Sunshine Coast COUNCIL

Attachment Folder

Ordinary Meeting

Thursday, 18 May 2017

commencing at 9.00am

Council Chambers, 1 Omrah Avenue, Caloundra

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Sunshine Coast Council
Environmental Reserves Network Management Plan

2017– 2027

The Environmental Reserves Network Management Plan—comprised of three key documents—will guide and support the sustainable management of council's environmental reserve network over the next ten years. Volume I Environmental Reserves Network Management Plan: describes current management issues and provides a framework of goals objectives and targets which aim to maintain or improve identified values; Volume II Environmental Reserves Network Management Plan Service Level Framework: is an operational tool for allocating resources and the provision of services to each reserve and; Volume III Environmental Reserves Network Management Plan Manual: includes templates, restoration guidelines, links to other key documents and best practice manuals, and provides the current legislative framework for restoration and natural area management.

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Acknowledgements

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INTRODUCTION

Council manages a large and diverse range of environmental reserves which have an important role to play in the protection of the regions natural values and associated lifestyle. Therefore the Environmental Reserves Network Plan (ERNMP) has been developed as a key action in supporting the aim of the SCC Biodiversity Strategy 2010–2020 to expand, protect and enhance council's environmental reserve network.

Overview

As shown in the diagram below the Plan (a) Describes five reserve categories which will simplify management planning; (b) Contains general information on ecological, social, economic and cultural values found within the reserves; (c) Provides an implementation program based on five themes which complement Councils Biodiversity and Open space strategy; (d) Guides future coordinated reserve management by providing overarching goals and measurable targets which have been developed with extensive stakeholder input across Council; and (e) is guided by eight best practice principles which are the foundation for reserve management in the future

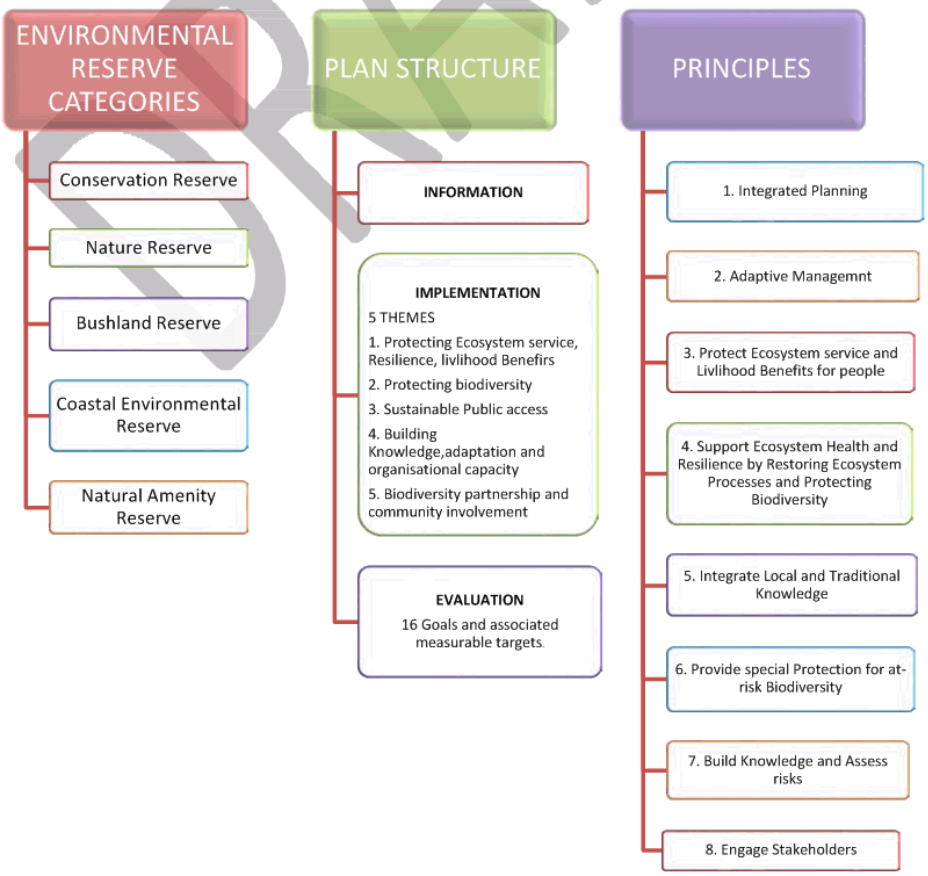

Figure 1. The Plan at a Glance:
Five Reserve categories
Sixteen Goals
Eight Principles

Eight (8) best practice principles[1] for reserve management guide the coordinated delivery of actions described in this plan. These principles recognise the importance of a reserve network that is not only protecting and restoring the plants, animals and ecosystems of the reserves, but is also resilient, adaptable and cost effective and a valued part of our community wellbeing and livelihood.

1. **Integrated planning and management** ensures all relevant parties and associated policies and strategies have been included in the Plan
2. **Contribute to adaptive management** so that future changes can be addressed in a timely manner
3. **Protect ecosystem service and livelihood benefits for people** because these direct benefits to the people will ensure our reserves are valued in the future
4. **Support ecosystem health and resilience** by restoring ecosystem processes and protecting biodiversity. This will ensure the reserves are more cost effective to maintain and will not be impacted by economic and social changes in the future
5. **Integrate local and traditional knowledge** which can provide deeper insights into reserve management and adds value and interest which was not previously known.
6. **Provide special protection for 'at-risk' biodiversity** which is a statutory requirement for reserve managers
7. **Build knowledge and assess risks** both within the organizational capacity of Council as land managers and for a greater understanding of how to best protect and maintain wildlife systems within the reserves
8. **Engage stakeholders to ensure reserve management** is meeting public expectations and to gain knowledge and innovative opportunities

Council's environmental reserve network, comprising 547 properties, represents approximately 11% (5,782ha.) of the Sunshine Coast's protected area estate. These reserves range in size from small parcels less than 1ha to much larger reserves which are up to 333 ha's. The reserves are located throughout all 6 catchments - Pumicestone, Stanley, Mooloolah, Maroochy, Noosa and Mary - and from the coastal plain to the uplands of the Sunshine Coast hinterland featuring the Conondale Range.

Most of the reserves are accessible to the public with facilities and infrastructure supporting a range of recreational, cultural and educational activities. These include a public access trail network over 131km that facilitates walking, bicycle and horse trails in designated areas, fire trails, a permit process which facilitates research and environmental and cultural educational programs within the reserves, and community partnerships in bush care. Council also manages three reserves with developed visitor centers that supports approximately 245,000 visits per year, which include interpretative displays, educational resources, art exhibition space and guided walks supported by community volunteers.

Some of the significant environmental values which are represented across the reserves include iconic landscape features including Mt Ninderry and the Coastal foreshore reserves, high biodiversity, and nationally endangered plant and animal species including many such as the Buderim Holly which are only found on the Sunshine Coast.

Whilst many reserves are in good condition and contain a high variety of native plant and animal species and offer important protection for our endangered plants and animals—there is still a lot of work to be done restoring these areas to their previous richness and enabling our natural assets to be more resilient in the

[1] Appendix 3 provides details of each principle

future.

Therefore this whole of reserve plan has been developed to review what has been our approach to reserve management to date, reinforce what we already do, and propose new directions and added value for future sustainable management.

To address the complexity of issues in reserve management the plan delivers innovative solutions under 5 themes:

- Protecting and restoring ecosystem service, resilience and livelihood benefits
- Protecting existing biodiversity values
- Facilitating sustainable access
- Building knowledge, adaptation and organisational capacity
- Maintaining biodiversity partnerships and community involvement

Guided by Councils Asset Management Plans, the Environmental Reserves Network Plan provides a guideline that focuses resources where they count and delivers added benefits to the community. This will specifically support the performance measures in the Coastal and Environmental Infrastructure Asset Management Plan 2015 (s1.4.2)—*to provide ecological protection services that will enable sustainable and where possible an improved contribution to global biodiversity, with sustainable recreation opportunities dependent on the location and its natural values*

Ultimately the ERNMP supports the delivery of council's corporate vision to be Australia's most sustainable region – healthy, smart, creative.

Purpose of the Plan

The Environmental Reserves Network Management Plan (2017 - 2027) sets the priorities for the management of council's Environmental Reserves over the next 10 years. These priorities are underpinned by the environmental reserves significant ecological, social, cultural and economic values.

The purpose of reserve management is to ensure the ecological, social, cultural and economic values are protected and maintained.

Scope

- Compliance with statutory requirements relating to environmental management and public safety
- Consistent with Sunshine Coast Council corporate policies, strategies and plans
- Sets the direction for the effective management and future use of the environmental reserves, including conservation, education, research and eco-recreation.
- Consolidate the planning context and broad range of issues relating to environmental reserve into a single document
- Applies to all council managed Environmental Reserves.
- Reserve statistics reflect a point in time when this plan was written, providing a baseline for a two, five and ten year plan review.

Policy and Legislation

The Sunshine Coast Council Biodiversity Strategy and the Sunshine Coast Council Open Space Strategy provide the head of power within Council for the Environmental Reserves Network Management Plan

The diagram below shows where the ERNMP sits in relation to Councils Corporate and Operational planning hierarchy

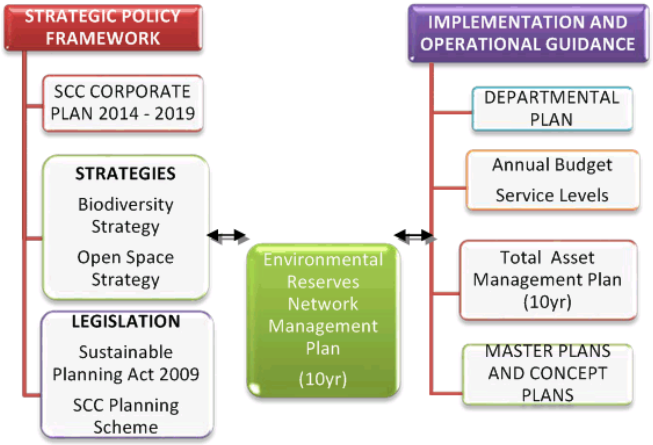

Figure 1 Planning hierarchy showing where the Plan incorporates Sunshine Coast Council policy and informs operational management decisions pertaining to environmental

The Plan also integrates and delivers actions on the policy outcomes of other strategies and plans including the Sunshine Coast Council Asset Management Plan Coastal and Environmental Infrastructure 2015, Recreational Trails Plan 2012; Waterways and Coastal Management Strategy 2011-2021; Sunshine Coast Community Plan and the Council's Pest Management Plan 2012-2016.

Under State and Commonwealth Law Council also has a range of statutory and non-statutory obligations for the protection of the environment, public safety, good governance and sustainable planning outcomes.

Table 1 below lists all relevant legislation, including statutory and non-statutory instruments and head of power within Sunshine Coast Council which apply to reserve management actions. These apply to the following key activities carried out on Environmental Reserves:

- ecological restoration
- vegetation management
- vegetation offsets
- species protection
- fire management, and
- the control of declared pests.

Further detailed information about relevant legislation and policy is contained in ERNMP Volume Three Resources manual.

Table 1 Statutory and non-statutory instruments relevant to bushland reserve management

Statutory Instrument	Government Administrator
The Environment Protection and Biodiversity Conservation Act 1999	Commonwealth
Agricultural and Veterinary Chemicals (Queensland) Act 1994	State
Aboriginal Cultural Heritage Act 2003	State
Agricultural Chemicals Distribution Control Act 1998	State
Biosecurity Act 2014	State
Chemical Usage (Agricultural and veterinary) Control Act 1988	State
Coastal Protection and management Act 1995	State
Environmental Offset Act 2014	State
Environmental Protection Act 1994	State
Fire and Rescue Service Act 1990	State
Nature Conservation Act 1992;	State
The Land Act 1994	State
The Local Government Act 2009 (QLD) (LGA 2009)	
Plant Protection Act 1989	State
Regional Planning Interests Act 2014—Repealed the Strategic Cropping Land Act 2011	State
SEQ Regional Plan 2009 - 2031	State
Sustainable Planning Act 2009	State
Vegetation management Act 2009	State
South East Queensland Koala conservation State Planning Regulatory Provisions (SPRP)	State
State Planning Policy 2/10 Koala Conservation in SEQ	State
SCC Planning Scheme	Local
Non-statutory instrument	
SEQ NRM Plan 2009 – 2031	State
Draft SEQ Climate Change Management Plan 2009 – 2031	State
SCC Biodiversity Strategy 2010 -2020 (head of power)	Local
SCC Open Space Strategy 2011	Local

Council's Environmental Reserve Estate

There are currently over 547 Environmental Reserve properties with a total area, approximately 5 782ha. This represents approximately 11% of the Sunshine Coasts protected area estate.

Reserve land is acquired through developer contributions and the Environmental Levy land acquisition program. Thus the majority of Environmental Reserves are owned by council as fee simple land tenure, however there are some which are crown land in trust.

14 reserves—comprising 500.48ha which is approximately 9% of the total reserve area—are declared Nature Refuge sites. Nature Refuge reserves have extra conservation status under the *nature Conservation Act 1992.*

Open Space Categories

Reserves within the network comprise many individual areas differing in size, access opportunities, and ecological significance.

Environmental reserves are divided into five broad open space categories:

- Conservation Reserve
- Nature Reserve
- Bushland Reserve
- Coastal Environmental Reserve
- Natural Amenity Reserve

Conservation Reserve

The primary purpose of a conservation reserve is the protection and enhancement of the sites significant terrestrial, riparian and aquatic habitats including various plant and animal communities.

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

Any identified secondary purposes in these reserves are limited. Appropriate activities could be supported by low impact infrastructure where required. These reserves may support research activities.

Access is restricted—managed through research permits and supervision.

Currently less than 5% of reserves would be in this category.

Nature Reserve

The primary purpose of a nature reserve is the protection and enhancement of the sites significant terrestrial, riparian and aquatic habitats including various plant and animal communities.

Nature reserves have significant ecological values and may provide habitat for threatened or locally significant species. Contains areas of remnant vegetation and may also contain areas of degraded habitat (cleared and non-remnant vegetation) that require rehabilitation to consolidate the reserve and build landscape connectivity.

Secondary purposes include sustainable recreation, research, and education activities associated with the promotion and knowledge sharing of the sites ecological and cultural values.

Access is supervised—managed through permits, opening hours, or the on-site presence of staff or authorised volunteers.

Bushland Reserve

The primary purpose of a bushland reserve is the protection and enhancement of the sites terrestrial, riparian and aquatic habitats including various plant and animal communities.

Bushland reserves have areas of degraded habitat (cleared areas and non-remnant vegetation) that requires rehabilitation to

consolidate the reserve and build landscape connectivity. May also contain areas of remnant vegetation and may provide habitat for rare and threatened species or locally significant species.

Bushland reserves are more resilient to external impacts and may support various sustainable nature based activities.

Access is unsupervised and facilitated and managed through signage, reserve landscape design and purpose built infrastructure.

Coastal Environmental Reserve

The primary purpose is for the protection and enhancement of coastal habitat (dunal, foreshore, headlands and beach) which may include significant flora and fauna (e.g. turtle's and migratory wader birds).

Coastal process can occur naturally without the need for interference

Appropriate management responses are guided by the level of modification on and demand of the coastal reserves, which can include formal public access and approved viewing areas.

Natural Amenity Reserve

Natural Amenity Reserves contribute to the local environment, amenity and character of an area.

Natural Amenity Reserves generally consist of small fragmented patches of land that contain a mix of remnant and non-remnant vegetation and the associated habitat. These reserves, which can also include drainage elements may be impacted by the adjacent land use and have ongoing edge effects.

Recreational opportunities are likely to be limited given the small size of these reserves but may support linkages to other areas.

Roles and Responsibilities

The goal of reserve management to date has been to maintain or restore native vegetation according to regional ecosystem classifications, protect any threatened species which have been identified within a reserve and facilitate and maintain community access where appropriate. These actions aim to protect native fauna and flora, ensure public safety and support education, culture and eco-recreation.

Fundamental to the allocation of resources for reserve management is the service level scoring matrix[2]. In summary each reserve is allocated management resources (labor days for weed control, inspection schedules, slashing etc.) in accordance with a reserve score. Reserve scores are determined by a range of factors including size, biodiversity and recreational elements. The reserves are divided into four service level categories—B1, B2, B3 and natural amenity—however the matrix is more complex with each reserve also assigned a recreational score (R1-R3) and an educational score (E1,E0) to guide the annual service requirements of each site.

The Environmental Operations Natural Areas team is responsible for the operational planning, management and maintenance of the reserves and associated facilities. The primary activity of the team in the management of Councils Environmental Reserves is to protect and maintain ecological values within these areas; undertake ecological restoration; provide for safe and sustainable built assets (for the protection of fauna and flora, public safety and recreational opportunities) and facilitate community involvement in the maintenance of reserve values.

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[2] Described in detail in Volume II Environmental Reserves Network management Plan Service Level framework

Council is also required to manage fire hazards associated with reserves in conjunction with protecting regional ecosystems and public safety.

Each reserve may also be guided by a specific management intent which is identified in the reserve management plan and for nature Refuges is guided by the IUCN category[3].

All management actions —guide by the operational service level—are delivered on a site by site basis. Future management will include monitoring the ecological outcomes of these activities.

Operational activities which apply to the management of the environmental reserve network are also supported by important collaborations with other groups in council including; Community Partnerships; Coast, Constructed Water and Planning, Healthy Places; Community Land Permits and Parking; Response Services; Communication, Parks and Gardens; Community Relations; Community Programs and Events; Project Delivery; Employment and Development; Environment and Sustainability Planning; Development Services; and Property Management.

Table 2 shows the range of reserve management activities and associated sectors carrying responsibility for these actions.

[3] IUCN. (2008). '*Guidelines for Applying Protected Area Management Categories*', N Dudley (Ed), Gland, Switzerland.

Table 2: Key Operational Activities within Environmental Reserves

Activity	Description	Responsibility
Fauna and Flora assessments	Required for elected high value reserves as per service level classification Aims to identify reserve values and inform the management plans to protect these values. The distribution of significant species records are captured on a council GIS database.	Natural Areas planning team.
Fire Management Plans	Required for selected high value reserves as per service level or where there is an identified fire hazard associated with the reserve.	Natural Areas planning team and Bushfire Management Officer
Community Volunteers	Community conservation volunteers, guides, environmental visitor education centre volunteers	Natural Areas team; Community Partnerships; Employment and Development
Bushland Operational Assessment	Provides a resilience based condition assessment reviewed every 5 -10 years depending on reserve classification.	Natural Areas planning team
Bush Regeneration Works Plan	Underpinned by the BOA; Developed for each reserve to guide restoration activity over 10 years	Natural Areas planning team
Management Plans	Required for high value reserves as per service level. This may include landscape or site master plans. A management plan describes the primary purpose and objectives specific to a reserve	Natural Areas planning team.
Ecological Restoration	Ecological restoration is the approach taken by natural areas in the restoration and maintenance of native vegetation and habitat. Standard practice is guided by the SEQ Ecological Restoration Framework manual. This approach is underpinned by scientific ecological research, Australian and international standards of best practice in ecological restoration, and local knowledge.	Natural Areas planning and operational teams; Community Conservation Partnerships team
Pest Animal Management	Control and monitoring of declared pest animals	Healthy Places Team
Customer Request Management	Responding to boundary issues including over-hanging branches or other tree hazards; controlling weeds; pest animal issues; maintaining fire breaks; illegal waste dumping in reserves, Request to access or utilise Environment Reserves, land boundary changes	Natural Areas planning and operational teams; Healthy Places pest management team; Response Services; Community Relations; Property Management
Research	Provide access and resource use permits for public	Natural Areas

Activity	Description	Responsibility
Requests	and educational/research access and use of reserve resources. Ensures all activities are compliant with relevant legislation and council policy.	planning team; Property Management
Community Land Permits	Permits for public events held on Council managed land	Community Land Permits and Parking
Compliance	Educate and regulate a range of legislation within the Sunshine Coast community	Response Services
Infrastructure and Asset Management	Capital works program; planning, construction asset inspections; asset maintenance; safety. - Includes fire trails; bridges; roads; pathways; signage; gates and fences; forestry coups;	Natural Areas Management Team; Project Delivery
Media and Marketing	Development of materials for communication, media releases, factsheets, videos, signage	Natural Areas team; Communications

Plan Structure

The Environmental Reserves Network Management Plan is divided into three volumes which provides a comprehensive guide for both strategic and operational outcomes—providing quick access to management information which is most relevant to different roles and responsibilities of operational staff and contractors working in reserve management.

Volume I: Environmental Reserves Network Management Plan – an integrated strategic and operational planning document which culminates in a comprehensive framework of goals, actions, and measurable targets to prioritise management activities across the entire reserve network, and provides a tool to monitor and evaluate performance.

Key users of the management guideline are the environmental planners; Environmental Operations branch co-ordinators; senior project officers and operational project officers.

Volume II: Environmental Reserves Network Management Plan Service Level Framework - an operational tool for allocating resources and the provision of services to each reserve.

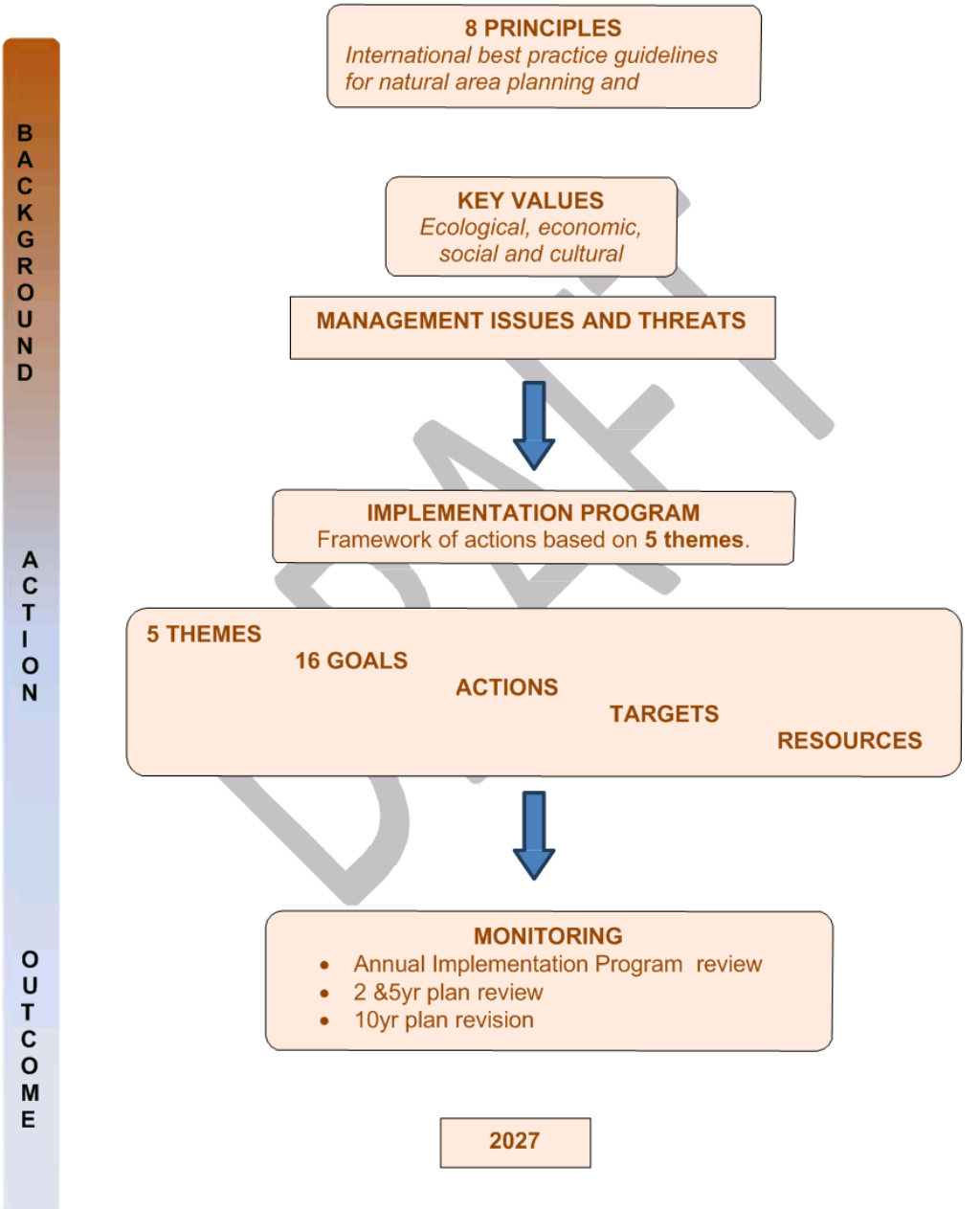
The current Service Level is a reserve classification system which guides the allocation of planning and management resources to each reserve. Reserves are classified on the basis of a range of criteria including size, biodiversity factors; recreation and infrastructure factors.

Key users of the Service Levels will be the Environmental Operations branch co-ordinators; senior project officers and operational project officers.

Volume III: Environmental Reserves Network Management Plan Manual – a compendium of resources for achieving best practice in technical operations and reporting. Includes templates, restoration guidelines, links to other key documents and manuals, and provides the current legislative framework for restoration and natural area management. These guidelines are aimed at ensuring a co-ordinated and integrated approach is implemented and outcomes align with the goals of the Network Plan.

Key users of the resources manual are all staff associated with natural area management, including field staff and contractors

PLAN OVERVIEW



BACKGROUND

1.1 Current Ecological Condition and Land Use History of Environmental Reserves

The Sunshine Coast region is recognised as a Biodiversity hotspot and important climate refuge[4]—located at the subtropical boundary between tropical and temperate bioregions to the north and south and providing wet coastal refuge for the arid areas to the west.

The sunshine coast currently provides habitat for many endangered, vulnerable and near threatened, (EVNT) plant and animal species, some of which are only found in this area. The area also provides important food resources and resting points for migratory species including birds and bats.

The landscape is characterised by diverse and iconic features including the Glasshouse Mountains and several other volcanic intrusions along the coastal zone; coastal dunes and foreshores; the Conondale range; 5 major river systems; and coastal floodplain wetlands, including 8 wetlands of national importance.

In recognition of the coasts natural heritage values, the Sunshine Coast community has endorsed a vision for the Sunshine Coast region *"to be Australia's most sustainable region—healthy, smart, creative."*

In the past 100 years, since early European settlement on the coast, there have been significant losses to the extent and condition of the sunshine coast natural heritage.

In the early pioneering days of the late 19th century the timber logs felled on the sunshine coast region were instrumental in the creation of a significant amount of Australia's earlier infrastructure, including railway and road bridges, sleepers, fence posts, house building, wharves and telegraph poles. Initial logging was followed by widespread tree clearing for agriculture and livestock grazing, especially in areas of rich volcanic soil such as the Maleny plateau. Townships and settlements arose and continue to expand to this day due to the beach and rural lifestyle and natural beauty of the area combined with its close proximity to Brisbane, a large metropolitan business centre.

Currently there is 41% of the previous extent of pre-European natural remnant vegetation throughout the Sunshine Coast region[5]. Of this, 36% is within core habitat areas and only 4.5% remains as existing or potential habitat linkages.

View from Kirbys Road Environmental reserve

[4] Maggini et al, 2013, Protecting and Restoring Habitat to Help Australia's threatened Species adapt to Climate Change.

[5] SCC Biodiversity Report, 2016

Nest boxes installed to create habitat for wildlife on reserves.

In 2016, of the total 54 173ha of protected remnant and non-remnant vegetation occurring on the sunshine coast under different land tenures, Sunshine Coast Council owns and or manages as trustee 5 782ha (approx. 11%) of the protected area, comprising over 547 Environmental Reserves. This is shown as the red areas mapped in Figure 1 below.

Council also supports a further 8 772ha (16%) of the land area being protected and managed under registered covenant and/or land for wildlife agreements. The larger proportion of protected and unprotected remnant vegetation which comprises 39 684 (73%) is managed by the Queensland government as national Parks, Nature Refuges, State Forests, or resource reserves.[6]

[6] SCC Biodiversity Report 2016

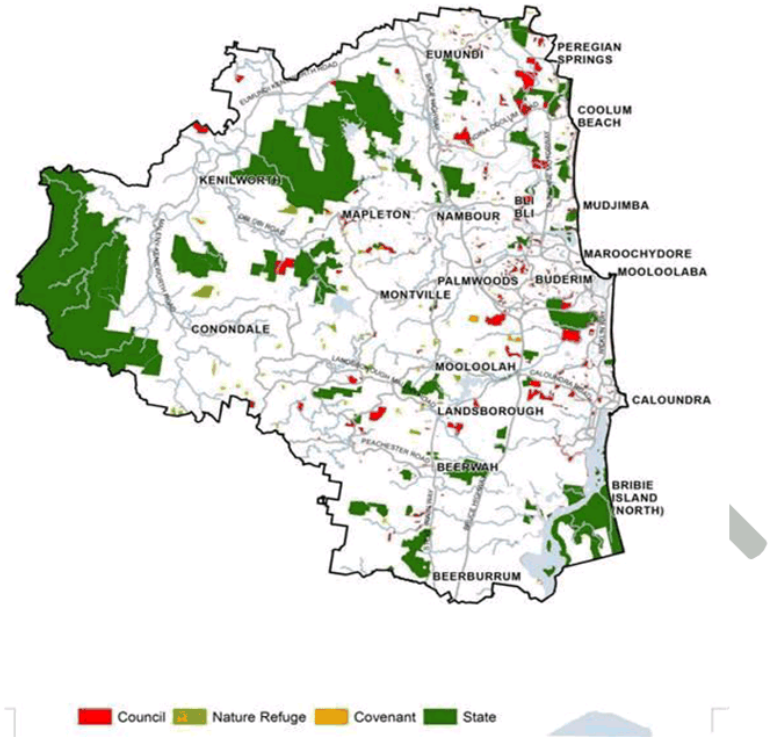
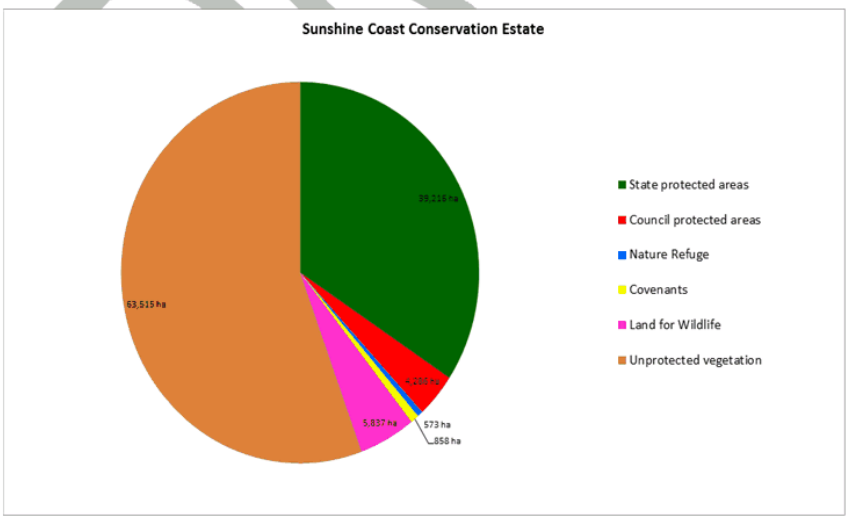


Figure 1.a) Protected areas in the Sunshine Coast



b) Sunshine Coast LGA vegetation extents within the Conservation Estate in 2014

Managing the threats to Australia's biodiversity—An Assessment of Australia's Terrestrial Biodiversity, Australian Government 2008.

A series of case studies representing a range of institutional responses revealed two particularly significant issues: ***a lack of effective and systematic monitoring systems for evaluation*** *and* ***limited resources invested in responses to threats compared with the scale and nature of the threats****.*

The scale of the impacts from threatening processes is such that the ***voluntary and uncoordinated approaches adopted to date will not be effective.*** *Getting the mix of responses right will require levels of cooperation hitherto not fully demonstrated.*

Reducing threats at a landscape scale is a major challenge but is essential to arresting decline. The ***move to large-scale, multi-partner responses that take a systems approach and focus on ecological processes*** *is an encouraging development.*

…building on, and integrating with existing programs; the need for cross tenure delivery; having well-designed monitoring and evaluation for adaptive management

1.2 Threats

A primary role of the Sunshine Coast Council's Environmental Operations natural Areas branch is to maintain the ecological values of the Environmental Reserves. Therefore it is useful to identify key threats in order to develop targeted response actions.

To ensure the actions are achieving a desired outcome it is also important to include monitoring.

An effective monitoring program which addresses council's reserve management practices will be necessary to manage threats and threatening processes.

The Sunshine Coast Biodiversity Strategy has identified key threats to biodiversity in the area. Other potential threats which have been identified through operational management of reserves can be added to this list. The relevance of these threats to council's Environmental Reserves management is summarised in Table 1.

Table 1: Threats to Biodiversity in Council's Environmental Reserves

Biodiversity Strategy	Relevance to natural Areas
Population growth and development	- Development adjoining reserves – edge effects (roaming domestic animals; weeds; run-off; road kill; wildlife movement barriers) - Reserve area diminished by requests for easements/access or boundary re-alignments – increased edge effects; habitat loss.
Veg clearing and habitat loss - *"the current rate of habitat loss is much higher than reinstatement or rehabilitation rates.* ***The Sunshine Coast is experiencing a period of net habitat loss"***[7]	- Approximately 45% of core habitat areas are protected under State, Council or private tenure. The remaining 55% is potentially under threat from future land use. This presents a significant threat to the integrity of the Council managed reserve network. - Approximately 3.3% of connecting habitat area is protected under State, Council or private tenure. The remaining 96.7% is potentially under threat from future land use. This presents a significant threat to the integrity of the Council managed reserve network.
Climate change	- Increased risk of drought, fire, higher temperatures; rising sea level and increased risk of storm surges effect foreshore reserves; increased cyclone and flooding intensity may case riparian and coastal erosion; saltwater intrusion into freshwater swamps; changes in bird behavior including arrival of migratory birds and range shifts.
Weeds and Pest Animals	- Roaming cats and dogs - Wild dogs; cats; foxes; deer; pigs and cane toads - Weeds - Relates to edge effects
Land management practices	- Altered fire regimes: fire restrictions and hazard reduction burns have negatively impacted fauna, flora and overall biodiversity values. - Pollutant runoff to waterways and wetlands - Spread of weeds; - Changed hydrological regimes.

[7] SCC Biodiversity Strategy, 2010.

Other Potential threats	
Tenure security	- Reserves have different levels of protection. - Approximately 9% are protected under state agreements, the remainder are currently subject to private tenure regulations where council is the owner or under trustee arrangements associated with the *Land Act* 1994.
Global trends (environmental scanning reports)	**Relevance to natural Areas**
Reserves being sold or re-configured for economic gain due to loss of biodiversity value. - Global trends indicate that under current pressures there is an inability to maintain biodiversity within protected areas[8]. Hence increasing pressure to forsake areas which are not fulfilling biodiversity goals. Primary threats to biodiversity include: • Reserve size and degree of isolation limits opportunities for genetic mixing • Unable to sustain maintenance costs of small reserves due to edge effects • Loss of ecological processes required to sustain biodiversity	- The Environmental Reserve network contains many small and isolated reserves. - Highlights the need to identify and promote values in addition to biodiversity in order to justify long term protection. - Highlights the importance of landscape scale management approaches—harnessing partnerships- to maintain ecological processes. *"In a world increasingly modified by human activities, the conservation of biodiversity is essential as insurance to maintain resilient ecosystems and ensure a sustainable flow of ecosystem goods and services to society. However, (small and fragmented) existing reserves and national parks are unlikely to incorporate the long-term and large-scale dynamics of ecosystems… …Present static reserves should be complemented with …dynamic successional reserves.and.. a reconsideration is required of how reserves are designed and managed as parts of dynamic landscapes increasingly dominated by humans".* Bengtsson et al. Reserves, Resilience and Dynamic Landscapes. Royal Swedish Academy of Sciences, 2003

[8] **Geldman et al. 2013.**

VALUES

Environmental Reserves support a wide range of ecological, social, economic and cultural values that contribute to the region's viability and vibrancy. **The primary purpose of natural areas management is to protect, restore and maintain these values—including the built asset components—and to facilitate opportunities for sustainable public access.** A clean and healthy environment, which both protects and preserves the natural ecological values, will also enhance community lifestyle, wellbeing and economy.

Environmental Reserves Values Statement

Diverse topography, iconic waterways and large tracts of natural bushland underpin the Sunshine Coast lifestyle, character and identity.

The Councils Environmental Reserves are valued by the community for their contribution in providing a range of educational, scientific, environmental and recreational opportunities.

Biodiversity and healthy functioning ecosystems are fundamental to all life, providing a range of essential ecosystem services such as oxygen production, water purification, pollination, soil formation and nutrient recycling.

Sixteen key ecological, economic, social and cultural values of the environmental reserves are described in the following section. These have been compiled from values listed in other council strategies and previous reserve management plans.

2.1 Ecological values

2.1.1 Biodiversity

In its narrowest sense, biodiversity is the variety of all life forms. Biodiversity is not static, but constantly changing; it is increased by genetic change and evolutionary processes and reduced by processes such as habitat degradation, population decline, and extinction.

The Australian government recognises the significance of biodiversity and is a signatory to the international biodiversity agreement, the Convention on Biological Diversity.

Biodiversity Hub

The Sunshine Coast Council area is located within the South East Queensland bioregion which is one of the state's richest areas in terms of the variety of plant and animal species.

Over 1600 individual flora and fungi species have been recorded within the Sunshine Coast's boundaries. This diversity of the Coast's vegetation supports overall biodiversity, providing feeding, sheltering, breeding and resting resources for native fauna[9].

2.1.2 Fauna and Flora

Unique and Rare

Many fauna and flora species of the Sunshine Coast area are found only in this area. The area also contains a wide range of rare and threatened species.

The Sunshine Coast Local Government Area (SCLGA) has 186 of the state's 1,379 listed *endangered, vulnerable and near threatened*

9 http://www.sunshinecoast.qld.gov.au/sitePage.cfm?code=plants-animals

(EVNT) flora and fauna species, (13%).

Endangered Giant barred frog – The largest breeding habitat in Qld is in a SCC environmental reserve.

Of the total number of native plant species, over 100 (6%) are listed as endangered, vulnerable, rare or threatened; several included on the internationally IUCN Red List of Threatened Species. *Eucalyptus conglomerata* (Swamp Stringybark) found in this area is one of the rarest eucalypts in Australia.

PROJECT SNAPSHOT
Protecting an endangered plant species

The endangered species *Graptophyllum reticulatum* (Buderim Holly) is found only in two locations on the sunshine coast, and occurs nowhere else in Australia.

The future of this species has been strengthened by securing the protection of the remaining populations through purchasing land under the council's environmental levy land acquisition program. Populations of this species area now protected and managed by council within an environmental reserve.

Over 14% of the 700 known animal species found locally are listed as endangered, vulnerable, and rare or threatened. Over 60 fauna species are listed on the internationally IUCN Red List of Threatened Species.

PROJECT SNAPSHOT
Management of a threatened fauna species in Bushland Reserves

Long Nosed potoroo (*Potorus tridactylus*) have been detected in Council reserves.

The Australian government national recovery plan for this species identifies the importance of eradicating cats and foxes to protect long nosed potoroos.

natural areas in partnership with council's Pest Management team will be trialling the use of newly approved ejector baits which have been shown to achieve a %100 target uptake.

An important aspect of the project will be the implementation of a systematic monitoring program to determine the effectiveness of council's' management approach. Council will employ ecological expert consultants to assist with the survey design and monitoring program. This scientific case study will be used to develop monitoring methods for pest management that can be used across the reserve network.

Diverse

Over 1 600 native plant species have been found in the Sunshine Coast area.

Studies conducted in the previous Maroochy Shire Council have found that the coastal rainforest and heathland communities had significant high diversity of plant families, genera and species, (Turnbull & Olsen, 1992;

Mary Maher and Associates, 1998.) Rare and threatened species are also significantly represented in these vegetation communities.

The Kenilworth Bluff Bushland Conservation Reserve (124ha) has the highest plant diversity recorded with 454 species.

Smaller reserves may contain much fewer species such as the Mooloolaba foreshore reserve with 26 recorded plant species, however with many noteworthy species, these smaller reserve are also crucial to overall plant diversity.

Over 700 animal species are known to occur in the Sunshine Coast area.

2.1.3 Regional Ecosystems

There are 84 mapped regional ecosystems within the local government area, Regional ecosystems are vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil (Sattler and Williams, 1999).

Council has recently undertaken an updated fine scale (LIDAR) vegetation mapping of the sunshine coast area leading to a more accurate assessment of vegetation cover and the total area of different regional ecosystems. This quality baseline vegetation dataset will assist with the prioritisation of management actions within the environmental reserves.

Identifying the regions poorly conserved vegetation communities will assist council to identify gaps in the conservation network's ecosystem representation and inform strategic investment priorities for Council's Environment Levy acquisition program. The ERNMP will guide management to restore and protect these valued land acquisition assets.

PROJECT SNAPSHOT
Rehabilitation of an endangered regional ecosystem

Doonan Creek Environmental reserve protects remnants of re12.3.1 endangered subtropical lowland gallery rainforest.

Historical landuse of this site includes logging, grazing and cane farming.

Specialist teams of bush regenerators, community volunteers and council officers are rehabilitating the endangered rainforest by removing barbed wire and weeds from the riparian area.

Avian surveys have detected migratory rainforest bird species utilizing the site over the winter months. More rainforest fruiting trees are needed to maintain these migratory populations so annual community planting days include planting rainforest food trees along the cleared edges of the gallery rainforest.

RE status relevant to Council's Environmental Reserves.

- Of the 92 Regional Ecosystems occurring on the sunshine coast, 9 are listed as *endangered*, 34 listed as *Of Concern* and 49 listed as *Least Concern* according to the *Vegetation Management Act 1999*.
- The Sunshine Coast currently has 33 different Regional Ecosystems that are considered to be 'Poorly' conserved using the Comprehensively and Adequately Represented (CAR) system at a Sunshine Coast scale
- 6 of the 92 RE's are not represented by any of the current protection mechanisms such as voluntary conservation agreements on private land; national parks; nature refuges; or council owned Environmental Reserves.
- Council's Environmental Reserves currently help protect 67 different RE types.

The Convention on Biological Diversity

The convention on Biological Diversity was inspired by the world community's growing commitment to sustainable development. It was signed by 150 government leaders at the 1992 Rio Earth Summit. The Convention recognises that biological diversity is about more tha n plants, animals and microorganisms and their ecosystems. It is about people and a need for food security, medicines, fresh air and water, shelter and a clean and healthy environment in which to live.

2.1.4 Landscape

The Sunshine Coast landscape is an area of 3,127 square kilometres characterised by diverse and iconic features including the Glasshouse Mountains and several other volcanic intrusions along the coastal zone; coastal dunes and foreshores; the Conondale range; 5 major river systems; and coastal floodplain wetlands, including 8 wetlands of national importance

The Biodiversity Strategies landscape vision to **protect**, **enhance**, and **connect** is supported by the Environmental Reserves management activities and the overall guidance of this Network Plan.

Green Infrastructure:
Green infrastructure is the physical natural environment within and between our cities, towns and villages. It is a network of parks, gardens, native vegetation, green corridors, waterways, street trees and open countryside. There is general consensus that protecting and enhancing green infrastructure across the landscape will build resilience to climate change, (SCC Biodiversity Strategy, 2010 – 2020).

Green infrastructure has the potential to buffer the edge effects on Environmental Reserves. This is supported by council's open space strategy under the theme to "*co-locate parks and reserves to contribute to amenity and strengthen intra-urban separation*".

The SCC Biodiversity Strategy also lists strategies and actions which aim to build green infrastructure across the landscape which will strengthen and reconnect high value natural assets and optimise the services to the community that healthy, functioning ecosystems provide. Council's Environmental Reserves will add to

and are supported by the green infrastructure network.

Under the planning scheme—in areas defined as Core Habitat—the desired environmental outcome will be to limit development potential to promote the protection and consolidation of ecological values.

In areas defined as Connecting Habitat, multiple planning outcomes may be sought. This relates to Environmental Reserves—for example—in high priority linkages, where development potential is restricted and habitat rehabilitation is promoted. A range of mechanisms both statutory and non-statutory exist whereby these linkage areas may be added to the natural areas estate, e.g. through developer contributions or offsets. This also applies to connecting habitat areas outside of the priority linkages where permitted development with compensatory habitat resulting in a net gain may also result in additions to the environmental reserve network.

Core and connecting habitat:
SCC has identified broad spatial landscape elements—'core habitat areas' and 'connecting habitat areas'—as the basis from which strategic planning and biodiversity conservation outcomes can be achieved.

The sunshine coast habitat network is divided into 48 core habitat areas comprising 79% (130,000 hectares) of the regions vegetation.

These core habitat areas are high value landscape features which have been recognised as being critical to the maintenance and protection of biodiversity in the area, (SCC Biodiversity Strategy, 2010 – 2020).

However only half of the core and connecting habitat area is protected and managed under government or non-government arrangements. From the data provided by the fine scale mapping, approximately 92.3% of all Environmental reserves occur within these core habitat areas.

LANDSCAPE FEATURES VS LANDSCAPE FUNCTION

Core habitat areas are landscape features which are a remnant of previous land use. These areas are what remain due to development constraints such as steep topography or poor soil quality. Landscape function describes an ecological landscape feature that supports biodiversity such as floodplain ecosystems.

2.1.5 Habitat Refuge

Environmental reserves act as valuable habitat refuge for native fauna. These refuge areas are the larger core habitats, including the links and/or corridors between the significant core areas and the vegetation mosaics or stepping stones across the landscape.

Isolated and small bushland fragments have been identified in previous management plans as having a limited habitat function, in comparison to remnants of larger size and greater connectivity in the landscape. However these reserves need to be reviewed in terms of their habitat function and not just as a factor of size and isolation.

Sunshine Coast Council area has also been identified as a potentially important climate change refuge due to relatively stable rainfall and temperature conditions[10].

It is predicted that many species will migrate south with increasingly warm and wet conditions found to be more favorable in this area and also inland species may be increasingly moving to the coast as they retreat from extended drought and bushfire conditions

Examples of patterns of fauna movement dependent on habitat refuge within the Sunshine Coast area.

1. Seasonal migration of birds during winter:
   a) Many open forest birds and birds of prey that feed on them migrate from the Conondale ranges into the Mary River Valley; also movement occurs east of the Blackall ranges.
   b) Several kinds of rainforest birds migrate from the range to the lowlands; and these birds provide food for migrating raptors.

   Note: none of these birds needs continuous corridors for migration. Their need is for more forest remnants in the lowlands and foothills.

   Long distance migration of birds into the region during summer or winter:
   a) During winter, many birds migrate into the region from southern Australia or further west;
   b) During summer a different suite of birds migrate into the area.
2. Diffuse movement of birds (including rainforest species), mammals and reptiles across the landscape, especially where vegetation mosaics exist:
   a) Mosaic vegetation will provide a corridor for species not averse to crossing open ground, across farmlands, using weeds for cover, when getting from one place to another. Species include Richmond Birdwing Butterfly, Mountain Brushtail Possum, Wallabies, echidnas, open forest birds, bandicoots, reptiles, frogs, and koalas.
3. Movement of fauna, which shun open ground or in areas of major impediments to movement such as houses and cane fields, requiring continuous corridors.
   a) This is critical in the coastal lowlands, because of the large expanses of houses. For example one of the few usable connections for these types of fauna between the coastal lowland and the hinterland is the Eumundi connection. Linking the Lake Weyba Complex and Coolum Complex with Mapleton State Forest. Areas in this corridor should be conserved and enhanced.
4. Movement of glossy black cockatoos and other fauna between Mapleton state forest and Imbil State forest
5. Isolation of some species because corridors have been broken

- *Adapted from Maroochy Shire Council report, 2003*

[10] **Maginni et al 2013. Protecting and restoring habitat to help Australias threatened species adapt to climate change.**

2.1.6 High Value Assets

- Iconic species and places and ecosystems are those which have local recognition and strong association with the sunshine coast.
- rare and threatened species
- nature Refuges
- B1 reserves are identified in council's reserve classification as high conservation and biodiversity value.
- Undisturbed ecosystems
- The biodiversity strategy lists eight wetlands of national importance which are highlighted environmental values of this area.

Annie Hehir Environmental Reserve

2.2 Economic Values

Councils' environmental reserves also have an important role to play in supporting the regions' economic development. The following section profiles a wide range of economic values found within the reserve network. These values provide leverage for our natural assets to assist in activating the economy through appropriate, innovative and sustainable approaches to reserve management.

The open space Environmental Reserve categories (see introduction) provide a foundation for coordinating the management of access to the reserve network and takes into account the high ecological sensitivities of some sites.

Economic values are underpinned by the third principle of reserve management:

Principle 3 is to protect ecosystem service and livelihood benefits for people where *…nature conservation remains first priority therefore any economic activities will ensure provisioning of natural capital does not inadvertently undermine conservation*

The following economic values are described in this section

1. **Ecosystem services**
2. **Nature based recreation** is also addressed as a management issue in section 3.3. This includes managing access for ecotourism and nature based recreation. Activities may include a walk in the bush or taking a painting class at a scenic location; reserves can be our celebration spaces, hosting festivals, events and social gatherings. However while access for education, ecotourism and nature based recreation is to be considered in Environmental Reserves this will not compromise the primary purpose which is conservation.
3. **Knowledge systems** includes education supported through school curriculums and training in landcare; horticultural industries; ecological restoration; botany, zoology, ecology and cultural heritage.
   Environmental reserves are frequently accessed by research institutions and schools for field work and delivery of school based curriculum.
4. **Job creation** in a range of high value industries including fauna and flora consultancies; ecological restoration and horticulture; archaeology; environmental education; landscape design; the arts and tourism operators.
5. **Innovation and technology** which includes the development of open data systems and citizen science. New technologies in remote viewing and data capture is changing the way the community accesses the environmental reserve network.

2.2.1 Ecosystem Services

Ecosystem services are the goods and services provided by ecosystems that benefit, sustain and support the well-being of people. They are derived from the structural components (e.g. vegetation, water, soil, atmosphere and animals) and the complex interactions between components of an ecosystem, or across ecosystems and include the ecological processes which shape and sustain ecosystems.[11]

The SEQ ecosystem services framework provides a comprehensive identification, measurement, and value assessment for ecosystem services across SEQ. Volume three Appendix E (c) lists and describes nineteen (19) ecosystem functions which are grouped into different roles under 4 ecosystem function categories, (regulating function; supporting function; provisioning function; and cultural function). There are 19 corresponding map overlays which are available for further analysis through the Healthy Waterways and catchments website.

Classification of Ecosystem Services by the Millennium Ecosystem Assessment

1. Regulating services: benefits obtained from the regulation of ecosystem processes, e.g. water regulation, erosion regulation, water purification, waste regulation, climate regulation and natural hazard regulation (e.g. droughts, floods, storms).

2. Supporting services: those that are necessary for the production of all other ecosystem services. They differ from provisioning, regulating, and cultural services in that their impacts on people are often indirect or occur over a very long time, whereas changes in the other categories have relatively direct and short-term impacts on people. Some services, like erosion regulation, can be categorised as both a supporting and a regulating service, depending on the time scale and immediacy of their impact on people. Supporting services include primary production, nutrient cycling and water cycling.

3. Provisioning services: products obtained from ecosystems, e.g. fresh water, food, fibre, fuel, genetic resources, biochemical, natural medicines and pharmaceuticals.

4. Cultural services: nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences, e.g. cultural diversity, knowledge systems, educational values, social relations, sense of place, cultural heritage and ecotourism.

Source: derived from MA (2005a)

[11] **SEQ Ecosystem Services Framework, 2013.**

Within the sunshine coast, the high ecosystem service areas tend to occur away from urban centres on the coast and hinterland and also away from the cleared Maleny Plateau and riverine flats of the upper Mary River. These areas of high ecosystem service which are strongly correlated with wetlands and un-cleared areas of natural bushland provide a supporting buffer of resilience to the adjacent agricultural and urban areas.

Ecosystem services provided by Councils Environmental reserves include:

- pollination functions from the diversity of flowering plants supporting insect life—essential to small and large scale fruit and vegetable farming that occurs throughout the area;
- vegetated watersheds protecting water quality downstream and generating water re-charge areas;
- Local climate regulation buffering against extreme variations in temperature and rainfall;
- Supporting habitats which are breeding grounds and refugia for plants and animals; and maintaining "biodiversity banks" and associated resources used in medical research, the horticultural industry and native fauna protection and promotion.

Bushland areas in the Sunshine Coast have been identified in the "*2014 update of SEQ NRM Plan: Sunshine Coast"* as a key natural asset providing the following benefits (ecosystem services) to the community[12].

- Maintaining our habitable climate
- Reducing Pests and Disease
- Therapeutic landscapes

It has been estimated that maintaining areas that provide this benefit will save at a minimum $10 million in health costs for SEQ (to 2031)[13]

- Buffering against extremes, particularly in coastal areas
- Protecting water quality

It is widely recognised that natural assets contribute to the purification of water that provides good water quality. This benefit also saves in water treatment costs with healthy waterways able to remove one kilogram of nitrogen for $14.50 while it costs $242 to do the same job using a sewerage treatment plant[14].

Council's environmental reserves contain vegetation growing in key water filtration areas such as on slopes, riparian zones and floodplains. These areas are important for trapping and processing sediments and nutrients. Forested areas also provide shade over water thereby decreasing its temperature and increasing O2 levels and associated chemical processes required to maintain good water quality

[12] **2014 Update of the SEQ NRM Plan: Sunshine Coast.**

[13] **Marsden Jacobs and Assoc. (2010) *Managing What Matters SEQ Catchments*, Brisbane.**

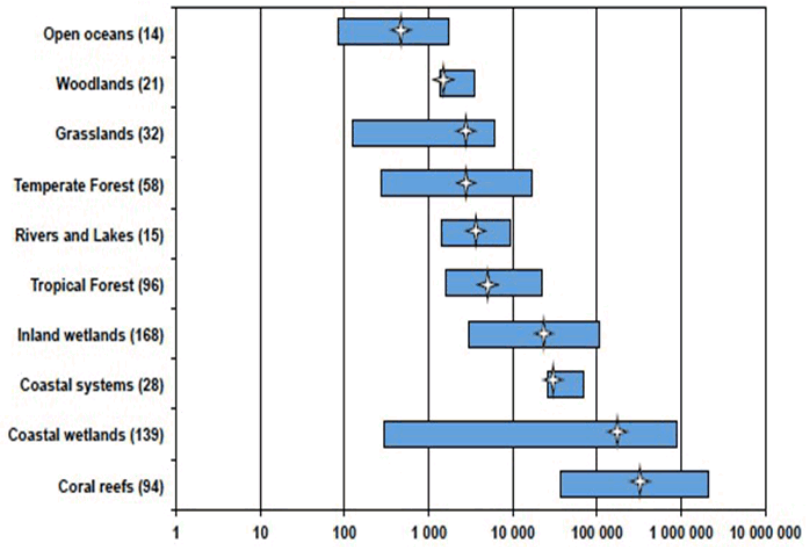
[14] **Volders, A. (2013) The costs of Sediment Export A.R. Volders Environmental Consulting, Brisbane.**

Economic Value of Ecosystem Services

There is currently a growing area of research adding monetary data to ecosystem service values as shown in Figure 2.2 below.

A new economy -
Payments for ecosystem services such as water cleansing, carbon capture and biodiversity can potentially increase the financing for ecological restoration which offers a way to enhance natural capital through employment

Figure 2.2 Range of values of all ecosystem services provided by different types of habitat (Int.$/ha/yr2007/PPP-corrected)[6]



Note: Figure 2.2 shows range and average of total monetary value of the bundle of ecosystem services per biome. The total number of published value estimates per biome is indicated in brackets; the average value of the value range is indicated as a star sign.
Source: de Groot et al. (2012) building on TEEB (2010).

2.2.2 Nature Based Recreation

Key industries that benefit:

Tourism
The Tourism industry is worth more than $2.7B per year (direct and indirect) to the local economy.

Preferred visitor experiences are based on interactions with natural assets. Food and wine and nature based activities and cultural and heritage experiences are the top three reasons why people visit the area[15].

Health
"Urban nature is a promising tool for enhancing the wellbeing of the world's growing urban population[16]".

Healthcare and social assistance is a $1.2B industry on the Sunshine Coast accounting for 15% of the economy. Elderly and young people benefit more from green space than other population groups. People living in a greener environment are significantly healthier than others with 11% more green space associated with a reduction in the number of symptoms[17].

2.2.3 Knowledge Systems

Key industries that benefit:

Education and training
Natural assets attract students and educators to SEQ while also providing unique experiences to interact with natural systems as part of the learning experience. This sector contributes $636M to the local economy.

Professional, scientific, and technical services
Natural assets provide the settings and lifestyles that attract professionals and inspire innovation. This industry adds $726M to the local economy.

Ecologist checking harp traps at Lower Mooloolah Environmental Reserve

USC student undertaking Antechinus research on Frizzos Environmental Reserve

Fauna survey research at Bells Creek and Environmental Reserves

[15] Regional Tourism Profiles (2011 -12). Tourism Research Australia.
[16] Shanahan et al 2016, "A dose of nature is just what the doctor ordered", Decision Point, Issue 98, CEED, Qld.
[17] Australian institute of Health and Welfare 2011. Health and the environment: a compilation of evidence. Cat. No. PHE 136. Canberra: AIHW.

2.2.4 Job Creation

- Ecotourism ranges from self-guided walks and bird watching groups who are attracted to the areas unique natural wonders to organised tours taking advantage of recreational and educational facilities located on reserves.
- Education – universities, schools and other training organisations access the reserves for educational purposes.
- Ecological Restoration is a growing industry and the environmental reserves provide a showcase for experimentation in accelerated restoration practices as well as best practice methodology.
- Horticulture and land management
- Environmental assessment
- Opportunities for traditional owners to work on country in ecological restoration, and provide education and interpretation services.
- Technological advances in fauna and flora survey is a growing industry with national and international interest.

Solar powered acoustic survey equipment installed on an environmental reserve to detect endangered birds. Equipment developed by local engineers in partnership with leading acoustic software experts from a university in Japan.

2.2.5 Innovation and Technology

Advances in data management and internet technologies are changing the way we interact with the natural environment—expanding new opportunities in nature based recreation, ecotourism and other industries.

For example natural areas officers are exploring soundscapes technology, live webcams and open data software currently under development on the Sunshine coast.

2.3 Social Values

The social values of Environmental Reserves include being part of our shared cultural heritage and in contributing to the quality of the lifestyle enjoyed by local residents in their neighborhoods and of visitors to the Sunshine Coast area. In order to address social values the provision of public access and associated facilities for the public to see and interact with the environment is achieved in a sensitive manner which balances the ecological and social values. The emphasis is on eco-recreation and education, equitable access, volunteer contributions and achievements in bushland management and how community awareness and education enhances these social values.

A range of social values of Environmental Reserves which have been listed here are also addressed in the strategies and actions of the SCC Biodiversity Strategy as shown in Appendix E (d).

2.3.1 Eco – Recreation

Council's reserve network provides a range of eco-recreation experiences

which are supported by different levels of facilities. Some of the existing facilities found at different reserves include:

- Pathways and nature walks
- Barbeques
- Picnic shelters and tables
- Interpretive displays
- Comfort facilities such as toilets, taps and bins
- Parking
- Education and research

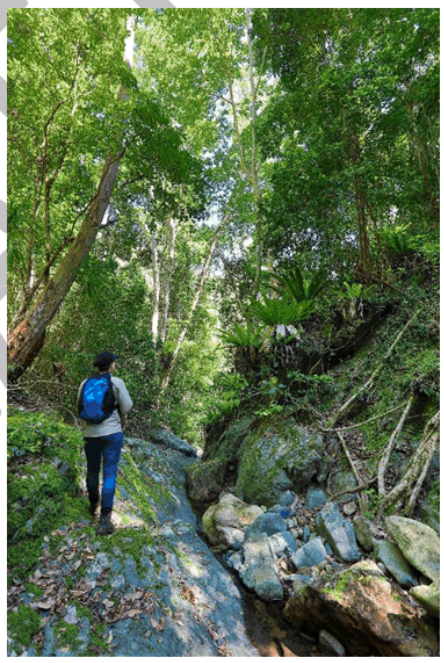
Environmental reserves offer a range of opportunities for the community to explore their interest in native wildlife, including bird watching, wildflower season, and photography. Many reserves also offer aspects of a wilderness experience including absence of noise pollution, limited or no facilities and lack of crowding.

Sunshine coast council is also committed to offering equitable access for residents and visitors to Environmental Reserves.

Different reserves offer a range of different opportunities depending on their conservation values; proximity to facilities and terrain. The Sunshine Coast Recreational Trail Plan 2012, provides a more detailed assessment of equitable access for the existing and proposed trail network across the region.

"..bush regeneration offers a way to bring the human community together and to strengthen the relationship between human and nonhuman nature, on which the fate of the classic landscape ultimately depends…".
- *William, R. Jordan. 2003*

Community education event at Kirbys Road Environmental Reserve



Kirbys Road Environmental reserve landscape plan is developing concepts for a range of trail walking opportunities, from short easy walks to wilderness type experiences

2.3.2 Volunteers and the Community Conservation Partnerships

Volunteers in community conservation groups and schools are playing a significant part in helping to manage and learn from the diverse ecosystems occurring throughout council's Environmental Reserves.

Volunteers are actively supported and co-ordinated through council's Community Catchment Partnerships unit within the Environmental operations branch.
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2.3.3 Knowledge

Environmental Reserves offer opportunities to learn more about ecological processes; biodiversity; and land management practices.

Ecological and social research is encouraged in council's Environmental reserves and there have been numerous projects undertaken ranging from population genetics of the distribution of the endangered Swamp Orchid—*Phaius australis* and *P. bernaysii*—to estimating effective population size of the IUCN listed Spiny Crayfish *Euastacus urospinosus.*

In the period 2012-16, council issued access permits for 35 research projects conducted in council's Environmental Reserves.

Council also encourages research partnerships with academic institutions across a range of disciplines, through an annual scholarship program coordinated through council's Regional Strategy and Planning department.

2.4 Cultural Values

Sunshine coast council recognises cultural heritage places and landscapes. These include indigenous and non-indigenous cultural heritage, places or structures of historical significance which occur within Environmental Reserves.

2.4.1 Aboriginal Cultural Heritage

Aboriginal cultural heritage value includes a cultural landscape where the entire sunshine coast and all of its elements have cultural significance; identified cultural heritage sites, including areas within council's Environmental Reserves; and traditional land management knowledge.
Aboriginal traditional knowledge and cultural practices in land management were responsible for shaping and maintaining the high biodiversity values of the region—Traditional Owners today have custodial obligations to maintain land and sea resources for the protection of biodiversity.

Cultural heritage burn used to clear a site for an archaeological survey of a tools scatter site on an Environmental Reserve

Possible significant cultural heritage sites may include:

- Scar trees
- Burial area
- Tool scatter
- Bora ring
- Midden
- Rock art
- Significant event

2.4.2 Non-Aboriginal Cultural Heritage

These are places and structures of historical cultural heritage, and may be where an area:

- Displays historical, economic or social themes that are of importance;
- Represents characteristic customs or ways of life;
- Has played an important part in the lives local residents;
- Associated with a notable personality or event;
- Landmark;
- Of cultural significance to a particular group within the community.

In relation to the management of environmental reserves these may include:

- Buildings
- Bridges
- Parks
- Cemeteries
- Significant trees
- Landscape heritage
- Relics and archaeological sites

Old shingle cutting site located at Kirby's Road Environmental reserve

MANAGEMENT ISSUES: CHALLENGES AND OPPORTUNITIES

There are immediate external pressures on reserve values as well as broader changes occurring across the landscape and with climate change. Changes arising from impacts—habitat loss and fragmentation; restrictions in the movement of fauna; alteration of fire regimes; weed infestations and predation and competition from animal pests—are potentially devastating. However, these impacts which began more than 100 years ago have only recently—in the past 15 years—received attention in both management and in understanding the long term effects of these changes and the outcomes of any intervention. There has been very little monitoring in the fairly recent field of ecological restoration and the long term implications of threats and the long term effects of management solutions is not well understood.

It is through an improved understanding of the impacts of current 'best bet' solutions , that strategies can be developed, implemented, monitored and adapted to achieve the best outcomes.

The following management issues are underpinned by the **values based approach to reserve management.** Therefore this section describes the management issues highlighted by current threats to values and also addresses a range of value adding social, cultural and economic opportunities.

3.1 Biodiversity is in decline

Recent fine scale vegetation mapping of the Sunshine Coast shows there has been a 56% loss of regional ecosystems that once covered the area[18]. Numerous species previously known to be widespread are in low numbers and many species have become locally extinct, including the iconic Albert's Lyrebird, emus, Spotted Tail Quoll and several frog species.

Koalas which once occurred in high numbers throughout the coast are now listed as vulnerable—with loss of habitat, road kills and wild dog attacks among the range of threats to this species.

The Ground Parrot has disappeared from most of its previous range on the sunshine coast due to housing developments which have broken corridor linkages between key areas such as Mooloolah River National Park

Key findings of the Mary Maher report, (1998) for vegetation loss in the previous Maroochy Shire area of the sunshine coast:

In the seven years between 1990 and 1997 -

- The whole shire experienced a **loss of** 11% (6 313ha) of remnant vegetation, which is equivalent to **2 football fields per day**.
- The coast area of the shire lost 22% (3 399ha) of its vegetation cover, equivalent to 1 football field per day.
- Local extinctions are expected to have occurred and the present trends in species loss indicate that local extinctions may accelerate in the ensuing years if vegetation loss and crucial habitats are not addressed.

Land clearing has a significant impact on biodiversity through habitat loss

[18] SCC, 2013.

and fragmentation. Fauna and flora are subsequently diminished by:

- Loss of territory or adequate range for fauna to maintain breeding populations or access to food.
- Exposure to domestic animals and cars causing increased deaths of fauna
- Disruption of normal life cycle movements for fauna
- Disruption of dispersal for fauna and flora
- Disruption of normal pollination mechanisms for flora
- Population replenishment after catastrophic events is unlikely or impossible
- Disruption of genetic exchange mechanisms causing inbreeding and reduction in vigor of flora and fauna populations

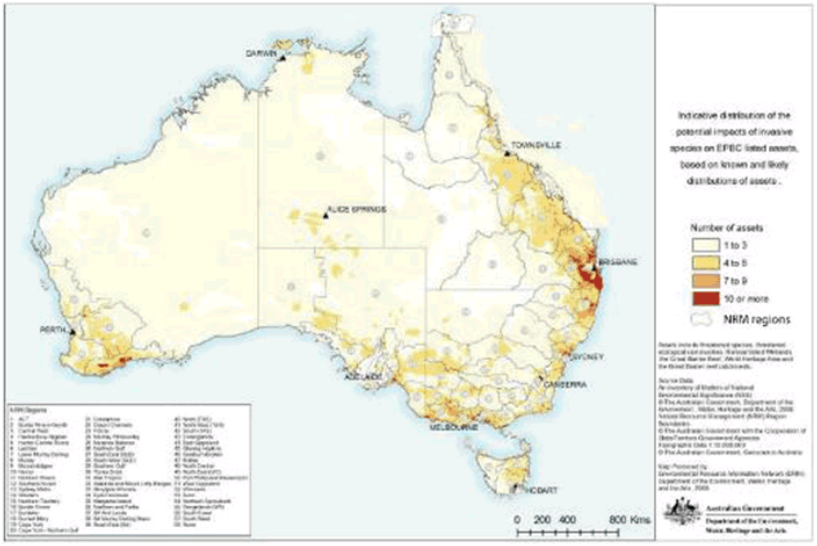
Species recovery is an important management issue where past practices of land clearing, selective logging and introduced pest animals and weeds have had a significant impact on the populations of native plants and animals in this area. In response to the dramatic loss of biodiversity and declining population numbers a range of species recovery approaches have been developed both locally and at the commonwealth government level.

Under the Commonwealth government, species recovery plans have been developed for threatened fauna, threatened flora (other than conservation dependent species) and threatened ecological communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). These plans are available on-line and provide written advice on how to best manage individual species found in an area.

Under the Queensland State government, species recovery is addressed by QPWS through a framework called 'Back on Track/The SPRING'. This approach develops management actions to address the recovery of priority species, with the goal of affecting positive outcomes for all plants and animals. The Back on Track framework guides the strategic allocation of conservation resources, and provides information to increase the capacity of government and other natural resource management (NRM) bodies and communities to make informed decisions. Relevant Back on Track species and associated actions are incorporated into the Implementation Program—section 4.0 of this plan.

Pest animals and plants – The *Sunshine Coast Biodiversity Strategy 2010-2020* recognises weeds and pest animals as one of the most significant threats to biodiversity on the Sunshine Coast. This is also highlighted in the 2008 assessment of Australia's Biodiversity, (DEWHA, 2009) where invasive plant and animal species have been identified as a significant threat to nationally listed threatened species and communities in the sunshine coast area, (DEWHA, 2008).

Locations where invasive species are noted as threats to nationally listed threatened species and communities



Council has developed a coordinated response to pest management with the development of the *Sunshine Coast Local Government Area Pest Management Plan* 2012-2016 which provides background and strategic guidelines for pest management in this area. In this plan the Council categorizes known pest plants into five (5) management categories -

- Under Surveillance;
- Broad Control;
- Strategic Management;
- Local Control; and
- General Environmental Pests.

Weed and Pest animal issues are often exacerbated along reserve boundaries, particularly at the urban interface. Residential gardens adjoining reserves can be the source of weed invasions and people dumping garden waste into environmental reserves introduces substantial weed loads into these areas.

Roaming domestic animals can also cause major impacts in urban bushland parks where they are known to hunt and kill native fauna such as native mammals, including koalas, birds, lizards and frogs. In 2008 the *Queensland Animal Management (Cats and Dogs) Act* was passed and aims to promote responsible pet ownership and strengthen the management of unwanted cats and dogs.

In peri-urban and rural reserves a broader range of pest animals can also be found, including wild and domestic roaming dogs and cats, the European fox (*Vulpes vulpes*), European rabbit (*Oryctolagus cuniculus*), feral pig (*Sus scrofa*), cane toads (*Rhinella marina*) and several deer species.

Environmental threats from deer include the spread of declared plant species and exotic diseases; populations can quickly degrade pristine areas causing damage to vegetation and ground cover, increasing erosion and sediment transport into waterways.

Threats from predators such as foxes and wild dogs are currently managed on Environmental Reserves in partnership with Councils Healthy Places team. Pest animal predators are a threat to native wildlife, however the loss of the ecological function of native predators such as Quolls and Dingos in the landscape is also an important management issue impacting biodiversity.

Therefore the current control program on Environmental reserves also takes into account the ecological importance of predator prey relationships in maintaining healthy ecosystems. For example predators act as keystone species with a profound influence on the balance of organisms, often preventing single species from becoming dominant in a particular area (Lovari et al,. 2009).

In order to meet Councils legal obligations to control pest animals such as wild dogs, dingos and foxes, the Environmental Reserve managers work closely with the Pest Animal control team to achieve an integrated landscape approach and provide monitoring support to ensure pest animal issues are being addressed.

A range of monitoring approaches are being delivered through Healthy Places and Environmental Operations which aim to inform the control program. For example fox population monitoring and behavioural research has occurred in the coastal dunes and preliminary results suggests a cautious approach to fox control based on evidence which shows that undisturbed fox populations will reach a self- managed population threshold in a similar way that dingos restrict the number of breeding females In a local area. It has also been found that some predator threats can be managed through animal behaviour. This has been shown in the coastal dunes where after a few seasons of meshing turtle nests it was found that resident foxes learned to no longer eat turtle eggs.

The highly modified urban environment has also provided suitable habitat for introduced bird species, such as the Indian myna bird (*Acridotheres tristis*). While not yet as prevalent on the Sunshine Coast as they are elsewhere in Australia, Indian mynas are known for their aggressive competition for nesting hollows and can displace hollow dependent native fauna.

Coastal ecosystems where urban development has been most extensive are particularly impacted by the boundary effects of weeds and pest animals. These are also significant economic impacts since the coastal ecosystems are a highlight of the coastal scenery and lifestyle. The encroachment of development into coastal areas has meant that garden escapees such as asparagus fern (*Asparagus* spp.), glory lily (*Gloriosa superba*), Singapore daisy (*Sphagneticola trilobata*), cocos palm (*Syagrus romanzoffiana*) and coastal morning glory (*Ipomoea cairica*) have become prevalent in many coastal environmental reserves.

Throughout the reserve network, natural areas staff and contractors manage both declared and environmental weeds. Declared weeds are listed species which—under the Rural lands Protection Act—must be eradicated. **Environmental weeds are species which are not naturally found in the local area and which cause the degradation of local vegetation communities.** Weeds may also have direct impacts on fauna found in the reserves.

Some weeds such as lantana are less problematic and have been found to provide beneficial shelter for fauna in the absence of any other native plant cover. However restoration of native vegetation is the preferred outcome and therefore these lower risk weeds are managed according to the site situation and resources available to provide follow up restoration.

Integrated weed management is the approach used by natural areas to manage environmental weeds. This method combines re-vegetation and restoration of native plant communities. Weed control methods used in this approach are:

- Mechanical Control: includes hand weeding, machinery such as brush-cutter or chain saw;
- Chemical control: herbicide application using a variety of techniques;
- Biological control: makes use of invasive plants natural enemies to reduce its impact.

PROJECT SNAPSHOT

1. Weed impacts on native vegetation

Cats Claw Creeper (*Macfadyena unguis-cati)* is a declared pest plant under the *Land Protection (Pest and Stock Route Management) Act 2002).* The plant is widespread in the coastal reserves and has the devastating effect of smothering tall trees to the point of felling the trees under the weight of the vine.

2. Weed impacts on native fauna

Dutchmans Pipe (*Aristolochia elegans*) is a declared pest plant under the *Land Protection (Pest and Stock Route Management) Act 2002)* mimics and yet is fatal as a local food plant for the endangered Richmond Birdwing Butterflies. This plant has contributed to the decline of the Richmond Birdwing Butterflies and other butterfly species which also mistake the Dutchmans pipe for their natural food plants.

Photo courtesy of Rosie Booth

Aquatic weeds and pest animals identified in council's pest management plan are also relevant to wetlands and waterways found in many of council's environmental reserves. Weeds of concern in Sunshine Coast waterways are salvinia (*Salvinia* spp.), cabomba (*Cabomba caroliniana*), dense waterweed (*Egeria densa*), and yellow waterlily (*Nymphaea mexicana*) and hygrophila (*Hygrophila costata*). These weeds grow aggressively and can dramatically alter environmental and physicochemical conditions and interfere with ecological processes[19]. Aquatic pest animals found in the area include the red-eared slider turtle (*Trachemys scripta elegans*). This species can aggressively out-compete native species for food, basking and nesting sites and prey on native aquatic reptiles, frogs, fish, crustaceans and insects and have the potential to carry diseases and parasites that can infect native fauna.

Other pest management issues which have been identified include, high costs for on-going control of pest animals and plants; and insufficient monitoring to determine effects on biodiversity of eradication techniques. For example, in the key findings of a national assessment into Australia's biodiversity—although weeds remain a threat to biodiversity—weed impacts on biodiversity are not generally assessed and weed management strategies and policies have historically failed to address impacts on biodiversity adequately, (DEHP, 2008).

A recent assessment into the economic impact of state and local government expenditure on weed and pest animal management in Queensland (LGAQ, 2006), found the net benefit from investment into the control and management of Environmental weeds provides a positive return on investment of $1.10 and $1.80 for each dollar spent. Education such as the weed buster program provided higher returns on investment where for every dollar invested in education and awareness, between $8 - $80 of benefits are returned. This applies to both government and private lands where pest issues exist.

SCC pest management plan recognizes the cost and effort required to control established pests is extremely high at both the landscape and property scales. **It is therefore generally accepted that preventing the establishment of new pests is the most efficient and cost effective control strategy**[20].

With an increasing diversity of pests at various stages of invasion across a range of land uses, plus a general trend of declining resources for natural resources management, managers may need to prioritise pests for control programs. This approach has been adopted in South Australia and found to have fundamentally improved weed and pest animal management in the state, with a cultural shift in recognising the benefits of early intervention and in being driven by economic, environmental and/or social outcomes rather than simply pest control activity.

[19] **SCC Pest management plan, 2012-2016.**

[20] **SCC Pest management plan, 2012-2016.**

These findings support the use of the resilience-based restoration method (Mc Donald, 2011), which is applied to council's environmental reserve management. Under this approach resources are prioritised to maintain weed free or less weed infested areas first before moving to the more degraded sites. However in urban areas this may not occur due to boundary issues and the influence of customer requests. Early results of the Bushland Operational Assessment (BOA) monitoring, suggests that resources will continuously be required to maintain the condition of these high profile reserves

Problem Animals - under the SC Pest Management Plan 2012-2016 the term 'problem animals' refers to native fauna that are sometimes considered to be pests in some situations. All native fauna are protected species under the *nature Conservation Act 1992* however in some circumstances management of certain species might be required.

Problem animal issues on environmental reserves arise where the animal is occurring along the boundary and where customer complaints require a response to mitigate the problem. **In contrast to pests, which are managed to reduce populations and impacts, management of native fauna on environmental reserves must be approached in all cases with an overarching goal of conservation of the species.**

Often the most appropriate and effective strategies will involve changing the expectations and behaviour of the human neighbours and manipulating the environment in problem areas to make it less attractive as habitat. In exceptional cases management strategies for dealing with problem animals may include mechanisms that focus on individual animals or populations. Where this is the case, management must be conducted under a damage mitigation permit in accordance with the *nature Conservation Act 1992.*

Some of the problem animals associated with reserve boundaries are detailed in council's Pest Management Plan and summarised below:

Australian white ibis (*Threskiornis molucca*) have been successful in colonising urban environments due to their ability to utilise urban landfill and open space as feeding grounds and the constant availability of water provided by constructed water bodies.

Australian brush-turkey (*Alectura lathami*) are a common resident of rainforests and a visitor to suburban gardens in some areas.

Problems arise where residents have been known to re-locate numbers of Turkeys into environmental reserves and there is anecdotal evidence that this causes damage to the reserve due to overpopulation. Relocating wildlife is also not permitted without a permit and is known to cause harm to the animal due to competition with resident populations and the likelihood of attempting to return to its previous location.

Council staff provide support and advice to residents to manage this issue. This may include building new gardens in stages, protecting new plants with tree guards and using heavy gravel mulch rather than standard mulch.

Flying foxes (*Pteropus spp.*) are social animals that usually live in large roosts. One local species of flying fox, the grey-headed flying fox is listed nationally as 'vulnerable' under the Environment Protection and Biodiversity Conservation Act 1999 due to declining numbers.

Flying foxes are important pollinators and seed dispersers of many plant species. They play important roles in the reproduction, regeneration and dispersal of plants within rainforests, eucalypt forests, woodlands and wetlands. Eucalypts rely heavily on these pollinators, producing most of their nectar and pollen at night to coincide when flying foxes are active.

The noise, smell, and mess caused by flying foxes can be a problem if a roost is located near houses. Council has developed a Regional flying Fox Management Plan which has been approved by State and Commonwealth Government—to guide management actions for flying fox management and conservation.

Diseases and Pathogens -
Outbreaks of emerging and exotic diseases often deplete animal populations. Threats to native fauna are increasing, as systems are increasingly put under pressure, and animal and human habitats come into closer contact. Disease can also be an indicator of ecosystem health or changing environmental conditions such as temperature variations.

On the sunshine coast significant disease threats include the Chytridiomycosis fungal infections in frogs which have been implicated in the extinction of several local species and continues to threaten remaining endangered species such as the cascade frog (*Litoria pearsoniana*), and the giant barred frog (*Mixophyes iterates*), currently found in a number of council's Environmental Reserves, (Bunn and Woods 2005).

PROJECT SNAPSHOT
Protecting an endangered plant species from disease

In 2015, the Council staff initiated assessments on the impacts of Myrtle Rust on the endangered Sunshine Coast Myrtle *(Lenwebbia sp. Blackall Range)* after noticing severe dieback at Doonan Creek Environmental Reserve.

Myrtle rust fungus *(Puccinia psidii)* was first detected in Australia in NSW in 2010 and has since spread throughout most states. It only effects plants in the Myrtle family which includes native Lilly Pilly, Eucalyptus, Bottle brush and Tea trees. The rust spreads via wind, people and animals

Photo courtesy of Garry Thomas

The endangered Sunshine Coast Myrtle is a small tree occurring only on the Sunshine Coast. Results suggest that the population is very susceptible to the rust and is in decline. Across the region, a handful of plants were in relatively good condition and it is hoped that these plants could provide the breeding stock that is resistant to the rust.

The project has seen collaboration with the University of the Sunshine Coast, the Qld Herbarium and the department of Agriculture & Fisheries. Further research and collaboration is planned and may be expanded to incorporate other important species affected by the rust

Roads and River crossings
Roads are a major cause of habitat fragmentation and species loss. Where roads intersect wildlife corridors road kills take their toll on fauna including birds, mammals, reptiles, amphibians and invertebrates. With regard to Environmental Reserves, in instances where these lands abut roads, the movement of wildlife is restricted and the degree of loss of fauna is unknown.

River crossings such as culverts and causeways can also cause declines in biodiversity where in-stream fauna are unable to move up or down a river channel to complete their life cycle or to reach suitable food or habitat requirements. Many Environmental Reserves contain streams and rivers where causeways may occur either within the reserve or within the affected catchment. Burnett Mary biopass strategy, (Stockwell et al, 2008), provides management recommendations for river crossing design and identifies critical sites in the middle and upper Mary on the sunshine coast where river crossings have restricted fauna movement. Several environmental reserves are located within the study area.

3.2 Responding to climate change

There is significant uncertainty regarding how species and ecological systems will be impacted by climate change. Studies show that impacts in Australia will be complex and highly variable (CSIRO and Australian Bureau of Meteorology 2007a). The distribution, diversity and abundance of species and the functioning and dynamics of ecosystems will change, with some responding better than others. The most vulnerable species include those with very restricted geographic and climatic range, those unlikely to migrate successfully and/or those already highly compromised by small populations, fragmented habitat and other threats, (DEHP, 2008). These include some of the sunshine coasts iconic species such as the Glossy Black Cockatoo (*Calyptorhynchus lathamii*), and the koala. Also relevant to the sunshine coast are the effects of predicted weather extremes for this area such as extended droughts alternating between high rainfall and extreme flood events. Wetland birds that are dependent on freshwater habitat under stress from drought conditions will be disadvantaged by lower rainfall.

It is essential to maintain the current capacity of the ecological and hydrological systems to withstand these changes. **This requires protecting the groundwater systems which sustain terrestrial and freshwater ecosystems through drought; maintaining functional landscape connectivity to facilitate movement of fauna toward areas of suitable micro climate and resources**; and minimizing any other potential threats which add to the cumulative impacts on species and communities.

Under objective 5 of the SCC Climate Change Strategy to help the Sunshine Coast adapt to long term impacts of climate change, the following proposed actions are relevant to Environmental Reserves management:

- Strengthen protection and enhancement of strategic wildlife corridors and riparian corridors (to allow for species shift) and reduce pest species
- Protect opportunities for carbon sinks
- Adjust biodiversity plantings to include a mix of local native species

tolerant to potential future climate characteristics

- Strengthen partnerships to protect and enhance biodiversity and waterways

3.3 Managing access for education, ecotourism and nature based recreation

It is recognized under the council's open space strategy that environmental reserves are important to the sunshine coast lifestyle, contributing to the livability of the area. Activities include a walk in the bush or taking a painting class at a scenic location; reserves can be our celebration spaces, hosting festivals, events and social gatherings. However while access for education, ecotourism and nature based recreation is to be considered in Environmental Reserves this will not compromise the fundamental principle as stated in the open space strategy that:

Biodiversity values and ecological processes are protected and enhanced for future generations. The health, resilience and connectivity of environmental reserves, riparian corridors and foreshores are maintained. Impacts of climate change and peak oil are considered.

The Open Space Strategy integrates management considerations for environmental reserves through a framework of policy direction, outcomes and actions, including desired standards of service prepared for recreation trails, environment reserves and amenity reserves. This includes community feedback to the open space strategy which found that while the smaller local amenity reserves do contribute to an area's 'green feel' they have limited value as spaces to support the community's recreation and social need. A number of small or inadequate parks have been identified that provide limited community benefit, yet are costing a considerable amount to maintain. Therefore the sale of low performing open space to increase financial reserves for the purchase of quality open space is proposed for consideration.

The ERNMP recommends an ecological function assessment before removing small amenity reserves from the network (Implementation program section 4.0 - action 9.04).

These specific policy directions, outcomes and action are listed in Volume three under Appendix E: Integrated Planning: Summary of relevant Policy Direction under Open Space Strategy (2011) and have been incorporated where appropriate into the implementation program for the ERNMP. Details of service delivery are also discussed further in Volume two of the ERNMP

3.4 Maintaining Protected Area Status

Legal mechanisms for securing protection of high value ecosystems and buffers are identified as a priority under the overarching themes of the SCC biodiversity strategy and also in the outcomes of the Open Space Strategy, 2011, shown below.

Strategy 5.3: Further develop the inter-urban and intra-urban breaks as part of open space planning to encourage the protection of distinct communities.
5.3.4 Continue to identify and strengthen the character and biodiversity values of the inter- and intra-urban breaks referred to as 'green wedges' through an ongoing planning and protection with the State Government

Strategy 6.3: Ensure that the open space network provides for the changing and increasing needs of the community.
6.3.5 Actively seek to reduce space lost to secondary uses, especially in foreshore areas (e.g. car parking, commuter paths, and storage spaces).
6.3.6 Work with the State Government to reclassify land into appropriate

3.5 Building Great Partnerships

This has been identified by council as a priority to address the extent of biodiversity located on private land, (SCC Biodiversity Strategy). Environmental Reserves also have the opportunity to benefit from partnership building opportunities to address a range of management issues such as:

- Customer requests associated with boundary issues, such as trees over fences, and pest animals and plants which are mostly addressed in a reactive capacity and can be costly and time consuming to manage.

- Reserve neighbors include wildlife refuge and other private and government protected areas where opportunities exist to improve resource and management efficiencies through a collaborative response between neighbors.

A collaborative response to land management in Environmental Reserves is recommended in the open space strategy to address cultural heritage issues on reserves; provide an integrated management approach within council; and to meet council expectations for community involvement.

Stakeholders include:
2 QPWS and DNRM;
3 SEQ Catchments
4 BMRG; MRCCC
5 Other strategic land management teams within Council include Environment and Planning, Healthy Places and Parks and Gardens

Strategy 1.2: Work collaboratively with the community for the protection and enhancement of our cultural heritage in open space.

1.2.2 Work collaboratively with traditional owners to strengthen connections through projects and programs

Strategy 3.2: Develop an integrated approach to planning and management of open space that strives to strengthen the environmental, social and economic outcomes.

3.2.2 Establish an integrated open space team within Council to encourage the integration of planning and management of open space functions.

Strategy 7.2: Encourage and promote community involvement in the open space.

7.2.1 Develop guidelines and protocols that enable volunteer involvement in management and operation of parks, trails and reserves.

7.2.2 Prepare a philanthropic model or guidelines to encourage community donations and support for the open space network.

7.2.3 Continue to engage with communities on detailed planning, management and delivery in accordance with Council's Community Engagement Policy.

7.2.4 Prepare a suite of information tools (e.g. print, web, radio) to promote access and provide information

Skilling Queensland trainees at Kirbys Road Environmental Reserve

3.6 Understanding Ecosystems

Enhancing our collective understanding of the region's biodiversity is crucial to the cycle of continuous improvement. Key areas for improvement in the knowledge of Environmental Reserves management are in monitoring the effects of restoration activities and improving knowledge of species requirements in relation to habitat function and ecosystem processes.

3.7 Achieving Integrated Landscape Management

Integrated landscape management is required to achieve effective and efficient outcomes for the protection and restoration of ecological processes. Integrated planning involves collaboration between stakeholder groups and neighboring land managers to ensure management outcomes are coordinated and effective. This includes:

- Integrated Catchment Management
- Integrated Pest Management
- Integrated Fire Management
- Integrated open space management
- Integrated Biodiversity Management

3.8 Maintaining Ecological Processes

Ecological processes are the interactions and connections between living and non-living systems, including movements of energy, nutrient cycling and other chemical substances such as carbon, and organisms and propagules. Ecological processes are usually landscape scale interactions that drive the capacity of ecosystems to reproduce and maintain themselves over time. These include regenerative processes such as flood and fire and reproductive processes such as pollination, and dispersal.

Fire - In a fragmented and urbanized landscape, fire as an ecological process is compromised to meet public expectations and legislative requirements of the Queensland Fire Services Act 1990 which aims to reduce fire hazard. Therefore ecological fire management on environmental reserves is implemented to achieve a balance between maintaining environmental values and managing risks to neighboring properties.

Sunshine Coast Council has developed a Bushland Reserve Network Fire Management Guideline.

Flood – Floodwaters spreading unimpeded across the landscape form and re-shape river channels and wetland features; replenish aquifers; disperse seeds and animals; create woody debris habitat in both terrestrial and aquatic environments; and play a vital role in the replenishment and cycling of nutrients required for plant and animal growth. On a landscape scale flooding processes are impeded by large dams, flood mitigation infrastructure; and urban developments which channelize wetlands to prevent overbank flow.

Dispersal – involves the movement of fauna and flora across a landscape which supports genetic mixing and resilience. Dispersal barriers are different for different species. Some bird species require continuous tree cover while other species may be affected by light and noise. Koalas will cross roads, however the high mortality associated with road kills effects population dispersal capacity. Roads and tree clearing are among

the more significant barriers to dispersal. In aquatic environments dispersal can be impeded by pipe culverts and concrete causeways.

Reproduction – pollination and seed dispersal processes are important to maintain many flora species. Mechanisms for maintain reproductive processes range from animal dispersal, to wind and water dispersal. Habitat connectivity can be an important component of reproductive processes especially when local population numbers are low and require dispersal opportunities to find mates or to achieve pollination between plants

PROJECT SNAPSHOT – Flying Fox management on council reserves

Ecological Process: Flying-foxes are essential **pollinators** and seed dispersers for native forests, making a significant contribution to maintaining healthy ecosystems.

Threats: Flying-fox numbers have seriously declined in the last century due to the clearance of eucalypt forests across their range.

There are 22 known flying fox roost sites within the SCC LGA, including 9 which occur in environmental reserves. Natural areas provides monitoring a coordinated management and monitoring response at these locations based on the SCC Regional Flying Fox management Plan 2013. Some of these roosts are relatively isolated from residential areas and the potential for land use conflict is fairly low. However, where large roosts occur very close to residential areas, the potential for conflict increases dramatically as the noise and odour associated with large camps disrupt the lifestyles of nearby residents.

Council response: The SCC Regional Flying Fox Management Plan 2013 provides a range of management options available to Council for managing flying-fox roosts on Council controlled land. The document also recognises the need for Council participation in a cross-tenure landscape approach to the management of all flying-fox roosts in the Sunshine Coast area. With the knowledge that the three flying-fox species currently found in South East Queensland will almost certainly always reside in the region, this document outlines some strategic responses to the management of existing flying-fox roosts and incorporates a proactive and predictive response to possible population movements over time.

3.9 Ecological Restoration

Ecological Restoration provides the opportunity to restore habitat values in areas which have been degraded from past land use such as clearing and loss of old-growth habitat trees. However ecological restoration can be costly and requires monitoring and evaluation to prioritise resources and ensure vegetation condition is being improved over time.

Reserve boundaries may compromise the progress of ecological restoration due to encroachments; weed invasions from neighboring properties; rubbish and garden waste dumping; illegal fence line clearing and requests for tree removal. Due to the public visibility of boundary areas these edges also often demand higher resources to maintain which may come at the expense of maintaining the good – excellent condition bushland found elsewhere on the reserve.

3.10 Maintaining Built Assets/hard infrastructure (tracks, trails, signs.)

Reserve management includes the installation and maintenance of the built assets which provide infrastructure support to the range of ecological, economic, social and cultural values of the reserve network. Built assets on Environmental Reserves include fire trails, recreational trails, roads and bridges, signs and habitat structures such as nest boxes.

Management issues:

- Risk Management and Public safety
- Geotechnical risk management
- Ecologically sensitive design
- Asset maintenance and replacement costs

3.11 Managing Growth

Growth occurs through the expansion of the reserve network due to developer contributions and levy acquisitions. The service level framework for natural Areas prescribes the allocation of resources across 4 reserve categories, B1, B2, B3 and natural Amenity.

Large reserves acquired through the environmental levy acquisition program have a higher initial establishment cost/service due to the high investment values and to ensure the higher ecological values of these reserves are maintained and any degradation is prevented. Smaller amenity reserves are mostly located throughout the urban areas and with a higher boundary/area ratio; these reserves often require the greatest amount of ongoing maintenance service.

Reserve Size Class Analysis

Council's environmental reserves range in size from small amenity reserves <1ha to the largest reserve which is 380 ha's. Table 3 and figure 1a) and b) below shows the representation in both area and numbers of different reserve size classes across the region.

Summary of reserve class data:

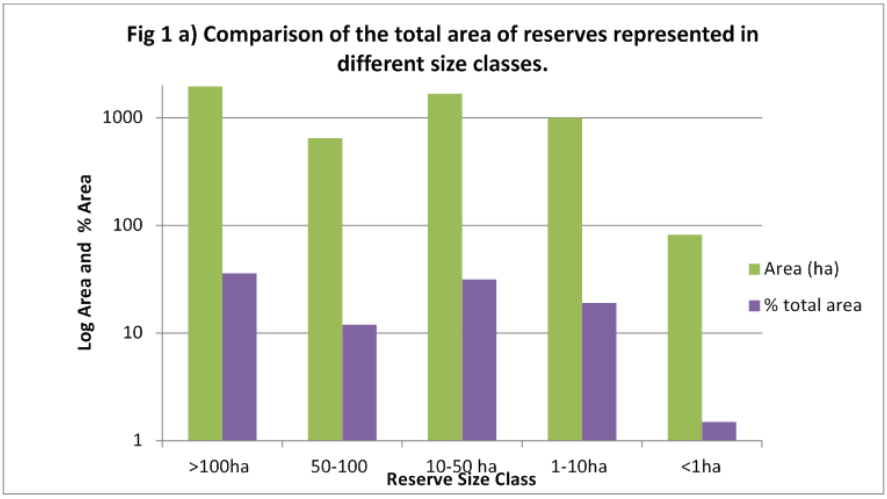
- **82% of all reserves are less than 10ha in size.**
- There are proportionally very high numbers of small reserves <1ha, however these represent a significantly low total area of the reserve network
- Larger reserves >10ha have a proportionally higher representation in term of the total area that is managed

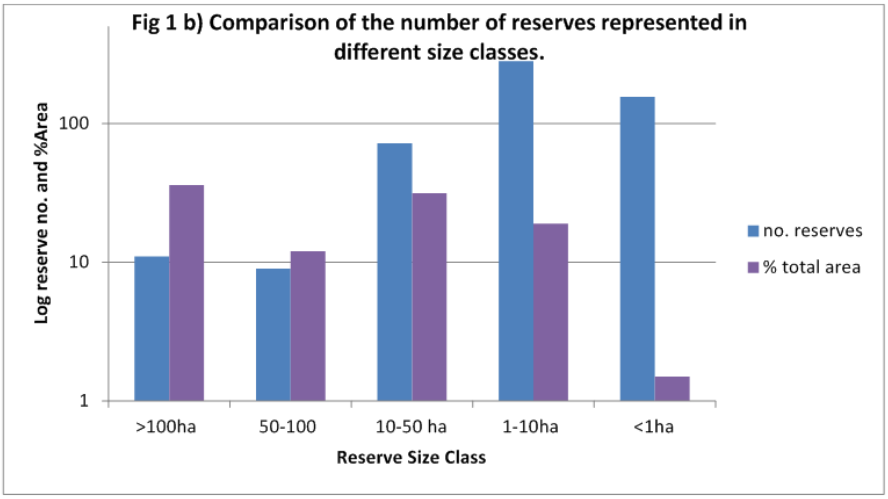
This data highlights some of the management issues in relation to growth. For example there are implications for resource allocation where smaller reserves may receive higher service maintenance over time due to high profile locations and increased edge effects.

Growth affects the capacity of the council to maintain the established standards of service and therefore resourcing issues have to be reviewed regularly.

Table 3: Representation of reserve size in council's environmental reserve network 2014-2017

Reserve Size Class	# of Reserves Managed 2014 - 2017	% of Reserves Managed 2014 - 2017	Area Managed (Ha) 2014 -2017	% of Area Managed 2014 -2017
100 Ha +	11 – 13	2	1950 - 2172	36
50-100 Ha	9 – 10	2	648 - 621	11
10-50 Ha	72 - 75	14	1672 - 1869	32
1-10 Ha	281 - 290	53	1002 - 1033	19
<1 Ha	156 - 160	29	82 - 85	1
Total	530 – 547		4 352 - 5782	





IMPLEMENTATION PROGRAM

4.1 Management Themes, Goals and Performance Targets

In the following section the implementation program provides a framework of actions to guide and measure the operational management of council's Environmental Reserves network over the next ten years. A summary of each relevant ERNMP principle is included to show what is achieved by these actions.

The actions are underpinned by the ecological, social, cultural and economic values of the Environmental Reserves network (see section 2.0) and support the delivery of council's higher strategic objectives contained in the SCC Biodiversity Strategy 2010 -2020; SCC Open Space Strategy 2011; SCC Waterways and Coastal Management Strategy 2011 -2021; Pest Management Plan 2012-2016 and the SCC Asset Management Plan Coastal and Environmental Infrastructure.

The primary aim of reserve management is to protect ecological values; any actions which address other values must not compromise the primary aim.

Within the framework of actions there are 16 management goals grouped under five themes which are also integrated from other Council strategies. These goals aim to address the reserve management issues identified in the ERNMP.

Themes	Goals
Protecting Ecosystem Service, Resilience and Livelihood Benefits	1. Maintain and restore regional ecosystems within reserves for enhancing ecosystem resilience 2. Ecosystem processes are protected and maintained. 3. Maintain and Restore habitat function within reserves 4. Restore ecosystems that provide essential services 5. Livelihood benefits preserved for the future
Protecting Biodiversity Values	6. Protect threatened and iconic animal and plant species 7. Protect Threatened Regional Ecosystems in Environmental Reserves 8. Protect council's High Value Reserves
Sustainable Public Access	9. Sustainable infrastructure and urban design 10. Environmental Reserves are accessible to the community
Building knowledge, adaptation and organizational capacity	11. Innovative programs to protect our ecology 12. Regularly evaluate management effectiveness of Environmental Reserves 13. Maintain information credibility and best practice
Biodiversity partnership and community involvement	14. Co-ordinated pest management 15. Co-ordinated ecological restoration activities 16. Co-ordinated biodiversity management

How to read the Framework of Actions[21]

Title	Description
Action	Proposed action to achieve the performance measures
Measurable Target	Measurable outcome that describes how we plan to measure success in achieving the Goal
Timeframes	When we plan to start or complete the actions Short term: commenced during 2016/17 Medium term: commence during 2017-2020 Long term: commence in 2021 with 5yr ERNMP review
Funding	Core business: Costed in our day-to-day activities associated with core business, and/or currently funded under an Environment levy project New Initiatives: Research and costings need to be conducted.
Responsibility	Specific council branch that will lead the implementation

[21] Delivery of the identified outcomes is dependent upon ongoing funding based on current budget allocations and future budget deliberations of Council

4.2 Framework of actions.

PROTECTING ECOSYSTEM SERVICE, RESILIENCE AND LIVELIHOOD BENEFITS

Principle 3: Protect ecosystem service and livelihood benefits for people.
Principle 4: Support ecosystem health and resilience by restoring ecosystem processes and protecting biodiversity.
Why is this important?

- Healthy resilient systems are better equipped to cope with change.
- This will address the impact of **climate change**—a priority for achieving ecological sustainability under the corporate plan.
- Ecological restoration has a key role to play in the recovery and resilience of biodiversity, which in turn contributes to the maintenance of ecosystem services essential to our wellbeing.
- Job creation is a key outcome associated with the restoration of healthy ecosystems, including growth in high value industries such as fauna and flora consultancies; ecological restoration and horticulture; archaeology; environmental education and landscape design. Economic growth in areas associated with environmental place based art, culture and ecotourism is also linked to the restoration and maintenance of healthy ecosystems.
- Recognized by the international society for ecological restoration (SERI) where ecosystem restoration aims to: - a) enhance ecosystem resilience for climate change mitigation and adaptation and b) promote the recovery of threatened species and c) provide essential services.

What is our approach?
Ecological restoration is the foundation for much of the work carried out on council's Environmental Reserves. The South East Queensland Ecological Restoration Framework sets the standard for ecological restoration projects. Restoration projects should maximise ecosystem mosaics and connectivity by increasing protected area size; establish buffers and easements; reducing habitat fragmentation; provide migration corridors and stepping stones; conserve sources of plant material for propagation and colonists; conserve refugia for sedentary species; reduce edge effects; and increase opportunities for adaptation to disturbances, including climate change.

Goal 1. Maintain and restore regional ecosystems within reserves for enhancing ecosystem resilience

***Issues addressed**: **3.1** biodiversity in decline; and **3.2** responding to climate change*

OBJECTIVES (actions)	MEASURABLE TARGET	TIME	LEAD and PARTNER[3]	COSTINGS
1.1 Maintain and restore the vegetation condition of regional ecosystems within councils Environmental Reserves network:	**R1:** The condition of bushland in B1 (regional) reserves is maintained to achieve >75% in good-excellent condition (current KPI) across the B1 network. (1.01)	Ongoing	EO	Core business
1.1.1 Implement resilience based restoration methods to achieve long term reduction in maintenance requirements				
1.1.2 All staff and bush regeneration contractors are required to adhere to the SEQ Ecological Restoration Framework guidelines.	**R2:** The extent of good- excellent bushland in B2 (district) and B3 reserves is known and targets set.	Medium term	EO	Core business
1.2 No net loss of excellent condition vegetation within Environmental Reserves.	**R3**: No net loss of remnant vegetation within Environmental Reserves.	Long term	EO	Core business

[3] **EO-Environmental Operations; HP – Healthy Places; P&E – Planning and Environment; ICTS – Information and Communication Technology Services**

1.2.1 Review resourcing constraints caused by boundary issues				
1.3	**No net loss of remnant vegetation on the Sunshine Coast as per the "2014 Update for SEQ NRM Plan: Sunshine Coast" - target for bushland cover by 2031 is a minimum of 44% and noting that 50% is the new international objective of the SERI.**	**R4:** 50% of the remnant vegetation on the sunshine coast is protected	Long term	EO	Core business
1.3.1	*All applications for clearing remnant vegetation on bushland reserves are reviewed by natural areas planning assessment team and application is refused or offsets are implemented to ensure no net loss as per councils existing offsets policy.*				
1.4	**Complete sufficient BOA assessments and analysis to provide baseline data.**	**R5:** BOA assessment report produced annually (reviewing restoration and associated service level and CRM outcomes).	Ongoing	EO	Core business
1.5	**Habitat values of different regional ecosystems found within a reserve are protected and maintained.**	**R6:** Fauna monitoring project completed which will describe a program for monitoring habitat condition of the reserve network	Medium term	EO	Core business
1.5.1	*Undertake fauna surveys which include habitat assessments on all B1 reserves.*				
1.5.2	*Maintain and improve the condition of vegetation within reserves;*				
1.5.3	*Continue to provide input on habitat assessment for levy acquisition to prioritise reserves with fewer maintenance and restoration risks.*				
1.6	**Manage declared and noxious weeds in accordance with the SCC Pest Management Plan**	**R7:** 60 sites completed for targeted weed control in road reserves adjacent to Environmental Reserves. *(75 assessed; 20 completed for woody weeds)*	Medium term	HP - EO;	Core business
1.6.1	*Meet the obligations of the Queensland weed Strategy*				
1.6.2	*Identify and manage declared plant populations in Environmental Reserves, including keeping accurate records of locations and treatments used based on pest info database.*	**R8:** Monitoring report submitted annually for a 4 year review on 2018 of woody weed road reserve project.	Medium term	HP	Core business
1.6.3	*Prevent establishment of non-target weeds into newly created niches, by the additional treatment of weeds in the affected or degraded areas*	**R9** Hygiene protocols are established for all work programs through QMS	Medium term	HP – EO;	Core business
1.6.4	*Support Healthy Places approach to minimise spread of weeds caused by Councils use of unsuitable slashers; trialling methods to prevent re-growth of weeds; e.g. use of black plastic ; remove soil; burning; steam mulching with camphor laurel; habitat modification; planting with alternative grasses to do same.*	**R10:** All relevant restoration project staff and contractors are aware of and working to LIM planting (landscape) specifications in relation to soil born weeds and pathogens.	Ongoing	EO EO	Core business
1.7	**Manage risks associated with pathogens** (e.g. *Phytophthora cinnamonii; myrtle rust* and amphibian Chytrid fungus)	**R11:** preliminary fungi assessment completed on one reserve per annum. (Research partnership program).	Medium term	EO-HP	New initiative
1.7.1	*Liaise with Healthy Places team to develop plans or policy to address risk of pathogen contamination across the region*	**R12:** Mapping complete for all reserve sites known or suspected to be at risk from pathogens and included with (a) management plan addressing risks within the site, and (b) establish a management plan to reduce risks of contamination to other sites.	Medium term	HP	Core business
1.7.2	*Once established council staff and contractors have access to a wash down facility to manage dispersal of pathogens and weeds.*	**R13**: Wash down facility in place	Short term		Core business
1.7.3	*1.07.03 Once established, council staff and contractors have access to a chemical disposal and storage facility to prevent unauthorised disposal into reserves, waterways and other bushland areas.*				

Goal 2. Ecosystem processes are protected and maintained. ***Issues addressed:* 3.2** *responding to climate change;* **3.7** *achieving integrated landscape management* **3.8** *maintaining ecological processes;* **3.9** *ecological restoration (boundary issues).*					
2.1	**Reserve boundaries are planned to improve landscape links which support ecosystem processes.**				
2.1.1	*EO will develop a list of buffer criteria to be added to reserve management guidelines contained in the ERNMP.*	**R14**: 100% of development services (DS) contributions include buffers for potential environmental hazards such as flying fox camps, overhanging trees, weeds and fire.	Ongoing	EO	Core business
2.1.2	*Ensure all future developments address opportunities to establish strategic buffers adjacent to Environmental reserves to address potential environmental hazards such as flying fox camps, over-hanging trees and fire*				
2.1.3	*Investigate opportunities to ensure the buffer is in addition to 10% developer contribution. This may be incorporated into the private landholder's property as a covenant however the covenant must have a clear intent.*				
2.2	**Reserve boundaries are designed to improve landscape links which support ecosystem processes.**				
2.1.1	*Investigate the use of the Marxan analysis tool to identify optimum reserve configuration for existing reserve network in order to reduce the reserve area to boundary ratio*	**R15:** An environmental reserves consolidation policy will be informed by outputs from MARXAN to determine Optimum reserve configuration options for the existing reserve network.	Medium term	EO	Core business
2.1.2	*Review and consolidate the existing reserve network to reduce boundary effects.*	**R16:** An environmental reserves consolidation policy will include recommendations for the open space layer to reclassify and potentially remove from natural areas the high maintenance park like reserves.	Long term	EO	Core business
2.2.3	*EO will develop reserve consolidation recommendations for the existing reserve network to support annual recommendations for growth through acquisition, CCP or developer contribution in strategic reserve areas. Recommendations are aimed at supporting the resilience of the existing reserve network. This will also guide DS response to developer contribution to ensure best outcome for natural areas management. (e.g. connecting riparian reserves within close proximity such as along Coonowrin Ck).*	**R17**: An environmental reserves consolidation policy will contribute to the recommendations for future acquisitions.	Long term	EO	Core business
2.3	**ERNMP to assist in informing Planning Scheme outcomes in relation to the Goals and Objectives of this plan**	**R18:** Planning scheme is amended as per input from EO so that buffer requirements are included as outcomes	Long term	P&E	Core business
2.3.1	*Submit amendment request to planning scheme to include reference to the natural areas ERNMP with reference to sections on buffer requirements.*	**R19:** The planning scheme includes reference to Environmental Reserve Buffer criteria (see Volume III: Environmental reserves Network management Plan Manual)	Long term	EO – P&E	Core business
2.4	**Integrated landscape management is implemented through collaboration and active communication between council departmental branches**	**R20:** Open Space Strategy is amended as per input from EO to ensure the collated parks are "along the linear boundary of the reserve".	Short term	EO	Core business
2.4.1	*Support Open Space Strategy theme to co-locate parks and reserves and add "along the linear boundary of the reserve" (currently some co-located parks are perpendicular to the reserve edge and therefore not as effective)*				
2.4.2	*Maintain current arrangements for EO to have input on DS assessments relevant to the natural area estate*	**R21:** CRM data reflects a decline in the response to boundary issues.	Long term	EO	Core business
2.4.3	*Support ESP in the acquisition of levy properties in core habitat areas to protect landscape scale ecosystem processes and associated reserve resilience.*	**R22:** BOA data reflects better resourcing across the reserve due to less time spent on boundary issues.	Long term	EO	Core business
2.4.4	*Support ESP in the acquisition of levy properties to connect existing reserves to*				

	protect landscape scale ecosystem processes and associated reserve resilience				
2.4.5	*EO assisting in assessment of new acquisition properties to provide input on buffer requirements to address boundary issues*				
2.5	**Strengthen partnerships with neighbouring land managers to restore ecosystem processes**	**R23:** Minimum of 1 prioritised reserve per year has an open day where neighbours are invited to engage with council staff and learn about programs and opportunities	Short term	EO	Core business
2.5.1	*Remove barriers to terrestrial dispersal*				
2.5.2	*Remove barriers to in stream movement (migration and dispersal) of aquatic fauna*				
2.5.3	*Restore critical linkages for fauna and flora movement*				
2.5.4	*Address boundary issues to reduce weed incursions from road reserves and private land-holders*	**R24:** Each new levy acquisition reserve has an open day where neighbours are invited to engage with council staff and learn about programs and opportunities	Short term	EO	Core business
2.6	**Maintain opportunities for movement of fauna and flora between reserves**	**R25:** SCC Design standards for fauna movement *a) Bridges and causeways* *b) Roads and paths* *c) Fences* *d) Utilitty clearings (e.g. unity water, ergon, fire)*	Short term	EO	Core business
2.6.1	*Develop design standards and protocols for restoring and building river crossings within reserves*				
2.6.2	*Reduce impacts associated with in-stream barriers to aquatic fauna movement, such as causeways and culverts.*				
2.7	**Provide ecological information to support DS contributions and acquired offsets in connecting habitat areas.**	**R26:** A reserve consolidation policy developed with MARXAN is available to support annual recommendations for growth through developer contribution in strategic reserve areas.	Medium term	EO	Core business
2.7.1	*Marxan support tool may be used to identify optimum reserve configuration for existing reserve network using connecting habitat as an objective.*				
2.7.2	*Retain and manage connections at Triunia Biodiversity Link and rationalize boundaries using MARXAN*	**R27**: Triunia Biodiversity link is included in Triunia management plan recommendations.	Short term	EO	Core business
2.7.3	*Retain and manage Petrie Creek corridor to align with SEQ NRM objectives*				
2.08	**Support the draft flying fox management plan (2013) options to enhance flying fox habitat and roosting opportunities in Environmental Reserves.**	**R28:** Research and trial sites investigated for Flying fox roosting habitat enhancement e.g. central zone of Emerald Woods	Medium term	EO	Core business
2.5.1	*Map sites within Environmental Reserves, including potential offset sites where bush regeneration aimed at enhancing flying fox habitat would be suitable*	**R29**:12 prescribed burns/yr. Includes ecological outcomes in line with fire management guidelines for regional ecosystems.	Ongoing	EO	Core business
2.09	**Support SCC Fire Management Strategy**				
Goal 3. Maintain and Restore habitat function within reserves ***Issues addressed:*** ***3.1*** *biodiversity is in decline;* ***3.6*** *understanding ecosystems;* ***3.7*** *ecological restoration*					
3.1	**Identify and protect specific habitat functions within each reserve**	**R30:** Reserve Management plans include recommendations to restore and protect habitat function.	Medium term	EO	Core business
		R31: Scoping paper developed to define the requirements for a habitat function map of the reserve network. a) existing data available (see also R30, R31, R34, R35, R39) b) additional data requirements	Medium term	EO	New initiative
3.2	**Develop an understanding of habitat function of different reserves in relation to both resident and migratory populations of fauna.**	**R32:** fauna inventories of all terrestrial vertebrates, including bats completed on all B1 reserves	Medium term	EO	Core business
3.2.1	*Develop a fauna distribution database for Environmental Reserves.*				

3.2.2	*Identify habitat requirements for prioritized resident fauna species*	**R33**: seasonal fauna inventories of frogs completed on all relevant B1 reserves.	Medium term	EO	Core business
3.2.3	*Identify habitat requirements for prioritized migratory bird species*				
3.2.4	*Support and promote investigations of species requirements in terms of patch size, connectivity and function*	**R34**: seasonal fauna inventories of birds completed on B1 reserves.	Medium term	EO and Birds Australia	Core business
3.2.5	*Fauna monitoring will assess the function of the reserve network in relation to seasonal bird movements*	**R35:** In partnership with other stakeholders (Birds Australia, SEQ catchments; QPWS; SEQ water; SCC WPSQ) Reserve network habitat function mapped for seasonal and migratory birds. (see eramea bird records-citizen science)	Medium term	EO and partners	Core business
3.2.6	*Develop a preliminary list of known habitat functions within and between reserves to provide a habitat function audit of all environmental reserves. (e.g. paired low and high altitude sites required to maintain bird populations for seed dispersal)*	**R36:** fauna monitoring project outcomes include recommendations to monitor aspects of habitat function	Medium term	EO	Core business
3.3	**Site establishment through ecological restoration aims to restore habitat structure and function**	**R37**: Reserve management plans with habitat restoration guidelines completed for all B1 reserves.	Medium term	EO	Core business
3.3.1	*Habitat restoration goals included in reserve management plans*				
3.3.2	*Habitat restoration activities are monitored for fauna occupancy and abundance.*	**R38**: fauna monitoring in place for targeted habitat restoration sites.	Medium term	EO	New initiative
3.3.3	*Develop a nest box monitoring project (map and monitor nest box usage across reserve and LFW sites*	**R39:** nest box monitoring project is underway	Medium term	EO	Core business
3.4	**Protect and enhance key patches and corridors in the reserve network which function as migratory or dispersal routes for fauna.**	**R40**: Habitat function map produced for the reserve network showing a) *patches and corridors used by locally migrating bird species* b) *patches and corridors used by national and international migratory bird species*	Medium term	EO and Birds Australia	New initiative
3.4.1	*Build knowledge of the habitat function of patches and corridors within the reserve network.*				
3.4.2	*Build knowledge of the habitat function of patches and corridors within the reserve network*				
3.5	**In partnership with Healthy Places.**	**R41**: Declared pest animals removed from sites where adjacent neighbors have reported to be personally at risk	Medium term	HP –EO	Core business
3.5.1	*Priority service for controlling pest animals will be given where it is identified there is a public health and safety risk to the general public.*	**R42:** Declared Pest animals managed and outcomes monitored (before and after) at sites where there is a known threat to EVNT species.	Medium term	HP -EO	Core business
3.5.2	*Priority service for controlling pest animals will be given where there is a known threat to EVNT animals.*	**R43:** Declared Pest animals managed and outcomes monitored (before and after) removed from sites where there is a known threat in identified high value reserves, including corridors and core habitat areas.	Medium term	HP -EO	Core business
3.5.3	*Priority service for controlling pest animals will be given where there is a known threat in identified high value reserves, including corridors and core habitat areas*				
Goal 4. Restore ecosystems that provide essential services ***Issues addressed:*** ***3.3*** *managing access for education, ecotourism, and nature based recreation;* ***3.6*** *understanding ecosystems;* ***3.8*** *maintaining ecological processes;* ***3.9*** *ecological restoration*					
4.01	**Develop priorities and plans for restoring stream water quality in and upstream of Environmental Reserves.**	**R44**: Water quality program established for London CK.	Medium term	**EO**	Core business
4.1.1	*Work with partners—SEQ catchments; DA and CCP—to increase the vegetation cover in priority watersheds*	**R45**: CCP undertaking hotspot investigations at London Ck ER and Kirbys Rd ER	Medium term	**EO**	Core business

4.1.2	*London Ck ER upper catchment is identified as a priority catchment for CCP funding and included in annual grants funding criteria.*	**R46:** London Ck environmental reserve open space is revegetated to achieve minimum 90% forest cover across the reserve by 2025	Medium term	**EO**	Core business
4.2	**Restore and protect reserves within the core habitat areas surrounding the Maleny Plateau; the Connondale ranges and Coastal wetlands.**	**R47:** Kirby's Rd environmental reserve open space is revegetated to achieve minimum 90% forest cover across the reserve by 2025	Medium term	**EO**	Core business
4.2.1	*Re vegetate deforested watersheds*	**R48**: Develop a wetland restoration plan for the Doonan Creek environmental reserve.	Medium term	**EO**	Core business
4.2.2	*Restore degraded coastal wetlands*	**R49**: management plans completed for all regional coastal reserves	Medium term	**EO**	Core business
Goal 5. Livelihood benefits preserved for the future ***Issues addressed:* *3.3* *managing access for education, ecotourism, and nature based recreation* ***3.4:*** *maintaining protected area status;* ***3.11*** *managing growth***					
5.3	**Plan for tenure security.**				
5.3.1	*Consolidate land management agreements with state government*	**R50:** All of Council's high value reserves have tenure protection which may include Nature Refuge status.	Medium term	P&E-EO	Core business
5.3.2	*Identify opportunities for greater tenure security such as nature refuge agreements for high value reserves.*	**R51:** No net loss of land within the environmental reserves conservation estate	Long term	EO	Core business
5.3.3	*Identify planning mechanisms which prevent loss of reserve land encroachments caused by applications for easements and boundary re-alignments*				
5.4	**Develop opportunities to have input into the forward planning for local, regional, state and national infrastructure priorities which may impact Environmental Reserves.**	**R52:** Reserve classification and Zoning maps are available as a communication tool for future planning and marketing (See K5 below)	Medium	EO –P&E	Core business
5.5	**Maintain and expand links between the natural environment and the local economy through investment and growth in high value industries**				
5.5.1	*Maintain and expand relationships with partners to strengthen reserve values through community ownership and innovation*	**R53**: The levy acquisition property establishment program includes developing community partnerships through site based events and training.	Short term	EO	Core business
5.5.2	*Develop landscape design plans which complement reserve categories to facilitate sustainable access and associated nature-based recreation, ecotourism and cultural opportunities*	**R54**: landscape design plans complete for Kirbys Road ER; Mt Ninderry ER; and Doona Ck ER	Medium term	P&E-EO	Core business
5.5.3	*Develop multi-use opportunities for reserves based on a reserve classification model (e.g. MARXAN*	**R55**: report developed to investigate opportunities to utilise the reserve network for internal and external offsetting **See also B23** and A5 below	Ongoing	EO	Core business
5.5.4	*Support an innovative knowledge economy through environmental reserve planning and management* *See also actions and outcomes in section 11.00 below (Building knowledge, adaptation and organizational capacity)*	**R56**: A discussion paper is developed to examine the opportunities and constraints for establishing councils reserve network as a national research reserve network. (See K3 below)	Medium term	EO	New Initiative

PROTECTING EXISTING BIODIVERSITY VALUES

Principle 6: Provide special protection for at-risk biodiversity. *The health of natural areas is supported by a focused and coordinated regional approach aimed at protecting rare and threatened species; and endangered and of-concern regional ecosystems.*

Biodiversity values have been prioritised to provide an integrated approach with other land managers and plans covering the sunshine coast region, such as the SEQ NRM plan, SEQ catchments Back on Track Species Prioritization, and the Council's Biodiversity Strategy. Therefore the goals are grouped to address threatened and iconic animal and plant species, threatened regional ecosystems, and high value Environmental Reserves.

Within these categories the direct threats to biodiversity values are (1) pest animals (foxes, toads, cats, dogs and pigs); (2) vegetation clearing and habitat loss associated with requests for easements/access or boundary re-alignments; (3) edge effects; (4) weeds; (5) inappropriate fire regime; (6) climate change affecting species distribution and reproduction; (7) habitat fragmentation and (8)Insufficient knowledge of - distribution and density, habitat requirements, and threatening processes (9) roads and railways – fencing, overpasses and underpasses, speed reduction, traffic calming, subdivision design

Goal 6. Protect threatened and locally significant animal and plant species
Issues addressed: ***3.1*** *biodiversity is in decline;* ***3.4*** *building great partnerships*

OBJECTIVES (actions)		MEASURABLE TARGET	TIME	LEAD and PARTNER	COSTINGS
6.1	**Threatened plants and animals on reserves are mapped under management considerations**	**B1:** Threatened plant and animal records available to DS and pest management.	Medium term	EO-P&E; HP	Core business
6.2	**Implement recovery plans for identified EVNT species for which there are recovery plans.**	**B2:** recovery plans for EVNT species included in all reserve management plans.	Ongoing	EO	Core business
6.2.1	*Include recovery organizations in stakeholder engagement and establishment planning e.g. FAME, Birdlife Australia; A.W.C.*				
6.3	**Work with Healthy Places for coordinated wild dog control in reserves in peri-urban and rural areas.**	**B3:** Healthy Places operational coordination group established.	Medium term	EO-P&E; HP	Core business
6.3.1	*Where koalas may occur.*				
6.3.2	*to protect identified vulnerable species*				
6.3.3	*to implement recommendations associated with specific reserve management plans*				
6.3.4	*Identify and action conservation management options for flying fox camps, as listed in councils draft flying fox management plan, (2013).*	**B4**: Options papers completed for all urban roost sites;	Ongoing	EO	Core business
6.4	**Support the outcomes of the SCC Biodiversity Strategy by adding to the reporting data the presence of endangered, vulnerable, and near threatened species occurring in Environmental Reserves on the sunshine coast.**	**B5:** Fauna monitoring and data management project complete.	Short term	EO	Core business
6.5	**Align the ERNMP targets with back on track species prioritization.**				
6.5.1	*Undertake targeted Dutchman's pipe control where the Richmond birdwing butterfly and its habitat occur on council land and Dutchman's pipe is a threat. (Have an info session with HP to ID)*	**B6:** Dutchman's pipe is 100% eradicated from all council reserves where there is habitat for Richmond Birdwing Butterfly	Long term	EO-HP	Core business
6.5.2	*Obtain spatial data for Richmond Birdwing Butterfly from confluence of issues mapping from SEQ catchment and add to council database to enable the prioritization of areas for action.*	**B7**: Partnership established with CCP; Healthy Places and Maroochy Catchment Services addressing eradication of	Long term	EO-HP	Core business

6.5.3	*Obtain mapping for Dutchman's Pipe in adjacent properties from Barung; LBCCG and MRCCC*	Dutchman's Pipe in properties adjacent to council reserves.			
6.5.4	*Investigate outcomes of Research into the biological control for mistflower (DEEDI).*	**B8:** Threatened and locally significant species added to fauna monitoring objectives, including consideration of locally significant butterfly species such as Chocolate Brown Butterfly; Sword-grass butterfly and Regent skipper Butterfly.	Medium term	EO	Core business
6.5.5	*Access spatial data for Brunoniella spiciflora Butterfly from confluence of issues mapping from SEQ catchment and add to council database to enable the prioritization of areas for action.*				
6.5.6	*Undertake targeted mistflower control at sites where, Brunoniella bella core habitat or populations occur in the Sunshine Coast Environmental reserves*	**B9:** EO has a communication protocol established with HP to prioritise notification of pigs or evidence of pigs in coastal reserves,	Medium term	EO-HP	Core business
6.5.7	*Assess threats to water mouse populations associated with pigs in coastal reserves*				
6.6	**In partnership with healthy places investigate whether mistflower can be declared under the local law or under the new biosecurity act as a local government pest plant**	**B10**: Pest management coordination group actions includes investigation into whether mistflower can be declared under the local law or under the new biosecurity act as a local government pest plant	Medium term	EO-HP	Core business
6.7	**Align ERNMP weed management targets with SCC land owner environment grants priority weeds - a) cats claw; b) madeira vine; c) Dutchman's pipe.**	**B11**: ERNMP priority weeds—cats' claw; madeira vine; and Dutchman's pipe considered in SCC land owner environment grants priority weeds.	Medium term	EO	Core business
6.8	**Provide advice to DS on requirements for locally significant species e.g. fencing, nest boxes; weed control; re vegetation.**	**B12:** All environmental operations officers reviewing DS applications have access to relevant species recovery reports and information pertaining to the habitat requirements of significant fauna and flora.	Ongoing	EO	Core business
6.9	**Identify iconic and threatened flora and fauna species which occur on council reserves.**	**B13**: all council records of EVNT species are added to wildnet	Medium term	EO	Core business
6.9.1	*Based on a database that is maintained/current*				
6.10	**Review the effectiveness of Councils management practices aimed at protecting biodiversity on environmental reserves.**	**B14**: discussion papers prepared to inform the development of a monitoring program addressing Councils management practices within reserves. *a) fire management;* *b) Bush regeneration* *c) Landscape processes*	Short term	EO	Core business
Goal 7. Protect Threatened Regional Ecosystems in Environmental Reserves ***Issues addressed**: **3.1** biodiversity is in decline; **3.4** building great partnerships; **3.6** understanding ecosystems; **3.9** ecological restoration*					
7.1 Where necessary protect and restore the condition of threatened regional ecosystems (NC ACT 1992) within the reserves network. *(Threats include encroachments, boundary disturbance, loss of ecological processes and tenure re-configuration.)*		**B15:** Prioritised list for repeat BOA's for all Environmental Reserves containing threatened regional ecosystems.	Medium term	EO	Core business
7.2 Where necessary protect and restore regional ecosystems which are poorly conserved within the reserve network. *(Threats include encroachments, boundary disturbance, loss of ecological processes and tenure re-configuration.)*		**B16:** Prioritised list for repeat BOA's for all Environmental Reserves containing the Sunshine Coasts poorly conserved regional ecosystems.	Medium term	EO	Core business
7.3 Build capacity to understand and address existing and future threats to the threatened and poorly conserved regional ecosystems.		**B17:** Established reference ecosystem network for establishment, monitoring and evaluation of restoration activities occurring on council reserves	Ongoing	EO	Core business

Goal 8. Protect Councils High Value Reserves ***Issues addressed:* *3.4* *maintaining protected area status;* *3.5* *building great partnerships; 3.6 understanding ecosystems;* *3.11* *managing growth***					
8.1	**High value reserves are identified in the annual reserve classification database.**	**B18:** Reserve classification is updated annually	Medium term	EO	Core business
8.2	**Review reserve classification criteria to include landscape function for species which may occur outside core and connecting habitat areas. *e.g. critical stepping stones for migratory birds; protecting isolated populations of endangered species. These reserves need to be identified especially where they may not meet the criteria for achieving a high bio-score in the current service level classification.***	**B19:** reserve classification criteria includes a score for sites identified as important stepping stones.	Ongoing	EO	Core business
8.3	**Identify and enhance the ecological knowledge of high value reserves in order to optimize the protection and management of these reserves. These include reserves located in Core and connecting habitat areas.**	**B20:** Fauna and flora surveys completed on all high value reserves. **B21:** All fauna surveys include an assessment of habitat for identified fauna and associated management recommendations **B22:** Add/prioritise high value reserves for citizen science surveys. a) Involving youth b) Involving traditional owners c) Involving existing community partners	Ongoing Ongoing Medium term	EO EO EO	Core business Core business Core business
8.4	**Where appropriate Cultural Heritage significance is added to the management considerations GIS layer and reported in reserve management plans.**	**B23**: Reserve management plans completed on all high value reserves.	Ongoing	EO	Core business
8.5 *8.5.1* 8.5.2	**Prioritise weed management in high value reserves** *Address weed management associated with boundaries through partnership with Healthy Places (HP).* *Address weed management associated with boundaries through partnership with Community Conservation Partnerships (CCP)*	**B24:** Submit 50 sites to pest management for targeted weed control in road reserves adjacent to Environmental Reserves. **B25:** Monitoring report submitted annually for a 4 year review on 2018 of woody weed road reserve project	Ongoing Medium term	EO-HP HP	Core business Core business

FACILITATING SUSTAINABLE ACCESS (relates to eco recreation and other access as well as boundary issues and requests for easements on reserves)

Principle 1: Integrated Land Use Planning
Land use planning involves all relevant stakeholders so that ecological, social, cultural and economic concerns are addressed in a balanced and considered way. Collaborative efforts develop co-benefits which also help build support for conservation and ecological restoration

Principle 3: Protect ecosystem service and livelihood benefits for people
Healthy ecosystems support the ecosystem services which contribute to the Sunshine Coasts capital.
The provision of public access and associated facilities for the public to see and interact with the environment is achieved in a sensitive manner which balances the ecological and social values. The emphasis is on eco-recreation and education, equitable access, volunteer contributions and achievements in bushland management and how community awareness and education enhances these social values.

Goal 9 Environmental Reserves are accessible to the community
Issues addressed: 3.3 *managing access for education, ecotourism, nature based recreation and education*

OBJECTIVES (actions)	MEASURABLE TARGET	TIME	LEAD and PARTNER[4]	COSTINGS
9.1 Support SCC Biodiversity strategy implementation plans for a "Biodiversity Interpretive Trail Network that provides community and visitor access to the regions natural assets in a range of settings…" *9.1.1 Ensure access is compatible with the primary purpose of the reserve.* *9.1.2 Access that is sustainable will include capacity to deliver required levels of service in order to maintain the trail network and interpretive tools.* *9.1.3 Support opportunities to co-locate parks and reserve to facilitate access*	**A1:** Reserve zonation maps developed (1.Sanctuary; 2.Education; 3.Recreation. **(See K4 below)**	Medium term	EO	Core business
	A2: Reserves zoning maps developed by Natural Areas are available to be used for complementary design within the "Recreational Parks plan". **(See K5 below)**	Medium term	EO	Core business
9.2 Sustainable access is coordinated on a landscape scale across the reserve network. *9.2.1 Provide input to the SCC recreational trail strategy through identifying suitable environmental reserves which provide opportunities that support community and visitor access*	**A3:** Reserve management plans include recommendations for suitable access points and multi-use buffers.	Ongoing	EO	Core business
9.2.2 All roads and tracks on the boundary of reserves and adjacent parks include integrated planning and design principles to provide multi-use reserve buffers where appropriate. *9.2.3 Maintain currency of Environmental Operations ArcGIS base map trails layer and integrate this with the Councils ArcGIS open space layer. (See asset matrix as a tool for delivering this outcome)*	**A4**: trails on the open space layer are updated to accurately reflect the status of the existing trail network within the environmental reserves. This includes trail classification and e.g. management trail; walking trail; cycling etc.	Ongoing	EO	Core business
9.2.4 Provide input and relevant information to support Council plans and subsequent capital funding bids associated with ecotourism and nature based recreation	**A5:** landscape plans developed for Bushland category environmental reserves, addressing ecotourism and nature based recreational opportunities for these sites. a) Kirby's Rd Environmental Reserve. b) Doonan Ck Environmental Reserve. c) Mt Ninderry Environmental Reserve. d) Sugarbag Rd Environmental Reserve. e) Hardie Buzacott Wildlife Reserve	Ongoing	EO- P&E	Core business

[4] **EO-Environmental Operations; HP – Healthy Places; P&E – Planning and Environment; ICTS – Information and Communication Technology Services**

9.3 **Recreation access and management is sustainable (including maintenance costs) and compatible with the primary purpose of the reserve.** *9.3.1 Landscape design plans are developed for identified Environmental Reserves (as per Open space category descriptions) to support ecotourism and nature based recreation*	**A6:** landscape plans developed for Environmental category environmental reserves addressing ecotourism, education and nature based recreational opportunities a) London Ck Environmental Reserve. b) Maroochy Wetlands Sanctuary c) Maroochy Bushland Botanic Garden and Tanawha Reserve	Medium term	EO	Core business
9.4 **Review the ecological value of amenity reserves.** *9.4.1 Develop criteria for disposal of reserves.* *9.4.2 Undertake a workshop with relevant teams to assess sites considered for disposal* *9.4.3 Review service levels and weighting of size criteria in relation to ecological function and value.*	**A7:** reserve function score added to reserve classification.	Medium term	**EO**	Core business
9.5 **Improve sustainable public access through awareness and promotion of reserves.** *Information is delivered electronically through a mixture of social media and web-based tools* 9.5.1 *Interpretive signage* 9.5.2 *Media* *9.5.4 Events*	**A8:** Prioritise and review use of current brochures—identify any new requirements. **A9:** Every 3 months maintain and review current info on web site in relation to natural areas.	Short term Short term	**EO** **EO**	Core business Core business
Goal 10 Sustainable infrastructure and reserve design ***Issues addressed**: **3.1** biodiversity is in decline; **3.7** achieving integrated landscape management; **3.10** maintaining built assets/hard infrastructure; and **3.11** managing growth*				
10.1 **All roads and tracks within reserves are designed to maintain ecological values of the reserve.** *10.1.1 Include track and trail best practice guidelines and links to council resources such as LIM; PEAT; SCC trail construction guidelines; and fire trail construction guideline see LIM;* *10.1.2 Develop trail construction guidelines for natural areas which include river crossing guidelines for bridge and causeway construction associated with access through the reserve.* *10.1.3 Any associated planting guidelines will be aimed to complement the unique habitat of each environmental reserve.*	**A10:** Trail construction guidelines for natural areas included in ERNMP resources and includes: *a) Fauna and flora risk assessment for imported material* *b) track grades* *c) hygiene protocols* *d) Creek crossings for in stream fauna passage* *e) Terrestrial and in stream erosion control* *f) setback criteria in place for maintaining fire trails* *g) setback criteria in place for maintaining bushland vegetation* - *Criteria is dependent on boundary type e.g. road, residential,* - *Include easily defined mowed strip*	Long term	EO	Core business
10.2 **Hygiene protocols are implemented for high risk reserves where there is promoted recreational use.** *10.2.1 Based on guidelines* *10.2.2 includes direction of mowing to minimise weed spray* *10.2.3 Support achievable outcomes for infrastructure development which will meet IS capital works annual delivery goals of 80% investment in renewal, 20% investment in growth.*	**A11:** Hygiene protocols for off trail public entry to Mary Cairncross Scenic reserve **A12:** Environmental reserves annual funded plans reflect capital investment goal of 80% renewal, 20% growth. (see also A5 and A6 for potential growth projects	Medium term Ongoing	EO EO	Core business Core business

BUILDING KNOWLEDGE, ADAPTATION AND ORGANISATIONAL CAPACITY

Principle 1: Integrated land Use Planning. *Land use planning involves all relevant stakeholders so that ecological, social, cultural, sustainable recreation and economic concerns are addressed in a balanced and considered. Collaborative efforts develop co-benefits which also help build support for conservation and ecological restoration.*

Principle 2: Contribute to adaptive management. *Adaptive management is applied as a mechanism to address uncertainties associated natural area management and involves learning through doing and reviewing. There is a strong correlation between effective monitoring and effective management, therefore success relies on adaptive management which is informed by monitoring outcomes. The importance of this will increase under climate change.*

Principle 5: Integrate local and traditional knowledge and values. *Cultural heritage and social history associated with natural areas are protected and promoted to preserve the character, identity and traditions of the Sunshine Coast.*

Principle 7: Build knowledge and assess risks. *Management will aim to support and add to the collective knowledge of the region's biodiversity and ecosystem function. Risks can be minimised by ensuring a robust planning process, which includes a rigorous assessment of the capacity and support for restoration activities*

Goal 11. Innovative programs to protect our ecology
***Issues addressed**: **3.5** building great partnerships; and **3.6** understanding ecosystems*

OBJECTIVES (actions)	MEASURABLE TARGET	TIME	LEAD and PARTNER[5]	COSTINGS
11.1 Align planning and management outcomes of Environmental Reserves with SEQ Catchments ecosystem services framework.	**K1:** A natural area Network Plan finalized and includes feedback in relation to SEQ catchments ecosystems services.	Short term	EO	Core business
11.2 Develop Research Portfolio for Councils reserve network based on management needs.	**K2:** list of specific research priorities to address gaps in current management knowledge of Environmental Reserves is finalized.	Short term	EO	Core business
11.2.1 Promote ecological research which will inform management practices on council's Environmental Reserves.				
11.2.2 Identify and address knowledge gaps regarding ecosystem function of reserves.	**K3:** A report is prepared investigating opportunities to establish the SCC Reserve network as a national ecological research reserve system (addressing any potential risks associated with this). (See R.56)	Short term	EO	New initiative
11.2.3 Use the ERNMP as a basis for guiding research priorities on Environmental Reserves.				
11.2.4 ***Develop a citizen science monitoring program for the reserve network Currimundi catchment grp; fauna watch***	**K4:** at least one citizen science project underway *(e.g. Brisbane Wildlife Survey; M8 DA Fauna/Flora Lists*) (see also P8)	Short term	EO	New initiative
i) Select sites to align with curriculum needs of education institutions				
ii) Look at reserves close to education facilities				
iii) Facilitate opportunity for council volunteers to undertake glossy black cockatoo surveys at sites not currently covered in SEQ catchments monitoring day.				
iv) Collaborate with other departments in SCC to achieve integrated outcomes. (e.g. send research priority list to LFW)				
11.3 Establish innovative reserve network management programs which add value to protect ecology and tenure security of reserves.	**K5:** The zonation methodology has been used to develop	Short	EO	Core business

[5] **EO-Environmental Operations; HP – Healthy Places; P&E – Planning and Environment; ICTS – Information and Communication Technology Services**

11.3.1	*Consider identifying a number of reserves to be available for marketing to research institutions or organisations for innovative restoration outcomes (non-destructive experimental techniques)*	criteria and systematically test a use based classification of the reserve network based on the following proposed Zones. **1. Sanctuary** (limited infrastructure, rudimentary access, conservation and management reference ecosystem, low cost) **2. Education** (specific infrastructure, controlled access, med-high cost); **3. Recreation** (existing access, functional infrastructure, med-high cost). *a) Zoning criteria includes representation targets for each category based on sustainability (economic: capacity to maintain; ecological: protects biodiversity; cultural/social: provides access where needed)* *b) Reserve zones have been applied to a visual/map marketing or branding tool used to promote the reserve network*	term		
11.3.2	*Zoning should not detract from our core business. Therefore investigate whether there needs to be a target for %recreational which provides a realistic capacity to maintain*				
11.3.3	*Ensure any future assessments include the value of the existing trail network already found in most reserves which is currently used for passive recreation.*				
11.3.4	*Signage developed for each zone.*				
11.3.5	*Differentiate what the status of the current trails are on current arcMap*				
11.4	**Support SCC Biodiversity report card recommendations to incorporate mobile technology into the capture and management of flora and fauna data.**	**K6**: A natural areas Open Data Expo at Doonan Creek Environmental reserve serves to activate existing and new open data applications across Councils reserve network.	Short term	EO-ICTS	New initiative
11.5	**EO working collaboratively with P&E to improve resilience of reserves**	**K7:** EO assisting in assessment of new acquisition properties to provide input on potential management risks.	Ongoing	EO	Core business
11.6	**Identify and utilize bio control opportunities for weed management to achieve ecological outcomes.**	**K8:** bio-control trial sites and experiments continue to be in place on selected council reserves.	Ongoing	EO	Core business
11.6.1	*Rearing facility proposed for sunshine coast.*				
11.6.2	***bio-control sites within the reserve network***				
11.7	**Support the development of project officer technical skills aimed at maintaining and improving team capacity for the protection of ecological values across the reserve network.**	**K9:** annual review of data management skills and requirements for project officers.	Short term	EO	Core business
11.7.1	*Data entry and data management for optimum retrieval and analysis*	**K10:** wildlife management skills training included in bi-annual conservation forum at London Ck Environmental Reserve	Ongoing	EO	Core business
11.7.2	*Identification of known EVNT plant and animal species*	*a) Fauna monitoring techniques*			
11.7.3	*Fauna monitoring using non-invasive remote sensor techniques*	b) *EVNT fauna/flora* identification			
Goal 12. Regularly evaluate management effectiveness of Environmental Reserves ***Issues addressed:* *3.6* *understanding ecosystems;* *3.8* *maintaining ecological processes; and* *3.9* *ecological restoration***					
12.1	**Review the reserve network boundaries to propose merging adjacent reserves into single management units.**	**K8:** Re-run service level classification annually to update existing reserve scores and include merged reserves.	Ongoing	EO	Core business
12.1.1	*Opportunistically applied until a systematic analysis is undertaken using MARXAN*	**K9:** MARXAN report available to inform a review of the reserve boundaries and reconfiguration options	Medium term	EO	Core business
12.2	**Develop a priority schedule for BOA assessments on all reserves in order to assess the condition over time following ecological restoration activity.**	**K10:** Repeat BOAs and work plans for all new levy properties handed over after 5 years are available for evaluation of management objectives	Ongoing	EO	Core business

	K11: prepare an annual BOA report.	Ongoing	EO	Core business
12.3 Develop an achievable review schedule for all reserve planning and management documents	**K12:** Review and update all planning documents on all reserves before 2026 (as per service level requirements)	Ongoing	EO	Core business
12.4 Develop a reserve scoring matrix that integrates open space and natural areas data and includes biodiversity (B1-3); size (local, district, regional); recreation (R)	**K13**: Reserve scoring matrix is available for application to planning, management plans and reserve zoning.	Ongoing	EO	Core business
12.5 Review ERNMP *12.5.1 Network Plan Targets to be used as a KPI for annual reporting and review.* *12.5.2 An interim review of the ERNMP will be undertaken in consideration of the corporate strategy review currently underway.* *12.5.3 The plan will be reviewed after 5 years to update reserve network status and identify any emerging issues that are not addressed in the plan* *12.5.4 The plan will be completely reviewed after 10 years.*	**K14:** ERRNP updated as per review schedule.	Medium term	EO	Core business
Goal 13. Maintain information credibility and best practice ***Issues addressed**: **3.5** building great partnerships; and **3.6** understanding ecosystems*				
13.1 Maintain and improve communication opportunities between the natural areas team and boundary stakeholders within the Council organisations: • P&E – Environment and Sustainability Policy(ESP); Development Services; • Corporate Services - Property Management; • Strategic Planning – Open Space Planning; • Community Services - Healthy Places; Cultural Heritage officer. • Infrastructure Services- Parks and Gardens; civil asset management; Environmental Operations (Coastal and Constructed Water bodies and Planning; Community Catchment Partnerships) *13.1.1 Initiate cross team meetings where representatives attend each other's team meeting at least once a year.*	**K15:** Report to IET the outcomes of cross team meetings. **K16:** environmental officers forum *a) bi-monthly seminar series* **b)** *annual or bi-annual environmental officers forum*	Short term Ongoing	EO EO-E&P	Core business Core business
13.2 Improve knowledge of fauna and flora within reserves	**K17:** By 2025, fauna assessments will be completed on all B1 reserves.	Long term	EO	Core business
13.3 Improve data capture and storage for sharing within council *13.3.1 Files* *13.3.2 Spatial* *13.3.3 Open data*	**K18**: By 2025, Flora assessments will be completed on all B1 reserves. **K19:** updated RE species lists available to the team *(flora and fauna?)* **K21**:Reports and records are spatially linked and accessible via Open data applications on Council web page	Long term Short term Long term	EO EO EO-ICTS	Core business Core business New initiative
13.4 **Support the development of a robust regional flora and fauna database and associated protocols and data sharing agreement to improve Council's Flora and fauna data management**	**K22:** council wide database for storage of all fauna and fauna records and reports	Medium term	EO-ICTS	New initiative
13.5 **Establish a technical advisory panel for reviewing management tools, including fauna and flora assessments, BOA's, and reserve management plans**	**K23:** Technical Advisory Panel (TAP) established	Medium term	EO	Core business

MAINTAINING BIODIVERSITY PARTNERSHIP AND COMMUNITY INVOLVEMENT				
Principle 1: Integrated Land Use Planning *Land use planning involves all relevant stakeholders so that ecological, social, cultural and economic concerns are addressed in a balanced and considered way. Collaborative efforts develop co-benefits which also help build support for conservation and ecological restoration.* **Principle 8: Engage stakeholders** *Restoration benefits from collective decisions arising from thoughtful deliberations, which are more likely to be honoured, implemented and sustained over long ecological time horizons and across political changes than are unilateral decisions.* Enhancing restoration activities through community partnerships on council reserves. Partnership and Collaboration will assist the management of boundary issues				
Goal 14 Integrated pest management ***Issues addressed**: **3.1** biodiversity is in decline; **3.5** building great partnerships; **3.7** achieving integrated landscape management; **3.9** ecological restoration; and **3.11** managing growth*				
OBJECTIVES (actions)	**MEASURABLE TARGET**	**TIME**	**LEAD and PARTNER[6]**	**COSTINGS**
14.1 Align with SCC Pest Management Desired Outcomes and associated Specific Outcomes *14.1.1 All stakeholders are committed to and undertake coordinated management of weeds and pest animals* *14.1.2 Reliable information is available as a basis for decision- making.* *14.1.3 Strategic directions are established, maintained and owned by all stakeholders* *14.1.4 Introduction spread and establishment of weeds and pest animals is prevented* *14.1.5 Integrated systems for managing the impacts of established weeds and pest animals are developed and widely Implemented* *14.1.6 Ecological weed **management is a fundamental principle to be applied to control measures on environmental reserves.** (NB: camphor Laurel removal requires a staged program of Camphor-laurel with replacement species fruiting at same time of year for pigeons).*	**P1:** By 2018 all road reserve boundaries on at least 60 reserves have achieved "good" resilience through natural areas and pest management partnership program. **P2:** An interdepartmental meeting schedule in place for collaboration between natural areas and healthy places. *a) Shared resources available on pest management pest animal and plant data collection and management system.* **P3:** By 2018 a fauna monitoring plan will include targeted pest animal issues in environmental reserves. See also target **R7-R9**. - preventing spread of weed and pathogens.	Ongoing Ongoing Ongoing	EO-HP EO-HP EO-HP	Core business Core business Core business
Goal 15 Collaborative ecological restoration activities ***Issues addressed:** **3.1** biodiversity is in decline; **3.5** building great partnerships; **3.7** achieving integrated landscape management; **3.9** ecological restoration and **3.11** managing growth*				
15.1 **Promote ecological restoration principles and practices with council partners and reserve neighbors** ***15.2* Foster community support for the fire management program** *15.2.1 Collaborate with CCP to promote bush regeneration, ecological restoration and fire management practices on Environmental Reserves.* **15.3 Support no net loss of remnant vegetation on the Sunshine Coast as per the "2014 Update for SEQ NRM Plan: Sunshine Coast" target for bushland cover by 2031 is a minimum of 44% (16% of total bushland cover in SEQ.)** *15.3.1 Retain and manage connections at Triunia Biodiversity Link* *15.3.2 Retain and manage Petrie Creek corridor*	**P4:** London Ck Environmental reserve hosts bi-annual conservation field day to educate and promote conservation land management and restoration practices. Ongoing **P5:** CCP representatives and nominated contractors invited to BOA training workshop with Tein McDonald, hosted by natural areas. **P6:** Triunia environmental reserve manager supports hub of partners around Triunia Biodiversity link **P7:** Petrie Creek reserve managers support hub of partners around Petrie Ck corridor.	Ongoing Ongoing Ongoing Ongoing	EO-HP EO EO EO	Core business Core business Core business Core business

[6] **EO-Environmental Operations; HP – Healthy Places; P&E – Planning and Environment; ICTS – Information and Communication Technology Services**

Goal 16 Collaborative implementation of Councils environmental strategies. ***Issues addressed:*** ***3.1*** *biodiversity is in decline;* ***3.5*** *building great partnerships;* ***3.7*** *achieving integrated landscape management;* ***3.9*** *ecological restoration and* ***3.11*** *managing growth*					
16.1	**Support SCC Biodiversity Strategy Actions:**	**P8:** By 2017 the environmental levy fauna monitoring project will review opportunities to establish a citizen science fauna monitoring program (see also K4)	Ongoing	EO	Core business
16.1.1	*Provide more opportunities for involving Traditional Owners in both planning and management of the area's natural assets.*				
16.1.2	*Seek new ways to engage groups that are not traditionally involved in conservation, as well as ways to better engage new arrivals to the Sunshine Coast.*	**P9.** Reserve management plans will include reference to any recovery plans available for EVNT species occurring on site – as per the Environmental Reserve Management Plan template included in Volume III: Environmental Reserves Network management Plan Manual.	Ongoing	EO	Core business
16.1.3	*Develop new opportunities for the community to access and enjoy our natural environments.*				
16.1.4	*Continue to maintain and develop constructive working relationships and partnerships with natural resource management groups and individuals within the region.*				
16.2	**Maintain or establish partnerships with non-government wildlife organisations involved with protecting biodiversity.**	**P10.** Update annually the list of potential fauna conservation organisation partners included in Volume III: Environmental reserves Network management Plan Manual (e.g. Birdlife Australia; fauna watch; FAME; A.W.C).	Medium term	EO	Core business
16.2.1	*Maintain partnership with "Birdlife Australia" Branch currently provides bird survey data in return for access to Environmental reserves.*				
16.3	**Maintain or establish working partnerships with Aboriginal custodians to restore biodiversity and cultural heritage values.**	**P11.** Establishment of all new acquisition properties includes a cultural heritage database search to identify any known significant sites and trigger involvement with local Aboriginal custodians	Ongoing	EO	Core business
16.4	**SCC natural areas team invites traditional owner involvement in reserve management**				
16.4.1	*Identify all sites listed on cultural heritage database register*	**P12**. A dynamic map is developed showing different aboriginal peoples clan areas and Branch to contact for engagement.	Ongoing	EO	Core business
16.4.2	*Identify sites with anecdotal evidence of cultural heritage significance and use this as a trigger for follow up action*	**P13:** Add cultural heritage values to management considerations layer.	Ongoing	EO	Core business
16.4.3	*Identify communication protocols for existing sites with aboriginal cultural heritage records and initiate contact with Aboriginal custodians*				
16.4.4	*If we have known sites or stumble across things we should be inviting aboriginal custodians to inform our decision making.*				
16.5	**Support SCC Waterways and Coastal Management Strategy 2011-2012 outcomes**	**P14**: 100% of cleared riparian areas within reserves are revegetated.	Medium term	EO	Core business
16.5.1	*Prioritise restoration of riparian areas in reserves*				
16.5.2	*Environmental management guidelines are available in the resources section of the ERNMP to guide any capital works activities adjacent to or crossing water bodies in reserves.*	**P15:** all capital works carried out on reserves are delivered in accordance with best practice environmental guidelines for protecting the ecological values of aquatic and associated riparian ecosystems. **Waterways targets: See t P5, P7, R35 and R37**	On going	EO	Core business
16.5.3	*Partner with CCP for water quality monitoring on prioritised reserves*				
16.5.4	*Support waterways education through research partnerships and open days on reserves*				

REPORTING AND REVIEW

Progress towards goals and targets outlined in this plan will be assessed by regular monitoring, evaluation and reporting to investigate the effectiveness of management activities and identify opportunities for improvement. Therefore the schedule for reviewing the ERNMP will occur in stages over the life of the plan as follows:

1. Network plan targets to be used as a KPI for annual reporting and review.
2. An interim review of the ERNMP will be undertaken in consideration of the corporate strategy review currently underway.
3. The plan will be reviewed after 5 years to update reserve network status and identify any emerging issues that are not addressed in the plan
4. The plan will be completely reviewed after 10 years.

Knowledge from evaluating monitoring results will be used to adaptively manage natural resource assets, contribute to reporting against state-wide strategies and policies and identify gaps where new strategic monitoring needs to be undertaken.

Active implementation of this network management plan requires an adaptive management approach to improve individual and organisation's or groups performance.

Steps to achieve this outcome include:
Maintain input from state strategic targets into more specific and locally relevant targets, indicators and measures included in this plan.

Develop or use existing monitoring protocols to ensure quality, objectivity, measurement, confidence levels and credibility of data.

Work with stakeholders to review performance indicators and information necessary to measure program success and progress towards desired outcomes.

Ensure indicators are informative (in terms of their purpose), sensitive to changes in condition or abundance of the natural resource of interest, practical to assess, meaningful (for their purpose) and able to be clearly linked to management activities.

Work with collaborators to ensure measures are feasible in terms of sampling logistics, project costs, training required and commitment to on-going monitoring.

Actively implement adaptive management approaches to meet the organisation's owns needs and to contribute to state-wide strategies and policies.

Plan for adaptive management by identifying assumptions, risks, decision points, key evaluation questions, evaluation processes, evidence and reporting processes to ensure critical resource management decisions are appropriately informed.

Individual reserve reports
Reporting and review of all planning documents has been developed to meet the service level requirements for different types of reserves. Table 4 below shows the review schedule established under the current Service Levels.

Table 4 Review schedule and status of planning and reporting documents required for each type of Reserve.

SCC Protected Area Categories	Management Plan Category	Review schedule
Educational Centre's	Site Plans Management Plans Major Development Plans	
nature Refuges	Conservation Agreements	10yr
Regional Reserve (B1)	Reserve Management Plan	10yr
District Reserve (B2)	Statement of Management Intent	5yr
Local Reserve (B3)	Statement of Management Intent	5yr
Local Amenity Reserve	Work Plan	10yr

5.1 Research and Monitoring

Research and monitoring are important elements of an adaptive management framework.

A range of fauna and flora research projects are carried out across the reserve network by different academic institutions, including Sunshine Coast University. Council provides financial incentives as part of council's research partnership program where SCC has the opportunity to submit research proposals for council managed reserves and similarly tertiary institutions are encouraged to conduct peer reviewed research within council reserves.

SCC also oversees all permit applications, ensuring best practice and compliance with relevant legislation in relation to applications which may interfere with native fauna and flora. Council does not currently advocate a coordinated research programme across the reserve network, therefore research is largely driven externally by the applicants. This is addressed as a proposed action in section 4.2 above (objective 11.02) where it is proposed that a research framework be developed to coordinate targeted research activities which will address Councils reserve management issues.

There are currently two aspects to monitoring across the reserve network,
1) Draft Biodiversity Report Card broad scale monitoring which is related to vegetation extent and indicators of habitat condition across the sunshine coast area; and
2) Environmental Reserve monitoring which specifically addresses management practices on council managed reserves.

The biodiversity report card is based on data collected over 4 years which

can be used to improve council's understanding of the sunshine coast council's biodiversity assets and provide a benchmark against which the effectiveness of council's and the community's biodiversity protection, enhancement and investment efforts could be assessed against when repeated in future years. The following reporting categories are used in the biodiversity report card

Within Council's Environmental Reserve network vegetation condition is monitored across a range of reserves using Bushland Operational Assessments (BOA). This is a systematic methodology developed in partnership with restoration ecologist Tein McDonald, and provides a map of each reserve showing the vegetation condition ranging from poor- excellent. This includes a comprehensive assessment of weed species and cover and resilience based on the regional ecosystems indicators developed for the sunshine Coast, (McDonald, 2015).

A 5 year BOA review of selected B1, B2 and B3 reserves is currently underway with review targets set in section 4.2 framework of actions of this ERNMP. Results from the BOA monitoring will be used to inform the 5 year interim review of the ERNMP.

A fauna monitoring program is also currently being developed for the reserve network which is aimed at reviewing management practices in relation to habitat function. Under this approach the information gleaned from structured monitoring will act like a feedback loop allowing appraisal of specific management strategies.

Regular monitoring also helps to identify emerging issues and appropriate response strategies.

5.2 Best Practice Monitoring and Review of High value reserves:

A broad framework for reporting and review of council's high value reserves has been adapted from the state and commonwealth standards established under the current national Reserve System (NRS) which is referred to as the Monitoring, Evaluation, Reporting and Improvement (MERI) plan. The MERI plan provides a framework to:

- evaluate the contribution of the reserve in Queensland as a protected area to a comprehensive, adequate and representative (CAR) reserve system
- evaluate the effectiveness of the methodology and approach used
- incorporate lessons learned into future work in the area of Land purchased for inclusion in the NRS

Figure 3 shows monitoring and evaluation time-frames and outcomes linked to the management plan objectives of Environmental Reserves. This has been adapted from the national reserve System and SEQ NRM Plan MERI program logic

Outcomes								
Long-term outcomes (20 years)	A well-managed, comprehensive reserve system protecting, in perpetuity, examples of at least ?% of the extant native ecosystems present in the sunshine Coast (Contributes to the long-term and intermediate outcomes of Biodiversity and natural Icons)							
Environment outcomes (5 years)	Reduced threat from invasive species	Thematic links- Ramsar, Coastal Hotspot, HCVAE, WHA	Improved ecological connection	Increased representativeness of regional ecosystems	Increased protection of under-represented	Enhanced resilience of the protected areas to disturbance	Protected native habitat	Matters of national Environmental Significance
Protection and management outcomes (5 years)	The Reserve System is expanded in priority areas and is effectively managed							
	Managers are effectively implementing plans of management				More land (public, private, IPAs) is securely protected as part of the NRS			
Engagement and capacity outcomes (5 years)	Managers have the capacity for effective management planning							
Immediate outcomes (biophysical and non-biophysical outcomes)	High priority areas (including those within under-represented bioregions) are acquired through purchase and will be managed for nature conservation							
Proponent influence activities	Partnership purchases (Discretionary grants)							

Figure 3: MERI Program Logic – adapted from the national Reserve System

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GLOSSARY

Bioregion : an area of land that comprises broad landscape patterns that reflect major structural geologies and climate, as well as major floristic and faunal assemblages (from Sattler and Williams 1999)"

IUCN: International Union for the Conservation of nature. A leading authority on the environment and sustainable development. Founded in 1948, the IUCN is today the largest professional global conservation network.

Land zone: land zones represent major differences in geology and in the associated landforms, soils, and physical processes that give rise to distinctive landforms or continue to shape them. The twelve different land zones in Queensland are defined in Wilson and Taylor (2012) and listed on the Queensland Government web site

Non-remnant vegetation all vegetation that is not mapped as remnant vegetation. May include regrowth, heavily thinned or logged and significantly disturbed vegetation that fails to meet the structural and/ or floristic characteristics of remnant vegetation. It also includes urban and cropping land. Non-remnant vegetation may retain significant biodiversity values

Reference or Best-On-Offer (BOO) site in a regional ecosystem that is mature, and relatively unmodified by human management since European settlement

Reference state the ecological state of a regional ecosystem that is mature, and relatively unmodified by human management since European settlement

Regional ecosystem means a vegetation community in a bioregion that is consistently associated with a particular combination of geology, landform and soil. Regional ecosystems of Queensland were originally described in Sattler and Williams (1999). The Regional Ecosystem Description Database (Queensland Herbarium 2012) is maintained by Queensland Herbarium and contains the current descriptions of regional ecosystems

ACRONYMS

BOA: bushland operational assessment:

CAM: SCC Civil Asset Management

DEHP: Department of Environment and Heritage Protection

DS: SCC Development Services branch

EO: SCC Environmental Operations branch

ESP: SCC Environment and Sustainability Policy branch

EVNT: Endangered Vulnerable or Near Threatened

FAME: Foundation for Australia's Most Endangered species

HP: SCC Healthy Places team

IUCN: International Union for the Conservation of nature

P& E: SCC Planning and Environment department

QPWS: Queensland Parks and Wildlife Service

RE: regional Ecosystem

SP: SCC Strategic Planning branch

SCC: Sunshine Coast Council

SERI: Society for Ecological Restoration International

SEQ: South East Queensland

SEQ NRM: South East Queensland natural Resource Management

APPENDICES

Appendix One

CONSULTATION

Consultation for the ERNMP has included focus groups with the natural Areas operational staff and other stakeholder groups within Council. A steering committee was also formed to provide guidance and feedback for the early and final stages of the plan. The final draft plan is made available on Council's website for comment.

The steering committee includes both internal and external stakeholder representatives including links to natural Resource Management (NRM) groups and community organisations with primary involvement in natural area management across the Sunshine Coast region. The external representative bodies of the steering committee are SEQ Catchments and QPWS. The internal representative groups—some of which also have key links to the community—are SCC Community Conservation Partnerships; SCC Environmental Operations; and SCC Environment and Regional Strategy and Planning.

Draft versions of the plan are provided to the steering committee to be circulated for comment among other key non-government organisations and individuals. The final draft of the plan will be available for public comment on the council website.

Key management goals developed under public consultation for other relevant sectors have also been taken into account in the development of this plan. These include QPWS Master Plan 2020; SEQ NRM Plan 2009-2031; SEQ Back on Track Actions for Biodiversity; and the SEQ Ecosystem Services Framework.

Appendix Two

Steering Committee Members 2012-2013

name	Contact	Organisation
Liz Gould		SEQ Catchments (NGO) – Biodiversity conservation manager • SEQ NRM Plan • Back on Track Species Prioritisation framework
Andrew Davidson		SEQ Catchments (NGO) - Planning and innovation manager • SEQ regional Plan • SSEQ Ecosystem Services Framework
Mick Cubis		QPWS (Qld Gov.) – Sunshine Coast
Denise Lindon		SCC - waterways
Connor Jenkins		SCC – natural Areas coordinator (South region)
David Luhrman		SCC – natural Areas coordinator (North region)
Peter nagel		SCC – natural Areas team leader.
Michael Gilles		SCC – Community conservation partnerships
David Moore		SCC – Regional Strategy and planning • Biodiversity strategy
Glen Fensom		SCC – Regional Strategy and planning • Open Space Strategy • Rec Trails Strategy

Appendix Three

Principles

Current trends in reserve management best practice set the following priorities:

- protect ecosystem service and livelihood benefits for people;
- restore ecosystem processes and protect biodiversity;
- provide special protection for at-risk biodiversity;
- build knowledge and assess risks;
- integrate local and traditional knowledge and values;
- contribute to climate change adaptation and mitigation;
- engage stakeholders.

Eight management principles developed for the Environmental Reserves Network Management Plan 2017-2027, draw on best practice and reflect the recommendations in the national Review of Australia's biodiversity management (2008) and international guidelines for reserve management (Andre et al, 2013, IUCN WCPA, 2012).

Approximately 9% (500.84 ha) of the total area of council's Environmental Reserves comprising 13 of the 542 individual reserves is declared nature Refuge. Therefore management principles in this plan also correspond to those for nature Refuges as per s22 of the nature Conservation Act 1992:
A nature refuge is to be managed to—
(a) conserve the area's significant cultural and natural resources; and
(b) provide for the controlled use of the areas cultural and natural resources; and (c) provide for the interests of landholders to be taken into account

The following planning and management principles propose how the Sunshine Coast Council's Environmental Reserves are to be managed.

Principle 1: Integrated Land Use Planning
Land use planning involves all relevant stakeholders so that ecological, social, cultural, sustainable recreation and economic concerns are addressed in a balanced and considered way. Collaborative efforts develop co-benefits which also help build support for conservation and ecological restoration

Bushland management overlaps, and needs to integrate with, numerous other strategic documents of the Sunshine Coast Council and other non-government and State land management agencies. These include:

- Community groups – SEQ catchments and council's Community Conservation partnerships (CCP).
- SCC Biodiversity Strategy; SCC Open Space Strategy; SCC Waterways and Coastal management Strategy; SCC Climate Change Strategy; SCC Pest Management Plan; SCC Planning Scheme.
- SEQ NRM Plan; SEQ Open Space Strategy; SEQ Ecosystem Services Framework; Back on Track Species Prioritisation Framework.
- SEQ Catchments Strategic Plan.
- QPWS Master Plan.

Principle 2: Contribute to adaptive management.
Adaptive management is applied as a mechanism to address uncertainties associated natural area management and involves learning through doing

and reviewing. There is a strong correlation between effective monitoring and effective management, therefore success relies on adaptive management which is informed by monitoring outcomes. The importance of this will increase under climate change.

Adaptive management is underpinned by a hypothesis or goals based framework where there are expected outcomes that can be reviewed and changed where necessary to adapt to emerging issues and new knowledge. This approach is well suited to council's Environmental Reserves management where the effects of management intervention on ecosystem function are largely unknown, especially in a changing landscape affected by climate change, urban expansion and changing socio-economic expectations.

Principle 3: Protect ecosystem service and livelihood benefits for people
Healthy ecosystems support the ecosystem services which contribute to the Sunshine Coasts capital.

Ecosystem services fundamental to our physical, social, cultural and economic well-being include: provisioning services (e.g. food, fibre, fuel, fresh water); cultural and social services (e.g. recreation, spiritual values, aesthetic values, and knowledge systems); supporting services (e.g. primary production, habitat provision, nutrient cycling, soil formation and retention); and regulating services (e.g. pollination, seed dispersal, climate regulation, pest and disease regulation, water purification) , (MEA, 2005). *NB: nature conservation remains first priority therefore ensure provisioning of natural capital does not inadvertently undermine conservation.*

Principle 4: Support ecosystem health and resilience by restoring ecosystem processes and protecting biodiversity.
Healthy and resilient ecosystems are better able to cope with unexpected changes or impacts and also contribute more effectively to ecosystem services which underpin the Sunshine Coasts environmental economic and social capital.

Ecosystem resilience is the capacity of an ecosystem to tolerate disturbance and maintain function without collapsing into a qualitatively different state that is controlled by a different set of processes. Resilience includes capacity to cope with changes in ecological factors, socio-economic factors, organisational factors and climate change. A resilient ecosystem can withstand shocks and rebuild itself when necessary.

Restoration priorities for protected areas will increasingly address the need to re-establish resilient systems that are capable of absorbing and adapting to climate-driven changes in variables such as temperature, rainfall and extreme weather events; or the need to re-enforce the resilience of systems to prevent them from transitioning across key biotic or abiotic thresholds.

The following actions support ecosystem health and resilience of council's Environmental Reserves.

- Restore regional ecosystem values within reserves
- Restore habitat function within reserves
- Restore strategic landscape connections

- Restore core habitat areas
- Maintain ecological processes
- Promote ecological values

Principle 5: integrate local and traditional knowledge and values.
Cultural heritage and social history associated with natural areas are protected and promoted to preserve the character, identity and traditions of the Sunshine Coast.
Management also recognises and respects Aboriginal traditional Owners connections to the landscape and their role as traditional natural resource managers.

Principle 6: provide special protection for at-risk biodiversity.
The health of natural areas is supported by a focused and coordinated regional approach aimed at protecting rare and threatened species; and endangered and of-concern regional ecosystems.

- Provide special protection for at-risk biodiversity including rare and threatened species and regional ecosystems
- key ecological processes are maintained/reinstated;
- biodiversity linkages are strengthened

Principle 7: build knowledge and assess risks.
Management will aim to support and add to the collective knowledge of the region's biodiversity and ecosystem function. Protected area managers need a clear vision for prioritising management activities. Prioritisation frameworks should include a combination of factors including: determining which actions when conducted promptly will save significant effort in future; risk assessment at several scales; and understanding the broader social and ecological context.

Risks can be minimised by ensuring a robust planning process, which includes a rigorous assessment of the capacity and support for management activities; and is also supported by having effective monitoring processes in place to help make sure that the management activities are having the desired outcome(s).

Principle 8: engage stakeholders
Planning, management and restoration benefits from collective decisions arising from thoughtful deliberations, which are more likely to be honoured, implemented and sustained over long ecological time horizons and across political changes than are unilateral decisions.

Building and maintaining support for reserve management can be helped by the supply of regular and accurate information provided to local communities and others interested in the protected area.

Management activities can include opportunities for meaningful public engagement and visitor experiences that connect people more deeply to their protected areas.