshwater aquatic survey, including an assessment of chemical water quality parameters, at different times of the year, during different weather conditions and at different times of the day
- Commence an on-going, periodic water quality monitoring where any particular contaminants are identified, and actions are taken to manage them
- Collaborate with adjacent property owners to facilitate co-ordinated weed management and changes to management practices where they are identified to be impacting on the reserve and/or Mooloolah River.

One of the many rock pools carved into the sandstone substrate of the upper Mooloolah River

5 Bioregional and landscape contexts

The bioregional landscape descriptions that have been included here support the reserve's recognition as a nature refuge and part of a national reserve system (CoA, 2010).

5.1 IBRA

Interim Biogeographic Regionalisation for Australia (IBRA) is endorsed by all levels of government as a key tool for identifying land for conservation. Australia's landscapes have been classified into 89 large geographically distinct bioregions based on common climate, geology, landform, native vegetation and species information. Under the latest IBRA (7), the reserve is in the SEQ bioregion (no.74), which has a total area of 78,049.21 square kilometres (7,804,921 hectares).

13.1% of the SEQ IBRA region is protected in reserves and 13.98% of the Sunshine Coast/ Gold Coast Lowlands subregion (SEQ04) that includes this site is protected in reserves (CoA, 2012).

5.2 Catchment

The reserve is situated at the headwaters of the Mooloolah River catchment (refer to **Appendix 2**, **Figure 6**). A dense network of meandering gullies and streams traverse the landscape, draining the upper catchment into the main watercourse, the Mooloolah River, which is approximately 50 km long from its headwaters to the mouth where it discharges into the Pacific Ocean at Mooloolaba. The Mooloolah River catchment is approximately 221 square kilometres (22,100 hectares).

5.3 Local planning context

The area falls within the Sunshine Coast Council Planning Area. Under the Sunshine Coast Planning Scheme 2014, the conservation values of this site have been identified and protected.

5.4 CAR contribution

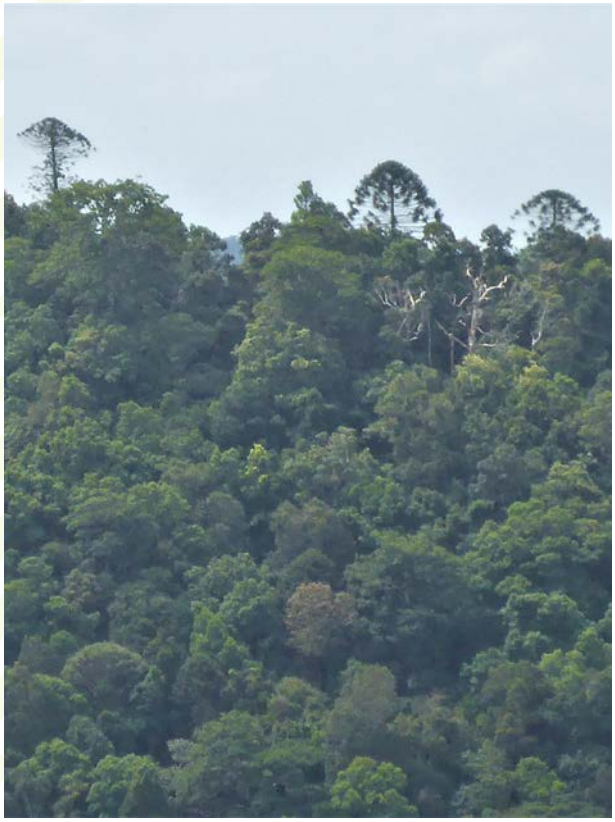
Comprehensive: There are three regional ecosystems occurring within the Upper Mooloolah Nature Refuge that are included in the SEQ bioregion and SEQ04-Sunshine Coast Gold Coast Lowlands IBRA sub-region.

Adequate: The reserve comprises approximately 46 hectares of remnant and high value regrowth vegetation (refer to **Appendix 2**, **Figure 9** and **Figure 11**). Vegetation is predominantly observed to be in 'good' to excellent' condition indicating an overall high level of resilience within the reserve.

Although interrupted by roads and various land uses, the reserve provides an important link between extensive corridors and isolated remnant patches scattered throughout the landscape, therefore providing ecological viability and integrity for numerous populations, species and ecological communities.

Representative: The regional ecosystem types present within the reserve provide representation of the pre-clearing landscape that previously covered the eastern escarpment of the Blackall Range on the Sunshine Coast and within the broader South-east Queensland region.

The reserve preserves an important mosaic of habitats, including 'Of Concern' microphyll to notophyll vine forest dominated by Bunya Pine. These habitats are poorly conserved throughout south-east Queensland and/or the Sunshine Coast.



Emergent bunya pines in Upper Mooloolah Nature Refuge

6 Management issues

6.1 Regional background

The SEQ region is the most densely populated part of Queensland, experiencing rapid growth over the previous two decades, (Ambrey and Fleming, 2011).

Gristle fern *Blechnum cartilagineum*

The SEQ bioregion has been identified as an area which is at a critical threshold, where increased development throughout the urban footprint creates challenges for biodiversity protection due to increasing loss and degradation of remaining ecosystems and habitat for wildlife (Peterson et al., 2007).

To address these challenges and protect the beauty and richness of the natural areas, native plants and animals—will require the protection and restoration of important habitat corridors, catchments, and remnant vegetation. Therefore refuge areas such as the UMNR will play an important role in protecting ecological function and associated biodiversity for SEQ.

6.2 Preliminary risk analysis

Throughout the establishment phase of works undertaken on this reserve, a range of risks have been identified that may affect council's capacity to protect and restore biodiversity values of this site. These include:

- invasive plants and animals
- snigging track erosion
- fungal disease/dieback
- water pollution

However there are opportunities proposed to address each of the risks which are listed in **Table 8** below.

Table 8: Summary of reserve management risks and opportunities

Risks	Opportunities
Invasive animals	Educate local residents of their responsibilities to managing their domesticated animals and the values of the reserve. Undertake pest animal management for wild dogs and cats. Undertake condition assessment of boundary fencing to identify repairs / replacement / new construction requirements, preferably using animal friendly designs. Establish an on-going pest animals monitoring program to monitor pest animals and impacts to the reserve and its values.
Prohibited, restricted and invasive plants	Educate local residents of their responsibilities to managing their plants and the values of the reserve. Develop a RWP and implement to control and progressively remove all declared and environmental weeds from the reserve.
Snigging track erosion	Identify and assess the condition of existing snigging tracks for improvement, for rehabilitation within the RWP.
Water pollution	Investigate education and land restoration opportunities through Council's Community Catchment Partnerships team to protect water quality impacts from upstream landholders

6.3 Invasive plants and animals

There are at least thirty-two invasive plant species recorded for the reserve. Of these, five are declared under the *Biosecurity Act 2014* as 'Restricted Invasive'. The remaining 27 are identified in the Sunshine Coast Council Biosecurity Plan (2017d) as locally significant invasive plants.

All invasive plant species recorded from the plant surveys are listed in **Appendix 6**.

Management action

- Implement invasive plant management activities in line with RWP and Sunshine Coast Council Local Government Area Biosecurity Plan 2017

Cat's claw creeper (*Macfadyena unguis-cati*) weed

Dieback/tree stress

Myrtle rust is a plant disease caused by the exotic fungus *Puccinia psidii*. Myrtle rust has been found throughout the Sunshine Coast on trees and shrubs in the Myrtaceae family of which numerous species can be found within this reserve.

Symptoms include defoliation, leaf deformity, reduced fertility, stunted growth and plant death.

Infected plants left untreated will continue to produce spores and increase the chances of other myrtaceous plants nearby becoming infected.

Brown root rot is a plant disease caused by *Phellinus noxius*, which is a naturally occurring rainforest fungus that can negatively impact some native species of plant. It is anticipated that the risk of introducing this disease into the reserve is low because of the reserve category conservation—access is restricted and managed through research permits and supervision.

The Department of Agriculture and Fisheries (DAF, 2018b) website provides information on the identification and management of this fungus and myrtle rust.

A rough stem stocking around the bole of a tree may be the first sign of *brown* root rot (Source: DAF, 2018)

Management action

- Surveillance for myrtle rust within the reserve
- Surveillance for brown root rot with the reserve

Fire

Most regional ecosystems are primarily vine forest (comprising rainforest species) that would be damaged by fire. The small isolated patches of *Eucalyptus* forest within the reserve that could benefit from the inclusion of fire are so isolated (being surrounded by vine forest) that fire has not impacted them in recent times. Additionally, isolated patches of *Eucalyptus* forest cannot currently be accessed for fire management due to the reserve's steep terrain.

Management action

- Manage lantana and other invasive plants that could increase the risk of fire and restore native vine forest vegetation.

Erosion

Minimal erosion is present; however, some erosion is occurring along the old snigging

tracks and there may be some erosion along the watercourses where there has been previous disturbance from logging activities.

Management action

- Undertake an assessment of erosion prone areas and identify management actions to stabilise or rehabilitate.

Historical land use

Vegetation clearing

The site has been impacted to a small extent (<10%) by a history of irregular logging and clearing on some boundaries for grazing. There are quite a few old growth habitat trees remaining and regrowth in the areas where logging occurred is progressing naturally, although some weeds are present and require management to encourage faster regeneration. The cleared patches for grazing remain open but are regenerating naturally and will be enhanced by invasive plant management.

Management action

- Continue to manage reserve to allow for ongoing, unhindered natural recruitment of native species
- Extend weed control works into cleared areas along boundaries to encourage faster regeneration.

Stock grazing

There is no fencing on private grazing lands to the south east of the reserve where cattle can access the upper Mooloolah River. This is likely to have a negative impact on river water quality and riparian habitat. Some fencing has been installed to keep cattle out of the reserve however FPE (2014) reported that sections of boundary fencing are damaged, broken or missing completely.

Management action

- Engage with neighbouring landholders to remove stock from the watercourse and restore riparian habitat.
- Undertake condition assessment of fencing, where present, to identify repairs/replacement/ new construction requirements, preferably using animal-friendly designs.
- Investigate removal or replacement of fencing on western side of river.

Visitor use and impact

Public access is currently not provided due to the ecological significance of the reserve and lack of infrastructure to manage health and safety concerns.

Giant moss (*Dawsonia longiseta*) on the banks of the upper Mooloolah River are susceptible to damage from trampling.

Climate change

Research to date indicates that climate change will threaten ecosystems through loss of plant and animal species, loss of habitat, proliferation of weed species, and increased bush fire risks. Stream processes may also be impacted by increased flood events.

The ELS recognises that climate change is a significant long-term threat to the area's biodiversity. Strategies such as protecting habitat, rehabilitating areas, enhancing wildlife corridors and reducing pest species are suggested to help wildlife adapt to changing conditions and also provide the potential to sequester carbon.

Management action

- Through the conservation partnerships program, work with adjacent landholders to build resilience in stream ecosystems by restoring riparian vegetation and controlling bed and bank erosion that has potential to impact on the reserve, which is located downstream of these areas.
- Consider expansion of protected area in surrounding core and connecting habitat in the local area.
- Build resilience to change through habitat connectivity
- Build resilience to hydrological changes through protecting natural surface and groundwater flows.

7 Implementation plan

7.1 Purpose of the protected area

To protect and enhance the biodiversity values associated with the reserve.

7.2 Management objectives

Council has ascribed the following management objectives to achieve the purpose:

- Manage the area to perpetuate, in as natural a state as possible, representative examples of regional ecosystems, biotic communities, genetic resources and unimpaired natural processes.
- Maintain viable and ecologically functional populations and assemblages of native species at densities sufficient to conserve ecosystem integrity and resilience in the long term.
- Contribute to conservation of wide-ranging species, regional ecological processes and migration routes.
- Take into account the non-exclusive native title rights of the Jinibara People.

7.3 Protection mechanism

The majority of the reserve is freehold tenure owned by Sunshine Coast Council. Under the SCC Planning Scheme 2014 the whole reserve area is protected for the purpose of environmental management and conservation

The intent of this management plan is, therefore, to ensure the conservation values are maintained so the current protection mechanisms are not compromised.

In addition to the above, the reserve is protected as a Nature Refuge under a formal conservation agreement between the State of Queensland and Council.

7.4 Restoration goals

Restoration activities aim to protect and enhance existing natural values and improve overall resilience of vegetation.

A RWP will describe priorities for restoration based on the reserve's BOA mapping.

All vegetation management activities undertaken on this site will be guided by the RWP. The RWP will be reviewed every five years.

Management action

- Commission preparation of a RWP.

Significant plants and animals

Six EVNT and a number of locally significant plant and animal species were found at the reserve. Additionally, there is considerable likelihood that previously known EVNT and significant plant and animal species could be found at the reserve with further monitoring during a range of seasonal and climatic events.

There are no Commonwealth recovery plans currently available for the EVNT species relevant to the reserve. Once a recovery plan is in place, Australian Government agencies must act in accordance with that plan.

Management action

- Where a recovery plan is published for an EVNT species, ensure the management actions are in accordance with the published plan.

Under the Queensland Government's Back on Track Species Prioritisation Framework, management of the Coxen's fig parrot (*Cyclopsitta diophthalma coxeni*) is ranked as a critical priority. Queensland threatened species unit has undertaken acoustic monitoring for this species at UMNR with results pending

Management of the other priority EVNT species is as follows:

- three-leaved bosistoa (*Bosistoa transversa*) is not ranked
- Maroochy nut (*Macadamia ternifolia*) ranked as a low priority
- Richmond birdwing vine (*Pararistolochia praevenosa*) ranked as high
- romnalda (*Romnalda strobilacea*) ranked as Medium
- red lilly pilly (*Syzygium hodgkinsoniae*) ranked as low.

Management action

- Establish on-going monitoring programs for the identified threatened species to monitor fluctuations in numbers seasonally and annually

- Adopt SPRING guidelines from the Back on Track framework for the management of threatened and significant species found at this reserve.

Management actions

All of the management actions noted throughout this plan are compiled below in **Table 9**. This provides a separable consolidated management implementation plan for the reserve.

Key technical reports and plans that guide these management outcomes are the plant and animal survey reports; and BOAs.

Finance and resourcing

The Natural Areas operational management program delivers the restoration, maintenance and development of council's environmental reserve network.

An annual operational budget is determined by the service level classification for each reserve, which is based on several factors including:

- biodiversity values and risk
- reserve condition, function and size
- recreation and educational opportunities
- minimum community expectations

Community conservation partnerships unit

There are currently no community partnerships associated with this reserve directly; however, the Land for Wildlife properties nearby support the biodiversity values of the site at the boundary and also across the broader landscape scale.

Healthy Places Team

In conjunction with the Natural Areas Management team, the Healthy Places - Animal Education and Control team fulfils and delivers council's statutory responsibility to manage impacts of plants and animals within council reserves.

Fruit of sour cherry (*Syzygium corynanthum*) on forest leaf litter

Table 9: Management implementation plan for Upper Mooloolah Nature Refuge

Management actions	Relevant documentation	Cost / Status	Priority
Native plants, animals and habitat			
Undertake a bird survey.	Section 4.1; 4.2; Czechura report (2005)	Core business / not started	Medium
Undertake freshwater invertebrates survey.	Section 4.1; Czechura report (2005)	Core business / not started	Medium
Add Plant and animal data records to the state Wildnet database.	Section 4.1; Terrestrial fauna survey (FPE, 2014); Frog survey (FPE, 2015)	Core business / Not started	Low
Where a recovery plan is published for an EVNT species, ensure the management actions are in accordance with the published plan.	Section 7.4	Core business / not started	Low
Establish on-going monitoring programs for the identified threatened species to monitor fluctuations in numbers seasonally and annually.	Section 7.4	New initiative / not started	Medium
Investigate and promote the use of animal sensitive road design principles and practices on State and local roads to provide safer connectivity between linking habitat patches.	Section 4.1; Environment and Liveability Strategy (SCC, 2017b)	Environment Levy / Commenced	Medium
Adopt SPRING guidelines from the Back on Track framework for the management of threatened and significant species found at this reserve.	Section 7.4; RWP	Core business / not started	Low
Consider expansion of protected area in surrounding core and connecting habitat in the local area.	Section 4.1; Environment and Liveability Strategy (SCC, 2017b)	Core business / Commenced	High
Condition of values, environmental weeds, declared plants and pest animals			
Undertake a BOA every 5 years to determine changes in vegetation condition and to measure success of restoration works.	Section 4.4; BOA (BTE, 2010; Barung Landcare, 2017)	Core business / Commenced	Low
Prepare a Regeneration Works Plan (RWP) to identify areas for restoration.	Section 4.2; BOA (BTE, 2010; Barung Landcare, 2017)	Core business / Not started	High
Continue to manage the reserve to allow for ongoing, unhindered natural recruitment of native species.	Section 6.3; RWP.	Core business / Commenced	On-going
Extend weed control works into cleared areas along boundaries to encourage faster regeneration	Section 6.3 RWP.	Core business / Not started	Low
Collaborate with adjacent property owners and community to facilitate co-ordinated weed management and changes to management practices where they are identified to be impacting on the reserve and/or Mooloolah River.	Section 4.4.	Core business / Commenced	On-going

Management actions	Relevant documentation	Cost / Status	Priority
Implement invasive plant management activities in line with RWP and Sunshine Coast Council Local Government Area Biosecurity Plan 2017.	Section 6.3; SCC LGA Biosecurity Plan (SCC, 2017d)	Core business / Not started	On-going
Engage with neighbouring landholders to remove stock from the watercourse and restore riparian habitat.		Core business / Not started	High
Undertake condition assessment of fencing, where present, to identify repairs/ replacement/new construction requirements, preferably using animal-friendly designs.	Section 6.3; RWP	Core business / Not started	Low
Cultural, Social and Economic Values			
Consult Jinibara People prior to any works that will cause ground disturbance in a previously undisturbed area.	Section 2.1; *Aboriginal Cultural Heritage Act 2003* Duty of Care Guidelines	Core business	On-going
Promote partnerships with community groups and the university to assist council with gathering data on the reserve.	Section 4.1 and 4.2.	Core business / Commenced	High
Fire			
Map existing access / snigging tracks.	RWP	Core business / Not started	Medium
Manage lantana and other invasive plants that could increase the risk of fire and restore native vine forest vegetation.	Section 6.3; RWP	Core business / Commenced	On-going
Erosion and Water Quality			
Undertake an assessment of erosion prone areas and identify management actions to stabilise or rehabilitate.	Section 6.3; RWP.	New initiative / not started	Medium
Undertake a freshwater aquatic survey, including an assessment of chemical water quality parameters, at different times of the year, during different weather conditions and at different times of the day	Section 4.4.	New initiative / not started	Medium
Commence on-going, periodic water quality monitoring where any particular contaminants are identified, and actions are taken to manage them	Section 4.4.	New initiative / not started	Medium
Dieback/tree stress			
Surveillance for myrtle rust within the reserve.	Section 6.3; RWP	Commenced	On-going
Surveillance for brown root rot within the reserve.	Section 6.3; RWP	Commenced	On-going
Historical land use			
Conduct site survey and mapping to identify non-indigenous cultural heritage values, such as snigging tracks, log bridges, axe-marked trees, loading ramps,	Section 4.2	New initiative / not started	Low

Management actions	Relevant documentation	Cost / Status	Priority
etc. and assess relevance/importance for preservation, and to assist with management of the reserve.			
Hazards			
Investigate removal or replacement of fencing on western side of river.	Section 6.3; RWP	Core business / Not started	Low
Climate change			
Through the conservation partnerships program, work with adjacent landholders to build resilience in stream ecosystems by restoring riparian vegetation and controlling bed and bank erosion that has potential to impact on the reserve, which is located downstream of these areas.	Section 6.3. Environment and Liveability Strategy (SCC, 2017b).	Core business / Not started	Low
Consider expansion of protected area in surrounding core and connecting habitat in the local area.	Section 6.3; Environment and Liveability Strategy (SCC, 2017b)	Core business / Commenced	High
Build resilience to change through habitat connectivity.	Section 6.3; Environment and Liveability Strategy (SCC, 2017b)	Core business / Commenced	On-going
Build resilience to hydrological changes through protecting natural surface and groundwater flows.	Section 6.3; Environment and Liveability Strategy (SCC, 2017b)	Core business / Not started	Medium

7.5 Monitoring

The SEQ NRM Plan uses the Monitoring, Evaluation, Reporting and Improvement (MERI) framework. The MERI framework logic, shown in **Figure 4**, provides time-frames and outcomes linked to the management plan objectives, which can be assessed during monitoring and evaluation.

The MERI framework provides for:

1. Evaluating the contribution of the reserve to the overall Sunshine Coast reserve network
2. Evaluating the effectiveness of the methodology and approach used
3. Incorporating lessons learned into future work in land purchased for inclusion in Council's reserve estate.

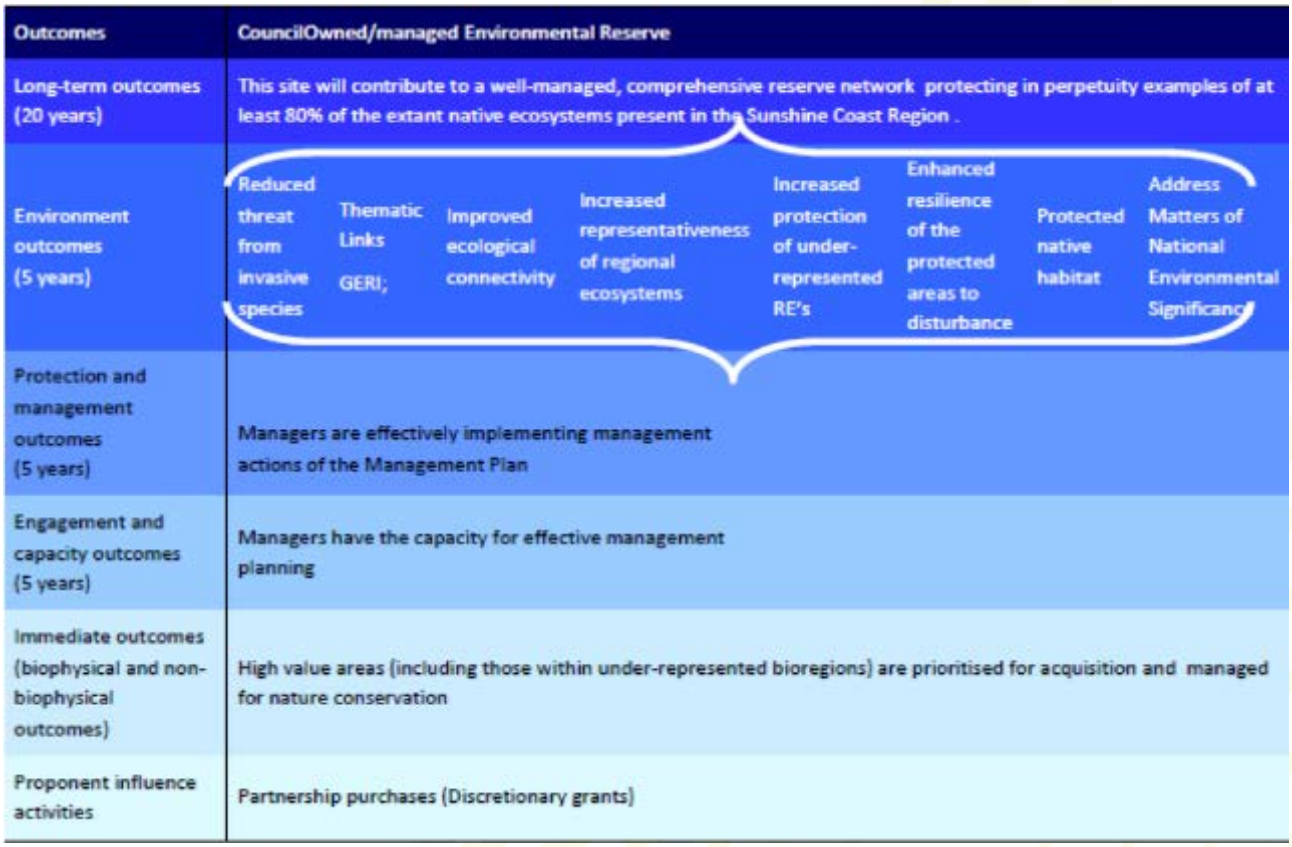


Figure 4: Monitoring, Evaluation, Reporting and Improvement framework

7.6 Communications plan

Preliminary consultation for this management plan has been based on input from stakeholders within council. This includes recreational, conservation and community partnerships.

Public and external stakeholder groups were invited to comment on the first draft through the council web site and specific targeted notifications.

Council will continue to provide information to the public via reports, publications, newsletters, and webpages and through media outlets as and when suitable opportunities present.

7.7 Plan review

The management plan will be reviewed after 5 years in line with the MERI guidelines, supported by the 5 year review of the restoration works plan.

This management plan will be comprehensively evaluated after 10 years of implementation (SCC Guidelines for Strategies and Plans 2018) underpinned by the framework of actions described in this plan.

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Staghorn fern (*Platycerium superbum*) growing on a tree trunk in the reserve

Appendix 1: National Reserve System Principles of Protected Area Management

Interconnectedness of values and places

Protected area management aims to incorporate and integrate natural values, Indigenous cultural values and broader community and historic heritage values.

Protected areas are also part of broader bioregional, social, cultural and economic landscape and they should be managed in this context.

Good neighbour

Protected area managers are economically and socially part of local and regional communities and recognise the need to be valued, responsible, and active local and regional community participants and members.

Community participation and collaboration

Protected areas are conserved for the benefit of and with the support of the community and this is best achieved through awareness, understanding and involvement.

Environmental stewardship

Responsibility for protecting and conserving protected area values extends beyond the management body to include lessees, licensees, relevant public and private authorities, visitors, neighbours and the wider community.

Transparent decision making

The framework and processes for decision-making should be open and transparent. The reasons for making decisions should be publicly available, except to the extent that information, including information that is culturally sensitive or commercial-in-confidence, needs to be treated as confidential.

Effective and adaptive management

Protected area management should apply an adaptive management approach to support continuous improvement in management. This includes monitoring the outcomes of management and taking account of the findings of monitoring and other research to improve management effectiveness. Management decisions should have a firm scientific basis or be supported by relevant experience. Management bodies need to maintain and improve their capacity to learn from experience, to value and build staff expertise and draw on input from other stakeholders.

Appropriate use

Access to and use of protected areas must be consistent with the long-term protection of their values, the maintenance of physical and ecological processes and agreed management objectives.

Indigenous people's knowledge and role

Protected areas are part of landscapes that have supported and continue to give identity to Indigenous people who have traditional and historical connections to and knowledge of the land. Indigenous people are recognised and respected as the original custodians of the lands, waters, animals and plants within protected areas. Their living and spiritual connections with the land through traditional laws, customs and beliefs passed on from their ancestors are also recognised.

The role of Indigenous organisations in the protection and management of country is acknowledged.

Applying the “precautionary principle”

Protection of the natural and cultural heritage of the NRS should include identifying and taking appropriate actions to avert and actively manage emerging threats and risks. Effective management must be based on the best available information. However, where there are threats or potential threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation or harmful disturbance to natural and cultural places.

Inter-generational and intra-generational equity

Management seeks to ensure that the health, diversity and productivity of the environment and the integrity and significance of cultural places are maintained or enhanced for the benefit of future generations and that decisions affecting current generations are socially equitable.

Appendix 2: Terrain, Catchment, Vegetation and Habitat Connectivity Mapping

2a. Terrain

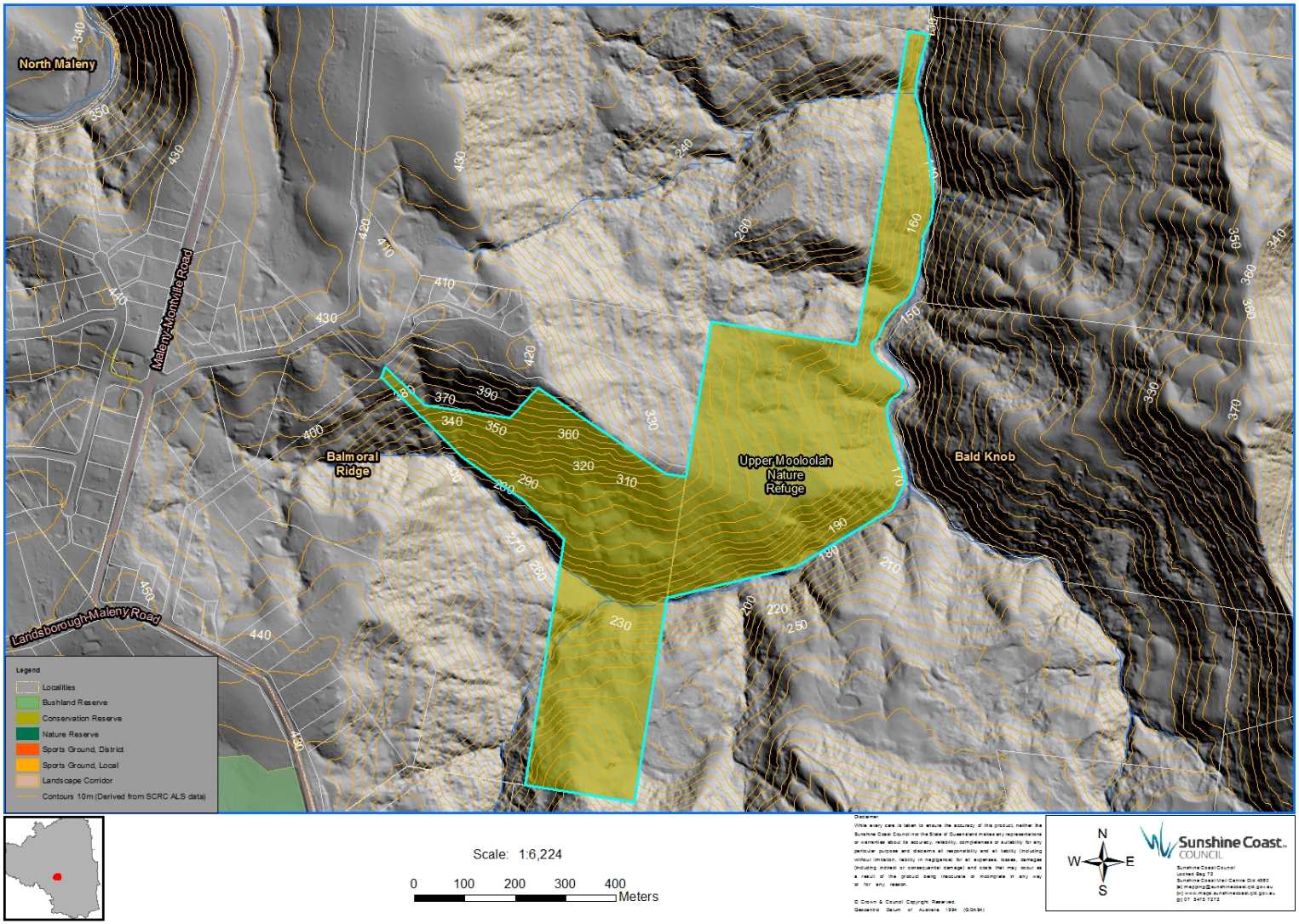


Figure 5: Upper Mooloolah Nature Refuge terrain

2b. Catchment boundaries

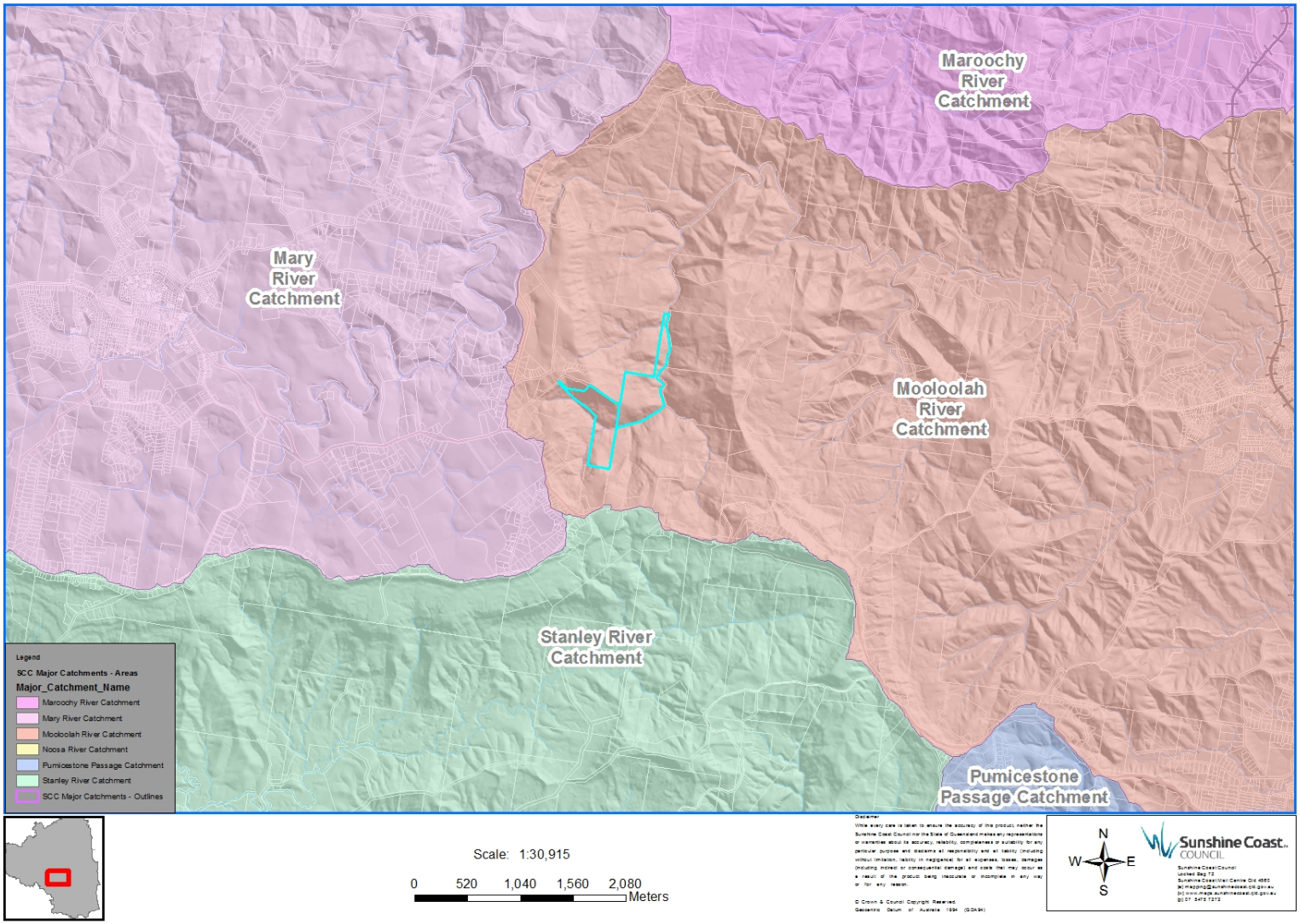


Figure 6: Upper Mooloolah Nature Refuge catchment boundaries

2c. Core and connecting habitat areas **(source SCC)**

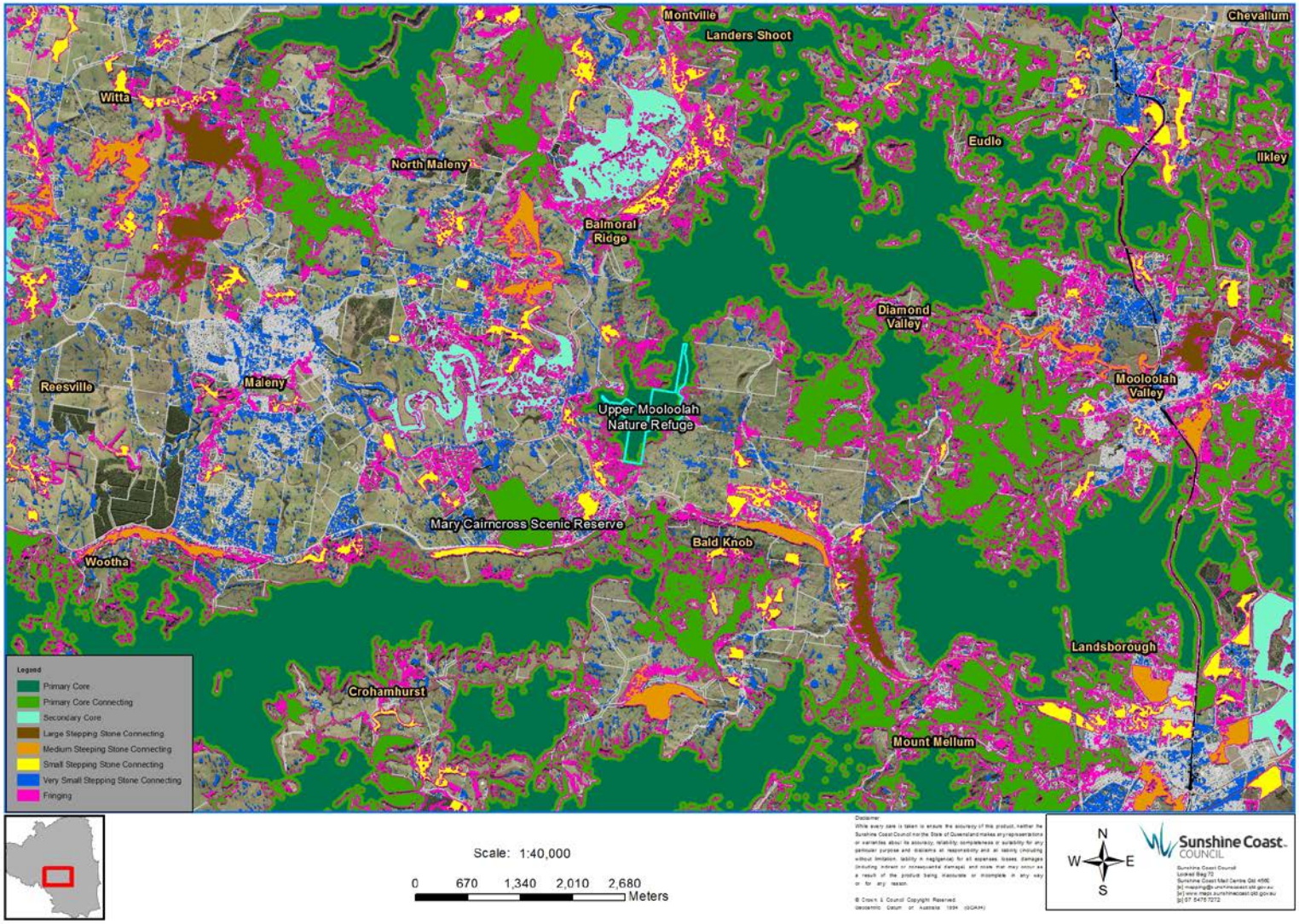


Figure 7: Upper Mooloolah Nature Refuge core and connecting habitat areas

2d. State and regional corridors

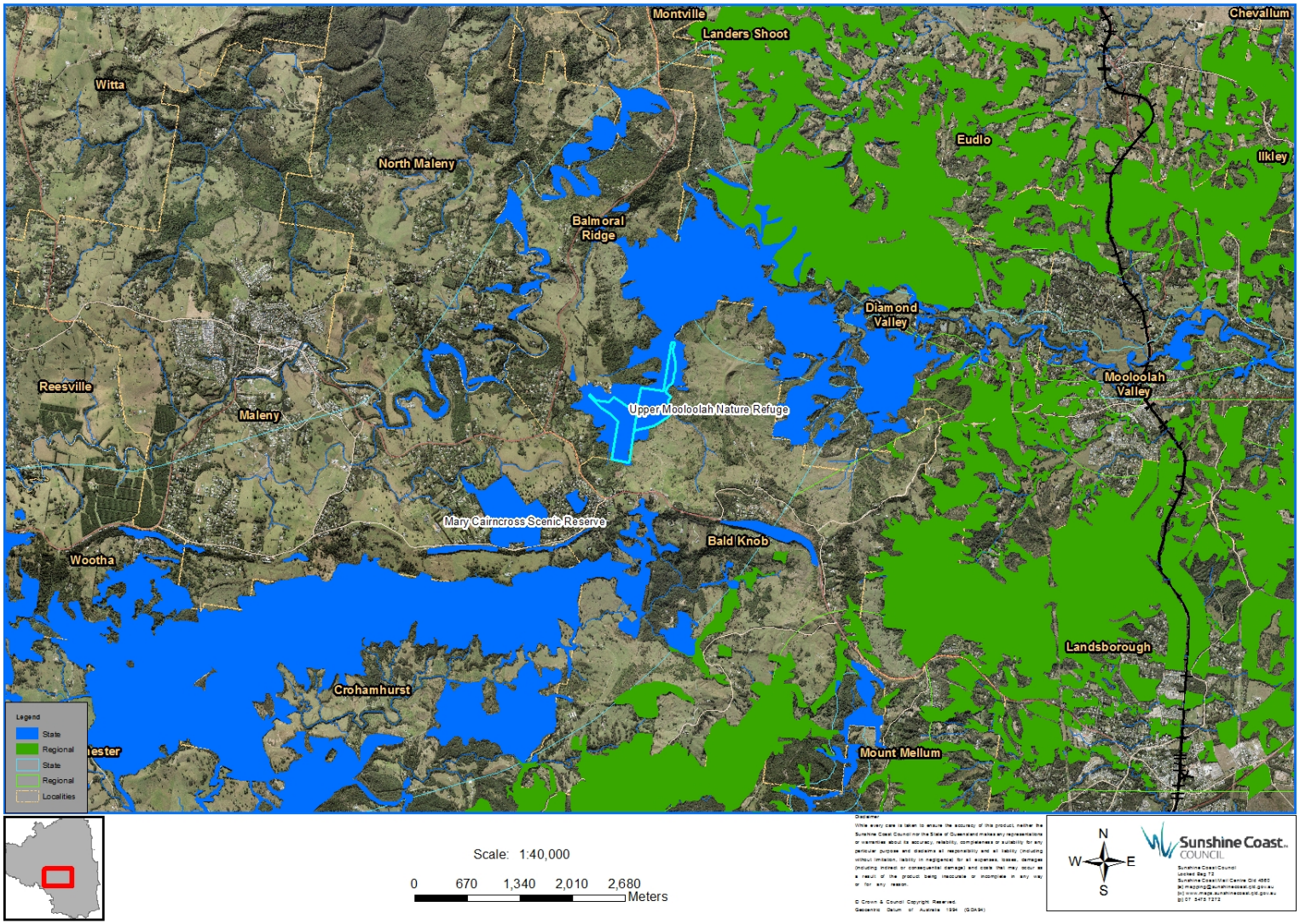


Figure 8: Upper Mooloolah Nature Refuge State and regional corridors

2e. Regional ecosystems (vegetation management class) and essential habitat

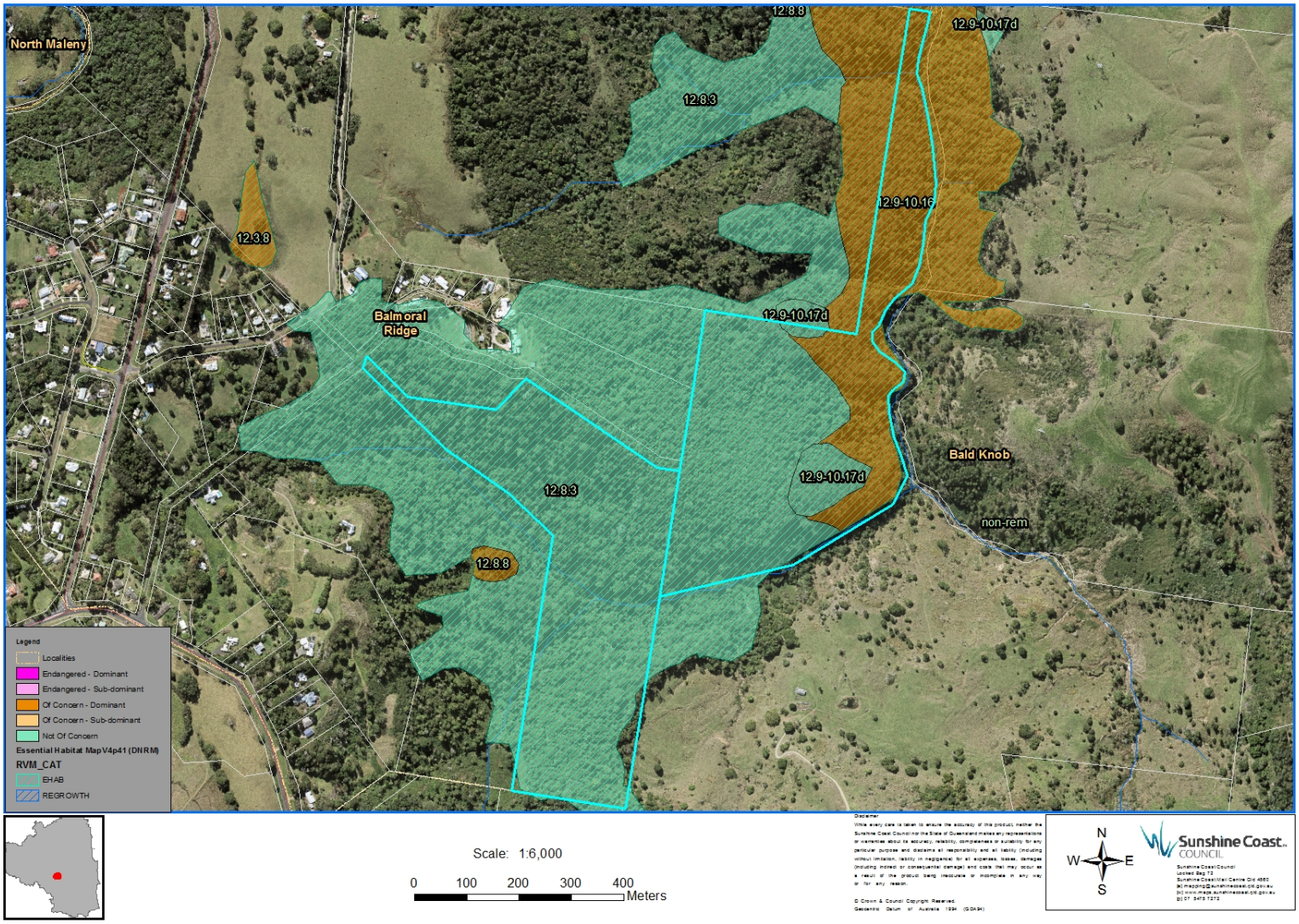


Figure 9: Upper Mooloolah Nature Refuge regional ecosystems (vegetation management class) and essential habitat

2f. Regional ecosystems (biodiversity status)

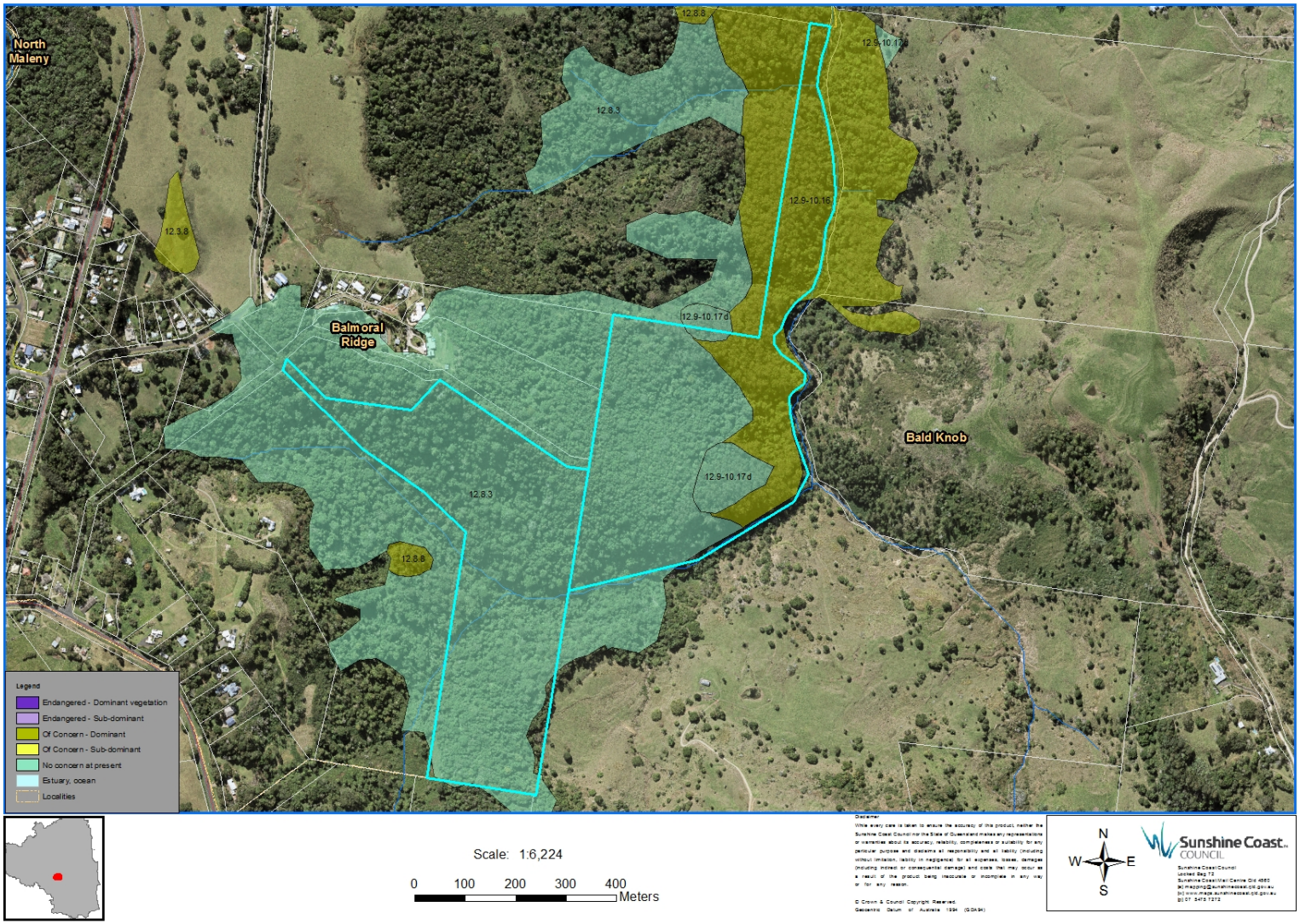


Figure 10: Upper Mooloolah Nature Refuge regional ecosystems (biodiversity status)

2g. High value regrowth

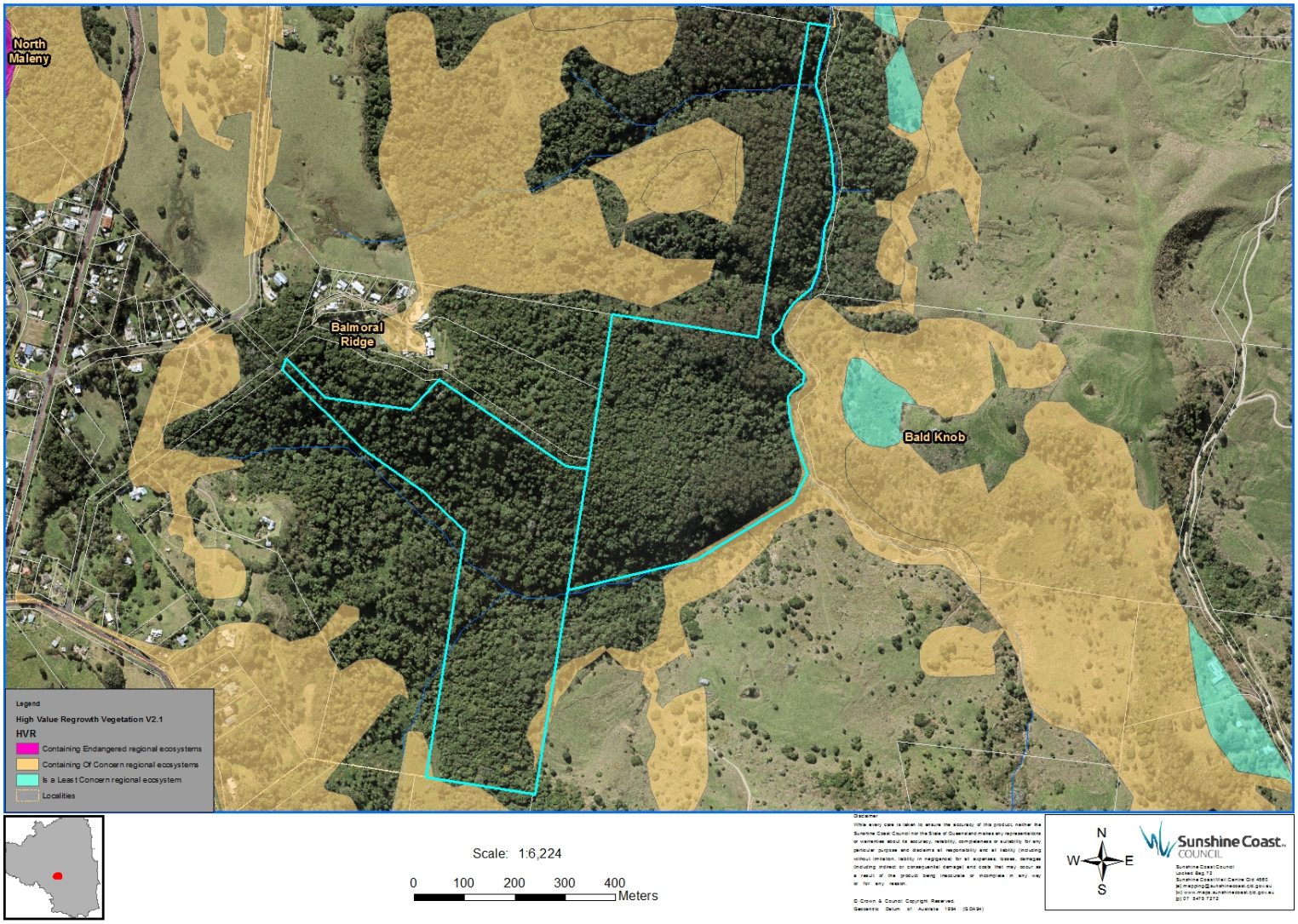


Figure 11: Upper Mooloolah Nature Refuge high value regrowth

Appendix 3: Sunshine Coast priority regional ecosystems

Table 10: Status of vegetation communities on the Sunshine Coast

RE	SCLGA Pre-clearing extent (ha)	SCLGA current extent (ha)	SCLGA 'Vulnerable' [4] loss (%)	Conservation status (VMA)	SCLGA poorly conserved REs (target RE)	Extent currently protected	Additional area required to adequately represent (ha)
12.8.3	12,758	1,563	88	Least Concern	Yes, currently at 2.8% representation	365	910
12.9-10.16	1,733	1,177	32	Of Concern	22%	383	-
12.9-10.17d	3,418	1,947	43	Least Concern	10.7%	368	-

Notes: A regional ecosystem is considered a priority if it constitutes one (or more) of the following factors: 1) VMA 'Endangered' conservation status; 2) 'Vulnerable' at a SCLGA scale; 3) having lost more than 70% of its Sunshine Coast pre-clearing extent; 4) Poorly conserved at a SCLGA scale (>10% of SC pre-clearing extent protected); 5) Commonwealth EPBC listed critically 'Endangered' ecosystems (Lowland sub-tropical rainforest)

Table 11: Extent of observed regional ecosystems in Sunshine Coast conservation estate

RE	Pre-clearing extent	Current extent	Protected areas (ha)					Voluntary conservation areas (ha)	Total extent of RE within conservation estate (ha)
			Nature refuge	Covenant	State	Council	Total extent in protected areas	Land for wildlife	
12.8.3	12,758	1,563	66	46	202	51	365	255	620
12.9-10.16	1,733	1,177	25	34	212	112	383	130	513
12.9-10.17d	3,418	1,947	19	66	221	62	368	240	608

[4] Vulnerable = Loss of >70% of pre-clearing extent

Appendix 4: Plants species list*

Abund = Abundance estimate for reserve from (Thomas, 2011)

R = Rare (<5 plants) U = Uncommon (6 -10 plants) O = Occasional (11-20 plants) C = Common (21-30 plants), A = Abundant (>31 plants)

EPBCA = Commonwealth *Environment Protection and Biodiversity Conservation Act 1999; NCA = Qld Nature Conservation Act 1992*

E = Endangered; V = Vulnerable; NT = Near Threatened

Family	Scientific name	Common name	^Abund.	Status	
				EPBCA	NCA
MIMOSACEAE	*Acacia bakeri*	marblewood	U		
MIMOSACEAE	*Acacia melanoxylon*	blackwood	O/C		
MIMOSACEAE	*Acacia oshanesii*	Irish wattle			
EUPHORBIACEAE	*Acalypha nemorum*	hairy acalypha	U		
MYRTACEAE	*Acmena ingens*	red apple			
RUTACEAE	*Acronychia oblongifolia*	common acronychia	U		
PHYLLANTHACEAE	*Actephila lindleyi*	actephila	O/C		
ADIANTACEAE	*Adiantum diaphanum*	filmy maidenhair	O		
ADIANTACEAE	*Adiantum hispidulum*	rough maidenhair	O/C		
AKANIACEAE	*Akania bidwillii*	turnip wood	U		
CORNACEAE	*Alangium villosum v. tomentosum*	muskwood	U		
EUPHORBIACEAE	*Alchornea ilicifolia*	native holly	O/C		
ARACEAE	*Alocasia brisbanensis*	elephant's ears	U		
RHAMNACEAE	*Alphitonia excelsa*	red ash	O		
RHAMNACEAE	*Alphitonia petriei*	pink ash	U		
ZINGIBERACEAE	*Alpinia arundelliana*	small native ginger	O		
ZINGIBERACEAE	*Alpinia caerulea*	native ginger	O		
APOCYNACEAE	*Alyxia magnifolia*	broad-leaved chain-fruit	U		
COMMELINACEAE	*Aneilema acuminata*	slug herb	O/C		
COMMELINACEAE	*Aneilema biflorum*				
MELIACEAE	*Anthocarapa nitidula*	incense cedar	U		
ULMACEAE	*Aphananthe philippinensis*	rough-leaved elm	O		
ARAUCARIACEAE	*Araucaria bidwillii*	bunya pine	O		
ARECACEAE	*Archontophoenix cunninghamiana*	piccabeen/Bangalow palm	C		
STERCULIACEAE	*Argyrodendron actinophyllum*	black booyong	U/O		
STERCULIACEAE	*Argyrodendron* sp. (Kin Kin W.D. Francis) (syn. *Argyrodendron* sp. aff. *A. trifoliolatum)*	rusty tulip oak	O		
STERCULIACEAE	*Argyrodendron trifoliolatum*	white booyong	O		
NEPHROLEPIDACEAE	*Arthropteris tenella*	jointed fern	O		
SAPINDACEAE	*Arytera distylis*	twin-leaf coogera	O		
SAPINDACEAE	*Arytera divaricata*	coogera	U		
ASPLENIACEAE	*Asplenium attenuatum*	attenuate asplenium	O		

Family	Scientific name	Common name	^Abund.	Status	
				EPBCA	NCA
ASPLENIACEAE	*Asplenium australasicum*	bird's nest fern	O		
ASPLENIACEAE	*Asplenium polyodon*	mare's tail fern			
SAPINDACEAE	*Atalaya multiflora*	broad-leaved Whitewood	U/O		
SAPINDACEAE	*Atalaya salicifolia*	whitewood			
RUBIACEAE	*Atractocarpus benthamiana*	native gardenia	U		
RUBIACEAE	*Atractocarpus chartaceus* (syn. *Randia chartacea*)	narrow-leaved gardenia	O		
PITTOSPORACEAE	*Auranticarpa rhombifolia*	hollywood, white holly	U		
ORCHIDACEAE	*Australorchis monophylla* (syn. *Dendrobium monophylum*)	lily-of-the-valley orchid	U		
FABACEAE	*Austrosteenisia blackii*	blood vine			
FABACEAE	*Austrosteenisia glabristyla*	giant blood vine	O		
MYRTACEAE	*Backhousia myrtifolia*	grey myrtle	O		
EUPHORBIACEAE	*Baloghia inophylla*	scrub bloodwood	O		
LAURACEAE	*Beilschmiedia elliptica*	grey walnut	O		
LAURACEAE	*Beilschmiedia obtusifolia*	blush walnut	O		
BLECHNACEAE	*Blechnum cartilagineum*	gristle fern	O/C		
RUTACEAE	*Boronia bipinnata*	rock boronia			
RUTACEAE	*Bosistoa transversa*	three-leaved bosistoa	U/O	V	
RUTACEAE	*Bouchardatia neurococca*	union nut	O/C		
STERCULIACEAE	*Brachychiton acerifolius*	flame tree	O		
STERCULIACEAE	*Brachychiton discolor*	Queensland lacebark	U		
PHYLLANTHACEAE	*Breynia oblongifolia*	coffee bush	U		
ACANTHACEAE	*Brunoniella spiciflora*	white brunoniella	C		
CAESALPINIACEAE	*Caesalpinia subtropica*	corky prickle-vine	C		
ARECACEAE	*Calamus muelleri*	lawyer vine	A		
ORCHIDACEAE	*Calanthe triplicata*	Christmas orchid	U		
FABACEAE	*Callerya megasperma*	native wisteria	U/O		
DICKSONIACEAE	*Calochlaena dubia*	false bracken	O		
CAPPARACEAE	*Capparis arborea*	brush caper berry	O		
CYPERACEAE	*Carex horsfieldii*		U		
APOCYNACEAE	*Carissa ovata*	carissa	U		
MENISPERMACEAE	*Carronia multisepalea*	carronia	O/C		
EUPHORBIACEAE	*Casearia multinervosa*	Casearia	U		
FABACEAE	*Castanospermum australe*	black bean	O/C		
VITACEAE	*Cayratia clematidea*	slender grape	U/O		
ARALIACEAE	*Cephalaralia cephalobotrys*	climbing panax	O		
THELYPTERIDACEAE	*Christella dentata*	dinung	O		
VITACEAE	*Cissus antarctica*	water vine	O		

Family	Scientific name	Common name	^Abund.	Status	
				EPBCA	NCA
VITACEAE	*Cissus hypoglauca*	five-leaf water-vine	O		
VITACEAE	*Cissus opaca*	small-leaf grape	U		
VITACEAE	*Cissus sterculiifolia*	long-leaf water vine	U/O		
ICACINACEAE	*Citronella moorei*	charnwood	O		
PHYLLANTHACEAE	*Cleistanthus cunninghamii*	cleistanthus	O		
VERBENACEAE	*Clerodendron tomentosum*	hairy clerodendron	U		
BYTTNERIACEAE	*Commersonia bartramia*	brown kurrajong	U		
LAXMANNIACEAE	*Cordyline petiolaris*	broad-leaf palm-lilly	U/O		
LAXMANNIACEAE	*Cordyline rubra*	red fruit palm-lilly	O		
MYRTACEAE	*Corymbia intermedia*	pink bloodwood	O/C		
EUPHORBIACEAE	*Croton acronychioides*	thick-leaf croton	U		
LAURACEAE	*Cryptocarya glaucescens*	jackwood	O		
LAURACEAE	*Cryptocarya laevigata*	red-fruited laurel	C		
LAURACEAE	*Cryptocarya macdonaldii*	cryptocarya	O		
LAURACEAE	*Cryptocarya microneura*	murrogun	U		
LAURACEAE	*Cryptocarya obovata*	pepperberry tree	O		
LAURACEAE	*Cryptocarya sclerophylla*	cryptocarya	U/O		
LAURACEAE	*Cryptocarya triplinervis*	three-veined cryptocarya	U		
SAPINDACEAE	*Cupaniopsis parvifolia*	small-leaf tuckeroo	U		
SAPINDACEAE	*Cupaniopsis serrata*	smooth tuckeroo	O		
CYATHEACEAE	*Cyathea cooperi*	scaly tree fern	U		
CYATHEACEAE	*Cyathea leichhardtiana*	prickly tree fern	U		
RUBIACEAE	*Cyclophyllum coprosmoides*	coast canthium	U		
POACEAE	*Cymbopogon refractus*	barbed-wire grass			
CYPERACEAE	*Cyperus gracilis*	slender flat sedge			
CYPERACEAE	*Cyperus tetraphyllus*		O		
ATHEROSPERMACEAE	*Daphnandra micrantha*	socketwood	R		
DAVALLIACEAE	*Davallia pyxidata*	hair's foot fern	U		
ORCHIDACEAE	*Dendrobium aemulum*	ironbark orchid			
URTICACEAE	*Dendrocnide excelsa*	giant stinging tree	O		
URTICACEAE	*Dendrocnide photinophylla*	shiny leaf stinging tree	O		
CELASTRACEAE	*Denhamia celastroides*	denhamia	U		
FABACEAE	*Derris involuta*	native derris	O		
LAXMANNIACEAE	*Dianella caerulea*	blue flax lilly	U/O		
POLYPODIACEAE	*Dictymia brownii*	strap fern			
DIOSCOREACEAE	*Dioscorea transversa*	native yam	O		
EBENACEAE	*Diospyros australis*	black plum	O		
EBENACEAE	*Diospyros pentamera*	myrtle ebony	O/C		

Family	Scientific name	Common name	^Abund.	Status	
				EPBCA	NCA
SAPINDACEAE	*Diploglottis australis*	native tamarind	O		
PICRODENRACEAE	*Dissiliaria baloghioides*	lancewood	C		
ORCHIDACEAE	*Dockrillia mortii*				
ORCHIDACEAE	*Dockrillia teretifolium*	bridal veil orchid	U		
BLECHNACEAE	*Doodia aspera*	prickly rasp fern	O		
BLECHNACEAE	*Doodia caudata v caudata*	small rasp fern	U		
BLECHNACEAE	*Doodia media*	rasp or hacksaw fern	U		
CARYOPHYLLACEAE	*Drymaria cordata*	tropical chickweed	O		
PUTRANJIVACEAE	*Drypetes deplanchei*	yellow tulip	O		
MELIACEAE	*Dysoxylum mollissimum*	red bean	O		
ELAEOCARPACEAE	*Elaeocarpus eumundi*	Eumundi quandong	U		
ELAEOCARPACEAE	*Elaeocarpus grandis*	blue quandong	O		
ELAEOCARPACEAE	*Elaeocarpus obovatus*	hard quandong	U		
URTICACEAE	*Elatostema reticulatum*	rainforest spinach	U		
URTICACEAE	*Elatostema stipitatum*	small soft nettle	U		
SAPINDACEAE	*Elattostachys nervosa*	green tamarind	O		
MYRSINACEAE	*Embelia australiana*	embelia	O		
RHAMNACEAE	*Emmenosperma alphitonioides*	yellow ash	U		
LAURACEAE	*Endiandra compressa*	white bark	U		
LAURACEAE	*Endiandra discolor*	rose walnut	O		
LAURACEAE	*Endiandra pubens*	hairy walnut	O		
POACEAE	*Entolasia stricta*	wiry panic			
MYRTACEAE	*Eucalyptus grandis*	rose gum	C		
MYRTACEAE	*Eucalyptus microcorys*	tallowwood	O		
MYRTACEAE	*Eucalyptus pilularis*	blackbutt			
MYRTACEAE	*Eucalyptus propinqua*	grey gum	U		
MYRTACEAE	*Eucalyptus tereticornis*	Queensland blue gum			
EUPOMATIACEAE	*Eupomatia bennettii*	small bolwarra	U		
EUPOMATIACEAE	*Eupomatia laurina*	bolwarra	O		
ANACARDIACEAE	*Euroschinus falcata*	ribbonwood	O		
LAXMANNIACEAE	*Eustrephus latifolius*	wombat berry	U		
EUPHORBIACEAE	*Excoecaria dallachyana*	blind-your-eye	U		
MORACEAE	*Ficus coronata*	creek sandpaper fig	O		
MORACEAE	*Ficus fraseri*	sandpaper fig	U		
MORACEAE	*Ficus macrophylla*	Moreton bay fig	U		
MORACEAE	*Ficus obliqua*	small-leaved fig	O		
MORACEAE	*Ficus virens*	white fig	U		
MORACEAE	*Ficus watkinsiana*	nipple fig, strangler fig	U		
CYPERACEA	*Fimbristylis dichotoma*	common fringe sedge			
FLAGELLARIACEAE	*Flagellaria indica*	flagellaria	O		
RUTACEAE	*Flindersia bennettiana*	Bennett's ash	U		

Family	Scientific name	Common name	^Abund.	Status	
				EPBCA	NCA
RUTACEAE	*Flindersia schottiana*	bumpy ash	O		
RUTACEAE	*Flindersia xanthoxyla*	yellow wood			
PANDANACEAE	*Freycinetia excelsa*	narrow-leaved climbing pandanus	U		
PANDANACEAE	*Freycinetia scandens*	broad-leaved climbing pandanus	O		
CYPERACEA	*Gahnia aspera*	red-fruited saw-sedge			
HEMEROCALLIDACEAE	*Geitonoplesium cymosum*	scrambling lilly	O		
GERANIACEAE	*Geranium solanderi*	native geranium			
PHYLLANTHACEAE	*Glochidion ferdinandi*	cheese tree	O		
VERBENACEAE	*Gmelina leichhardtii*	white beech	U		
MYRTACEAE	*Gossia bidwillii* (syn. *Austromyrtus bidwillii*)	python tree	O		
PROTEACEAE	*Grevillea hilliana*	white yiel yiel	U		
SIMAROUBACEAE	*Guilfoylia monostylis*	native plum	U/O		
SAPINDACEAE	*Guioa acutifolia*	northern guioa	U		
SAPINDACEAE	*Guioa semiglauca*	guioa	O		
ARACEAE	*Gymnostachys anceps*	settler's flax	O		
RUTACEAE	*Halfordia kendack*	saffron heart	U		
SAPINDACEAE	*Harpullia hillii*	blunt-leaved tulipwood	U		
SAPINDACEAE	*Harpullia pendula*	tulipwood	O		
CELASTRACEAE	*Hedraianthera porphyropetala*	hedraianthera	O		
PROTEACEAE	*Helicia glabriflora*	smooth helicia	U/O		
DILLENIACEAE	*Hibbertia scandens*	golden guinea vine			
MALVACEAE	*Hibiscus heterophyllus*	rosella			
EUPHORBIACEAE	*Homalanthus nutans*	bleeding heart	U		
FABACEAE	*Hovea acutifolia*	hovea			
APOCYNACEAE	*Hoya australis*	Australian hoya	U		
PITTOSPORACEAE	*Hymenosporum flavum*	native frangipani	U		
MENISPERMACEAE	*Hypserpa decumbens*	hyperpa			
POACEAE	*Imperata cylindrica*	blady grass			
SAPINDACEAE	*Jagera pseudorhus*	foam bark	O		
OLEACEAE	*Jasminum dallachii*	soft jasmine			
OLEACEAE	*Jasminum suliflorum*	soft jasmine	U		
DRYOPTERIDACEAE	*Lastreopsis acuminata*	shiny shield fern	O		
DRYOPTERIDACEAE	*Lastreopsis decomposita*	trim shield fern			
DRYOPTERIDACEAE	*Lastreopsis munita*	prickly shield fern			
MENISPERMACEAE	*Legnephora moorei*	round leaf vine	U		
ARECACEAE	*Linospadix monostachya*	walking stick palm	U/O		
LAURACEAE	*Litsea reticulata*	bolly gum	U		
ARECACEAE	*Livistona australis*	cabbage palm	U		

Family	Scientific name	Common name	^Abund.	Status	
				EPBCA	NCA
LAXMANNIACEAE	*Lomandra hystrix*	mat rush	O		
MYRTACEAE	*Lophostemon confertus*	brush box	O/C		
PROTEACEAE	*Macadamia ternifolia*	Maroochy nut	U		V
EUPHORBIACEAE	*Macaranga tanarius*	macaranga	U		
MORACEAE	*Maclura cochinchinensis*	cockspur thorn	C		
ZAMIACEAE	*Macrozamia lucida*	pineapple zamia	U/O		
EUPHORBIACEAE	*Mallotus claoxyloides*	smell-of-the-bush	U/O		
EUPHORBIACEAE	*Mallotus philippensis*	red kamala	O		
APOCYNACEAE	*Marsdenia rostrata*	common milk vine			
RUTACEAE	*Medicosma cunninghamii*	bonewood	U		
MELIACEAE	*Melia azedarach*	white cedar	U		
APOCYNACEAE	*Melodinus acutiflorus*	hairy melodinus	U		
ANNONACEAE	*Melodorum leichhardtii*	zig-zag vine	O		
POLYPODIACEAE	*Microsorum scandens*	fragrant fern	O		
SAPINDACEAE	*Mischarytera lautereriana*	corduroy tamarind	O		
SAPINDACEAE	*Mischocarpus anodontus*	veiny pear-fruit	O/C		
SAPINDACEAE	*Mischocarpus pyriformis*	yellow pear-fruit	O		
MYRSINACEAE	*Myrsine variabilis*	muttonwood	U		
LAURACEAE	*Neolitsea dealbata*	grey bollywood	O		
NEPHROLEPIDACEAE	*Nephrolepis cordifolia*	fishbone fern	C		
OLEACEAE	*Notelaea johnsonii*	veinless mock olive	U		
OLEACEAE	*Notelaea longifolia*	large mock olive	U/O		
SANTALACEAE	*Notothixos subaureus*	golden mistletoe			
ORCHIDACEAE	*Oberonia complanata*				
OLEACEAE	*Olea paniculata*	native olive	O/C		
OPHIOGLOSSACEAE	*Ophioglossum pendulum*	ribbon fern	U		
POACEAE	*Oplismenus aemulus*	basket grass	O		
POACEAE	*Ottochloa gracillima*	shade grass	U		
ASTERACEAE	*Ozothamnus diosmifolius*	rice flower			
MONIMIACEAE	*Palmeria scandens*	arch vine	U		
BIGNONIACEAE	*Pandorea jasminoides*	pink trumpet flower	O		
BIGNONIACEAE	*Pandorea pandorana*	wonga vine	U		
MIMOSACEAE	*Pararchidendron pruinosum*	tulip siris			
ARISTOLOCHIACEAE	*Pararistolochia praevenosa*	birdwing butterfly vine	U/O		NT
APOCYNACEAE	*Parsonsia lilacina*	crisped silkpod	U		
APOCYNACEAE	*Parsonsia straminea*	monkey vine	U		
APOCYNACEAE	*Parsonsia velutina*	hairy silkpod	U		
APOCYNACEAE	*Parsonsia ventricosa*	silkpod	U		
RUBIACEAE	*Pavetta australiensis*	butterfly bush	U		
ADIANTACEAE	*Pellaea falcata*	sickle fern	O		

Family	Scientific name	Common name	^Abund.	Status	
				EPBCA	NCA
ADIANTACEAE	*Pellaea nana*	small sickle fern	O/C		
PENNANTIACEAE	*Pennantia cunninghamii*	brown beech	O		
PIPERACEAE	*Peperomia blanda* var. *floribunda*				
MYRTACEAE	*Pilidiostigma rhytispermum*	small-leaf plum myrtle	O		
PIPERACEAE	*Piper hederaceum* (syn. *P. novae-hollandiae*)	New Holland pepper	O		
URTICACEAE	*Pipturus argenteus*	native mulberry	U		
PITTOSPORACEAE	*Pittosporum multiflorum*	orange thorn	O		
PITTOSPORACEAE	*Pittosporum undulatum*	sweet daphne	U		
POLYPODIACEAE	*Platycerium bifurcatum*	elkhorn fern	O		
POLYPODIACEAE	*Platycerium superbum*	staghorn fern	U		
LAMIACEAE	*Plectranthus parviflorus*	native coleus			
PODOCARPACEAE	*Podocarpus elatus*	brown pine	O		
FABACEAE	*Podolobium ilicifolium*	prickly pea			
COMMELINACEAE	*Pollia crispate*	pollia	U		
COMMELINACEAE	*Pollia macrophylla*	large-leaved pollia	O		
GROSSULARIACEAE	*Polyosma cunninghamii*	featherwood	U		
ARALIACEAE	*Polyscias elegans*	celery wood	O		
ARACEAE	*Pothos longipes*	pothos	O/C		
SAPOTACEAE	*Pouteria australis*	black apple	U		
SAPOTACEAE	*Pouteria myrsinoides*	blunt-leaved coondoo	U		
SAPOTACEAE	*Pouteria queenslandica*	blush coondoo	U		
ACANTHACEAE	*Pseuderanthemum variable*	love flower	U		
CUNONIACEAE	*Pseudoweinmannia lachnocarpa*	red carabeen	O		
PSILOTACEAE	*Psilotum nudum*	skeleton or fork fern	U		
RUBIACEAE	*Psychotria daphnoides*	smooth psychotria			
RUBIACEAE	*Psychotria loniceroides*	rusty psychotria	O		
RUBIACEAE	*Psychotria simmondsiana*	small psychotria	O		
POLYPODIACEAE	*Pyrrosia confluens*	robber fern	O		
POLYPODIACEAE	*Pyrrosia rupestris*	rock felt fern	U		
GROSSULARIACEAE	*Quintinia verdonii*	grey possumwood	U		
RUBIACEAE	*Randia benthamiana*				
MYRTACEAE	*Rapanea variabilis*	scrub turpentine	U		
SAPINDACEAE	*Rhysotoechia bifoliolate subsp. bifoliolate*				
RIPOGANACEAE	*Ripogonum elseyanum*	hairy supplejack	O		
LAXMANNIACEAE	*Romnalda strobilacea*	romnalda	U/O		V
ROSACEAE	*Rubus moluccanus*	molucca bramble	U		

Family	Scientific name	Common name	^Abund.	Status	
				EPBCA	NCA
ROSACEAE	*Rubus parvifolius*	pink-flowered native raspberry	O		
RUTACEAE	*Sarcomelicope simplicifolia*	yellow aspen			
SAPINDACEAE	*Sarcopteryx stipata*	steelwood	O		
PHYLLANTHACEAE	*Sauropus albiflorus*	snowbush			
CUNONIACEAE	*Schizomeria ovata*	crab apple	O		
FLACOURTIACEAE	*Scolopia braunii*	flintwood			
CYPERACEAE	*Scleria sphacelata*	wasted nut rush	O		
APOCYNACEAE	*Secamone elliptica*	secamone			
ELAEOCARPACEAE	*Sloanea australis*	maiden's blush	O		
ELAEOCARPACEAE	*Sloanea woollsii*	yellow carrabeen	O		
SMILACACEAE	*Smilax australis*	Austral smilax	O/C		
SMILACACEAE	*Smilax glyciphylla*	sarsaparilla	U		
SOLANACEAE	*Solanum densevestitum*	felty nightshade			
PROTEACEAE	*Stenocarpus sinuatus*	firewheel tree	U		
MENISPERMACEAE	*Stephania japonica*	snake vine	U		
STERCULIACEAE	*Sterculia quadrifida*	peanut tree	U		
GLEICHENIACEAE	*Sticherus flabellatus*	shining fan fern			
MORACEAE	*Streblus brunonianus*	whalebone	U		
MYRTACEAE	*Syncarpia glomulifera*	turpentine			
MELIACEAE	*Synoum glandulosum*	scentless rosewood	U/O		
MYRTACEAE	*Syzygium australe*	brush cherry	U		
MYRTACEAE	*Syzygium crebrinerve*	purple cherry	U		
MYRTACEAE	*Syzygium floribundum*	weeping lilly pilly	O		
MYRTACEAE	*Syzygium francisii*	giant water gum	O		
MYRTACEAE	*Syzygium hodgkinsoniae*	red lilly pilly	U/O		V
MYRTACEAE	*Syzygium ingens*	red apple	U		
APOCYNACEAE	*Tabernaemontana pandacaqui*	banana bush	U/O		
WINTERACEAE	*Tasmannia insipida*	brush pepper bush	O		
VITACEAE	*Tetrastigma nitens*	three-leaved water vine	U		
ORCHIDACEAE	*Thelychiton speciosus* (syn. *Dendrobium speciosum*)	rock orchid			
POACEAE	*Themeda triandra*	kangaroo grass			
SAPINDACEAE	*Toechima dasyrrhache*	blunt-leaved steelwood			
MELIACEAE	*Toona ciliate*	red cedar	R		
ULMACEAE	*Trema tomentosa*	native peach	U		
EPACRIDACEAE	*Trochocarpa laurina*	tree heath	U		
MORACEAE	*Trophis scandens*	burny vine	O		
APOCYNACEAE	*Tylophora paniculata*	thin-leaved tylophora	U		
VIOLACEAE	*Viola banksii*	native violet	U		

Family	Scientific name	Common name	^Abund.	Status	
				EPBCA	NCA
VERBENACEAE	*Vitex lignum-vitae*	lignum-vitae	O		
MYRTACEAE	*Waterhousea floribunda*	weeping lilly pilly			
MONIMIACEAE	*Wilkiea macrophylla*	large-leaved wilkiea			
XANTHORRHOEACEAE	*Xanthorrhoea latifolia subsp. latifolia*	grasstree			
XANTHORRHOEACEAE	*Xanthorrhoea macronema*	bottle brush grasstree	O		
RUTACEAE	*Zieria smithii*	sandfly zieria	U/O		

Olsen, 2003; ECO 9, 2011

Appendix 5: Animals species list*

EPBCA = Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*; NCA = Qld *Nature Conservation Act 1992*

E = Endangered; LC =Least Concern; V = Vulnerable

Scientific name	Common name	Status	
		EPBCA	NCA
Amphibians			
Limnodynastes peronii	striped marshfrog	-	-
Litoria fallax	eastern sedgefrog	-	-
Litoria gracilenta	graceful treefrog	-	-
Litoria peronii	emerald-spotted treefrog	-	-
Litoria wilcoxii	stoney creek frog	-	-
Mixophyes fasciolatus	great barred frog	-	-
Mammals			
Antechinus flavipes	yellow-footed antechinus	-	-
Antechinus mysticus	buff-footed antechinus	-	-
Austronomus australis	white-striped free-tailed bat	-	-
Chalinolobus morio	chocolate wattled bat	-	-
Isoodon macrourus	northern brown bandicoot	-	-
Melomys cervinipes	fawn-footed melomys	-	-
Miniopterus australis	little bentwing bat	-	-
Myotis macropus (unconfirmed)	large-footed myotis	-	-
Nyctophilus spp.	long-eared bat species	-	-
Perameles nasuta	long-nosed bandicoot	-	-
Pseudocheirus peregrinus	common ring-tailed possum	-	-
Rattus fuscipes	bush rat	-	-
Rhinolophus megaphyllus	eastern horseshoe bat	-	-
Thylogale sp.	pademelon	-	-
Trichosurus caninus	short-eared brushtailed possum	-	-
Vespadelus pumilus	eastern forest bat	-	-
Wallabia bicolor	swamp wallaby	-	-
Reptiles			
Anomalopus verreauxii	Verreaux's skink	-	-
Lampropholis delicata	delicate skink	-	-
Lygisaurus foliorum (syn. *Carlia foliorum*)	irridescent litter-skink	-	-
Morelia spilota	carpet python	-	-
Ramphotyphlops proximus	blind snake	-	-
Saproscincus rosei	rose-shaded skink	-	-
Silvascincus murrayi (syn. *Eulamprus murrayi)*	Murray's skink	-	-
Varanus varius	lace monitor	-	-
Birds			
Cyclopsitta diophthalma coxeni	Coxen's fig parrot	E	E
Freshwater crustaceans			
Euastacus hystricosus	Conondale spiny crayfish	-	-

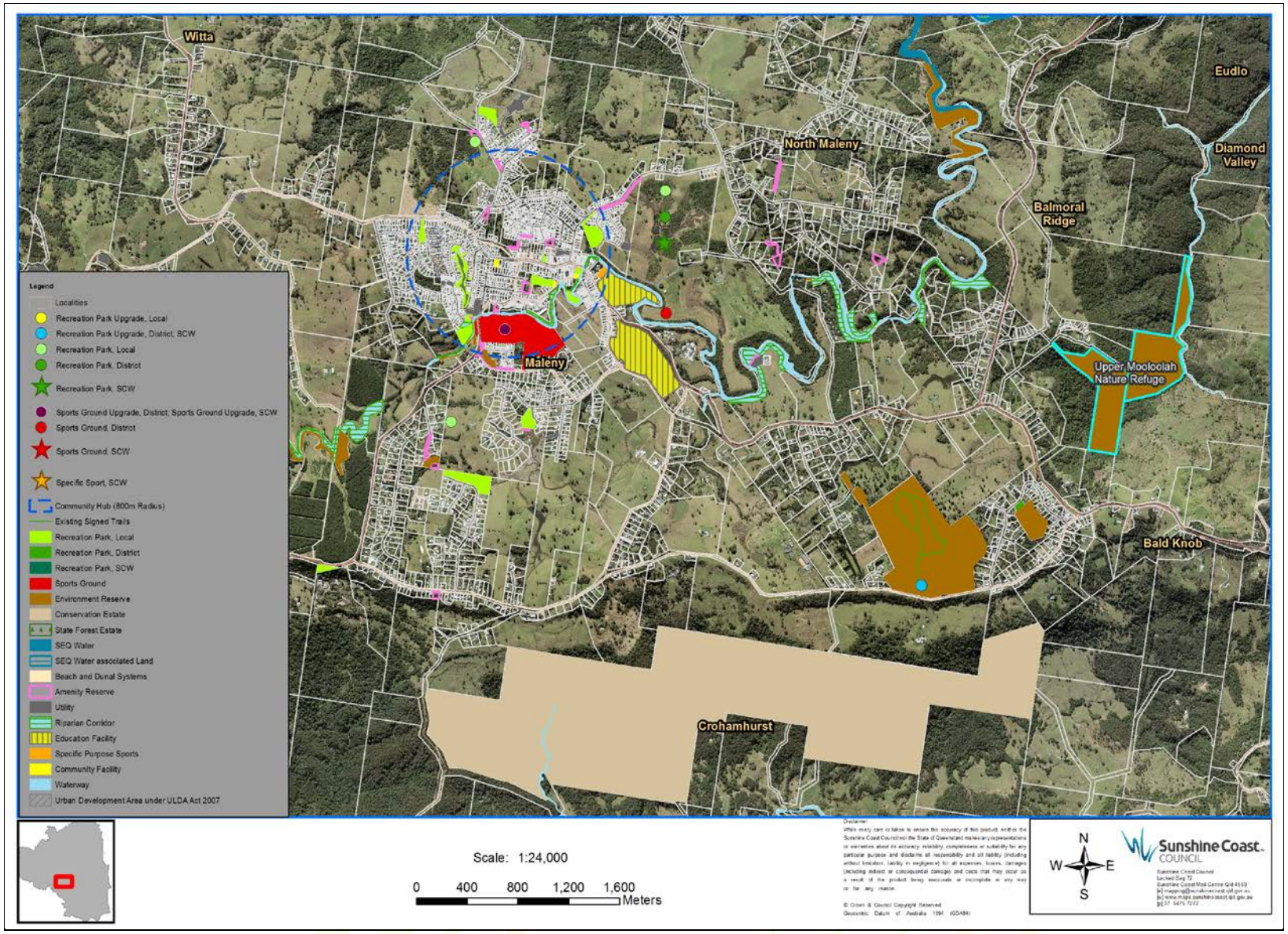
**** FPE, 2014; FPE, 2015 surveys.***

Appendix 6: Invasive plants and animals list*

Family	Scientific name	Common name	Status under Bio Act 2014
Invasive Plants			
ASTERACEAE	*Ageratina adenophora*	crofton weed	Locally Significant Invasive
ASTERACEAE	*Ageratina riparia*	mist flower	Locally Significant Invasive
ASTERACEAE	*Ageratum houstonianum*	blue top	Locally Significant Invasive
APOCYNACEAE	*Asclepias curassavica*	Mexican butterfly weed	Locally Significant Invasive
ASTERACEAE	*Baccharis halimifolia*	groundsel bush	Restricted invasive
ASTERACEAE	*Bidens pilosa*	cobbler's pegs	Locally Significant Invasive
ASTERACEAE	*Cirsium vulgare*	spear thistle	Locally Significant Invasive
APIACEAE	*Cyclospermum leptophyllum*	slender celery	Locally Significant Invasive
FABACEAE	*Desmodium intortum*	greenleaf desmodium	Locally Significant Invasive
FABACEAE	*Desmodium uncinatum*	silverleaf desmodium	Locally Significant Invasive
ASTERACEAE	*Eclipta prostrata*	flase daisy	Locally Significant Invasive
ACANTHACEAE	*Hypoestes sanguinolenta*	polka-dot plant	Locally Significant Invasive
VERBENACEAE	*Lantana camara*	lantana	Restricted invasive
OLEACEAE	*Ligustrum lucidum*	large-leaved privet	Restricted invasive
OLEACEAE	*Ligustrum sinense*	small-leaved privet	Restricted invasive
BIGNONIACEAE	*Macfadyena unguis-cati*	cat's claw creeper	Restricted invasive
POACEAE	*Megathyrsus maximus* (syn. *Panicum maximum*)	Guinea grass	Locally Significant Invasive
POACEAE	*Melinis minutiflora*	molasses grass	Locally Significant Invasive
ACANTHACEAE	*Odontonema tubiforme*	fire spike	Locally Significant Invasive
POACEAE	*Paspalum dilatatum*	dallis grass	Locally Significant Invasive
POACEAE	*Paspalum mandiocanum*	broadleaf paspalum	Locally Significant Invasive
PASSIFLORACEAE	*Passiflora suberosa*	small passion flower	Locally Significant Invasive
PASSIFLORACEAE	*Passiflora subpeltata*	white passion flower	Locally Significant Invasive
POACEAE	*Pennisetum clandestinum*	kikuyu grass	Locally Significant Invasive
ACANTHACEAE	*Ruellia squarrosa*	water bluebell	Locally Significant Invasive
ARALIACEAE	*Schefflera actinophylla*	umbrella tree	Locally Significant Invasive
MALVACEAE	*Sida rhombifolia*	sida	Locally Significant Invasive
SOLANACEAE	*Solanum americanum*	glossy nightshade	Locally Significant Invasive
SOLANACEAE	*Solanum chrysotrichum*	devil`s fig	Locally Significant Invasive
SOLANACEAE	*Solanum hispidum*	giant devil's fig	Locally Significant Invasive
SOLANACEAE	*Solanum linnaeanum*	apple of sodom	Locally Significant Invasive
SOLANACEAE	*Solanum mauritianum*	wild tobacco	Locally Significant Invasive
Invasive/Introduced Animals			
BOVIDAE	*Bos taurus/indicus*	cow	
CANIDAE	*Canis familiaris*/*C. lupus dingo*	wild dog/dingo	Restricted invasive
FELIDAE	*Felis catus*	cat/feral cat	Restricted invasive
MURIDAE	*Mus musculus*	house mouse	
BUFONIDAE	*Rhinella marina*	cane toad	Invasive

Olsen, 2003; ECO 9, 2011; FPE, 2014; FPE, 2015 surveys.

Appendix 7: SCC Regional Open Space Planning Areas – current and future



Glossary and abbreviations

ASL
Above sea level

Bio Act
Queensland - *Biosecurity Act 2014*.

BOA
Bushland operational assessment (a resilience-based condition assessment to guide management).

EPBCA
Commonwealth - *Environment Protection and Biodiversity Conservation Act 1999*.

EVNT
Endangered, vulnerable or near threatened.

IBRA
Interim Biogeographic Regionalisation for Australia.

LiDAR
Light detection and ranging.

NCA
Queensland - *Nature Conservation Act 1992*.

RE
Regional ecosystem.

RWP
Restoration works plan.

SCLGA
Sunshine Coast local government area.

SEQ
South-east Queensland.

UMNR
Upper Mooloolah Nature Refuge.

VMA
Queensland - *Vegetation Management Act 1999*.

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